

2nd Edition

*Clinical Techniques*  
*in*  
**SURGERY**



**Muhammad Shamim**

# **Clinical Techniques in SURGERY**

**Comprehensive guide to the art of  
history taking & clinical examination in surgery  
for Undergraduates & Postgraduates**

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# Dedicated To my parents

Muhammad Naseem

Saleha Bano (late)



## Preface

This book has been written with an eye towards both clinical diagnosis in actual patient management, as well as clinical diagnosis in your own practical exam settings. It represents a departure from the usual physical examination teaching tools which, in their attempts to be all inclusive, tend to de-emphasize the practical nature of patient care. As a result, students frequently have difficulty identifying what information is truly relevant, why it's important & how it applies to the actual patient. By approaching clinical surgery in a pragmatic & demystified fashion, the significance of the material should be readily apparent & the underlying principles more clearly understood.

### Format of this book

- Topics of the modules are carefully selected according to the needs of undergraduate surgical students & postgraduate general surgery trainees.
- In particular each module is written to answer the question: "What do I really need to know about this area of patient disease?" The material covered is presented in a concise, ordered fashion that should be readily applicable to the common clinical scenarios that you will actually see in day to day practice.
- Important & relevant points in history taking are given in each module with an emphasis to formulate a working diagnosis before clinical examination.
- Clinical examination techniques are described in step-by-step detail, with aids of photographs.
- Special maneuvers that are frequently utilized or asked in viva examination are also described.
- The rationale for each aspect of the examination is addressed &, where appropriate, relevant pathophysiology discussed.
- In general, students identify their role in patient care either by trial & error, or through the beneficence of more senior students, residents or consultants. This is not particularly efficient & diminishes the potential for learning & fun.

- Colored photographs, as well as illustrations, clearly identifying appropriate clinical techniques are given including a lot of gross clinical photographs.

I hope that this book helps you to master the art of history taking & clinical examination, both for the benefit of your patients & for your excellence in the profession. As the skills required of a surgeon/physician cannot be learned from any single source, I encourage you to make use of as many other references as possible. This should reinforce basic principles & alert you to the fact that there are often many ways of achieving the same end (ie there is frequently no single right way of doing something). What follows, then, serves merely as an introduction. I have tried to capture those core behaviors that define clinical excellence & will have prolonged applicability, even in a technology driven world. The learning process continues (I hope) until the day you stop practicing medicine. There are always new techniques to learn & unusual findings to incorporate into your personal libraries of medical experience. However, unless you take the time to build a solid foundation, you will never have confidence in the accuracy & value of what you can uncover with a sharp mind, agile fingers & a few simple tools!

### Thanks

I am grateful to the following persons, for their valuable helps & suggestions; Mehmood Alam Fatemi, Rashid Fatemi, Dr. Ghazala Arfa, Dr. Shumaila Bano, Shakeel Nawab, Dr. Akram, Dr. Ali Haider, Dr. Naveed Badar, Dr. Abid Owais, Dr. Zoon Norain, Dr. Saima Javed, Dr. Saima Asrar, Dr. Soobia, M. Nadim & M. Aamir Pervaiz.

### Suggestions

Any suggestion for the improvement of this book will be acknowledged with thanks.

**Dr. Muhammad Shamim**

1<sup>st</sup> February, 2016.

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## Contents

(1) History taking _____	1
(2) General physical examination _____	12
(3) Lump _____	33
(4) Ulcer, sinus & fistula _____	45
(5) Chest: respiratory system _____	55
(6) Chest: cardiovascular system _____	69
(7) Chest: breasts _____	81
(8) Chest: esophagus _____	93
(9) Abdomen: gastrointestinal & biliary tracts _____	96
(10) Abdomen: genitourinary tract _____	123
(11) Abdomen: herniae _____	132
(12) Abdomen: anorectum _____	142
(13) Abdomen: external genitalia _____	153
(14) Thyroid gland _____	165
(15) Neck _____	176
(16) Salivary glands _____	183
(17) Peripheral arterial system _____	188
(18) Peripheral venous system _____	197
(19) Lymphatic system _____	204
(20) Nervous system _____	210
(21) History taking & examination proforma _____	a-k

## Classified

### NEW WRITERS REQUIRED

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14. Essentials of General Pathology
15. Essentials of Special Pathology
16. Review of Anatomy

# Module 7

## **History Taking**

### INTRODUCTION

You must keep all your senses on alert, while interviewing or examining the patient. Start your clinical observation the moment patient walks to you (as in outpatient clinics), or you walks to the patient (as in ward). With practice you will be able to pick even minor clues leading to the diagnosis.

Always introduce yourself to the patient. Then try to make the environment as private & free of distractions as possible. This may be difficult depending on where the interview is taking place. The emergency room or non-private patient rooms are notoriously difficult spots. Do the best that you can & feel free to be creative. If the room is crowded, it's OK to try & find alternate sites for the interview. It's also acceptable to politely ask visitors to leave so that you can have some privacy.

When you (medical student, house officer or postgraduate trainee) walks to a patient, always ask permission for interviewing & examination. When a patient walk to you, he/she is mentally prepared to interviewing & examination, but a formal permission is required here too. Remember patients don't like to be the seat of experimentation (eg students coming one by one for eliciting a clinical sign). Always examine an opposite sex patient in the presence of a 'chaperone'.

Obtaining an accurate history is the critical first step in formulating a diagnosis of patient's problem(s), & its subsequent management. A large percentage of the time, you will actually be able to make a diagnosis based on the history alone. The value of the history, of course, will depend on your ability to elicit relevant information. Your sense of

### GENERAL POINTS TO REMEMBER

1. **Keep all your senses on alert.**
2. **Always introduce yourself to the patient.**
3. **Always ask permission for interviewing & examination.**
4. **Ensure patient's dignity & privacy.**
5. **Always examine opposite sex patient in the presence of a chaperone.**
6. **Diagnosis can be made by history alone.**
7. **Identify covert disease states in addition to overt disease.**
8. **Build rapport with the patient.**
9. **Deal with your own discomfort.**

what constitutes important data will grow exponentially in the coming years as you gain a greater understanding of the pathophysiology of disease through increased exposure to patients & illness. However, you are already in possession of the tools that will enable you to obtain a good history. That is, an ability to listen & ask common-sense questions that help defines the nature of a particular problem. It does not take a vast, sophisticated fund of knowledge to successfully interview a patient. In fact seasoned physicians/surgeons often lose site of this important point, placing too much emphasis on the use of testing while failing to take the time to listen to their patients.

Successful interviewing is for the most part dependent upon your already well developed communication skills. What follows is a framework for approaching patient complaints in a problem oriented fashion. The patient initiates this process by describing a symptom. It falls to you to take that information & use it as a springboard for additional questioning that will help to identify the root cause

of the problem. Note that this is different from trying to identify disease states which might exist yet do not generate overt symptoms. To uncover these issues requires an extensive "Review of Systems" (ROS). Generally, this consists of a list of questions grouped according to organ system & designed to identify disease within that area.

If possible, sit down next to the patient while conducting the interview. Remove any physical barriers that stand between yourself & the interviewee (eg put down the side rail so that your view of one another is unimpeded, & make sure to put it back up at the conclusion of the interview). These simple maneuvers help to put you & the patient on equal footing. Furthermore, they enhance the notion that you are completely focused on them. You can either disarm or build walls through the speech, posture & body language that you adopt. Recognize the power of these cues & the impact that they can have on the interview. While there is no way of creating instant intimacy & rapport, paying attention to what may seem like rather small details as well as always showing kindness & respect can go a long way towards creating an environment that will facilitate the exchange of useful information.

### DEALING WITH YOUR OWN DISCOMFORT

Many of you will feel uncomfortable with the patient interview. This process is, by its very nature, highly intrusive. The patient has been stripped, both literally & figuratively, of the layers that protect them from the physical & psychological probes of the outside world. Furthermore, in order to be successful, you must ask in-depth, intimate questions of a person with whom you essentially have no relationship. This is completely at odds with your normal day to day interactions.

There is no way to proceed without asking questions, peering into the life of an otherwise complete stranger. This can, however, be done in a way that maintains respect for the patient's dignity & privacy. In fact, at this stage of your careers, you perhaps have an advantage over more experienced clinicians as you are hyper-aware that this is not a natural environment. Many clinicians become immune to the sense that they are violating a patient's personal space & can thoughtlessly over

step boundaries. Avoiding this is not an easy task. Listen & respond appropriately to the internal warnings that help to sculpt your normal interactions.

### COMPONENT OF HISTORY

1. Patient's data.
2. Present complaint.
3. History of present complaint.
4. Past & associated medical history.
5. Past surgical history.
6. Drugs, allergies & immunization.
7. Substance abuse
8. Menstrual & obstetric history (in females).
9. Family history.
10. Socio-economic history.
11. Review of systems.

### GETTING STARTED

Begin by recording the patient's particulars;

- (1) Name:
- (2) Age (or date of birth):
- (3) Sex:
- (4) Marital status:
- (5) Occupation:
- (6) Religion:
- (7) Ethnic group:
- (8) Residence:

Also record the date of history & examination, & in cases of inpatients the date, time & mode of admission.

### PRESENT ILLNESS

### PRESENTING COMPLAINT (PC)

The patient's reason for presenting to the clinician is usually referred to as the "Chief Complaint."

- (1) Open ended questions are a good way to get the ball rolling. Ask in this way: What's your complaint/problem? What brings you here? How can I help you?
- (2) Don't ask like this: What is the matter? The patient will probably tell you the diagnosis, which might be wrong.

- (3) This must be put in a short statement preferably in patient's own words.
- (4) If there is more than one complaint, list them in order of severity or in chronological order.

**Example**

- (i) Abdominal pain for 2 days.
- (ii) Vomiting for last 24 hours.
- (iii) Abdominal distension for 6 hours.

**HISTORY OF PRESENT COMPLAINT (HOPC)**

- (1) Ideally, you must let the patient to tell the story in their own words without interrupting. Push them to be as descriptive as possible. Afterwards, ask specific questions, using terms readily understood by the patient, either enlarging upon or clarifying their symptoms.

- (2) While it's simplest to focus on a single, dominant problem, patients occasionally identify more than one issue that they wish to address. When this occurs, explore each one individually using general questions which are applicable to any complaint. These include:

- (a) **Duration:** How long this problem present?
- (b) **Location/Radiation:** Is the symptom (eg pain) located in a specific place? Has this changed over time? If the symptom is not focal, does it radiate to a specific area of the body?
- (c) **Severity/Character:** How bothersome is this problem? Does it interfere with your daily activities? Does it keep you up at night?

Try to have them objectively rate the problem. If they are describing pain, ask them to rate it from 1 to 10 with 10 being the worse pain of their life, though first find out what that was so you know what they are using for comparison (eg childbirth, a broken limb, etc.).

Ask them to describe the symptom. When describing pain, ask if it's like anything else that they've felt in the past; knife-like? a sensation of pressure?

- (d) **Have you tried any therapeutic maneuvers?** If so, what's made it better (or worse)?

- (e) **Pace of illness:** Is the problem getting better, worse, or staying the same? If it is changing, what has been the rate of change?

- (f) **Are there any associated symptoms?**

- (g) **Previous history of present complaint(s):** If the patient has had similar symptoms in the past, obtain detailed information in chronological order, including any treatment received & the results of any investigations (if known).

- (h) **What do you think the problem is &/or what are you worried it might be?**

- (i) **Why today?** This is particularly relevant when a patient choose to make mention of symptoms/complaints that appear to be long standing. Is there something new/different today as opposed to every other day when this problem has been present? Does this relate to a gradual worsening of the symptom itself? Has the patient developed a new perception of its relative importance (eg a friend told them they should get it checked out)?

- (3) The content of subsequent questions will depend both on what you uncover & your knowledge base/understanding of patients & their illnesses. The presenting complaint(s) usually points to one system, & other questions related to this system should be asked at this stage.

**Example**

If the patient's chief complaint was abdominal pain you might have uncovered the following:

The pain began 2 days ago in the peri-umbilical area, but for last 24 hours it shifted to the right lower abdomen. It aggravates with movement & coughing, & rapidly goes away by pain killers. It is roughly 5 (on a scale of 1 to 10), & constant. It had never happened before. It is associated with anorexia & low-grade fever, but there is no vomiting, constipation or diarrhea.

This is quite a lot of information. However, if you were not aware that acute appendicitis causes a symptom complex identical to what the patient is describing, you would have no idea what further questions to ask.

- (4) With additional experience, exposure, & knowledge you (the undergraduate students) will learn the appropriate settings for particular lines of questioning. When clinicians obtain a history, they are continually generating differential diagnoses in their minds, allowing the patient's answers to direct the logical use of additional questions. With each step, the list of probable diagnoses is pared down until a few likely choices are left from what was once a long list of possibilities.
- (5) At the completion of the HOPC, you should have a pretty good idea as to the likely cause of a patient's problem. You may then focus your clinical examination on the search for physical signs that would lend support to your working diagnosis & help direct you in the rational use of adjuvant testing.
- (6) Recognizing symptoms/responses that demand an urgent management (eg pain of peritonitis) vs. those that can be handled in a more leisurely fashion (eg pain of chronic cholecystitis) will come with time & experience. All patient complaints merit careful consideration. Some, however, require time to play out, allowing them to either become "a something" (a recognizable clinical entity) or "a nothing," & simply fade away. Clinicians are constantly on the look-out for markers of underlying illness, historical points which might increase their suspicion for the existence of an underlying disease process. More often, however, the challenge lies in having the discipline to continually re-consider the diagnostic possibilities in a patient with multiple, chronic complaints who presents with a variation of his/her "usual" symptom complex.
- (7) You will undoubtedly forget to ask certain questions, requiring a return visit to the patient's bedside to ask, "Just one more thing." Don't worry, this happens to everyone! You'll get more efficient with practice.
- (8) Remember, when presenting the case to your seniors or examiners never say: "According to the patient, he/she was alright \_\_\_ days back."
- (a) It is always the patient who gives the history. However, if the patient is unable to give the history, or you suspect is giving unreliable information, it may be helpful to talk to relatives or witnesses. Then you

must record the source of this & all aspects of the history that are not directly from the patient.

- (b) It is of no matter when the patient was alright before. You are required to mention about the symptoms which are of concern to the patient.
- (c) Present in a manner as given in the example of acute appendicitis above.

### REST OF THE HISTORY

### PAST & ASSOCIATED MEDICAL HISTORY

It's quite amazing how many patients forget what would seem to be important medical events. You will all encounter the patient who reports little past history during your interview yet reveals a complex series of illnesses to resident or consultant. These patients are generally not purposefully concealing information. They simply need to be prompted by the right questions!

- (1) Start by asking the patient if they have any medical problems.
- (2) If you receive little/no response, the following questions can help uncover important past events: Have they ever received medical care? If so, what problems/issues were addressed? Was the care continuous or episodic? Have they ever undergone any procedures, X-rays, CT scans, MRIs or other special testing? Ever been hospitalized? If so, for what?
- (3) Ask specifically about common medical problems: hypertension, diabetes mellitus, tuberculosis, arthritis, angina/myocardial infarction, chronic pulmonary disease. Many of these illness continue life-long, so it is better to use the term, 'past & associated medical history.'

### PAST SURGICAL HISTORY

- (1) Were they ever operated on, even as a child? What year did this occur? Were there any complications? If they don't know the name of the operation, try to at least determine why it

was performed. Encourage them to be as specific as possible.

- (2) Were they ever suffered accident? What was the injury? What treatment they received? Were there any complications?

## DRUGS, ALLERGIES & IMMUNIZATION

### Drugs

Do they take any prescription medicines? If so, what is the dose & frequency? Do they know why they are being treated?

- (1) Medication non-compliance/confusion is a major clinical problem, particularly when regimens are complex, patients older, cognitively impaired or simply disinterested. It's important to ascertain if they are actually taking the medication as prescribed. This can provide critical information as frequently what appears to be a failure to respond to a particular therapy is actually non-compliance with a prescribed regimen.

Identifying these situations requires some tact, as you'd like to encourage honesty without sounding accusatory. It helps to clearly explain that without this information your ability to assess treatment efficacy & make therapeutic adjustments becomes difficult/potentially dangerous.

- (2) If patients are, in fact, missing doses or not taking medications altogether, ask them why this is happening. Perhaps there is an important side effect that they are experiencing, a reasonable fear that can be addressed, or a more acceptable substitute regimen which might be implemented.
- (3) Don't forget to ask about over the counter or "non-traditional" medications. How much are they taking & what are they treating? Has it been effective? Are these medicines being prescribed by a practitioner or self administered?

Encourage them to keep an up to date medication list &/or write one out for them. When all else fails, ask the patient to bring their medicines with them when they return or, if they are in-patients, see if a family member/friend can do so for them.

### Allergies/Reactions

Have they experienced any adverse reactions to medications? The exact nature of the reaction should be clearly identified as it can have important clinical implications.

- (1) Anaphylaxis, for example, is a life threatening reaction & an absolute contraindication to re-exposure to the drug.
- (2) A rash, however, does not raise the same level of concern, particularly if the agent in question is clearly the treatment of choice.

### Immunization

Ask about immunization against tuberculosis, polio, diphtheria, pertusis, tetanus, measles, mumps, rubella, typhoid, hemophilus influenza & hepatitis B, particularly in children.

## SUBSTANCE ABUSE

Get in the habit of asking all your patients these questions as it can be surprisingly difficult to accurately determine who is at risk strictly on the basis of appearance. Remind them that these questions are not meant to judge but rather to assist you in identifying risk factors for particular illnesses (eg HIV, hepatitis). In some cases, however, a patient will clearly indicate that they do not wish to discuss these issues. Respect their right to privacy & move on. Perhaps they will be more forthcoming at a later date.

### Tobacco

- (1) Have they ever smoked cigarettes, cigar, pipe or 'huqqa'? If so, record the frequency, quantity & duration of smoking. If they quit, when did this occur? The packs per day multiplied by the number of years gives the pack-years, a widely accepted method for cigarette-smoking quantification.
- (2) Do they chew tobacco? If so, how much per day, what type of tobacco (tobacco alone, with pan or pan masala) & the duration of abuse?

### Alcohol

Do they drink alcohol? If so, how much per day (week or month), what type of drink & the duration of drink?

**Drug abuse**

Do they abuse heroine, charas or ganja? If so, how much per day (week or month), & the type & duration?

weight & the rate of mental & physical development in early life.

**MENSTRUAL & OBSTETRIC HISTORY (IN FEMALES)****Menstruation**

- (1) When did menstruation begin (menarche)?
- (2) When did it end (menopause)?
- (3) What is the duration & quantity of the menses?
- (4) Is menstruation associated with pain (dysmenorrhea)? When? What is the nature & severity of the pain?
- (5) Is there any abdominal pain midway between the periods (Mittelschmerz)?

**Pregnancies**

Record details of the patient's pregnancies:

- (1) Number.
- (2) Dates.
- (3) Outcome (eg full term vaginal delivery, caesarian section, spontaneous abortion, therapeutic abortion).
- (4) Complications.

**FAMILY HISTORY**

- (1) Your aim is to search for heritable illnesses among first or second degree relatives. Enquire about the health & age, or cause of death (if not alive) of the patient's parents, grandparents, brothers, sisters & children.
  - (a) Most common are coronary artery disease, diabetes mellitus & certain malignancies (eg carcinoma of colon & breast, medullary thyroid carcinoma).
  - (b) In cases of positive history, find out the age of onset of the illnesses, as this has prognostic importance for the patient. For example, a father who had an MI at age 70 is not a marker of genetic predisposition while one who had a similar event at age 40 certainly would be.
- (2) If the patient is a child, enquire about mother's pregnancy, any drugs taken during pregnancy, any difficulty during delivery, patient's birth

**SOCIO-ECONOMIC HISTORY**

These questions do not necessarily reveal information directly related to the patient's health. However, it is nice to know something non-medical about them. This may help improve the patient-physician bond & relay the sense that you care about them as a person. It also gives you something to refer back to during later visits, letting the patient know that you paid attention & really remember them.

**Sexual Activity**

- (1) This is an uncomfortable line of questioning for many clinicians. However, it can provide important information & should be pursued. As with questions about substance abuse, your ability to determine on sight who is sexually active (& in what type of activity) is rather limited.
- (2) By asking all of your patients these questions, the process will become less awkward.
  - (a) Do they participate in intercourse?
  - (b) With persons of the same or opposite sex?
  - (c) Married?
  - (d) Do they use condoms or other means of birth control?
  - (e) Health of spouse?
  - (f) Divorced?
  - (g) Past sexually transmitted diseases?

**Accommodation/Work/Hobbies/Other**

- (1) Ask about the type, place & duration of current living accommodation? Where are they from originally?
- (2) What sort of work does the patient do? Pay special attention to contact with hazards eg dusts & chemicals. Have they always done the same thing? Do they enjoy it? If retired, what do they do to stay busy?
- (3) Any hobbies? Participation in sports or other physical activity?
- (4) Has the patient traveled abroad? When & which country?

### REVIEW OF SYSTEMS (ROS)

History of present complaint consist a detail enquiry of at least one of the body systems. However, patients might have associated or concomitant disease states, which yet do not generate overt symptoms. The existence of these disease states have important influence on surgical decision making. To uncover these issues requires an extensive "Review of Systems" (ROS). Generally, this consists of a list of questions grouped according to organ system & designed to identify disease within that area.

A detailed questions list for each system is given below; however, in a practical sense, it is not necessary to memorize an extensive ROS question list. Rather, you will have an opportunity to learn the relevant questions that uncover organ dysfunction when you review the physical examination for each system individually. In this way, the ROS will be given some context, increasing the likelihood that you will actually remember the relevant questions. These are direct questions that you must ask every patient; remember, negative answers are as important as positive answers. It is very easy to forget to ask some of them. The only way to memorize this list is by taking as many histories as possible & writing them out in full, giving the answer to every question.

**Note:** The heading of personal history is purposefully omitted from description of history taking. The practical point is that the whole history is personal to the patient, & not just the few aspects. Substance abuse has to be mentioned separately, while sleep, appetite, bowel & micturition come under review of systems. So, there is no point in mentioning personal history separately.

### ALIMENTARY SYSTEM

#### ***Appetite***

- (1) Has the appetite increased, decreased, or remained unchanged?
- If it has decreased, is this caused by a lack of desire to eat, or is it due to apprehension because eating always causes pain?

### REVIEW OF SYSTEMS

- 1. Alimentary system**
  - i. Appetite, diet & weight
  - ii. Teeth & taste
  - iii. Swallowing
  - iv. Regurgitation, reflux & heartburn
  - v. Vomiting & hematemesis
  - vi. Flatulence
  - vii. Abdominal pain
  - viii. Abdominal distension
  - ix. Defecation & stool
  - x. Skin color
- 2. Respiratory system**
  - i. Cough
  - ii. Sputum & hemoptysis
  - iii. Dyspnea
  - iv. Chest pain
- 3. Cardiovascular system**
  - a. Heart
    - i. Dyspnea
    - ii. Chest pain
    - iii. Palpitation
    - iv. Cough & sputum
    - v. Dizziness & headache
    - vi. Ankle swelling
  - b. Peripheral vascular
    - i. Intermittent claudication
    - ii. Rest pain
    - iii. Varices
    - iv. Ulceration
    - v. Color changes
- 4. Urogenital system**
  - a. Urinary
    - i. Pain
    - ii. Edema
    - iii. Thirst
    - iv. Micturition & urine
  - b. Genital
    - i. Pain
    - ii. Discharge
    - iii. Intercourse
    - iv. Secondary sex characters
- 5. Nervous system**
  - i. Mental state
  - ii. Cranial nerves
  - iii. Peripheral nerves
- 6. Musculoskeletal system**
  - i. Pain
  - ii. Swelling
  - iii. Limitation in movements
  - iv. Walking
- 7. Metabolism**

- (2) Has the patient developed any food fads what are his special new likes or dislikes?

### **Diet**

What type of food does the patient eat?

### **Weight**

Has the patient's weight changed? How much? How quickly? Many patients never weigh themselves but will have noticed if their clothes have got tighter or looser, or friends may have told them of a change in physical appearance.

### **Teeth & taste**

- (1) Can the patient chew his food? Does he have his own or false teeth?
- (2) Does he get odd tastes & sensations in the mouth?
- (3) Does he get water brash or acid brash, the sudden filling of the mouth with watery or acid tasting fluid (saliva & gastric acid respectively)?

### **Swallowing**

- (1) Does the patient has difficulty in swallowing (dysphagia),
  - Ask about the type of food that causes difficulty, the level at which the food sticks, & the duration & progression of these symptoms.
- (2) Is swallowing painful?

### **Regurgitation & reflux**

Regurgitation is the effortless return of esophageal content (above an obstruction) into the mouth, whereas reflux is passive return of gastroduodenal contents to mouth.

- (1) Does the patient have regurgitation or reflux? What comes up?
- (2) How often does it occur & does anything, such as stooping or straining, precipitate it?

### **Heartburn**

It is a burning sensation behind the sternum caused by the reflux of acid into the esophagus.

How often does it occur? What makes it happen?

### **Vomiting**

- (1) How often does the patient vomit?
- (2) What is the nature & volume of the vomitus? Is it recognizable food from previous meals, digested food, clear acidic fluid or bile-stained fluid?
- (3) Is the vomiting preceded by nausea, pain, headache or giddiness?

- (4) Does it follow eating?

### **Hematemesis**

Always ask the patient if he has ever vomited blood, fresh or altered; old, altered blood looks like coffee grounds. If the patient has had hematemesis, ask if he has had a recent nose bleed.

### **Flatulence**

Does the patient belch frequently? Does this affect any of his other symptoms?

### **Indigestion or abdominal pain**

When the patient gives history of pain, take its detailed history noting its site, time of onset, severity, nature, radiation, progression & precipitating, exacerbating & relieving factors.

### **Abdominal distension**

- (1) Has the patient noticed any abdominal distension? What brought this to his attention?
- (2) When did it begin & how has it progressed? Is it constant or variable?
- (3) What factors are associated with any variations?
- (4) Is it painful? Does it affect respiration?
- (5) Is it relieved by belching, vomiting or defecation?

### **Defecation**

- (1) How often does the patient defecate? The terms diarrhea & constipation are lay words & mean different things to different people. Never use these words in your notes without also recording the frequency of bowel action & the consistence of the feces.
- (2) What are the physical characteristics of the stool?
  - (a) Color → Brown, black, pale, white or silver?
  - (b) Consistence → Hard, soft or watery?
  - (c) Size → Bulky, pellets, string or tape like?
  - (d) Specific gravity → Does it floats or sinks?
  - (e) Smell?
- (3) Has the patient ever passed any blood?
  - (a) How much?
  - (b) Is the blood mixed with or on the surface of the stool, or does it appear after passing the stool?
- (4) Is he passing more gas than usual?
- (5) Has the patient ever passed mucus or pus?
- (6) Is defecation painful? When does the pain begin? → Before, during, after, or at times unrelated to defecation.

**Change of skin color**

Has the patient's skin turned yellow (jaundiced)? When? How long did it last? Were there any other accompanying symptoms such as abdominal pain or loss of appetite? Did the skin itch?

**RESPIRATORY SYSTEM****Cough**

- (1) How often does the patient cough?
- (2) Does the coughing come in bouts? When?
- (3) Does anything, such as a change of posture, precipitate or relieve the coughing?
- (4) Is it a dry or productive cough?

**Sputum**

What is the quantity (teaspoon, dessertspoon, etc.), color, taste, & smell of the sputum? When? Some patients only produce sputum in the morning or when they are in a particular position.

**Hemoptysis**

- (1) Has the patient ever coughed up blood?
- (2) Was it frothy & pink, red streaks in the mucus, or clots of blood?
- (3) What quantity was produced?
- (4) How often does the hemoptysis occur?

**Dyspnea (breathlessness)**

- (1) Does the patient wheeze?
- (2) Does he get breathless?
  - (a) How many stairs can he climb?
  - (b) How far can he walk on a level surface before the dyspnea interferes with the exercise?
  - (c) Can he walk & talk at the same time?
- (3) Is the dyspnea present at rest?
  - (a) Is it present when sitting or lying down? Dyspnea on lying flat is called orthopnea.
  - (b) How many pillows does the patient need at night?
  - (c) Does the breathlessness get worse if the patient slips off his pillows?
  - (d) Does the patient wake at night short of breath?
- (4) Is the dyspnea induced or exacerbated by external factors such as allergy to animals, pollen or dust?
- (5) Does the difficulty with breathing occur with both phases of respiration or just with expiration?

**Pain in the chest**

Ascertain the site, severity & nature of the pain. Chest pains can be continuous, pleuritic (made worse by inspiration), constricting or stabbing.

**CARDIOVASCULAR SYSTEM****Cardiac symptoms****Breathlessness**

Ask the same questions as those described above. Ask for orthopnea, & paroxysmal nocturnal dyspnea (sudden attacks of dyspnea at midnight that waken the patient).

**Pain in the chest**

If present take its detailed history. Ask, does the pain radiate to the neck or to the left arm? Is the pain relieved by rest?

Cardiac pain begins in the midline & is usually retrosternal but may be epigastric. Its nature is often constricting, band like or squeezing. It is usually related to exercise or excitement.

**Palpitations**

These are episodes of tachycardia which the patient appreciates as a sudden fluttering or thumping of the heart in the chest.

**Cough & sputum**

Ask the same questions as those described above.

**Dizziness & headaches**

These symptoms may be associated with a labile blood pressure, hypotension or hypertension.

**Ankle swelling**

- (1) Do the ankles or legs swell? When? How much?
- (2) What is the effect of bed rest &/or elevation of the leg on the swelling?

**Peripheral vascular symptoms**

- (1) Does the patient get pain in the leg muscles on exercise (intermittent claudication)?
  - (a) Which muscles are involved?
  - (b) How far can he walk before the pain begins?
  - (c) Is the pain so bad that he has to stop walking?
  - (d) How long does the pain take to wear off?
  - (e) Can he walk the same distance again?
- (2) Is there any pain in the limb at rest?

- (a) Which part of the limb is painful?
  - (b) Does the pain interfere with sleep?
  - (c) What analgesic drugs give relief?
  - (d) What positions relieve the pain?
  - (e) Are the extremities of the limbs cold?
  - (f) Are there color changes in the skin, particularly in response to a cold environment?
  - (g) Does the patient experience any paresthesiae in the limb, such as tingling or numbness?
- (3) Does the patient have any visible or prominent veins? Ask for the location & extent.
  - (4) Is there any ulceration? Whether it is painful & discharging pus?

## UROGENITAL SYSTEM

### Urinary tract symptoms

#### **Pain**

Has there been any pain in the loin, groin or suprapubic region? What is its nature & severity? Does it radiate to the groin or scrotum?

#### **Edema**

Do any parts of the body, not just the ankles, swell?

#### **Thirst**

Is the patient thirsty? Does he drink excessive volumes of water?

#### **Micturition**

- (1) How often does the patient pass urine? Express this as a day/night ratio.
- (2) How much urine is passed?
- (3) Is micturition painful? What is the nature & site of the pain?
- (4) Is there any difficulty with micturition, such as a need to strain or to wait? Is the stream good? Can it be stopped at will? Is there any dribbling at the end of micturition?
- (5) Does the bladder feel empty at the end of micturition or does he have to pass urine a second time?

#### **Urine**

- (1) What is the color, smell & quantity of the urine?
- (2) Has the patient ever passed blood in the urine? When & how often?
- (3) Has he ever passed gas bubbles with the urine (pneumaturia)?

### **Other symptoms**

Also ask about headache, drowsiness, visual disturbance, fits & vomiting, because these are the symptoms of uremia.

### Genital tract symptoms

#### **In males**

- (1) Has the patient any pain in the penis or urethra, at rest, during micturition or intercourse?
- (2) Is there any difficulty with retraction of the prepuce (in un-circumcised males) or any urethral discharge?
- (3) Has the patient noticed any swelling of the scrotum?
- (4) Can he achieve an erection & ejaculation?
- (5) When did secondary sexual characters appear?

#### **In females**

- (1) Menstrual & obstetric history (described above).
- (2) Is intercourse painful (dyspareunia)?
- (3) Do the breasts change during the menstrual cycle? Are they ever painful or tender? Are there any swellings or lumps in the breasts? Did the patient breast feed her children?
- (4) When did secondary sexual characters appear?

## THE NERVOUS SYSTEM

### **Mental state**

- (1) Is the patient placid or nervous?
- (2) Has he noticed any changes in his behavior or reactions to others? Patients will often not appreciate such changes themselves & these questions may have to be asked of close relatives.
- (3) Does the patient get depressed & withdrawn, or excitable & extroverted?

### **Brain & cranial nerves**

- (1) Does the patient ever become unconscious or stuporous?
- (2) Does he ever have fits?
  - (a) What happens during a fit? It is often necessary to ask a relative or a bystander to describe the fit.
  - (b) Did the patient lie still or jerk about, bite his tongue, pass urine?
  - (c) Was he sleepy after the fit?

- (d) Did he have any warning (an aura) that the fit was about to develop?
  - (e) Has there been any subsequent change in the senses of smell, vision & hearing?
- (3) Is the face ever weak or paralyzed?

**Peripheral nerves**

- (1) Are any limbs or part of a limb weak or paralyzed?
- (2) Is there ever any loss of cutaneous sensation (pain, light touch & temperature)?
- (3) Does the patient experience any paresthesiae (tingling, pins & needles) in the limbs?

**MUSCULOSKELETAL SYSTEM**

- (1) Ask if the patient suffers from pain, swelling, or limitation of the movement of any joint? What precipitates or relieves these symptoms?
- (2) Are any limbs or groups of muscles weak or painful?
- (3) Can he walk normally?
- (4) Has he any congenital musculoskeletal deformities?

**METABOLISM**

Record the patient's weight & appetite, & any recent changes in either. (Note: These are described either in alimentary system or in metabolism, & there is no need of repetition).

Ask if growth has been normal in rate & quantity. Has the patient noticed any abnormality of body growth & development?

# Module 2

## General Physical Examination

### INTRODUCTION

The students beginning their clinical training will be surprised at the formal way this examination is taught & performed. They should remember that it ensures a thorough examination & that important signs are not overlooked because of a haphazard method. Masters the clinical techniques as being taught in this book, & don't care for time; you will gain speed & efficiency with constant & repetitive patient practice.

For clinical examinations (final year or post-graduation), the examiners expect all candidates to have a polished & thorough formal examination method. This formal approach leads to the examination of parts of the body in systems. The attention of the examining doctor is directed particularly towards those systems identified in the history as possibly being diseased, but of course proper physical examination requires that all the systems are examined. Within each of these examining systems one can describe four elements which comprise the main parts of the physical examination: looking (inspection), feeling (palpation), tapping (percussion) & listening (auscultation). These will each be discussed in detail in the following modules.

### GETTING STARTED

- (1) Reassure the patient, explaining the nature of physical examination.
- (2) Make the patient comfortable & relaxed, keeping inconvenience to the minimum.
- (3) A warm environment is essential &, similarly, yours (the examiner's) hands must be warm; in cold weather rub your hands to get it warm.
- (4) The privacy of a small room or a curtained area is desirable, with optimal preferably natural lighting.
- (5) The patient undresses down to underclothes & puts on a dressing gown. They then lie supine on a couch, with an adjustable back to provide head support covered with a sheet or blanket.
- (6) Each region must be adequately exposed as required without embarrassment to the patient; remember to expose both sides when examining paired structures in order to compare the diseased with the normal, eg a limb or breast.
- (7) A chaperon may be appropriate when examining members of the opposite sex. Relatives are usually best excluded except when examining children.
- (8) By convention, patients are always examined from the right side of the bed, even when you are left handed. When students learn this they often feel safer standing on the left side of the bed with their colleagues in tutorial groups, but many tutors are aware of this device.
- (9) It is usual to commence with the general examination; always spend some time on looking at the patient's general appearance, which may give many clues to the diagnosis. This is followed by systematic examination.
- (10) The examination time should not be prolonged in ill or frail patients &, in emergencies, it may be appropriate to concentrate on diseased areas, completing a routine examination at a later time.

**GENERAL IMPRESSION**

**FIRST IMPRESSION**

First impression of a patient's condition must be made while you are taking the history. Decide how sick the patient seems to be ie, does he look generally ill or well. Look at the patient's general state of health, build & nutrition, posture, state of hygiene, & mental & physical activity.

**Examples**

- (1) The cheerful patient sitting up in bed who looks the picture of good health is unlikely to require urgent attention to save his life.
- (2) At the other extreme, the patient on the verge of death may be described as in extremis or moribund. The patient may be lying still in bed & seem unaware of his surroundings. The face may be sunken & expressionless, respiration may be shallow & labored, & at the end of life respiration often becomes slow & intermittent, with longer & longer pauses between rattling breaths.

**MENTAL STATUS**

- (1) Make a note of patient's behavior; it is greatly influenced by the disease, particularly if there is pain or a problem of ano-genital area. This may be manifest by facial expression, the degree of eye contact, restlessness, sweating, anxiety, apathy, depression, embarrassment, lack of cooperation or aggression.
- (2) Note the patient's level of consciousness, & orientation in time, place & person. Drugs, head injuries & other diseases of CNS can affect the level of consciousness, varying through alert, slow & confused, lacking concentration & reduced level of response to spoken & physical stimuli. Glasgow coma scale (table 2.1) is a valuable way of documenting the level of consciousness for serial measurement.

The syndrome of hepatic encephalopathy, due to decompensated advanced cirrhosis (chronic liver failure) or fulminant hepatitis (acute liver failure), is an organic neurological

**Table 2.1: GLASGOW COMA SCALE (GCS)**

<b>Eye opening</b>	
Spontaneous	4
To voice	3
To pain	2
None	1
<b>Verbal response</b>	
Orientated	5
Confused	4
Inappropriate words	3
Incomprehensible sounds	2
None	1
<b>Motor response</b>	
Obeys command	6
Localizes pain	5
Withdraws (pain)	4
Flexion (pain)	3
Extension (pain)	2
None	1
<b>Total</b>	<b>3-15</b>

disturbance. The patients eventually become stuporous & then comatose.

- (3) Make a note of the patient's speech. This may be impaired by diseases of CNS (producing dysphasia or dysarthria), & there may be voice changes such as hoarseness in laryngeal infection or myxedema. Impairment of motor function can produce weakness or spasticity & these may affect the speech.

**BODY HABITUS, BUILD, POSTURE & GAIT**

**Table 2.2: EXAMPLES OF BODY HABITUS**

<b>Endocrine</b>	
1) Acromegaly	
2) Cushing's syndrome	
3) Hypopituitarism	
4) Pseudohypoparathyroidism	
5) Rickets	
6) Paget's disease	
<b>Musculoskeletal</b>	
1) Marfan's syndrome	
2) Turner's syndrome	
3) Klinefelter's syndrome	
4) Achondroplasia	

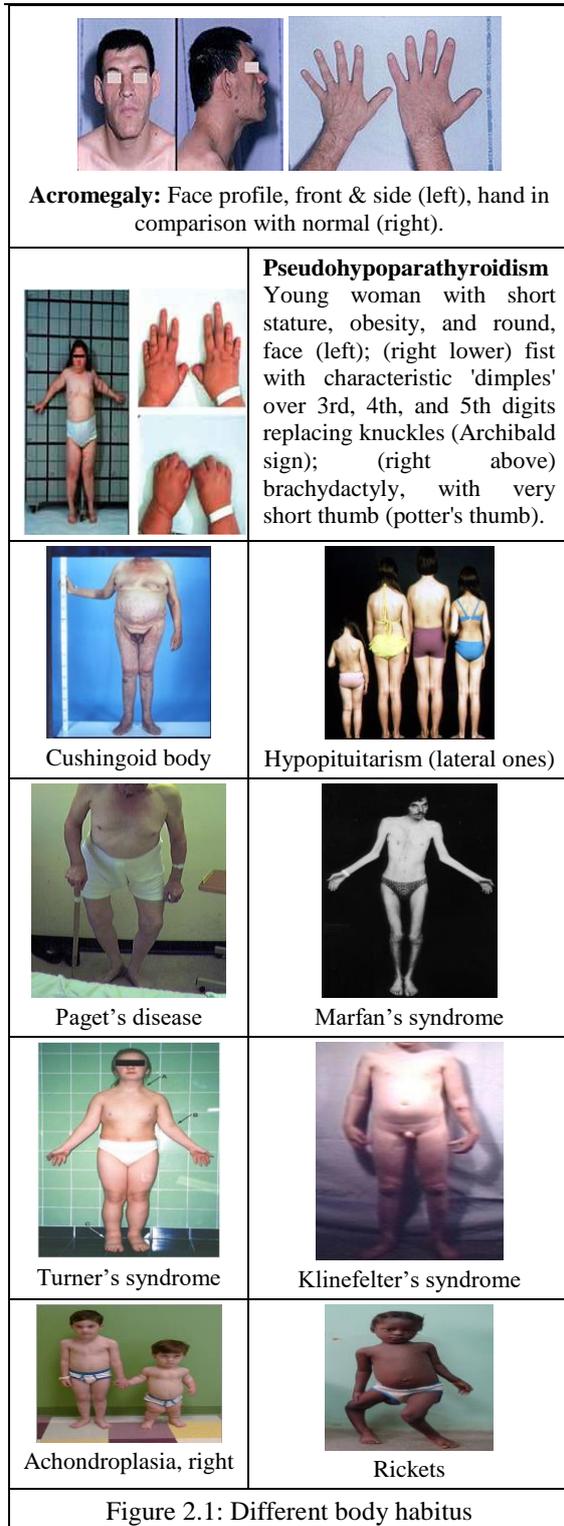


Figure 2.1: Different body habitus

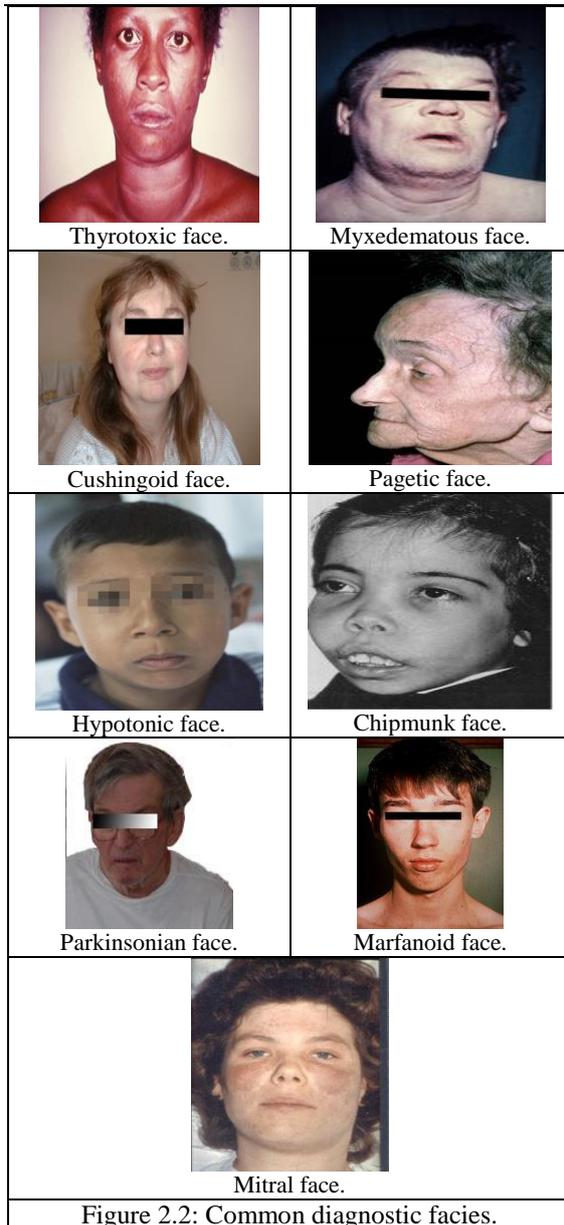
- (1) A number of body shapes are almost diagnostic of different conditions (table 2.2, figure 2.1).
  - (a) Look specifically for obesity.
  - (b) Also look for wasting of the muscles, which may be due to neurological or debilitating disease. Cachexia & wasting are present in malignancy. Folds of loose skin may be visible hanging from the abdomen & limbs suggesting recent weight loss.
- (2) Note excessively short or tall stature, which may be better judged in the standing position.
- (3) Inspect for limb deformity or missing limbs (rather embarrassing if missed in viva-voce examination) & observe if the physique is consistent with the patient's stated chronological age.
- (4) Note if there are any added movements;
  - (a) Fine tremors of age, thyrotoxicosis, Parkinsonism & alcoholism.
  - (b) Flapping tremors of hepatic, respiratory, renal & cardiac failure.
  - (c) Involuntary movements due to specific neurological abnormalities.
- (5) Examine the gait, especially if the patient walks into the examining room (details are given in module 20).

### FACIES

Some facial characteristics are so typical of certain diseases that they immediately suggest the diagnosis & are called the diagnostic facies (table 2.3, figure 2.2). Apart from these, there are several other important abnormalities that must be looked for in the face.

**Table 2.3: COMMON DIAGNOSTIC FACIES**

- 1) Acromegalic
- 2) Thyrotoxic
- 3) Myxedematous
- 4) Cushingoid
- 5) Pagetic
- 6) Myopathic
- 7) Hypotonic
- 8) Parkinsonian
- 9) Chipmunk (thalassemia)
- 10) Marfanoid
- 11) Mitral
- 12) Hippocratic (terminal peritonitis)



**FACE**

**ANEMIA (PALLOR)**

Anemia is defined as a decrease in the concentration

of hemoglobin in the blood. Normal hemoglobin in men is 14-18 g/dL, while in women it is 12-16 g/dL.

Clinically anemia can be detected by the pallor of skin & mucous membranes. It depends on the thickness & quality of skin, & the amount & quality of blood in capillaries. Thus, pallor may be a normal variant due to a deep lying capillaries & opaque skin.

**Grading**

The WHO system places anemic patients in 5 grades (table 2.4). However, this system does not distinguish between men & women (despite men normally having higher hemoglobin), & that some patients may have significant symptoms and a significant decline in quality of life from anemia despite not having even a mild anemia under the WHO guidelines.

Grade	Hemoglobin
0 (within normal limits)	11.0 g/dL
1 (mild)	9.5-10.9 g/dL
2 (moderate)	8.0-9.4 g/dL
3 (severe)	6.5-7.9 g/dL
4 (potentially life threatening)	<6.5 g/dL

However, this is biochemical grading. Compare your clinical assessment with the lab report. With repeated practice you will be able to pick different grades of anemia; but remember, this is at best a crude assessment of anemia.

**Clinical techniques**

Anemia can be looked at the following sites.

- (1) **Conjunctiva of lower eyelid**  
Ask the patient to look upwards, & pull the lower eyelid down (figure 2.3). See the color of blood in capillaries showing through the transparent mucous membrane of conjunctiva. Normally this is pink or pinkish-red, but in anemia it appears pale.
- (2) **Mucosa of oral cavity**  
Ask the patient to open the mouth, & see the color of mucosa overlying tongue, buccal cavity & palates.
- (3) **Nails**



Figure 2.3: Pale lower conjunctiva in anemia.

Inspect the color underneath the nails, & compare it with your nails.

**(4) Hands**

Inspect the color of palmar creases, & compare it with your own.

**(5) Skin**

Look at the skin color. Pallor is more apparent in fair skinned patients. The skin will also appear cold & clammy in anemia due to hemorrhagic shock.

### Causes of anemia

**(A) Hemorrhage (blood loss)**

- (1) Acute: trauma.
- (2) Chronic: lesions of GI tract, gynecologic disturbances.

**(B) Increased rate of RBCs destruction (hemolytic anemia)**

**(1) Intrinsic abnormalities of RBCs**

- (a) Hereditary spherocytosis.
- (b) Hereditary elliptocytosis.
- (c) Disorders of hemoglobin synthesis
  - (i) Thalassemia syndromes.
  - (ii) Sickle cell anemia.
- (d) Red cell enzyme deficiencies, eg pyruvate kinase, hexokinase, G6PD, glutathione synthetase.
- (e) Paroxysmal nocturnal hemoglobinuria

**(2) Extrinsic abnormalities**

- (a) Antibody mediated, eg transfusion reactions, drug reactions, SLE, erythroblastosis fetalis, idiopathic.
- (b) Mechanical trauma to red cells as in microangiopathic hemolytic anemias, eg thrombotic thrombocytopenic purpura, DIC.
- (c) Infections, eg malaria.

**(C) Impaired red cell production**

- (1) Disturbance of proliferation & stem cells differentiation: aplastic anemia, pure red cell aplasia, anemia of renal failure, anemia of endocrine disorders.
- (2) Disturbance of proliferation & maturation of erythroblasts
  - (a) Defective DNA synthesis: deficiency or impaired utilization of vitamin B12 & folic acid (megaloblastic anemia).
  - (b) Defective hemoglobin synthesis
    - (i) Deficient heme synthesis: iron deficiency.
    - (ii) Deficient globin synthesis: thalassemias.
  - (c) Unknown or multiple mechanisms: sideroblastic anemia, anemia of chronic infections, myelophthisic anemia due to marrow infiltrations.

### JAUNDICE

Jaundice refers to yellow discoloration of the skin, sclerae & mucosa resulting from an increased bilirubin concentration in the body fluids. Normal plasma level is 5-17  $\mu\text{mol/L}$  (0.2-1.3 mg/dl). It is detectable clinically when the plasma bilirubin exceeds 50  $\mu\text{mol/L}$  (3 mg/dl).

When the plasma bilirubin level rises to about twice the upper limit of normal, bilirubin is deposited in the tissues of the body & particularly in those tissues which contain elastin. It then stains the sclerae (which are rich in elastin fibers) & affects the color of the skin. The sclerae are rarely affected by other pigment changes, & in fact, jaundice is the only condition causing yellow sclerae. Other causes



Figure 2.4: Yellow discoloration of sclera in jaundice.

of yellow discoloration of the skin, but where the sclerae remain normal, are carotenemia (usually due to excess consumption of carotene, eg carrots or mangoes), & acriflavine, fluorescein & picric acid ingestion.

Internal tissues & body fluids are also colored yellow, but not the brain as bilirubin does not cross the blood-brain barrier other than in the immediate neonatal period.

### Clinical techniques

Jaundice can be looked at the following sites.

#### (1) Sclerae

Ask the patient to look downwards, & retract the upper eyelid up. See the color of sclera, which appears yellow in jaundice (figure 2.4).

#### (2) Mucosa of oral cavity

Ask the patient to open the mouth, & see the color of mucosa overlying under surface of tongue, & rest of the oral cavity.

#### (3) Skin

- (a) Look at the skin color. In jaundice, there is yellow discoloration of skin & this may progress to yellow/orange or even dark brown with high levels of plasma bilirubin.
- (b) Also look for scratch marks, which may be prominent due to associated pruritus, in patients with obstructive or cholestatic jaundice. Students often fail to note this, especially in the exam. Make it your routine to fully inspect the whole skin in patients with jaundice.

### Causes of jaundice

#### (A) Predominantly indirect (unconjugated) hyperbilirubinemia

##### (1) Excess production of bilirubin

- (a) Hemolytic anemias.
- (b) Resorption of blood from internal hemorrhage, eg GI tract bleeding, hematomas.
- (c) Ineffective erythropoiesis syndromes
  - (i) Pernicious anemia.
  - (ii) Thalassemia.

##### (2) Reduced hepatic uptake

Drug interference with membrane carrier systems.

##### (3) Impaired bilirubin conjugation

- (a) Physiologic jaundice of the newborn.

- (b) Breast milk jaundice.
- (c) Crigler-Najjar syndrome.
- (d) Gilbert syndrome.
- (e) Diffuse hepatocellular disease, eg viral or drug induced hepatitis, cirrhosis.

#### (B) Predominantly direct (conjugated) hyperbilirubinemia

##### (1) Decreased hepatic excretion of bilirubin glucuronides

- (a) Dubin-Johnson syndrome.
- (b) Rotor's syndrome.
- (c) Drug-induced canalicular membrane dysfunction, eg oral contraceptives, cyclosporine.
- (d) Hepatocellular damage or toxicity, eg viral or drug-induced hepatitis, total parenteral nutrition, systemic infection.

##### (2) Decreased intrahepatic bile flow

- (a) Impaired bile flow through bile canaliculi, eg drug-induced micro-filament dysfunction.
- (b) Inflammatory destruction of intra-hepatic bile ducts
  - (i) Primary biliary cirrhosis.
  - (ii) Primary sclerosing cholangitis.
  - (iii) Graft-versus-host disease.
  - (iv) Liver transplantation.

##### (3) Extrahepatic biliary obstruction

- (a) Gallstone obstruction of biliary tree.
- (b) Carcinomas of head of pancreas, extrahepatic bile ducts, ampulla of Vater.
- (c) Extrahepatic biliary atresia.
- (d) Biliary strictures.
- (e) Choledochal cysts.
- (f) Primary sclerosing cholangitis.
- (g) Liver fluke infestation.

### CYANOSIS

This refers to a blue or purple discoloration of the skin & mucous membranes due to increase amount of deoxygenated (reduced) hemoglobin (HbFe<sup>+2</sup>) in superficial blood vessels. It occurs, if more than 5 g/dl of deoxygenated hemoglobin is present in the blood. Usually the oxygen saturation of the blood has to drop below 85% before this occurs. It does not occur in anemic hypoxia because

the total hemoglobin content is low.

### **Central cyanosis**

There is an abnormal amount of deoxygenated hemoglobin in the arteries, due either to imperfect oxygenation of blood in the lungs, or mixture of arterial & venous blood in the presence of right-to-left shunts in the heart. Cyanosis is general, being evident in parts of the body with a good circulation, especially the tongue. Cyanosed extremities are felt warm.

### **Peripheral cyanosis**

This occurs when the blood supply to a certain part of the body is reduced & the tissues extract more oxygen than normal from the circulating blood eg, the lips in cold weather are often blue, but the tongue is spared. Cyanosed part is felt cold.

### **Methemoglobinemia**

- (1) Normally, as much as 2% of hemoglobin is in the form of methemoglobin (metHb), the oxidized form of hemoglobin ( $\text{HbFe}^{+3}$ ). Because metHb is unable to bind with oxygen, arterial oxygen saturation is reduced by the same amount that metHb is increased.
- (2) MetHb imparts an intense bluish tinge to the skin; therefore, the cyanosis that comes with methemoglobinemia is not related to reduced hemoglobin but to oxidized hemoglobin.
- (3) Methemoglobinemia usually occurs as a drug reaction:
  - (a) Nitrite or nitrate-containing compounds (eg, nitroglycerin).
  - (b) Dapsone.

### **Sulfhemoglobinemia**

Sulfhemoglobinemia is caused by sulfur binding with hemoglobin so that oxygen cannot be bound. Unlike metHb, the iron moiety remains in the reduced state ( $\text{HbFe}^{+2}$ ). It also imparts an intense bluish color to the skin.

### **Pseudocyanosis**

Pseudocyanosis is a bluish tinge to the skin &/or mucosa that is not associated with either hypoxemia or peripheral vasoconstriction. Most causes are related to metals (eg, silver nitrate, silver iodide, silver, lead) or drugs (eg, phenothiazines, amiodarone, & chloroquine hydrochloride).

### **Clinical techniques**

Look for bluish discoloration at the following sites;



Figure 2.5: Cyanosis of nail beds.

- (1) Tongue.
- (2) Mucosa of oral cavity.
- (3) Lips.
- (4) Tip of nose.
- (5) Ear lobes.
- (6) Under the nails (figure 2.5).

### **Causes of cyanosis**

#### **Central cyanosis**

- (1) Decreased arterial oxygen saturation
  - (a) Decreased concentration of inspired oxygen: high altitude.
  - (b) Lung diseases: chronic airflow limitation with cor pulmonale, massive pulmonary embolism.
  - (c) Right-to-left cardiac shunt (cyanotic congenital heart disease).
- (2) Polycythemia.
- (3) Hemoglobin abnormalities: methemoglobinemia, sulphhemoglobinemia.
- (4) Methylene blue (given for cardiac investigation).

#### **Peripheral cyanosis**

- (1) All causes of central cyanosis cause peripheral cyanosis.
- (2) Exposure to cold.
- (3) Reduced cardiac output: left ventricular failure or shock.
- (4) Arterial or venous obstruction.

### **HAIRS & CONTOUR**

- (1) Note the abnormal distribution of hairs, eg bearded or bald ladies, & hairless men. These may be due to endocrine disease.

- (2) Generalized weight loss may be apparent in changing facial & cervical contours.
- (3) Note the presence of edema, which may be obvious within the face, particularly the eyelids, after a night's sleep.
  - (a) Regional edema of the head, neck & upper limbs is seen in superior vena cava obstruction.
  - (b) Edema of myxedema may be particularly obvious in the eyelids, associated with skin & hair changes.

## MOUTH

The examination of mouth reveals a local pathology, or gives clue to a systemic illness.

### Breath

The breath must be smelled for halitosis (offensive or abnormal — feter oris), which may indicate respiratory, upper gastrointestinal or systemic disease.

#### Clinical technique

Unless the smell is obvious one should get a patient to exhale through the mouth while one sniffs a little of the exhaled air.

#### Causes of feter oris

- (1) Faulty oral hygiene, purulent oral infection, & oral candidosis.
- (2) Nasal & sinus infections & degenerative tumors.
- (3) **Feter hepaticus:** It is like a dead mouse or sweet fecal smell. It is an indication of severe hepatocellular disease, & may be due to the chemical methylmercaptan. This is exhaled in the breath, being derived from methionine when this amino acid is not demethylated by diseased liver. Severe feter hepaticus, filling the patient's room, is a bad sign & indicates a precomatose condition.
- (4) Ketosis (diabetic keto-acidosis results in excretion of ketones in exhaled air causing a sickly sweet smell).
- (5) Uremia (fish breath — an ammoniacal odor).
- (6) Alcohol (distinctive).
- (7) Paraldehyde.
- (8) Putrid (due to anaerobic chest infections with large amounts of sputum).

- (9) Alimentary diseases (gastroenteritis, obstruction of the pylorus & small or large gut).

## Teeth, gums & buccal mucosa

### Clinical techniques

- (1) A good light is essential.
- (2) A spatula allows movement of the lips, cheeks & tongue to inspect all areas.
- (3) Palpation is with a gloved finger, the second hand being used for bimanual exploration of the floor of mouth & the cheeks. The tongue may be pulled forward by holding it with a swab to examine its sides & the adjacent structures.

### Clinical findings

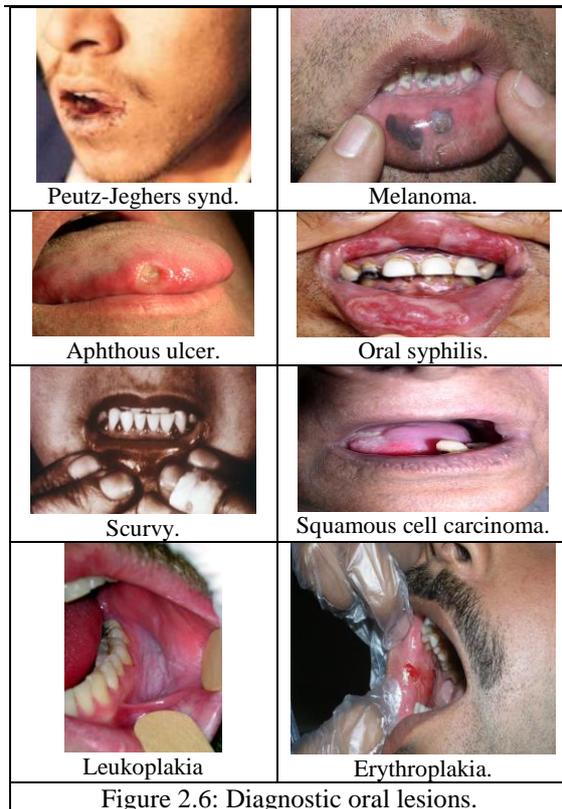
- (1) Look first at the state of the teeth & note whether they are real or false. False teeth will have to be removed for complete examination of the mouth. Loose fitting false teeth may be responsible for ulcers, & decayed teeth may be responsible for fetor.
- (2) Note if there is gum hypertrophy.

#### Causes of gum hypertrophy

- (a) Phenytoin.
- (b) Pregnancy.
- (c) Scurvy (vitamin C deficiency — the gums become spongy, red, bleed easily & are swollen & irregular).
- (d) Gingivitis, eg Vincent's angina.
- (e) Leukemia (monocytic).
- (3) Note if there is any pigmentation in the mouth.

#### Causes of pigmented lesions in the mouth

- (a) Heavy metals
  - (i) Lead or bismuth → Blue black line on the gingival margin.
  - (ii) Iron (hemochromatosis) → Blue grey pigmentation of hard palate.
- (b) Drugs: Antimalarials, oral contraceptive pill (brown or black areas of pigmentation anywhere in the mouth).
- (c) Addison's disease → Blotches of dark brown pigment anywhere in the mouth.
- (d) Peutz-Jeghers syndrome → Melanin spots on lips, buccal mucosa or palate.
- (f) Malignant melanoma → Raised, painless black lesions anywhere in the mouth.



- (4) Note if there is any ulcerated lesion in the mouth, including tongue.

#### Causes of mouth ulcers

- Aphthous ulcers.
  - Drugs eg, steroids.
  - Trauma, eg ill-fitting dentures.
  - Gastrointestinal diseases: Crohn's disease, ulcerative colitis, celiac disease.
  - Rheumatological disease: Behcet's syndrome, Reiter's disease.
  - Erythema multiforme.
  - Infection
    - Viral: Herpes zoster, herpes simplex
    - Bacterial: Syphilis (primary chancre, secondary snail tract ulcers, mucous patches), tuberculosis.
  - Malignant ulcers: Squamous cell carcinoma, malignant melanoma.
- (5) Note if there is any premalignant lesion in the mouth.

#### Causes of premalignant lesions in the mouth

- Leukoplakia:** It is defined as 'any white patch or plaque that cannot be

characterized clinically or pathologically as any other disease'.

- Erythroplakia:** It is defined as 'any lesion of the oral mucosa that presents as bright red velvety plaques which cannot be characterized clinically or pathologically as any other recognizable condition'.
- Oral submucous fibrosis:** It is a progressive disease in which fibrous bands form beneath the oral mucosa. These bands progressively contract so that ultimately opening of mouth is severely limited.

#### Tongue

- Thickened epithelium with bacterial debris & food particles commonly causes a coating over the tongue especially in smokers. It is rarely a sign of disease & is more marked on the posterior part of the tongue where there is less mobility & the papillae desquamate more slowly.
- Lingua nigra (black tongue) is due to elongation of papillae over the posterior part of the tongue which appears dark brown because of the accumulation of keratin. There is no known cause; bismuth compounds may also cause a black tongue.
- Geographical tongue is a term used to describe slowly changing red rings & lines which occur on the surface of the tongue. Occasionally it is painful & the condition tends to come & go. It may be due to riboflavin (vitamin B2) deficiency.
- Leukoplakia & erythroplakia can involve the tongue.
- The term glossitis is generally used to describe a smooth appearance of the tongue which may also be erythematous. The appearance is due to atrophy of the papillae, & in later stages there may be shallow ulceration. These often occur as a result of nutritional deficiencies; deficiencies of iron, folate & the vitamin B group, especially vitamin B12, are common causes.
- Enlargement of the tongue (macroglossia) may occur in congenital conditions such as Down's syndrome, or in endocrine disturbances such as cretinism or acromegaly. It can also occur due to tumor infiltration (eg hemangioma or

- lymphangioma).
- (7) Fungal infection with candida albicans (thrush) causes creamy white curd like patches in the mouth which are removed only with difficulty & leave a bleeding surface. The infection may spread to involve the esophagus causing dysphagia.
  - (8) Examination of tongue also reveals pallor of anemia, central cyanosis & the yellow tingeing of jaundice, as well as the general state of dehydration.
  - (9) Ask the patient to protrude the tongue out.
    - (a) With a lower motor neuron paralysis, the tongue deviates towards the side of lesion.
    - (b) The tongue receives bilateral cortical innervations; therefore wasting only occurs with bilateral upper motor neuron lesions (pseudobulbar palsy).
    - (c) Tongue weakness & dysphagia may be present in myasthenia gravis.
    - (d) Tremor is present in Parkinsonism & thyrotoxicosis.

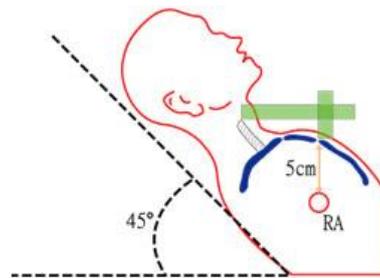


Figure 2.7: The technique of examining JVP.

**NECK**

**EXAMINATION OF NECK VEINS**

Inspection of both jugular veins can provide a reliable indication of the volume and pressure in the right side of the heart since internal jugular veins pulsate in response to phasic changes in right atrial pressure. Proper positioning of the patient to increase the effects of gravity enhances distention of the jugular veins and, therefore, increases the ability to observe venous pulsations.

**Clinical techniques**

Measurement of jugular venous pressure (JVP) tells about the level of the central venous pressure (CVP). An increase in CVP is often termed jugular vein distension (JVD). Medical students are not expected to master this technique, but begin learning a skill to be developed during residency, and as a clinician.

**(A) Measurement of jugular venous pressure**

- (1) Ask the patient to lie supine, & reclining with head elevated 45°. Neck should not be

sharply flexed. Light should be tangential to illuminate highlights and shadows.

- (2) Identify the internal jugular vein & distinguished it from the carotid artery, & carefully detects the column height in the jugular vein. If the internal jugular vein is not detectable, use the external jugular vein.
- (3) Using a centimeter ruler, measure the vertical distance between the angle of Louis (manubrio-sternal joint) & the highest level of jugular vein pulsation. A

**Table 2.5: Distinguishing the internal jugular vein pulsations from the carotid artery.**

Jugular Vein	Carotid Artery
No pulsations palpable.	Palpable pulsations.
Pulsations obliterated by pressure above the clavicle.	Pulsations not obliterated by pressure above the clavicle.
Level of pulse wave decreased on inspiration; increased on expiration.	No effects of respiration on pulse.
Usually two pulsations per systole (x and y descents).	One pulsation per systole.
Prominent descents.	Descents not prominent.
Pulsations sometimes more prominent with abdominal pressure.	No effect of abdominal pressure on pulsations.

straight edge intersecting the ruler at a right angle may be helpful (Lewis Method). Add 5 cm to measurement since right atrium is 5 cm below the sternal angle.

(4) Normal JVP is 8 cm H<sub>2</sub>O.

**Note:** Ability to measure jugular venous pressure will be difficult if pulse is >100 per minute.

**(B) Jugular venous wave form analysis**

- (1) After localization of the jugular vein, the "a" and "v" waveforms are observed.
- (2) Normal neck veins show a big "a wave", with a "v wave":
  - (a) Neck vein wave forms have a gradual up-slope and a dramatic collapse. This is the exact opposite of the carotid, which have a dramatic upslope and a gentle collapse.
  - (b) Because the collapse in neck veins is the most dramatic movement, it is what you time when you are trying to determine what type of wave it is:
    - (i) Big x prime descent : a wave
    - (ii) Big y descent: v wave
  - (c) How do you time which is x descent and which is y descent? The easiest way is to time it with S<sub>2</sub>.

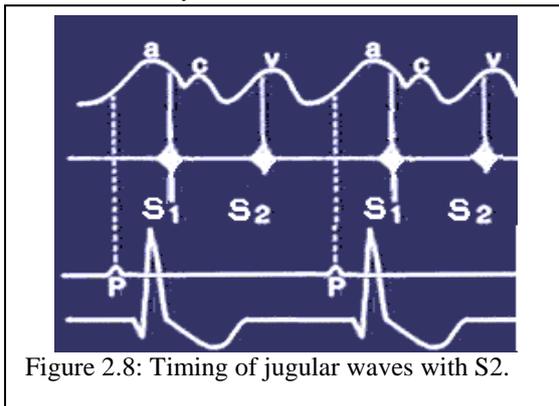


Figure 2.8: Timing of jugular waves with S<sub>2</sub>.

### EXAMINATION OF LYMPH NODES

See module 19.

### EXAMINATION OF THYROID GLAND

See module 14.

### HANDS

Always make an introductory hand shake with the patient.

- (1) Note whether there is unusual sweating, or abnormal soft tissue.
- (2) The hand may be unusually large as in acromegaly, or small or deformed, perhaps relating to a previous injury or to systemic disease.
- (3) Skin abnormalities of the palm & dorsum of the hand should be carefully noted. They include pallor, cyanosis, polycythemia, palmer erythema, pigmentation, bruises, rashes & nicotine stains.

### NAILS

- (1) Nails may have stunted growth, & they may be brittle & deformed. Nail biters can be identified from the loss of the projecting nail in all the digits of both hands.
- (2) **Leukonychia:** These are whitish spots under the nail, usually associated with minor trauma.
- (3) **Koilonychia:** It refers to spoon shaped depression of the nail, which is seen in iron deficiency anemia & Plummer-Vinson's syndrome.
- (4) **Paronychia:** It refers to infections around the nail, which may be acute (bacterial) or chronic (fungal).
- (5) **Splinter hemorrhages:** These are longitudinal brown strips along the length of the middle of nail, which are seen in subacute bacterial endocarditis & vasculitic disorders.
- (6) Pallor of anemia & bluish color of cyanosis are usually well shown.
- (7) Pitting of the nails is found in psoriasis.

### CLUBBING

In clubbing of the fingers, the tissues at the base of the nail are thickened & the angle between the nail base & the adjacent skin of the finger, which should

measure approximately 160°, becomes obliterated. Clubbing may also involve the feet, particularly the congenital variety.

**Mechanisms of clubbing**

- (1) It is a response to arterial hypoxemia, in which release of an unknown humoral substance causes dilation of the vessels of fingers & toes.
- (2) It results from a neurovascular abnormality. In support of this is the fact that a vagal section may reverse clubbing.

However, no theory adequately explains the sheer variety of diseases in which clubbing occurs.

**Grading**

Finger clubbing can be graded depending on its stage of development.

- (1) **Stage 1**  
The fluctuation of the nail bed increases, which may be described as sponginess. There may be glossiness to the adjacent skin over the nail bed.
- (2) **Stage 2**  
Curvature of the nail bed increases leading to obliteration of the diamond created by opposing the dorsal surface of the terminal phalanx of identical fingers from either hand, referred as Schamroth's sign.
- (3) **Stage 3**  
The longitudinal curvature of the nail increases and the enlarged finger tips are referred to as drum sticks.
- (4) **Stage 4**  
Hypertrophic pulmonary osteoarthropathy is due to subperiosteal reaction & new bone formation which typically affects the wrists & ankles.

**Clinical techniques**

- (1) **Schamroth's sign**  
Place the dorsal surfaces of patient's terminal phalanges on opposing fingers together (figure 2.9). Normally, a diamond-shaped window appears in a patient without clubbing, whereas in a patient with clubbing this window is obliterated.
- (2) **Digital index**  
Measure 2 separate circumferences on each of the 10 fingers at the nail bed (NB) & the distal interphalangeal joint (DIP). The sum of the 10

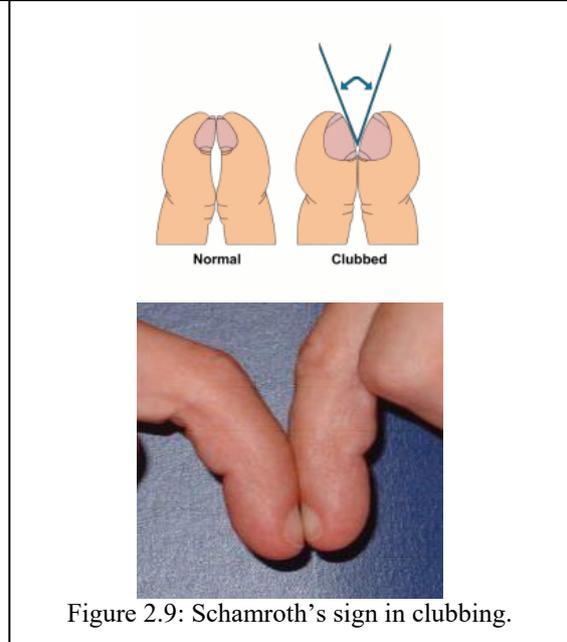


Figure 2.9: Schamroth's sign in clubbing.

ratios (NB:DIP) determines the digital index. A digital index of 10.2 or higher signifies the presence of clubbing. Although a NB:DIP ratio of 1.0 or greater at any single digit is suggestive of clubbing, the sum of 10 ratios is more specific.

- (3) **Phalangeal depth ratio**  
The ratio of the anteroposterior depth of the (index) finger at the nail bed (DPD) to that at the distal interphalangeal joint (IPD) is measured, using calipers. If the DPD:IPD ratio is > 1, clubbing is present (figure 2.10).
- (4) **Nail bed angle**  
Look at the nail bed angle; in clubbing, this is obliterated.

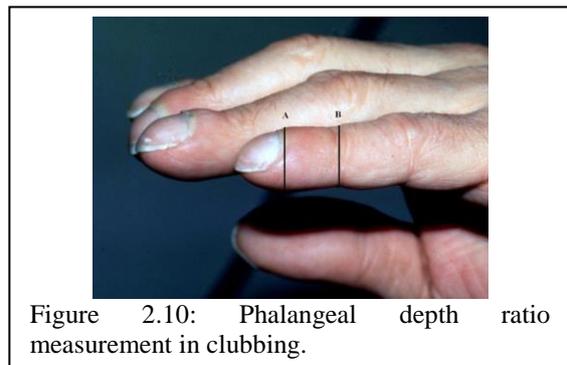


Figure 2.10: Phalangeal depth ratio measurement in clubbing.

### Causes of clubbing

#### (A) Pulmonary

- (1) Bronchiectasis.
- (2) Chronic interstitial lung disease.
- (3) Chronic lung infection, eg pulmonary tuberculosis.
- (4) Cystic fibrosis.
- (5) Lung abscess.
- (6) Empyema.
- (7) Carcinoma of lung.
- (8) Pleural mesothelioma.

#### (B) Cardiovascular

- (1) Cyanotic congenital heart disease.
- (2) Infective endocarditis.
- (3) Left atrial myxoma.
- (4) Bronchial arteriovenous malformations.

#### (C) Other causes

- (1) Celiac disease.
- (2) Inflammatory bowel disease.
- (3) Cirrhosis.
- (4) Thyrotoxicosis.
- (5) Hereditary.
- (6) Idiopathic.

- (7) Note the nutrition of the fingers in gout, scleroderma, rheumatoid arthritis, other collagen disease & ischemic conditions. There may be loss of pulp & small areas of ulceration around the fingertips.
- (8) Painful nodules around the fingertips are seen in infective endocarditis (**Osler's nodes**).
- (9) Thickening of the palmar fascia (**Dupuytren's contracture**) may be idiopathic, hereditary or associated with cirrhosis & various gut & pulmonary disorders.

### MUSCLES & JOINTS

### SKIN

- (1) Examination of the palmer skin gives some indication of the type of work undertaken.
- (2) Stretch the palmer skin to examine the color of the skin creases.
- (3) Look for **palmer erythema**, which is most marked over the thenar & hypothenar eminences. It is an important finding in chronic liver disease, & has been attributed to raised estrogen levels. It may also occur in pregnancy, thyrotoxicosis, polycythemia, leukemia, chronic febrile illnesses & rheumatoid arthritis.
- (4) Look for **spider nevi**, which may also present in chronic liver disease.
- (5) The skin on the dorsum is a useful site to assess skin turgidity, & to look for generalized pigmentation & bruising.
- (6) Laxity of skin is seen in older subjects, but may indicate extensive dehydration at all ages. Similarly, areas of bruising & senile keratosis are normal features of ageing but may also indicate disease. Skin nodules & moles are also common.

- (1) The small muscles of the hand provide an early indication of general wasting, as well as peripheral nerve injury.
  - (a) Note particularly the dorsum of hand, the loss of substance of the interossei of thumb & index finger, & the loss of muscle bulk deep to the long extensor tendons.
  - (b) Local causes of muscle wasting include carpal tunnel syndrome, proximal lesions of the median & ulnar nerves & their roots, motor neuron disease, poliomyelitis, syringomyelia, peripheral neuropathy & rheumatoid arthritis.
- (2) The joints of the hands are commonly affected in rheumatoid arthritis, & occasionally the terminal interphalangeal joint is involved with osteoarthritic changes. There may be palpable osteophytes in this area, eg Heberden's nodes in osteoarthritis.
- (3) Examination of the pulse is made (described in detail in vital signs).
- (4) **Hepatic flap (asterixis)**: Ask the patient to stretch out the arms in front, separate the fingers & extend the wrists.
  - (a) Jerky, irregular flexion-extension movements at the wrist & metacarpophalangeal joints, often accompanied by lateral movements of the fingers, constitute the flapping tremor of hepatic encephalopathy. The flap is usually bilateral, tends to be absent at rest, & is brought on by sustained posture.
  - (b) It can also occur in cardiac, respiratory & renal failure, as well as hypoglycemia & barbiturate intoxication.

**HYDRATION**

Although accurate assessment can not be made, you must be able to estimate the approximate hydration of a patient. For example, a severely dehydrated patient is at risk of death from developing acute renal failure, while an over hydrated patient may develop pulmonary edema.

**DEHYDRATION**

It refers to inadequate body fluids, which may occur due to reduced intake, increased needs or increased loss. It is usually accompanied by low body sodium.

**Clinical techniques**

The following symptoms & signs will help in the clinical assessment of dehydration.

**Mild dehydration (< 2 litres)**

- (1) Thirst.
- (2) Concentrated urine.
- (3) **Dry tongue & oral mucosa:** Ask the patient to open the mouth & protrude the tongue.
  - (a) Note whether it is wet & shining (well hydrated), or dry & dull (dehydrated).
  - (b) Touch the surface with your finger to confirm the inspection finding.

**Moderate dehydration (2-3 litres)**

As above, plus:

- (4) Dizziness, weakness.
- (5) Oliguria (< 400 ml/day).
- (6) Postural hypotension (> 20 mmHg systolic).
- (7) Low jugular venous pressure (JVP).

**Severe (> 3 litres)**

As above, plus:

- (8) Confusion, stupor.
- (9) Systolic blood pressure < 100 mmHg.
- (10) Tachycardia, low pulse volume.
- (11) Sunken eyes.
- (12) Cold extremities, poor capillary return.
- (13) **Reduced skin turgor:** Pinch the patient's skin; normal skin springs right back into position, but it sag back into position slowly in dehydration.
- (14) **Reduced body weight:** Following the body weight daily is the best way to determine changes in hydration over time. For example, a 5% decrease in body weight over 24 hours

indicates that more than 5% of body water has been lost.

[Note: Clinical techniques of 6, 9 & 10 are described below, whereas of 7 is described above].

**Causes of dehydration****(A) Reduced intake**

- (1) Debilitation.
- (2) Oral pathology.
- (3) Dysphagia.
- (4) Coma (trauma, metabolic, intracranial lesion/surgery).

**(B) Loss from alimentary tract****External loss**

- (1) Vomiting.
- (2) Aspiration of GI contents.
- (3) Fistulae.
- (4) Diarrhea.
- (5) Villous adenoma of large bowel.

**Sequestration of fluid in bowel**

- (1) Ileus.
- (2) Intestinal obstruction.

**(C) Loss in urine****Extrarenal factors acting on kidney**

- (1) Osmotic diuresis
  - (a) Diabetes mellitus.
  - (b) Mannitol.
- (2) Diuretics.
- (3) Metabolic acidosis.
- (4) Adrenocortical insufficiency.

**Renal disease**

- (1) Diuretic phase of acute tubular necrosis.
- (2) Post-obstructive diuresis.
- (3) Chronic renal insufficiency.
- (4) Proximal renal tubular acidosis.
- (5) Medullary cystic disease.
- (6) Congenital polycystic disease.
- (7) Chronic interstitial nephritis.

**(D) Loss in sweat**

- (1) Fever.
- (2) Hot environment.

**(E) Loss in exudates & transudates (third space losses)****Loss from body surfaces**

- (1) Burns.
- (2) Extensive dermatitis.

**Loss into body cavities or soft tissues**

- (1) Ascites.
- (2) Peritonitis.

- (3) Acute pancreatitis.
- (4) Rhabdomyolysis.
- (5) Inferior vena cava thrombosis.

## EDEMA

It refers to an accumulation of interstitial fluid in abnormally large amounts. It may be generalized, or localized eg limb edema, scrotal edema & pulmonary edema. Generalized edema becomes clinically evident when the interstitial fluid volume is increased by about 15%.

### Edema distribution

Edema is dependent ie, the fluid shift in response to gravity:

- (1) In ambulant patients, the fluid accumulates in the feet & ankles.
- (2) In bed-bound patients, fluid collects posteriorly (sacrum).

## Clinical techniques

Press your thumb firmly over the skin of bony surface in edematous area for 5 seconds & then quickly remove it → Observe.

- (1) An indentation is left that fills slowly → Pitting edema is present. OR
- (2) No indentation is left in the skin → Nonpitting edema is present. Here the tissues become fibrotic & so fails to pit, eg in grades II & III lymphedema (see module 19).

In ambulant patients the lower end of tibia is pressed (pedal edema), while in bed-ridden patients the sacrum is pressed.

## Causes of edema

### (A) Systemic disease

- (1) Cardiac failure.
- (2) Renal failure.
- (3) Hepatic failure.
- (4) Hypoproteinemia (nephritic syndrome, liver failure, malnutrition, malabsorption, protein-losing enteropathy).

### (B) Fluid retention

- (1) Pre-menstrual.
- (2) Pregnancy.
- (3) ADH tumors.
- (4) Inappropriate ADH secretion.
- (5) Sodium-retaining drugs/steroids.

- (6) Added salt (infants).
- (7) Myxedema.
- (8) Idiopathic edema.

### (C) Water intoxication

- (1) Excess intravenous hypotonic solution.
- (2) Bladder/peritoneal wash-out with water or hypotonic solutions.
- (3) Overload during hemo/peritoneal dialysis.

### (D) Abnormal capillary permeability

- (1) Angioneurotic edema.
- (2) Allergy (food, drugs, chemical, toxins).
- (3) Snake bites.
- (4) Bee stings.

### (E) Local edema

- (1) Inflammation.
- (2) Venous hypertension.
- (3) Impaired lymphatic drainage.
- (4) Prolonged dependency.
- (5) Tight bandaging.
- (6) Fictitious.

## VITAL SIGNS

Vital signs include the measurement of: pulse, blood pressure, temperature, respiratory rate, pain &, where appropriate, blood oxygen saturation. These numbers provide critical information (hence the name "vital") about a patient's state of health. In particular, they:

- (1) Can identify the existence of an acute medical problem.
- (2) Are means of rapidly quantifying the magnitude of an illness and how well the body is coping with the resultant physiologic stress? The more deranged the vitals, the sicker the patient.
- (3) Are markers of chronic disease states (eg hypertension is defined as chronically elevated blood pressure)?

Most in-patients will have had their vital signs measured by casualty medical officers, house officers or residents before you have a chance to see them. However, these values are of such great importance that you should get in the habit of repeating them yourself, particularly if you are going to use these values as the basis for management decisions. This not only allows you to

practice obtaining vital signs but provides an opportunity to verify their accuracy. As noted below, there is significant potential for measurement error, so repeat determinations can provide critical information. Prior to measuring vital signs, the patient should have had the opportunity to sit or lie supine for approximately five minutes so that the values are not affected by the exertion required to walk to the exam room.

**PULSE**

This can be measured at any place where there is a large artery (eg carotid, femoral, or simply by listening over the heart), though for the sake of convenience it is generally done by palpating the radial impulse. Also, upper extremity peripheral vascular disease is relatively uncommon, so the radial artery should be readily palpable in most patients.

**Techniques for measuring the radial pulse**

- (1) Place the tips of your index and middle fingers just proximal to the patient’s wrist on the thumb side, orienting them so that they are both over the length of the vessel.
- (2) Push lightly at first, adding pressure if there is a lot of subcutaneous fat or you are unable to detect a pulse. If you push too hard, you might occlude the vessel and mistake your own pulse for that of the patient.
- (3) Note the rate, rhythm & volume of pulse.

**Features**

- (1) **Rate**  
Measure the rate of the pulse (recorded in beats per minute). Count for 30 seconds and multiply by 2 (or 15 seconds x 4). If the rate is particularly slow or fast, it is best to measure for a full 60 seconds in order to minimize the impact of any error in recording over shorter periods of time. Normal is between 60 and 80.
- (2) **Rhythm**
  - (a) Is the time between beats constant? In the normal setting, the heart rate should appear metronomic.
  - (b) Irregular rhythms, however, are quite common. If the pattern is entirely chaotic

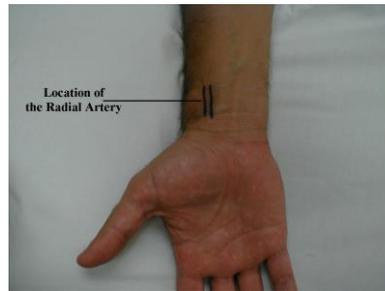


Figure 2.11: Surface anatomy of radial artery.

with no discernable pattern, it is referred to as irregularly irregular and likely represents atrial fibrillation. Extra beats can also be added into the normal pattern, in which case the rhythm is described as regularly irregular. This may occur, for example, when impulses originating from the ventricle are interposed at regular junctures on the normal rhythm.

- (c) If the pulse is irregular, it's a good idea to verify the rate by listening over the heart. This is because certain rhythm disturbances do not allow adequate ventricular filling with each beat. The resultant systole may generate a rather small stroke volume whose impulse is not palpable in the periphery.
- (3) **Volume**
  - (a) Does the pulse volume (ie the subjective sense of fullness) feel normal? This reflects changes in stroke volume.
  - (b) In the setting of hypovolemia, for example, the pulse volume is relatively low (weak or thready). There may even be beat to beat variation in the volume, occurring occasionally with systolic heart failure.



Figure 2.12: Technique of measuring pulse.

## BLOOD PRESSURE (BP)

### BP apparatus

Blood pressure is measured using mercury based manometers, with readings reported in millimeters of mercury (mm Hg).

- (1) The size of the BP cuff will affect the accuracy of these readings. The inflatable bladder, which can be felt through the vinyl covering of the cuff, should reach roughly 80% around the circumference of the arm while its width should cover roughly 40%. In adults this is 12.5 cm.
- (2) If it is too small, the readings will be artificially elevated. The opposite occurs if the cuff is too large. Clinics should have at least 2 cuff sizes available, normal and large.

### Techniques for recording BP

- (1) Wrap the cuff around the patient's upper arm so that the line marked "artery" is roughly over the brachial artery, located towards the medial aspect of the antecubital fossa (ie. the crook on the inside of their elbow). The placement does not have to be exact nor do you actually need to identify this artery by palpation. It should not impinge on the axilla or the cubital fossa, & the manometer should be at your eye level.
- (2) Turn the valve on the pumping bulb clockwise until it no longer moves. This is the position which allows air to enter and remain in the bladder. Now palpate the radial pulse & inflate the cuff. The pressure is raised to approximately 30mmHg above the level at which the pulse disappears (which indicates the systolic BP).
- (3) Put on your stethoscope so that the ear pieces are angled away from your head. Twist the head piece so that the diaphragm is engaged. This can be verified by gently tapping on the end, which should produce a sound. Place the diaphragm over the area of the brachial artery, on the medial aspect of cubital fossa. While most clinicians use the diaphragm of the stethoscope, the bell may actually be superior for picking up the low pitched sounds used for measuring BP. Experiment with both and see if this makes a difference.
- (4) Grasp the patient's elbow & raise their arm so that the brachial artery is roughly at the same



Figure 2.13: Antecubital fossa (surface anatomy).

height as the heart. The arm should remain somewhat bent and completely relaxed. If the arm is held too high, the reading will be artifactually lowered, and vice versa.

- (5) Now slowly deflate the blood pressure cuff (ie a few mm Hg per second) by turning the valve in a counter-clockwise direction while listening over the brachial artery and watching the pressure gauge. The first sound that you hear reflects the flow of blood through the no longer completely occluded brachial artery. The value on the manometer at this moment is the systolic BP. Note that although the needle may oscillate prior to this time, it is the sound of blood flow that indicates the systolic BP.
- (6) Continue listening while you slowly deflate the cuff. The diastolic BP is measured when the sound completely disappears. This is the point when the pressure within the vessel is greater than that supplied by the cuff, allowing the free flow of blood without turbulence and thus no



Figure 2.14: Technique for measuring BP.

audible sound. These are known as the Sounds of Koratkov.

- (7) Repeat the measurement on the patient's other arm; the two readings should be within 10-15 mm Hg of each other. Differences greater than this imply that there is differential blood flow to each arm, which most frequently occurs in the setting of subclavian artery atherosclerosis.
- (8) When you are unsure of the readings repeat the measurement. Ideally, you should allow the cuff to completely deflate, permit any venous congestion in the arm to resolve (which otherwise may lead to inaccurate measurements), and then repeat a minute or so later. Also repeated measurement can be uncomfortable for the patient, another good reason for giving the arm a break.
- (9) Avoid moving your hands or the head of the stethoscope while you are taking readings as this may produce noise that can obscure the Sounds of Koratkov.

#### ***Improving the accuracy***

- (1) Do not place the blood pressure cuff over patient's clothing or roll a tight fitting sleeve above their biceps when determining blood pressure as either can cause elevated readings.
- (2) Make sure the patient has had an opportunity to rest before measuring their BP.
- (3) If the reading is surprisingly high or low, repeat the measurement towards the end of your examination.
- (4) Instruct your patients to avoid coffee, smoking or any other unprescribed drug with sympathomimetic activity on the day of the measurement.
- (5) If possible, measure the BP of a patient who has an indwelling arterial catheter (these patients can be found in the ICU). Arterial transducers are an extremely accurate tool for assessing BP, & therefore provide a method for checking your non-invasive technique.

#### **Clinical correlation**

- (1) Normal is between 100/60 mmHg & 140/90 mmHg.
- (2) Hypertension is thus defined as either SBP greater than 140 or DBP greater than 90. It is important to recognize that BP is rarely elevated to a level that causes acute symptoms.

That is, while hypertension in general is common, emergencies resulting from extremely high values and subsequent acute end organ dysfunction are quite rare. Rather, it is the chronically elevated values which lead to target organ damage, though in a slow and relatively silent fashion.

- (3) At the other end of the spectrum, the minimal SBP required to maintain perfusion varies with the individual. Therefore, interpretation of low values must take into account the clinical situation. Those with poorly functioning hearts, eg, can adjust to a chronically low SBP (eg 80-90) and live without symptoms of hypoperfusion. However others (eg patients with hypovolemic shock), used to higher baseline values, might become quite ill if their SBP were suddenly decreased to these same levels.
- (4) Orthostatic (postural) measurements of pulse & BP are part of the assessment for hypovolemia.
  - (a) This requires first measuring these values when the patient is supine and then repeating them after they have stood for 2 minutes, which allows for equilibration. Normally, SBP does not vary by more than 20 mmHg when a patient moves from lying to standing. In the setting of significant volume depletion, a greater than 20 mmHg drop may be seen.
  - (b) This is frequently associated with symptoms of cerebral hypoperfusion (eg light headedness). Heart rate should increase by more than 20 beats/minute in a normal physiologic attempt to augment cardiac output by providing chronotropic compensation.
  - (c) In the setting of GI bleeding, for example, a drop in BP &/or rise in heart rate after this maneuver is a marker of significant blood loss and has important prognostic implications.
  - (d) Orthostatic measurements may also be used to determine if postural dizziness is the result of a fall in BP. For example, patients who suffer from diabetes frequently have autonomic nervous system dysfunction and cannot generate appropriate arteriolar vasoconstriction

when changing positions. This results in postural vital sign changes and symptoms.

- (5) In peripheral vascular disease of lower limbs, BP may also be measured in the lower limbs. A wider cuff is required for thigh compression & a Doppler probe is used to detect the presence or absence of a distal pulse. The SBP is the point of reappearance of audible pulsation when letting down the cuff.

### TEMPERATURE

- (1) This is generally obtained using an oral thermometer that provides a digital reading when the sensor is placed under the patient's tongue.
- (a) It is measured in either Celsius or Fahrenheit, with a **fever** defined as greater than 38-38.5 °C or 101-101.5 °F.
- (b) The **normal temperature** ranges from 36.6 to 37.2 °C (98 to 99 °F).
- (c) There is a **diurnal variation**, & the body temperature is lowest on rising in the morning & reaches a peak between 6.00 & 10.00 pm. The febrile pattern of most diseases follows this diurnal variation.
- (d) Very high temperatures (**hyperpyrexia**, defined as above 41.6 °C) are very serious & may result in death. The causes include heat stroke from exposure or excessive exertion, malignant hyperthermia (due to anesthetics eg, halothane, or muscle relaxants eg, suxamethonium), & hypothalamic disease.
- (e) **Hypothermia** is defined as a temperature less than 35 °C; special low reading thermometers must be used where hypothermia is suspected. Causes include prolonged exposure to cold & hypothyroidism.
- (2) Rectal temperatures, which most closely reflect internal or core values, are approximately 1 °F higher than those obtained orally.
- (3) Axillary temperature, in contrast, is approximately 1 °F lower than those obtained orally.

### Types of fever

- (1) **Continuous**: Temperature does not remit.

**Examples:** Typhoid fever, typhus.

- (2) **Intermittent**: Temperature falls to normal each day.

**Examples:** Pyogenic infections, lymphomas, miliary tuberculosis.

- (3) **Remittent**: Daily fluctuations of >2 °C, temperature does not return to normal.

**Examples:** Not characteristic of any particular disease.

- (4) **Relapsing**: Temperature returns to normal for days before rising again.

**Examples:**

- (a) Malaria →

(i) Tertian → 3 day pattern, fever peaks every other day (plasmodium vivax, p ovale).

(ii) Quartan → 4 day pattern, fever peaks every 3<sup>rd</sup> day (p falciparum).

- (b) Lymphoma → Pel-Ebstein fever of Hodgkin's disease.

- (c) Pyogenic infection.

### RESPIRATORY RATE (RR)

- (1) Respirations are recorded as breaths per minute. They should be counted for at least 30 seconds as the total number of breaths in a 15 second period is rather small and any miscounting can result in rather large errors when multiplied by 4.
- (2) Try to do this as surreptitiously as possible so that the patient does not consciously alter their rate of breathing. This can be done by observing the rise and fall of the patient's gown while you are taking their pulse.
- (3) Normal is between 12 and 20. In general, this measurement offers no relevant information for the routine examination. However, particularly in the setting of cardio-pulmonary illness, it can be a very reliable marker of disease activity.

### PAIN

The importance of pain has been underscored by the American Pain Society in 2002, by making it "the fifth vital sign."

Its assessment is an essential, but challenging, component of any pain management plan. It is

subjective, so no satisfactory objective measures of pain exist. It is also multidimensional, so the clinician must consider multiple aspects (sensory, affective, & cognitive) of the pain experience. Finally, the nature of the assessment varies with multiple factors (eg, purpose of the assessment, the setting, patient population, & clinician), so no single approach is appropriate for all patients or settings.

**Clinical techniques**

Whenever a patient complains of pain, take its complete history & perform a thorough examination to know the underlying cause/disease. Pain intensity levels are measured at the initial encounter, following treatment, and periodically, as suggested by guidelines and the clinical situation. Assess its severity using one of the following methods.

**(A) Unidimensional (rating) scales**

They provide a simple means for patients to rate pain intensity.

- (1) **Numeric rating scale (NRS):** Patients rate their pain on a 0-to-10 scale or a 0-to-5 scale, with 0 representing “no pain at all” and 5 or 10 representing “the worst imaginable pain.”
- (2) **Visual analog scale (VAS):** It consists of a 10-cm line, with anchors at either end. One end is marked “no pain” and the other end is marked “pain as bad as it could be” or “the worst imaginable pain.” The patient marks the place on the line to indicate his or her pain intensity. The clinician then measures the line with a ruler and assigns a score.
- (3) **Categorical scales:** Patients rate pain intensity using five verbal descriptors (ie, mild, discomforting, distressing, horrible, and excruciating).
- (4) **Faces pain scale (FPS):** It consists of eight images of faces with various expressions (eg, smiling, frowning, & grimacing). The patient selects the face that is consistent with his or her current level of pain.

**(B) Multidimensional tools**

These tools are designed for patient self-report, but a clinician may assist the patient.

- (1) **Initial pain assessment inventory (IPAI):** It includes a diagram for indicating pain

location(s), a scale for the patient to rate pain intensity, and a space for documenting additional comments and management plans.

- (2) **Brief pain inventory (BPI):** It consists of a series of questions that address aspects of the pain experienced over the preceding 24 hours (eg, pain location and intensity, impact on the patient’s life, type and effectiveness of any treatments).
- (3) **McGill pain questionnaire (MPQ):** It assesses pain in three dimensions (ie, sensory, affective, and evaluative) based on words that patients select to describe their pain.
- (4) **Neuropathic pain scale (NPS):** It evaluates eight common qualities of neuropathic pain (ie, sharp, dull, hot, cold, sensitive, itchy, and deep versus surface pain). The patient rates each item on a

**Table 2.6: GENERAL EXAMINATION REVIEW**

- A) General impression**
  - 1) First impression
  - 2) Mental status
  - 3) Body habitus, build, posture & gait
  - 4) Facies
- B) Face**
  - 1) Anemia
  - 2) Jaundice
  - 3) Cyanosis
  - 4) Hairs & contour
  - 5) Mouth
    - ◆ Breath
    - ◆ Teeth, gums & buccal mucosa
    - ◆ Tongue
- C) Neck**
  - 1) Neck veins
  - 2) Lymph nodes
  - 3) Thyroid gland
- D) Hands**
  - 1) Nails
  - 2) Clubbing
  - 3) Skin
  - 4) Muscles & joints
- E) Hydration**
  - 1) Dehydration
  - 2) Edema
- F) Vital signs**
  - 1) Pulse
  - 2) Blood pressure
  - 3) Temperature
  - 4) Respiratory rate
  - 5) Pain

scale from 0 to 10, with 0 for none and 10 for the "most imaginable."

### **OXYGEN SATURATION**

This non-invasive measurement of gas exchange & RBCs oxygen carrying capacity has become available in all hospitals and many clinics. While imperfect, it can provide important information about cardio-pulmonary dysfunction and is considered by many to be included among the vital signs. In particular, for those suffering from either acute or chronic cardio-pulmonary disorders, it can help quantify the degree of impairment.



Figure 2.15: Pulse oxymeter.

# Module 3

## Lump

### HISTORY

Follow the general pattern as given in module 1, with particular emphasis on the following points.

### SITE

#### Q1 Where is the lump?

Always begin with this question. This will hint towards diagnosis, as many swellings are peculiar to a particular site (see below), & will guide you to modify your subsequent questions accordingly.

### DURATION

#### Q2 When was the lump first noticed?

Remember duration is patient's notice about the existence of lump; however, a lump may be present asymptotically without patient's knowledge, & some complication or trauma later in the course draws his/her attention about its presence.

- (1) Congenital swellings usually present since birth.  
Example: Cystic hygroma, meningocele.
- (2) Acute inflammatory swellings presents with history of short duration & pain.  
Example: Abscess, mumps.
- (3) Chronic inflammatory swellings presents with history of long duration & slight pain.  
Example: Cold abscess.
- (4) Benign neoplastic swellings presents with history of long duration (without any pain).

Example: Lipoma.

- (5) Malignant neoplastic swellings presents with history of short duration.

Example: Osteosarcoma.

### MODE OF ONSET

#### Q3 How did the swelling start?

- (1) Developed just after a trauma.  
Example: Fracture of bone, dislocation of joint, hematoma.
- (2) Developed spontaneously & grown rapidly with severe pain.  
Example: Inflammatory swellings.
- (3) Developed spontaneously & gradually increasing in size.  
Example: Neoplastic swellings.
- (4) Developed on some pre-existing lesions.  
Example: Marjolin ulcer from a scar of burn, malignant melanoma from a benign nevus or a birth mark.

### FIRST SYMPTOM

#### Q4 What made the patient notice the lump?

- (1) Patient felt/saw it when washing.
- (2) Patient experienced pain & found the lump when felt the painful area.
- (3) Someone else noticed it & told the patient about it (eg thyroid swelling).

### OTHER SYMPTOMS ASSOCIATED WITH THE LUMP

**Q5 What are the symptoms of the lump?**

Depending upon the site of swelling ask specifically about pain, difficulty in respiration, difficulty in swallowing, interfering with any movement, disfiguring etc.

**Pain**

If the patient complains of pain associated with the lump, you must take detailed history of pain (as described in module 9).

**(1) Nature of the pain**

Throbbing pain suggests inflammation leading to suppuration (eg abscess).

**(2) Site**

- (a) Usually the pain is localized to the site of swelling.
- (b) Sometimes the pain is referred to elsewhere, eg in case of hip joint problem, the pain may be referred to the corresponding knee joint.

**(3) Time of onset**

- (a) In inflammatory swellings, pain always appears before the swelling.
- (b) In neoplastic swellings, pain appears much later than the swelling;
  - (i) Initially malignant tumors are usually painless, but later on pain appears due to involvement of nerves, deep infiltration, ulceration, fungation or associated inflammation.
  - (ii) Only exception is osteosarcoma in which mild pain is usually the first symptom & precedes the appearance of swelling.

**PROGRESS OF THE SWELLING****Q6 Has the lump changed since it was first noticed?**

- (1) Variation in size & rate of growth, are the features most easily appreciated by the patient;
  - (a) Benign growths grow in size very slowly & sometimes may remain static for a long time.
  - (b) Malignant tumors (painless) & inflammatory swellings (painful) grow very quickly.
  - (c) Sometimes the swelling suddenly increases in size after remaining stationary for a long

period; this suggests malignant transformation of a benign growth.

- (d) If the swelling decreases in size this suggests inflammatory lesion.
- (2) Patient should also be asked about the change in shape, surface, edge & consistency of the swelling, & whether he/she has experienced any tenderness.

**DISAPPEARANCE****Q7 Has it ever disappeared?**

Patient should always be asked if the lump ever goes away. It may disappeared either temporarily (eg inguinal hernia on lying down) or permanently (eg lymphadenitis); disappearance may also be partial or complete.

**Q8 What causes it to appeared again?**

This should be asked when patient gives the history of temporary disappearance.

Example: Obstructed parotid gland swelling on eating, & hernia on standing, walking or coughing.

**MULTIPLICITY****Q9 Has the patient ever had any other lumps?**

Patient may have lump of similar nature in the past or he may have lump of similar nature at another place at the same time (which is not bothering him). Example:

- (1) Sebaceous cyst is usually multiple.
- (2) Lymphadenopathy in Hodgkin's disease may occur at more than one site.
- (3) Abscess may healed at one place, & appear at another.

**PREVIOUS TREATMENT****Q10 Has the patient ever received any treatment for this lump?**

- (1) A swelling reappearing after antibiotic treatment is usually inflammatory.
- (2) If the swelling recurs after excision, this often indicates malignant change in a benign growth or the primary tumor was a malignant one.

- (3) Cystic swellings may recur if the cyst wall is not completely removed.

### SYSTEMIC EFFECTS

#### Q11 Has the patient experiences fever, loss of body weight?

Asked the patient to detect any systemic effect that can be produced by infection, trauma or neoplastic changes.

### CAUSE

#### Q12 What does the patient think caused it?

Lumps occasionally follow injuries or systemic diseases known to the patient.

#### LUMP HISTORY REVIEW

1. Site
2. Duration
3. Mode of onset
4. First symptom
5. Other symptoms
6. Progress
7. Disappearance
8. Reappearance
9. Multiplicity
10. Previous treatment
11. Systemic effects
12. Cause

### CLINICAL EXAMINATION

Many lumps have characteristic features, giving valuable clues for diagnosis. The following features must be considered with every lump, although all are not necessary in every case; clinical reflexes are built by practicing these in an organized fashion, so that important steps will not be omitted (esp. during exams).

### LOCAL EXAMINATION

#### Inspection

Always spends some time in inspection, & make it a

practice. (During exams., examiner doesn't like if candidate hasten to touch the swelling as soon as he/she sees it). Appropriate exposure is necessary; in case of limb swelling, always expose both limbs simultaneously.

#### Site

Exact anatomical location of the lump must be described, using distances measured from fixed bony points or other landmarks.

Some swellings have peculiar positions eg, dermoid cysts are mostly seen in the midline of body or on the line of fusion of embryonic processes (outer canthus of the eye or behind the ear).



Figure 3.1: Dermoid cysts; outer canthus of eye (upper), sternum (lower).

#### Size

All lumps have 3 dimensions: width, length & depth/height. During inspection, you can only assess width & length.

#### Shape

Noted whether the shape of swelling is ovoid, pear-shaped, kidney-shaped, spherical or irregular.

#### Surface

Note whether it is smooth or irregular. Some swellings have diagnostic surfaces eg, cauliflower surface of squamous cell carcinoma, & irregular numerous branched surface of papilloma.

#### Edge

Note whether the edge is clearly defined or

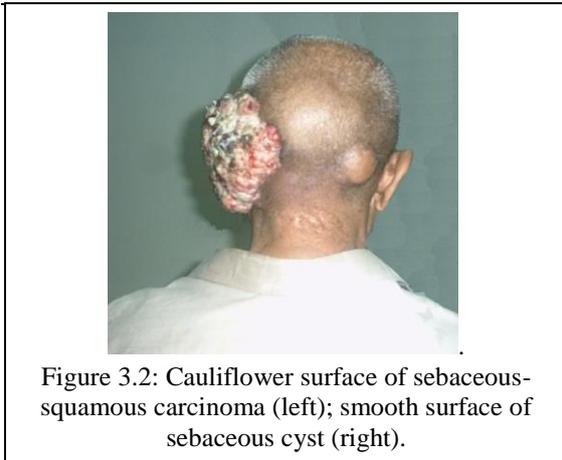


Figure 3.2: Cauliflower surface of sebaceous-squamous carcinoma (left); smooth surface of sebaceous cyst (right).

indistinct, & whether the swelling is pedunculated or sessile.

**Color & texture of overlying skin**

Sometimes, they are very diagnostic:

- (1) Black color of benign nevus & melanoma.
- (2) Red or purple color of hemangioma (arterial or venous).
- (3) Bluish color of ranula.
- (4) Red & edematous skin, if the swelling is inflammatory.
- (5) Tense & glossy skin with venous prominence, if the swelling is a sarcoma with rapid growth.
- (6) Black punctum over a cutaneous swelling indicates sebaceous cyst.
- (7) Presence of scar indicates either previous operation (if the scar is linear with suture marks), injury (a regular scar), or previous suppuration (if the scar is puckered, broad & irregular).
- (8) Sometimes the skin over a growth looks like the peel of an orange, "peau d' orange"; it is



Figure 3.3: Pedunculated papilloma (with ulceration).



Figure 3.4: (From above down) melanoma, hemangioma, carbuncle & sebaceous cyst (having black punctum in the centre).

due to edematous swelling from blockage of cutaneous lymphatics, seen esp. in carcinoma of breast.

**Pulsation**

Note whether the swelling rise & fall with each arterial beat. If the swelling exhibit pulsation, they are either arterial swellings or swellings lying just superficial to arteries.

**Cough impulse**

Ask the patient to cough, & note whether there is any momentarily bulge or increase in size of the

swelling. Swellings, which are in continuity with peritoneal cavity, pleural cavity, spinal canal or cranial cavity, will give rise to impulse on coughing.

### Number

Whole-body examination is required to know whether the swelling is solitary or multiple. Sometimes, even the patient is not aware of similar swelling at other place.

- (1) Some swellings are always multiple, eg neurofibromatosis, lymphadenopathy.
- (2) Some swellings are more known to be solitary, eg lipoma, dermoid cyst.



Figure 3.5: Neurofibromatosis.

### Any pressure effect

- (1) In cases of swelling over limb, always examine the limb distal to the swelling. Axillary swelling with edema of the upper limb means the swelling is probably arising from the lymph nodes.
- (2) Sometimes a hidden swelling is revealed due to its pressure effect. Goitre with venous engorgement in the neck is due to retrosternal extension of the swelling, giving rise to venous obstruction.

### Palpation

Confirm your findings on inspections, besides elaborating others. Be gentle with the patient.

### Temperature

#### Clinical techniques

- (1) Always begin palpation by noting temperature

### LUMP EXAMINATION REVIEW

#### A) Inspection

- 1) Site
- 2) Size
- 3) Shape
- 4) Surface
- 5) Edge
- 6) Overlying skin
- 7) Pulsation
- 8) Cough impulse
- 9) Number
- 10) Pressure effect

#### B) Palpation

- 1) Temperature
- 2) Tenderness
- 3) Site, size, shape
- 4) Surface & edge
- 5) Consistency
- 6) Fluctuation & indentation
- 7) Translucency
- 8) Cough impulse
- 9) Reducibility
- 10) Compressibility
- 11) Pulsatility
- 12) Mobility

#### C) Percussion

- 1) Resonance
- 2) Fluid thrill

#### D) Auscultation

#### E) Don't forget to examine

- 1) Regional lymph nodes
- 2) Neurovascular structures
- 3) Movement
- 4) General examination

of the swelling, because subsequent handling of the swelling during palpation may increase the temperature without any pathology.

- (2) It is best felt by the dorsal surfaces of the fingers, because they are usually dry (free of sweat) & cool; however, there is no difference between the sensitivity of palm & back of hand.
- (3) First assess the temperature of adjacent normal area (to have an idea about patient's body temperature), & then feel over the lump.

#### Significance

Local temperature is raised due to increased blood flow in superficial tissues. It may be due to infection eg abscess, due to well vascularized tumor eg sarcoma, or due to a vascular tumor.

#### Tenderness

#### Clinical techniques

- (1) It is a sign being elicited by the clinician; always ask the patient whether there is any

pain/tenderness in the lump before eliciting this sign, so that you can adjust the level of pressure applied.

- (2) Watch the patient's face for signs of discomfort as you apply pressure over lump.
- (3) Note whether the whole lump or a part of it is tender.

### Significance

- (1) Tenderness is present in cases of traumatic & inflammatory swellings, & malignant lumps that are expanding rapidly, degenerating or invading nervous tissue.
- (2) Benign neoplastic swellings are usually non-tender.

### Site, size, & shape

- (1) Site is described in terms of anatomical location measured (using measuring-tape) from fixed bony prominence eg angle of mandible, pubic tubercle. It also includes defining the anatomical origin & anatomical plane of lump, ie whether the swelling is arising from skin, subcutaneous tissues, glands, bones, joints, muscles, or one of the body cavities or viscera. Always define the whole extent of the swelling. If a portion of the swelling disappears behind a bone, it should be clearly mentioned.



Figure 3.6: Lipoma (upper),  
branchial cyst (lower).

- (2) Measurement of size of lump is helpful in assessing the change in size at subsequent visits. Lumps are 3 dimensional, & so measure all 3 three dimensions (using measuring-tape); learn to estimate the depth of deeply placed lumps because they can not be measured accurately. You can use your hands for quick measuring reference in case of small swellings; measure the length of your index finger (& its 3 phalanges) & width of thumb nail, & practice using them for measurements.
- (3) Shape is also 3 dimensional; describe shape of lump for each plane, using common terms eg round, oval, flattened, triangular, rectangular, square or irregular. Shape may be characteristic of the organ of origin eg kidney-shaped (kidney), globular (gallbladder), H-shaped (thyroid gland).

Make it your practice, to draw diagrams for the description of site, size & shape of the swelling.

### Surface & edge

#### Clinical techniques

Palpate the entire surface of the swelling with the palmar surfaces of your fingers, & when you reach the periphery of the swelling use your finger tips to assess the edge (margin).

#### Findings & example

- (1) Surface of a swelling is either uniform or variable. It may be;
  - (a) Smooth → Cyst.
  - (b) Lobular with smooth bumps → Lipoma.
  - (c) Nodular → Mass of matted lymph nodes.
  - (d) Irregular & rough → Carcinoma.
- (2) Edge may be well-defined or indistinct merging imperceptibly into the surrounding structures;
  - (a) Acute inflammatory swellings have ill-defined or indistinct margins.
  - (b) Neoplastic swellings & chronic inflammatory swellings have well-defined margins.
    - (i) Benign swellings have smooth margins.
    - (ii) Malignant swellings have irregular margins.

Swellings with well-defined margins tend to slip away from the finger.

#### Lipoma vs. cyst

Margin of the lipoma slips away from the palpating finger but does not yield to it

(slipping sign), whereas margin of the cyst yields to the palpating fingers & cannot slip away.

### Consistency

- (1) It may vary from very soft to very hard, depending on the composition of lump, as well as tension within the lump.
- (2) One practically useful classification is as follows:
  - (a) Stony hard → Not indentable, eg carcinoma.
  - (b) Rubbery → Hard to firm, but slightly indentable; examples are fibroma (firm), chondroma (hard but yielding).
  - (c) Spongy → Soft & squeezable, but with some resilience.
  - (d) Soft → Squeezable & no resilience, eg lipoma.

Another convenient classification is: very soft (like jelly), soft (like relaxed muscle), firm (like contracted muscle), hard (like contracted biceps of a boxer), & stony or bony hard.

- (3) Additional terms used for fluid & gaseous swellings are:
  - (a) Cystic (liquid) → eg cysts, chronic abscesses.
  - (b) Crepitus (gas) → eg gas gangrene, surgical emphysema.
- (4) Note whether the consistency is uniform or variable (indicating malignancy).

### Fluctuation & indentation

Fluctuation can be demonstrated in fluid-filled or gas-filled lumps. If sudden pressure is applied to one part of lump, the pressure within the cavity rises & will be transmitted equally at right angles to all parts of its wall resulting in its bulging (provided the contents can not escape into another compartment).

### Clinical techniques

- (1) Lump is held between thumb & finger (watching digits) of one hand, & sudden pressure applied downwards between them with a digit of the other hand (displacing digit); watching digits can feel the expansion, as they rises & aparted.
- (2) This test should always be performed in two planes at right angles to each other. Because this same expansion can be felt if a bundle of muscle fibers is held transversely, but the sign



Figure 3.7: Demonstration of fluctuation in a cold abscess.

is not present if an attempt is made to hold the muscle longitudinally.

- (3) In case of freely mobile lumps like hydrocele, they should be held fixed with the thumb & fore-finger of one hand, while the swellings are compressed on the other pole by the thumb & fingers of the other hand.
- (4) In case of very small swelling, which cannot accommodate 3 digits, simply pressing the swelling at its centre (Paget's test). Fluid-filled lumps will be softer at the centre than its periphery, while a solid lump will be firmer at the centre than its periphery.

### Fallacies

Very soft swellings sometimes yield false positive fluctuation test, eg lipoma, myxoma, soft fibroma, vascular sarcoma. But when you fully practiced the fluctuation test, then you will easily realize that these swellings yield to pressure, but fail to expand in other parts of the swelling like a true fluctuant swelling.

### Indentation

- (1) It is demonstrated by applying firm pressure with finger over the swelling.
- (2) It is present if the contents of lump are semi-solid & not too tense. Examples include:
  - (a) Indentation of feces in palpable sigmoid colon in left iliac fossa.
  - (b) Lax sebaceous cyst.
  - (c) Large dermoid cyst.
  - (d) Pitting of edematous tissue & inflammatory swelling.

### Translucency

Clear fluid transmits light but not the solid tissues. If a lump transilluminates, it must contain clear fluid, eg water, serum, lymph, plasma or highly

refractile fat. A fluid-filled lump may not transilluminate, if it contains opaque fluid (eg blood) or pultaceous material (dermoid or sebaceous cyst).

#### **Clinical techniques**

- (1) A bright pen torch with a unidirectional beam is shone across the lump, which causes the lump to glow.
- (2) Darkness is essential to see the glow. Switch off the room lights, or alternatively use a roll of x-ray film, which is held on one side of the swelling, while torch is held on the opposite side of the swelling.

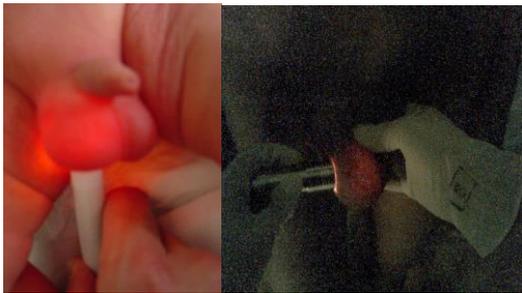


Figure 3.8: Demonstration of transillumination in hydrocele.

#### **Examples**

- (1) Vaginal hydrocele & epididymal cyst are brilliantly transilluminant.
- (2) Spermatocele (less).
- (3) Cystic hygroma & branchial cyst.
- (4) Ganglia & bursae.
- (5) Meningocele.
- (6) Hydrocele of canal of Nuck.

#### **Fallacies**

- (1) Hydroceles with thick-walls or those containing blood may not transilluminate.
- (2) Non-cystic lesions can transilluminate, eg
  - (a) Lipoma.
  - (b) In a baby, inguinal hernia containing small intestine.

#### **Cough impulse**

Confirm your finding detected in inspection.

#### **Clinical techniques**

- (1) Place your hand over the swelling, grasp the swelling or hold the root of scrotum in case of scrotal swelling, & ask the patient to cough. You will felt a definite bulge striking your fingers/hand, & the fingers will be raised &

aparted (ie expansile cough impulse).

- (2) In children, this is demonstrated by making the child cry.

#### **Examples**

- (1) Swellings in continuity with the abdominal cavity, eg herniae, iliopsoas abscess, lumbar abscess.
- (2) Swellings in continuity with the pleural cavity, eg empyema necessitatis.
- (3) Swellings in continuity with the spinal canal or cranial cavity, eg spinal or cranial meningocele.
- (4) Some vascular swellings, eg saphena varix; here cough impulse can be palpated as, with increased abdominal pressure, blood is expelled from inferior vena cava & iliac vessels proximally into heart & distally down to first competent valve.

#### **Reducibility**

A lump can be reduced (emptied) into another place by squeezing (applying pressure), but does not return spontaneously; it can only come out again by an additional force eg, cough or effect of gravity.

#### **Examples**

- (1) Lumps that exhibit expansile cough impulse, eg



Figure 3.9: Demonstration of reducibility in left inguinal hernia.

hernia, meningocele.

- (2) Vascular lumps, eg saphena varix, lymph varix, varicocele.

### **Compressibility**

Some fluid-filled lumps can be compressed (emptied) by squeezing (applying pressure), but reappear spontaneously on release of pressure.

### **Examples**

- (1) Blood-filled lesion, eg hemangiomas (arterial, capillary or venous).
- (2) Lymphangiomas.
- (3) Narrow-necked meningoceles.



Figure 3.10: Compressible hemangioma.

### **Pulsatility**

A lump will exhibit pulsatility if it lies just superficial to an artery (transmitted pulsation), or if it arises from the artery itself or if the lump is very vascular (expansile pulsation).

### **Clinical techniques**

- (1) Gently press a finger of each hand on either side of the swelling (as far apart as possible)
  - 
  - (a) With each arterial beat, the fingers will move outward away from each other in case of expansile pulsation.
  - (b) With each arterial beat, the fingers will move in the same direction in case of transmitted pulsation.
- (2) To differentiate between the expansile & transmitted pulsation of an abdominal swelling, the patient is placed in the knee elbow position
  - 
  - (a) Pulsation will remain as such in case of abdominal aortic aneurysm (expansile).
  - (b) Pulsation will diminish or disappear in case of an abdominal mass lying in front of the abdominal aorta (transmitted), as the mass falls away from the aorta.



Figure 3.11: Pulsatile aneurysm of radial artery.

### **Examples**

- (1) Expansile pulsation →
  - (a) Aneurysms.
  - (b) Vascular growths eg, carotid body tumor.
  - (c) Vascular malformations & veins of arteriovenous fistulae.
  - (d) Very vascular tumor eg, telangiectatic sarcoma.
- (2) Transmitted pulsation → Pancreatic pseudocyst.

### **Lump mobility**

It depends on the fixation of lump to surrounding tissues, either due to inflammation or neoplastic infiltration. However, local features of lump & its site of origin can also produce characteristic signs of mobility.

### **Clinical techniques**

- (1) **Fixity to the overlying skin**

Attempt to-&-fro movement of skin over the lump, or gently squeezed (pinched up) the skin over the lump, in at least 2 directions at right angles to one another. You will not be able to do so or there will be pitting, wrinkling or pulling on the skin, in cases of deeper lump fixed to the skin or a lump arising from the skin itself.
- (2) **Fixity to the deeper structures**

Grip the lump between finger & thumb, & move it in 2 planes at right angles to one another. Repeat the movement once the underlying fascia has been tensed by appropriate muscle contraction.

  - (a) Lumps which are not fixed moves equally in both planes, whether the underlying muscles are contracted or relaxed.
  - (b) Lumps fixed to muscles or deep fascia moves only when the muscles are relaxed, but not when they are contracted.
  - (c) Lumps fixed to bone will not move

whether the muscles are contracted or relaxed.

### Examples

- (1) Cutaneous swellings eg, sebaceous cyst, papilloma, epithelioma are fixed to the skin. They will invariably move along with the skin, unless become fixed to deep structures (eg malignant infiltration of epithelioma, infected sebaceous cyst).
- (2) Subcutaneous lumps, eg lipoma & dermoid cyst, are usually free from overlying skin which can be easily moved over the swelling. They are also free from underlying contracted muscles, which make them more prominent & easily palpable.
- (3) Underlying malignant tumor (eg carcinoma of breast) can infiltrate the skin, making the lump to become fixed to the skin.
- (4) Tumors arising from the deep fascia will not be as mobile as those arising from the subcutaneous tissue. They become even less mobile or immobile, on contraction of underlying muscle.
- (5) Muscular lumps (eg rhabdomyoma, rhabdomyosarcoma, tears) can only be moved with the muscle relaxed. To define the origin of tumor, asks the patient to carry out movement against resistance to make the underlying muscle taut (contracted);
  - (a) In case of subcutaneous tumor fixed to the muscle, the tumor will become more prominent & cannot be moved along the line of the muscle fibers.
  - (b) In case of muscle tumor, it will become immobile & its size will be diminished.
  - (c) In case of tumor deep to the muscle, it will virtually disappear.
  - (d) Tear in the muscle or its tendon, will become evident only when the muscle contract.
  - (f) Swelling arising from the tendon moves along with the tendon, & will become fixed when the muscle contract.
- (6) Swellings arising from the vessels & nerves do not move along the line of vessel or nerve, but move at right angles to their axes.
- (7) Swelling arising from (eg osteoma) or infiltrating (eg carcinoma) a bone, is absolutely immobile even when the overlying muscle is

fully relaxed.

- (8) Abdominal lumps have characteristic mobility;
  - (a) Liver, gallbladder, spleen & stomach descends vertically on deep inspiration.
  - (b) Some lumps can be bounced anteroposteriorly or from side to side, termed ballottement; examples are renal mass & pregnant uterus.
  - (c) Mesenteric cyst moves perpendicular to the line of mesenteric attachment, but not along the line.

### Percussion

#### Resonance

Percussion is done over lumps to assess the contents, ie whether having resonance of gas-filled organs (eg gut), or dullness of solid structures (eg liver) or fluid;

- (1) Full bladder (in urinary retention), pregnant uterus or ovarian cysts are dull to percussion.
- (2) Inguinal & paraumbilical hernia are dull to percussion if it contains omentum, but resonant if it contains gas-distended loops of gut.

#### Fluid thrill

Tapping a fluid-filled lump produces a ripple through it, which is conducted across the fluid & appreciated as thrill by the palpating hand.

#### Clinical techniques

- (1) A gentle tap is made by one or two fingers on one side of the lump, while the percussion wave is felt on the other side of lump with palmar aspect of other hand.
 

**Note:** If the lump is large, percussion wave can be transmitted along its wall. This is prevented by placing the edge of patient's or assistant's hand on the lump midway between your percussing & palpating hands.
- (2) If the lump is small, place 3 fingers on one hand over the swelling; tap the middle finger with a finger of the other hand, while the percussion wave is felt by other two fingers.
 

**Note:** Percussion wave can not be felt across small lumps because the wave moves so quickly that the time gap due to conduction can not be appreciated, or distinguished from the mechanical shaking of the tissue caused by tap.

### Auscultation

Auscultation of lumps can reveal characteristic

diagnostic signs;

- (1) Bowel sounds over a hernia.
- (2) Bruits over vascular swellings, eg machinery murmur of arteriovenous fistula.
- (3) Bruits over diffuse toxic goitre (in Graves' disease).
- (4) Crepitus over a joint or fractured rib.

### DON'T FORGET TO EXAMINE

#### State of the regional lymph nodes

- (1) Regional lymph nodes must always be palpated as part of examination of a swelling. This includes:
  - (a) Cervical lymph nodes for a lump in head & neck region.
  - (b) Axillary lymph nodes for a lump of upper limb & trunk (above the level of umbilicus).
  - (c) Inguinal lymph nodes for a lump of lower limb & trunk (below the level of umbilicus).
  - (d) Pre-aortic & para-aortic lymph nodes for a lump in scrotum & abdomen.
- (2) When the draining lymph nodes are enlarged, examine other groups of lymph nodes to exclude generalized lymphadenopathy. (Detailed technique is given in module 19).

#### State of the neurovascular structures

- (1) Blood vessels supplying or draining a lump may undergo change:
  - (a) A lump may press on the main artery of the limb & causes weak pulse distally.
  - (b) Enlarged feeding arteries of vascular malformations.
  - (c) Veins may become more prominent in association with a lump, & there may be local thrombosis (with pain & edema).
  - (d) Dilated veins over trunks to provide alternative channels for venous return to the heart, when the primary channel is obstructed.

#### Examples

- (i) Superior vena cava obstruction at thoracic inlet, eg due to retrosternal goitre.
- (ii) Inferior vena cava obstruction, eg due to pelvic masses.

#### Technique to demonstrate direction of flow

- (i) Compress the vein with the tip of your left index finger, & with the right index finger empty a segment of vein by milking it away from the compressed point.
  - (ii) By releasing the right index pressure, emptied segment fills rapidly if the obstruction is in direction of milking.
  - (iii) Repeat the test, milking a segment of vein in opposite direction; this will show slow refilling towards non-obstructed direction.
- (2) Adjacent nerves may be affected by the pressure of the swelling, or involved by neoplastic infiltration;
    - (a) This may give rise to pain or motor & sensory abnormalities.
    - (b) Examine for sensory loss around & distal to lump, & the power of related muscles.

#### Movements

- (1) Always examine the movements of the nearby joint to exclude any impairment (due to the size or location of lump).
- (2) Lump may exert pressure on the subjacent bone, resulting in its erosion. This is sometimes seen in aneurysm & dermoid cyst on the skull.

#### General Examination

A very common mistake made by students is that they examine the lump about which the patient is complaining, & then forget about the rest of the patient. This will not only lead to innumerable misdiagnoses, but also in failure in examinations (esp. in short cases). You must always examine the patient as a whole. This is to exclude systemic disease related or unrelated to the lump; signs may include weight loss, malaise, & increased pulse rate & temperature.

### DIAGNOSTIC INVESTIGATIONS

- (1) Routine blood tests ie, complete blood counts (CBC), hemoglobin (Hb%), erythrocyte sedimentation rate (ESR) & sugar (RBS/FBS):

- (a) Inflammatory lumps will show leukocytosis (increased white cells count) & increased neutrophils in differential count.
  - (b) Chronic inflammatory & malignant lumps will show increased ESR & low Hb (anemia).
  - (c) Carbuncles & recurrent abscesses are commonly associated with diabetes mellitus, which is revealed by raised RBS/FBS.
- (2) Radiography is valuable in case of bony lumps & to find out if the subjacent bone has been eroded by an aneurysm or a dermoid cyst. It is also useful in breast lumps (mammography).
  - (3) Ultrasonography is helpful in defining the anatomical plane/organ of origin & the relationship of lumps to its surroundings. It also helps in differentiating whether the lump is solid or cystic, & can help in guided aspiration or core-biopsy.
  - (4) Fine needle aspiration (FNA) & examination of the aspirated material physically, chemically, cytologically & bacteriologically can help in making diagnosis of lumps. In case of simple cystic lumps, it may prove therapeutic.
  - (5) Biopsy (core/trucut, incisional or excisional) will give definitive diagnosis of lumps. This is especially done in cases of suspicious malignant tumors.

#### DIFFERENTIAL DIAGNOSIS OF CUTANEOUS & SUBCUTANEOUS LUMPS

- A) Congenital**
  - 1) Dermoid cyst
  - 2) Branchial cyst
  - 3) Cystic hygroma
  - 4) Hemangioma
- B) Traumatic**
  - 1) Hematoma
  - 2) Pseudoaneurysm
- C) Inflammatory**
  - 1) Cellulitis
  - 2) Abscess
  - 3) Boil (furuncle)
  - 4) Carbuncle
  - 5) Pyogenic granuloma
  - 6) Lymphadenitis
- D) Neoplastic**
  - Benign**
    - 1) Lipoma
    - 2) Papilloma
    - 3) Fibroma
    - 4) Neurofibroma
  - Malignant**
    - 1) Squamous cell carcinoma
    - 2) Melanoma
    - 3) Sarcoma
- E) Others**
  - 1) Sebaceous cyst
  - 2) Warts
  - 3) Keloid
  - 4) Callosity & corn

#### DIFFERENTIAL DIAGNOSIS

At the end of history & examination, you should have an idea about two things;

- (1) Origin of lump ie, whether it is arising from skin, subcutaneous tissue, muscles, vessel, nerve or bone.
- (2) Etiology of the lump ie, it is a congenital or acquired, traumatic or spontaneous, inflammatory or neoplastic, or otherwise.

Most of the common lumps have peculiar characteristics, which helps in spot diagnosis. You should read the details of these lumps from text books, so that you can correctly diagnose them. A list of common lumps encountered in surgical practice is given in the box below.

# Module 4

## Ulcer, Sinus & Fistula

### THE ULCER

An ulcer is a persistent discontinuity of an epithelial surface that can occur in skin or mucosa of gastrointestinal, urinary & respiratory tracts. It is usually due to recurrent minor physical or chemical injury, ischemia, neoplastic change & poor healing response (as in malnutrition).

### HISTORY

Follow the general pattern as given in chapter 1, with particular emphasis on the following points.

#### Site

##### Q1 Where is the ulcer?

Always begin with this question (if patient has not told you already). This will hint towards diagnosis, as many ulcers are peculiar to a particular site (see below), & will guide you to modify your subsequent questions accordingly.

#### Duration

##### Q2 When was the ulcer first noticed?

Remember duration is patient's notice about the existence of ulcer; however, an ulcer may be present asymptotically without patient's knowledge eg, neuropathic ulcer on the sole of foot.

- (1) Acute ulcer presents with history of short duration & pain.  
Example: Meleney's synergistic gangrene / ulceration.

- (2) Chronic ulcer presents with history of long duration & slight or no pain. It is important to know the incubation period in cases of ulcers associated with contacts (sexual); in Hunterian chancre (syphilis) the incubation period is 3 to 4 weeks, whereas in chancroid (soft sore) it is about 3 to 4 days.

Example: tuberculous ulcer, syphilitic ulcer, trophic ulcer.

- (3) Malignant ulcer presents with history of short duration.

Example: rodent ulcer.

### Mode of onset

#### Q3 How did the ulcer start?

- (1) Developed just after a trauma. They usually heal if traumatic agent is removed.  
Example: ulcer of the tongue or oral mucosa (due to ill-fitting dentures or broken teeth).
- (2) Developed spontaneously over pre-existing swelling.  
Example: tuberculous ulcer on scrofula, syphilitic ulcer on gumma, malignant melanoma.
- (3) Developed spontaneously in association with varicose veins or vascular insufficiency.  
Example: Varicose ulcer.
- (4) Developed on some pre-existing lesions.  
Example: Marjolin ulcer from a scar of burn.

### First symptom

#### Q4 What made the patient to notice the ulcer?

- (1) Commonest symptom is pain. Ask about the time of onset, nature, site, & aggravating & relieving factors.

**Examples**

- (a) Ulcers associated with acute inflammation are painful.
  - (b) Tuberculous ulcers are slightly painful.
  - (c) Malignant ulcers (eg rodent ulcer) are absolutely painless initially, but become painful later when the carcinoma infiltrates pain nerve endings.
- (2) In neuropathic (trophic) ulcer, the pain is absent. So, patient notices ulcer late when some complication occur, eg discharge (abscess or osteomyelitis), blackening (gangrene) or deformity.

**ULCER HISTORY REVIEW**

1. Site
2. Duration
3. Mode of onset
4. First symptom
5. Other symptoms
6. Progress
7. Healing (disappearance)
8. Reappearance
9. Multiplicity
10. Previous treatment
11. Systemic effects
12. Cause

**Other symptoms associated with the ulcer****Q5 What are the symptoms of the ulcer?**

Other associated (& occasionally the presenting) symptoms are:

- (1) Bleeding.
- (2) Discharge, which may be foul smelling.
- (3) Interference with daily activity eg, chewing, swallowing, defecation & walking.

Enquire about the history of each symptom.

**Progress of the ulcer****Q6 Has the ulcer changed since it was first noticed?**

Enquire about the changes in size, shape, edge, depth, base, discharge & pain.

**Healing/Disappearance****Q7 Has it ever healed?**

Patient should always be asked if the ulcer has ever healed. It may healed & reappear at the same site (eg traumatic ulcer), or healed at one site & appear at another (eg tuberculous ulcer).

**Q8 What causes it to appeared again?**

Negligence of care (eg trophic ulcer), trauma (eg traumatic ulcer), & discontinuity of drugs (eg tuberculous ulcer) are some of the causes. Enquire about the feature of each episode.

**Multiplicity****Q9 Has the patient ever had any other ulcer?**

Patient may have ulcer of similar nature in the past

or he may have ulcer of similar nature at another place at the same time (which is not bothering him). Example: tuberculous ulcer, syphilitic ulcer, varicose ulcer.

**Previous treatment****Q10 Has the patient ever received any treatment for this ulcer?**

- (1) An ulcer reappearing after antituberculous treatment is usually due to drug resistant tuberculosis.
- (2) If the ulcer recurs after excision, this often indicates malignant change in a benign growth or the primary tumor was a malignant one.

**Systemic effects****Q11 Has the patient experiences fever, loss of body weight?**

Asked the patient to detect any systemic effect that can be produced by infection, trauma or neoplastic changes.

**Cause****Q12 What does the patient think about its cause?**

Every patient has ideas about the cause of their problem, & most often they are right. Commonest cause resulting in ulcer is trauma. An associated disease might be the cause, eg peripheral neuritis, generalized tuberculosis, nephritis, or diabetes mellitus.

**CLINICAL EXAMINATION**

Clinical examination is along the same lines, as described for lump.

**Local examination**

**Inspection**

Always spends some time in inspection. Appropriate exposure is necessary; in case of lower



limb ulcer, always expose full both limbs simultaneously.

**Site**

Exact anatomical location of the ulcer must be described, using distances measured from fixed bony points or other landmarks.

The site of ulcer is usually characteristic, often giving spot diagnosis:

- (1) Venous ulcers are sited just above the malleolus; they are usually medial, but in more severe cases can become circumferential.
- (2) Arterial (ischemic) ulcers are usually situated distally, ie over the tips of toes & between toes. They may also occur over the dorsum of feet, malleoli, heel & shins.
- (3) Diabetic ulcers (due to arteriopathy, neuropathy & infection) are typically situated on the sole, esp. over the heads of first & second metatarsals & heel.
- (4) Tuberculous ulcers are usually situated where tuberculous adenopathy is common, ie in the neck, axilla or groin.
- (5) Hunterian chancre & soft sores are usually sited over the external genitalia.
- (6) Peptic ulcers are usually sited in distal stomach & proximal duodenum.
- (7) Rodent ulcers are usually situated on the upper

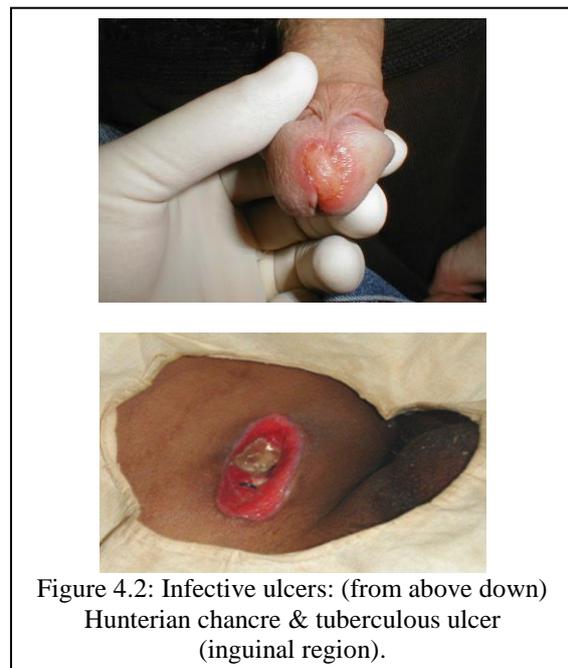




Figure 4.3: Malignant ulcers: (from above down) Marjolin's ulcer & rodent ulcer.

part of face above a line joining the angle of mouth to the lobule of ear, occurring frequently near the inner canthus of eye.

- (8) Malignant ulcers are common on the lips, tongue, breast, penis, anus & burns scar, & also in esophagus, stomach, colon & rectum.

#### Size

Measurement of the size of ulcer will give a rough estimate about the time it will take to heal; it also helps in subsequent follow-up visits.

Take an exact record of the shape & size, by pressing a piece of sterile gauze onto the ulcer to get its imprint, & then cut around it or trace it on paper. Alternatively, place a transparent polythene sheet over the ulcer, & trace around its edge with a marker-pen.

#### Shape

Noted whether the shape of ulcer is oval, circular or irregular;

- (1) Tuberculous ulcers are usually oval, but their coalescence may give an irregular crescentic border.
- (2) Syphilitic ulcers are also circular or semilunar to start with but may unite to form a serpiginous ulcer.

- (3) Venous ulcers are usually vertically oval in shape.

- (4) Malignant ulcers are irregular in shape.

#### Edge

There are 5 types of ulcer edge, each of which is characteristic of the underlying pathology.

##### (1) Flat, sloping edge

The epithelium is growing in from the edge in an attempt to heal the ulcer, which is shallow & superficial, often only half-way through the skin. The new skin around the edge is red-blue & almost transparent.

Example: venous, traumatic & septic ulcers.

##### (2) Punched out (square-cut) edge

The edge drops down at right angle to the skin surface as if it has been cut out with a punch. It follows rapid death & loss of whole thickness of skin, without any attempt by the body to heal it.

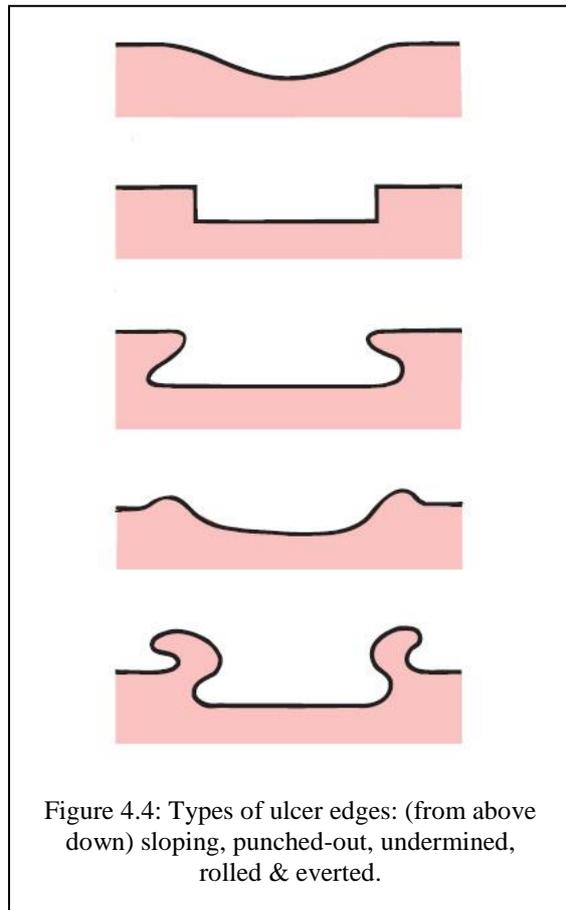


Figure 4.4: Types of ulcer edges: (from above down) sloping, punched-out, undermined, rolled & everted.

Example: syphilitic, trophic, diabetic, leprosy & ischemic ulcers.

**(3) Undermined edge**

The disease causing the ulcer spreads in & destroys the subcutaneous tissue faster than it destroys the skin. The resultant overhanging skin is thin friable, reddish-blue & unhealthy.

Example: tuberculous ulcers & pressure sores on buttock.

**(4) Raised (rolled) edge**

It develops when there is slow growth of tissue in the edge of ulcer; the edge is usually pale-pink or white, with clumps of cells visible through paper-thin superficial covering of squamous cells.

Example: rodent ulcer (basal cell carcinoma).

**(5) Everted edge**

It develops when the tissue in the edge of ulcer is growing rapidly & spilling out of the ulcer to overlap the normal skin.

Example: ulcerated carcinoma of skin & gastrointestinal, urinary & respiratory tracts.

Other characteristic features of the edge of ulcer are:

- (1) Edge is inflamed & edematous in spreading ulcers.
- (2) Color of the edge may be red from inflammation, or pale or cyanosed from ischemia progressing later to permanent staining of blue, purple or black.
- (3) Pigmentation may be present around venous ulcers & malignant melanoma.
- (4) Keratinization of edge is common in neuropathic ulcers.

**Floor**

It is the exposed surface of the ulcer. Its nature gives some indication about the cause & progress of ulcer.

- (1) Ulcers heal by secondary intention. Initially, there is an inflammatory response with the production of slough, a yellowish adherent surface on floor made up of dead tissue & inflammatory cells.
- (2) In a healing ulcer, the slough is replaced by granulation tissue, & the skin creeps in over the granulating floor. Granulation is usually pink with red dots at the site of capillary loops; pale & smooth granulation tissue indicates a slowly healing ulcer.
- (3) Wash-leather slough on the floor is typical of

syphilitic ulcers.

- (4) Bluish granulation tissue on floor is present in tuberculous ulcers.
- (5) Ischemic ulcers often contain no granulation tissue, & the underlying structures (tendons, deep fascia, bones or joints) may lie exposed on the floor.

**Discharge**

Note the character of the discharge (serous, sanguineous, serosanguineous or purulent), & its amount & smell. Always take bacteriological swab of an ulcer for culture & sensitivity test.

- (1) Serous discharge implies that the ulcer is healing.
- (2) Purulent discharge implies that the ulcer is spreading & inflamed.

**Characteristic purulent discharge**

- (a) Staphylococci produce yellow, creamy pus.
  - (b) Streptococci produce watery & opalescent pus.
  - (c) Pseudomonas produces blue/green pus.
  - (d) Amebic ulcer (spreading from liver abscess) produces purplish-brown pus.
  - (e) Actinomycosis pus contains yellow granules.
- (3) Serosanguineous discharge is often seen in a tuberculous or a malignant ulcer. A healing granulating surface bleeds with minimal trauma. Bleeding may also indicate erosion of adjacent vessels, esp. in malignant ulcer.
  - (4) Discharge may be more copious when associated with edema, whether from lymphatic or venous obstruction or generalized edema.
  - (5) Smell may provide a diagnostic clue;
    - (a) Infection with fecal organism is particularly offensive.
    - (b) Dead tissue, associated with malignant ulcer & wet gangrene, may also be foul smelling.
  - (6) Discharge & slough may dry to become a scab on floor, & a layer of dead tissue may become dry to form a dark brown or black eschar. It is then necessary to remove the scab/eschar to examine the ulcer properly.

**Number**

Tuberculous, syphilitic, & venous ulcers may be more than one in number. Appropriate exposure is required because sometimes, even the patient is not aware of ulcer/swelling at other place.

**Surrounding tissues**

The effect of ulcer on surrounding tissues is largely dependent on its etiology:

- (1) In acutely inflamed ulcer, the surrounding area is glossy, red & edematous.
- (2) In venous ulcer, the surrounding skin is eczematous & pigmented, & the limb may also show varicose veins.
- (3) In tuberculous ulcer, a scar or a wrinkling in the surrounding skin indicate an old case of tuberculosis.

**Palpation**

Confirm your findings on inspections, besides elaborating others. Be gentle with the patient.

**Tenderness**

- (1) Acutely inflamed ulcer is always exquisitely tender; local temperature may also be raised.
- (2) Arterial ulcer is usually painful & tender, whereas venous ulcer is usually not tender.
- (3) Tuberculous & syphilitic ulcers are slightly tender.
- (4) Neuropathic & malignant ulcers are not tender.

**Edge**

- (1) Confirm your inspection finding about the type of the edge.
- (2) Marked induration (hardness) of the edge is a characteristic feature of carcinoma. However, slight induration is present in any chronic ulcer.

**Base**

It is the surface on which the ulcer rests.

**Technique**

Pick up the ulcer with your thumb & index finger, & the tissue that you feel is the base. In this position, also assess the mobility of the ulcer & its relation to the surrounding structures.

**Significance**

- (1) Slight induration of the base is found in any chronic ulcer, but marked induration implies carcinoma.
- (2) Inflammatory ulcers usually only extend into subcutaneous tissue, but may communicate with a deep abscess cavity (eg tuberculous ulcer).
- (3) Skin cancers progressively infiltrate through subcutaneous tissue to deeper structures, with fixation to fascia, muscles & bone.
- (4) Penetration of the wall of a viscus may lead to perforation into a body cavity, or fistulation into another organ.

**ULCER EXAMINATION REVIEW****A) Inspection**

- 1) Site
- 2) Size
- 3) Shape
- 4) Edge
- 5) Floor
- 6) Discharge
- 7) Number
- 8) Surrounding tissues

**B) Palpation**

- 1) Tenderness
- 2) Edge
- 3) Base
- 4) Depth
- 5) Bleeding
- 6) Surrounding tissues

**C) Don't forget to examine**

- 1) Regional lymph nodes
- 2) Neurovascular structures
- 3) General examination

**Depth**

It should be described both in millimeters, & in terms of tissue the ulcer has penetrated or reached.

**Bleeding**

Note whether the ulcer bleeds to touch. It is either a healing granulating ulcer or a malignant ulcer.

**State of the surrounding & deeper structures**

- (1) Induration of the surrounding tissues is found, due to inflammatory response to infection, trauma & malignancy, or it may be direct invasion of a malignant ulcer.
- (2) In neuropathic ulcers, there is sensory loss over adjacent skin & reduced sweating (autonomic neuropathy).

(Mobility & fixation is already discussed above with base).

**Don't forget to examine****State of the regional lymph nodes**

As with lumps, it is essential to examine the regional lymph nodes:

- (1) In acutely inflamed ulcers, the regional lymph nodes become enlarged & tender (acute lymphadenitis).; an abscess may form later.
- (2) In tuberculous ulcer, the lymph nodes become enlarged, matted & slightly tender.
- (3) In Hunterian chancre, the regional lymph nodes become enlarged but they are discrete, firm & shotty.

- (4) In rodent ulcer, the lymph nodes are not affected.
- (5) In malignant ulcer, the regional lymph nodes may become enlarged either due to secondary infection or metastasis; in metastasis, the nodes are stony hard & may be fixed to the surrounding structures.

#### **State of the neurovascular structures**

- (1) In venous ulcer, varicose veins or deep vein incompetence may be found. (In such case, a detailed examination is required, as given in module 18).
- (2) In arterial ulcer, examine the arteries of the limb proximal to the ulcer. Atherosclerosis, Buerger's disease, Raynaud's disease & diabetes may be the cause of ulcer (due to ischemia). [See module 17 for examination of arterial system].
- (3) In neuropathic ulcers, there is sensory loss from peripheral neuropathy which results in neglect of minor trauma, ultimately leading to ulcer; sensory loss extends over to the adjacent skin. (A detailed examination of peripheral nerve is required, as given in module 20).

#### **General examination**

As for lump, you must always examine the patient as a whole. This is to exclude other stigmata of suspected disease, as well as concurrent systemic disease;

- (1) In acutely inflamed ulcer, increased pulse rate & temperature are found.
- (2) In malignant ulcer, weight loss & malaise can be found.
- (3) In tuberculous ulcer, primary focus can be found in chest, neck & abdomen; there may be involvement of more than one lymph node regions.
- (4) In syphilitic ulcer, other stigmas can be found, eg involvement of genitalia & oral cavity.
- (5) In arterial ulcer, atherosclerosis or its complication can be found at other places in the body. Buerger's disease is a bilateral condition & the other limb may also be involved.
- (6) In neuropathic ulcer, neurologic & metabolic assessment will lead to the cause, eg peripheral neuropathy, tabes dorsalis, transverse myelitis or diabetes mellitus.

#### **DIAGNOSTIC INVESTIGATIONS**

- (1) Routine blood tests ie, complete blood counts (CBC), hemoglobin (Hb%), erythrocyte sedimentation rate (ESR) & sugar (RBS/FBS):
  - (a) Inflammatory ulcers → Leukocytosis (increased white cells count) & increased neutrophils in differential count.
  - (b) Tuberculous ulcers → Lymphocytosis & increased ESR.
  - (c) Malignant ulcers → Low Hb (anemia).
  - (d) Trophic ulcers → Raised RBS/FBS, as they are commonly associated with diabetes mellitus.
- (2) Bacteriological examination of discharge;
  - (a) Gram's staining & microscopy for Gram-positive & Gram-negative organism.
  - (b) Ziehl-Neelsen staining & microscopy for acid-fast bacilli (AFB).
  - (c) Giemsa's staining & dark field illumination for treponema pallidum.
  - (d) Culture & sensitivity test will not only identify the causative organism, but also give information about appropriate antibiotic to be used.
- (3) Radiography
  - (a) X-ray chest may detect primary focus in the lungs.
  - (b) X-ray of bones or joint may be required, when an ulcer is situated close to them, to detect their involvement.
- (4) Ultrasonography is helpful to evaluate a mass adjacent to ulcer, eg tuberculous adenitis. Similarly, duplex scan gives information about the state of veins in case of venous ulcer.
- (5) Biopsy (incisional or excisional) will give definitive diagnosis of ulcers. This is especially done in cases of suspicious malignant ulcers.

#### **DIFFERENTIAL DIAGNOSIS**

As in lump, many of the ulcers have peculiar characteristics, which help in spot diagnosis. You should read the details of these ulcers from text books, so that you can correctly diagnose them. A list of common ulcers encountered in surgical practice is given in the box below.

**DIFFERENTIAL DIAGNOSIS OF ULCER****A) Traumatic**

- 1) Mechanical, eg dental ulcer of tongue
- 2) Physical, eg electrical or x-ray burns
- 3) Chemical, eg peptic ulcer, application of caustics

**B) Inflammatory**

- 1) Acute inflammatory ulcers, eg Meleney's ulcer
- 2) Chronic ulcers, eg tuberculous ulcer, syphilitic ulcer, actinomycosis

**C) Neurovascular**

- 1) Arterial ulcer, as in atherosclerosis, Buerger's disease, Raynaud's disease
- 2) Venous ulcer, as in post-thrombotic limb, varicose veins
- 3) Neuropathic (trophic) ulcer, as in diabetes mellitus, peripheral neuropathy

**D) Malignant**

- 1) Rodent ulcer (basal cell carcinoma)
- 2) Squamous cell carcinoma
- 3) Malignant melanoma
- 4) Adenocarcinoma

(pilonidal sinus).

- (5) When the tract becomes epithelialized.
- (6) Malignant disease in the tract or cavity.

**HISTORY**

Follow the pattern as described above for ulcer; take information about the site, duration, mode of onset, symptoms, progress, disappearance, multiplicity, previous treatment, systemic effects, & cause.

- (1) Congenital sinuses & fistulae may be present since birth, eg preauricular sinus, tracheo-esophageal fistula.
- (2) A sinus or fistula usually presents with recurrent discharge & recurrent bouts of acute infection of the abscess cavity. They are likely to persist until removal of the causative factors (listed above).
- (3) A sinus associated with an abscess, eg osteomyelitis, may present with pain, swelling & high-grade fever, along with the discharge. It will persist so long as there will be sequestrum at the depth.
- (4) In tuberculous sinus, a previous history of tuberculous adenitis, osteomyelitis or arthritis may be elicited. Subsequently a cold abscess will develop, which will burst (or be incised) leading to a sinus.
- (5) In perianal sinus or fistula, a previous history of perianal or ischiorectal abscess may be elicited.

**THE SINUS OR FISTULA**

A sinus is a blind tract lined with granulation tissue, connecting the deeper tissue to an epithelial surface. There may be an abnormal cavity in the tissue, usually commencing as an abscess in which normal healing process is impaired. Granulations may be exuberant & protrude through the orifice.

A fistula is an abnormal tract between two epithelial surfaces, commonly between a hollow viscus & the skin (external fistula) or between two hollow viscera (internal fistula). The tract is lined with granulation tissue which is subsequently epithelialized.

**Etiology of sinus or fistula**

- (1) Congenital (see below).
- (2) Inadequate or inappropriate drainage of abscess, eg fistula-in-ano.
- (3) Chronic inflammation, eg due to tuberculous, syphilitic or leprosy bacteria, actinomycosis, Crohn's disease.
- (4) Presence of foreign body or necrotic tissue in the abscess cavity, eg clothing material (from trauma), suture material, orthopedic or vascular prosthesis, sequestrum (in osteomyelitis), hairs

**CLINICAL EXAMINATION**

Clinical examination is along the same lines, as described for ulcer.

**Local examination****Inspection****Site**

Exact anatomical location of the sinus/fistula must be described, using distances measured from fixed bony points or other landmarks.

The site of sinus/fistula is also usually characteristic, often giving spot diagnosis (as for lump & ulcer):

- (1) Preauricular sinus (due to failure of fusion of the ear tubercles) is situated at the root of the helix or on the tragus of the pinna, the direction

of sinus being upwards & backwards.

- (2) Branchial fistula (due to failure of fusion of the second branchial arch with the fifth) is situated just in front of the lower third of anterior border of sternomastoid muscle.
- (3) A single sinus over the lower irregular jaw is mostly due to osteomyelitis.
- (4) Tuberculous sinus is usually found in close relation to tuberculous lymphadenopathy or cold abscess.
- (5) Multiple indurated sinuses in the upper part of the neck, or abdomen following appendicectomy suggests the diagnosis of actinomycosis.
- (6) Pilonidal sinus is situated in the midline posteriorly, about the level of first segment of coccyx.
- (7) Fistula-in-ano is situated in close relation to the anus.

**Multiplicity**

- (1) Most of the sinuses/fistulae are single, eg preauricular sinus, branchial fistula.
- (2) Some are notoriously known for their multiplicity: watering-can perineum, Crohn's disease of anorectum producing multiple anal fistulae, & actinomycosis.
- (3) Some are single initially, but later develop multiple secondary tracts; examples are fistula-in-ano, pilonidal sinus.

**Orifice(s)**

- (1) Sinus has a single external orifice, whereas fistula has both external & internal orifices.
- (2) Exuberant granulation tissue (proud flesh) at the opening of the sinus suggests presence of foreign body at the depth, eg sequestrum, infected non-absorbable suture, or bullet.
- (3) Opening of a tuberculous sinus is often wide & the margin is thin blue & undermined.
- (4) Hairs projecting from the orifice indicates pilonidal sinus.

**Discharge**

Note the character & odor of the discharge;

- (1) Streptococcal pus from newly infected tissue is watery & only slightly opalescent, staphylococcal pus is yellow & of creamy consistency, pseudomonas pus is blue or bluish-green, & pus from amebic liver abscess is anchovy-sauce colored.
- (2) Foul-smelling pus suggests fecal organisms &



Figure 4.5: (From above down) preauricular sinus, branchial fistula, & mandibular osteomyelitis.

the likely presence of a fistulous connection.

- (3) In fistulae connecting deeply to another viscus, urine, feces, gas bubbles, or bile may be seen coming out.
- (4) In tuberculous sinus, it is often serosanguineous.
- (5) In actinomycosis, the discharge contains sulphur granules.

- (6) In osteomyelitis, it is often pus.  
 (7) In mammary fistula, the discharge is milk.

### **Surrounding skin**

- (1) A surgical scar in relation to a sinus indicates an infected suture/mesh in the depth.
- (2) A secondary healing scar in the surrounding tissue may indicate chronic osteomyelitis or previously healed tuberculous sinus.
- (3) There may be surrounding dermatitis & pigmentation which are characteristic features of Crohn's disease & actinomycosis.

### **Palpation**

#### **Tenderness**

A sinus or fistula resulting from an inflammatory process (ie associated with a deep abscess) is tender; examples are infected pilonidal sinus, fistula-in-ano & osteomyelitis. The local temperature may also be raised.

#### **Tract of the sinus**

##### **Technique**

Palpate carefully around the orifice of sinus/fistula to determine the direction & thickness of the tract. In cases of fistula in relation to anus or jaw, bidigital palpation leads to valuable information (with thumb or one finger of one hand palpating around external orifice & the other finger of same or other hand is palpating around internal orifice, & both fingers being pushed towards each other to palpate the intervening tissue).

**Note:** Examination with a probe is a painful procedure, & can lead to complications by forcing in wrong direction. Previously a routine, it should not be done because as much information can be obtained by careful digital palpation; also investigation are available which clearly define the tract (see below).

##### **Significance**

Long-standing sinuses/fistulae will have thick tract due to presence of fibrosis surrounding the wall. Knowledge of direction of tract will help during surgical exploration.

##### **Mobility**

Note whether the sinus is mobile over the deep structures. Sinuses resulting from osteomyelitis are fixed to the bone, which becomes irregular, thickened & tender.

##### **Lump**

If a lump is found in relation to sinus or fistula, examine it in detail noting all the features (as

described in module 3). The lump is usually an abscess, either pyogenic (eg ischiorectal abscess related to fistula-in-ano) or tuberculous (eg collar-stud abscess related to sinus of neck).

### **Don't forget to examine**

#### **Examination of regional lymph nodes**

As with lumps & ulcers, it is essential to examine the regional lymph nodes.

#### **General examination**

Always examine the patient as a whole. Depending on the site & cause of the sinus/fistula, examination of the relevant system should be performed.

- (1) In case of tuberculous sinus related to adenitis, all lymph node regions must be examined.
- (2) In case of a sinus in the loin, the spine, ribs & kidneys should be examined.
- (3) In case of a sinus due to chronic empyema or osteomyelitis, the chest or bone should be thoroughly examined respectively.
- (4) In case of fistula-in-ano, in addition to digital rectal examination & proctoscopy, sigmoidoscopy & examination of the whole abdomen should be performed.

### **DIAGNOSTIC INVESTIGATIONS**

- (1) Routine blood tests ie, CBC, Hb%, ESR & RBS/FBS.
- (2) A detailed examination of the discharge; it includes macroscopic, microscopic, physical, chemical & bacteriological examinations.
- (3) Radiography
  - (a) X-ray of the involved bone may show a sequestrum & osteomyelitic changes.
  - (b) X-ray chest or air/contrast swallow may show tracheo-esophageal fistula. X-ray chest may also detect primary focus in the lungs.
- (4) Sinogram/fistulogram helps in mapping the tract; however, it may cause recrudescence of inflammation.
- (5) Ultrasonography & magnetic resonance imaging are more helpful in mapping complex sinus/fistulous tracts; endoluminal ultrasound is used to map complex fistula-in-ano.
- (6) Excisional biopsy will give the tissue diagnosis.

# Module 5

## Chest: Respiratory System

Many of the clinical surgery books are lacking in the evaluation of respiratory & cardiovascular systems, considering it as the domain of medicine. However, in this book you will find a detailed account, as in many of the surgical emergencies especially the trauma cases you are required to evaluate these systems. Furthermore, in elective cases you are required to assess the patients' fitness for the operation, & many of the surgical patients have associated medical problems, which require proper clinical evaluation.

### HISTORY

### COUGH

Cough may be either a voluntary act or a reflex response to irritation of the respiratory mucosa mediated through medullary centre. It consists of a forceful expiratory effort with the glottis closed, followed by the sudden explosive release of the pent-up air along with sputum or other irritant matter.

Note whether the cough is dry or productive of sputum, whether it is short or paroxysmal, the times at which it tends to occur & finally the character of the sound.

### Nature of cough

- (1) Dry cough occurs when the mucosa of the larynx, trachea or bronchi is congested with little or no exudates, as in the early stages of respiratory infections & following inhalation of

irritant dusts or fumes, eg tobacco smoke.

- (2) Productive cough indicates free exudates in the respiratory passages, as in chronic bronchitis & bronchiectasis.

### Duration of cough

- (1) Short cough is usual in upper respiratory infections such as the common cold & when respiratory movements are suppressed by pleuritic pain.
- (2) Prolonged or paroxysmal coughing is characteristic of chronic bronchitis & also of whooping cough.
  - (a) A foreign body may be responsible for the abrupt onset of paroxysmal cough.
  - (b) A severe paroxysm may be followed by vomiting or by syncope, the latter being due to the raised intrathoracic pressure interfering with venous return to the heart & thus diminishing cardiac output.

### Time of cough

- (1) Cough & expectoration of sputum are often most troublesome on rising in the morning & going to bed at night, especially in chronic bronchitis & bronchiectasis. This may be due to the change in posture moving secretions from damaged insensitive areas of mucosa to more sensitive parts.
- (2) A change of temperature, as in moving from a warm room to the cold outside air, also provokes cough in patients with chronic bronchitis. For this reason, & also because of the greater frequency of respiratory infections the cough is worse in winter than in summer.

- (3) Cough waking the patient at night, although quite common in chronic bronchitis, should always suggest the possibility of pulmonary congestion due to left heart failure or mitral stenosis. Other causes of nocturnal cough include asthma (especially in children), secretions running down the larynx from the posterior nares in patients with chronic infections of the nose or sinuses & the inhalation of esophageal or gastric contents due to esophageal obstruction or hiatus hernia.

**Character of sound**

- (1) Intrathoracic tumors, especially aneurysm, can press on the trachea & cause cough with a metallic, hard quality described as brassy.
- (2) If a tumor involves the recurrent laryngeal branch of the vagus nerve & interferes with the normal movements of the vocal cords, the cough loses its explosive character & becomes prolonged & wheezing, like that of a cow; it is then known as a bovine cough. Diseases of the larynx responsible for cough (eg neoplasm) are sometimes identified by the hoarseness of the cough & the accompanying stridor.

**Sputum**

Important information can be gained by naked eye inspection of the sputum. The patient should be instructed to expectorate into a sputum cup, & the amount measured after 24 hours. The student should note the amount, consistency & color of the sputum.

- (1) Large amounts may be found in bronchiectasis & pulmonary abscess or when an empyema ruptures into a bronchus. The expectoration of large quantities of sputum on change of posture is characteristic of bronchiectasis & pulmonary abscess, & the sputum may have an offensive smell due to infection by anaerobic organisms.
- (2) A large amount of thin, colorless sputum is seen in the relatively rare alveolar cell carcinoma of the lung.
- (3) Thick, viscid sputum, which sometimes takes the shape of bronchial casts, occurs in asthma, especially with bronchopulmonary aspergillosis.
- (4) Thin, watery sputum suggests pulmonary edema.
- (5) Green coloration indicates pus, while a yellow

color may be due to pus or to a high eosinophil content.

- (6) Blood in the sputum may give a rusty appearance in pneumonia, a diffuse pink staining in pulmonary edema or it may appear as streaks or clots.

**Hemoptysis**

Expectoration of blood is known as hemoptysis. The amount may vary from streaks to several pints & may consist of pure blood or be mixed with sputum or salivary secretions.

**Table 5.1: HEMOPTYSIS VS. HEMATEMESIS**

Hemoptysis	Hematemesis
Cough precedes hemorrhage	Nausea & vomiting precede hemorrhage
Blood frothy from admixture with air	Generally airless
Sputum bright red in color & may be stained for days	Blood often altered in color by admixture with gastric contents, usually dark red or brown
History suggests respiratory disease	Previous history of indigestion
Confirmed by bronchoscopy	Confirmed by gastroscopy

**Table 5.2: CAUSES OF HEMOPTYSIS**

<p><b>Bronchial disease</b></p> <p>1) Carcinoma</p> <p>2) Bronchiectasis</p> <p>3) Acute bronchitis</p> <p>4) Bronchial adenoma</p> <p>5) Foreign body</p> <p><b>Parenchymal disease</b></p> <p>1) Tuberculosis</p> <p>2) Suppurative pneumonia</p> <p>3) Lung abscess</p> <p>4) Hydatid cyst</p> <p>5) Trauma</p> <p>6) Actinomycosis</p> <p>7) Aspergillosis</p>	<p><b>Lung vascular disease</b></p> <p>1) Pulmonary infarction</p> <p>2) Polyarteritis nodosa</p> <p>3) Goodpasture's syndrome</p> <p><b>Cardiovascular disease</b></p> <p>1) Acute left ventricular failure</p> <p>2) Mitral stenosis</p> <p>3) Aortic aneurysm</p> <p><b>Blood disorders</b></p> <p>1) Leukemia</p> <p>2) Hemophilia</p> <p>3) Anticoagulants</p>
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If it is definitely established that the blood has been spat up, the mouth & throat should be examined for any local cause, such as epistaxis, bleeding gums or a congested pharynx, which may cause small amounts of blood to appear in the mouth. However, hemoptysis must never be

attributed to these causes until a chest radiograph has been proved normal.

### DYSPNEA (BREATHLESSNESS)

It is defined as an undue awareness of respiratory effort or of the need to increase this effort. The respiratory awareness is related to the force used to ventilate the lungs. This force is increased when the thoracic cage or pleura is abnormally rigid, the pleural cavity filled with fluid or air, airways resistance increased, or the lungs less distensible than normal; this also occurs when there is an increased demand for breathing as a result of hypoxia, anemia, acidosis or thyrotoxicosis.

An attempt should be made to assess the severity of the dyspnea by noting whether it is present at rest, with gentle activity such as undressing or walking on level ground, during moderate exertion, such as climbing stairs, or only on more strenuous exercise. The ability of the patient to carry out routine tasks at work or in the home should also be recorded.

- (1) Dyspnea due to disease of the bronchi, lungs, pleura or thoracic cage is usually brought on by exertion. Dyspnea which develops suddenly at rest suggests pulmonary embolism or pneumothorax.
- (2) Dyspnea of cardiac failure is due to an increased stiffness of the lungs resulting from engorgement with blood when the mitral valve is diseased or the left ventricle fails.
  - (a) It is provoked by exertion & relieved by rest, but it is also influenced by posture.
  - (b) When the patient lies flat, gravitational effects increase the congestion of the lungs. This causes dyspnea when the patient lies down (orthopnea), & sometimes a violent attack of breathlessness may waken him from his sleep (paroxysmal nocturnal dyspnea).
  - (c) These attacks may be accompanied by cyanosis & the expectoration of large amounts of thin, frothy sputum stained pink with blood due to pulmonary edema.
  - (d) Attacks of cardiac dyspnea unassociated with effort or changes in posture can also result from myocardial infarction or a rapid dysrhythmia.
- (3) Dyspnea can result from an increased demand for respiration due to stimulation of central receptors by hypoxia (eg high altitudes, anemia), acidosis (eg diabetes, uremia), or when metabolism is increased (eg fever, thyrotoxicosis). The pallor of anemia should especially be looked for in all patients complaining of breathlessness.
- (4) Psychogenic dyspnea is diagnosed when all possible organic causes have been excluded. Any discomfort in the chest may be interpreted as breathlessness by the nervous patient. Such discomfort may be due to anxiety about the heart or lungs, ectopic beats, muscular symptoms or gastric distension; dyspnea occurs as often at rest as on exertion & especially while talking. These patients may ventilate in excess of metabolic requirements, thus lowering the arterial tension of CO<sub>2</sub> to produce symptoms such as dizziness, paresthesiae & tetanic cramps in the hands due to respiratory alkalosis.

### PAIN

Lung tissue is insensitive & pain in the chest is always the result of conditions which affect the surrounding structures.

- (1) When the pleura is involved, pain is a prominent feature.
  - (a) It is usually described as cutting, stabbing or tearing on deep breathing or coughing.
  - (b) Most commonly it is felt in the axillae & beneath the breasts.
  - (c) Parietal pleura, including that covering the diaphragm, is innervated through the thoracic roots (intercostals nerves), the lower six of which are responsible for the supply of skin of abdominal wall & back. Pleural pain is therefore frequently referred to the abdomen & lumbar regions.
  - (d) Innervation of the central portion of diaphragm by the phrenic nerve (3<sup>rd</sup> & 4<sup>th</sup> cervical) occasionally leads to referred pain in the neck & shoulder tip in diaphragmatic pleurisy.
  - (e) In lesions of the apex of the lung such as Pancoast's syndrome (bronchial carcinoma causing Horner's syndrome with

involvement of the 8<sup>th</sup> cervical & 1<sup>st</sup> dorsal nerve roots), the pain may be referred to the arm.

- (2) Pain of fractured rib(s) get worse on deep inspiration.
- (3) Finally, many chest pains are not associated with respiratory disease. These include pains due to disease of the heart (see module 6), esophagus & upper abdominal viscera (eg hiatus hernia), osteoarthritis of the spine, lesions of the ribs, sternum & intercostals muscles, herpes zoster & diseases of the breast.

### EXTRATHORACIC SYMPTOMS

Diseases of the respiratory system can produce symptoms in other parts of the body.

- (1) Constitutional symptoms such as anorexia, weight loss & fever, as in tuberculosis & carcinoma.
- (2) Symptoms of hypoxia & hypercapnia, including mental disturbances, headaches, sweats, tremors, convulsions & coma.
- (3) Symptoms of lung vascular disease (cor pulmonale) ie edema, jugular venous engorgement, liver distension & ascites.
- (4) Finger clubbing & painful swellings in the limbs due to pulmonary osteoarthropathy, as in bronchial carcinoma & bronchiectasis.
- (5) Metastatic symptoms such as bone pain, & fractures, as in bronchial carcinoma.

### CLINICAL EXAMINATION

- (1) This should be examined with the patient laying at 45°, & then sitting upright so that the front & back of the chest may be examined.
- (2) The 4 major components of the respiratory system examination are: inspection, palpation, percussion & auscultation.
- (3) The general physical examination, including the vital signs, providing an important source of information, is discussed in module 2.

### INSPECTION

A great deal of information can be gathered from simply watching a patient breathe. Pay particular attention to:

- (1) General comfort & breathing pattern of the patient. Do they appear distressed, diaphoretic, labored? Are the breaths regular & deep?
- (2) **Accessory muscles:** Use of accessory muscles of breathing (eg scalenes, sternocleidomastoids) signifies some element of respiratory difficulty.
- (3) Color of the patient, in particular around the lips & nail beds. Obviously, blue is bad!
- (4) Breathing through pursed lips, often seen in cases of emphysema.
- (5) **Posture of the patient:** Those with extreme pulmonary dysfunction will often sit up-right. In cases of real distress, they will lean forward, resting their hands on their knees in what is known as the tri-pod position (figure 5.1).



Figure 5.1: Patient with emphysema bending over in tri-pod position.

- (6) **Direction of abdominal wall movement during inspiration:** Normally, the descent of the diaphragm pushes intra-abdominal contents down & the wall outward. In cases of severe diaphragmatic flattening (eg emphysema) or paralysis, the abdominal wall may move inward during inspiration, referred to as paradoxical breathing. If you suspect this to be the case, place your hand on the patient's abdomen as they breathe, which should accentuate its movement.
- (7) **Ability to speak:** At times, respiratory rates can be so high &/or work of breathing so great that patients are unable to speak in complete sentences. If this occurs, note how many words they can speak (ie the fewer words per breath, the worse the problem!).

- (8) Any audible noises associated with breathing as occasionally, wheezing or the gurgling caused by secretions in large airways are audible to the "naked" ear.
- (9) Note abnormal dilated veins on the chest wall, & the presence of any operation scars.
- (10) **Symmetry & shape of chest:** They should be inspected together with any thoracic spinal curvature. Deformities may arise as a result of chronic lung disease (eg emphysema), occur congenitally, or be otherwise acquired. In any case, they can impair a patient's ability to breathe normally.



Figure 5.2: Patient with pectus excavatum.

- (a) **Pectus excavatum (funnel chest)**  
Congenital posterior displacement of lower aspect of sternum. This gives the chest a somewhat "hollowed-out" appearance. The x-ray shows a subtle concave appearance of the lower sternum (figure 5.2).

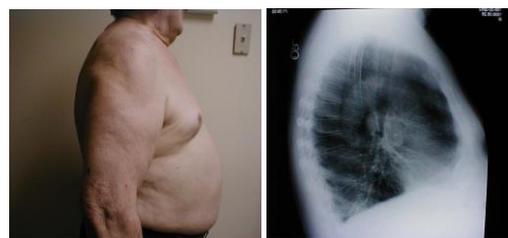


Figure 5.3: Patient with barrel chest.

- (b) **Pectus carinatum (pigeon or barrel chest)**  
Sternum is pushed forwards, associated with emphysema & lung hyperinflation. Accompanying x-ray also shows increased anterior-posterior diameter as well as diaphragmatic flattening (figure 5.3).

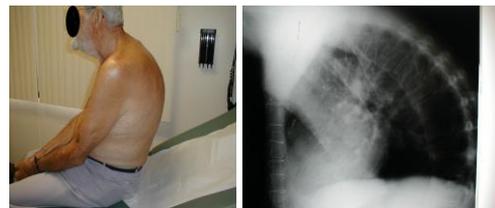


Figure 5.4: Patient with kyphosis.

- (c) **Spine abnormalities**
  - (i) **Kyphosis:** Causes the patient to bend forward. Accompanying x-ray of same patient clearly demonstrates extreme curvature of the spine (figure 5.4).
  - (ii) **Scoliosis:** The spine is curved to either the left or right. In figure 5.5, scoliosis of the spine causes right shoulder area to appear somewhat higher than the left. Curvature is more pronounced on x-ray.



Figure 5.5: Patient with scoliosis.

- (11) **In injured patients:** Look for,
  - (a) Signs of pain on inspiration indicating rib fracture.
  - (b) **Flail chest**
    - (i) It is the result of a crushing injury producing comminuted fractures of multiple ribs, each with a fracture posteriorly at or near the costochondral junction. A more serious variant is when a number of ribs or costal cartilages are fractured on either side near the sternum, rendering the sternum flail.

- (ii) The flail segment is sucked in during inspiration & driven out during expiration; the breathing is therefore paradoxical.

- (iii) The injured side of the thorax moves in while the uninjured side moves out; this results in air being shunted from the injured to the uninjured side & back again, rather than being exhaled.
  - (iv) There is therefore a progressive accumulation of CO<sub>2</sub> which, together with loss of effective cough & resulting accumulation of tracheobronchial secretions, produces respiratory embarrassment.
  - (v) The increasing anoxia & CO<sub>2</sub> retention result in increased dyspnea & more pronounced paradoxical movement with worsening respiratory failure (a vicious cycle that can be broken only by mechanical ventilation).
- (c) Open sucking chest wound, in which air is drawn in & out at each respiration. This indicates traumatic pneumothorax due to rib fracture or stab injury. Associated hemothorax may also be present.

## PALPATION

Palpation plays a relatively minor role in the examination of the normal chest as the structure of interest (the lung) is covered by the ribs & therefore not palpable. Specific situations where it may be helpful are described below.

### Position of trachea

#### Clinical technique

Confirm the central position of trachea, by palpating it with the tip of a finger placed in the suprasternal notch.



Figure 5.6: Checking tracheal position.

#### Clinical correlation

Trachea may be displaced by tumors in the neck or upper mediastinum, or by a shift of the mediastinum due to lung collapse, massive pleural effusion or a pneumothorax.

### Accentuating normal chest excursion

The symmetry & extent of the movements of the chest on deep inspiration & expiration should be determined.

#### Clinical techniques

- (1) Place your hands on the patient's chest with thumbs opposing in the midline. Remember to first rub your hands together so that they are not too cold prior to touching the patient. Your hands should lift symmetrically outward when the patient takes a deep breath.



Figure 5.7: Detecting chest excursion.

- (2) The adequacy of chest movements can be tested by measuring (via tape measure) the inspiratory to expiratory difference of chest circumference at nipple level, which is normally greater than 5 cm.

#### Clinical correlation

In the absence of any spinal deformity, diminished movement on one side usually indicates disease on that side. For example, processes that lead to asymmetric lung expansion (such as pleural effusion or pneumothorax) cause less expansion on the affected side.

### Tactile vocal fremitus (TVF)

Normal lung transmits a palpable vibratory sensation to the chest wall, referred to as tactile vocal fremitus.

#### Clinical techniques

Place the ulnar border of your hands (or dorsal surface of fingers) firmly against either side of the chest while the patient says the words "Ninety-Nine or 3-3-3 in urdu." This maneuver is repeated until



Figure 5.8: Assessing TVF.

the entire posterior thorax is covered. The bony aspects of the hands are used as they are particularly sensitive for detecting these vibrations.

#### **Clinical correlation**

Some pathologic conditions may alter tactile vocal fremitus.

- (1) **Lung consolidation:** Consolidation occurs when the normally air filled lung parenchyma becomes engorged with fluid or tissue, most commonly in the setting of pneumonia. If a large enough segment of parenchyma is involved, it can alter the transmission of air & sound. In the presence of consolidation, fremitus becomes more pronounced.
- (2) **Pleural fluid:** Fluid, known as a pleural effusion, can collect in the potential space that exists between the lung & the chest wall, displacing the lung upwards. Fremitus over an effusion will be decreased.

In general, fremitus is a pretty subtle finding & should not be thought of as the primary means of identifying either consolidation or pleural fluid. It can, however, lend supporting evidence if other findings (see below) suggest the presence of either of these processes.

#### **Investigating painful areas**

If the patient complains of pain at a particular site it is obviously important to carefully palpate around that area. In addition, special situations (eg trauma) mandate careful palpation to look for evidence of rib fracture, subcutaneous air (feels like you're pushing on Rice Krispies or bubble paper), etc.

#### **Clinical correlation**

##### **(1) Fractured rib**

- (a) Palpation along each rib in the region of pain may reveal local tenderness, the fracture may itself be felt (bony crepitus).
- (b) Signs of concomitant injury of the pleura & lung, & on the left splenic rupture, should be sought.

##### **(2) Sternal fracture**

- (a) Patient is commonly bent forward & in great pain. The accessibility of this bone provides easy detection of a fracture.
- (b) Patient must be assessed with particular regard to myocardial contusion & the possibility of an associated spinal injury.

##### **(3) Lung injury**

Two important early signs of lung injury are hemoptysis & subcutaneous emphysema.

**Subcutaneous emphysema** (air crepitus) is the result of the extravasation of air into the subcutaneous tissue, most commonly the result of a rib fracture.

- (a) In severe cases, air may spread widely from the face to the perineum (including scrotum in male) & upper thigh. This may develop after a wound or rupture of trachea or large bronchus, or following laceration of the adjacent lung by a fractured rib or stab wound.
- (b) Minor degrees of subcutaneous air are common after thoracic operations.

#### **Rib counting**

It is often necessary to know which rib is injured or diseased.

#### **Clinical technique**

Run your finger downwards over sternum from the suprasternal notch, until a transverse ridge can be felt & often seen (angle of Louis, or sternal angle). Now move your finger to the side along this ridge, which passes directly on the second rib. Count the ribs from this point.

**Evaluation of any swelling or sinus**

These are evaluated along the same lines as given in modules 3 & 4.

**Clinical correlation**

In addition to lumps & sinuses found elsewhere on the skin, the following are specific to the thorax.

**(1) Solid swellings of the thoracic cage**

- (a) **Non-specific costochondritis (Tietze's syndrome)** is a varyingly painful swelling of the chest wall; 2<sup>nd</sup> costal cartilage is most commonly affected. The affected costochondral junction is felt swollen.
- (b) **Neoplasm of the rib** commonly lies in the long axis & expands the rib. It may be primary or secondary neoplasm.
  - (i) Chondrosarcoma is the most common primary rib neoplasm.
  - (ii) In secondary carcinoma, pain & local tenderness are marked & may be present long before a swelling is manifest. Spontaneous fracture of the rib may also occur.
- (c) **Neoplasms of the sternum** are less frequent than those of the ribs. Secondary tumors are, however, more likely.

**(2) Cold abscess arising in the thoracic wall**

- (a) **Anterior abscess** may originate either in a tuberculous rib or costal cartilage, or tuberculous internal mammary lymph node. In the later, the related ribs & costal cartilages look & feel normal.
- (b) **Posterior abscess** (figure 3.7) may arise from a tuberculous rib, a tuberculous dorsal vertebra or a perinephric abscess.
- (c) **Empyema necessitans** normally appears on the anterior or lateral aspects of the thorax somewhere between the third & sixth intercostal spaces.
  - (i) Fluctuation is obtained readily.
  - (ii) If the flat of the hand is laid over the swelling & the patient is asked to cough, a fluid thrill can usually be felt.

**(3) Pulsating swelling of thoracic cage**

A syphilitic aneurysm of the ascending aorta may give rise to a pulsatile swelling near the sternum. It is very rare.

**(4) Discharging sinuses of the thoracic wall**

Chronic empyema sinus may follow drainage of an empyema, due to inadequate drainage,

underlying suppurative lung disease, osteomyelitis of the ribs, TB & actinomycosis.

**PERCUSSION**

This technique makes use of the fact that striking a surface which covers an air-filled structure (e.g. normal lung) will produce a resonant note while repeating the same maneuver over a fluid or tissue filled cavity generates a relatively dull sound.

**Clinical techniques**

Initially, you will find that this skill is a bit awkward to perform. Allow your hand to swing freely at the wrist, hammering your finger onto the target at the bottom of the down stroke. A stiff wrist forces you to push your finger into the target which will not elicit the correct sound. In addition, it takes a while to develop an ear for what is resonant & what is not.



Figure 5.9: Percussion technique.

- (1) If you're percussing with your right hand, stand a bit to the left side of the patient's back.
- (2) Ask the patient to cross their hands in front of their chest, grasping the opposite shoulder with each hand. This will help to pull the scapulae laterally, away from the percussion field.
- (3) Work down the "alley" that exists between the scapula & vertebral column, which should help you avoid percussing over bone.
- (4) Try to focus on striking the distal interphalangeal joint of your left middle finger with the tip of the right middle finger. The impact should be crisp so you may want to cut your nails to keep blood-letting to a minimum!
- (5) The last 2 phalanges of your left middle finger should rest firmly on the patient's back. Try to keep the remainder of your fingers from

touching the patient, or rest only the tips on them if this is otherwise too awkward, in order to minimize any dampening of the percussion notes.

- (6) When percussing any one spot, 2 or 3 sharp taps should suffice, though feel free to do more if you'd like. Then move your hand down several inter-spaces & repeat the maneuver. In general, percussion in 5 or so different locations should cover one hemi-thorax. After you have percussed the left chest, move yours hands across & repeat the same procedure on the right side. If you detect any abnormality on one side, it's a good idea to slide your hands across to the other for comparison. In this way, one thorax serves as a control for the other. In general, percussion is limited to the posterior lung fields. However, if auscultation reveals an abnormality in the anterior or lateral fields, percussion over these areas can help identify its cause.
- (7) The goal is to recognize that at some point as you move down towards the base of the lungs, the quality of the sound changes. This normally occurs when you leave the thorax. It is not particularly important to identify the exact location of the diaphragm, though it's better if you are able to note a difference in level between maximum inspiration & expiration. Ultimately, you will develop a sense of where the normal lung should end by simply looking at the chest. The exact vertebral level at which this occurs is not really relevant.
- (8) "Speed percussion" may help to accentuate the difference between dull & resonant areas. During this technique, the examiner moves their left (i.e. the non-percussing) hand at a constant rate down the patient's back, tapping on it continuously as it progresses towards the bottom of the thorax. This tends to make the point of inflection (ie change from resonant to dull) more pronounced.

Practice percussion! Try finding your own stomach bubble, which should be around the left costal margin. Note that due to the location of the heart, tapping over your left chest will produce a different sound than when performed over your right. Percuss your walls (if they're sheet rock) & try to locate the studs. Tap on tupperware filled with various amounts of water. This not only helps you develop a

sense of the different tones that may be produced but also allows you to practice the technique.

#### **Clinical correlation**

- (1) If the normal, air-filled tissue has been displaced by fluid (eg pleural effusion, hemothorax) or infiltrated with white cells & bacteria (eg pneumonia), percussion will generate a dull note.
- (2) Alternatively, processes that lead to chronic (eg emphysema) or acute (eg pneumothorax) air trapping in the lung or pleural space, respectively, will produce hyper-resonant (ie more drum-like) notes on percussion.
  - (a) In older patients, pneumothorax may be associated with asthma, chronic bronchitis & peripheral bronchial carcinoma (rarely).
  - (b) Spontaneous pneumothorax tends to occur in tall, asthenic young peoples. It is liable to recur, & is frequently bilateral.
  - (c) Other causes of pneumothorax include trauma, placement of a central venous line, esophagoscopy, surgical operations (thyroid, trachea, & kidney) & mechanical ventilation.
  - (d) If the communication between the airways & pleura remains open a bronchopleural fistula is created. But, once the communication between the lung & the pleural space is obliterated, air is eventually reabsorbed.
  - (e) Tension pneumothorax can develop where air enters the pleural cavity from the lung during inspiration but does not escape during expiration.
  - (f) As the air accumulates in the pleural cavity, the mediastinum & trachea become more & more displaced, resulting in a decrease in blood returned to the heart with circulatory embarrassment. There will be increasing dyspnea, cyanosis, absence of breath sounds, hyper-resonance, cardiac displacement, pallor, poor pulse & hypotension.
- (3) Lung injury, similarly, results in either dull or hyper-resonant note;
  - (a) Lung contusion leads to dull note due to bleeding within the lung substance.
  - (b) Lung laceration leads to hyper-resonance due to communicating or tension pneumothorax.

- (c) Hemothorax & hemopneumothorax may follow thoracic fractures.
- (d) Bronchial tear due to major trauma produces tension pneumothorax, as well as subcutaneous air (described above).

**Note:** The diagnosis of above mentioned, though suspected clinically, can easily be confirmed radiologically.

### AUSCULTATION

Prior to listening over any one area of the chest, remind yourself which lobe of the lung is heard best in that region:

- (1) Lower lobes occupy the bottom 3/4 of the posterior fields.
- (2) Right middle lobe heard in right axilla.
- (3) Lingula in left axilla.
- (4) Upper lobes in the anterior chest & at the top 1/4 of the posterior fields.

This can be quite helpful in trying to pin down the location of pathologic processes that may be restricted by anatomic boundaries (eg pneumonia). Many disease processes (eg pulmonary edema, bronchoconstriction) are diffuse, producing abnormal findings in multiple fields.

#### **Clinical techniques**

- (1) Put on your stethoscope so that the ear pieces are directed away from you. Adjust the head of the scope so that the diaphragm is engaged. If you're not sure, scratch lightly on the diaphragm, which should produce a noise. If not, twist the head & try again. Gently rub the head of the stethoscope on your shirt so that it is not too cold prior to placing it on the patient's skin.
- (2) The upper aspects of the posterior fields (ie towards the top of the patient's back) are examined first. Listen over one spot & then move the stethoscope to the same position on the opposite side & repeat. This again makes use of one lung as a source of comparison for the other. The entire posterior chest can be covered by listening in roughly 4 places on each side. Of course, if you hear something abnormal, you'll need to listen in more places.
- (3) The lingula & right middle lobes can be examined while you are still standing behind the patient.



Figure 5.10: Lung auscultation.

- (4) Then, move around to the front & listen to the anterior fields in the same fashion. This is generally done while the patient is still sitting upright. Asking female patients to lie down will allow their breasts to fall away laterally, which may make this part of the examination easier.

#### **A few additional things worth noting**

- (1) Don't get in the habit of performing auscultation through clothing.
- (2) Ask the patient to take slow, deep breaths through their mouths while you are performing your exam. This forces the patient to move greater volumes of air with each breath, increasing the duration, intensity, & thus detectability of any abnormal breath sounds that might be present.
- (3) Sometimes it's helpful to have the patient cough a few times prior to beginning auscultation. This clears airway secretions & opens small atelectatic (ie collapsed) areas at the lung bases.
- (4) If the patient cannot sit up (eg in cases of neurologic disease, post-operative states, etc.), auscultation can be performed while the patient is lying on their side. Get help if the patient is unable to move on their own. In cases where even this cannot be accomplished, a minimal examination can be performed by listening laterally/posteriorly as the patient remains supine.
- (5) Requesting that the patient exhale forcibly will occasionally help to accentuate abnormal breath sounds (in particular, wheezing) that might not be heard when they are breathing at normal flow rates.

#### **Clinical findings**

What can you expect to hear? A few basic sounds to listen for are described here.

##### **(1) Vesicular breath sounds**

These are normal breath sounds, heard in

healthy individuals breathing through their mouth at normal tidal volumes, which produces a soft inspiratory sound as air rushes into the lungs, with little noise produced on expiration.

(2) **Bronchial (tubular) breath sounds**

These sounds are heard in dense consolidation of the lung parenchyma (eg pneumonia), which results in the transmission of large airway noises (ie those normally heard on auscultation over the trachea) to the periphery. In this setting, the consolidated lung acts as a terrific conducting medium, transferring central sounds directly to the edges. It's very similar to the noise produced when breathing through a snorkel.

Furthermore, if you direct the patient to say the letter 'eee', it is detected during auscultation over the involved lobe as a nasal-sounding 'aaa'. These 'eee' to 'aaa' changes are referred to as egophony.

(3) **Wheezes**

These are whistling-type noises produced during expiration (& sometimes inspiration) when air is forced through airways narrowed by bronchoconstriction, secretions, &/or associated mucosal edema.

- (a) As this most commonly occurs in association with diffuse processes that affect all lobes of the lung (eg asthma & emphysema), it is frequently audible in all fields.
- (b) Occasionally, focal wheezing can occur when airway narrowing is restricted to a single anatomic area, as might occur with an obstructing tumor or bronchoconstriction induced by pneumonia.
- (c) In cases of significant bronchoconstriction, the expiratory phase of respiration (relative to inspiration) becomes noticeably prolonged. Clinicians refer to this as an increased I to E ratio.
  - (i) Normal is approximately 1:2 (ie expiration twice as long as inspiration).
  - (ii) Focus on, noting whether E seems >> I. The greater the difference, the worse the obstruction.
- (d) Wheezing heard only on inspiration is referred to as **stridor**, & is associated with

mechanical obstruction at the level of the trachea/upper airway. This may be best appreciated by placing your stethoscope directly on top of the trachea.

(4) **Rales (crackles)**

These are scratchy sounds that occur in association with processes that cause fluid to accumulate within the alveolar & interstitial spaces. The sound is similar to that produced by rubbing strands of hair together close to your ear.

- (a) Pulmonary edema is probably the most common cause, & results in symmetric findings. This tends to occur first in the most dependent portions of the lower lobes & extend from the bases towards the apices as disease progresses.
- (b) Pneumonia, on the other hand, can result in discrete areas of alveolar filling, & therefore produce crackles restricted to a specific region of the lung.
- (c) Very distinct, diffuse, dry-sounding crackles are caused by pulmonary fibrosis.

(5) **Ronchi**

These are gurgling-type noises, produced when secretions form/collect in larger airways (eg bronchitis), similar to the sound produced when you suck the last bits of a milk shake through a straw.

(6) **Pleural sounds**

- (a) The sound caused by two layers of pleura rubbing together (pleural rub) may be heard. It indicates pleural inflammation.
- (b) Auscultation over a pleural effusion will produce a much muffled sound. If, however, you listen carefully to the region on top of the effusion, you may hear sounds suggestive of consolidation, originating from lung which is compressed by the fluid pushing up from below.

- (7) Auscultation of patients with severe, stable emphysema will produce very little sound. These patients suffer from significant lung destruction & air trapping, resulting in their breathing at small tidal volumes that generate almost no noise. Wheezing occurs when there is a superimposed acute inflammatory process (see above).

**Table 5.3: RESPIRATORY SYSTEM EXAMINATION REVIEW**

- A) Inspection**
- 1) General comfort & breathing pattern
  - 2) Use of accessory muscles
  - 3) Color of skin
  - 4) Posture
  - 5) Abdominal wall movement
  - 6) Speaking
  - 7) Symmetry & shape of chest
  - 8) Any visible vein
  - 9) In chest injury
    - a) Painful inspiration
    - b) Flail chest
    - c) Open sucking chest wound
- B) Palpation**
- 1) Position of trachea
  - 2) Chest excursion
  - 3) Tactile vocal fremitus
  - 4) In case of injury
    - a) Tenderness
    - b) Bony crepitus
    - c) Air crepitus
  - 5) Evaluation of any lump or sinus
  - 6) Rib counting
- C) Percussion**
- D) Auscultation**
- 1) Breath sounds
  - 2) Added sounds
  - 3) Vocal fremitus

Most of the above techniques are complimentary. Dullness detected on percussion, for example, may represent either lung consolidation or a pleural effusion. Auscultation over the same region should help to distinguish between these possibilities, as consolidation generates bronchial breath sounds while an effusion is associated with a relative absence of sound. Similarly, fremitus will be increased over consolidation & decreased over an effusion. As such, it may be necessary to repeat certain aspects of the exam, using one finding to confirm the significance of another. Few findings are pathognomonic. They have their greatest meaning when used together to paint the most informative picture.

### DYNAMIC LUNG EXAMINATION

Oftentimes, a patient will complain of a symptom that is induced by activity or movement. Shortness of breath on exertion, one such example, can be a marker of significant cardiac or pulmonary

dysfunction. The initial examination may be relatively unrevealing. In such cases, consider observed ambulation (with the use of a pulse oxymeter, a device that continuously measures heart rate & oxygen saturation, if available) as a dynamic extension of the cardiac & pulmonary examinations.

Quantifying a patient's exercise tolerance in terms of distance &/or time walked can provide information critical to the assessment of activity induced symptoms. It may also help unmask illness that would be inapparent unless the patient was asked to perform a task that challenged their impaired reserves. Pay particular attention to the rate at which the patient walks, duration of activity, distance covered, development of dyspnea, changes in heart rate & oxygen saturation, ability to talk during exercise & anything else that the patient identifies as limiting their activity. The objective data derived from this low tech test can aid you in determining disease & symptom severity, helping to create a list of possible diagnoses & assisting you in the rational use of additional tests to further delineate the nature of the problem. This can be particularly helpful in providing objective information when symptoms seem out of proportion to findings, or when patients report few complaints yet seem to have a considerable amount of disease. It will also generate a measurement that you can refer back to during subsequent evaluations in order to determine if there has been any real change in functional status.

### DIAGNOSTIC INVESTIGATIONS

#### (1) Routine blood tests

These includes complete blood counts (CBC), hemoglobin (Hb %), erythrocyte sedimentation rate (ESR) & sugar (RBS/FBS) :

- (a) Pulmonary infections will show leukocytosis (increased white cells count) & increased neutrophils in differential count.
- (b) Pulmonary tuberculosis & bronchial carcinoma will show increased ESR & low Hb (anemia).

#### (2) Radiography

- (a) A chest x-ray must be regarded as routine

- in all patients complaining of persistent respiratory symptoms.
- (b) Special radiological investigations include;
- (i) Fluoroscopy (or screening) of the lung & diaphragmatic movements.
  - (ii) Lateral, oblique & apical views.
  - (iii) Bronchography, ie introduction of a radio-opaque medium into the bronchial tree, to demonstrate bronchiectasis or bronchial narrowing.
  - (iv) Pulmonary angiography to demonstrate arterial occlusions by embolism.
- (c) Computerized axial tomography (CAT scan) may be used to define the precise size, site & consistency of an intrathoracic lesion.
- (3) Examination of sputum & pleural fluid**
- (a) Microscopy of the sputum may reveal cells & organisms of various kinds. These include;
- (i) Tubercle bacilli, appearing as red rods when stained by Ziehl-Neelsen's method.
  - (ii) Malignant cells.
  - (iii) Excess of eosinophil leukocytes, suggesting an allergic state.
  - (iv) Evidence of the inhalation of a noxious dust, eg asbestos bodies.
- (b) Culture & sensitivity (C/S) of the sputum is of value in detecting the dominant infecting organism & its sensitivity to the available antibiotics.
- (c) Microscopy & C/S of the pleural fluid similarly provides valuable information; additional help can be obtained by a cell count & by measuring the specific gravity & protein content of the fluid.
- (i) A high value for any of these three suggests exudate (eg tuberculosis) rather than transudate (eg congestive cardiac failure).
  - (ii) Type of cell in pleural exudates should also be noted: a predominance of red cells is commonest in carcinoma, pus cells indicate empyema, while a lymphocytic effusion favors a chronic infection such as tuberculosis.
- (iii) Fat globules may be seen in the chylous effusion of thoracic duct obstruction.
- (4) Pulmonary function tests**
- These include tests to assess ventilation of the lungs & gas exchange in the lungs.
- (a) Ventilation tests include measurements of;
- (i) Lung size eg vital capacity (VC).
  - (ii) Patency of the airways eg forced expiratory volume in one second (FEV<sub>1</sub>).
  - (iii) Amount of air used to ventilate the lungs during normal breathing at rest & on exercise (minute & alveolar ventilation).
- These tests can all be made by simple spirometric methods.
- (b) Gas exchange is examined by measuring;
- (i) Tensions of oxygen (PaO<sub>2</sub>) & carbon dioxide (PaCO<sub>2</sub>) in arterial blood.
  - (ii) Gas transfer factor or diffusing capacity.
- (5) Endoscopy & biopsy procedures**
- (a) Direct inspection of the larynx (laryngoscopy) & the bronchial tree (bronchoscopy) by a rigid or flexible fiberoptic instrument to detect carcinoma or other abnormality in the wall or lumen of the airways.
- (b) Various secretions or tissues can be procured for histopathological examination.
- (i) Pleural fluid is collected by aspiration of the pleural cavity with a needle, while broncho-alveolar secretions & samples of the bronchial mucosa or lung can be obtained during bronchoscopy.
  - (ii) Percutaneous biopsy of the pleura, lymph nodes or lung can be carried out with a special needle (tru-cut or core-cut), or by means of thorascopic or open surgical procedure.
- (6) Immunological tests**
- (a) Sensitivity to certain respiratory allergens may be inferred in atopic subjects by skin prick tests producing a wheal & flare reaction or occasionally provoked by the inhalation of the appropriate antigen.

- 
- (b) Autoantibodies such as rheumatoid factor & antinuclear antibody are present in some cases of fibrosing alveolitis not associated with rheumatoid arthritis, & specific precipitating antibodies can be detected in the sera of patients with extrinsic allergic alveolitis, such as farmer's lung, bronchopulmonary aspergillosis & aspergilloma.
  - (c) Tuberculin test for tuberculosis consists of the intradermal injection of killed tubercle bacilli.
  - (d) Kveim test for sarcoidosis must be biopsied 6 weeks after the intradermal injection of Kveim antigen & examined microscopically for characteristic granulomata.

# Module 6

## Chest: Cardiovascular System

### HISTORY

The patient with heart disease may complain of many different symptoms, some of which may apparently be unconnected with the cardiovascular system. Often there are no symptoms & a cardiac disease is found by routine examination or investigation.

### DYSPNEA

It is already described in module 5, but as it is such a common symptom of heart disease, some points needs worth mentioning.

#### ***Dyspnea on effort***

- (1) This generally precedes other forms of breathlessness. Serious cardiovascular disease, such aortic incompetence or hypertension may exist for many years without dyspnea, yet in mitral stenosis dyspnea is often an early feature.
- (2) The grade of the dyspnea, provided that other causes mentioned in module 5 are excluded, may give valuable information about the state of the cardiac reserve. For example, in valve disease for some years there may be no dyspnea, then a patient becomes increasingly breathless with physical tasks of diminishing grade, until finally, when he reaches the stage of cardiac failure, dyspnea will occur even on slight movement in bed.

#### ***Paroxysmal dyspnea at rest***

These attacks generally occur in bed & may follow a period of dyspnea on exertion, but occasionally

they are the first indication of a rise in pulmonary venous pressure in many types of heart disease, notably left ventricular failure & mitral stenosis. They are associated with a rise in left atrial pressure of whatever cause, as this prevents an adequate return of blood from the lungs to the left side of the heart. The attacks are often called cardiac asthma, ie paroxysmal dyspnea of cardiac origin to distinguish it from bronchial asthma. Sometimes both occur in the same patient.

#### ***Orthopnea***

Orthopnea is said to be a later feature of cardiac failure than paroxysmal dyspnea, though the two conditions are often found in the same patient.

#### ***Cheyne stokes breathing***

In heart disease this type of respiration, also known as periodic breathing, is common in diseases in which cardiac asthma occurs. The waxing & waning of the respiration, periods of hyperpnea & apnea, are particularly common during sleep, which they may interrupt.

Any or all of these types of dyspnea may be found in the same patient.

### PALPITATION

This term means that the patient is conscious of his heart beats, which he may describe as bumping throbbing, pounding or fluttering in the chest or peripheral vessels.

- (1) Several factors may be responsible for the symptoms namely, increased force, increased rate & irregularity of the heart but unless the nervous system is unduly sensitive they may not result in palpitation.

- (a) For this reason the symptoms is more common in such conditions as hyperthyroidism & anxiety states than in organic heart disease.
- (b) A placid patient with a heaving apical beat or with an abnormal rhythm or even tachycardia may be quite unaware of the heart's action.
- (2) In simple sinus tachycardia, emotion or exercise generally causes the heart to beat faster, & as the precipitating cause diminishes so the heart rate & the palpitation lessen.
- (3) In arrhythmias, such as atrial flutter or paroxysmal tachycardia, the onset & offset of attacks are instantaneous. The patient often states that he is conscious of the heart missing a beat or turning over & then the palpitation is in full swing. Similarly, the attack passes away by a sudden consciousness of some alteration in the heartbeat.
  - (a) Short attacks of this character are suggestive of paroxysmal tachycardia.
  - (b) Longer attacks, lasting many hours or days, suggest atrial flutter.
  - (c) Atrial fibrillation may also come in attacks, & the patient may be able to date the onset of the attack by the sudden appearance of palpitation having an irregular character.
  - (d) Extrasystoles are usually appreciated as occasional irregularities. The patient may be aware of a missed beat or an extra large bump corresponding with the next normal beat after the extrasystole.

## CARDIAC PAIN

Pain as a symptom of heart disease is very important but sometimes difficult to evaluate. It occurs so frequently without gross evidence of cardiovascular disease that a diagnosis may have to rest on this symptom alone. For this reason an accurate & careful description of the site, character & duration of the pain is essential.

### **Angina pectoris**

This is a strangling type of pain, experienced in the chest, generally midsternal or trans-sternal, & often spreading to one or both arms, less commonly to the neck or jaw, & sometimes to the epigastrium or back.

It occurs under the following circumstances.

#### **(1) Angina of effort**

- (a) Pain provoked by varying degrees of physical exertion, especially walking quickly or uphill, or against a wind. It is usually worse in cold weather & on walking after a meal. Similar pain may result from emotion.
- (b) The pain usually disappears within a few minutes of rest or freedom from emotion.
- (c) It may be described as like a tight band, a sense of crushing or pressure, or very commonly as indigestion with which it is often confused.

#### **(2) Acute coronary insufficiency**

- (a) The pain has a similar character & distribution but may occur at rest & lasts longer than angina of effort.
- (b) It occurs when there is impairment of coronary blood flow & usually indicates critical (more than 95%) narrowing of a major coronary artery. It may also occur in aortic disease, in severe anemia & occasionally during a rapid dysrhythmia of the heart.

#### **(3) Myocardial infarction**

This usually results from occlusion of a major coronary artery; pain may present & persist at rest.

#### **Other forms of precordial pain**

- (1) Pain of aching character is common in an effort syndrome, especially associated with fatigue.
- (2) Aching or sharp pains occur in various rheumatic, traumatic & neuralgic affections of the chest wall. These pains are usually worse on movement of the affected parts & are sometimes associated with localized tenderness.
- (3) Pain of pleurisy is generally severe, cutting or burning in character, & constantly related to breathing.
 

**Note:** Above 3 types of pain tend to be mammary, axillary or dorsal in position rather than substernal. Further, they are often of long duration (hours or days).
- (4) Sometimes esophageal lesions cause a centrally placed pain like angina, as in obstructive lesions & hiatus hernia. Such pains may be related to swallowing or posture, but only

occasionally to physical effort.

- (5) Aneurysm by erosion may produce severe pain in the precordium, in the back or in the upper abdomen according to the site of the aortic dilatation. The pain may be due to pressure effects on bony structures & nerves, but in dissecting aneurysm the pain is caused by the splitting of the aortic wall.

## OTHER SYMPTOMS

### **Gastrointestinal symptoms**

In cases of congestive heart failure, the liver & gastrointestinal tract are engorged with blood, leading to;

- (1) Dyspeptic symptoms: Loss of appetite, nausea, fullness after meals & distension of the abdomen. Vomiting occurs occasionally, & the bowels are usually constipated.
- (2) Pain in right hypochondrium.

### **Respiratory symptoms**

With the onset of pulmonary venous hypertension, the lungs are usually congested, resulting in cough, dyspnea & not uncommonly in hemoptysis.

### **Urinary symptoms**

In cardiogenic or circulatory shock, decreased circulation through the kidneys leads to decrease in the secretion of urine (oliguria), rarely to complete suppression (anuria). The urine passed is dark colored, & frequently contains protein casts, & red cells.

### **Cerebral symptoms**

- (1) In cerebral atherosclerosis & cardiac failure, dizziness, headache & psychological changes may occur.
- (2) Inadequacy of the cerebral blood flow, eg embolism from the left side of the heart, can result in transient loss of consciousness (syncope).

## CLINICAL EXAMINATION OF HEART

- (1) The major elements of the cardiac examination include inspection, palpation and, most importantly, auscultation (percussion is omitted).

- (2) As with all other areas of the physical exam, establishing adequate exposure and a quiet environment are critical. Initially, the patient should rest supine with the upper body elevated 30 to 45 degrees. Most exam tables have an adjustable top. If not, use 2 or 3 pillows.
- (3) Remember that although assessment of pulse and blood pressure are discussed in the vital signs section, they are actually important elements of the cardiac exam.

## INSPECTION

### **Assessment for right internal jugular vein (IJV) distention**

Its importance lies in the fact that the IJV is in straight-line communication with the right atrium. The IJV can therefore function as a manometer, with distention indicating elevation of central venous pressure (CVP). This in turn is an important marker of intravascular volume status and related cardiac function. The students are required to focus on simply determining whether or not jugular venous distention (JVD) is present; assessment of a, c and v waves are quite difficult to detect for even the most seasoned clinician.

### **Clinical techniques**

- (1) Try to inspect anatomically.
  - (a) The right IJV runs between the two heads (sternal and clavicular) of sternocleidomastoid muscle (SCM) and up in front of the ear. SCM can be identified by asking the patient to turn their head to the left and into your hand while you provide resistance to the movement. The two heads form the sides of a small triangle, with the clavicle making up the bottom edge. You should be able to feel a shallow defect formed by the borders of these landmarks.
  - (b) Note you are trying to identify impulses originating from the IJV and transmitted to the overlying skin in this area. You can't actually see the IJV.
  - (c) External jugular vein (EJV) runs in an oblique direction across the sternocleidomastoid and, in contrast to the IJV, can usually be directly visualized. If the EJV is not readily apparent, have the patient look to the left and valsalva. This

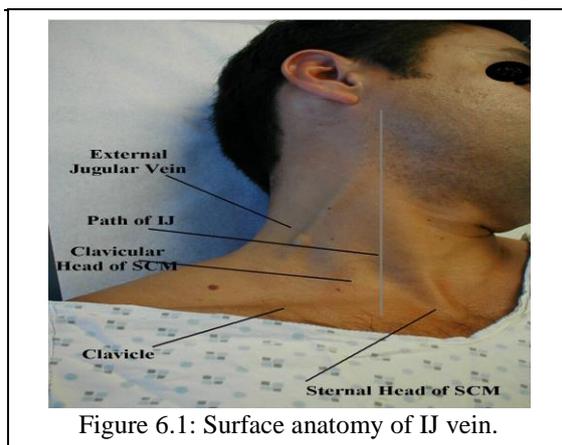


Figure 6.1: Surface anatomy of IJ vein.

usually makes it quite obvious. EJV distention is not always a reliable indicator of elevated CVP as valves, designed to prevent the retrograde flow of blood, can exist within this vessel causing it to appear engorged even when CVP is normal.

- (2) Concentrate patiently.
  - (a) Look at the area in question for several minutes while the patient's head is turned to the left.
  - (b) Carotid artery is adjacent to the IJV, lying just medial to it. If you are unsure whether a pulsation is caused by the carotid or the IJV, place your hand on the patient's radial artery and use this as a reference. The carotid impulse coincides with the palpated radial artery pulsation, and is characterized by a single upstroke timed with systole, followed by down pulsation. Furthermore, the carotid is palpable.
  - (c) Venous impulse (at least when the patient is in sinus rhythm and there is no tricuspid regurgitation) has three components, each associated with "a, c and v waves" (figure 2.8). When these are transmitted to the skin, they create a series of flickers that are visible diffusely within the overlying skin. The IJV is not palpable, and can be obliterated by applying pressure in the area where it emerges above the clavicle.
  - (d) Search along the entire projected course of the IJV as the top of the pressure wave (which is the point that you are trying to identify) may be higher than where you are

looking. In fact, if the patient's CVP is markedly elevated, you may not be able to identify the top of the wave unless they are positioned with their trunk elevated at 45 degrees or more (else there will be no identifiable "top" of the column as the entire IJV will be engorged).

- (e) After you've found the top of the wave, see what effect sitting straight up and lying down flat have on the height of the column. Sitting should cause it to appear at a lower point in the neck, while lying has the opposite effect.
  - (f) Shine a pen light tangentially across the neck. This sometimes helps to accentuate the pulsations.
  - (g) If you are still uncertain, apply gentle pressure to the right upper quadrant of the abdomen for 5 to 10 seconds. This elicits hepato-jugular reflux which, in pathologic states, will cause blood that has pooled in the liver to flow in a retrograde fashion and fill out the IJV, making the transmitted pulsations more apparent.
- (3) Once you identify JVD, try to estimate how high in cm the top of the column is above the angle of Louis (figure 2.7).
    - (a) First identify the supra-sternal notch; then walk your fingers downward until you detect a subtle change in the angle of the bone, which is approximately 4 to 5 cm below the notch. This is the angle of Louis (or manubrio-sternal joint) & is roughly at the level of the 2nd intercostal space.
    - (b) The vertical distance from the top of the column to this angle is added to 5cm, the rough vertical distance from the angle to the right atrium with the patient lying at a 45 degree angle. The sum is an estimate of the CVP; the normal is 7-9 cm.

### Significance

Abnormalities of the JVP can help in diagnosis;

- (1) Large "a" wave → Tricuspid stenosis, pulmonary hypertension, pulmonary stenosis.
- (2) Cannon wave → Atrial fibrillation, complete heart block, ventricular tachycardia.

Note: A cannon wave occurs when the right atrium contracts against a closed tricuspid valve.

- (3) Steep "x", "y" descent → Constrictive pericarditis, cardiac tamponade.
- (4) Large "v" wave, "cv" wave → Tricuspid regurgitation.
- (5) Kussmaul's sign (rise of JVP on inspiration) → Constrictive pericarditis, cardiac tamponade.

### **Apex beat**

Take some time to look across the left chest and try to identify the transmitted impulse caused by ventricular contraction, which may be apparent when contractions are particularly vigorous.

## **PALPATION**

### **Precordium**

The palm of your right hand is placed across the patient's left chest so that it covers the area over the heart. The heel should rest along the sternal border with the extended fingers lying below the left nipple. Focus on the following things.

- (1) Can you feel a point of maximum impulse (PMI) related to contraction at the apex of the underlying left ventricle? If so, where is it located? After identifying the rough position with the palm of your hand, try to pin down the precise location with the tip of your index finger.
  - (a) The normal sized and functioning ventricle will generate a penny sized impulse that is best felt in the mid-clavicular line, roughly at the 5th intercostal space.
  - (b) If the ventricle becomes dilated, most



Figure 6.2: Palpation of the precordium to determine the location of the PMI.

commonly as the result of past infarcts and always associated with ventricular dysfunction, the PMI is displaced laterally. In cases of significant enlargement, the PMI will be located near the axilla.

- (c) Occasionally, the PMI will not localize to any one area, which does not necessarily indicate ventricular enlargement or dysfunction. Obesity and COPD may also limit your ability to identify its precise location. Palpating while the patient is in the left lateral decubitus position can make the PMI more obvious.
- (2) What is the duration of the impulse? In the setting of hypertension or any other state of chronic pressure overload, the ventricle hypertrophies and the PMI becomes sustained.
- (3) How vigorous is the transmitted impulse? Processes associated with ventricular hypercontractility (eg compensated mitral regurgitation or aortic insufficiency that results in exceptionally large stroke volumes) generate an impulse of unusual vigor.
- (4) Do you feel a thrill, a vibratory sensation produced by turbulent blood flow that is usually secondary to valvular abnormalities?
  - (a) The feeling is similar to that produced when you squeeze on a garden hose, partially obstructing the flow of water.
  - (b) The location of the thrill will depend on the involved valve (eg thrills caused by aortic stenosis are best felt toward the right upper sternal border).
  - (c) If a loud murmur is detected during auscultation, you may then go back and reassess for the presence of a thrill.
- (5) Palpation of the precordium of a female patient is best done by placing the palm of your right hand directly beneath the patient's left breast such that the edge of your index finger rests against the inferior surface of the breast. Make sure that you tell the patient what you are about to do (and why) before actually performing this maneuver. Remember that with age tissue turgor often declines, causing the breasts to hang below the level of the heart.

### **Carotid artery palpation**

- (1) This is of greatest value during the assessment of aortic valvular and out flow tract disease and

should thus be performed after auscultation so that you know whether or not these problems exist prior to palpation. However, for the sake of completeness it will be described here.

- (2) The carotids can be located by sliding the second and third finger of either hand along the side of the trachea at the level of the thyroid cartilage (ie Adams apple). The carotid pulsation is palpable just lateral to the groove formed by the trachea and the surrounding soft tissue. The quantity of subcutaneous fat will dictate how firmly you need to push.
- (3) The pulsations should be easily palpable. Diminution may be caused by atherosclerosis, aortic stenosis, or severely impaired ventricular performance.
- (4) Do not push on both sides simultaneously as this may compromise cerebral blood flow.

**AUSCULTATION**

- (1) Don't get frustrated! Auscultation is a difficult skill to "master" and we are all continually refining our techniques. Take your time. Make sure the room is quiet. Be patient.
- (2) Become comfortable with your stethoscope; the bell is for low pitched sounds, while the diaphragm is for higher pitched sounds.
- (3) Ask for help frequently. Read about particular murmurs and their pathophysiology when you encounter them. A number of the more subtle findings (eg S3 or S4) can be very difficult to identify when the patient is tachycardic, a not uncommon scenario as this is one of the compensatory mechanisms for dealing with the dysfunction that has generated these findings in the first place. Re-examination after the patient has made clinical improvement may be more revealing.
- (4) If a patient has an abnormal heart sound due to a structural defect that has been quantified by echocardiography, make sure that you compare your findings to those identified during the study. This is a great way of learning!
- (5) Many of the techniques (described below) are not used when examining every patient. If the exam is normal, it would be neither efficient nor revealing to put a patient through all of these maneuvers. The goal is to have a "bag of

skills" at your disposal that you can reach into and employ to better define abnormalities when they present themselves.

**Table 6.1: Patient positions for auscultation**

Position	Use
Supine	General auscultation and most heart sounds
Sitting up, leaning forward and holding expiration	Aortic stenosis, aortic regurgitation, pericardial rubs
Left lateral decubitus	S3, S4, mitral stenosis (using bell of stethoscope)
Valsalva maneuver	Increases intensity of mitral valve prolapse and hypertrophic cardiomyopathy, decreases intensity of aortic stenosis
Squatting and standing	Increases intensity of aortic stenosis, decreases intensity of outflow obstruction in hypertrophic cardiomyopathy

**Clinical techniques**

- (1) Carefully listen in the specific locations (figure 6.4); remember these locations are rough approximations and are generally determined by visual estimation.
  - (a) Engage the diaphragm of your stethoscope and place it firmly over the 2nd right intercostal space, the region of the aortic valve.
  - (b) Then move it to the other side of the sternum and listen in the 2nd left intercostal space, the location of the pulmonic valve.
  - (c) Move down along the sternum and listen over the left 4th intercostal space, the region of the tricuspid valve.
  - (d) And finally, position the diaphragm over the 4th intercostal space, left midclavicular line to examine the mitral area.
- (2) In each area, listen specifically for S1 and then S2.
  - (a) S1 will be loudest over the left 4th intercostal space (mitral/tricuspid valve areas) and S2 along the 2nd R and L intercostal spaces (aortic/pulmonic valve regions).

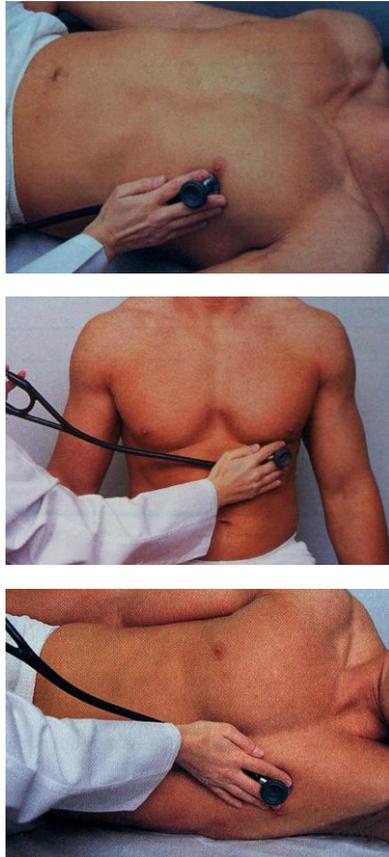


Figure 6.3: Auscultation positions (from above down); supine, sitting & lateral decubitus.

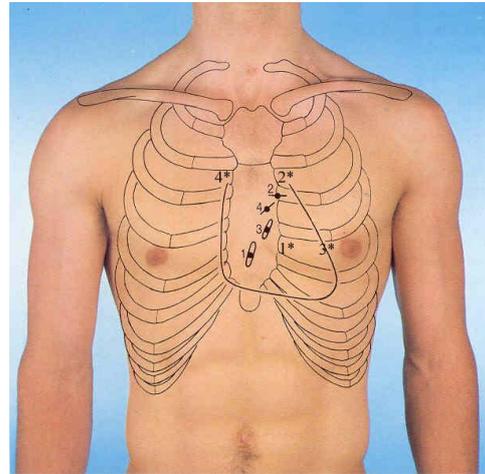
- (b) Note that the time between S1 and S2 is shorter than that between S2 and S1. This should help you to decide which sound is produced by the closure of the mitral/tricuspid and which by the aortic/pulmonic valves and therefore when systole and diastole occur.
- (c) Compare the relative intensities of S1 and S2 in these different areas.

### **Murmurs**

These are sounds that occur during systole or diastole as a result of turbulent blood flow. It is quite helpful to listen in many more areas, in addition to the traditional 4, when any abnormal sounds are detected.

#### **If you hear a murmur, ask yourself:**

- (1) Does it occur during systole or diastole?



1. Right Atrioventricular (Tricuspid) Valve
2. Pulmonary Semilunar Valve
3. Left Atrioventricular (Bicuspid or Mitral) Valve
4. Aortic Semilunar Valve

Listen for:

- 1\*. Right Atrioventricular Valve
- 2\*. Pulmonary Semilunar Valve
- 3\*. Left Atrioventricular Valve
- 4\*. Aortic Semilunar Valve

Figure 6.4: Surface anatomy of heart valves & areas of auscultation (\*).

- (2) What is the quality of the sound (ie does it get louder and then softer; does it maintain the same intensity throughout; does it start loud and become soft)? It sometimes helps to draw a pictorial representation of the sound.
- (3) What is the quantity of the sound? The rating system for murmurs is as follows:
- (a) 1/6 → Can only be heard with careful listening.
  - (b) 2/6 → Readily audible as soon as the stethoscope is applied to the chest.
  - (c) 3/6 → Louder than 2/6.
  - (d) 4/6 → As loud as 3/6 but accompanied by a thrill.
  - (e) 5/6 → Audible even when only the edge of the stethoscope touches the chest.
  - (f) 6/6 → Audible to the naked ear.
- Most murmurs are between 1/6 and 3/6. Louder generally (but not always) indicates greater pathology.
- (4) What is the relationship of the murmur to S1 and S2 (ie when does it start and stop)?
- (5) What happens when you march your

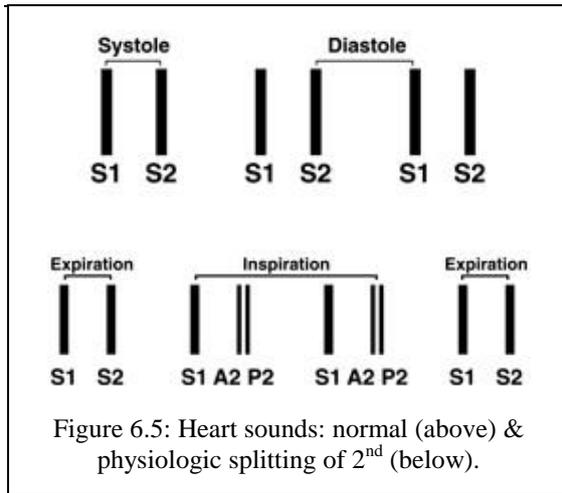


Figure 6.5: Heart sounds: normal (above) & physiologic splitting of 2<sup>nd</sup> (below).

stethoscope from the 2nd RICS (the aortic area) out towards the axilla (the mitral area)? Where is it loudest and in what directions does it radiate? By moving in small increments (ie listening in 8 or 10 places along the chest wall) you will be more likely to detect changes in the character of a particular murmur and thus have a better chance of determining which valve is affected and by what type of lesion.

**Additional heart sounds**

**Physiologic splitting of S2**

S2 is made up of 2 components, aortic (A2) and pulmonic (P2) valve closure. This can be detected in younger patients.

- (1) On inspiration, venous return to the heart is augmented and pulmonic valve closure is delayed, allowing you to hear first A2 and then P2.
- (2) On expiration, the two sounds occur closer together and are detected as a single S2.
- (3) Ask the patient to take a deep breath and hold it, giving you a bit more time to identify this phenomenon.

Note: 2 components of S1 (mitral and tricuspid valve closure) occur so close together that splitting is not appreciated.

**Extra heart sounds (gallops)**

While present in normal subjects up to the ages of 20-30, they represent pathology in older patients.

- (1) An S3 is most commonly associated with left ventricular failure and is caused by blood from

the left atrium slamming into an already overfilled ventricle during early diastolic filling.

- (2) S4 is a sound created by blood trying to enter a stiff, non-compliant left ventricle during atrial contraction. It is most frequently associated with left ventricular hypertrophy that is the result of long standing hypertension.
- (3) Either sound can be detected by gently laying the bell of the stethoscope over the apex of the left ventricle (roughly at the 4th intercostal space, mid-clavicular line) and listening for low pitched "extra sounds" that either follow S2 (ie an S3) or precede S1 (ie an S4). These sounds are quite soft, so it may take a while before you're able to detect them.
- (4) Positioning the patient on their left side while you listen may improve the yield of this exam.
- (5) Presence of both S3 and S4 simultaneously is referred to as a summation gallop.

**Murmurs**

**(1) Systolic murmurs**

These generally represent either aortic stenosis or mitral regurgitation.

**Murmurs of aortic stenosis (AS)**

- (a) Tend to be loudest along the upper sternal borders and get softer as you move down and out towards the axilla. There is,

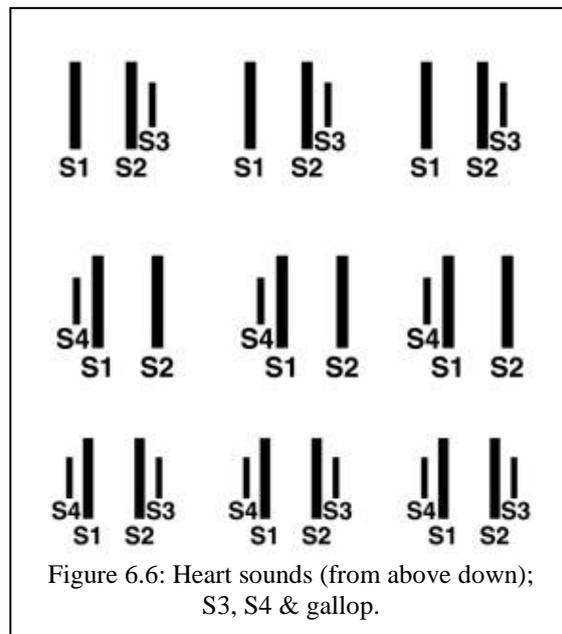


Figure 6.6: Heart sounds (from above down); S3, S4 & gallop.

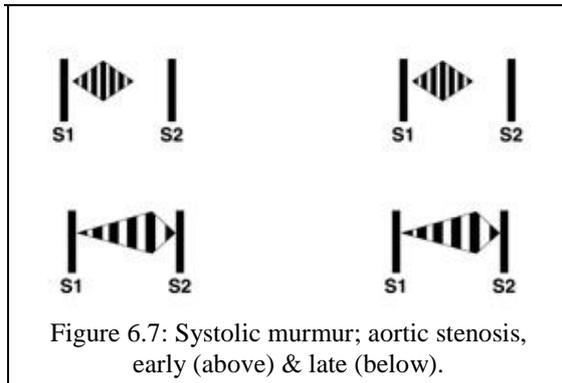


Figure 6.7: Systolic murmur; aortic stenosis, early (above) & late (below).

however, a phenomenon referred as 'Gallavardin effect' which can cause murmurs of AS to sound as loud towards the axilla as they do over the aortic region.

- (b) Have a growling, harsh quality (ie get louder and then softer); also referred to as a crescendo decrescendo, systolic ejection, or diamond shaped murmur).
- (c) Are better heard when the patient sits up and exhales.
- (d) Are heard in the carotid arteries and over the right clavicle.
  - (i) Radiation to the clavicle can be appreciated by simply resting the diaphragm on the right clavicle.
  - (ii) To assess for transmission to the carotids, have the patient hold their breath while you listen over each artery using the diaphragm.

#### Murmurs of mitral regurgitation (MR)

- (a) Sound the same throughout systole.
- (b) Generally do not have the harsh quality associated with aortic stenosis. In fact, they sound a bit like the "shshing" noise produced when you pucker your lips and blow through clenched teeth.
- (c) Get louder as you move your stethoscope towards the axilla.
- (d) Will get even louder if you roll the patient onto their left side while keeping your stethoscope over the mitral area of the chest wall and listening as they move. This maneuver brings the chamber receiving the regurgitant volume, the left atrium, closer to your stethoscope, accentuating the murmur.

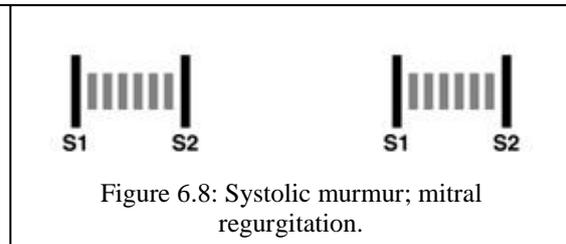


Figure 6.8: Systolic murmur; mitral regurgitation.

- (e) Get louder if after-load is suddenly increased, which can be accomplished by having the patient close their hands tightly.
- (f) Affected by the volume of blood returning to the heart.
  - (i) Squatting increases venous return, causing a louder sound.
  - (ii) Standing decreases venous return, thereby diminishing the intensity of the murmur.

Note: Sometimes murmurs of aortic stenosis and mitral regurgitation co-exist, which can be difficult to sort out on exam. Moving your stethoscope back and forth between the mitral and aortic areas will allow for direct comparison, which may help you decide if more than one type of lesion is present or if the quality of the murmur is the same in both locations, changing only in intensity (ie consistent with a one valve problem).

#### (2) Diastolic murmurs

Tend to be softer and therefore much more difficult to hear than those occurring during systole. In adults they may represent either aortic regurgitation or mitral stenosis.

##### Aortic regurgitation (AR)

- (a) Is best heard along the left para-sternal border, as this is the direction of the regurgitant flow.
- (b) Becomes softer towards the end of diastole (ie decrescendo).

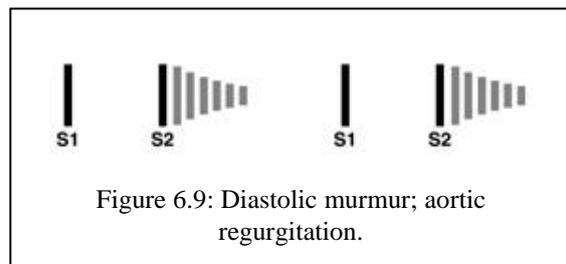


Figure 6.9: Diastolic murmur; aortic regurgitation.

- (c) Can be accentuated by having the patient sit up, lean forward and exhale while you listen.
- (d) Occasionally accompanies aortic stenosis, so listen carefully for regurgitation in patients with AS.
- (e) Will cause the carotid upstrokes to feel extraordinarily full as significant regurgitation increases ventricular pre-load, resulting in ejection of an augmented stroke volume.

**Mitral stenosis (MS)**

- (a) Heard best towards the axilla.
- (b) Can be accentuated by having the patient roll onto their left side while you listen with the bell of your stethoscope.
- (c) Associated with a soft, low pitched sound preceding the murmur, called the opening snap. This is the noise caused by the calcified valve "snapping" open. It can, however, be pretty hard to detect.

**(3) Other murmurs**

- (a) **Pulmonic valve murmurs** are rare in the adults &, are difficult to hear due to the relatively low pressures generated by the right side of the heart.
- (b) **Tricuspid regurgitation (TR)** is relatively common, most frequently associated with elevated left sided pressures which are then transmitted to the right side of the heart.
  - (i) In this setting, both mitral and tricuspid regurgitation often co-exist; the murmur of MR is generally louder than that of TR.
  - (ii) Try to listen along both the low left and right sternal borders (areas where the tricuspid valve is best assessed) and compare this to the mitral area.
  - (iii) TR murmurs are also accentuated by inhalation, which increases venous return and therefore flow across the valve.
- (c) **Rubs** are uncommon sounds produced when the parietal and visceral pericardium become inflamed, generating a creaky-scratchy noise as they rub together.
  - (i) Classic rub is made up of 3 sounds, associated with atrial contraction, ventricular contraction, & ventricular filling.

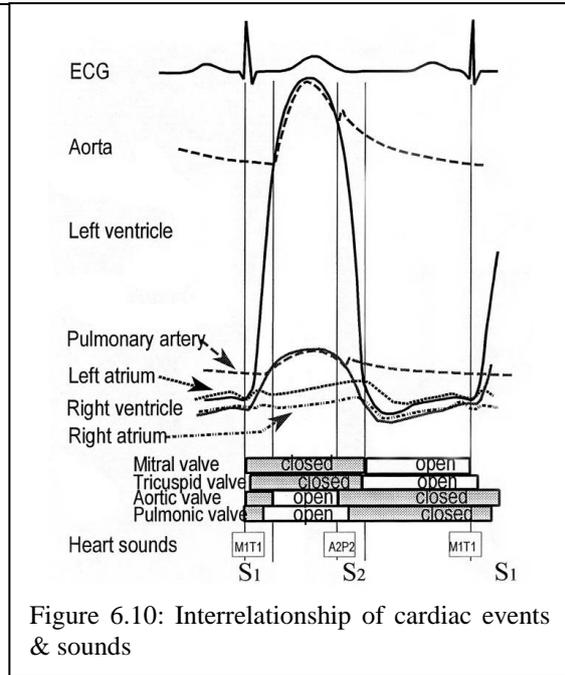


Figure 6.10: Interrelationship of cardiac events & sounds

- (ii) In reality, it's rare to hear all 3 components (more commonly, 2 are apparent).
- (iii) They can be accentuated by listening when the patient sits up, leans forward and exhales, bringing the two layers in closer communication.

Table 6.2: Auscultation, an ordered approach.
Try to focus on each sound individually and in a systematic fashion. Ask yourself: <ol style="list-style-type: none"> <li>1) Do I hear S1?</li> <li>2) Do I hear S2?</li> <li>3) What is their relative intensities in each of the major valvular areas?</li> <li>4) Is S2 split physiologically?</li> <li>5) Are there extra sounds before S1 or after S2 (i.e. an S4 or S3)?</li> <li>6) Is there a murmur during systole?</li> <li>7) Is there a murmur during diastole?</li> <li>8) If a murmur is present, how loud is it? What is its character? Where does it radiate? Are there any maneuvers which affect its intensity?</li> </ol>
Remember that these sounds are created by mechanical events in the heart. As you listen, remind yourself what is happening to produce each of them.

**Auscultation over the carotid arteries**

- (1) In the absence of murmurs suggestive of aortic valvular disease, you can listen for carotid

**Table 6.3: CARDIOVASCULAR SYSTEM EXAMINATION REVIEW**

- A) Inspection**  
 1) JVP  
 2) Apex beat
- B) Palpation**  
 1) Precordium  
 2) Carotid artery  
 3) Radial artery
- C) Auscultation**  
 1) Heart sounds  
 2) Additional sounds
- D) General examination**

between when you hear the murmur and feel the impulse. This is referred to as diminished and delayed upstrokes (parvus et tardus), as opposed to the full and prompt inflow which occurs in the absence of disease. Mild or moderate stenosis does not alter the character of carotid in-flow.

**DON'T FORGET TO EXAMINE****General examination**

- bruits (sounds created by turbulent flow within the blood vessel) at this point in the exam.
- (2) Place the diaphragm gently over each carotid and listen for a soft, high pitched "shshing" sound. It's helpful if the patient can hold their breath as you listen so that you are not distracted by transmitted tracheal sounds.
  - (3) Carotid bruits can be confused with the radiating murmur of aortic stenosis.
    - (a) Carotid bruits are softer.
    - (b) AS murmurs are audible in both carotids and get louder as you move down the vessel, towards the chest.
    - (c) In settings where carotid pathology coexists with aortic stenosis, a loud transmitted murmur associated with a valvular lesion may overwhelm any sound caused by intrinsic carotid disease, masking it completely.
    - (d) Carotid upstrokes refer to the quantity and timing of blood flow into the carotids from the left ventricle.
      - (i) They can be affected by aortic stenosis and must be assessed whenever you hear a murmur that could be consistent with AS.
      - (ii) This is done by placing your fingers on the carotid artery, while you simultaneously listen over the chest.
      - (iii) There should be no delay between the onset of the murmur (which marks the beginning of systole), and when you feel the pulsation in the carotid.
      - (iv) In very severe aortic stenosis, small amounts of blood will be ejected into the carotid and there will be a lag

Many clues to the cardiac condition can be detected with a simple visual inspection.

- (1) In the acutely unwell patient, cyanosis, pallor, and sweatiness can all be signs of impending danger – cardiovascular compromise?
- (2) In nonacute patients, cachexia is perhaps the most important feature to note on general inspection since it is an important prognostic sign in heart failure.
- (3) Palpation for pitting edema can give clue to heart failure.
- (4) Certain physical appearances can give clue to cardiac abnormalities;
  - (a) Marfan's syndrome → Aortic regurgitation (aortic dissection).
  - (b) Down's syndrome → Atrial septal defect, ventricular septal defect.
  - (c) Turner's syndrome → Coarctation of aorta.
  - (d) Spondyloarthritides eg, ankylosing spondylitis → Aortic regurgitation.
- (5) Certain facial signs can also give clue to underlying cardiac abnormalities;
  - (a) Malar flush (redness around the cheeks) → Mitral stenosis.
  - (b) Xanthomata (yellowish deposits of lipid around the eyes, palms, or tendons) → Hyperlipidemia.
  - (c) Corneal arcus (a ring around the cornea) → Age, hyperlipidemia.
  - (d) Proptosis → Atrial fibrillation, in patients with Graves' disease.
- (6) Certain physical signs in hand can also give clue to underlying cardiac abnormalities;

- 
- (a) Clubbing → Infective endocarditis, cyanotic congenital heart disease.
  - (b) Splinter hemorrhages → Infective endocarditis.
  - (c) Janeway lesions (macules on the back of the hand) → Infective endocarditis.
  - (d) Osler's nodes (tender nodules in fingertips) → Infective endocarditis.
- (7) Abnormalities in pulse can help in diagnosis;
- (a) Regularly irregular → 2nd-degree heart block, ventricular bigeminy.
  - (b) Irregularly irregular → Atrial fibrillation, frequent ventricular ectopics.
  - (c) Slow rising (low gradient upstroke) → Aortic stenosis.
  - (d) Waterhammer or collapsing (steep up and down stroke) → Aortic regurgitation, patent ductus arteriosus.
  - (e) Bisferiens (double-peaked pulse – the second peak can be smaller, larger, or the same size as the first) → Aortic regurgitation, hypertrophic cardiomyopathy.
  - (f) Pulsus paradoxus (an exaggerated fall in pulse volume on inspiration, >10 mm Hg on sphygmomanometry) → Cardiac tamponade, acute asthma.
  - (g) Bounding (large volume) → Anemia, hepatic failure, type 2 respiratory failure (high CO<sub>2</sub>)
  - (h) Pulsus alternans (alternating large and small volume pulses) → Bigeminy.

# Module >

## Chest: Breasts

### HISTORY

#### Age

- (1) Fibroadenoma usually occur between 15-25 years of age.
- (2) Breast abscess is more commonly seen in young lactating women.
- (3) Carcinoma of breast can occur at any age after puberty; uncommon before age 20, but then a steady rise in its incidence to the time of menopause, followed by a slower rise throughout later life.

#### Residence

Carcinoma of breast occurs more commonly in western world; diets rich in saturated fatty acids may play a part (as estrogen is synthesized in fat depot).

### SYMPTOMS

#### Lump

- (1) Enquire about its mode of onset, duration & rate of growth.
  - (a) A lump after injury to the breast may be a hematoma, fat necrosis or merely the trauma has attracted the attention of the patient towards a pre-existing lump.
  - (b) A lump with a long history & slow growth is a benign condition, eg fibroadenosis & fibroadenoma. They often arise & disappear rapidly & repeatedly if they are cysts, & are often cyclical.

- (c) Rate of enlargement of malignant lumps is usually rapidly progressive with short history, & not related to the menstrual cycle.

- (2) Enquire about associated pain or discomfort of a breast lump or breast thickening or enlargement.

### DIFFERENTIAL DIAGNOSIS OF BREAST LUMP &/OR PAIN

#### 1) Painless lump

- a) Carcinoma.
- b) Cyst.
- c) Fibroadenoma.
- d) ANDI (Aberrations of normal development & involution).

#### 2) Painful lump

- a) Cyclical nodularity (ANDI, fibroadenosis).
- b) Cyst.
- c) Abscess (usually lactational).
- d) Periductal (plasma-celled) mastitis.
- e) Carcinoma (rare).

#### 3) Pain & tenderness but no lump

- a) Cyclical mastalgia (including premenstrual tension).
- b) Non-cyclical mastalgia.
- c) Pregnancy mastitis.

#### Pain

- (1) This is the main complaint of acute mastitis & breast abscess.
- (2) All neoplasms (benign or malignant) are painless to start with.
  - (a) Students must remember that the carcinoma of the breast is usually painless to start with & only becomes painful later.

- (b) However, pain without a lump is a recognized presenting symptom of carcinoma of the breast which is fairly well localized & constant, in contrast to the cyclical diffuse discomfort of benign breast disease.
- (3) Pain may be referred from the chest wall & thoracic organs to the breast.
- (4) Enquiry should also be made regarding pain at the back, shoulder & hip in case of carcinoma of breast. Patients may ignore their presence considering it to be due to rheumatism & not having any relation with the lump in the breast.
- (a) Carcinoma is more frequent in nulliparous than in multiparous women; breast feeding has a protective role.
- (b) Increased risk of carcinoma when over 30 at time of first child.
- (4) Drug history should be obtained with special regard to oral or parenteral contraceptives & hormone replacement therapy.
- (5) A family history is important as there is an increased incidence of carcinoma of the breast in first degree relatives of those with carcinoma of the breast. Family history of carcinoma of the colon is also associated with breast cancer.

### Discharge

Nipple discharge may be from one or more ducts. Note its color, character & quantity.

#### Differential diagnosis of nipple discharge

- (1) Bright red blood →
  - (a) Duct papilloma.
  - (b) Duct carcinoma.
  - (c) Carcinoma in a lactating breast.
- (2) Dark, altered blood → Duct papilloma
- (3) Slightly bloodstained fluid → Intracystic papilliferous carcinoma if associated with the presence of a sizeable cystic swelling
- (4) Clear, yellow, serous fluid →
  - (a) Benign breast disease with retention cysts, if associated with a lumpy breast.
  - (b) Women taking the oral contraceptive pill.
- (5) Thick, green discharge → Duct ectasia
- (6) Milky discharge →
  - (a) Insufficient suppression of lactation after weaning.
  - (b) Galactocele.
  - (c) Prolactinoma of the pituitary gland.
- (7) Pus → Breast abscess.

### OTHER POINTS IN HISTORY

- (1) Previous history of breast disease, its course & management.
- (2) Menstrual history including the age of menarche & menopause. The risk of carcinoma increases with early menarche & late menopause.
- (3) Obstetric history, especially pertaining to breast feeding & its complications.

### LOCAL EXAMINATION

#### Preparation, exposure & positioning

- (1) Seclusion, warmth & privacy are necessary for the examination of breast, to avoid discomfort & embarrassment to the very anxious patient.
- (2) Good lighting is essential to detect minor abnormalities.
- (3) Patient should be asked to undress to the waist, so as to expose breasts, axilla, arms & neck.
- (4) Initially the patient should be sitting comfortably upright. This gives more information regarding the level of nipples, a lump & palpation of the axillary lymph nodes.

### INSPECTION

#### Patient positions

- (1) Arms by the side of the body.
- (2) Arms lifted straight above her head; any lump or dimple may become more evident.
- (3) Arms are brought down with the patient pressing her hands into her hips to contract the pectoral muscles; abnormal movement of the nipple or exaggeration of skin dimples may be evident.
- (4) In large pendulous breasts, patient leaning forwards from the waist so that the breasts fall away from the body. Any failure of one nipple to fall away from the chest indicates abnormal fibrosis behind the nipple.



Figure 7.1: Breast examination (from above down); arms by the side, arms above the head, arms pressing on hips, & leaning forward.

## Nipples

### Presence & number

- (1) Note whether both nipples are present in its usual position.
- (2) Note the presence of accessory nipples, which can occur anywhere along the mammary ridge (extending from axilla to groin).

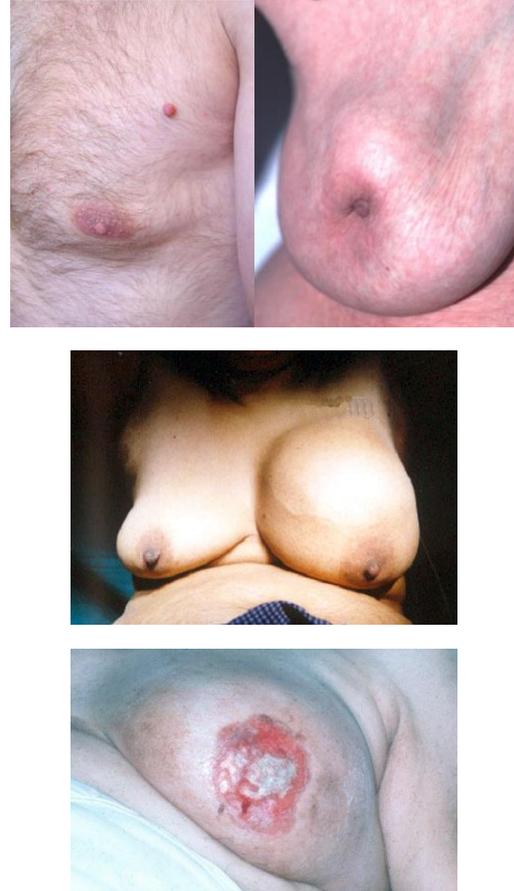


Figure 7.2: Nipples (from above & left); accessory nipple, retraction towards carcinoma, displacement from fibroadenoma, & destruction from Paget's disease.

### Position

Compare the level of nipples on both sides. Vertical distance from the clavicle & horizontal distance from the midline should be considered.

- (1) In carcinoma nipple of the affected side is drawn up towards the lump. This elevation of the nipple will be more marked if the patient is asked to raise both the hands above the head.
- (2) Inflammatory fibrosis may also cause similar elevation of the nipple.
- (3) Nipple may be displaced away from the lump in case of a large fibroadenoma or phylloides tumor.

**Size & shape**

The nipple usually points forward, more noticeably so when erect. Note whether the nipple is prominent, flattened or retracted.

- (1) Prominence of the nipple may be due to an underlying swelling such as a cyst.
- (2) Unilateral or bilateral nipple retraction may be congenital or occur during development.
- (3) Recent retraction may be a manifestation of underlying disease, eg carcinoma of the breast or chronic inflammation.
- (4) In Paget's disease the nipple is completely destroyed, a red & flat ulcer being present in its place.

**Color & surface**

- (1) Nipples darken with age & during pregnancy.
- (2) Look for any cracks, fissures or eczema. During lactation the nipple is prone to inflammation, cracking & infection.

**Discharge**

- (1) Note the character, eg bloody, purulent, milky, greenish or clear.
- (2) Note whether the discharge is coming from the nipple or from its immediate neighborhood.

**Areola****Color**

- (1) Pale pink in young girls.
- (2) Slightly darker in adult life.
- (3) Brown during pregnancy.

**Size**

- (1) Larger in cases of huge swellings eg phylloides tumor or sarcoma.
- (2) Smaller in scirrhus carcinoma.

**Surface**

- (1) Look for crack, fissure, ulcer, eczema, discharge or a swelling.
- (2) In Paget's disease, the areola becomes bright red in the early stage & is destroyed leaving a red weeping ulcer later on. Remember eczema is usually a bilateral affection whereas Paget's disease is unilateral.
- (3) Glands of Montgomery may become hypertrophied during pregnancy & lactation to produce small swellings under the areola. This is not a pathological condition.
- (4) Occasionally glands of Montgomery may be enlarged forming a retention cyst similar to a



Figure 7.3: Areola (from above down); discharge in breast abscess, & Montgomery tubercles.

sebaceous cyst. They may get secondarily infected.

- (5) Diminution of the size of the areola around a retracted nipple is a feature of carcinoma.

**Skin over the breast**

In large or pendulous breasts, do not forget to lift the breast in order to inspect the inferior surface.

**Color & texture**

- (1) In acute mastitis & breast abscess the skin becomes red, warm & edematous.
- (2) Similar picture may be seen in inflammatory mammary carcinoma.

**Engorged veins**

- (1) A few veins are normally visible, & these venous patterns enlarge & become more apparent during pregnancy.
- (2) Also seen in acute lactational mastitis with huge breast abscess.
- (3) More commonly seen in phylloides tumor & sarcoma.

**Dimpling, retraction or puckering**

- (1) Neoplasms may interfere with the supporting fibrous architecture of the breast, & give rise to skin dimpling or puckering & retraction or deviation of the nipple.



Figure 7.4: Skin over breast (from above down); breast abscess, TB breast & syphilis breast.

(2) These can be made prominent by lifting the breast gently upwards & in various inspection positions (described above).

**Peau d' orange**

Peau d' orange (French for orange peel) is a characteristic appearance of underlying neoplastic disease. There is infiltration of the lymphatic drainage of the breast giving rise to cutaneous edema; the appearance of the tiny pits of orange peel is produced by deep tethering of the sweat glands.

**Lumps**

Sebaceous cyst can occur which usually shows characteristic punctum. They may get secondarily infected.



Figure 7.5: Skin over breast; engorged veins & bosselated surface in Phylloides tumor.



Figure 7.6: Skin over breast in carcinoma; puckering & retraction (above), & peau d' orange (both).

**Nodules, ulceration & fungation**

- (1) Nodules over the breast are often metastatic, while fungation is a sign of locally advanced malignancy.
- (2) In a rapidly growing sarcoma & phylloides tumor the skin is liable to atrophy at the site of maximum pressure & ultimately gives way so that the growth fungates out. But the skin in



Figure 7.7: Fungating carcinoma (above) & cancer en cuirasse (below).

this case is not infiltrated. This can be demonstrated by means of a probe which can be passed underneath the skin margin. This is not possible in case of a fungating carcinoma where the skin becomes infiltrated.

**Breasts**

Both the breasts are inspected in their entirety, & compared with one another.

**Position**

Whether displaced in any direction.

**Size & shape**

There is marked variation in the appearance of women's breasts & the size of an individual woman's breast may change during development, normal menstrual cycle, pregnancy, lactation & ageing.

- (1) Breasts are rarely symmetrical, but any recent



Figure 7.8: Breast enlargement in galactoceles.

changes in symmetry should be noted;

- (a) Whether larger or smaller than its fellow. Sometimes the male breast becomes enlarged, referred as gynecomastia.
  - (b) In scirrhus carcinoma the breast may be shrunken & drawn in towards the growth.
- (2) Lumps that are large in comparison to the size of the breast or situated near the surface may be evident on first inspection.
- (a) In presence of a swelling or an ulcer note its site (in relation to four quadrants of breast), size, shape & surface.
  - (b) Further abnormalities may be evident or exaggerated if the arms or breasts are moved (as described above);
    - (i) Arms above the head.
    - (ii) Hands pressing on hips to contract the pectoral muscles.
    - (iii) Leaning forward in large pendulous breasts.

**Arm & thorax**

- (1) Cancer en cuirasse ie multiple cancerous



Figure 7.9: Lymphedema after modified radical mastectomy.

nodules & thicken infiltrated skin, like coat of armor, may be seen in the arm & the thoracic wall.

- (2) Brawny edema of the arm may be due to extensive neoplastic infiltration of the axillary lymph nodes causing lymphatic blockage.
- (3) Edematous arm may also be seen after radical mastectomy, due to lymphatic obstruction.

#### Axilla & supraclavicular fossa

Note whether there is any obvious lymphadenopathy, or accessory axillary breast.



Figure 7.10: Bilateral accessory axillary breast.

### PALPATION OF BREAST

#### Clinical techniques

- (1) Ask the patient to lie flat & then to put the hand of the side to be examined behind her head & then roll slightly to the opposite side, so that the breast lies flat on the chest wall & becomes more easily palpable. Semi-recumbent (45°) position is also helpful, as it renders the breast lump to palpate against the chest.
- (2) Examine the normal breast first; the normal breast gives a firm lobulated impression with nodularity.
- (3) Breast is palpated with the flat of the hand quadrant by quadrant, including beneath the nipple, finally examining the axillary tail.
- (4) If a lump is detected, the palpation should be made between the pulps of the fingers & the thumb.
- (5) Now the affected side is palpated in a similar fashion keeping in mind the findings of the normal side & comparing them with those of the affected side.



Figure 7.11: Position for breast palpation.

- (6) While palpating the nipple & areola an eye must be kept on it to note any discharge being expressed out of the nipple or not.
- (7) If the breasts are very large or pendulous it may be impossible to examine it adequately against the chest wall.
  - (a) Ask the patient to lean slightly forward so the breasts hang away from the chest wall.
  - (b) Use bimanual palpation to increase the ability to palpate the entire mass of breast tissue.

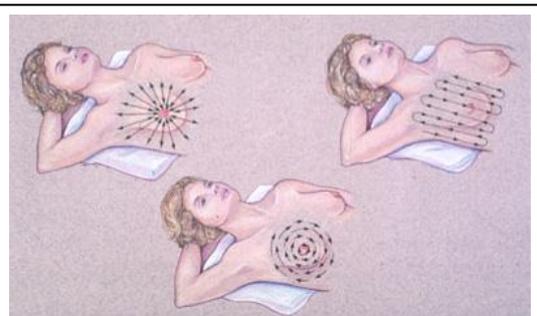


Figure 7.12: Scheme of breast palpation (from above left); wedge, vertical strip & circular.

#### Clinical findings

Any lump in the breast is examined (as given in module 3) for site, size, shape, surface, consistency, fluctuation, tenderness, & mobility, & its lymphatic drainage.

#### Local temperature & tenderness

Local temperature is best felt by the back of fingers.

- (1) A warm & tender swelling is generally inflammatory in origin, eg acute mastitis or breast abscess.
- (2) Inflammatory mammary carcinoma may presents with similar features.

- (3) Where the presenting complaint is mastalgia, ask the patient to point where the pain originates from &, then gently palpate this area to elicit tenderness of the underlying pectoral muscles, ribs & costal cartilages, as all of these structures can give rise to inflammation leading to mastalgia.

#### **Site**

Both benign lumps & carcinoma can occur anywhere in the breast including the axillary tail;

- (1) Fibroadenosis (ANDI) & carcinoma are more common in the upper & outer quadrant.
- (2) Fibroadenoma is more common in the lower quadrants.
- (3) Duct papilloma & duct ectasia occur beneath the areola.

#### **Size & shape**

- (1) Fibroadenoma is usually spherical, ovoid, or lobulated, & variable in size.
- (2) Carcinoma is usually irregular in shape & variable in size.

#### **Surface**

- (1) Smooth in benign conditions.
- (2) Irregular in carcinoma.

#### **Margin**

- (1) In fibroadenosis the margin is ill defined.
- (2) In fibroadenoma & carcinoma the margin is well defined;
  - (a) In fibroadenoma it is regular & tends to slip off the palpating fingers.
  - (b) In carcinoma it is irregular & does not tend to slip away from the palpating fingers as it is fixed to the breast tissue.

#### **Consistency**

Note whether it is cystic, firm, hard or stony hard.

- (1) A firm, lobular, diffuse rubbery feel is characteristic of fibroadenosis.
- (2) A fibroadenoma is a firm encapsulated tumor.
- (3) A carcinoma is stony hard.
- (4) In sarcoma consistency may vary from place to place.

#### **Fluctuation**

A cystic swelling should be tested for fluctuation.

#### **Clinical techniques**

- (1) With the thumb & fore-fingers of one hand hold the cyst, & with index finger of the other hand made a gentle tap on the centre of the cyst.

- (2) In cystic lumps the thumb & fingers of first hand will seem to be lifted & move apart.
- (3) The test should be conducted in 2 planes, perpendicular to each other.

#### **Clinical findings**

- (1) The test will be positive in cysts, chronic abscesses & lipoma.
- (2) A very tense cyst may not show fluctuation test positive.

#### **Transillumination**

##### **Clinical technique**

This should be carried out in a dark room. The torch is placed on the under surface of the breast so that the light is directed through the breast tissue to the examiner.

##### **Clinical findings**

- (1) Fat & cystic lumps appear translucent.
- (2) Solid tumors appear opaque.

#### **Mobility**

This is assessed for fixity to the skin, breast tissue, underlying muscles & chest wall.

##### **(1) Fixity to skin**

Breast lumps can be fixed to the skin in two ways: they may be tethered to it, or fixed to it.

##### **Tethering**

- (a) When carcinoma of breast begins to spread it grows along the fine fibrous septae, which pass from the skin through the subcutaneous fat & lobules of breast, called (Astley) Cooper's ligaments.
- (b) Infiltration of these strands by tumor makes them shorter & inelastic. This pulls the skin inwards, puckering the skin surface. The underlying lump can still be moved independently of the skin for a limited distance, & described as being tethered to the skin.

##### **Clinical techniques**

- (a) Move the lump from side to side or up & down, & note if the skin dimples at the extremes of movement.
- (b) Raising the arms above the head can have a similar effect.

##### **Fixation**

There is direct, continuous & widespread infiltration of skin by the underlying disease, with the disease has actually spread far

beyond the visible area of fixation. The breast lump & skin cannot be moved separately; whenever one is moved the other goes with it.

#### **Clinical techniques**

- (a) Hold the tumor & move it side to side or up & down; not possible if the tumor is fixed to skin.
- (b) Slide the skin over the tumor; not possible if the tumor is fixed to skin.
- (c) Skin over the tumor is pinched up;
  - (i) This is also not possible if the tumor is fixed to skin.
  - (ii) When a wide area of skin over the tumor is attempted to pinch up, peau d'orange will become prominent.

#### **Clinical findings**

- (a) Malignant lumps will exhibit skin fixation property, in late stages. Hard nodules may also be felt in the skin in late stage of breast cancer.
- (b) Presence of fixity to the skin of retroareolar lumps is of less concern as even benign masses demonstrate this property due the proximity of many ducts leading to the nipple.

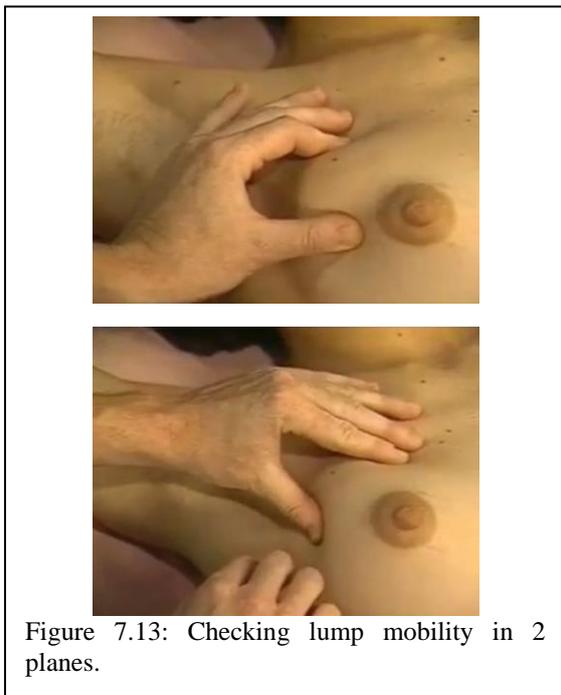


Figure 7.13: Checking lump mobility in 2 planes.

### **(2) Fixity to breast tissue**

#### **Clinical techniques**

Hold the breast tissue with one hand & gently move the tumor with other hand.

#### **Clinical findings**

- (a) A fibroadenoma is not fixed to the breast tissue & can be freely moved within the breast substance; that is why it is called a breast mouse.
- (b) A carcinoma is fixed to the breast substance & cannot be moved within it.

### **(3) Fixity to underlying fascia & muscles**

- (a) Fixity of a breast mass to the pectoral muscles is determined by checking mobility of the mass while the patient contracts her pectoral muscles.
  - (i) Patient is first asked to place her hand on her hip lightly.
  - (ii) Lump is first moved in the direction of fibers of pectoralis major & then perpendicular to it.
  - (iii) Now ask her to push hand into her hip. Feel the anterior fold of the axilla to verify that the muscle has been made taut. Again check the mobility in both directions.
  - (iv) Any restriction in mobility (with the contracted muscle) indicates fixity to the pectoral fascia & pectoralis major.
- (b) Fixity of a breast mass (in lower & outer quadrant) to the serratus anterior is determined by checking mobility of the mass while the patient contracts her serratus anterior.
  - (i) Ask the patient to push her hand forwards into your shoulder.
  - (ii) Again check mobility in 2 planes, perpendicular to each other.
  - (iii) Lump, if fixed to serratus anterior, will move very little.

### **(4) Fixity to chest wall**

If the tumor is fixed with the muscles in relaxed state, it is fixed to the chest wall.

#### **Nipple & areola**

- (1) Nipple is palpated between the thumb & fingers for tissue nodularity.
- (2) If there is a history of nipple discharge, an attempt should be made to produce it by firm palpation of the retroareolar area & then each

quadrant of the breast in a systematic fashion eg a 'round the clock pattern', so as to identify the individual ducts responsible for the discharge.

- (a) Note the location & number of ducts which produce the discharge.
- (b) Note the character & amount of discharge.

### **Ulcer**

If there is any ulcer, examine it as described in module 4.

## **PALPATION OF AXILLARY LYMPH NODES**

### **Positioning & preparation**

- (1) The palpation of axillary nodes is best carried out with the patient in sitting position, & the examiner standing.
- (2) Muscles & fasciae around the axilla should be relaxed. If this cannot be properly achieved the examination can be done in lying down position.

**Note:** Remember to palpate both axillae, even if the complaint is unilateral.

### **Clinical techniques**

#### ***Pectoral (anterior) group***

This group is situated just behind the anterior axillary fold.

- (1) If the patient's left axilla is to be examined, her left hand is taken & held by examiner's left hand while her forearm is supported by the examiner's right; this relaxes the muscles of the shoulder girdle to allow easy access to axilla.
- (2) Fingers of examiner's right hand are insinuated behind the pectoralis major. The palm should look forward, & the thumb of the same hand is used to push the pectoralis major backwards from in front.
- (3) Try to palpate the lymph nodes with the pulps of the fingers.

#### ***Central (medial) group***

- (1) This is examined in continuation with the pectoral group, ie in the same position & examiner's right hand for patient's left axilla.
- (2) With the patient's arm is slightly abducted, the examiner passes extended fingers right upto the apex of the axilla directing the palm towards the lateral thoracic wall.



Figure 7.14: Palpation of axillary lymph nodes (from above down); anterior group, medial group, lateral group, posterior group, & supraclavicular nodes.

- (3) Patient's arm is then brought to the side of her body & the forearm rests comfortably on examiner's forearm.
- (4) Palpation is carried out by sliding the fingers against the chest wall when the lymph nodes can be felt to slip out from the fingers.

#### **Apical group**

- (1) This is palpated in the same manner as the central group, but the fingers are pushed further up.
- (2) If the lymph nodes are very much enlarged they may push themselves through the clavicular fascia to be felt through the pectoralis major just below the clavicle.

#### **Brachial (lateral) group**

This group lies on the lateral wall of the axilla in relation to the axillary vein.

- (1) Change of hand is required, ie the examiner uses left hand for patient's left axilla.
- (2) The group is felt with the palm directed laterally against the upper end of the humerus.

#### **Subscapular (posterior) group**

This group lies on the posterior axillary fold.

- (1) Change of both position & hand are required, ie the examiner stands behind the patient, & uses left hand for the left axilla.
- (2) Palpate the anterior aspect of the posterior axillary fold, while with the right hand the patient's arm is semi-lifted.
- (3) Nodes are palpated with the palm of the examining hand looking backwards & the thumb pressing the posterior fold forward.

#### **Clinical findings**

- (1) Presence of axillary lymph nodes are normal but they are usually quite small & either impalpable or barely so.
- (2) When lymph nodes are enlarged & palpable careful assessment must be made as to their number, size, consistency, mobility etc. (as described in module 19).

#### **DON'T FORGET TO EXAMINE**

Examination of breast does not finish with just the breasts & axillae examination. Always remember to examine the followings.

#### **(1) Palpation of cervical lymph nodes**

- (a) One must always examine the supraclavicular group to conclude the examination of axillary lymph nodes.
- (b) Stands behind the patient & dips the fingers down behind the middle of the clavicle; two sides are simultaneously palpated & compared. Note particularly the presence & characteristics of the scalene node, behind the insertion of the sternocleidomastoid.
- (c) Passive elevation of the shoulders would relax the muscles & fasciae of the neck to facilitate palpation. One must always flex the neck of the patient's slightly for better palpation.

#### **(2) Examination of arm**

Obstruction of axillary lymphatics, eg from neoplastic invasion or damage secondary to radiation, gives rise to edema of the arm.

#### **(3) General examination**

#### **(4) Examination of chest**

In carcinoma of the breast, metastatic deposits can also occur in the lungs & pleura giving rise to pleural effusions.

#### **(5) Examination of abdomen**

In carcinoma of the breast, hepatomegaly can occur due to metastatic deposits.

#### **(6) Rectal & vaginal examination**

These can detect associated Krukenberg's tumor of the ovary, which occurs by transcoelomic implantation or lymphatic permeation.

#### **(7) Musculoskeletal examination**

In carcinoma of the breast, metastatic deposits can also occur in the skeleton most notably the ribs, spine, sternum, pelvis, upper ends of femur & humerus, giving rise to tenderness & pathological fractures.

#### **MALE BREASTS**

- (1) Generally, the male breasts are affected by same disease processes as female breasts, eg mastitis, fibroadenoma & carcinoma. So the history & examination is along the same lines.

**SUMMARY OF BREAST DISEASE EVALUATION****History**

- 1) Menarche, development, menopause.
- 2) Changes during menstrual cycle.
- 3) Pregnancies, lactation.
- 4) Family & drug history.

**Examination**

- 1) Undress the upper half of the trunk.
- 2) Positions
  - a) Arms by the sides.
  - b) Arms straight above head.
  - c) Hands pressing on hips.
  - d) Leaning forward in large pendulous breasts.
- 3) Inspection
  - a) Breast size & symmetry.
  - b) Skin
    - Puckering.
    - Peau d' orange.
    - Nodules.
    - Discoloration.
    - Ulceration.
  - c) Nipples & areolae.
  - d) Axillae, arms & neck.
- 4) Palpation
  - a) Feel the normal side first.
  - b) If lump is detected, note all its features.
- 5) Examine the axillae & arms.
- 6) Examine the supraclavicular fossae.
- 7) Palpate the abdomen for
  - a) Hepatomegaly.
  - b) Ascites.
  - c) Nodules in the pouch of Douglas.
- 8) Examine the skeleton.



Figure 7.15: Carcinoma of male breast.

- (3) Tumors, producing sex hormones → Testicular tumors, adrenal tumors & others producing ectopic hormones eg bronchogenic carcinoma.
- (4) Chronic hepatic failure.
- (5) Hyperthyroidism.
- (6) Drugs →
  - (a) Estrogens or estrogen-like compounds eg stilboestrol (for prostatic carcinoma), or steroids.
  - (b) Cimetidine.
  - (c) Neurotransmitter agonists eg methyl dopa, phenothiazines, & tricyclic anti-depressants.
  - (d) Spironolactone.
  - (e) Digitalis.

- (2) However, the gynecomastia (enlargement of the male breast) is the commonest complaint arising from the male breast.
  - (a) A careful history should be taken to identify the cause (listed below).
  - (b) Testis should be examined for anorchism, cryptorchidism, & teratoma.
  - (c) Liver should be examined for cirrhosis.

**Causes of gynecomastia**

- (1) Physiological →
  - (a) Neonatal.
  - (b) Puberty.
  - (c) Old age.
- (2) Hypogonadism → As a result of gonadotrophin insufficiency, decreased Leydig cell function, or androgen resistance.



Figure 7.16: Gynecomastia (before &amp; after surgery).

# Module 8

## Chest: Esophagus

**HISTORY**

**Age**

- (1) Carcinoma of esophagus occurs at 50 to 70 years of age.
- (2) Achalasia usually occurs between 30 to 40 years of age.
- (3) Paterson-Kelly syndrome occurs in females nearing menopause.
- (4) In children, dysphagia may be caused by impaction of a foreign body, paralysis of soft palate (due to diphtheria) & acute retropharyngeal abscess.
- (5) More elderly subjects are at risk of age-related causes for dysphagia (eg Parkinson's disease).
- (6) Dysphagia can be a feature of the normal ageing process (presbyphagia).

**Sex**

- (1) Carcinoma of esophagus mainly affects men.

- (2) Achalasia is seen in both sexes, though women may dominate.
- (3) Paterson Kelly syndrome occurs almost exclusively in females.

**SYMPTOMS**

**Dysphagia**

- (1) Distinction must be made between dysphagia & odynophagia (pain on swallowing). Odynophagia is usually due to infection (eg candidiasis), but may also be a feature of neoplasia.
- (2) In general, patients report a sensation of food or liquid becoming 'stuck' at a certain level as a feature of their dysphagia, but the level indicated often correlates poorly with the level of the disease. For example, a patient indicating a sensation of food sticking at the level of the sternal notch may have an obstructing lesion at the gastro-esophageal junction.

Table 8.1: CAUSES OF DYSPHAGIA			
High dysphagia		Low dysphagia	
Structural	Functional	Structural	Functional
<ul style="list-style-type: none"> <li>• Pharyngeal pouch</li> <li>• Tumor</li> <li>• Cricopharyngeal bar</li> </ul>	<ul style="list-style-type: none"> <li>• Stroke</li> <li>• Parkinson's disease</li> <li>• Presbyphagia</li> <li>• Myasthenia gravis</li> <li>• Multiple sclerosis</li> <li>• Cerebral palsy</li> <li>• Huntington's chorea</li> <li>• Polymyositis</li> <li>• Oculopharyngeal muscular dystrophy</li> </ul>	<ul style="list-style-type: none"> <li>• Tumor (intrinsic/extrinsic)</li> <li>• Stricture/web</li> <li>• Post-fundoplication</li> </ul>	<ul style="list-style-type: none"> <li>• Achalasia</li> <li>• Nutcracker esophagus</li> <li>• Reflux related to dysmotility</li> <li>• Scleroderma</li> </ul>

**Mode of onset & progress**

- (1) A sudden onset may suggest foreign body obstruction or acute esophagitis.
- (2) An esophageal malignancy will characteristically present with a relatively short history (weeks) of progressive dysphagia in the elderly, possibly associated with weight loss.
- (3) Dysphagia lasting several years with episodes of regurgitation may suggest a chronic motility disorder (eg achalasia).
- (4) A slow onset with a long history is also present in benign stricture, pharyngeal pouch etc.
- (5) Progressively worsening dysphagia is typical of carcinoma & stricture.
- (6) In case of spastic lesions (Paterson-Kelly syndrome & Schatzki's rings) there may be periods of remission.

**Nature of dysphagia**

- (1) Dysphagia first with solids & subsequently with liquids points to mechanical obstruction. This is mainly seen in carcinoma of esophagus.
- (2) Dysphagia first with liquids & subsequently with solids is typical of achalasia (cardiospasm); weight of the solid helps in overcoming the spasm.

**Regurgitation**

- (1) This is often seen in achalasia, but may be seen in gastroesophageal reflux disease (GERD) & sliding hiatus hernia with stooping or straining. Dysphagia related to reflux (with or without a stricture) may be suggested by heartburn & acid brash.
- (2) Patients with a pharyngeal pouch (Zenker's diverticulum) will characteristically experience regurgitation of undigested food some time after the original meal, possibly with an associated cough due to concomitant aspiration. In this case a lump in the neck may be visible which may be emptied with pressure.

**Pain (odynophagia)**

- (1) Typical pain along with dysphagia is only complained of in reflux esophagitis or in corrosive stricture.
- (2) But majority of patients with dysphagia will complain of some sort of discomfort at the site of obstruction. This type of pain is mainly felt

**Table 8.2: REVIEW OF DYSPHAGIA HISTORY**

- Duration of symptoms
- Is the dysphagia progressive or intermittent?
- Consistency causing difficulty (eg solid versus liquid)
- Associated cough & its timing after swallow
- Heartburn
- Weight loss
- Voice change
- Regurgitation (including nasal)
- Associated symptoms of neurological, rheumatological or psychiatric disorders

just beneath the sternum, either behind the upper part of sternum or behind its lower part.

**Vomiting**

If present, the vomitus should be examined noting the amount, reaction (it is generally not acid in causes other than reflux esophagitis), odor & presence of blood (carcinoma).

**PAST & ASSOCIATED MEDICAL HISTORY**

- (1) Immediate coughing after swallowing may suggest a functional disorder in the oropharyngeal phase of deglutition, as may be seen after a stroke or with Parkinson's disease.
- (2) High dysphagia must be differentiated from globus hystericus (the sensation of having a lump in the throat without true dysphagia). This symptom may affect up to 50 % of the population at any time, although only a small percentage seek medical attention. A physiological explanation for the symptom is difficult to establish, leading to invocation of psychiatric causes (eg conversion syndrome).
- (3) A history of radiation, instrumentation or swallowing of corrosive such as concentrated acid or alkali may be obtained in benign stricture of esophagus.
- (4) Dysphagia complicates up to two-thirds of stroke cases & contributes to the high mortality related to aspiration pneumonia.
- (5) Past history of vagotomy indicates periesophagitis to be the cause of dysphagia.
- (6) Similarly previous history of hiatus hernia repair indicates excessive tightness of the repair

to be the cause of dysphagia.

- (7) Diphtheria may result in dysphagia.
- (8) Symptoms of other bowel diseases may indicate a rare entity, Crohn's disease of esophagus.

### PHYSICAL EXAMINATION

### GENERAL EXAMINATION

This should be done along the same lines as given in module 2.

- (1) Emaciation is usual in a case of dysphagia but is much more prominent in case of malignant diseases.
- (2) Anemia is very much evident in Paterson-Kelly syndrome & carcinoma of esophagus.
- (3) Radial pulses will be unequal on two sides in case of aneurysm of the aorta.
- (4) Concave & spoon shaped nail is peculiar of Paterson-Kelly syndrome.
- (5) Tongue is also smooth, pale & devoid of papillae in Paterson-Kelly syndrome.

### EXAMINATION OF MOUTH & PHARYNX

- (1) Tonsils & fauces should be examined for any lesion.
- (2) Test the mobility of the soft palate to determine if it is paralyzed or not.
- (3) Posterior wall of the pharynx is examined to exclude retropharyngeal abscess.

### EXAMINATION OF NECK

- (1) An obvious swelling like goiter or lymphadenopathy may press upon the pharynx or esophagus to cause dysphagia.
- (2) Thin patients with a very large pharyngeal pouch may have a palpable mass on the left side of their neck. Pressure over such swelling will cause gurgling & regurgitation of food into the mouth.
- (3) Tracheal tugging is a sign of aneurysm of the arch of aorta.

(a) Clinician stands behind the patient & holds the cricoid cartilage with a little upward traction.

(b) Downward tug can be felt with each throb of the aorta.

- (4) It is must to palpate the left supraclavicular fossa to exclude presence of enlarged left supraclavicular nodes, which may be the only sign in case of carcinoma of the esophagus.

### EXAMINATION OF CHEST

- (1) This should be examined routinely but in majority of cases there will be hardly any abnormality in a case of dysphagia.
- (2) Pleural effusion may be detected in a late case of esophageal carcinoma.

### ABDOMINAL EXAMINATION

Barring an abnormal mass due to infiltration of esophageal carcinoma to the upper end of the stomach & enlarged liver due to metastasis in carcinoma of the cardia, there will be hardly any abnormality in a case of dysphagia.

### EXAMINATION OF SPINE

If Pott's disease is suspected to cause dysphagia due to its cold abscess pressing on the pharynx or esophagus, one should examine the cervical region of the spine.

### EXAMINATION OF CNS

- (1) Patients with a suggestion of a neurological disorder should have a full neurological examination with particular attention paid to cranial nerve function.
- (2) Presence or absence of a gag reflex is probably not relevant because up to one-third of non-dysphagic, healthy adults will not have a gag reflex.

# Module 9

## Abdomen: Gastrointestinal & Biliary Tracts

### HISTORY

### ABDOMINAL PAIN

Pain is an indicator of disease & is frequently the presenting symptom in every body system. It varies with the disease process & the tissue involved, & may be characteristic & diagnostic. It is very subjective & can be influenced by what the patient thinks or suspects its cause to be & its implications. Responses to pain also vary with age, sex, ethnic origin, education & personality. You must therefore develop an efficient & reliable method of questioning a patient about their pain, using clear, understandable language.

Abdominal pain of organic origin falls into two classes: visceral pain & somatic (referred) pain.

#### *Visceral pain*

- (1) This is due to increased tension on splanchnic nerve endings in the muscular wall of affected viscus.
- (2) It is deeply situated, sometimes colicky in type, & is found most commonly in obstructive conditions of the intestines, bile ducts & ureters.
- (3) When an organ is inflamed, the threshold to visceral pain is lowered, & it may then be induced by a variety of stimuli (eg acid secretion or local pressure in the case of peptic ulceration).

#### *Somatic (referred) pain*

- (1) This is due in many cases to the irritative effects of inflammatory, hemorrhagic or

neoplastic disease of the abdominal viscera upon the parietal peritoneum.

- (2) Parietal peritoneum in contact with the viscus receives its nerve supply from the same segments of the spinal cord as the overlying parts of the abdominal wall. This explains why the pain & tenderness are experienced in many cases over the viscus, although the pain is referred.
- (3) In other cases, eg shoulder tip pain, the area of skin is situated remotely from the irritated peritoneum. Here irritation of the peritoneum (or pleura) covering the central portions of the diaphragm, which receives its nerve supply from the phrenic nerve (3<sup>rd</sup>, 4<sup>th</sup> & 5<sup>th</sup> cervical segments), causes the pain to be felt in an area supplied by other somatic nerves arising at the same level, ie over the tip of the shoulder.
- (4) Pain of peritoneal irritation is usually associated with deep tenderness & often with muscular rigidity.
- (5) It is more constant than visceral pain & is generally stabbing, cutting or burning in character.

#### ***Special features to be noted***

An accurate history of pain is of the greatest value in the diagnosis of digestive diseases. The following points should be ascertained in every case: site, timing, severity, nature, modification factors & associated symptoms.

#### **Site**

- (1) This is a good indicator of pain origin:
  - (a) Right hypochondrium → Liver & gall-bladder.

- (b) Epigastrium → Stomach, duodenum & pancreas.
  - (c) Left hypochondrium → Pancreas & spleen.
  - (d) Right lumbar region → Right kidney.
  - (e) Umbilical region → Small bowel, cecum & retroperitoneal structures.
  - (f) Left lumbar region → Left kidney.
  - (g) Right iliac fossa → Appendix & cecum.
  - (h) Hypogastrium → Large bowel, urinary bladder, uterus & adnexa.
  - (i) Left iliac fossa → Sigmoid colon.
- (2) Ask the patient where the pain is & to point to the area of maximum intensity;
- (a) This may be localized & indicated with one finger, eg acute appendicitis.
  - (b) This may be diffuse & indicated by the whole hand placed over a quadrant of the abdomen, eg acute cholecystitis.

**Note:** When pain is due to peritoneal irritation it is usually experienced over the affected viscus, but when truly visceral it may be more vaguely situated & is usually central.

#### **Radiation of pain**

Pain may radiate from the site of origin to another region of the body, for example;

- (1) Pain from posterior abdominal wall structures such as the pancreas & abdominal aorta may radiate through to the back.
- (2) Renal colic may radiate from the loin around to the iliac fossa & on to the groin.
- (3) Gallbladder pain may be felt between the shoulder blades.

The radiated pain usually has same characters as the original pain.

#### **Shifting of pain**

Pain may initially felt at one site, & after sometime shifted to a new site. This is typical of acute appendicitis: initially the pain is felt around umbilicus, which later shifted to right iliac fossa (with the onset of local peritonitis).

#### **Referred pain**

It implies pain occurring at a site far remote from the originating disease. It is due to visceral nerve impulses stimulating the somatic afferent pathways of the same dermatome. A classic example is pain over the tip of shoulder from disease under the diaphragm, the visceral nerve being the phrenic, & the somatic dermatome the fourth cervical.

#### **Timing**

##### **Mode of onset**

The onset may be sudden or gradual.

- (1) Sudden (acute) pain is typical of that associated with injury, ruptured abdominal aorta & rupture of a viscus such as perforated peptic ulcer.
- (2) Gradual (chronic) pain timing varies considerably. It implies a gradual awareness of pain, & a gradual increase in the severity of pain.
  - (a) Acute inflammatory lesions may progress during a day or overnight, eg acute appendicitis, acute cholecystitis.
  - (b) Pain due to gastric & other visceral carcinomas often starts gradually & becomes more severe & continuous as time goes on.

##### **Progress**

Note the progress of the current attack, if it is changing & if there is any pattern to the pain.

- (1) It may gradually increase or decrease.
- (2) It may be intermittent or persistent. If the pain comes on after meals, the patient should be asked whether it disappears before the next meal or whether it is continuous. In apparently continuous pain there are often spells in which the patient is comparatively comfortable.
- (3) Intervals of freedom from the attacks of pain should also be noted. It is characteristic, for example, in gastric & duodenal ulcer to find periods of some weeks in which the patient is entirely free from discomfort.
- (4) There may be total relief between bouts indicating colic, which is due to waves of contraction down an obstructed hollow viscus, eg small or large bowel obstruction, or a stone blocking the bile duct. Note how often these attacks occur & their duration.
- (5) Enquire about previous bouts of pain or anything similar in the past. Record the patterns of previous attacks, their frequency, number & duration. Note if they are changing in character.

##### **Mode of offset**

It may also be gradual or sudden.

- (1) Relief of pain usually indicates improvement of the disease or removal of the precipitating cause. Improvement may be obtained by treating with analgesics, surgically or with other therapies.

- (2) Sometimes, reduction of pain is a bad sign, eg the rupture of a tense abscess into the peritoneal cavity.

### Severity

- (1) It is generally related to the severity of the underlying disease. However, individuals react differently to pain, which influenced by their pain tolerance, anxiety & a fear of the possible implications. Sometimes there may be a desire to impress the doctor on the extent of the problem for some personal reason.
- (2) A useful indicator is the influence of the pain on the patient's lifestyle. Enquire whether they have had to stop work or go to bed, & whether they are losing sleep.
- (3) It varies from the slight discomfort of gastric flatulence to the agonizing pain of a perforated ulcer. A rough quantitative measure can be obtained from a pain scale of 1 to 10 (see module 2).

### Nature (character)

The description of the nature of pain — griping, gnawing, stabbing, cutting & so forth — depends a good deal upon the intelligence & descriptive ability of the patient, & too much stress, therefore, cannot be laid upon it as a point in diagnosis.

- (1) Inflammation & pain from deeper organs are often described in less precise terms, such as aching, burning, gripping, crushing, twisting & breaking.
- (2) Colic is described in intestinal obstruction, when the patient may also complain of a distended or bloated feeling; this may also occur in childbirth & urinary retention.
- (3) A stabbing pain is sudden, severe, sharp & short lived.
- (4) A throbbing pain implies a tense, sensitive area with an increase of tension with each heart beat. Such situations can occur in vascular tumors, acute inflammation with or without an abscess, & vascular lesions such as expanding aneurysm.

### Modification factors

#### Aggravating factors

- (1) Abdominal pain so frequently arises from the stomach, intestines or organs which modify the

function of these that it naturally bears a close relationship to meals.

- (1) Inquiry should be made whether the pain occurs after meals, eg peptic ulcer pain with spicy foods. If so, for how long & whether relief is afforded by taking more food.
- (2) The patient should also be asked whether any particular kind of food causes pain, eg fatty foods in biliary disease & gastroesophageal reflux disease (GERD).
- (2) Also ask whether any particular movement causes pain, eg coughing & walking in acute peritonitis.

#### Relieving factors

- (1) Effect of starvation should be ascertained or whether abstinence from particular articles of diet gives relief.
- (2) Relief given by medicines, especially antacids, may also be a valuable diagnostic point.
- (3) Comfort produced by evacuation of the stomach, bladder or rectum may suggest these organs as the seat of pain.
- (4) Application of heat from a hot flannel, a fire or a hot water bottle is often used to get relief. The repeated use of heat on the abdomen, may produce a characteristic mottled brown skin pigmentation (erythema ab igne), providing an important physical sign.

#### Associated symptoms

- (1) Nausea &/or vomiting is commonly associated with abdominal pain. It should be noted whether vomiting gives relief from the pain, a common history in cases of gastric disease.
- (2) Association of constipation or diarrhea with abdominal pain should focus attention of the intestinal tract.
- (3) Fever suggests an inflammatory lesion such as appendicitis, cholecystitis or cholangitis complicating bile duct obstruction by stone.
- (4) Combination of fever with rigors, jaundice & abdominal pain is characteristic of ascending cholangitis (Charcot's triad) usually caused by a bile duct stone.

#### Cause of pain

It is important to ask the patient's opinion on the cause of their pain. They may know or think they

**Table 9.1: ANALYSIS OF SEVERE ABDOMINAL PAIN**

	Peptic ulcer perforation	Appendicitis	Acute pancreatitis	Gall-bladder colic	Renal colic	Large bowel obstruction	Small bowel obstruction
<b>Site</b>	Epigastrium	Umbilical	Epigastrium or RHC	RHC & epigastrium	Loin	Hypogastric	Umbilical
<b>Radiation/shift</b>	Whole abdomen & left shoulder	Right iliac fossa	Back & whole abdomen	Right scapula	Towards groin	Flanks	Nil
<b>Nature</b>	Sharp	Colicky, becoming constant	Constant	Colicky or continuous	Colicky	Colicky	Colicky
<b>Severity</b>	Very severe	Severe	Very severe	Very severe	Very severe	Severe	Severe
<b>Onset &amp; duration</b>	Instantaneous & persistent	Fairly rapid onset, many hours	Sudden & persistent	Sudden, lasting hours	Sudden, minutes to hours	Slow onset, lasting days	Fairly rapid onset, hours to days
<b>Aggravating factors</b>	Movement	Walking, coughing	Nil	Nil	Jolting	Nil	Nil
<b>Relieving factors</b>	Nil	Nil	Nil	Nil	Nil	Nil	Nil
<b>Associated symptoms</b>	Shock & vomiting	Vomiting, fever	Vomiting & shock	Vomiting & sometimes fever with rigors	Vomiting, frequency, hematuria	Constipation, distension, vomiting	Vomiting, constipation, distension
<b>Physical signs</b>	Board like rigidity	Tenderness & guarding in right iliac fossa	Abdomen rigid after initial softness	Tenderness in RHC	Nil	Flank distension, increased bowel sounds. Rectum ballooned & empty	Central distension. Bowel sounds increased, Rectum ballooned & empty
<b>Investigations</b>	Air under diaphragm seen on x-rays	Nil	Increased serum & urinary amylase	Ultrasound may show calculus	X-rays may show calculus	Intestinal fluid levels on x-rays	Intestinal fluid levels on x-rays

know what this is. They may be afraid or unwilling to tell you the cause as there may be a guilt complex, such as in current or previous self abuse, but there may still be some hints as to the underlying cause of pain. Such clues must be carefully noted.

**VOMITING**

It is a reflex act induced through the vomiting centre of the medulla & may be caused by central or peripheral stimulation. It implies the ejection of appreciable quantities of the stomach contents, sometimes consisting of undigested food, sometimes of partially digested food to which the

gastric secretions have been added.

**Differential diagnosis**

- (1) Central stimulation of the vomiting centre from external causes eg disgusting smells or sights or from increased intracranial pressure as in cerebral tumor.
- (2) Labyrinthine disturbances, eg in sea-sickness & Meniere's disease.
- (3) Early months of pregnancy.
- (4) Metabolic causes eg uremia & hypercalcemia.
- (5) Abdominal conditions;
  - (a) Gastro-esophageal conditions, eg ulcer, reflux disease or carcinoma.
  - (b) Diseases of gallbladder, appendix or other viscera.

(c) Obstruction of pylorus or intestine.

### Special features to be noted

#### Timing

Time of day at which vomiting occurs is important;

- (1) In cases of pyloric stenosis, each meal adds to the gastric contents, & vomiting may not occur until the latter part of the day when a large quantity has accumulated.
- (2) In pregnancy & alcoholic gastritis, it occurs characteristically in the mornings.

#### Nausea

- (1) This is a sensation of sickness without actual vomiting, & is frequently accompanied by salivation, sweating & a feeling of faintness.
- (2) It often results from psychic causes such as unpleasant sights or smells but also occurs in organic disease of the digestive system.
- (3) It generally precedes vomiting due to diseases of the digestive system, but in cases of increased intracranial pressure is often absent.
- (4) It is an early symptom of appendicitis, pancreatitis, hepatitis & gastric carcinoma.
- (5) Possibility of drug induced nausea should always be considered in patients receiving medicinal treatment.

#### Character & amount

- (1) Projectile copious vomiting is often seen in pyloric stenosis complicating duodenal ulcer & in pancreatitis.
- (2) In pyloric stenosis the vomitus often contains undigested food particles ingested even a day earlier.
- (3) Feculent vomiting is seen in intestinal obstruction.
- (4) Coffee ground vomiting is seen in conditions where slow hemorrhage takes place in the stomach eg carcinoma, gastric ulcer etc.
- (5) Biliary vomiting is often a feature of cholecystitis & intestinal obstruction.
- (6) Too much acidic vomiting is a feature of duodenal ulcer.

#### Frequency

- (1) It is constant in intestinal obstruction, & pyloric stenosis.
- (2) It is frequent in gastric ulcer, gallbladder disease & pancreatitis.
- (3) It is infrequent in appendicitis.

(4) It is usually absent in duodenal ulcer without obstruction.

#### Relation to food

- (1) Vomiting soon after the intake of food, within 2 hours, is usually seen in a gastric ulcer.
- (2) In pyloric stenosis it may occur at any time but usually takes place several hours after a meal, more often in the evening.

#### Relation to pain

- (1) Note whether the pain precedes or follows the vomiting & at what interval.
- (2) Vomiting sometimes brings relief to pain. This is more often seen in cases of gastric ulcer.

#### Hematemesis

- (1) This is vomiting of blood & should be distinguished from hemoptysis which means coughing out of blood.
- (2) Causes include hemorrhage from a posteriorly situated peptic ulcer, erosions, gastroesophageal varices, Mallory Weiss syndrome & carcinoma of stomach.
- (3) In profuse hemorrhage the color of the vomitus is bright red whereas in slow & small bleeding the blood becomes partly digested & looks like coffee ground.

### JAUNDICE

#### Prehepatic (hemolytic) jaundice

- (1) This is due to the presence of an excess of unconjugated bilirubin in blood.
- (2) Hemolysis is the most common cause;
  - (a) Hemolytic jaundice may occur in hereditary spherocytosis, thalassemia or incompatible blood transfusions.
  - (b) History of previous attacks of jaundice or a family history is of diagnostic importance.
- (3) Mild jaundice of an entirely benign nature occurs in Gilbert's syndrome; jaundice is often not clinically detectable, but may deepen during fasting or intercurrent illness, resulting in a mistaken diagnosis of hepatitis.
- (4) In most forms of prehepatic jaundice, the skin & mucosae are mildly jaundiced (a lemon yellow tint), but the urine & feces remain normal in color, though the urine may darken on standing due to oxidation of the excess urobilinogen.

	Prehepatic (hemolytic)	Hepatocellular	Posthepatic (obstructive)
<b>Mechanism</b>	Increased bilirubin formation	Hepatocellular failure	Bile duct obstruction
<b>Common causes</b>	<ul style="list-style-type: none"> <li>• Hemolysis</li> <li>• Gilbert's syndrome</li> </ul>	<ul style="list-style-type: none"> <li>• Virus hepatitis.</li> <li>• Drugs eg chlorpromazine</li> <li>• Chronic liver disease eg cirrhosis</li> </ul>	<ul style="list-style-type: none"> <li>• Common bile duct stones.</li> <li>• Carcinoma of pancreas</li> <li>• Cholangiocarcinoma</li> </ul>
<b>Past history</b>	May be previous attacks or a family history	History of contact, injections or of taking hepatotoxic drugs.	May be previous attacks (stone)
<b>Mode of development</b>	<ul style="list-style-type: none"> <li>• Rapid, with anemia &amp; sometimes fever &amp; rigors.</li> <li>• Periodic attacks.</li> </ul>	<ul style="list-style-type: none"> <li>• After a period of anorexia &amp; nausea.</li> <li>• Gradual onset &amp; recovery</li> </ul>	<ul style="list-style-type: none"> <li>• After an attack of pain.</li> <li>• Rapid &amp; sometimes intermittent (stone).</li> <li>• Insidious &amp; progressive (carcinoma)</li> </ul>
<b>Pruritus (bile salt retention)</b>	Absent	Occasional (if cholestasis). Primary biliary cirrhosis	Present
<b>Skin color</b>	Faint lemon yellow	Yellow	Brilliant or dark yellow
<b>Urine</b>	Colorless at first. Urobilinogen present later by oxidation (urobilin) & urine darkens slightly	Dark. (Bilirubin & urobilinogen)	Very dark. (Bilirubin, no urobilinogen)
<b>Feces</b>	Normal	Pale (if cholestasis)	Pale
<b>Gallbladder</b>	Normal	Normal	May be palpable in carcinoma; not with stone
<b>Enlarged spleen</b>	Usually	Sometimes	No
<b>Bilirubin</b>	Unconjugated	Mixed	Conjugated
<b>Serum alkaline phosphatase</b>	Normal	Raised (if cholestasis)	Markedly raised
<b>Tests for hepatocellular function</b>	Normal	Grossly abnormal	Slightly abnormal
<b>Tests for hemolysis</b>	Normal	Negative	Negative

### ***Hepatocellular jaundice***

- (1) This results from damage to the liver parenchyma interfering with the transport or conjugation of bilirubin & sometimes with its excretion through the canaliculi.
- (2) Commonest cause is viral hepatitis, so that a history of blood transfusion, contact with another case or, in hospital workers, contact with the blood of a carrier may be obtained. History of events preceding the jaundice, notably the prodromal period of anorexia & nausea is of particular importance in differentiating the hepatocellular & posthepatic varieties.

- (3) Possibility of exposure to a liver toxin, such as chlorpromazine, halothane or rifampicin, or an industrial one such as carbon tetrachloride, should always be considered.
- (4) It also occurs in congestive cardiac failure & in the later stages of cirrhosis.
- (5) When hepatic damage is accompanied by obstruction to the bile canaliculi (cholestatic jaundice), the characteristics of the jaundice itself are similar to those described under posthepatic obstruction. This is found in liver abscess, cysts, hepatoma or secondaries.

### ***Posthepatic (obstructive) jaundice***

- (1) This results from obstruction to the bile ducts

outside the liver.

- (2) Common causes include choledocholithiasis, biliary strictures, & primary carcinoma of the head of pancreas or bile ducts, & secondary carcinomatous masses in the porta hepatis.
- (3) An enquiry must be made about the mode of onset, duration, progressiveness (ie whether the jaundice is gradually deepening or intermittent) & associated pain.
  - (a) When the obstruction is due to calculus the jaundice is usually preceded by biliary colic & may be intermittent.
  - (b) Jaundice due to carcinoma tends to be insidious in onset & progressive in its course, & the gallbladder is palpable (Courvoisier's Law).
- (4) Jaundice varies in intensity from a slight yellowish tinge in the skin & mucosa to a pronounced canary yellow, or in long standing cases, a dark greenish yellow discoloration. It affects the skin of the whole body, but is most marked on the trunk & proximal parts of the limbs.
- (5) Intolerable itching is common & is probably due to bile salts, as it may precede the actual pigmentation of the skin & mucosae. The resultant scratch marks on the chest or abdomen sometimes gives a clue to the diagnosis even if yellow discoloration is not that prominent.
- (6) Excess of bile pigments (conjugated bilirubin) in the blood leads to their appearance in the urine, which may be visibly bile stained or in which bile may be detected by special tests.
- (7) Lack of the normal flow of bile into the duodenum deprives the feces of one of their coloring constituents & further interferes with the digestion & absorption of fats because of the lack of bile salts. As a result, the feces have a lighter color than normal & are often clay colored.
- (8) In complete obstruction, urobilinogen is absent from the urine.

**Note:** It must be stressed that more than one of the three types of jaundice can exist in the same patient; intrahepatic obstruction is common in hepatocellular jaundice, & obstruction due to pigment stones may also occur in hemolytic jaundice. Moreover, liver cell dysfunction can result

from the damming back of bile & ascending infection in obstructive jaundice.

## OTHER SYMPTOMS

### Flatulence

- (1) Stomach or intestines may be distended with gas, & the patient then complains of 'wind, flatulence or gases.
- (2) This may be belched through the mouth or passed per rectum, the former is gastric flatulence & the latter intestinal.
- (3) This mainly comprises swallowed air (aerophagy). It may follow attempts to relieve epigastric discomfort from any cause, but frequent belching of large amounts of gas usually indicates compulsive air swallowing of psychogenic origin.
- (4) It is more common in functional than in organic disease.

### Disturbance of appetite

- (1) Loss of appetite or anorexia must be distinguished from a fear of eating because of peptic ulceration or painful conditions of the mouth or gullet.
  - (a) It can occur in acute conditions eg acute appendicitis.
  - (b) Chronic persistent anorexia indicates serious underlying disorder eg carcinoma of esophagus, stomach, pancreas or intestine. In these conditions it is usually accompanied by weight loss.
  - (c) General debilitating diseases such as tuberculosis & severe anemias have a similar effect.
  - (d) Profound loss of appetite may be of psychogenic origin as in anorexia nervosa & in certain mental disorders.
  - (e) An aversion to particular kinds of food sometimes occurs, as in diseases of the liver & biliary system when fats are not tolerated.
- (2) Excessive appetite with compulsive eating between meals is common in certain anxiety states, especially in women, & can lead to considerable obesity. Increased appetite of more moderate grade may be a feature of

diseases where tissue waste is accelerated as in thyrotoxicosis & diabetes mellitus.

### Heartburn, waterbrash & eructations

- (1) Heartburn is a scalding or burning sensation experienced behind the sternum usually a little while after a meal or on stooping.
  - (a) In most cases, it is due to reflux of acid into the esophagus esp. when the pain threshold is lowered by esophagitis (eg in GERD & hiatus hernia).
  - (b) It may also occur with reflux of duodenal juices (bile & pancreatic enzymes).
- (2) Waterbrash refers to filling of the mouth with a watery fluid (composed of saliva). It is not necessarily a symptom of organic disease, but it may accompany the pain of duodenal ulcer or be due to reflex stimulation of saliva from gastrointestinal tract lesions.
- (3) Eructations of small amounts of the acid gastric contents along with flatus are common both in functional & organic disease of the stomach.

### Constipation

- (1) Normally defecation takes place once daily, but the event may occur twice daily or only once in 2 days in persons of quite good health.
  - (a) It is therefore important to inquire as to the normal habits of the individual over a period of some years.
  - (b) Most persons regard themselves as constipated if they do not have one action of the bowels in 24 hours.
  - (c) A sudden change in habit is significant.
- (2) Nature of constipation should be ascertained & precisely what the patient means by the term, eg less frequent evacuation or dry stools or small amounts, often pellets.
- (3) Intestinal obstruction is the most serious cause of constipation.
  - (a) In acute intestinal obstruction, there is absolute constipation (ie no passage of feces or flatus).
  - (b) In partial intestinal obstruction, there is relative constipation (ie passage of flatus only).
  - (c) In chronic cases, patient usually takes increasing quantities of purgatives, & the stools when passed are usually soft or

liquid & may be modified in shape eg ribbon shaped stool if the constricted area is in the rectum.

- (4) Constipation may arise from a great variety of factors, such as improper or temporarily reduced diet, insufficient exercise, carelessness in habits & general ill health from disease in other parts of the body.
- (5) It is important to distinguish between delay in the passage of feces through the large bowel into the rectum due to a hold up at or above the sigmoid (colonic spastic constipation) & delay in emptying of the rectum itself.
  - (a) In persons of careless habits the feces frequently pass normally through the colon into the rectum, but, owing to neglect of the call to defecation, they accumulate & cause distension of the rectum with loss of tone in its walls. This condition is called dyschezia, rectal constipation, & as a result of it a greater & greater amount of feces is required to give the necessary sense of fullness which provokes the desire for defecation.
  - (b) When feces are retained in the bowel, water is absorbed so that the stool becomes hard & nodular & thus more difficult to evacuate.
  - (c) Rectal constipation, sometimes with impaction of feces needing manual evacuation, is common in the elderly because of weakness of the pelvic musculature & in some cases, difficulty in visiting the lavatory. Such patients often present with fecal incontinence due to pseudo diarrhea.

### Diarrhea

- (1) It refers to an increased frequency in evacuation of stools of liquid or semi liquid character, not the discharge of mucus, blood or other abnormal constituents, though these may also be present.
- (2) In most cases the stools are paler than normal, esp. so in steatorrhea, in which condition the stool also tends to be bulky, float in the pan & is difficult to flush away.
- (3) Diarrhea due to organic causes commonly occurs during the night & early morning as well

as during the day.

- (4) When diarrhea is severe & persistent, the passage of frequent fluid stools may lead to physical exhaustion, dehydration with peripheral circulatory failure, the symptoms of potassium deficiency & protein loss (muscles weakness, edema, etc.) & painful excoriation of the perianal skin.
- (5) Presence of blood in the feces is important, & signifies organic rather than functional disease of the lower bowel (see module 12).
- (6) Melena means passing of dark or tarry stool per anum. It occurs commonly in peptic ulcer, but may be seen in all cases which may induce hematemesis.
- (7) Tenesmus often accompanies diarrhea & consists in straining with a desire to empty the lower bowel without evacuation taking place.
- (8) Also ask about position & character of any pain, character of the stool, evidence of gastric thyroid, pancreatic & malabsorption syndromes, pyrexia & exposure to infections.

#### **Causes of diarrhea**

- (1) Those of temporary duration (few hours to few days), eg nervousness, allergic responses to food & drugs, & acute infections of short duration, eg by salmonella & other organisms.
- (2) More severe & prolonged infections eg bacillary & amebic dysentery & intestinal tuberculosis.
- (3) Severe acute diarrhea eg cholera with rice water stools containing enormous numbers of the vibrios.
- (4) Colonic diseases eg neoplasm, ulcerative colitis & irritable bowel syndrome.
- (5) Toxic states eg poisoning with heavy metals (arsenic) or toxemias such as uremia.
- (6) Excessive use of purgatives or pseudo diarrhea due to the liquefaction of impacted or obstructed feces.
- (7) Endocrine causes including hyperthyroidism & gastrin secreting tumors of pancreas (Zollinger Ellison syndrome).
- (8) Malabsorption syndromes eg as celiac disease & chronic pancreatitis.
- (9) Crohn's disease of the small or large intestine.

#### **Fever**

- (1) Acute appendicitis, acute diverticulitis,

intraabdominal abscesses & toxic megacolon are usually associated with varying degrees of temperature.

- (2) Evening rise of temperature is characteristic of abdominal tuberculosis, as in any other parts of the body.
- (3) Intermittent fever occurring with rigor, pain & jaundice (Charcot's triad) is highly suggestive of cholangitis (due to a calculus in common bile duct).

#### **OTHER POINTS IN HISTORY**

A detailed history should be taken in every case with full systemic review (as given in module 1).

#### **Age & sex**

- (1) Peptic ulcer occurs mainly in males, & is rare before 15 years of age. If occur at young age, it is diagnostic of Zollinger-Ellison's syndrome.
- (2) Incidence of duodenal ulcer is much more before the age of 35 years, whereas gastric ulcer occurs more frequently after 35 years.
- (3) Carcinoma of stomach usually occurs in males after 40 years.
- (4) Diseases of gallbladder mainly affect women of fourth or fifth decade.
- (5) Congenital pyloric stenosis usually affect first born male baby, who start their symptoms from the 2nd month of their lives.
- (6) Acute appendicitis is more common among young patients.
- (7) Hiatus hernia occurs more often in females.

#### **Occupation**

Peptic ulcer is common among peoples who are involved in stressful works & who are habituated in drinking teas & coffees in odd times & indulged in excessive smoking. These include labors, bus conductors, clerks, garment factory supervisors, salesmen, civil servants, business executives etc.

## EXAMINATION OF THE ABDOMEN

The major components of the abdominal exam include: inspection, auscultation, percussion, and palpation. While these are the same elements which make up the pulmonary and cardiac exams, they are performed here in a slightly different order (ie auscultation before percussion) and carry different degrees of importance. Pelvic, genital, and rectal exams, all part of the abdominal evaluation, are discussed elsewhere.

### Pre-requisites

#### (1) Examination room

- (a) It must be warm & private, to make the patient relaxed & undressed (without any hesitation). A cold couch, in a draught, in view of other patients makes a proper examination impossible.
- (b) It must also have a good light;
  - (i) Daylight, coming obliquely from one side of the patient so that the shadows are emphasized, is the best light.
  - (ii) But in today's modern setups, you have to examine the patients in artificial light. If it comes from a source directly above the patient you will lose the soft shadows (that so often give you the first indication of the presence of asymmetry), & many neon lights falsify colors, particularly yellows & blues.

#### (2) Examination couch (bed)

- (a) The best one is a hard couch with a backrest that can be raised by 15-20°. The hard couch makes the patient maintain most of his lumbar lordosis, so opening the access to the abdomen & pushing the central contents anteriorly, but the elevation of the thoracic cage relaxes the anterior abdominal muscles.
- (b) It must be at a comfortable height for both you & the patient.
- (c) You may also found other couches;
  - (i) Hard, flat couch which by making the patient lie absolutely flat, opens the gap between the pubis & xiphisternum



Figure 9.1: Examination couch.

but stretches & tightens the abdominal muscles.

- (ii) Soft bed which lets the lumbar spine sink into a deep curve & closes the gap between pubis & ribs.

#### (3) Exposure

You must see the full extent of the abdomen. Therefore you must uncover the patient from nipples to femoral triangles.

- (a) Ask the patient to undress & wear a gown (in a private changing room), & then lie supine on the couch.
- (b) Take a spare bed sheet and drape it over their lower body such that it just covers the upper edge of their underwear (or so that it crosses the top of the pubic region if they are completely undressed). This will allow you to fully expose the abdomen while at the same time permitting the patient to remain somewhat covered. The gown can



Figure 9.2: Exposing & draping the abdomen

then be withdrawn so that the area extending from just below the nipples to the pelvic brim is entirely uncovered, remembering that the superior margin of the abdomen extends beneath the rib cage.

- (c) Begin by examining the genitalia & then cover them again with the sheet, before examining the rest of the abdomen. Many patients find this embarrassing, but if you do not do it then you will easily miss important clues to the diagnosis.

#### (4) Get the patient to relax

If the patient is tense you will not be able to feel anything within the abdomen. There are a number of ways by which you can encourage relaxation.

- First ask the patient to rest head on the couch or pillow. If the head is flexed, the abdominal musculature becomes tensed and the examination made more difficult.
- Patient's hands should remain at their sides, & not behind their head.
- Ask them to let the back sink into the couch.
- Ask them to breathe regularly & slowly, with open mouth, & only press your hand into the abdomen during expiration, when the abdominal muscles relax.
- Allowing the patient to bend their knees so that the soles of their feet rest on the couch will also relax the abdomen.

#### (5) The examiner

- Your hands must be clean & warm, & your nails short. You cannot palpate deeply with long nails, & it is an insult to the patient to have dirty hands.
- Your whole hand must rest on the abdomen. The only comfortable way to achieve this is by keeping your hand & forearm horizontal in the same plane as the front of the abdomen. This means that you must sit or kneel beside the patient.
- Sitting beside the patient with your forearm level with the front of the abdomen puts your eyes about 50cm above your hand. This is the ideal level for seeing the soft shadows caused by lumps & bumps.
- Palpate gently but deliberately that is to

say, firmly & with purpose. Rapid jerky or circular movements are distressing for the patient, make them lose confidence in your ability & yield no information. You will learn much more by keeping your hand still & feeling the structures moving beneath it.

#### Think anatomically

When looking, listening, feeling and percussing imagine what organs live in the area that you are examining.

- The abdomen is roughly divided into four quadrants: right upper, right lower, left upper and left lower.
- More anatomically, it is divided into nine regions by four imaginary lines (planes);
  - Vertical line** on each side corresponds to the midclavicular line; when extended downwards it reaches midinguinal point.
  - Upper transverse line, referred as **subcostal plane**, joins the most inferior points of costal margin. Some clinician uses the **transpyloric plane** as the upper transverse line, which is situated midway between the jugular notch & pubic symphysis.
  - Lower transverse line, referred as **intertubercular plane**, is drawn between the tubercles of the iliac crests.
- Using the above 4 lines, 3 **central regions** from above downwards are epigastric,

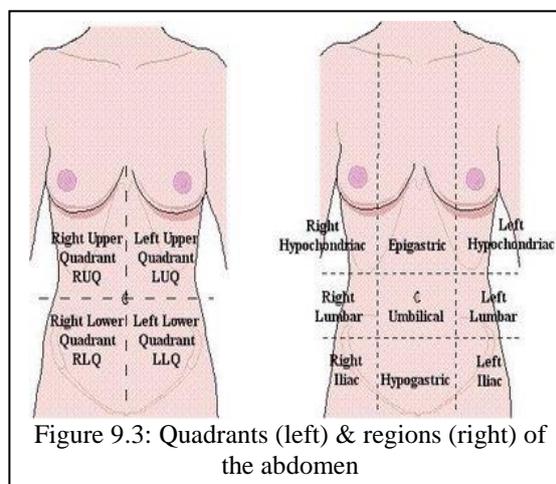


Figure 9.3: Quadrants (left) & regions (right) of the abdomen

- umbilical & hypogastric or suprapubic.  
 (e) Similarly there are 3 **lateral regions** on each side, ie hypochondrium, lumbar & iliac fossa.

By thinking in anatomic terms, you will remind yourself of what resides in a particular quadrant and therefore what might be identifiable during both normal and pathologic states.

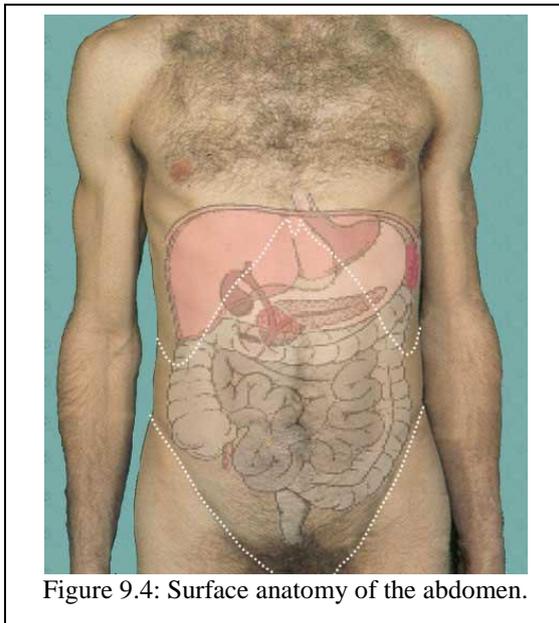


Figure 9.4: Surface anatomy of the abdomen.

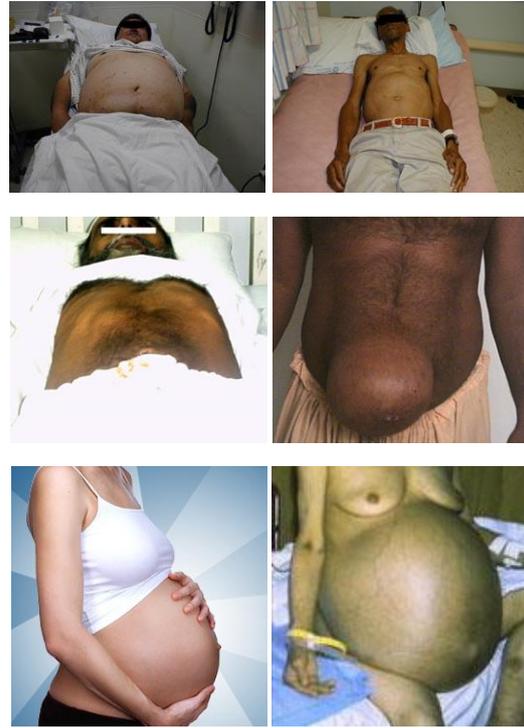


Figure 9.5: Various causes of abdominal distension. From above left: obesity, hepatomegaly, distended gallbladder, paraumbilical hernia, pregnancy & ascites.

**INSPECTION**

Much information can be gathered from simply watching the patient and looking at the abdomen. It should be done first from the patient's foot end, & then from the patient's right side (both from above, as well as tangentially).

**Contour of the abdomen**

- (1) Is it flat? Distended? Hollow (scaphoid)?  
Normal abdomen is neither distended nor hollow.
- (2) If distended, does this appear symmetric or are there distinct protrusions, perhaps linked to underlying organomegaly?  
Note: The contours can be best appreciated by standing at the foot of the table and looking up towards the patient's head.

- (3) Symmetrical distension may be due to fat, fluid, flatus, feces or fetus.
  - (a) In distension due to obesity, the umbilicus is deeply inverted.
  - (b) In distension due to intraabdominal causes, the umbilicus shows varying degree of eversion.
  - (c) In visceroptosis, undue protuberance of the lower abdomen will be evident as soon as the patient stands.
- (4) Asymmetrical distension may be due to organomegaly or localized accumulation of air & fluid.
  - (a) In hepatomegaly & mucocele of gallbladder, there will be distension of right hypochondrium.
  - (b) In splenomegaly, there will be distension of left hypochondrium.
  - (c) In pyloric stenosis, there may be fullness in the epigastrium.

- (d) In chronic intestinal obstruction, there will be fullness of the right iliac fossa due to distended cecum.
- (e) In retention of urine & pelvic mass, there will be fullness in the hypogastrium.
- (5) Generalized retraction is found in thin individuals, or in cachectic patients.

### Swelling

Any asymmetrical abdominal distension or obvious swelling should be examined as discussed in module 3. However, 3 tests need special mentioning here.

#### (1) Movement on respiration

Ask the patient to take deep breaths, while observing the swelling for any movement. Swellings arising from viscera (eg liver, spleen, stomach) which are attached to diaphragm will move up & down as the diaphragm moves with each respiratory movement.

#### (2) Cough impulse or valsalvas

- (a) Ask the patient to cough or do valsalva maneuver, while observing the swelling & other areas of potential weakness (eg



Figure 9.6: Above: Paraumbilical hernia. Below: Same patient while performs valsalva maneuver.

umbilicus, superficial & deep inguinal rings, femoral ring & any scar mark).

- (b) If the swelling become more pronounced or appeared (if not already present), often with a visible impulse, it indicates the presence of a hernia. This occurs due to rise in intraabdominal pressure, which forces the peritoneal content (eg omentum, intestine or fluid) through points of weakening in the abdominal wall.

#### (3) Carnett's test

It differentiates whether the swelling is intraperitoneal or in the abdominal wall.

- (a) Ask the patient to raise the head against resistance or to raise both lower limbs straight up (without bending knees), in order to render the abdominal muscles tense.
- (b) If the swelling is intraperitoneal, it either disappears completely or become less evident (if very large).
- (c) If the swelling is in abdominal wall, it will persist & become more pronounced.

#### Causes of anterior abdominal wall masses

- (1) Lipoma.
- (2) Sebaceous cyst.
- (3) Epigastric hernia.
- (4) Umbilical or paraumbilical hernia.
- (5) Incisional hernia.
- (6) Diverication of recti.
- (7) Hematoma.
- (8) Dermoid fibroma.
- (9) Malignant deposits, eg melanoma, carcinoma.

### Cough sign

Ask the patient to cough, while looking towards his/her face for any reaction. Patients with peritonitis find this act extremely painful & consequently tend to hold cough.

### Skin & subcutaneous tissue

- (1) Is there any color change, markings or other skin abnormalities?
  - (a) Striae caused by distension.
  - (b) Erythema due to hot water bottle application; it is referred as erythema ab igne, & indicates the site of pain.
  - (c) Scratch marks on chest, abdomen & limbs in cases of obstructive jaundice.

- (2) Look for the presence of scars, sinuses & fistulae;
  - (a) A linear scar indicates previous surgery.
  - (b) Broad & irregular scar indicates previous wound infection.
- (3) Look for engorged superficial veins;
  - (a) In caput medusae, due to portal hypertension, dilated veins will be found around the umbilicus.
  - (b) In inferior vena cava obstruction, dilated veins will be found on the sides of the abdomen.



Figure 9.7: Caput medusa (above), inferior vena cava obstruction (below).

#### Harvey's sign

It demonstrates the direction of blood flow, eg away from the umbilicus in portal obstruction, or from below upwards in inferior vena cava obstruction.

- (a) Two index fingers are placed close together on the vein.
- (b) A portion of the vein now emptied by milking it with one of the index fingers.

- (c) Now lift one index finger, & note the rate at which the vein fills.
- (d) Repeat the test, but this time releases the other finger. The vein fills rapidly when the finger obstructing the flow of the blood is released.

#### Umbilicus

Umbilicus is normally placed almost in the middle of the line joining the tip of xiphoid process to the top of the symphysis pubis.

- (1) It is displaced upwards by a swelling arising from the pelvis or downwards by ascites (**Tanyol's sign**). Also any swelling on one side of the abdomen will push the umbilicus to the opposite side.
- (2) It is also everted in ascites, & inverted in obesity.
- (3) Look for any swelling or discharge near the umbilicus.
  - (a) **Sister Joseph's nodules** are hard subcutaneous nodules near the umbilicus; it is a late manifestation of carcinoma of stomach, colon or ovary.
  - (b) Umbolith (umbilical calculus) is due to inspissated desquamated epithelium.
  - (c) Umbilical fistulae due to patent urachus or vitellointestinal duct cause persistent discharge.

#### Movements

Look generally (ie the patient), as well as locally (ie the abdomen). Three types of movements can be appreciated while inspecting the abdomen, ie respiratory, peristaltic & pulsatile.

##### (1) Patient's movement

- (a) Those with peritonitis (eg perforated duodenal ulcer) prefer to lie very still as any motion causes further peritoneal irritation and pain.
- (b) Those with renal colics will frequently writhe on the examination table, unable to find a comfortable position.

##### (2) Respiratory movements

Normally the abdominal wall moves with inspiration & expiration. However, limitation of respiratory excursion is present in subjacent inflammation.

- (a) In localized peritonitis, eg due to acute appendicitis, there will be localized limitation of respiratory movements.
- (b) In generalized peritonitis, eg due to perforated duodenal ulcer, the whole abdomen will lie still.

### (3) **Peristaltic movements**

Visible peristalsis is usually due to underlying obstruction. Its direction of propagation indicates the site of obstruction.

- (a) In pyloric stenosis, a rounded prominence will be seen travelling slowly from the left costal margin towards the right.
- (b) In obstruction of transverse colon at splenic flexure, the peristaltic wave will be seen in the reverse direction (from right to left).
- (c) In distal ileal obstruction, the peristalsis is ladder pattern (from above down).

In suspected cases, peristalsis can be induced by flicking the abdominal wall or by pouring a few drops of alcohol or ether on the abdomen.

### (4) **Pulsatile movements**

This is due to pulsations from the aorta or its major branches, either due to aneurysm or a mass in front of them.

- (a) Expansile pulsation will be present in cases of aneurysms.
- (b) Transmitted pulsation will be present in case of mass in front of the abdominal aorta.

Note: In thin persons, normal aortic pulsation may be seen.



Figure 9.8: Abdominal auscultation

sounds, if present, will be heard during this period. But, if not heard continue listening for full 3 minutes before labeling absent bowel sounds.

- (3) Stethoscope can be placed over any area of the abdomen as there is no true compartmentalization and sounds produced in one area can probably be heard throughout. However, the best place to listen is just below & to the right of umbilicus (ie over the ileo-cecal junction). Also, practice listening in each of the four quadrants and see if you can detect any "regional variations."
- (4) What exactly are you listening for and what is its significance? Three things should be noted:
  - (a) Are bowel sounds present?
  - (b) If present, are they frequent or sparse (ie quantity)?
  - (c) What is the nature of the sounds (ie quality)?

### (5) **Sign of splashing (succussion splash)**

The hand is laid over the stomach (in epigastrium), & short, sudden, dipping movements are made. At the same time, try to hear any sounds produced, either with your ears or stethoscope placed over epigastrium.

### **Interpretation**

- (1) Bowel sounds occur quite frequently, on the order of every 2 to 5 seconds, although there is a lot of variability. In the normal person who has no complaints and an otherwise normal exam, the presence or absence of bowel sounds is essentially irrelevant (ie whatever pattern they have will be normal for them). However, you should still practice listening to all the patients that you examine so that you develop a sense of what constitutes the range of normal.

## AUSCULTATION

It is performed before percussion or palpation as vigorously touching the abdomen may disturb the intestines, perhaps artificially altering their activity and thus bowel sounds.

### Bowel sounds

#### **Clinical techniques**

- (1) Gently & firmly place the pre-warmed diaphragm (of stethoscope) on the abdomen, & keep it absolutely still.
- (2) Listen for 15-30 seconds; usually bowel

- (2) In general, inflammatory processes of the serosa (as with peritonitis) will cause the abdomen to be quiet (ie bowel sounds will be infrequent or altogether absent).
- (3) Inflammation of the intestinal mucosa (as might occur with infections that cause diarrhea) will cause hyperactive bowel sounds.
- (4) Processes which lead to mechanical intestinal obstruction initially cause frequent low-pitched bowel sounds referred to as "rushes or borborygmi." Think of this as the intestines trying to force their contents through a tight opening. This is followed by decreased higher-pitched sounds, called "tinkles," and then silence.
- (5) Alternatively, the reappearance of bowel sounds (after complete silence) heralds the return of normal gut function following an injury. After abdominal surgery, for example, there is a period of several hours when the intestines lie dormant. The appearance of bowel sounds marks the return of intestinal activity, an important phase of the patient's recovery.
- (6) In pyloric obstruction, succussion splash produced gurgles (heard with or without stethoscope), suggesting incomplete gastric emptying. This test is of value only when the stomach would be empty normally, ie 3 hours after a meal.

Bowel sounds, thus, must be interpreted within the context of the particular clinical situation. They lend supporting information to other findings but are not in and of themselves pathognomonic for any particular process.

### Bruits

#### Renal artery bruits

- (1) Use the bell of your stethoscope to check for renal artery bruits, a high pitched sound (analogous to a murmur) caused by turbulent blood flow through a vessel narrowed by atherosclerosis.
- (2) The place to listen is a few cm above the umbilicus, along the lateral edge of either rectus muscles; you will need to press down quite firmly as the renal arteries are retroperitoneal structures.
- (3) Most clinicians will not routinely check for bruits. However, in the right clinical setting (eg

a patient with some combination of renal insufficiency, difficult to control hypertension and known vascular disease), the presence of a bruit would lend supporting evidence for the existence of renal artery stenosis.

#### Iliac artery bruits

- (1) As for renal artery bruit, use the bell & press down firmly. The place to listen is a few cm below the umbilicus, along the lateral edge of either rectus muscles.
- (2) Atherosclerosis distal to the aorta (ie at the take off of the iliac arteries) can also generate bruits.

**Note:** Blood flow through the aorta itself does not generate any appreciable sound. Thus, auscultation over aorta is not a good screening test for the presence of aneurysmal dilatation.

### PERCUSSION

#### Clinical techniques

The technique is the same as that used for the lung exam. First, remember to rub your hands together and warm them up before placing them on the patient. Then, place your left hand firmly against the abdominal wall such that only your middle finger is resting on the skin. Strike the distal interphalangeal joint of your left middle finger 2 or 3 times with the tip of your right middle finger, using the floppy wrist action.



Figure 9.9: Abdominal percussion

**Clinical findings**

- (1) There are two basic sounds which can be elicited:
  - (a) Tympanitic (drum-like) sounds produced by percussing over air filled structures.
  - (b) Dull sounds that occur when a solid structure (eg liver) or fluid (eg ascites) lies beneath the region being examined.
- (2) Also note, if percussion produces tenderness, which may occur if there is underlying inflammation, as in peritonitis.

**Liver**

Liver & spleen are the two solid organs which are percussable in the normal patient. In most cases, the liver will be entirely covered by the ribs, extending from the 6th rib to the costal margin on the right midaxillary line. Occasionally, an edge may protrude a centimeter or two below the costal margin. To determine the size of the liver, proceed as follows:

- (1) Start just below the right nipple in mid-clavicular line, a point that you are reasonably certain is over the lungs. Percussion in this area should produce a relatively resonant note.
- (2) Move your hand down a few cms & repeat. After doing this several times, you will be over the liver, which will produce a dull note.
- (3) Continue your march downward until the sound changes once again. This may occur while you are still over the ribs or perhaps just as you pass over the costal margin. At this point, you will have reached the inferior margin of the liver. The total span of the normal liver is quite variable, depending on the size of the patient (between 6 and 12 cm).
- (4) Don't get discouraged if you have a hard time picking up the different sounds as the changes can be quite subtle, particularly if there is a lot of subcutaneous fat.
- (5) The resonant note produced by percussion over the anterior chest wall will be somewhat less drum like than that generated over the intestines. While they are both caused by tapping over air filled structures, the ribs and pectoralis muscle tend to dampen the sound.
- (6) Speed percussion, as described in the respiratory module, may also be useful. Orient your left hand so that the fingers are pointing



Figure 9.10: Percussion of upper border of liver.

towards the patients head. Percuss as you move the hand at a slow and steady rate from the region of the right chest, down over the liver and towards the pelvis. This maneuver helps to accentuate different percussion notes, perhaps making the identification of the liver's borders a bit more obvious.

**Spleen**

- (1) Percussion of the spleen is more difficult as this structure is smaller and lies quite laterally, resting in a hollow created by the left lower ribs. It extends from the 9th to 11th rib on the left midaxillary line.
- (2) The technique is same as described for liver, except that the line of percussion is left midaxillary line. When significantly enlarged, percussion in the left upper quadrant will produce a dull note. Splenomegaly suggested by percussion should then be verified by palpation (see below).



Figure 9.11: Percussion of spleen.

**Bowels & masses**

- (1) The remainder of the normal abdomen is, for the most part, filled with the small and large intestines. Try percussing each of the four quadrants to get a sense of the normal variations in sound that are produced. These will be variably tympanic, dull or some combination of the above, depending on whether the underlying intestines are gas or liquid filled. The stomach "bubble" should produce a very tympanic sound upon percussion over the left lower rib cage, close to the sternum.
- (2) In case of intraabdominal mass;
  - (a) Assess its size by percussing in both horizontal & vertical directions, & mapped it out on the abdominal wall.
  - (b) Assess its content;
    - (i) Solid mass, eg mesenteric cyst will produce dull note; however, overlying bowel loops may give it a resonant note.
    - (ii) Bowel related mass, eg carcinoma of colon, will give variably resonant note.
  - (c) Note whether the percussion note is uniform or variable.

**Free fluid (Ascites)**

Percussion can be quite helpful in assessing the abdominal distention from fluid (ie ascites). The two techniques which can be used are the shifting dullness & fluid thrill.

**Shifting dullness**

It depends on the fact that air filled intestines will float on top of any fluid that is present. But there has to be a lot of ascites present for this method to

be successful as the abdomen and pelvis can hide several hundred ml of fluid that would be undetectable on physical exam. Also, it is based on the assumption that fluid can flow freely throughout the abdomen. Thus, in cases of prior surgery or infection with resultant adhesion formation, this may not be a very useful technique.

**Clinical techniques**

- (1) With the patient supine, begin percussion at the level of the umbilicus and proceed down laterally. In the presence of ascites, you will reach a point where the sound changes from tympanic to dull. This is the intestine-fluid interface and should be roughly equidistant from the umbilicus on the right and left sides as the fluid layers out in a gravity-dependent fashion, distributing evenly across the posterior aspect of the abdomen. It should also cause a symmetric bulging of the patient's flanks.
- (2) Mark this point on both the right and left sides of the abdomen and then have the patient roll into a lateral decubitus position (ie onto either their right or left sides).
- (3) Repeat percussion, beginning at the top of the patient's now up-turned side and moving down towards the umbilicus. If there is ascites, fluid will flow to the most dependent portion of the abdomen. The place at which sound changes from tympanic to dull will therefore shifted towards the umbilicus, & the previously marked (dull) site will now become resonant. Speed percussion (described above) may also be used to identify the location of the air-fluid interface.
- (4) If the distention is not caused by fluid (eg secondary to obesity or gas alone), no shifting will be identifiable.



Figure 9.12: Demonstration of shifting dullness.

**Fluid thrill**

It detects the presence of large amount of fluid in peritoneal cavity, either free (eg ascites) or encysted (eg large ovarian cyst).

**Clinical techniques**

- (1) Ask the patient or an assistant to place their hand longitudinally (ie over the ulnar border) in the midline of abdomen. They should press firmly to cut off any transmitted wave through the subcutaneous tissue.
- (2) Place your left hand on the left flank of patient. Now, firmly tap on the right flank with your right hand while your left hand remains against the abdominal wall. If there is a lot of ascites present, you may be able to feel a fluid wave (generated in the ascites by the tapping maneuver) strike against the abdominal wall under your left hand.



Figure 9.13: Assessing for a fluid thrill.

**Differentiation between ascites & ovarian cyst**

- (1) In ascites there is resonance anteriorly & dullness in the flanks, whereas in an ovarian cyst there is dullness anteriorly & resonance on the flanks.
- (2) Further, shifting dullness can be demonstrated in ascites but not in ovarian cyst.

**PALPATION**

What can you expect to feel? In general, don't be discouraged if you are unable to identify anything. Remember that the body is designed to protect critically important organs (eg liver & spleen beneath the ribs; kidneys & pancreas deep in the retroperitoneum). It is, for the most part, during pathologic states that these organs become identifiable to the careful examiner. However, you

will not be able to recognize abnormal until you become comfortable identifying variants of normal, a theme common to the examination of any part of the body. It is therefore important to practice all of these maneuvers on every patient that you examine. It's also quite easy to miss abnormalities if you rush or push too vigorously, so take your time and focus on the tips/pads of your fingers.

**Clinical techniques**

- (1) Patient's confidence which you gain during history & preceding examinations should not be lost.
  - (a) Ask the patient to palpate the area of complaint by themselves; this not only increases the confidence but also indicates the amount of tenderness & depth of palpation that can be undertaken without discomfort. This is especially useful in children.
  - (b) Warm your hands by rubbing them together before placing them on the patient.
- (2) If patient presents with pain in any region of the abdomen, have them first localize the affected area, if possible with a single finger, pointing you towards the cause of the problem. Then, start from a distant area & examine rest of the abdomen first before turning your attention to the area in question. This helps keep the patient as relaxed as possible and limit voluntary and involuntary guarding (ie abdominal muscle tightening which protects intra-abdominal organs from being poked), allowing you to gather the greatest amount of clinical data. Make sure you glance at the patient's face while examining a suspected tender area (for any grimace).
- (3) Additional useful measures to limit muscle guarding are:
  - (a) Ask the patient flex the hips & knees, so that abdominal muscles become relaxed.
  - (b) Ask the patient to breathe quietly & deeply with open mouth.
  - (c) Ask the patient not to lift the head off pillow & keep the arms by the sides.
  - (d) Engage the patient in conversation while palpating, to divert the attention.
- (4) Palpation should be carried out with the flat of the hand; the palmer surfaces of the fingers are

mainly used to assess the abdominal wall & the surface & edges of the liver and spleen as well as the deeper structures.

- (5) Avoid digging the fingers into abdomen, by keeping your forearm & wrist in the horizontal plane; this is better achieved by sitting on a chair or kneeling beside the patient's bed.
- (6) You may use either your right hand alone or both hands, with the left resting on top of the right.
- (7) Apply slow, steady pressure, avoiding any rapid/sharp movements that are likely to startle the patient or cause discomfort.
- (8) Examine each region of the abdomen in a systematic fashion, imagining what structures lie beneath your hands and what you might expect to feel. Use information that you've gathered during earlier parts of the exam to either confirm or refute your suspicions.

### General palpation

The aim is to identify the presence of tenderness, rigidity/guarding, & masses.

### Tenderness

#### Clinical techniques

- (1) If abdominal pain is present, first ask the patient about its site; then begin palpation from a remote region, only reaching the painful region in the last. For example, if the pain is in right iliac fossa, begin palpation in left hypochondrium & palpating in sequence (left lumbar region, left iliac fossa, hypogastrium, umbilical region, epigastrium, right hypochondrium, & right lumbar region) to finally reach the right iliac fossa.
- (2) First employ light palpation to detect the tender area;
  - (a) This should be done by gently resting the hand on the abdomen & pressing lightly. Palpate sequentially all regions of the abdomen.
  - (b) Always keep an eye on patient's face, for any wince or grimace indicating underlying tenderness.
- (3) Proceed to deep palpation, in the same fashion, if light palpation elicits no tenderness;
  - (a) Press more firmly & deeply to find out if there is deep tenderness. This requires the hand to be placed on abdominal wall at a

slight angle, & the extent of pressure depends on the depth of structure to be palpated & the degree of tolerance by the patient.

- (b) Very deep palpation may require both hands to be used, one on top of the other.
- (4) If you detect any tenderness;
  - (a) Assess its severity/degree i.e. whether it is mild, moderate or severe.
  - (b) Draw the area of tenderness on the history file as a hatched area.
- (5) **Moynihan method** is used to elicit tenderness in chronic cholecystitis, referred as **Murphy's sign**;
  - (a) Left hand is placed on right lower ribs, with the thumb pointing down & pressing the gallbladder point in right hypochondrium (ie just below the right costal margin on the lateral border of right rectus abdominis).
  - (b) Now ask the patient to take a deep breath; the gallbladder descends & strikes the thumb. The patient will immediately wince & hold the breath, in chronic cholecystitis.



Figure 9.14: Demonstration of Murphy's sign.

**Note:** Don't try to elicit rebound tenderness (Aaron's or Blumberg's sign), feeling of rebound pain when pressure is suddenly released; it doesn't add to diagnosis & only hurt the patient.

#### Clinical interpretation

- (1) In gastric ulcer, tenderness is usually situated in the mid epigastrium below the xiphoid process.
- (2) In duodenal ulcer, it is about 3.5-4 cms to the right of the midline on the transpyloric plane.
- (3) In cholecystitis, it is present in the right hypochondrium.

- (4) In cystitis, it is present in the hypogastrium.
- (5) In pyelonephritis, it is present in the corresponding lumbar region.
- (6) In appendicitis, it is present in right iliac fossa, at McBurney's point which is situated at the junction of the lateral 1/3 & medial 2/3 of the line joining the right anterior superior iliac spine & the umbilicus.

### **Guarding & rigidity**

Guarding refers to voluntary contraction of abdominal muscles, whereas rigidity refers to involuntary contraction of abdominal muscles.

#### **Clinical techniques**

- (1) Assess guarding/rigidity at the same time while you are palpating the abdomen for tenderness.
- (2) Rest the flat of your hand firmly & gently over the abdomen. Contracted muscles will immediately be apparent.
- (3) To differentiate between guarding & rigidity, attempt to relax the muscles by one or more of the maneuvers described above. Rigidity, if present, will persist.

#### **Clinical interpretation**

- (1) Both guarding & rigidity indicate underlying inflamed peritoneum (peritonitis); however, guarding indicates initial milder peritonitis while rigidity indicates severe peritonitis.
- (2) An intense, board-like rigidity is characteristic of peritonitis due to perforated peptic ulcer.

### **Mass**

#### **Clinical techniques & findings**

- (1) Palpate the whole abdomen firmly, searching specifically for masses.
- (2) If you found a lump, examine it completely (as given in module 3). Following tests need special mentioning here.
  - (a) **Cough impulse**  
Confirm whether the mass is hernia.
  - (b) **Carnett's test**
    - (i) Confirm whether the mass is intraabdominal or in abdominal wall.
    - (ii) Abdominal muscles are made taut by asking the patient either to raise the shoulders from the bed with the arms folded over the chest (rising test), or to raise both the extended legs from the bed (leg lifting test), or to try to blow out with nose & mouth shut.
    - (iii) If the swelling is parietal the swelling

will become more prominent & will be freely movable over the taut muscle.

- (iv) If the swelling is parietal but fixed to the abdominal muscle the swelling will not be movable when the muscles are made taut eg rectus sheath hematoma.
  - (v) If the swelling disappears or becomes smaller, it is an intraabdominal one.
- (c) **Movement with respiration**
- (i) Place the hand over the lower border of swelling & the patient is asked to take deep breath in & out. During inspiration the swelling will move downwards along with the downward excursion of the diaphragm. During expiration the swelling goes back to its normal position.
  - (ii) Intraabdominal swellings moves vertically (up & down) with respiration, eg that associated with the liver, gallbladder, spleen & stomach.
- (d) **Mobility**
- (i) The swelling is held & tried to move in vertical & horizontal directions. Any restriction of movement is noted.
  - (ii) A mesenteric cyst moves freely at right angle to the line of attachment of the mesentery but not so along the line; the line of attachment of mesentery is an oblique line starting 2.5 cm to the left of midline & 2.5 cm below the transpyloric plane & extending downwards & to the right for about 15 cm.
- (e) **Ballotable**
- (i) One hand is placed behind the loin & the other hand in front of the abdomen & the swelling is moved antero-posteriorly between the two hands.
  - (ii) A renal swelling or a retroperitoneal tumor is ballotable.
- (f) **Pulsatility**
- (i) A swelling in front of the abdominal aorta will be pulsatile; this pulsation will be transmitted one.
  - (ii) Aneurysm of abdominal aorta will also be pulsatile; but this pulsation will be expansile one.

	<i>Mesenteric cyst</i>	<i>Ovarian cyst</i>	<i>Pancreatic pseudocyst</i>
General features	Smooth & spherical lump in the centre of abdomen.	Smooth & spherical lump arising from the pelvis (cannot get below it).	Firm, sometimes tender, mass in epigastrium with indistinct lower edge & impalpable upper limit.
Mobility	Moves freely at right-angles to the line of root of mesentery, but only slightly along its line.	Mobile from side to side, but cannot be moved up & down.	Only slight side to side movement is possible.
Percussion	Dull	Dull	Resonant (as it is usually covered by stomach).
Fluctuation	Present	May be present	Absent
Fluid thrill	Present	Present	Absent

- (iii) To differentiate between transmitted & expansile pulsations one may put index finger of each hand over the swelling. With each pulsation the two fingers will be diverted in expansile pulsation whereas fingers will not be diverted in case of transmitted pulsation.
- (iv) Another differentiating point is to place the patient in knee elbow position. A swelling in front of the abdominal aorta will be separated from the aorta & will become non-pulsatile, whereas an aneurysm will continue to pulsate.

**Causes of intraabdominal masses**

**(A) Right iliac fossa mass**

- (1) Acute purulent appendicitis
- (2) Appendicular lump
- (3) Appendicular abscess
- (4) Ileocecal tuberculosis
- (5) Carcinoma of cecum
- (6) Amebiasis
- (7) Actinomycosis
- (8) Psoas abscess
- (9) Iliac lymphadenopathy
- (10) Ovarian tumor or cyst
- (11) Tumor in undescended testis
- (12) Crohn's disease
- (13) Pelvic kidney
- (14) Chondrosarcoma of ileum

**(B) Left iliac fossa mass**

- (1) Diverticulitis
- (2) Carcinoma of sigmoid or descending colon

- (3) Feces (indentable mass usually in sigmoid colon).
- (4) Psoas abscess
- (5) Iliac lymphadenopathy
- (6) Ovarian tumor or cyst
- (7) Tumor in undescended testis
- (8) Pelvic kidney
- (9) Chondrosarcoma of ileum

**(C) Upper (central) abdominal mass**

- (1) Retroperitoneal lymphadenopathy (eg lymphoma, secondaries).
- (2) Abdominal aortic aneurysm (expansile).
- (3) Carcinoma of stomach
- (4) Pyloric stenosis
- (5) Pancreatic pseudocyst or tumor
- (6) Carcinoma of transverse colon

**(D) Pelvic mass**

- (1) Ovarian tumor or cyst.
- (2) Uterus (pregnancy, tumor, fibroids).
- (3) Urinary bladder.

**Liver**

In adults the normal liver is impalpable. Its inferior border is oblique, lying behind & parallel to right costal margin. In hepatomegaly this parallel relation to the costal margin is maintained. But, in left lobe enlargement the inferior border becomes horizontal.

**Clinical techniques**

- (1) Initial palpation is done lightly. Start in the right iliac fossa lateral to rectus muscle, with radial border of your index finger placed parallel to the right costal margin. This should insure that you are well below the liver edge. In



Figure 9.15: Palpation of lower border of liver.

- general, it is easier to detect abnormal if you start in an area that you're sure is normal.
- (2) Ask the patient to take a deep breath, while you gently push down & towards the patient's head. Inspirations push the liver down, & its inferior border strikes against the radial border of your right index finger.
  - (3) On expiration, advance your hands a few cm cephalic and repeat until ultimately you are at the bottom margin of the ribs.
  - (4) Following this, repeat the palpation but push a bit more firmly so that you are interrogating the deeper aspects of the right upper quadrant, particularly if the patient has a lot of subcutaneous fat. Pushing up and in while the patient takes a deep breath may make it easier to feel the liver edge as the downward movement of the diaphragm will bring the liver towards your hand.
  - (5) An enlarged gallbladder is also detected by the above technique.
  - (6) **Hepatic punch:** With your right thumb, give a sudden firm push to the liver (at right lower rib cage laterally). Note patient's reaction for tenderness; a positive punch indicates hepatic abscess.

### **Clinical findings**

#### **(1) Extent**

Note the extent of liver enlargement below the costal margin in cms, inches or finger breadths. A palpable liver is not necessarily enlarged, as normal liver may be pushed down by pathology from above.

#### **(2) Edge**

Note whether the inferior border is oblique or horizontal, thin & sharp or thick & rounded, regular or irregular.

#### **(3) Surface**

Note whether it is smooth, nodular or irregular.

#### **(4) Consistency**

Note whether it is firm or hard. A stony hard & irregular liver is suggestive of metastatic deposits, whereas an irregular firm liver with small nodules is characteristic of hepatic cirrhosis

#### **(5) Lobe**

Note whether the enlargement is generalized, or predominantly right or left lobe is enlarged.

#### **(6) Tenderness**

Note the presence of tenderness on palpation & on hepatic punch.

### **Causes of hepatomegaly**

#### **(A) General enlargement**

##### **(1) With Jaundice**

##### **(a) Regular**

- (i) Viral hepatitis
- (ii) Cholangitis
- (iii) Pylephlebitis
- (iv) Carcinoma of head of pancreas
- (v) Carcinoma of common bile duct

##### **(b) Irregular**

- (i) Hepatic cirrhosis
- (ii) Late secondary tumors

##### **(2) Without Jaundice**

##### **(a) Regular**

- (i) Hepatic cirrhosis
- (ii) Budd-Chiari syndrome
- (iii) Cardiac failure
- (iv) Leukemia
- (v) Rickets
- (vi) Amyloid

##### **(b) Irregular**

- (i) Secondary tumors
- (ii) Gummas

#### **(B) Localized swelling**

- (1) Riedel's lobe
- (2) Hydatid cyst
- (3) Liver abscess (amebic or bacterial)

- (4) Hepatoma
- (C) **Massive irregular enlargement**
  - (1) Polycystic disease
  - (2) Cholangiohepatoadenoma
  - (3) Secondary tumors
- (D) **Tender enlargement**
  - (1) Hepatitis
  - (2) Liver abscess
  - (3) Rapid enlargement (Budd-Chiari syndrome, right heart failure)
  - (4) Hepatoma
- (E) **Pulsatile enlargement**
  - (1) Tricuspid incompetence
  - (2) Hepatoma
  - (3) Vascular abnormalities

### Spleen

The normal spleen is not palpable. When enlarged, it appears below the tip of 10<sup>th</sup> rib, & tends to grow towards the umbilicus & right iliac fossa.

#### Clinical techniques

- (1) Again start palpating from the right iliac fossa, but this time place your hand such that the radial border of index finger is parallel to left costal margin.
- (2) Palpate superficially and then more deeply, advancing your hand in the same fashion as described above for the liver. The edge, when palpable, is soft, rounded, notched, & rather superficial.
- (3) When you reach the left costal margin & spleen is not felt, try three additional techniques to detect mild splenic enlargement;
  - (a) When you reach the left costal margin, lift the lower left rib cage with your left hand & ask the patient to take a deep breath. This technique occasionally lifts a slightly enlarged spleen forwards enough to make it palpable.
  - (b) With your left hand slide down the skin over lower left rib cage, while pushing your right hand beneath the left costal margin. A relatively smaller spleen which has not become big enough to reach below the level of the costal margin can now become palpable.
  - (c) Go the patient's left side, & with your claw fingers of both hands hook the left costal margin.



Figure 9.16: Palpation of spleen, supine (above) & lateral (below).

- (4) Note the extent of enlargement, characteristics of the border & surface of spleen, & presence of tenderness.

#### Causes of splenomegaly

- (A) **Congestion**
  - (1) Portal hypertension
  - (2) Congestive heart failure
- (B) **Reactive hyperplasia**
  - (1) Hemolytic diseases
    - (a) Hereditary spherocytosis
    - (b) Sickle-cell disease
    - (c) Thalassemia
    - (d) Autoimmune hemolytic anemia
    - (e) Erythroblastosis fetalis
  - (2) Bacterial infections
    - (a) Tuberculosis
    - (b) Infective endocarditis
    - (c) Typhoid & paratyphoid
    - (d) Typhus
    - (e) Anthrax
    - (f) Septicemia
    - (g) Splenic abscess
    - (h) Syphilis
    - (i) Weil's disease
    - (j) Psittacosis
    - (k) Brucellosis
  - (3) Viral infections

- (a) Infectious mononucleosis
- (b) Cytomegalo virus infection
- (4) Parasitic infections
  - (a) Malaria & tropical splenomegaly
  - (b) Toxoplasmosis
  - (c) Schistosomiasis
  - (d) Trypanosomiasis
  - (e) Kala-azar
  - (f) Hydatid cyst
- (5) Connective tissue diseases
  - (a) Systemic lupus erythematosus (SLE)
  - (b) Rheumatoid arthritis
  - (c) Felty's syndrome
  - (d) Still's disease
- (C) **Nonparasitic cysts**
  - (1) Congenital
  - (2) Acquired
- (D) **Infiltrative diseases**
  - (1) Non - neoplastic
    - (a) Gaucher's disease
    - (b) Amyloidosis
    - (c) Sarcoidosis
  - (2) Neoplastic
    - (a) Acute lymphocytic leukemia
    - (b) Chronic lymphocytic leukemia
    - (c) Chronic granulocytic leukemia
    - (d) Hodgkin's lymphoma
    - (e) Non-Hodgkin lymphoma
    - (f) Polycythemia vera
    - (g) Myelofibrosis
    - (h) Angioma
    - (i) Primary fibrosarcoma

### Kidneys

Kidneys are normally not palpable, except in very thin patients.

#### Clinical techniques

- (1) Place your left hand behind the patient's loin at renal angle, & lifts the loin & kidney forwards.
- (2) Place your right hand anteriorly in the lumbar region, pushing down towards your left hand.
- (3) Ask the patient breathe deeply. With each expiration (when the abdominal musculature becomes more relaxed), the right hand is gradually pressed posteriorly. If the kidney is enlarged, you may be able to feel it between your hands.
- (4) Once the kidney is felt, an attempt must be made to palpate it during inspiration; the



Figure 9.17: Bimanual kidney palpation, right (above) & left (below).

kidney moves downwards & you can better assess its size, shape & consistency.

- (5) **Murphy's renal punch:** Ask the patient to sit up & folds the arms in front so that the back is stretched. Now, pound gently with the bottom of your fist on the renal angle (ie where the 12<sup>th</sup> rib articulate with the vertebral column);



Figure 9.18: Demonstration of Murphy's renal punch.

tenderness will be exhibited if the underlying kidney is inflamed. It is known as costo-vertebral angle tenderness (CVAT), & it should be pursued when the patient's history is suggestive of renal infection (eg fever, back pain and urinary tract symptoms).

### **Clinical findings**

When palpable, note its size, shape, surface, consistency etc. A solid renal swelling suggests compensatory hypertrophy, neoplasm or advanced tuberculosis, whereas a cystic swelling is mainly due to hydronephrosis, pyonephrosis, solitary cyst or polycystic kidney.

### **Characteristics of renal swelling**

- (1) It lies in the loin or can be moved into the loin.
- (2) It is reniform in shape.
- (3) It is ballotable.
- (4) It moves with respiration.
- (5) There is a band of colonic resonance anteriorly.
- (6) It is dull posteriorly.
- (7) Fingers can be insinuated between the costal margin & the swelling.

### **Differentiation between enlarged left kidney & splenomegaly**

- (1) If a sharp anterior border &/or a notch is felt, it is the spleen.
- (2) The kidney is ballotable, unless it is extremely adherent to surrounding structures.
- (3) The spleen enlarges inferiorly & medially, whereas kidney enlarges medially & posteriorly.
- (4) If dullness of the palpable swelling is continuous with the normal splenic dullness, it is the spleen.

### **Stomach**

- (1) Normally the stomach cannot be palpated.
- (2) In congenital pyloric stenosis, thickened pylorus can be palpated in the epigastrium.
- (3) In adults, a palpable swelling of the stomach usually suggests gastric tumor (carcinoma, lymphoma or stromal tumor). In carcinoma, the mass is irregular, & hard with varying degrees of mobility; remember, gastric carcinoma can remain un-palpable.

### **Gallbladder (GB)**

#### **Clinical findings**

- (1) When enlarged it can be felt as a tense globular

swelling projecting downwards & forwards from below the liver just lateral to the outer border of the right rectus muscle below the tip of the 9th rib (ie at gallbladder point).

- (2) It moves freely with respiration, & it can be moved slightly from side to side.

### **Causes of GB enlargement**

- (1) Tender enlargement
  - (a) Phlegmon
  - (b) Empyema
- (2) Non-tender enlargement
  - (a) Mucocele
  - (b) Carcinoma of gall bladder
  - (c) Carcinoma of head of pancreas

### **Courvoisier's law**

In a jaundiced patient, GB enlargement is mainly due to carcinoma of the head of pancreas or carcinoma of the common bile duct. Calculous jaundice is seldom associated with GB enlargement due to previous inflammatory fibrosis.

### **Exceptions to Courvoisier's law**

- (1) Double impaction of stones ie one in the cystic duct & the other in the common bile duct.
- (2) Oriental cholangiohepatitis.
- (3) A pancreatic calculus obstructing the ampulla of Vater.

### **Pancreas**

It cannot be palpated normally unless a growth or cyst has developed in it.

#### **Clinical technique**

Ask the patient to turn to the right & flexed the hips & knees. The left subcostal & epigastric regions are deeply palpated. This will evoke tenderness in acute & sometimes in chronic pancreatitis (**Mallet Guy's sign**).

### **Colon**

- (1) Examine along the colonic line especially the left and right lower quadrants, palpating first superficially and then deeper.
- (2) A lump in the line of the large intestine may be due to either a fecal mass or a neoplasm. To eliminate the first possibility one can re-examine the patient after a bowel wash, the fecal mass will disappear. Otherwise a fecal mass will yield to digital pressure showing indentation.
- (3) Also look for tenderness; it may be due

inflamed colon or associated local lymphadenitis.

### Pelvic organs

- (1) The smooth dome of the urinary bladder may rise above the pelvic brim and become palpable in the mid-line, though it needs to be quite full of urine for this to occur.
- (2) Other pelvic organs can also occasionally be identified, most commonly the pregnant uterus, which is a firm structure that grows up and towards the umbilicus. The ovaries and fallopian tubes are not identifiable unless pathologically enlarged.

### Abdominal aorta

- (1) Try to feel the abdominal aorta. First push down with a single hand in the area just above the umbilicus.
- (2) If you are able to identify the aorta, try to estimate its size. To do this, orient your hands so that the thumbs are pointed towards the patient's head. Then push deeply and try to position them so that they are on either side of the blood vessel. Estimate the distance between the palms (it should be no greater than roughly 3 cm). Remember, that the aorta is a retroperitoneal structure and can be very hard to appreciate in obese patients.

### DON'T FORGET TO EXAMINE

Abdominal examination does not finish with the inspection, auscultation, percussion & palpation of the abdomen. Many of the candidates get failed in the final clinical exam by forgetting these (especially in the short cases component of exam). Always remember to examine the following six.

#### (1) *General examination*

This should be along the lines as given in module 2, noting especially the build, facies, anemia, jaundice, hydration etc. Also note the vital signs.

#### (2) *Supraclavicular fossae*

Palpate for supraclavicular lymphadenopathy (**Troisier's sign**); palpable left-sided nodes suggests intraabdominal malignancy eg

**Table 9.4: ABDOMINAL EXAMINATION REVIEW**

#### A) Inspection

- 1) Contour of abdomen
- 2) Swelling
  - a) Movement on respiration
  - b) Cough impulse
  - c) Carnett's test
- 3) Cough sign
- 4) Skin & subcutaneous tissue
- 5) Umbilicus
- 6) Movements
  - a) Patient's movement
  - b) Respiratory movement
  - c) Peristaltic movement
  - d) Pulsatile movement

#### B) Palpation

- 1) Tenderness
- 2) Guarding & rigidity
- 3) Masses
- 4) Visceras

#### C) Percussion

- 1) Shifting dullness
- 2) Fluid thrill
- 3) Mapping solid visceras or abdominal masses
- 4) Tenderness

#### D) Auscultation

- 1) Bowel sounds
- 2) Bruits

#### E) Don't forget to examine

- 1) General examination
- 2) Supraclavicular fossa
- 3) Hernial orifices
- 4) Femoral pulses
- 5) External genitalia
- 6) Digital rectal examination

carcinoma of stomach, pancreas or colon, or carcinoma of breast or testis.

#### (3) *Hernial orifices*

Feel the hernial orifices at rest & when the patient coughs (inguinal region, femoral canal & umbilicus).

#### (4) *Femoral pulses*

#### (5) *External genitalia*

#### (6) *Digital rectal examination*

# Module 10

## Abdomen: Genitourinary Tract

### HISTORY

### PAIN

#### Renal pain

- (1) It is mainly caused by distension of the renal capsule & the pelvis, eg in acute pyelonephritis & pelviureteric junction obstruction.
- (2) It is usually felt as a dull & constant ache at the angle between the outer border of sacrospinalis muscle & the lower border of 12th rib (renal angle).
  - (a) It often spreads along the subcostal area towards the umbilicus.
  - (b) So when the patient is asked to show the site of the pain, he/she invariably spreads hand around the waist with thumb placed on the renal angle & the fingers pointing towards the umbilicus.
- (3) Many renal diseases are painless because their progression is so slow that capsular distension does not occur. These include carcinoma, chronic pyelonephritis, staghorn calculus, tuberculosis etc.

**Note:** Do not to use the term renal colic, as colicky pain only develops when a muscular conducting tube gets obstructed.

#### Ureteric pain

It is mainly caused by acute obstruction eg due to a calculus or a blood clot.

- (1) There is severe colicky pain due to spasm of the renal pelvis & ureteric muscle.
  - (a) This characteristically starts from the renal angle & radiates downwards along the

course of the ureter, around the waist obliquely across the abdomen to the groin, base of the penis & to the scrotum in case of males & to labia majora in females.

- (b) If the stone is lodged in the upper ureter, the pain radiates to the testicle (referred pain, T11-12).
- (c) When the stone is in the middle ureter, the pain is referred to McBurney's point on right side resembling appendicitis & on the left side simulates diverticulitis (T12, L1).
- (d) When the stone approaches the bladder symptoms of vesical irritability appear &, the pain may be referred to the inner side of thigh (L1, through genitofemoral nerve).
- (2) It is of griping nature & comes in waves with exacerbations & wanes. The patient rolls over the bed during the attacks trying in vain to get relief.
- (3) It may be accompanied by vomiting, profuse sweating, & strangury.

#### Vesical pain

It varies from mild discomfort in suprapubic area to an intense strangury. [**Strangury** is a painful desire to micturate which starts in the bladder & radiates into the urethra, but it neither produces any urine nor relieves the pain].

- (1) Over distended bladder in acute retention will cause agonizing pain in the suprapubic area.
- (2) In chronic retention, there is little or no suprapubic discomfort even though the bladder reaches the umbilicus.
- (3) Interstitial cystitis & vesical ulceration caused by tuberculosis or bilharziasis may cause suprapubic discomfort when the bladder becomes full & is usually relieved by urination.

- (4) Cystitis does not produce any pain over the suprapubic region but is referred to the distal urethra during micturition.
- (5) In vesical calculus, pain is often referred to the tip of penis with or without hematuria towards the end of micturition. In children, vesical calculus is indicated by sudden screaming & pulling at the prepuce during micturition.

#### **Prostatic pain**

- (1) In prostatitis, the patient may feel a vague discomfort or fullness in the perineal or rectal area (S2-4). Lumbosacral backache is occasionally experienced as referred pain from the prostate but is not a common symptom of prostatitis.
- (2) In prostatic abscess, there will be severe throbbing pain in the perineum.

#### **Urethral pain**

Scalding pain during micturition is characteristic of acute urethritis; it occurs during or at the end of micturition.

#### **Tubo-ovarian pain**

- (1) Acute salpingitis pain on right side resembles acute appendicitis & on the left side simulates diverticulitis.
- (2) In pelvic inflammatory disease (PID), there will be mild to moderate dull ache in the corresponding iliac fossa.

#### **Uterine pain**

In fibroids there may be lower abdominal pain & backache, in addition to irregular & heavy periods.

### **SWELLING**

#### **Renal swelling**

Patient may present with a swelling in the loin.

- (1) When a middle aged man comes with such a swelling with a short history one must suspect renal carcinoma. This may or may not be associated with hematuria, & is generally painless.
- (2) Similar painless swelling may be the presenting feature in children under the age of 5 years; this is characteristic of nephroblastoma.
- (3) Sometimes a swelling with long history may become diminished in size immediately after passing urine; this is a case of intermittent hydronephrosis.

- (4) Bilateral renal swelling in a man of 40 years of age is typical of polycystic disease of kidneys.

#### **Other swellings**

- (1) In retention, patient may presents with a full bladder in hypogastrium arising out of the pelvis.
- (2) Gravid uterus & fibroids also presents with a swelling in hypogastrium arising out of the pelvis.
- (3) In ovarian cyst or tumor, patient may presents with a swelling in hypogastrium or either iliac fossa, arising out of the pelvis.

### **DISTURBANCES IN MICTURITION ACT**

#### **Frequency (without increase in the amount of urine)**

It refers to an increase in the act of micturition.

##### **Causes**

- (1) Irritation of the bladder by infection, stone, tumor or blood.
- (2) Reduction in bladder capacity eg by fibrotic contraction or pressure from a pelvic tumor.
- (3) Benign prostatic hyperplasia (BPH).

**Note:** In all these conditions, the patient's sleep is disturbed by the need to micturate (nocturia), whereas frequency due to emotional causes or cold is usually confined to the waking hours.

##### **Retention**

The urine is forming normally, but the patient fails to pass urine.

- (1) Acute retention is painful; the patient cries in agony urgently begging to be relieved.
- (2) In chronic retention, the bladder is distended upto the umbilicus, but the patient is absolutely painless. When infection supervenes, the condition becomes painful.

##### **Causes**

##### **(A) Mechanical**

- (1) In the lumen of urethra
  - (a) Congenital valves.
  - (b) Calculus.
  - (c) Clot.
  - (d) Foreign bodies.
- (2) In the wall of urethra or bladder
  - (a) Urethritis.
  - (b) Meatal ulcer.
  - (c) Urethral stricture.

- (d) Rupture of urethra.
- (e) Neoplasm.
- (3) Outside the wall
  - (a) Phimosis & paraphimosis.
  - (b) Benign prostatic hypertrophy.
  - (c) Carcinoma of prostate.
  - (d) Retroverted gravid uterus.
  - (e) Uterine fibroids.
  - (f) Ovarian cyst.
- (B) **Neurogenic**
  - (1) Postoperative retention.
  - (2) Spinal cord injuries.
  - (3) Spinal cord diseases
    - (a) Disseminated sclerosis.
    - (b) Tabes dorsalis.
  - (4) Drugs
    - (a) Anticholinergics.
    - (b) Antihistamines.
    - (c) Smooth muscle relaxants.

**Difficulty in urination**

- (1) Progressive loss of force & caliber of urinary stream is noted as a man grows older.
  - (a) In BPH, there is a delay in starting the act of micturition & the stream instead of being projectile tends to fall vertically.
  - (b) The patient should be asked whether straining improves the stream eg urethral stricture or retards the stream eg BPH.
- (2) Sudden stoppage of stream during micturition is suggestive of a vesical calculus or pedunculated papilloma of bladder, the micturition may be started again by changing posture.
- (3) Complete retention may be heralded by a phase of hesitance (delay in starting micturition), & by terminal dribbling.

**Incontinence**

There are five types of incontinence;

- (1) True incontinence → Patient passes urine without warning, & the bladder remains empty.
- (2) False (overflow) incontinence → Urine overflows from the distended bladder.
- (3) Automatic bladder → There is periodic contraction of the bladder without patient's knowledge.
- (4) Urge incontinence → Patient feels urgency to pass urine & if it is not possible a few drops may come out. This occurs in acute cystitis particularly in women.

- (5) Stress incontinence → A few drops of urine come out during physical strain eg coughing, laughing, rising from a chair etc. due to slight weakness of the sphincteric mechanism.

**Causes**

- (1) **In males**
  - (a) Chronic urinary retention with overflow
    - (i) BPH.
    - (ii) Carcinoma of prostate.
    - (iii) Urethral stricture.
    - (iv) Hypertrophy of bladder neck.
  - (b) Postprostatectomy.
- (2) **In female**
  - (a) Genuine stress incontinence (GSI)
  - (b) Vesicourethral fistulae.
- (3) **Common to both sexes**
  - (a) Idiopathic detrusor instability.
  - (b) Ageing.
  - (c) Congenital
    - (i) Ectopic vesicae.
    - (ii) Epispadias.
    - (iii) Abnormal entry of an ectopic ureter distal to the sphincter complex or into the vagina.
  - (d) Trauma.
  - (e) Infection.
  - (f) Locally advanced cancers in the pelvis, esp. carcinoma of the cervix in a woman & prostate in a man.
  - (g) Neurogenic incontinence
    - (i) Myelodysplasia.
    - (ii) Multiple sclerosis.
    - (iii) Spinal cord injuries.
    - (iv) Cerebral dysfunction [cerebrovascular accident (CVA), dementia];
    - (v) Parkinson's disease.
    - (vi) Alzheimer's disease.

**Note:** Term dysuria is a misnomer (do not use it).

**ALTERATION IN URINARY AMOUNT**

Urine volume may be increased (polyuria) or diminished (oliguria) or negligible (anuria).

**Polyuria**

Large quantities of urine will be passed if the reabsorption of water from the tubular fluid is impaired in any way.

- (1) Urine volume is increased normally following the ingestion of large quantities of fluid esp.

when this contains substances with a diuretic action (eg alcohol, tea, coffee).

- (2) Diseases causing polyuria includes;
- Chronic renal failure.
  - Diabetes mellitus.
  - Diabetes insipidus (neurohypophysial or nephrogenic).
  - Edematous states, such as cardiac failure, cirrhosis & the nephrotic syndrome treated with diuretics.

**Note:** In chronic renal failure, diabetes mellitus, & diabetes insipidus, thirst & polydipsia result from the abnormal losses of water.

### **Oliguria**

It refers to the passage of less than 500 ml of urine daily.

- It can occur physiologically under conditions of water deprivation. In a healthy subject the functions of the kidney can be maintained with the passage of as little as 500 ml of urine daily.
- Diseases causing oliguria includes;
  - Prerenal conditions, eg shock, hemorrhage, dehydration & cardiac failure.
  - Acute renal failure from primary renal disease such as acute glomerulonephritis.

### **Anuria**

The urine is not excreted by the kidneys, & so the bladder remains empty.

#### **Causes of anuria**

- Prerenal**
  - Hypovolemia.
  - Blood loss.
  - Sepsis.
  - Cardiogenic shock.
  - Anesthesia.
  - Hypoxia.
  - Dissecting aneurysm of the abdominal aorta with occlusion of the renal arteries.
- Renal**
  - Pyelonephritis.
  - Glomerulonephritis.
  - Incompatible blood transfusion.
  - Crush syndrome (myoglobinuria).
  - Renal tuberculosis.
  - Renal infarction.
  - Bilateral cortical necrosis due to severe postpartum hemorrhage.
  - Drugs

- Aminoglycosides, cephalosporins & diuretics esp. if used in combination.
- Prolonged use of NSAIDs.
- Angiotensin-converting enzyme inhibitors.
- Contrast media.

### (3) **Postrenal**

- Complete obstruction of the ureters from bilateral stone or retroperitoneal fibrosis.
- Accidental ligation of both ureters during the operation of hysterectomy etc.

## ALTERATION IN URINE APPEARANCE

The patient may first suspect urinary disease by noticing alteration in color & general appearance of the urine, eg. red or smoky brown in hematuria, cloudy with an offensive smell when infected, frothy with proteinuria, & dark orange or brown in obstructive jaundice.

### **Hematuria**

This is an alarming symptom & must not be taken trivially. Enquiry must be made about;

- Quantity.
- Relation to micturition
  - At the beginning of the act → Urethral.
  - Towards the end of the act → Vesical.
  - Intimately mixed throughout the process → Prerenal, renal or vesical.
- Association with pain.

#### **Causes of hematuria**

##### (A) **Kidney**

- Congenital → Polycystic kidney.
- Traumatic
  - Ruptured kidney.
  - Calculus.
- Inflammatory → Tuberculosis.
- Neoplastic
  - Carcinoma of kidney.
  - Carcinoma of renal pelvis.
- Vascular
  - Infarction.
  - Renal vein thrombosis.
- Blood disorders
  - Hemophilia.
  - Sickle cell disease.
  - Scurvy.
  - Malaria.
  - Anticoagulant drugs.

- (B) **Ureter**
- (1) Calculus.
  - (2) Neoplasm.
- (C) **Bladder**
- (1) Calculus.
  - (2) Carcinoma of bladder.
  - (3) Inflammatory
    - (a) Non-specific cystitis or ulceration.
    - (b) Tuberculosis.
    - (c) Schistosomiasis.
- (D) **Prostate**
- (1) Benign prostatic hypertrophy.
  - (2) Carcinoma of prostate.
- (E) **Urethra**
- (1) Rupture of urethra.
  - (2) Calculus.
  - (3) Acute urethritis.
  - (4) Neoplasm.

**Other causes of red or colored urine**

- (1) Red urine after eating beets or taking laxatives containing phenolphthalein.
- (2) Red urine after ingestion of cakes, cold drinks, fruit juice containing rhodamine B.
- (3) Hemoglobinuria.
- (4) Drugs eg rifampicin cause orange color urine.

**DISCHARGE FROM THE URETHRA**

- (1) In acute gonococcal urethritis, the discharge is profuse & purulent.
- (2) In chronic urethritis or prostatitis, a glairy fluid (gleet) is noticed to be discharged particularly in the morning just before micturition.

**GENERAL SYMPTOMS****Renal edema**

- (1) In acute glomerulonephritis the edema may be slight & short-lived chiefly occurring in the face, though sometimes in dependent parts.
- (2) In the nephrotic syndrome the edema may be generalized, extreme & long-standing.
- (3) In severe chronic renal failure the development of edema indicates that the failing kidney can no longer maintain homeostasis with respect to sodium & water & that the terminal stage of the illness is not far away.
- (4) In most patients the effect of gravity is

apparent, ankle edema developing at the end of the day in the ambulant patient & sacral edema in the patient who rests in bed.

**Symptoms due to high blood pressure**

- (1) Hypertension in chronic renal disease may be associated with headaches, vomiting & left ventricular failure.
- (2) In most patients the rise in blood pressure is caused by the retention of sodium, chloride & water with an increase in plasma volume &, not by an increased secretion of renin.

**Renal failure**

When more than 90-95% of nephron function has been lost, or when the system is stressed by trauma or by intercurrent illness, the manifold features of the uremic syndrome appear.

- (1) Generally, the patient feels tired, listless & breathless on exertion (due to anemia).
- (2) There may be purpura & bleeding from GIT (due to defective platelet function).
- (3) Urogenital symptoms include thirst, polydipsia, polyuria & nocturia. In both sexes there is loss of libido & infertility, with impotence in men & secondary amenorrhoea in women.
- (4) Cardiovascular symptoms include precordial pain from pericarditis, ankle swelling, breathlessness on exertion & paroxysmal nocturnal dyspnea from hypertension.
- (5) Alimentary symptoms include anorexia, nausea, vomiting & sometimes diarrhea. The patient loses weight.
- (6) Respiratory system is implicated in the hyperventilation that results from metabolic acidosis, & which the patient often does not notice (Kussmaul's breathing).
- (7) Central, peripheral & autonomic nervous system involvement leads to an inability to concentrate, muscle twitching, restlessness of legs, paresthesiae & pareses.
- (8) Skeleton is affected in patients with long standing renal disease. Bone pain & pathological fractures indicate defective mineralization & secondary hyperparathyroidism.
- (9) Ultimately there is extreme prostration, drowsiness, mental confusion, convulsions & coma, gastrointestinal hemorrhage & hemorrhagic pericarditis with cardiac tamponade.

(10) Death may also result from hyperkalemia or severe acidosis.

## PHYSICAL EXAMINATION

The description here is focused on genitourinary system only, but the students are advised to follow the complete protocol of general physical examination (module 2), abdominal examination (module 9), rectal examination (module 12), & examination of external genitalia (module 13).

## EXAMINATION OF KIDNEYS

### Inspection

- (1) In recumbent position a renal swelling cannot be seen. However, in children a huge renal swelling of hydronephrosis or nephroblastoma may be seen as fullness of the corresponding lumbar region. The swelling moves slightly with respiration.
- (2) In sitting posture from behind fullness of the area, just below the 12th rib & lateral to the sacrospinalis muscle, is more evident in cases of renal carcinoma & perinephric infection. Presence & persistence of indentations in the skin from lying on wrinkled sheets suggests edema of the skin secondary to the perinephric abscess.



Figure 10.1: Posterior view:  
Location of the kidneys.

### Palpation

- (1) The technique of routine bimanual palpation is described in module 9.
- (2) Another method of palpating the kidney is to ask the patient to lie on the opposite side. The affected side is bimanually palpated in the usual way.
- (3) In case of new born babies, the hand is placed in such a way that the fingers will be on the renal angle & the thumb anteriorly. The two hands are used for two sides.

### Percussion

- (1) Anteriorly, there is always a band of resonance due to the presence of colon & small intestine, unless the swelling is large enough to push them aside.
- (2) Posteriorly a dull note will always be present, lateral to the erector spinae muscle.
- (3) At times a greatly enlarged kidney cannot be palpable, particularly if it is soft eg a large hydronephrosis. This swelling can be readily outlined by percussion both anteriorly & posteriorly.
- (4) Always remember to elicit Murphy's renal punch (module 9).

### Auscultation

- (1) A systolic bruit may be heard in cases of stenosis or aneurysm of the renal artery.
- (2) Bruits may be heard over the femoral arteries in Leriche syndrome, which may be a cause of impotence.

## EXAMINATION OF URETERS

- (1) Ureters cannot be felt abdominally, even if grossly dilated.
- (2) Its terminal part may occasionally be felt through the vagina or rectum, esp. if it is pathological (eg thickened due to tuberculosis, or contains calculus).

### Clinical techniques

- (1) Index finger is passed into the vagina & into the lateral fornix upwards & outwards until its pulp reaches the highest point it can touch. It is then carried downwards & inwards to feel the pathological ureter.

- (2) Bimanual palpation (with the other per abdominal hand pressing down) further helps in palpating the ureter.

### EXAMINATION OF BLADDER

Empty bladder (in pelvis) is impalpable, but it rises up out of pelvis & above the symphysis pubis when distended.

#### Per abdominal examination

##### Inspection

In thin subjects, it can be seen as hemi-ovoid swelling in the hypogastrium.

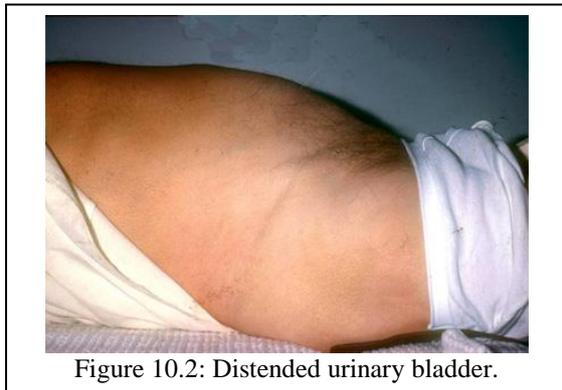


Figure 10.2: Distended urinary bladder.

##### Palpation

##### Clinical techniques

- (1) Use the flat of your hand & fingers.
- (2) You should start well above the umbilicus (in epigastrium), & moves down gradually towards symphysis pubis, so not to miss a markedly distended bladder.

##### Characteristics

- (1) It is smooth, symmetrical, elastic, immobile, & usually deviated to one side.
- (2) Its upper border is convex downwards, while lower border is not palpable.
- (3) Size is variable; a markedly distended bladder may reach well above the umbilicus.
- (4) Pressure induces a desire for micturition.

##### Percussion

##### Clinical techniques

This should also be started well above the umbilicus, moving down gradually towards symphysis pubis (similar to that in palpation).

##### Characteristics

- (1) Dull on percussion.
- (2) Fluid thrill may be elicited in marked distension.

##### Other techniques

- (1) Vesical calculus may be palpable per rectum.
- (2) Bimanual palpation (abdominorectal or abdominovaginal) is the best way to determine the extent of vesical neoplasm. It must be done under general anesthesia.

### EXAMINATION OF FEMALE INTERNAL GENITAL ORGANS

- (1) The normal uterus, fallopian tubes & ovaries are not evident clinically. However, in diseased states they become revealed by tenderness &/or abdominal mass.
- (2) The clinical techniques involve usual abdominal examination, vaginal examination & bimanual examination. [See module 9 & 13].

#### Ovaries & fallopian tubes

- (1) In salpingitis & salpingo-oophoritis, tenderness can be in the corresponding iliac fossa per abdominally or in the lateral fornix per vaginally.
- (2) In pyosalpinx & tubo-ovarian mass, a tender mass will be felt in the corresponding iliac fossa.
- (3) Small ovarian cysts are common & are not palpable. When they enlarge they rise up out of the pelvis into the lower abdomen & become palpable.

##### Characteristics of a large ovarian cyst

- (a) Smooth & spherical, with distinct edges.
- (b) Arises from the pelvis so its lower limit is not palpable.
- (c) Mobile from side to side but cannot be moved up & down.
- (d) Dull to percussion.
- (e) Fluid thrill is present.
- (f) Lower extremity may be palpable in the pelvis during rectal or vaginal examination, & movement of the cyst may produce some movement of the uterus.

**Uterus****Pregnant uterus**

Never forget that pregnancy is the commonest cause of enlargement of the uterus, & of abdominal distension.

- (1) A pregnant uterus is a smooth, firm, dull swelling, arising out of the pelvis.
  - (a) It enlarges to the xiphisternum by the 36<sup>th</sup> week of pregnancy. At this stage the fetus is palpable & jumping about.
  - (b) Diagnosis of pregnancy is more difficult in the first 20 weeks, when the uterus is smaller & there are no fetal movements.
- (2) Bimanual examination reveals that the mass cannot be moved independently of the cervix & that the cervix is soft & patulous.
 

**Note:** Never squeeze an enlarged uterus during a bimanual examination, as you might cause an abortion.

**Fibroids****Characteristics**

- (1) Arises out of the pelvis & so its lower edge is not palpable.
- (2) Can grow to an enormous size & fill the whole abdomen.
- (3) They are usually multiple, firm or hard, bosselated or distinctly knobby (each knob corresponding to a fibroid).
- (4) Moves slightly in a transverse direction &, any movement of the abdominal mass moves the cervix.
- (5) Dull to percussion.
- (6) Palpable bimanually; a moderately enlarged uterus can be pushed down into the pelvis.

**EXAMINATION OF MALE INTERNAL GENITAL ORGANS**

The prostate, the seminal vesicles & lower part of the base of the bladder can only be palpated through rectum. [For detailed clinical technique see module 12].

**Prostate gland**

While palpating for the prostate the following points should be noted.

- (1) **Size**  
It is described in terms of normal or enlarged.

With practice, gradually you will learn about the normal size of prostate while palpating through the rectum.

- (a) Mild → Palpating finger reaches well above the top of gland.
- (b) Moderate → Palpating finger just reaches the top of gland.
- (c) Severe → Palpating finger can not reach the top of gland.

Note: Clinical importance of prostatic hyperplasia is measured by the severity of symptoms & the amount of residual urine, & not by the size of the gland.

(2) **Consistency**

- (a) Normally & in BPH, the prostate is rubbery.
- (b) It becomes mushy when congested, & becomes indurated in chronic infection with or without calculi.
- (c) It becomes stony hard in carcinoma.

(3) **Surface**

Whether smooth (BPH) or irregular (carcinoma).

(4) **Median groove**

- (a) Palpable in BPH.
- (b) Obliterated in carcinoma.

(5) **Mobility of overlying rectal mucosa**

- (a) Mobile in BPH.
- (b) Tethered in carcinoma.

**Prostatic massage**

It is important particularly in case of asymptomatic prostatitis. However, it should not be done in acute prostatitis, acute urethritis & obvious cancer of prostate.

**Seminal vesicles**

These can only be palpated when diseased.

- (1) In acute inflammation, commonly gonococcal or E. coli, the vesicles feel cystic & tender.
- (2) In chronic infection, particularly in tuberculous disease, they feel indurated & irregular.

**DON'T FORGET TO EXAMINE**

Examination of genitourinary tract does not finish with just the abdominal examination. Always remember to examine the followings.

(1) **General examination**

This should be along the lines as given in

module 2, noting especially the build, facies, anemia, jaundice, hydration etc. Also note the vital signs.

(2) ***Cardiovascular system***

Heart should be examined in case of suspected renal hypertension.

(3) ***Respiratory system***

(a) Lungs should be examined in tuberculosis of kidneys, ureters, bladder & seminal vesicles.

(b) Renal carcinoma mainly spreads by blood & lungs are the commonest site of metastasis.

(4) ***External genitalia***

(5) ***Digital rectal examination***

(6) ***Vaginal examination***

(7) ***Examination of back***

Radicular pain is often confused with renal pain. Every patient who complains of flanks pain should be examined for evidence of nerve root irritation.

(a) Arthritic changes in the costovertebral or costotransverse joints, hypertrophy of costovertebral ligaments pressing on a nerve, intervertebral disc disease & impingement of a rib spur on a subcostal nerve are the causes of such irritation.

(b) Radiculitis usually causes hyperesthesia of the area of skin supplied by the irritated peripheral nerve.

(c) Pressure exerted by the thumb over the costovertebral joints will reveal local tenderness at the point of emergence of the involved peripheral nerve.

# Module 17

## Abdomen: Herniae

### GENERAL DESCRIPTION

#### DEFINITION

Hernia is defined as protrusion of a viscus or part of a viscus through a weakening or defect in the wall of the cavity that contains it.

The term can be applied to protrusion of a muscle through its fascial covering or of brain through foramen magnum into the spinal canal. But by far the commonest variety of hernia is protrusion of a viscus or a part of it through the abdominal wall (discussed in this module).

#### ETIOLOGY

- (1) High intra-abdominal pressure from;
  - (a) Powerful muscular effort or strain occasioned by lifting a heavy weight.
  - (b) Chronic cough.
  - (c) Straining on micturition, or on defecation.
  - (d) Obesity.
  - (e) Pregnancy.
- (2) Intra-abdominal malignancy.
- (3) An acquired weakness following trauma.
- (4) An anatomical weakness where;
  - (a) Structures pass through abdominal wall.
  - (b) Muscles fail to develop.
  - (c) No muscles, only scar tissue eg umbilicus.
- (5) Smoking (causing acquired collagen deficiency).
- (6) Peritoneal dialysis.

### COMPOSITION OF A HERNIA

#### (1) Sac

It is a diverticulum of peritoneum consisting of mouth, neck, body, & fundus.

#### Neck

- (a) Usually well defined.
- (b) In some direct inguinal hernia & in many incisional hernias there is no actual neck.
- (c) In femoral & umbilical herniae it is narrow, thus predisposing to strangulation.

#### Body

It varies greatly in size, & is not necessarily occupied.

#### (2) Coverings of sac

Derived from the layers of abdominal wall through which sac passes.

#### (3) Contents of sac

- (a) Fluid → Derived from peritoneal exudate.
- (b) Omentum (**omentocele, epiplocele**).
- (c) Intestine (**enterocele**) → Usually small bowel, but in some cases large bowel.
- (d) A portion of circumference of intestine (**Richter's hernia**).
- (e) A portion of bladder, or a diverticulum of bladder.
- (f) Ovary with or without corresponding fallopian tube.
- (g) A Meckel's diverticulum (**Littre's hernia**).
- (h) Inflamed appendix (**Amayand's hernia**).
- (i) Uterus & fallopian tube in a male patient, as persistent mullerian duct syndrome (**hernia uteri inguinale**).

**CLINICAL CLASSIFICATION****(1) Reducible hernia**

- (a) Hernia either reduces itself when the patient lies down, or can be reduced by the patient or surgeon:
  - (i) Intestine gurgles on reduction, & first portion is more difficult to reduce than last.
  - (ii) Omentum is doughy, & last portion is more difficult to reduce than first.
- (b) It imparts an expansile impulse on coughing.

**(2) Irreducible hernia**

Contents cannot be returned to abdomen, & there is no evidence of other complications.

**Etiology**

- (a) Adhesion of its contents to each other.
- (b) Adhesion of its contents with sac.
- (c) Adhesion of one part of sac to other part.
- (d) Sliding hernia.
- (e) Very large scrotal hernia.

**(3) Obstructed hernia**

This is an irreducible hernia containing intestine which is obstructed from without or from within; there is no interference to blood supply of bowel.

**(4) Strangulated hernia**

A hernia is said to be strangulated when the contents are so constricted as to interfere with their blood supply.

**On examination**

- (a) Hernia is tense, & extremely tender.
- (b) It is irreducible.
- (c) There is no expansile impulse on coughing.

**(5) Inflamed hernia**

Inflammation can occur from irritation or sepsis of contents within sac eg acute appendicitis or salpingitis, & also from external causes eg from a sore caused by an ill-fitting truss.

**On examination**

- (a) Hernia is tender but not tense.
- (b) Overlying skin becomes red & edematous.

**ANATOMICAL CLASSIFICATION**

Common varieties of abdominal herniae are inguinal, femoral, umbilical, epigastric & incisional, while the rare varieties are obturator, lumbar, gluteal & Spigelian.

**(1) Inguinal hernia**

It comes out through the superficial inguinal ring.

- (a) Indirect or oblique inguinal hernia comes out of the abdominal cavity through the deep inguinal ring, traverses all along the inguinal canal & ultimately becomes superficial through the superficial inguinal ring.
- (b) Direct inguinal hernia enters the inguinal canal through the medial half of its weak posterior wall (Hesselbach's triangle) & becomes superficial through the same superficial inguinal ring.
- (c) Inguinal hernia is said to be complete when the contents have reached the bottom of the scrotum. Otherwise the hernia is incomplete.

**(2) Umbilical hernia**

- (a) Infantile umbilical hernia is a hernia through a weak umbilical scar, usually the result of neonatal sepsis.
- (b) Paraumbilical hernia (supraumbilical or infraumbilical hernia) is a protrusion through the linea alba just above or sometimes just below the umbilicus.



Figure 11.1: Right inguinal & umbilical hernia.

**(3) Femoral hernia**

It comes out through the femoral canal & becomes superficial through the saphenous opening.

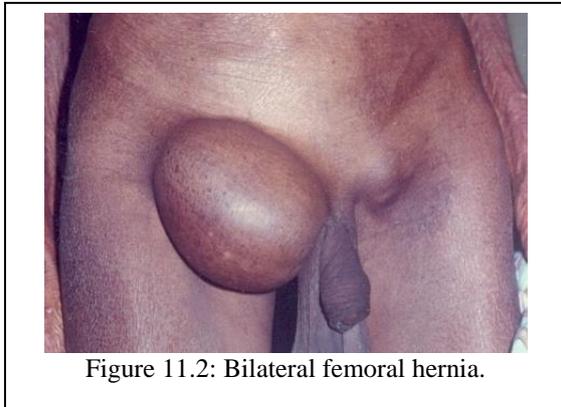


Figure 11.2: Bilateral femoral hernia.

**(4) Epigastric hernia**

It occurs through the linea alba anywhere between xiphoid process & umbilicus, usually midway between these structures. It commences as a protrusion of extraperitoneal fat, & when enlarges, it drags a pouch of peritoneum after it.

**(5) Incisional (postoperative) hernia**

This is a hernia through an acquired scar in abdominal wall, usually caused by previous



Figure 11.3: Incisional hernia.

surgical operation or accidental trauma.

**HISTORY OF GROIN HERNIA****Age**

Indirect inguinal hernia usually occurs in young

individuals, whereas direct hernia mostly affects older subjects.

**Sex**

- (1) Inguinal hernia is more common in males.
- (2) Femoral hernia is more common in females.

**Occupation**

Strenuous work is responsible for development of hernia. Of course, there should be associated underlying weakness of the abdominal muscles or persistence of processus vaginalis.

**COMPLAINTS****Pain**

- (1) In the beginning when there is a 'tendency to hernia' the patient complains of a dragging & aching type of pain which gets worse as the day passes. Pain may appear long before the lump is noticed. It continues so long as the hernia is progressing but ceases when it is fully formed.
- (2) Later the pain occur when hernia becomes complicated with obstruction &/or strangulation.

**Lump**

Many herniae may cause no pain & the patient presents because he/she noticed a swelling in the groin. But this is very rare & some sort of discomfort is almost always present. Ask the following sets of questions.

**How did it start?**

- (1) Spontaneously → Congenital hernia.
- (2) On straining like coughing or lifting weight → Acquired hernia.

**Where did it first appear?**

- (1) Start in the groin & gradually extended into the scrotum → Inguinal hernia.
- (2) Start below the groin crease & gradually ascends above it → Femoral hernia.

**What was the size & extent when it was first seen?**

- (1) If the hernia reaches the bottom of the scrotum at its first appearance, it is a congenital hernia developed into a preformed sac. It must be remembered that though it is a congenital hernia it may appear at any age.
- (2) In the acquired type the swelling is small to

start with & gradually increases in size.

***Does it disappear automatically on lying down?***

- (1) Direct inguinal hernia disappears automatically as soon as the patient lies down.
- (2) Indirect hernia reduces slowly or has to be reduced.
- (3) Femoral hernia often cannot be completely reduced.

**Systemic symptoms**

If the hernia is obstructing the lumen of bowel (incarcerated hernia) cardinal symptoms of intestinal obstruction will appear, ie colicky abdominal pain, vomiting, abdominal distension & absolute constipation.

**Other complaints**

The cause of the hernia must be enquired into;

- (1) Persistent coughing of chronic bronchitis.
- (2) Chronic constipation.
- (3) Prostatism of BPH.

**Note:** Leading questions may be asked to find out these complaints.

**PAST HISTORY**

- (1) Whether the patient had any operation or not? During appendectomy division of nerve may lead to weakness of the abdominal muscles at the inguinal region & a subsequent direct inguinal hernia.
- (2) Many a time the patient gives a previous history of hernia repair on the same side (recurrent hernia) or on the opposite side (right sided hernia generally precedes that of the left side).

**LOCAL EXAMINATION OF GROIN HERNIA**

**Exposure**

This includes whole abdomen down to the knees; both inguinal regions must be exposed. Many a times the patient complains of inguinal hernia of one side, but he/she may have another inguinal or other abdominal hernias.



Figure 11.4: Left direct inguinal hernia, in standing & supine positions.

**Position of the patient**

- (1) Patient is first examined in the standing position & then in the supine position.
  - (a) If you suspect the diagnosis from the history, start examination with the patient standing.
  - (b) If you discover a hernia during routine abdominal examination, complete the abdominal examination & then ask the patient to stand up.
- (2) While standing patient should be relaxed, must not bend forward while being examined.



Figure 11.5: Relative position of the patient & the examiner.

**Position of the examiner**

- (1) First sit in front of the standing patient for inspection, palpation, percussion & auscultation.
- (2) Then, go to the hernial side of the standing patient for palpation.
- (3) Finally palpate from the right side of patient lying down on couch.

**EXAMINATION WHILE THE PATIENT IS STANDING****Inspection**

Look at both inguinal regions simultaneously; patient may complain of right inguinal hernia & be unaware of a small hernia on the left side, & if you fails to detect it you will surely failed in a postgraduate exam.

**Swelling**

If a swelling is obvious note all of its features, as given in module 3, with particular emphasis on followings.

**(1) Site**

- (a) Inguinal hernia lies above the groin crease at the corner of mons veneris.
- (b) Femoral hernia lies below the groin crease at the medial end.

**(2) Size, shape & extent****(a) Indirect inguinal hernia**

- (i) It is pyriform in shape, with a stalk at the superficial inguinal ring.
- (ii) It usually extends down into the scrotum, on first appearance (congenital) or progressively with time (acquired).
- (iii) It may be small in size limited to inguinal canal (bubonocoele), moderate reaching the top of testis (funicular) or bottom of scrotum (complete), large with scrotum reaching mid thigh level, or massive with scrotum reaching the level of knee.

**(b) Direct inguinal hernia**

It is usually small, hemi-spherical in shape & shows little tendency to enter into the scrotum.

**(c) Femoral hernia**

It takes up ovoid or hemi-spherical shape,

starting from below the groin crease & ascends upwards.

**(3) Impulse on coughing**

- (a) The patient is asked to turn face away from the clinician & to cough. This is done to avoid the salivary shower from the patient.
- (b) Look carefully at the inguinal region.
  - (i) If a swelling already exists, it will expand during coughing as more abdominal contents will be driven out into the hernial sac due to increased abdominal tension (expansile cough impulse).
  - (ii) If a swelling was not present a momentary bulge may be seen synchronously with the act of coughing.
  - (iii) In some thin subjects there can be an oval-shaped longitudinal bulge produced on coughing, above & parallel to the medial half of the inguinal ligament; this is **Malgaigne's bulge**. It is a normal finding & not necessarily associated with a concomitant inguinal hernia. The key to the diagnosis of the latter is the protrusion of hernial contents through the superficial inguinal ring.
- (c) Presence of expansile cough impulse is almost diagnostic of a hernia, but absence of this sign does not exclude a hernia. If the neck of the sac is blocked by adhesions additional viscera will not get access into the sac during coughing.

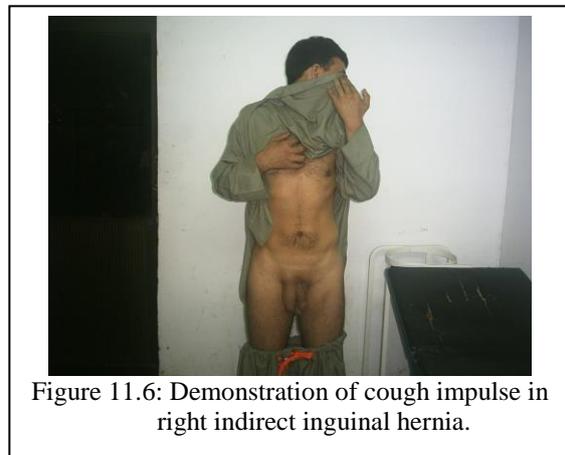


Figure 11.6: Demonstration of cough impulse in right indirect inguinal hernia.

**(4) Any other scrotal swelling**

Look carefully for any other scrotal swelling.

**Skin of inguinoscrotal region**

Examine the skin overlying hernia, as well as that of scrotum & penis; remember to lift the scrotum & penis to examine their under surfaces.

- (1) In uncomplicated hernia the overlying skin should be normal.
- (2) If the patient is using truss for a long time, discoloration & streaks of brown pigmentation due to deposition of hemosiderin may be seen. The subcutaneous tissue may be atrophied, so the skin may be wrinkled.
- (3) If the hernia is inflamed or strangulated the overlying skin may be reddened.
- (4) In case of recurrent hernia scar of previous operation will be evident. A wide, irregular, & puckered scar indicates wound infection following previous operation.



Figure 11.7: Inspection of scrotal undersurface.



Figure 11.8: Demonstration of 'get above the lump.'

**Expansile cough impulse**

While you are holding the necks of scrotum & can not get above the lump, ask the patient to cough.

- (a) Present in cases of hernia or congenital hydrocele.
- (b) Absent in infantile hydrocele.

**Traction test**

Testis is pulled downwards & with this the encysted hydrocele of the cord descends slightly & becomes fixed.

**Clinical findings**

- (a) Hernia may coexist with an epididymal cyst or hydrocele.
  - (b) Hematocele, spermatocoele, chronic epididymitis or testicular tumor may be present.
- (2) Palpate the penis & penile urethra for any lump, stricture or discharge (figure 11.9).

**Palpation from front**

- (1) Palpate the scrotum & its contents. If a swelling is found, decide whether it is hernia or true scrotal lump.

**Clinical technique & its interpretation****Get above the lump**

Hold the neck of scrotum between your thumb & index finger, using two hands simultaneously on both sides, & try to feel the structure underneath it.

- (a) If you clearly get above the lump & feel only the spermatic cord between your fingers, it is a true scrotal lump.
- (b) If you can not get above the lump & feel structures which are thicker than the spermatic cord, it is either a hernia or congenital or infantile hydrocele.

**Percussion from front**

- (1) In enterocele the note over hernia is resonant.
- (2) In omentocele & hydrocele the note is dull.

**Auscultation from front**

In enterocele gut sounds can be heard over the hernia.

**Palpation from side****Clinical techniques**

- (1) Now stand at the side of patient, on the same side as hernia. Place one hand on patient's back for support, & your examining hand on the lump (or on inguinal region if lump is not obvious) with your fingers & arm roughly parallel to the inguinal ligament.



Figure 11.9: Penis examination (from above down); undersurface, urethral orifice & urethra.

- (2) Remember to examine the other side, even if the patient complains of hernia on one side. Bilateral inguinal hernias are common, & a small hernia may be present on other side which becomes evident only on coughing.

### **Clinical findings**

Palpate the swelling systematically from all side, noting points as mentioned in module 3, with particular emphasis on following points.

#### **(1) Site & extent**

- (a) Inguinal hernia lies above the inguinal ligament & medial to the pubic tubercle.
  - (i) Indirect hernia usually extends into the scrotum.
  - (ii) Direct hernia rarely extends into the

scrotum.

- (b) Femoral hernia lies below the inguinal ligament & lateral to the pubic tubercle. But when it enlarges it can ascend above the inguinal ligament.

#### **(2) Size, shape & surface**

#### **(3) Temperature, tension & tenderness**

In strangulated hernia, temperature will be raised & the hernia will be tense & tender.

#### **(4) Consistency**

- (a) Doughy in omentocele.
- (b) Elastic in enterocele.
- (c) Cystic in hydrocele.

#### **(5) Cough impulse**

- (a) In hernia expansile cough impulse will be present.
- (b) It will be absent in case of strangulated hernia, incarcerated hernia & when the neck of the sac becomes blocked by adhesions which prevent fresh entrance of the contents into the sac.
- (c) Lipoma of cord & undescended testis in inguinal canal moves down on coughing & may come out through the superficial inguinal ring, but there is no true expansile cough impulse.

#### **(6) Fluctuation**

#### **(7) Translucency**

This should not be omitted even if the diagnosis of hernia is confirmed, because it may co-exist with a hydrocele.

## EXAMINATION WHILE THE PATIENT IS LYING

### Palpation

#### **Reducibility**

The patient is first instructed to lie down on the bed:

- (1) Direct inguinal hernia usually reduces spontaneously as soon as the patient lies down.
- (2) In reducible indirect inguinal hernia of long-standing, patient usually learnt the art of reducing the hernia. You may ask the patient to reduce the hernia & in majority of cases the patients can reduce it aptly.
- (3) **Taxis:** In the remaining cases, ask the patient to flex the thigh & knee of the affected side & to adduct it. This will not only relax the pillars of the superficial ring but will also relax the



Figure 11.10: Demonstration of taxis to reduce the left indirect inguinal hernia.

oblique muscles of the abdomen.

- (a) The fundus of the sac is gently held with one hand & even pressure is applied to it to squeeze the contents towards the abdomen while the other hand will guide the contents through the superficial inguinal ring.
- (b) Taxis must be carried out very gently. Undue force can rupture the sac extraperitoneally.
- (4) Note whether the contents reduce with gurgling; this occurs in an enterocele.
- (5) Note any difficulty in reduction;
  - (a) In enterocele the first part is often difficult to reduce but the last part slips in easily.

- (b) In omentocele the first part goes in easily while the last part is difficult to be reduce.
- (6) In case of femoral hernia similar maneuver is employed to reduce except for the fact that the contents are reduced through the saphenous opening.
- (7) If a hernia cannot be reduced, it is an irreducible, obstructed or strangulated hernia.

#### **Ring occlusion test**

This test can be performed in standing position, but it is better performed in lying down position; the hernia must be reduced first. It differentiates an indirect inguinal hernia from a direct inguinal hernia.

#### **Clinical techniques**

- (1) First step is identification of anatomical landmarks;
  - (a) Palpate the inguinal ligament, which is the only cord like structure in inguinal region & is felt easily.
  - (b) Follow the inguinal ligament laterally; the first bony landmark felt is the anterior superior iliac spine.
  - (c) Now follow the inguinal ligament medially, the first bony landmark felt is the pubic tubercle.



Figure 11.11: Demonstration of ring occlusion test; landmarks (above) & test (below).

<i>Indirect hernia</i>	<i>Direct hernia</i>
1) Common in children & young adults.	1) Common in elderly.
2) Pear shaped, & passes obliquely down the inguinal canal.	2) Hemi-spherical & bulges directly forwards.
3) Usually descends into scrotum.	3) Rarely descends into scrotum.
4) Reduces upwards, then laterally & backwards.	4) Reduces upwards & then straight backwards.
5) Does not come out with ring occlusion test.	5) Come out with ring occlusion test.
6) Defect is not palpable as it lies behind the external oblique muscle.	6) Defect may be felt above the pubic tubercle.

(d) Deep inguinal ring lie approximately 1.25 cm above the inguinal ligament midway between anterior superior iliac spine & pubic tubercle (ie midpoint on inguinal ligament).

(2) Now occlude the deep inguinal ring with your thumb, & ask the patient to cough.

#### **Clinical findings**

Since an indirect hernia comes out through the deep inguinal ring & a direct hernia medial to the ring, pressure over the deep inguinal ring will occlude the indirect hernia but not the direct hernia.

(1) Direct hernia will show a bulge medial to the occluding finger.

(2) Indirect hernia will not come out.

**Note:** In case of femoral hernia if pressure is exerted over the femoral canal, the hernia will not be able to come out.

#### **Zieman's test**

This differentiates between direct inguinal, indirect inguinal & femoral hernias. Hernia must be reduced first as done in ring occlusion test.

#### **Clinical techniques**

(1) Place the index finger over the deep inguinal ring, approximately 1.25 cm above the inguinal ligament between anterior superior iliac spine & pubic tubercle.

(2) Place the middle finger over the superficial inguinal ring, approximately 1.25 cm above pubic tubercle.

(3) Place the ring finger over the saphenous opening, approximately 4 cm below & lateral to the pubic tubercle.

(4) Then patient is asked to hold the nose & blow (this is better than cough).

#### **Clinical findings**

(1) In indirect inguinal hernia the impulse is felt on the index finger.

(2) In direct inguinal hernia the impulse is felt on the middle finger.

(3) In femoral hernia the impulse is felt on the ring finger.

#### **Tone of abdominal muscles**

Examine the tone of abdominal muscles to select the type of operation suitable for the particular case.

(1) Observe the patient in profile; this can be done when you are palpating the inguinal region from side. Undue protrusion of the lower abdomen denotes loss of tone.

**Table 11.2: EVALUATION OF GROIN HERNIA**

#### **HISTORY**

- 1) Age, sex & occupation
- 2) Complaints
  - a) Lump
  - b) Pain
  - c) Systemic complaints
  - d) Causative complaints

#### **LOCAL EXAMINATION**

##### **A) Examination while the patient is standing**

##### **1) Inspection from front**

- a) Swelling
- b) Skin of inguinoscrotal region

##### **2) Palpation from front**

- a) Get above the lump
- b) Expansile cough impulse
- c) Traction test

##### **3) Percussion from front**

##### **4) Auscultation from front**

##### **5) Palpation from side**

##### **B) Examination while the patient is lying**

##### **Palpation**

- 1) Reducibility
- 2) Ring occlusion test
- 3) Zieman's test
- 4) Tone of abdominal muscles

##### **C) Don't forget to examine**

- 1) General examination
- 2) Abdominal examination
- 3) Digital anorectal examination
- 4) Cardiovascular examination
- 5) Respiratory examination

Table 11.3: D/D OF INGUINAL HERNIA

**A) In male**

- 1) Femoral hernia.
- 2) Congenital hydrocele.
- 3) Encysted hydrocele of cord.
- 4) Spermatocele.
- 5) Undescended testis.
- 6) Lipoma of cord.

**B) In female**

- 1) Femoral hernia.
- 2) Hydrocele of canal of Nuck.

Table 11.4: D/D OF FEMORAL HERNIA

- 1) Inguinal hernia
- 2) Saphena varix
- 3) Enlarged femoral lymph node
- 4) Ectopic testis
- 5) Lipoma
- 6) Femoral aneurysm
- 7) Psoas abscess
- 8) Distended psoas bursa
- 9) Adductor longus rupture with hematoma
- 10) Hydrocele of femoral hernial sac

- (2) In recumbent position the patient is asked to raise the shoulders against resistance or lift both legs straight off the bed (Carnett's test). Palpate the muscles noting the strength of contraction.

**(3) Digital anorectal examination**

This should be done to identify whether BPH is the cause of hernia.

**(4) Cardiovascular & respiratory system**

This is required to assess the patient's fitness for operation, as well as to identify an etiology of hernia eg chronic obstructive pulmonary disease.

**EXAMINING A CHILD**

A small inguinal hernia is often invisible due to presence of thick pad of fat over the inguinal region. To make visible such a hernia following can be done.

- (1) Ask the child to jolt or jump from the examining table or deliberately make it cry, according to its age. Now palpate the spermatic cord as it emerges from the superficial inguinal ring. If there is a hernia the cord will be felt thicker than its fellow on the opposite side due to presence of hernial sac.
- (2) **Gornall's test:** The child is held from back by both hands of the clinician on its abdomen. The abdomen is pressed & the child is lifted up. This will make the hernia apparent by increasing intra-abdominal pressure.

**OTHER ABDOMINAL HERNIAS**

- (1) The patient is examined on same lines as given above & as given in module 3 for swelling;
  - (a) Inspection, palpation, percussion & auscultation while the patient is standing.
  - (b) Palpation while the patient is lying down.
- (2) Complete abdominal examination must be done, including digital anorectal examination.

**DON'T FORGET TO EXAMINE****(1) General examination****(2) Abdominal examination**

Examine the abdomen if this has not already been done, looking especially for any cause that raises the intraabdominal pressure eg large bladder, ascites, chronic intestinal obstruction, tumor, cyst or pregnancy.

# Module 12

## Abdomen: Anorectum

### HISTORY

### BLEEDING

#### **Amount**

This generally indicates the severity of underlying condition.

#### **Color**

This gives hint about the site of origin;

- (1) Bright red coming from rectum or anal canal.
  - (a) In a child, rectal polyp is the most common cause.
  - (b) In adults, hemorrhoid is the most common cause.
- (2) Dark red coming from ascending, transverse, descending or sigmoid colon.
- (3) Black ie melena from small intestine or higher.

#### **Relation to defecation**

Whether bleeding occur during or independent of the act;

- (1) In fissure in ano small amount of bleeding occurs at the time of passing hard stool. A streak of fresh blood may be frequently noticed on the side of the stool in both acute & chronic fissure in ano. With the advent of chronicity pain becomes the main symptom.
- (2) In hemorrhoids bleeding occurs at the time of passing stool, which is bright red & spatters all over the pan.
- (3) Bleeding occurring at times other than during defecation may be due to prolapsed piles, polypus, unreduced prolapse of the rectum, carcinoma, diverticulosis, ulcerative colitis etc.

### DISCHARGE OF PUS OR MUCUS

- (1) In fistula in ano the patient complaint of soiling of the clothes with purulent discharge coming from a perianal cutaneous orifice.
- (2) In ulcerative carcinoma of rectum the patient often passes a considerable quantity of blood stained, purulent & offensive discharge at the time of defecation.
- (3) Excessive mucus is also discharged in colitis, Crohn's disease & colloid carcinoma of rectum.

### PAIN

All pathological conditions below the Hilton's line are painful but above this line they are painless as long as they remain confined within the rectal wall. Inflammation or infiltration beyond the rectal wall is likely to be painful.

#### **Nature**

- (1) Throbbing pain occur in anorectal abscesses.
- (2) Sharp cutting pain occurs in anal fissure.

#### **Relation with defecation**

- (1) Pain is the main symptom of fissure in ano. It starts with defecation & persists for sometime after the act.
- (2) In fistula in ano the pain is intermittent.
  - (a) When the fistula becomes closed the pain appears & gradually increases as the discharge accumulates inside.
  - (b) Ultimately the fistula is forced open, the collection is voided & pain disappears.
- (3) Uncomplicated piles are absolutely painless; when they are complicated by secondary infection or strangulation, they become painful.

- (4) Carcinoma of rectum is painless initially. Later pain appears as the tumor infiltrates into the pelvic cellular tissue or sacral plexus (causing bilateral sciatica).
- (b) If it is more than 4 cm in length, it is a complete prolapse or procidentia i.e. prolapse of all coats of the rectum.

#### ABNORMALITY OF BOWEL HABIT

- (1) In carcinoma of rectum the altered bowel habit depends on the site & macroscopic feature of the tumor;
- In annular growth at the pelvirectal junction or in the sigmoid colon increasing constipation is the earliest symptom.
  - A proliferative growth in the ampulla causes a sensation of fullness in the rectum & the patient feels that his bowel has not been completely emptied after defecation.
  - In ulcerative growth, mucus, pus, blood & feces accumulate overnight & the patient on rising from the bed gets an urgent call to stool; this is called spurious morning diarrhea.
- (2) A growth in the lower part of anal canal may alter the shape of the stool which becomes either pipestem or tape like.

#### Tenesmus

This is an intense, painful but fruitless desire to defecate; rectum feels full, but when the patient tries to empty it, nothing appears. It is due to space-occupying lesion in the lumen or wall of rectum which mimics the presence of feces.

#### PROLAPSE

In prolapse, polypus & long-standing hemorrhoids the patient complains of something coming out of the anal canal during defecation.

- Enquire about the reducibility of the prolapse;
  - In 2nd degree hemorrhoids it reduces automatically after the act.
  - In 3rd degree hemorrhoids it needs to be replaced by pushing it in.
  - In 4th degree hemorrhoids it remains permanently prolapsed.
- Enquire about the length of the protruded mass;
  - If the protrusion is slight, it is partial rectal prolapse i.e. prolapse of the mucosa & submucosa only.

#### PAST & ASSOCIATED MEDICAL HISTORY

- In a case of fistula in ano a previous history of anal abscess is often obtained. This abscess has either burst spontaneously or has been incised.
- Fistula in ano may be found in cases of tuberculosis, Crohn's disease, ulcerative colitis, colloid carcinoma of rectum etc. So relevant questions must be asked to find out if the patient is suffering or was suffering from any of these diseases.
- Habitual constipation is often associated with hemorrhoids & fissures.
- In the case of prolapse a previous history of dysentery or severe diarrhea may be obtained.

#### FAMILY HISTORY

Familial adenomatous polyposis, hemorrhoids & carcinoma of rectum have genetic predisposition.

#### ANORECTAL EXAMINATION

Anorectal & vaginal examination are part of the routine abdominal examination, & are generally the last part of the complete physical examination. While it may cause the patient (& perhaps you) some embarrassment as well as discomfort, it provides important information & should not be skipped. Omission has often proved to be the cause of diagnostic delay, embarrassment to the physician who failed to perform them, & regret to all concerned. This includes proper counseling & explanation of procedure, positioning of the patient, inspection & palpation of perianal region, digital anorectal examination & proctoscopy.

#### POSITION OF THE PATIENT

##### *Left lateral position (Sims)*

- This is the most commonly used position for

ano rectal examination esp. in clinics, being performed on usual examination couch.

- (2) Patient lies on the left side, with buttocks projecting over the edge of table. Hips are flexed to  $90^\circ$  or more, while the knees are flexed to slightly less than  $90^\circ$  (to avoid patient's ankles coming in your way), or alternatively both hips & knees are fully flexed with knees taken near to the chest of the patient & ankles well clear of buttocks.
- (3) This position is suitable for inspection of the perianal region & proctoscopy, & is also more convenient for right-handed examiner.

#### ***Dorsal position***

- (1) This is used when either the patient cannot be moved laterally, because of possible spinal injury, or because the patient is too ill to turn into the left lateral position.
- (2) Patient lies semirecumbent with the knees flexed & the examiner passes his or her arm under the patient's right thigh to gain access to the anorectum.
- (3) Digital examination is used in conjunction with the other hand upon the lower abdomen, such that pelvic swellings can be assessed bimanually & that access to the rectovesical or rectouterine pouches can be made with minimal disturbance of the patient.
- (4) This position is not suitable for inspection around the anus.

#### ***Table prone (knee elbow) position***

This is adopted more commonly in the USA, & is esp. useful for examining anteriorly located perianal pathology, the prostate & seminal vesicles.

#### ***Right lateral position***

- (1) This is useful in case of carcinoma at the pelvirectal junction when it tends to fall downwards & towards the anus for better palpation by the examining finger.
- (2) It is also more convenient for left-handed examiner.

#### ***Lithotomy position***

- (1) Normally this position is adopted for examination under anesthesia (EUA), & performed only on operation tables (having side poles).
- (2) With the patient supine, the buttocks project beyond the end of the operating table & the



Figure 12.1: Patient's positions for anorectal examination (from above down); Sim's, right lateral, table prone & lithotomy.

- (3) This allows the most thorough examination of the pelvis & allows lesions high in the rectum

to be felt which might not be so in the other positions.

- (4) Bimanual examination can be conveniently performed.

**INSPECTION**

This part of examination should never be omitted.

**Clinical techniques**

- (1) First inspect both buttocks.
- (2) Then gently part the buttocks to inspect the anus & perianal area.

**Clinical findings**

- (1) In **gluteal & ischiorectal abscesses** the affected quadrant of buttocks will be red, swollen & edematous. Tenderness may be elicited when you part the buttocks to inspect anus in such cases.
- (2) **Soiling** may be seen due to incontinence or poor local hygiene.
  - (a) Minor anal seepage from hemorrhoids, fissure, fistula, proctitis, rectal polyp, prolapse or malignancy, from minor incontinence secondary to anal surgery, & from liquid stool from whatever cause may lead to itching, scratching & excoriation of the perianal skin.
  - (b) **Excoriation** may also result from;
    - (i) Primary skin disorders which may affect the perineum.
    - (ii) Fungal, viral & parasitic infections.
    - (iii) Hypersensitivity reactions to washing agents, toilet paper & even those topical agents applied in the hope of relieving the itching.
- (3) **Anal tag** may be present anywhere around the anus.
- (4) **Sentinel pile** (an anal tag) is more or less constant on the midline posteriorly, in chronic fissure in ano.
- (5) In **fissure in ano**, the anus will be found tightly closed & puckered. The lower end of fissure can just be seen in midline posteriorly, when the anal margins are gently separated. If found no attempt should be made to digital anorectal examination, & arrangements made for EUA.



Figure 12.2: Anorectal diseases on inspection (from above down); right ischiorectal abscess, acute anal fissure, & 4<sup>th</sup> degree hemorrhoids.

- (6) In **fistula in ano** one or more external orifices may be seen around anus. Note its position whether situated anterior or posterior to an imaginary line passing transversely through the



Figure 12.3: Anterior anal fistula (left), & posterior anal fistula (right).

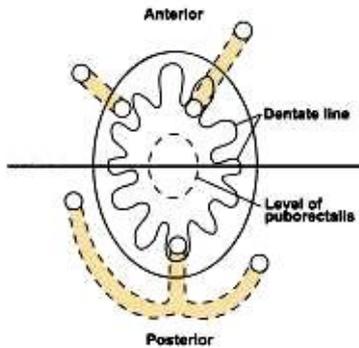


Figure 12.4: Illustration of the Goodsall's rule for anorectal fistulas. Note the curved nature of the posterior fistulas and the radial (straight) orientation of the anterior fistulas.

midline of anus. Its position gives a clue to the likely site of the internal opening.

**Goodsall's rule**

- (a) If the external orifice lies either behind the imaginary line or anterior to it but beyond 3 cm from the anus, the internal opening will be found on the midline posteriorly between the two sphincters, the fistulous track being curvilinear.
  - (b) When the external opening lies in front of the line within 3 cm of anus, the internal opening lies on the same radial line as the external opening, the track being straight.
- (7) Multiple sinuses may occur due to **hidradenitis suppurativa**.
  - (8) **Pilonidal sinus** is seen typically on the midline at the tip of the coccyx. A tuft of hair will be seen extruding through the sinus.
  - (9) **Condyloma** will be seen as flat, raised, white & hypertrophied epithelium at the mucocutaneous junction of the anus. They may also be present on the external genitalia & inside the anal canal.
  - (10) **Anal carcinoma** is mostly seen as an extensive ulcer with everted margin.
  - (11) When there is a history of **prolapse** ask the patient to strain as he would do during defecation, if required, in the squatting position. Note the protruded mass.
    - (a) In **rectal prolapse**, the mass will be circumferential; if the protrusion is less than 4 cm it is partial prolapse, whereas if



Figure 12.5: Pilonidal sinus (above), & pilonidal abscess (below).



Figure 12.6: Anogenital condyloma (above), & anal squamous cell carcinoma (below).



Figure 12.7: Complete rectal prolapse.

- more than 4 cm it is complete prolapse.
- (b) **4th degree hemorrhoids** also found protruding through the anus, but this protruded mass is divided in segments, usually at 3, 7 & 11 o'clock positions. 2nd, 3rd hemorrhoids will come into view when the patient strains.
  - (c) **External hemorrhoids** are seen covered with skin whereas internal hemorrhoids are covered with mucosa.
  - (d) At the anal margin olive-shaped subcutaneous **perianal hematoma** may be found.
  - (e) Very rarely polypus or **intussusception** may come out of the anal orifice.
- (12) **Melanoma** of the anus, though rare, may be seen as bluish black, soft mass which may be confused with a thrombotic pile.
  - (13) Look closely at the anus, ie its position in relation to ischial tuberosities at rest & on straining — **perineal descent**.
  - (14) Look for any **scars** from previous infection or surgery.

### PALPATION

Before digital examination palpation of the perianal region should be performed.

### Clinical techniques

Palpate systematically the perianal area, both buttocks & bottom of spine.

### Clinical findings

- (1) A swelling or an ulcer may be present in this region & should be examined as described in module 3 & 4. An indurated tender swelling with brawny edema on one side of the anus is usually due to an ischiorectal abscess.
- (2) Tracks leading from external openings of fistulae may course superficially & can easily be traced.
- (3) Apex of intussusception can be differentiated from the rectal prolapse. In the former a finger can be insinuated between intussusception & the anal margin, but in the latter this is not possible.

### DIGITAL ANORECTAL EXAMINATION

#### Clinical techniques

- (1) The patient should be briefed about the procedure, & instructed to open the mouth & breathe in & out deeply. The examination should be made gently & should not hurt the patient.
- (2) A well lubricated gloved finger should be used for this part of the examination.
- (3) Pulp of the index finger should be laid flat on



Figure 12.8: Technique of digital anorectal examination.

the anal verge, & gentle pressure is exerted till the sphincter yields. More pressure will gradually push the finger into the anal canal with rotatory movement. The tip of the index finger should not be introduced straight into the anus.

- (4) While the finger is within the anal canal & rectum, a systematic approach should be made to get all the necessary information.
- (5) A soft lesion of the rectal wall is likely to be felt on the downward stroke of the finger than in its upward course. So, as soon as a soft lesion is felt the finger is pushed up clear of the lesion till it reaches its upper limit. The finger is now flexed & withdrawn partially to feel the lesion properly.
- (6) At the end of digital examination always look at the examining finger for presence of feces, blood, pus or mucus.

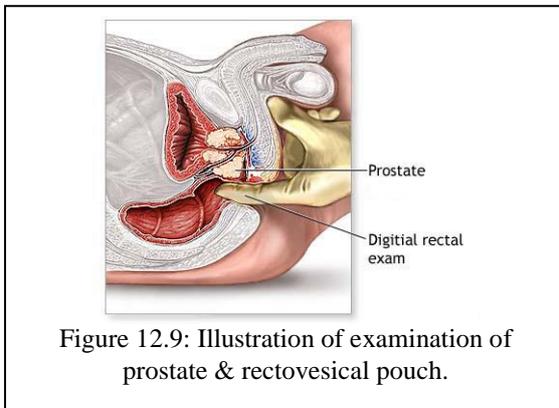


Figure 12.9: Illustration of examination of prostate & rectovesical pouch.

### Clinical findings

- (1) When the finger is in the anal canal note the tone of the sphincter, any pain or tenderness & any thickening of the wall of the anal canal.
- (2) Patients with fissures may have spasm of the sphincters & will complain of excruciating pain during digital examination. Examination may be deferred in these cases as necessary information cannot be gathered.
- (3) When finger enters the rectum, it should be pushed as high as possible. Information received in rectal examination can be divided into: intraluminal, intramural & extramural.

#### ***Within the lumen (intraluminal)***

- (1) Sometimes the rectum is found to be full of

hard feces, making a complete rectal examination impossible. Do examination at a later time, when the patient emptied bowel or after an enema.

- (2) Apex of an intussusception may occasionally be felt. Finger can easily insinuate between it & rectal wall all around the circumference.
- (3) In intestinal obstruction there may be ballooning of the rectum. This is evident by the fact that rectal wall can only be felt by bending the examining finger in the rectum. However this sign is not much reliable. False positive results are sometimes seen after administration of enema or in obstruction of the urinary tract presumably reflex in origin.
- (4) If a mass can be felt ask the patient to strain down. This will bring the mass further down for proper palpation.

#### ***In the wall (intramural)***

- (1) On initial insertion, the circular anal intermuscular groove can be felt just inside the anal orifice; this lies between the external & internal sphincter muscles.
  - (a) An assessment of internal sphincter tone can be made digitally with the patient at rest.
  - (b) Rotating the pulp of the finger around the circumference of the anal canal & asking the patient to squeeze allows a clinical assessment of external sphincter integrity. This takes much experience, especially the anterior sphincter aspect in females.
- (2) Further up the anorectal ring can be felt. It is about 3 cm above the anal verge; this marks the junction between the anal canal & rectum. Posteriorly it is best felt, due to sling like arrangement of the puborectalis part of levator ani muscle. These landmarks are important in determining the location of different anorectal abscesses or fistula in ano.
- (3) Above the anorectal ring the finger enters the spacious lower part of the rectum. The ascending finger may feel a soft fold of mucosa called valve of Houston.
- (4) Uncomplicated hemorrhoids cannot be felt with the finger; they are diagnosed by proctoscope. Only chronically inflamed, thrombosed or fibrotic hemorrhoids can be felt by digital examination.

- (5) Internal orifice of the fistula in ano is usually felt as a small dimple in the centre of an indurated area. Most frequently it is situated on the midline posteriorly between external & internal sphincters.
- (6) In cases of ulcer there is loss of normal smoothness of the rectal mucosa.
- Edge of the ulcer should be carefully palpated for induration & eversion (the pathognomonic features of a malignant ulcer).
  - Besides carcinoma, an ulcer may be due to tuberculosis, dysentery, gonorrhoea, soft sore, syphilis etc.
- (7) A polypus of the rectum is felt as soft round growth about the size of a small grape slipping under the finger. It may be possible to pull a polypus out of the anus & examine it thoroughly.
- (8) In cases of stricture the lumen of the rectum is constricted.
- Note the position & extent of such constriction, & the character of overlying mucosa, whether ulcerated or thickened.
  - Narrowing of the rectal lumen may be caused by pressure from outside in which case the mucous lining is perfectly smooth.
  - A stricture may be benign or malignant;
    - Benign stricture feels like a diaphragm with a clean cut hole in its centre. In lymphogranuloma inguinale the stricture is rubbery & tubular in character.
    - Malignant stricture feels hard, irregular & is often ulcerated.
- (9) About 90% of rectal cancer can be felt by digital examination & it is criminal not to perform anorectal examination in patients with any anorectal complaint.
- 75% of carcinoma of rectum occur in the lower part of the ampulla, where they tend to be papilliferous or ulcerative with everted edge.
  - Remaining 25% occur in the upper part of the rectum & are annular in shape.
  - Determine how much of the circumference of the rectum is involved by the growth.
  - Tumor may bleed readily during examination.
  - Determine whether the tumor is fixed or mobile.
  - Determine its local spread; whether the neighboring structures such as bladder & prostate or uterus & vagina anteriorly, & the sacrum & coccyx posteriorly are involved.

### ***Outside the wall (extramural)***

The structures around the rectum are explored systematically by palpating anteriorly, right lateral, left lateral & posteriorly.

#### ***Anteriorly***

- In males, the anatomical structures are the prostate, seminal vesicles, base of bladder & rectovesical pouch of peritoneum. [For clinical findings see module 10].
  - Normal prostate is 2-3 cm in size, firm, rubbery, & bilobed; its surface is smooth with a shallow central sulcus & the rectal mucosa can be moved freely over it.
  - A long digit may reach the seminal vesicles, especially if the patient is in the knee-elbow position.
- In females, the anatomical structures are uterus, cervix, vagina & rectouterine pouch (pouch of Douglas).
  - Uterus is felt as a tumor, whereas the cervix can be felt projecting through the anterior rectal wall which is popularly known as pons asinorum. It is a good practice to feel the cervix first & then follow to the uterus onwards.
  - Bimanual palpation can define the shape & size of the uterus, & any ovarian mass in a better way.
- Now try to feel the rectovesical or rectouterine pouch. The index finger when fully inserted reached about 2 cm above the floor of pouch of Douglas in female & about half that distance in the male. Presence of pus, blood, malignant deposit eg from carcinoma of the stomach or tumor of the sigmoid colon may be felt through the pouch.

#### ***Laterally***

The structures which are felt laterally are the ischio-rectal fossa, lateral wall of the pelvis, lower end of the ureters & internal iliac arteries.

- Tenderness of pelvic appendicitis can be elicited on right side.

- (2) In females fallopian tubes & ovaries may be palpable & rectal examination is of great help in diagnosing salpingitis, ovarian cysts & tumors. A mass may be palpable in case of ectopic pregnancy.
- (3) Ischiorectal abscess is often felt per rectum as an extremely tender & tense swelling on the side.
- (4) Rarely, a stone in the lower end of the ureter, & an aneurysm of the internal iliac artery may be felt.
- (5) Inflammation & growth from the bony wall of pelvis, central dislocation of hip joint, & fracture of the pelvic girdle may also be discovered.

**Posteriorly**

Hollow of the sacrum & coccyx are easily felt through rectum.

- (1) In coccydynia palpation by an index finger inside the rectum & a thumb over the coccyx helps to detect abnormal mobility & tenderness.
- (2) Sacrococcygeal teratoma & postanal dermoid can also be felt.

**BIMANUAL EXAMINATION**

Examination of pelvic contents can be conveniently made during rectal examination by placing another hand on the abdomen. This gives a better idea of the size, shape & nature of any pelvic mass. This is especially valuable in staging of bladder carcinoma (module 10).

**BIDIGITAL ANOVAGINAL EXAMINATION**

In a comparatively low lying lesion of the anterior rectal or posterior vaginal wall in parous women much valuable information is obtained either by an index finger in the rectum & a thumb in the vagina, or by inserting the left index finger into the vagina & right index finger into the rectum.

**ABDOMINAL EXAMINATION**

- (1) In case of annular carcinoma at the upper part of rectum an indistinct lump may be felt in left lower abdomen. This is descending colon loaded with hard feces, which pits on pressure

& thus distinguishes it from any solid swelling in this region.

- (2) Examine the liver for secondary metastasis.
- (3) Note also if there is any jaundice, hard subcutaneous nodules & free fluid within the abdomen.

**LYMPH NODES**

- (1) Carcinoma arising from rectum will metastasize to the iliac groups of lymph nodes. On deep palpation one may discover enlargement of these nodes particularly in thin patients.
- (2) Carcinoma arising from or involving the lower part of the anal canal below the pectinate line commonly spreads to the inguinal group of lymph nodes & these are easily palpable.

**DIAGNOSTIC PROCTOSCOPY****Instrument**

The simplest proctoscope as shown below is a cylindrical tube with a handle at one end & an

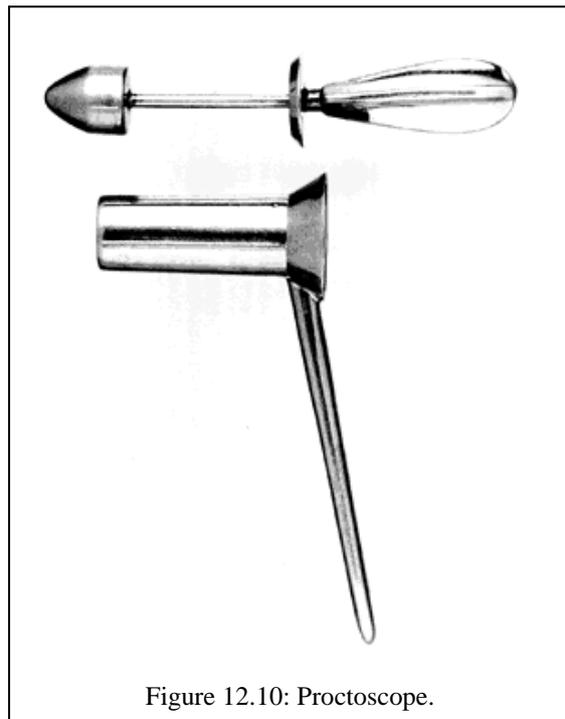


Figure 12.10: Proctoscope.

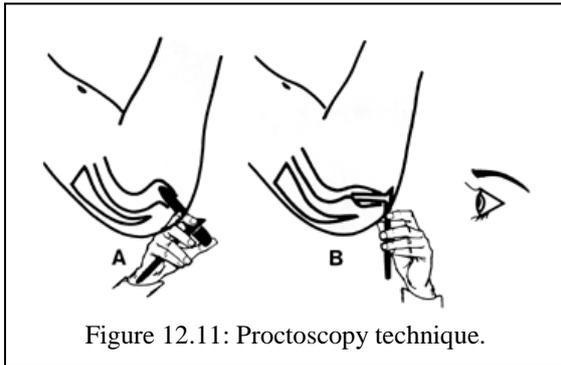
obturator for insertion into the anal canal. It should be 2cm or more in diameter for adequate visual inspection.

**Procedure**

- (1) Indications → All proctological complaints.
- (2) Contraindications → Nil.
- (3) Bowel preparation → Nil.
- (4) Position of patient → Left lateral or lithotomy position.
- (5) Anesthesia → Majority of patients do not require anesthesia. If pain results as in cases of fissures, the examination is terminated & proctoscopy is carried out under general anesthesia or sedation & pudendal block regional anesthesia.

**Clinical techniques**

- (1) The proctoscope with obturator is well lubricated & held in the right hand, as shown in figure.
- (2) It is slowly inserted towards the patient's umbilicus & into the curve of the sacrum.
- (3) The left hand now holds the proctoscope & the obturator is removed with the right hand.
- (4) Observations are made as the proctoscope is slowly withdrawn.

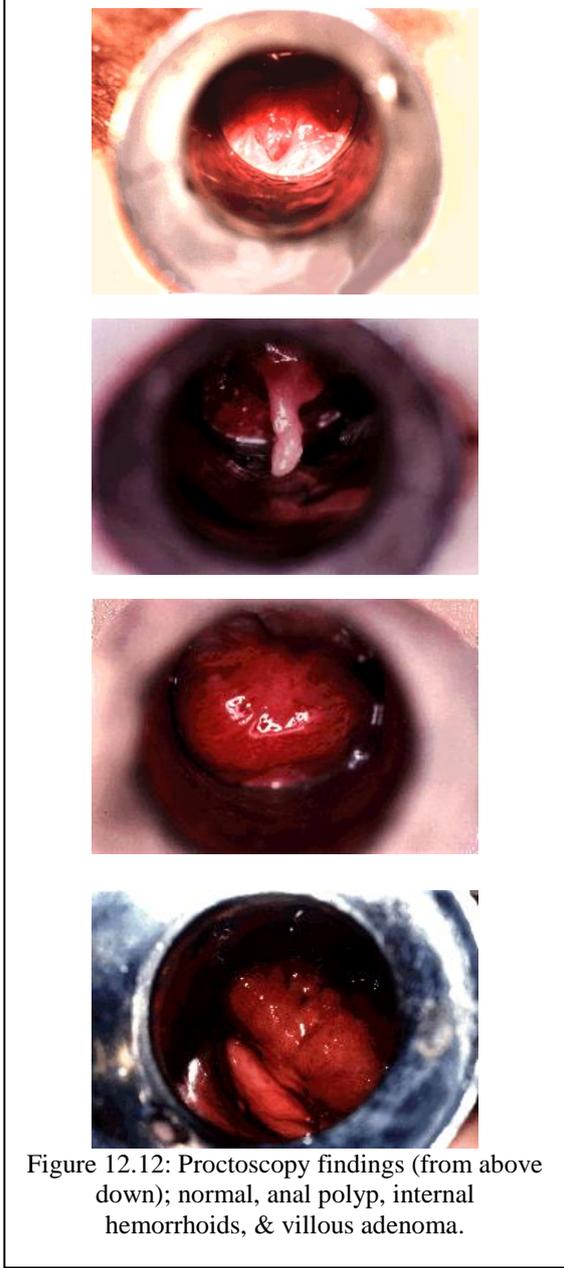


**Clinical findings**

**Normal findings**

From above down these are;

- (1) Typical colorectal mucosa, pink in color, with numerous folds.
- (2) Transitional zone approximately 1cm. Change from pink to purple with 8-14 vertical columns of Morgagni.



- (3) Dentate line → It has a serrated appearance with crypts and papillae. It demarcates ectoderm (below) from endoderm (above), sensitive area (below) from insensitive area (above), & stratified epithelium (below) from mucosa (above).

- 
- (4) The region of modified skin or anoderm is also about 1cm in width.

***Abnormal findings***

- (1) Followings can be identified as they bulge within the lumen of proctoscope;
- (a) Prolapsing hypertrophied anal papilla (anal polyp).
  - (b) Inflamed anal papilla.
  - (c) 1st, 2nd & 3rd degree internal hemorrhoids.
  - (d) Extensive villous adenoma.
- (2) Internal orifice of the fistula in ano can be identified.

# Module 13

## Abdomen: External Genitalia

### MALE EXTERNAL GENITALIA

#### HISTORY

##### Age

- (1) Torsion of testis occurs in young patients, usually between 10-25 years.
- (2) Similarly, epididymo-orchitis & funiculitis (inflammation of spermatic cord) is a disease of young age.
- (3) Encysted hydrocele of cord, lymph varix, varicocele etc. may present at any age.
- (4) Hydrocele is seen even in infants, but the primary hydrocele is most common over the age of 40 years. While the secondary hydrocele is commoner between 20 & 40 years of age.
- (5) Majority of epididymal cysts, spermatoceles occur in men above 40 years of age. Cysts of the epididymis, though congenital, appear in the middle aged men.
- (6) Testicular tumor occur in young to middle age group;
  - (a) Teratoma between 20-35 years.
  - (b) Seminoma between 35-45 years.
- (7) Carcinoma of the scrotal skin occurs after 50 years of age.

##### Occupation

- (1) Prolonged standing may be the cause of varicocele, eg in bus conductors.
- (2) Carcinoma of the scrotal skin is often caused by frequent contact (over many years) with soot (chimney sweep's cancer), tar or oil (mule spinner's cancer).

### Presenting complaints

#### Pain

- (1) In testicular torsion, acute epididymo-orchitis & funiculitis pain is the presenting symptom.
- (2) Tuberculous thickening of the cord, as an extension upwards from the epididymis, is also associated with pain.
- (3) In inguinal lymphadenitis, pain is associated with fever & swelling(s) above or below the groin crease.
- (4) Malignant extension upward from the testis may also be associated with pain.

#### Swelling

Swelling is the main presenting feature in case of hydrocele, encysted hydrocele of the cord, hematocele, varicocele, testicular tumor, diffuse lipoma of the cord, lymph varix etc.

##### (1) Mode of onset (How did it appear?)

- (a) Testicular tumors often grow silently without the knowledge of patient & in fact he may present with a lump in the epigastric or umbilical region due to secondary deposits in lymph nodes.
- (b) In hematocele there is history of trauma followed immediately by a swelling, which maintains this size for a long time.
- (c) In testicular torsion an exciting cause is almost always present like straining at stool, lifting a heavy weight or coitus. They cause violent contraction of spirally attached cremaster muscle, which favors testicular rotation around a vertical axis.
- (d) Acute epididymo-orchitis begins with an ache in the groin & slight rise of temperature. This is followed by severe

pain, a considerable rise of temperature with redness & swelling of the scrotum.

- (e) In filariasis periodic attacks of fever, pain & swelling of the spermatic cord & scrotum are the main features.
  - (f) In tuberculous epididymitis a slight ache or a trivial injury calls the patient's attention towards the testis.
  - (g) Injury to the bulb of urethra or bursting of a periurethral abscess is the usual history in extravasation of urine.
  - (h) In gummatous orchitis a trivial injury calls the patient's attention towards the already diseased testis.
- (2) **Site (where is the swelling & where did it appear first?)**
- (a) Inguinal hernia appears from above whereas infantile hydrocele, testicular tumor & varicocele appear from below.
  - (b) Encysted hydrocele of the cord & diffuse lipoma of the cord appear first in the cord & then gradually enlarge.
  - (c) Commonest place of ectopic testis is the superficial inguinal pouch, whereas undescended testis may give rise to the swelling in the inguinal region.
  - (d) In inguinal lymphadenitis, swelling(s) may be present above or below the groin crease, usually with overlying redness.
- (3) **Does it disappear automatically on lying down?**
- (a) Varicocele disappears spontaneously when the patient lies down with the scrotum elevated.
  - (b) A lymph varix also reduces spontaneously on lying down although slower than a varicocele.

#### **Any other complaints**

- (1) Patient with tuberculous epididymo-orchitis & funiculitis may present with symptoms like evening rise of temperature, excessive coughing, hemoptysis etc.
- (2) Rapid onset of varicocele with hematuria indicates renal carcinoma.

#### **Past history**

Previous history of periodic attacks of fever accompanied by pain & swelling of spermatic cord & scrotum is highly suggestive of filarial infection.

### **LOCAL EXAMINATION**

#### **Position of the patient**

- (1) Examine the patient in the standing position first & later in the recumbent position (as mentioned in module 11).
- (2) The patient is asked to hold the clothes up to expose the parts completely (top of abdomen to knees). He must not be allowed to bend forwards while he is being examined.

#### **Inspection**

Put on a pair of gloves prior to beginning. The gloves do not have to be sterile.

#### **Scrotum**

##### **(1) Skin & subcutaneous tissue**

Normally the scrotal skin is wrinkled & freely mobile over testis.

- (a) In epididymo-orchitis the skin will be red & edematous.
- (b) In hydrocele the scrotum is enlarged & the skin will be tense, with loss of normal rugosity.
- (c) Normal rugosity of the skin will also be lost in presence of underlying pathology such as tuberculous epididymitis, gummatous orchitis, teratoma & seminoma of the testis, in an otherwise normal size scrotum.
- (d) Multiple sebaceous cysts can occur in scrotal skin. Their features will be similar to sebaceous cyst anywhere in the body.
- (e) Carcinomatous ulcers may occur anywhere in the scrotum but the industrial cancers are common in the cleft between scrotum & thigh.
  - (i) These are small & circular with everted edge.
  - (ii) Floor is covered with yellowish grey infected necrotic tissue.
  - (iii) They usually discharge offensive, purulent or sero-sanguineous fluid.
- (f) Gummatous ulcer resulting from extension of a gumma of the testis lies always on the anterior aspect of the scrotum.
- (g) Tuberculous ulcer resulting from tuberculous epididymitis is always seen on the posterior aspect of the scrotum. These

positions are reversed if the testis is anteverted.

- (h) In severe infection the testis may protrude through the scrotum & appear as a granulating mass, referred as hernia testis.
- (i) Rarely the patient may present with gangrene of the scrotum, referred as Fournier's gangrene; testis may become exposed.
- (j) In watering can perineum there will be multiple sinuses.
- (k) Edema of scrotum & penis may be due to;
  - (i) Medical causes eg nephritis, heart failure, dengue hemorrhagic fever etc.
  - (ii) Surgical causes eg cellulitis, filariasis, blocking of lymphatics by cancer cells or following block dissection of inguinal lymph nodes, & extravasation of urine.
- (l) In filariasis thickening of the skin & subcutaneous tissues of scrotum may be so enormous that the scrotum assumes the size of a water melon (elephantiasis of scrotum), & the penis becomes buried in the scrotal swelling.
- (m) Another manifestation of filariasis is lymph scrotum in which the skin of the scrotum shows excessive rugosity with vesicles containing lymph. Rupture of these vesicles from friction will lead to profuse exudation of lymph (lymphorrea).

## (2) Swelling

Note all the features of swelling as mentioned in module 3.

- (a) Slight swelling of the scrotum is evident by loss of normal rugosity of scrotum. This is seen in any infection of testis & epididymis.
- (b) Epididymal cyst & spermatocele do not produce obvious swelling on inspection.
- (c) Hydrocele may bring forth various degrees of swelling of the scrotum — small to very big so as to hang up to knee level.
- (d) A localized swelling in the spermatic cord is encysted hydrocele of the cord whereas a diffuse swelling of cord may be a lipoma.
- (e) A swelling in the superficial inguinal pouch just above & slight lateral to the superficial inguinal ring with absence of



Figure 13.1: From above down; idiopathic scrotal edema, Fournier's gangrene, sebaceous cysts, & fungating testicular carcinoma.



Figure 13.2: Epididymo-orchitis (above), & condyloma (below).

testis in the scrotum is probably an ectopic testis.

- (f) Similarly a swelling in the inguinal region with absence of testis in the scrotum is an undescended testis.

### **Penis**

- (1) First examine the glans of the penis.
  - (a) If the patient is uncircumcised, draw back the foreskin so that you can look at the glans in its entirety.
  - (b) Make sure that you return the foreskin to its normal position at the end of the exam, else it can cause severe edema with venous & arterial obstruction, referred to as paraphimosis.
  - (c) Occasionally you will be unable to retract the foreskin from the glans, referred to as phimosis.
- (2) Look at the opening of the urethra.
  - (a) Make note of its site;
    - (i) More or less at the tip of the penis (normal).
    - (ii) On the upper surface (epispadias).
    - (iii) On the under surface (hypospadias).



Figure 13.3: Vaginal hydrocele (above), & encysted hydrocele of cord (below).



Figure 13.4: Phimosis (above), & paraphimosis (below).



Figure 13.5: Hypospadias.

- (b) Check for any obvious milky discharge suggestive of urethritis, a condition most commonly caused by the sexually transmitted diseases (gonorrhoea & chlamydia).
- (3) Look for any unusual curvature to the normally straight penis.
- (4) Examine at the base of penis for any skin abnormalities (eg pigmented areas, ulcers, vesicles etc.).

### Palpation

#### Scrotum

That the swelling is purely scrotal is confirmed by getting above the swelling (see module 11).

#### (1) Skin & subcutaneous tissue

- (a) If there is an ulcer, palpate it thoroughly as described in module 4.
  - (i) Carcinomatous ulcer has yellowish grey slough on the floor, hard base & everted margin. In the early stages it is freely mobile, but later becomes tethered to the underlying testis. At this stage it is difficult to decide whether the lesion is a primary skin cancer or a testicular tumor ulcerating through the skin.
  - (ii) Anteriorly placed ulcer which is fixed to the testis is probably a gummatous ulcer.
  - (iii) Posteriorly placed ulcer which is fixed to epididymis is a tuberculous ulcer.

- (b) Testis cannot be separated from the protruded necrotic mass in case of hernia testis, but the testis can be easily separated in hernia of a hydrocele.
- (c) Edema of the scrotum will pit on pressure.

#### (2) Swelling

This is examined in the usual line as discussed in module 3 & 12.

##### (a) Consistency

- (i) A localized cystic, fluctuant & translucent swelling is an encysted hydrocele of the cord.
- (ii) Lymph varix feels soft, cystic & doughy.
- (iii) Varicocele feels like a bag of worms.

##### (b) Cough impulse

Often a scrotal swelling is associated with a hernia, varicocele or lymph varix; omission of this test can miss the diagnosis. The root of the scrotum is held & the patient is asked to cough.

- (i) An expansile impulse is felt in hernia or congenital hydrocele.
- (ii) Varicocele & lymph varix give a thrill-like impulse on coughing.
- (iii) An undescended testis or lipoma of cord moves down on coughing.

##### (c) Reducibility

- (i) This is tested by raising the scrotum & compressing the swelling gently. Hernia, congenital hydrocele, varicocele & lymph varix are reducible, whereas vaginal hydrocele & other cystic lesions are irreducible.
- (ii) After reduction the superficial inguinal ring is pressed with a finger & the patient is asked to stand up. A varicocele & a lymph varix will gradually fill from below, but a hernia is prevented from coming down.

##### (d) Fluctuation

- (i) Hold the upper pole of the scrotal swelling between the thumb & the fingers of one hand to make the swelling tense & steady, while intermittent pressure is applied at the lower pole with the thumb & the fingers of the other hand. This will push the fluid inside the tunica vaginalis upwards, the thumb &



Figure 13.6: Demonstration of fluctuation.

fingers holding the upper pole of swelling will be pushed apart from each other making this test positive.

- (ii) Commonest cystic swelling is vaginal hydrocele (a collection of serous fluid in the tunica vaginalis). The two cardinal signs of a hydrocele are fluctuation & translucency.

**(e) Translucency**

- (i) This is best performed in darkness. A pencil torch is placed laterally, over the swollen scrotum. A red glow will be seen throughout the scrotum indicating presence of clear fluid inside the scrotum.
- (ii) Alternatively, in day light a roll of x-ray film placed on the other side of the scrotum can be used to see the glow. Do not place the torch on the posterior aspect of the scrotum & the roll of film anteriorly; testis comes in the way of the light & this test becomes false negative.
- (iii) Uncomplicated hydrocele & the cyst of the epididymis are translucent.
- (iv) Spermatocele & hematocele are not



Figure 13.7: Demonstration of translucency.

translucent as the containing fluid is not clear.

**(3) Testis**

Gently feel the testes, palpating the tissue between the thumb & next 2 fingers of your examining hand. The 'normal' side should be examined first so that an idea of the size, shape & surface of the unaffected side can be assessed before moving to the affected side. Note its site, size, shape, surface, consistency, weight, mobility & testicular sensation.

**(a) Site**

- (i) Normal, with epididymis posteriorly & body anteriorly.
- (ii) Anteverted, with epididymis anteriorly & the body posteriorly.
- (iii) Completely inverted ie upside down, with the globus major lying inferiorly.
- (iv) Incompletely inverted ie the testis lies horizontally; both inverted positions predispose to torsion of the testis.
- (v) Absent from the scrotum in undescended testis, ectopic testis & retractile testis.

**Note:** In general, the left testis lies a bit lower in the scrotum than the right.

**(b) Size, shape & surface**

- (i) Normal testes are smooth & ovoid, but vary in size both between individuals & within individuals (usually about the size of glans).



Figure 13.8: Empty scrotum (undescended testis).



Figure 13.9: Palpation techniques; elevation of testis (above), surface & consistency (middle), & cord (below).

- (ii) Smaller testis is an under-developed testis, whereas larger testis is often pathological, gummatous or a tumor.
  - (iii) Make careful note of any discrete lumps or bumps within the body of testis. The presence of a firm nodule would be worrisome for testicular malignancy.
- (c) **Consistency**
- (i) Hydroceles have a characteristic texture that is different from that of testicular tissue. You can also distinguish them from the body of the testis by trans-illumination.
  - (ii) Testicular tumors are firm to hard in consistency, which may be uniform or heterogenous eg in teratoma.
- (d) **Weight & effect of elevation**
- (i) This is assessed in respect of its size, by balancing the testis on the palm of the hand. Testis becomes relatively heavy in a case of neoplasm & old hematocele, but is comparatively light in a gumma of testis.
  - (ii) Elevation of the testis reduces the pain of epididymo-orchitis & makes it worse in torsion.
- (e) **Testicular sensation**
- (i) This is a peculiar sickening sensation felt by the patient when a mild pressure is applied on the testis.
  - (ii) In gumma & testicular tumor, the testicular sensation quickly dwindles away, more so in case of gumma.
  - (iii) In tumor one should be very gentle & should not squeeze roughly, otherwise the malignant cells will dislodged & spread to venous & lymphatic channels.
- (4) **Epididymis**
- (a) This is normally felt as a firm nodular structure attached to the posterior aspect of the testis. Its large upper part is known as head (globus major), the middle part as body & the lower as tail (globus minor).
  - (b) In tuberculosis the globus minor is first affected (infection being mostly retrograde), which becomes enlarged, nodular & slightly tender. Only in blood borne infection the globus major may be involved first. Gradually the whole epididymis becomes enlarged, firm, craggy & slightly tender. Finally, softening of the epididymis occur, with formation of cold abscess in the posterior aspect of scrotum.
  - (c) In filariasis the epididymis enlarges & becomes firm.
  - (d) Acute epididymo-orchitis is often gonococcal or E. coli infection from retrograde passage of urine, or is due to mumps.
  - (e) Remember syphilis attacks the testis & tuberculosis affects the epididymis; later on in both these conditions the disease

spreads to the other organ. In filariasis, both the testis & epididymis are simultaneously involved.

#### (5) Spermatic cord

The vas deferens, testicular artery/vein, ilio-inguinal nerve, lymphatics & fatty tissue make up the spermatic cord, a structure that runs from the epididymis up through the inguinal canal.

- (a) This is best palpated at the root of the scrotum between the thumb & the index finger simultaneously on both sides. The vas deferens will be felt as hard whipcord slipping between the thumb & the index finger. Besides the vas, the fingers normally feel a number of strings, which are nothing but fibers of cremaster muscle.
- (b) Dilated veins, referred as varicocele (feels like a bag of worms), will be palpable throughout the length of cord structures.
- (c) Spermatic cord is thickened & tender in any inflammatory condition of the epididymis, either acute or chronic.
- (d) Vas is thickened & beaded in tuberculous epididymitis.
- (e) Cord is not affected in syphilis but becomes thickened & slightly tender in filariasis.
- (f) In testicular tumor the growth may be extended upwards along the cord, which will feel hard & nodular.

#### Penis

- (1) Examine at the base of penis for any skin abnormalities (eg ulcers, vesicles etc.)
- (2) Shaft of the penis should be palpated & the two corpora cavernosa identified.
  - (a) Are there any underlying firm areas? Any unusual curvature to the normally straight penis?
  - (b) Palpable fibrous plaques within one or both corpora cavernosa represents Peyronie's disease which can cause pain on erection &/or angulation.
- (3) Glans can be the site of a number of inflammatory conditions, & benign, premalignant & malignant neoplasms.
- (4) Only the penile urethra can be examined externally.



Figure 13.10: Chancre (above), & erythroplakia (below).

- (a) Urethral meatus should be examined & opened, looking for abnormalities of position, neoplasms & meatal stenosis.
- (b) Remainder of the penile urethra can be palpated down the ventral aspect of the penis, between the testes & into the perineum. Along this line urethral diverticula, tumors or periurethral abscesses may be identified & sometimes the indurated tissue around a urethral stricture can be felt.
- (c) Milk the urethra towards meatus, checking for any obvious milky discharge suggestive of urethritis.

#### Percussion

- (1) Scrotal swellings are usually dull to percussion, as they are either cystic or solid lumps.
- (2) Resonant note can be heard if the swelling is a hernia containing intestine.
- (3) Tenderness can be elicited in inflammatory lumps.

#### Auscultation

Gut sounds can be heard if the swelling is a hernia containing intestine.

**DON'T FORGET TO EXAMINE**

- (1) **General examination**  
Look for other syphilitic stigmas in cases of gummatous orchitis.
- (2) **Lymph nodes**  
Lymphadenopathy can occur secondary to inflammation or tumor infiltration.
  - (a) Scrotal & penile skin drains into the inguinal group of lymph nodes.
  - (b) Coverings of the testis & spermatic cord (ie tunica vaginalis, & cremasteric & spermatic fasciae) drains to the internal & then to common iliac nodes.
  - (c) Testis & epididymis drain into the pre- & para-aortic lymph nodes at the level of origin of testicular artery from the aorta ie at the transpyloric plane.
  - (d) Left supraclavicular group of lymph nodes may be involved in testicular tumor, as in cases of malignancies in other abdominal organs, by lymphatic spread of malignant cells along the thoracic duct.
- (3) **Respiratory system**  
Lungs should be examined particularly in case of tuberculous epididymo-orchitis to exclude tuberculous affection of the lung, & malignancy of the testis to exclude secondary deposits in the lung.
- (4) **Abdominal examination**
  - (a) Abdomen should be examined thoroughly in cases of testicular tumor to exclude presence of palpable enlarged pre- & para-aortic groups of lymph nodes.
  - (b) Kidneys should be examined in cases of tuberculous epididymitis & varicocele of recent onset.
    - (i) In about 60% of cases there is either active tuberculosis in the renal tract or evidence of previous disease.
    - (ii) Varicocele may be a sequel to adenocarcinoma of the kidney of same side; this is due to spread of malignant cells along the lumen of renal vein (left side) or inferior vena cava (right side) to obstruct the testicular vein resulting in a varicocele.
- (5) **Digital anorectal examination**  
This should always be performed in epididymo-

orchitis either acute or chronic.

- (a) Acute prostatitis often precedes acute epididymo-orchitis.
- (b) Seminal vesicles are often enlarged & tender in cases of tuberculous epididymitis.

**FEMALE EXTERNAL GENITALIA****VAGINAL EXAMINATION**

Although vagina is mainly the territory of the gynecologist, diseases of the female reproductive organs can mimic conditions that present to general surgeons & vaginal examination is invaluable in the evaluation of these diseases. A clinician can gain further access to the pelvis & the organs within it, enabling more information to be gathered about their involvement in these diseases. For these reasons vaginal examination is a skill that should be acquired by those managing surgical conditions.

**Patient positioning**

- (1) It is usual for the surgeon to use the left lateral position rather than the usual lithotomy position used by gynecologists.
- (2) If it is desired to scrutinize the urethral orifice the dorsal position is better.
- (3) In gynecological practice it is wise to re-examine the patient bimanually in the lithotomy position after the bladder has been emptied.

**Clinical techniques**

- (1) The hands should be washed & a glove worn. In the general surgical setting the vaginal examination is carried out before or after rectal examination. For this reason the glove should be changed to avoid cross-contamination.
- (2) The right index & middle fingers are well lubricated.
- (3) After inspecting the external genitalia, the labia are separated by the thumb & the forefinger of the left hand.
- (4) Index finger is introduced into the vagina, followed, in women who have borne children, by the middle finger.



Figure 13.11: Inspection (above), & per vaginal examination (below).

- (5) First the cervix is located, & its characteristics are noted. The anterior, posterior and lateral fornices are palpated in turn.

### Clinical findings

#### **Vulva & introitus**

- (1) They are subject to all lesions found on the penis ie primary chancre, primary lesion of lymphogranuloma inguinale, chancroid, herpes simplex, leukoplakia, cancer & other subcutaneous lesions.
- (2) Papillomatous warts can be prolific, & sebaceous & Bartholin's cysts are also common.

#### **Palpation of Bartholin's (greater vestibular) glands**

- (a) Palpate the posterior part of labia majora between the finger & thumb. The gland lies more deeply & more posteriorly than one would expect.
- (b) While a fully formed abscess of a Bartholin's gland is obvious, nevertheless considerable enlargements of this gland (due usually to a retention cyst, but rarely to an adenocarcinoma) can be missed unless they are searched for correctly.



Figure 13.12: Sebaceous cysts (above), & Bartholin's abscess (below).

- (3) A vaginal discharge from the above conditions or uterine abnormalities may give rise to pruritus vulvae & there may be visible erythema, eczematous changes, excoriation & scratch marks.
- (4) Vaginal outlet (the introitus) is inspected & the presence or absence of the hymen is noted.
  - (a) Virginal hymen has a small sharp-edged opening that usually admits only the fingertip, but sometimes allows one finger to enter.
  - (b) In rare instances the hymen is imperforate, & after puberty it is seen to be bulging & purple from retained blood behind it.
  - (c) A slight bluish tinge of the introitus suggests early pregnancy.
- (5) Following conditions are analogous with imperforate anus but are unlikely to be detected in infancy as they are symptomless;
  - (a) Absent vagina.
  - (b) Imperforate hymen.
  - (c) Adherent labia minora.

**Urethra**

- (1) This is best done with the patient in the lithotomy position when the urethral orifice can be observed on parting of the labia majora.
- (2) Whole length of the urethra can be palpated through the anterior wall of the vagina; female urethra is about 2 cm long & contains the urethral sphincter mechanism.

**Vagina & uterus**

- (1) Determine the capacity of the vagina & the presence of any degree of vaginal vault descent, as well as the presence of any gynecological pathology.
- (2) Test the supporting musculature by asking the patient with an ample introitus to 'strain down', while looking for;
  - (a) Cystocele → Descent of the bladder through the anterior vaginal wall.
  - (b) Rectocele → Descent of the rectum through the posterior vaginal musculature; if present, musculature of the perineum is tested by bidigital anovaginal examination.
  - (c) Procidentia → Cervix appears at the introitus & becomes extruded to a varying degree, when the pelvic diaphragm & the ligaments supporting the uterus are defective.
- (3) Ask the patient to cough several times, when the competence of the sphincter urethrae is noted, as urine is spilled in cases of stress incontinence.
- (4) On digital palpation;
  - (a) Shape, size & surface of the os are assessed & irregularities noted for subsequent visualization.
  - (b) Size, position & attitude of the corpus of uterus are noted & the fornices are examined in turn, through which the pelvic contents are palpable.
  - (c) Torn cervix or the gross irregularity produced by carcinoma of the cervix can be detected.
  - (d) Fibromyoma (fibroid) are a painless, insensitive enlargement of the uterus which is nodular, hard & movable. Usually they are multiple & vary in size.
  - (e) Ovarian cyst is usually unilateral, & may become as large as to fill the abdomen.

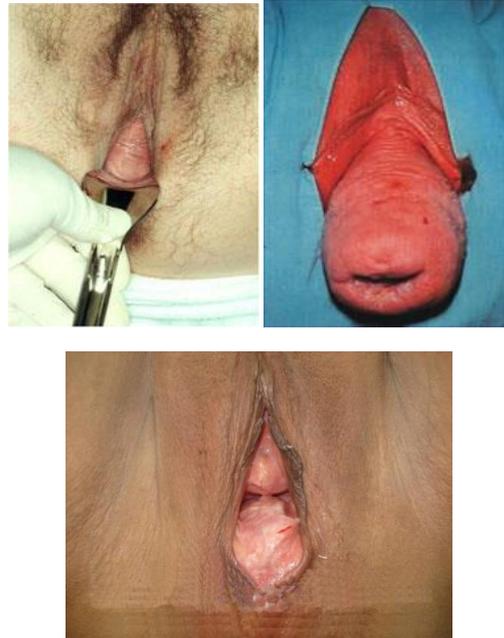


Figure 13.13: From above & left: Cystocele, procidentia, & rectocele.

- (f) Endometriosis is more difficult to diagnose;
  - (i) Patient is usually between 25 & 40 years of age.
  - (ii) Ovaries are enlarged, fixed, & somewhat tender.
  - (iii) Uterus may be slightly enlarged.
  - (iv) When right-sided, the condition is occasionally mistaken for an appendix abscess.
  - (v) Endometriosis also occurs rarely in the wall of bladder & the rectosigmoid, when it gives rise to signs of neoplasm of those organs.

**Vaginal discharge**

- (1) A small amount of whitish mucous vaginal discharge is normal, as well as bloodstained discharge due to menstruation, but bleeding is also present from an impending or recent abortion, ectopic pregnancy or uterine carcinoma.
- (2) A profuse whitish or purulent discharge denotes salpingitis, endometritis, cervicitis or, most commonly, vaginitis.

- (3) *Trichomonas vaginalis* infection causes profuse, watery, pale yellow, sometimes frothy discharge with intense pruritus.
- (4) Thrush (*Candida albicans* infection) leads to thick, yellowish discharge which is particularly excoriating.
- (5) In gonorrhoea, the discharge is purulent.

### **BIMANUAL EXAMINATION**

#### **Clinical technique**

The lubricated finger or fingers of the right hand are passed into, & are kept high in the vagina, while the left hand presses downwards & backwards above the pubic symphysis.

#### **Clinical findings**

- (1) Size & other characteristics of the uterus can be ascertained, especially whether it is in its normal anteverted position or is retroverted
- (2) Ovaries may be palpable & the mobility of any ovarian mass is assessed.
- (3) Fallopian tubes cannot usually be palpated but tenderness in the lateral fornices is marked in acute salpingitis, as is lateral movement of the cervix. A hydro- or pyosalpinx may be palpated.
- (4) Size & other characteristics of a pelvic swelling, whether or not it is attached to the uterus, whether it is cystic or solid, fixed or free, regular or irregular, can be ascertained.

### **EXAMINATION VIA SIMS SPECULUM**

- (1) For a full interpretation of the integrity of anterior & posterior vaginal walls, the patient should be turned into the left lateral position & a Sims speculum used to look for anterior & posterior wall vaginal prolapse.
- (2) Samples of secretions & any discharges taken for culture & cytology, & a cervical smear taken for cytological examination.



Figure 13.14: Sims speculum insertion (above), & inside view (below).

# Module 14

## Thyroid Gland

### HISTORY

#### Age

- (1) Simple goitre is commonly seen in girls approaching puberty. This is due to iodide deficiency in endemic areas, or due to goitrogens & dyshormonogenesis.
- (2) Simple goitre may appear in conditions of need eg puberty & pregnancy when requirement of hormone is augmented.
- (3) Both multinodular & solitary nodular goitres as well as colloid goitres are found in women of 20s & 30s.
- (4) In case of primary toxic goitre, the patients are usually young whereas in Hashimoto's disease the victims are usually middle aged women.
- (5) Risk of carcinoma is increased at either end of the age range & a discrete swelling in a teenager of either sex must be provisionally diagnosed as carcinoma.
  - (a) The risk increases as age advances beyond 50 years, & more so in males.
  - (b) Papillary carcinoma is seen in young girls, whereas follicular carcinoma in middle aged women.
  - (c) Anaplastic carcinoma is mainly a disease of old age.

#### Sex

- (1) All types of goitres, simple as well as toxic, are far more common in the female than in the males.
- (2) Incidence of thyroid carcinoma in women is about three times that in men, but a discrete

swelling in a male is much more likely to be malignant than in a female.

#### Residence

- (1) Simple goitre is endemic in areas where there is a very low iodide content in the water & food.
  - (a) Endemic areas are in the mountainous ranges, eg Himalayas, Vindhyas, Satpuda, Alps, Andes, & the Pennine chain of Derbyshire & Yorkshire.
  - (b) Endemic goitre is also found in lowland areas where the soil lacks iodide or the water supply comes from far away mountain ranges, eg Great Lakes of North America, Plains of Lombardy, Struma valley, Nile valley & Congo.
- (2) Calcium is also goitrogenic & goitre is common in low-iodine areas on chalk or limestone, eg Derbyshire & Southern Ireland.

#### Family history

- (1) Most common relevant family history is multinodular goitre.
- (2) Rarely, a patient may have a family history of medullary carcinoma of thyroid or even multiple endocrine neoplasia (MEN) or, very occasionally, papillary carcinoma.

### SYMPTOMS OF THYROID DISEASE

Thyroid gland disease can manifest by the presence of lump in the neck or alteration in endocrine activity of the gland.

#### Neck symptoms

**Lump in the neck**

Enquire about the onset, duration, rate of growth & associated pain.

- (1) Majority of thyroid swellings grow slowly & painlessly, but some lumps appear suddenly, & an existing lump may enlarge quickly.
- (2) A rapid change in the size of part of the gland, or of an existing lump, may be caused by hemorrhage into a necrotic nodule, a fast-growing carcinoma, or subacute thyroiditis. The sudden enlargement of a lump caused by hemorrhage is usually painful, but a fast-growing anaplastic carcinoma is not usually painful until it invades nearby structures.
- (3) A special feature of papillary & follicular carcinomas of the thyroid gland is their very slow growth. They may exist as a lump in the neck for many years before metastasizing.

**Pain**

The goitre is usually a painless condition.

- (1) Sudden increase in size with pain indicates hemorrhage within the goitre.
- (2) Inflammatory conditions are painful.
  - (a) Acute & subacute thyroiditis present with a painful gland.
  - (b) Hashimoto's disease often causes an uncomfortable ache in the neck.
- (3) Malignant diseases are painless to start with but become severely painful in late stages. Anaplastic carcinoma can cause local pain & pain referred to the ear if it infiltrates surrounding structures.

**Discharge**

In case of thyroglossal fistula a previous history of an abscess (an inflamed thyroglossal cyst) which was incised or burst spontaneously can be obtained.

**Discomfort during swallowing**

- (1) Large lumps give the patient a tugging sensation in the neck when she swallows; this is not true dysphagia.
- (2) Thyroid swellings rarely obstruct the esophagus because the esophagus is a muscular tube which is easily stretched & pushed aside. However, because the thyroid has to be pulled upwards with the trachea in the first stage of deglutition, an enlarged gland makes swallowing uncomfortable, even difficult.

**Dyspnea**

- (1) Deviation or compression of the trachea by a mass in the thyroid may cause difficulty in breathing. This is often worse when the neck is flexed laterally or forwards.
- (2) Whistling sound of air rushing through a narrowed trachea is called stridor.

**Hoarseness**

A change in the quality of the voice of a patient with a lump in the neck is alarming because it is probably caused by paralysis of one recurrent laryngeal nerve, which means that the lump is likely to be an anaplastic carcinoma infiltrating the nerve.

**Symptoms of thyrotoxicosis****Nervous system**

- (1) This is predominantly affected in primary thyrotoxicosis.
- (2) Symptoms are nervousness, irritability, insomnia, nervous instability & tremor of the hands; thyrotoxic psychosis can occur.

**Eye symptoms**

- (1) This is also predominantly affected in primary thyrotoxicosis.
- (2) Patient may complain of staring or protruding eyes & difficulty in closing her eyelids (exophthalmos), double vision caused by muscle weakness (ophthalmoplegia), & swelling of the conjunctiva (chemosis).
- (3) She may get pain in the eye if the cornea ulcerates.

**Cardiovascular system**

- (1) This is predominantly affected in secondary thyrotoxicosis.
- (2) Symptoms are palpitations, dyspnea on exertion, swelling of the ankles & chest pain.

**Metabolic & alimentary systems**

- (1) There is an increase in appetite but loss of weight, & sometimes a change of bowel habit, usually diarrhea.
- (2) Proximal muscle myopathies occur with wasting & weakness.
- (3) Patient has a preference for cold weather, with excessive sweating & an intolerance of hot weather.
- (4) Some women have a change of menstruation, usually amenorrhea.

**Symptoms of myxedema**

- (1) Increase of weight, with deposition of fat across the back of the neck & shoulders.
- (2) Slow thought, speech & action
- (3) Intolerance of cold weather.
- (4) Loss of hair, especially the outer third of the eyebrows.
- (5) Muscle fatigue.
- (6) Dry skin & 'peaches & cream' complexion.
- (7) Constipation.

**CLINICAL EXAMINATION**

This should be part of the general examination in every patient, but a detailed approach is required in patients presenting with thyroid symptoms. It requires assessment of both the anatomy (neck) & physiology (endocrine activity) in a combined approach.

**INSPECTION****Inspect the whole patient**

- (1) Is she sitting still & composed (hypo- or euthyroid), or fidgeting about, constantly moving her fingers & looking nervous & agitated (hyperthyroid)?
- (2) Is she thin (hyperthyroid) or fat (hypothyroid)? Where is the wasting or the fattening? Patients with thyrotoxicosis have a generalized loss of weight, especially about the face, but may also get wasting of their hand, face & shoulder muscles.
- (3) Is she under-clothed & sweaty (hyperthyroid), or wrapped up in a large number of jumpers but still cold (hypothyroid)?

**Inspect the neck**

Normal thyroid gland is not obvious on inspection. It can be seen only when the thyroid gland is enlarged.

**Deglutition test**

First step is to confirm that the swelling in the neck is in the thyroid gland.

**Clinical technique**

After checking that the lump is in the anatomical

site of thyroid gland, ask the patient to swallow; patient may need a sip of water to help deglutition.

**Clinical findings**

- (1) All thyroid swellings ascend during swallowing. This due to the fact that the thyroid gland is fixed to the larynx by Berry's ligament.
- (2) Other swellings which may move on deglutition are thyroglossal cysts, subhyoid bursitis & prelaryngeal or pretracheal lymph nodes fixed to the larynx or trachea.
- (3) Upward movement of the thyroid becomes greatly limited when it is fixed by inflammation or malignant infiltration. Skin can also be puckered & pulled up on swallowing, due to infiltration of carcinoma into the skin.

**General features of lump**

Pizzillo's method makes the neck & the swelling more prominent for easier inspection. This is especially valuable in obese & short necked individuals.

**Clinical technique (Pizzillo's method)**

Ask the patient to place her hands behind the head & to push her head backwards against her clasped hands.

**Clinical findings**

- (1) Note the pattern of thyroid gland enlargement;
  - (a) Diffuse enlargement of whole gland, eg physiological goitre, colloid goitre, Graves' disease, Hashimoto's disease.
  - (b) Enlargement of whole gland with scattered nodules of different sizes (multinodular goitre).



Figure 14.1: Graves' disease with exophthalmos.



Figure 14.2: Non-toxic multinodular goitre.

- (c) Isolated nodule in one lobe or isthmus.

**Causes**

- (i) Multinodular goitre.
  - (ii) Hemorrhage into a nodule.
  - (iii) Thyroid cyst.
  - (iv) Adenoma.
  - (v) Carcinoma (papillary or follicular).
  - (vi) Enlargement of whole of one lobe (usually Hashimoto's disease).
- (2) Observe the general contours & surface of the swelling.
  - (3) Skin may also be puckered & pulled up by swallowing if the patient has a thyroid carcinoma which has infiltrated into the skin.
  - (4) Note the presence of any swelling on the lateral side of the neck. This is usually caused by metastasis in cervical lymph nodes from an occult or otherwise known carcinoma of the thyroid gland.

**Retrosternal extension**

In retrosternal goitre, pressure on the internal jugular veins at the thoracic inlet gives rise to dilatation of the subcutaneous veins over the upper anterior part of thorax & neck.

**Clinical techniques & interpretation**

- (1) Look for the presence of obvious distended veins in neck & upper anterior chest wall.
- (2) Ask the patient to swallow & determine, on inspection, the lower border of the swelling as it moves up on deglutition. This is not possible in case of retrosternal goitre.
- (3) **Pemberton's test**  
The patient is asked to raise both the arms straight over the head, & maintained this position for a while.



Figure 14.3: Demonstration of Pemberton's test (negative in this case).

- (a) Congestion of face (plethora) & engorgement of neck & upper chest wall veins become evident in case of retrosternal goitre; this is due to obstruction of the internal jugular veins at the thoracic inlet.
  - (b) Respiratory distress & inspiratory stridor may also occur.
- (4) **Plunging goitre**  
Rarely whole of the enlarged thyroid gland lie in superior mediastinum & there is no obvious swelling in the neck. The goitre may become transiently visible when the intrathoracic pressure rises with coughing.

**Thyroid cartilage**

Look at the position of the thyroid cartilage. Is it in the centre of the neck or deviated to one side?



Figure 14.4: Carcinoma of thyroid with retrosternal extension &amp; cervical metastasis.

**Neck movements**

Check for flexion, extension & lateral movements of neck. This is necessary to know the presence of any cervical spondylolisthesis, as in case thyroid surgery is needed the patient is required to be placed on table with hyperextended neck.

**PALPATION**

In a reasonably slender person, a normal thyroid gland can be felt as a smooth firm structure that moves upwards on swallowing.

**Palpate the neck from front**

- (1) Most important part of palpation is done from behind, but it is worthwhile placing your hand on any visible swelling while standing in front of the patient, to confirm your visual impression of its size, shape & surface, & to find out if it is tender.
- (2) To get more information about a particular nodule of the thyroid gland one may ask the patient to extend the neck. This makes the nodule more prominent for better palpation.
- (3) **Crile's method:** Presence of small goitre can be appreciated by simply placing thumb on thyroid gland while asking the patient to swallow.
- (4) Measure & record the circumference of the neck with a tape measure (for future assessment).
- (5) Check the position of the trachea.
  - (a) This is best done by feeling with the tip of two fingers in the suprasternal notch. The trachea should be exactly central at this point.
  - (b) When a thyroid mass extends below the suprasternal notch & obscures the trachea you must examine the thyroid cartilage. A mass which is displacing the trachea will tilt the thyroid cartilage laterally.

**Palpate the neck from behind****Clinical techniques**

- (1) Stand behind the patient. Place your thumbs on the ligamentum nuchae & tilt the head slightly forwards to relax the anterior neck muscles. Let the palmar surface of your fingers rest on each



Figure 14.5: Demonstration of palpation from behind.

- side of the neck. They will be resting on the lateral lobes of the thyroid gland.
- (2) Additional information about one lobe may be obtained by relaxing the sternomastoid muscle of that side by flexing & rotating the face to the same side.
- (3) **Lahey's method:** A small lobe can be made prominent & easier to feel by pressing firmly on the opposite side of the neck.
  - (a) To palpate the left lobe, the thyroid gland is pushed to the left from the right side by the right hand of the examiner.
  - (b) It can also be done from front.
- (4) Palpate complete chain of cervical & supraclavicular lymph nodes (see module 15).

**Clinical findings & interpretations****(1) Confirmation of thyroid lump**

Ask the patient to swallow while you are palpating the gland to confirm that it moves up with swallowing.

**(2) Retrosternal extension (get below the thyroid gland)**

Swallowing also lifts up lumps that are lying behind the sternum, into the reach of your fingers. Make careful assessment of the lower margin, which is not possible in case of retrosternal extension.

**(3) Extent of involvement**

- (a) Note whether the whole thyroid gland or one lobe or part of a lobe is enlarged.
- (b) When a swelling is localized, note its site, size, shape, extent & consistency.

**(4) Surface**

- (a) Smooth → Primary thyrotoxicosis or colloid goitre.
- (b) Bosselated → Multinodular goitre.



Figure 14.6: Solitary nodule, right lobe of thyroid.

(5) **Consistency**

- (a) Firm → Primary thyrotoxicosis, Hashimoto's disease.
- (b) Slightly softer → Colloid goitre.
- (c) Hard → Riedel's thyroiditis or carcinoma in which the consistency may be variable in places. A cystic swelling in the thyroid gland often feels firm due to great tension within the cyst which is surrounded by relatively soft surrounding tissue of the gland; a calcified cyst may even feel hard.

(6) **Mobility**

- (a) The mobility should be noted in both horizontal & vertical planes, with sternocleidomastoid muscles in both relaxed & contracted states.
  - (i) Place your palm under the patient's chin & ask to push on your palm. This makes both sternomastoids to become taut simultaneously.
  - (ii) Alternatively, you can taut one sternomastoid at one time by placing your palm on patient's opposite side of face (mandible) & asking to push on it.
- (b) Fixity means malignant tumor or chronic thyroiditis.

(7) **Tracheal obstruction**

- (a) As the patient breathes a harsh noise is produced by the passage of air through the partially obstructed trachea (stridor).
  - (i) If the obstruction is slight the stridor can only be heard in a quiet room.
  - (ii) In suspected cases, slight push on the lateral lobes will produce stridor (**Kocher's test**).
- (b) Later, dyspnea, cyanosis & restlessness make the diagnosis obvious.

- (c) Narrowing of the trachea is found in carcinoma of thyroid, retrosternal goitres, the 'scabbard' trachea of longstanding multinodular goitre, & in Riedel's thyroiditis.

(8) **Carotid sheath (Berry's sign)**

- (a) It may be pushed backward & outward by a benign swelling of the thyroid gland, & the pulsation of the carotid artery may be felt behind the posterior edge of the swelling.
- (b) A malignant thyroid may engulf the sheath completely & pulsation of the artery cannot be felt.

## PERCUSSION

- (1) Percussion can be done when standing in front of or behind the patient.
- (2) It is used to define the lower extent of a swelling that extends below the suprasternal notch by percussing along the clavicles & over the sternum & upper chest wall. Percussion of the lump in the neck itself is rarely helpful.



Figure 14.7: Demonstration of percussion.

## AUSCULTATION

- (1) Listen over the swelling (at the upper poles of thyroid gland). A systolic bruit can be heard in thyrotoxicosis due to increased vascularity of the gland.
- (2) Position of the larynx & trachea may be assessed by placing stethoscope on the suspected zone. Passage of air will indicate the position of the trachea.



Figure 14.8: Demonstration of auscultation.

**DON'T FORGET TO EXAMINE**

**Examine the mouth**

**Tongue protrusion test**

**Clinical techniques**

Ask the patient to open her mouth (to fix the jaws) & then to protrude her tongue. While this position is maintained, observe the back of tongue with torch light.

**Clinical findings**

- (1) Thyroglossal cyst moves upwards with protrusion of the tongue, as the thyroglossal duct extends downwards from the foramen cecum of the tongue to the isthmus of the thyroid gland.
- (2) Tremor of tongue will become evident in primary thyrotoxicosis.
- (3) Swelling (lingual thyroid) may be seen at the back of tongue, which may be the only functioning thyroid tissue.
- (4) Thyroglossal fistula is seen near the midline a



Figure 14.9: Lingual thyroid.

little below the hyoid bone. The opening is indrawn & overlaid by a crescentic fold of skin, & it characteristically drawn upward on deglutition & tongue protrusion.

**Examine the eyes**

**Thyrotoxic ophthalmopathy**

Ophthalmopathy occur in about 85% patients with Graves' disease (thyrotoxicosis). It progresses through 4 stages, & may be unilateral or bilateral.

**(1) Lid retraction & lid lag**

These are caused by over-activity of the involuntary (smooth muscle) part of the levator palpebrae superioris muscle.

**(a) Stellwag's (Dalrymple's) sign**

The upper eyelid is higher than normal (lid retraction) & the lower lid is in its correct position, so that sclera is visible above the superior limbus (figure 14.1).

**(b) Von Graefe's sign**

**Clinical technique**

Move your index finger from above downwards, about one foot away from patient's eyeball.

**Clinical findings**

- (i) Normally patient's upper eyelid follows examiner's finger, ie move above downwards.

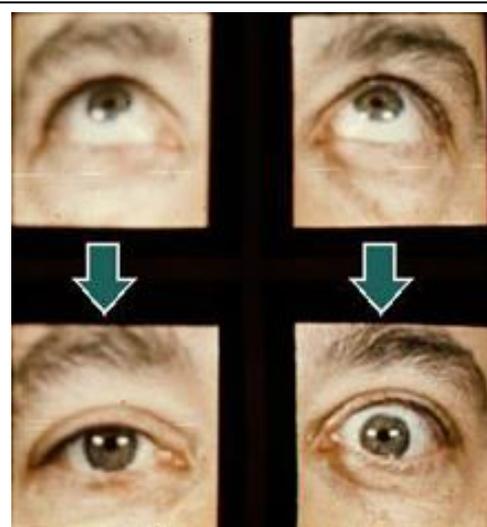


Figure 14.10: Demonstration of lid lag (right), as compared to normal (left).

**EYE SIGNS OF PRIMARY THYROTOXICOSIS**

- Lid retraction & lid lag
  - Stellwag's (Dalrymple's) sign
  - Von Graefe's sign
- Exophthalmos
  - Naffziger's test
  - Joffroy's sign
- Ophthalmoplegia
  - Inability to look up & out
  - Moebius's sign
- Malignant exophthalmos
  - Chemosis
  - Corneal ulcer
  - Impaired color vision

- (ii) In Graves's disease the upper lid does not keep pace with the eyeball as it follows a finger moving from above downwards, ie the patient has lid lag.

**(2) Exophthalmos**

The eyeball is pushed forwards by an increase in retro-orbital fat, edema & cellular infiltration; sclera becomes visible below the lower edge of the iris (the inferior limbus).

**(a) Naffziger's test**

It differentiates false exophthalmos due to lid retraction from true exophthalmos.

**Clinical technique**

Stand behind the seated patient & tilt her head backwards. Observe the eyeballs, your plane of vision being that of the superciliary ridges.

**Clinical findings**

Normally the eyeball is beneath the superciliary ridges, but it rises out & become readily apparent in true exophthalmos.



Figure 14.11: Naffziger's test revealing left exophthalmos.



Figure 14.12: Demonstration of Joffroy's test.

**(b) Joffroy's sign****Clinical technique**

Stabilize the patient's head with your hand & asks her to look upwards.

**Clinical findings**

- (i) Normally wrinkling appears over the forehead.
- (ii) In exophthalmos the patient can look up without wrinkling her forehead.

**CAUSES OF EXOPHTHALMOS****Bilateral**

- Graves' disease

**Unilateral**

- Graves' disease
- Cavernous sinus thrombosis
- Tumors of orbit, eg dermoid, optic nerve glioma, neurofibroma.
- Pseudotumors of orbit.

**(3) Ophthalmoplegia**

Weakness of the ocular muscles associated with severe exophthalmos is due to edema & cellular infiltration of the muscles themselves & the oculomotor nerves.

**Clinical techniques**

Patient's eyeballs are tested for their full range of movements (upwards, downwards, inwards, outwards & convergence), & inquiry made if any causes diplopia.

**Clinical findings**

- (a) Muscles most often affected are the superior rectus, lateral rectus & inferior oblique muscles. Patient can not look upwards & outwards.
- (b) Later, difficulty in convergence (**Moebius's sign**) occur.



Figure 14.13: Ophthalmoplegias.

**(4) Malignant exophthalmos**

Sometimes, despite thyrotoxicosis treatment, the exophthalmos continues to increase & visual acuity becomes impaired by one or more of the following complications.

- (a) Chemosis (edema of the conjunctiva) can occur, due to obstruction of the normal venous & lymphatic drainage of the conjunctiva by increased retro-orbital pressure
  - (i) Normal conjunctiva is smooth & invisible.
  - (ii) A thickened, crinkled, edematous & slightly opaque conjunctiva is easy to recognize.
- (b) Corneal ulcer can occur in severe exophthalmos as the patient cannot close her eyelids.
- (c) Ischemia of cone receptors at fovea can occur, due to traction on the optic nerve by bulging forward of the eyeball. Reduced visual acuity & increasingly impaired color vision are apparent

**Horner's syndrome**

This is due to pressure effect of goitre on sympathetic trunk, & it suggests the malignant nature of goitre. It is characterized by;

- (1) Enophthalmos (slight sinking of the eye-ball into the orbit).
- (2) Pseudoptosis (slight drooping of the upper eye lid).



Figure 14.14: Horner's syndrome.

- (3) Miosis (constriction of the pupil).
- (4) Anhidrosis (absence of sweating of the affected side of the face).

**Examine the hands****(1) Pulse**

- (a) Tachycardia without rise of temperature indicates primary toxic goitre (Graves' disease). Sleeping pulse rate is more diagnostic.
  - (i) In mild thyrotoxicosis, it is below 90/minute.
  - (ii) In moderate thyrotoxicosis it is between 90 to 110 per minute.
  - (iii) In severe thyrotoxicosis it is above 110/minute.
- (b) Regularity of the pulse may be disturbed in

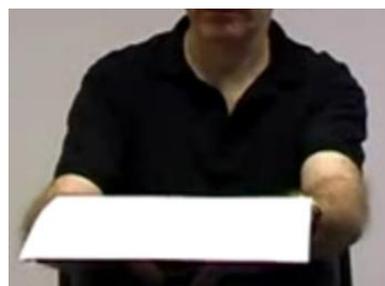


Figure 14.15: Demonstration of hand tremors.

secondary thyrotoxicosis, & a rapid irregular pulse should arouse suspicion of atrial fibrillation.

(c) Bradycardia indicates myxedema.

### (2) *Palmer surface*

Note whether the palms moist & sweaty. In primary thyrotoxicosis the palms are hot & moist; the patients cannot tolerate hot weather, on the contrary tolerance to cold is increased.

### (3) *Tremors*

#### *Clinical technique*

Ask the patient to hold her arms out in front of her with elbows & wrists straight, fingers straight & separated. If in doubt, place a piece of paper on to the patient's fingers.

#### *Clinical findings*

In primary thyrotoxicosis a fine tremor will be exhibited at the fingers. This is due to sympathetic overactivity.

## Examine the legs

### (1) *Pretibial myxedema*

- It is thickening of the skin by a mucin-like deposit, & nearly always associated with true exophthalmos, past or present hyperthyroidism, & high levels of TsAb.
- Earliest change is shiny red plaque of thickened skin with coarse hairs, which may be cyanotic when cold.
- In severe cases, skin of whole leg below knee is involved, together with that of the foot & ankle, & there may be clubbing of the fingers & toes (**thyroid acropachy**).



Figure 14.16: Pretibial myxedema.

### (2) *Ankle jerk*

- In thyrotoxicosis, it is hyper-reactive.
- In hypothyroidism, it is sluggish with prolonged relaxation period.

## GENERAL EXAMINATION

In general examination one should look for;

- Primary toxic manifestations in case of goitres affecting the young;
  - Exophthalmos.
  - Tachycardia.
  - Fine tremor of hands & tongue.
  - Moist skin.
  - Thyroid bruit.
  - Weight loss.
- Secondary toxic manifestations in nodular goitre (multinodular goitre or adenoma), usually in elderly patients.
  - Cardiovascular system is mainly affected.
    - Atrial fibrillation is quite common.
    - Heart may be enlarged.
    - Signs of cardiac failure eg edema of the ankles, orthopnea, dyspnea while

### EXAMINATION OF A PATIENT WITH GOITRE

- Inspect the whole patient for agitation, nervousness or lethargy.
- Inspect the neck.
  - Deglutition test.
  - Characteristics of lump
  - Retrosternal extension
    - Lower border of lump
    - Pemberton's test
    - Plunging goitre
  - Position of thyroid cartilage
  - Neck movements
- Palpate the neck
  - Lump from front
  - Lump from behind
  - Cervical lymph nodes from behind.
- Examine the mouth.
  - Tongue protrusion test for thyroglossal cyst & tremor.
  - Lingual thyroid.
- Examine the eyes.
- Examine the hands for sweating, tremor, tachycardia.
- Examine the legs.
  - Pretibial myxedema
  - Ankle jerk

- walking up the stairs may be observed.
- (b) Exophthalmos & tremor are conspicuous by their absence.
- (3) Manifestations of hypothyroidism;
- (a) Mental slowness.
  - (b) Face → Bloated look with puffiness of eyelids, ill-marked outer halves of eyebrows & a burgundy 'malar' flush of the cheeks.
  - (c) Bradycardia.
  - (d) Cold hands.
  - (e) Supraclavicular pads of fat & a fatty hump overlying 7<sup>th</sup> cervical vertebra.
  - (f) Psuedoedema.
- (4) Search for metastasis in case of malignant thyroid diseases, eg when the thyroid swelling appears to be stony hard, irregular & fixed losing its mobility even during deglutition.
- (a) Examine the cervical lymph nodes for metastatic enlargements. Sometimes, only the cervical nodes are palpable (metastatic deposits), while the thyroid gland itself remain impalpable; this suggests occult papillary carcinoma.
  - (b) Look for distant metastasis eg bony metastasis which is quite common in thyroid carcinoma especially the follicular type. The skull, spine, ends of the long bones, & pelvis should be examined for metastasis.
  - (c) Lastly metastasis in the lungs, which is not uncommon, should also be excluded.

# Module 15

## Neck

### HISTORY

#### Age

- (1) Sternomastoid tumor occurs in the new born baby & there is often a history of difficult labor.
- (2) Both branchial cyst & branchial fistula, though congenital, are more often seen in early adult life.
- (3) Cystic hygroma occurs in infancy or in early childhood.
- (4) Inflammatory swellings may occur at any age but commonly seen in early adults.
- (5) Carcinomatous swelling is more common in the old.

#### Swelling

Enquire along the same line as given in module 3, asking for site, mode of onset, duration, associated symptoms, progress, disappearance, multiplicity, systemic effects & previous treatment.

#### Duration

- (1) Swellings with long history are generally benign.
- (2) Quickly grown swellings within a short span of time are mostly malignant tumors.

#### Associated pain

Whether the swelling is painful or not?

- (1) Inflammatory swellings are always painful.
- (2) A swelling in the submandibular triangle particularly seen during meals with pain is due to calculus obstruction of the duct of the submandibular gland.

#### Head & neck symptoms

- (1) Skin, mouth, nose, larynx & pharynx are common sites for neoplasms, which commonly presents with cervical lymphadenopathy.
- (2) Ask about sore mouth, sore tongue or sore throat, nasal discharge or blockage, dysphagia, dyspnea, changes in voice, or lumps or ulcers on the skin of head & face that have changed size or begun to bleed.

#### Systemic symptoms

- (1) Ask about general malaise, fever, rigors & contact with persons with infectious diseases, indicating an infective cause of the swelling.
- (2) Ask about anorexia & weight loss. If present do full systemic review (module 1); pulmonary, alimentary & skeletal symptoms may suggest the site of primary neoplasm.
- (3) Skin irritation associated with lymphadenopathy is often found in lymphoma.

### LOCAL EXAMINATION

#### INSPECTION

##### Exposure

- (1) For full assessment of the neck, it has to be exposed upto the level of the nipples so that supraclavicular fossae, axillae & breasts are in view.
- (2) Students often forget to examine the supraclavicular fossa. Enlargement of the left supraclavicular lymph nodes is an important sign so far as the cancer of breast & cancer of many abdominal organs are concerned.

Table 15.1: ANATOMICAL REGIONS OF NECK		
Triangle	Boundaries	Contents
Anterior	<ul style="list-style-type: none"> <li>• Midline</li> <li>• Anterior border of sternomastoid</li> <li>• Inferior border of ramus of mandible</li> </ul>	<ul style="list-style-type: none"> <li>• May be subdivided into digastric, carotid &amp; muscular triangles</li> </ul>
Digastric	<ul style="list-style-type: none"> <li>• Inferior border of ramus of mandible</li> <li>• Anterior &amp; posterior bellies of digastric muscle, slung to the hyoid bone</li> </ul>	<ul style="list-style-type: none"> <li>• Submandibular gland</li> <li>• Facial artery</li> <li>• Lymph nodes</li> </ul>
Carotid	<ul style="list-style-type: none"> <li>• Omohyoid</li> <li>• Anterior border of sternomastoid</li> <li>• Posterior belly of digastric muscle</li> </ul>	<ul style="list-style-type: none"> <li>• Common carotid artery &amp; its division into internal &amp; external carotid arteries</li> <li>• Internal jugular vein</li> <li>• Vagus nerve</li> <li>• Lymph nodes</li> </ul>
Muscular	<ul style="list-style-type: none"> <li>• Omohyoid</li> <li>• Midline</li> <li>• Anterior belly of digastric muscle</li> </ul>	<ul style="list-style-type: none"> <li>• Laryngeal structures</li> <li>• Thyroid gland</li> </ul>
Posterior	<ul style="list-style-type: none"> <li>• Posterior border of sternomastoid</li> <li>• Anterior border of trapezius</li> <li>• Upper border of middle third of clavicle</li> </ul>	<ul style="list-style-type: none"> <li>• Lymph nodes</li> <li>• Scalenus anterior muscle</li> <li>• Accessory nerve</li> </ul>

**Swelling**

Inspection of a neck swelling is along the same line as given in module 3, noting features like site, size, shape, surface, edge, overlying skin, pulsation, cough impulse, number, & pressure effect.

**Site**

The site is very important as it often gives the spot diagnosis.

- (1) Branchial cyst is situated in the upper part of the neck with its posterior half lying under cover of the upper 3rd of sternomastoid muscle.
- (2) Cystic hygroma is commonly seen in the posterior triangle of the neck in its lower parts.
- (3) Dermoid cyst occurs in the midline of the neck, either in the most upper part giving rise to



Figure 15.1: Branchial sinus (above), & branchial cyst (below).



Figure 15.2: Cystic hygroma; neck (above), & axilla (below).

Table 15.2: DIFFERENTIAL DIAGNOSIS OF NECK LUMPS
<ul style="list-style-type: none"> <li>• <b>All regions</b> <ul style="list-style-type: none"> <li>• Skin &amp; subcutaneous tissues               <ul style="list-style-type: none"> <li>• Sebaceous cyst</li> <li>• Lipoma</li> <li>• Neurofibroma</li> </ul> </li> <li>• Lymphadenopathy               <ul style="list-style-type: none"> <li>• Acute infective</li> <li>• Chronic infective (TB)</li> <li>• Primary malignant (lymphoma)</li> <li>• Secondary malignant (nodal metastases)</li> </ul> </li> <li>• Superior vena cava obstruction (generalized swelling of the head &amp; neck with venous dilatation)</li> </ul> </li> </ul>
<ul style="list-style-type: none"> <li>• <b>Midline</b> <ul style="list-style-type: none"> <li>• Sublingual dermoid</li> <li>• Thyroglossal cyst, sinus or fistula</li> <li>• Pharyngocele</li> <li>• Laryngocele</li> <li>• Ranula</li> </ul> </li> </ul>
<ul style="list-style-type: none"> <li>• <b>Digastric triangle</b> <ul style="list-style-type: none"> <li>• Submandibular gland swellings</li> <li>• Ranula</li> </ul> </li> </ul>
<ul style="list-style-type: none"> <li>• <b>Carotid triangle</b> <ul style="list-style-type: none"> <li>• Carotid tortuosity</li> <li>• Carotid aneurysm</li> <li>• Carotid body tumor</li> <li>• Pharyngocele</li> <li>• Branchial cyst, sinus or fistula</li> </ul> </li> </ul>
<ul style="list-style-type: none"> <li>• <b>Muscular triangle</b> <ul style="list-style-type: none"> <li>• Thyroid swellings</li> <li>• Laryngocele</li> <li>• Inominate tortuosity</li> <li>• Inominate aneurysm</li> </ul> </li> </ul>
<ul style="list-style-type: none"> <li>• <b>Posterior triangle</b> <ul style="list-style-type: none"> <li>• Thyroid swellings</li> <li>• Subclavian aneurysm</li> <li>• Cystic hygroma</li> </ul> </li> </ul>

double chin or in the lowest part (in the space of burns).

- (4) Sternomastoid tumor is found as an oval swelling along the line of the sternomastoid muscle in a newly born baby (who has undergone breech delivery).
- (5) Carotid body tumor lies under the anterior margin of the sternomastoid at the level of



Figure 15.3: Sternomastoid tumor (above), & plunging ranula (below).

bifurcation of the common carotid artery, ie at the level of upper border of thyroid cartilage.

- (6) In the submandibular triangle, besides lymph nodes, there may be enlarged submandibular salivary gland & deep or plunging ranula.
- (7) Prominence of a cervical rib is found in the lower part of the posterior triangle.
- (8) An aneurysm is likely to be seen in the line of the carotid artery.
- (9) Swellings that occur over the known sites of the lymph nodes should be considered to have arisen from them unless some outstanding clinical findings prove their origin to be otherwise.

#### **Number**

Multiple swellings indicate the diagnosis of enlarged lymph nodes.

#### **Deglutition test**

Patient is asked to swallow & note whether the swelling moves on deglutition or not;

- (1) Swellings which are adherent to the larynx & trachea move upwards on swallowing, eg thyroid swelling, thyroglossal cyst & subhyoid bursitis.
- (2) Tuberculous & malignant lymph nodes when they become fixed to the larynx or trachea will also move on deglutition.

**Pressure effects**

- (1) Inspect the face, neck & upper part of chest for any venous engorgement, due to pressure over jugular veins eg from cervical lymphadenopathy.
- (2) Lymphadenopathy may also exert pressure on adjacent nerves to cause muscle wasting & paresthesiae.

**Skin**

- (1) A sinus, fistula, ulcer or scar should be noted during inspection of the skin of the neck.
  - (a) Tuberculous sinus or ulcer arising from bursting of caseous lymph nodes is a common finding.
    - (i) Undermining edge is typical of these ulcers.
    - (ii) Puckering scar may also be found on the skin after healing of these ulcers or sinuses.
  - (b) Sinus due to osteomyelitis of the mandible is usually single & lies a little below the jaw.
  - (c) Multiple sinuses over an indurated mass at the upper part of the neck would suggest actinomycosis. Sulphur granules in the pus are very much confirmatory of actinomycosis.
  - (d) Branchial fistula is seen just in front of the lower 3rd of the anterior border of the sternomastoid muscle.
  - (e) Gummatous ulcer rarely occurs in the sternomastoid muscle.
  - (f) Thyroglossal fistula (see module 14).
- (2) Condition of the skin
 

When there is a swelling, the condition of the skin over the swelling should be carefully noted.

  - (a) Redness & edema are features of inflammation.
  - (b) Presence of subcutaneous dilated veins indicates lymphosarcoma.
  - (c) Skin may be infiltrated by the malignant growth & the skin is stuck down to the growth causing a fold of skin to stand out above it. This is a characteristic feature of metastatic carcinoma of lymph nodes.

- (1) There may be torticollis (wry-neck) in case of sternomastoid tumor or lymphadenitis.
  - (a) Ipsilateral sternomastoid is tense & the head is held on the same side.
  - (b) Ask the patient to try to straighten the neck;
    - (i) Patient can not do so, & it may cause pain or distress.
    - (ii) Sternomastoid, esp. the sternal head, stands out.
  - (c) In a child, differentiate ocular torticollis (due to squint) from wry-neck (due to sternomastoid shortening);
    - (i) Clasps the child's head & slowly straightens it, at the same time watching patient's eye.
    - (ii) In ocular torticollis, on straightening the head a squint will become apparent.
- (2) Check for flexion, extension & lateral movements of neck.
  - (a) It will be restricted & painful in any inflammatory condition of neck.
  - (b) A patient with cold abscess of the posterior triangle of the neck may not be able to move his neck due to tuberculous affection of the cervical vertebrae. All movements of the neck will be restricted. Care must be taken to minimize forceful movements of the neck as sudden death can occur from dislocation of the atlanto-axial joint (dens pressing on the medulla).
  - (c) This is also necessary to know the presence of any cervical spondylolisthesis, as in case the surgery is needed the patient is required to be placed on table with hyperextended neck.

**PALPATION****Clinical techniques**

- (1) The swellings of the neck are best palpated from behind. The patient sits on a stool & the examiner stands behind the patient.
- (2) Natural tendency of the patient is to extend his neck while the clinician starts palpating the neck. This obscures the swelling. So the patient's neck is passively flexed with one hand on his head & the other hand is used for

**Neck position & movements**

palpating the swelling.

- (3) The head is also flexed passively towards the side of the swelling for proper palpation. This is to relax the muscles & fasciae of the neck.

### Clinical findings

#### Swelling

Palpate the swelling systematically noting its temperature, tenderness, site, size, shape, surface, edge, consistency, fluctuation, translucency, cough impulse, reducibility, compressibility, pulsatility, & mobility as discussed in module 3.

#### (1) Consistency

- (a) In non-specific lymphadenitis, the nodes are firm, solid & discrete.
- (b) In tuberculous lymphadenitis & abscess, the lump progresses through 4 stages (table 15.3);
  - (i) Initially the nodes are firm, discrete & between 1-2 cm in diameter.
  - (ii) Later the lump get bigger & become an indistinct, firm mass of nodes, often matted together.
- (c) Metastatic lymphadenopathy is felt hard, often stony hard.
- (d) Primary neoplasms of lymph nodes (eg lymphoma) are felt solid & rubbery.
- (e) Branchial & thyroglossal cysts consistence varies with the tension of cyst; most cysts are hard, but a lax cyst feels firm or soft.
- (f) Carotid body tumors are solid & hard;

they are often called 'potato tumors' because of their consistence & shape.

- (g) Cystic hygroma & pharyngeal pouch feel soft.

#### (2) Fluctuation

- (a) Fluid-filled & gaseous swellings will give positive fluctuation test.
- (b) Examples are branchial cyst, cystic hygroma, thyroglossal cyst, dermoid cyst, subhyoid bursa, cold abscess, pharyngeal pouch & laryngocele.

#### (3) Transillumination

- (a) Cystic hygroma is brilliantly translucent.
- (b) Other cystic neck lumps are not translucent.

#### (4) Pulsatility

- (a) One should carefully note whether the swelling is pulsatile or not.
- (b) In case of pulsatile swellings one should differentiate between transmitted pulsation & expansile pulsation.
- (c) In carotid artery aneurysm there will be expansile pulsation, whereas carotid body tumor or malignant lymphadenopathy around the carotid artery gives rise to transmitted pulsation.

#### (5) Mobility

Mobility should be tested in all directions. A carotid body tumor or an aneurysm can be moved across but not along the line of the carotid artery.

#### (6) Relation with the sternomastoid

Determine the relation of the swelling with the sternomastoid muscle.

- (a) To test one side place your hand on the side of the patient's chin opposite to the side of the lesion & tell him to nod the head to that side against the resistance of your hand.
- (b) To test both sides simultaneously, put your hand under the point of the chin & ask him to press down against resistance when both sternomastoids are put into action.
- (c) If the swelling lies deep to the muscle which is a common occurrence, it disappears under the taut muscle either completely or partially depending on the size of the swelling; the mobility of the swelling becomes very much restricted at

TABLE 15.3: PROGRESSION OF TUBERCULOUS CERVICAL LYMPHADENOPATHY.

<p>• <b>Stage I</b> Fairly solid moderately enlarged matted nodes.</p>
<p>• <b>Stage II</b> Lymph nodes break down &amp; liquefy, pus collecting beneath the deep fascia. A fluctuant mass is palpated that, unlike an acute abscess, has little or no overlying inflammation.</p>
<p>• <b>Stage III</b> Deep cervical fascia is eroded, resulting in release of pus beneath the superficial fascia. This dumb-bell like swelling is termed a collar stud abscess.</p>
<p>• <b>Stage IV</b> Following spontaneous discharge or surgical drainage of the abscess, a chronic discharging sinus results.</p>

the same time.

- (d) If the swelling is situated superficial to the muscle, it will be more prominent & movable over the contracted muscle.

**(7) Relation with the neighboring structures**

- (a) Whether the swelling has involved the neighboring structures such as the larynx, trachea, esophagus, blood vessels, nerves etc. should also be determined.
- (b) A malignant growth lying just below the angle of the jaw may involve the hypoglossal nerve & lead to paralysis of the same half of the tongue. The patient is asked to put his tongue out. In case of paralysis the tongue will deviate towards the side of lesion.

**(8) Fixity to the overlying skin**

- (a) Attempt to-&-fro movement of skin over the lump, or gently squeezed (pinched up) the skin over the lump, in atleast 2 directions at right angles to one another.
- (b) You will not be able to do so or there will be pitting, wrinkling or pulling on the skin, in cases of deeper lump fixed to the skin (eg metastatic lymphadenopathy or tuberculous lymphadenitis with cold abscess) or a lump arising from the skin itself.

**Lymph nodes**

- (1) In case of palpation of the cervical lymph nodes one should follow the same technique as used for palpation of swelling in the neck.
- (2) A system should be maintained to palpate all the groups of lymph nodes in the neck: submental → submandibular → preauricular → postauricular → occipital → jugulo-digastric → anterior cervical (internal jugular) → jugulo-omohyoid → scalene → supraclavicular → posterior triangle (external jugular).
- (3) In case of enlargement of lymph node;
- (a) Examine the drainage area for inflammatory or neoplastic focus.
- (b) Examine other groups of lymph nodes lying in other parts of the body; these groups include the axillary, the inguinal & abdominal groups.
- (c) Examine the spleen & the liver for visceromegaly in a suspected case of Hodgkin's disease.

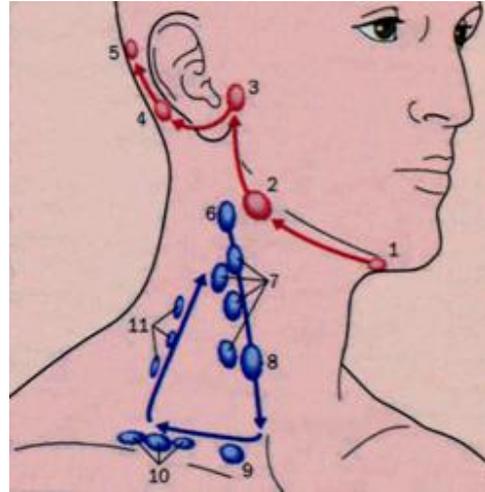


Figure 15.4: Sequence of cervical lymph node examination.

- |  |                    |
|--|--------------------|
| 1 Mental                                   | 2 Submandibular    |
| 3 Preauricular                             | 4 Postauricular    |
| 5 Occipital                                | 6 Jugulodigastric  |
| 7 Internal jugular (deep cervical)         | 8 Jugulo-omohyoid  |
| 9 Scalene                                  | 10 Supraclavicular |
| 11 External jugular (superficial cervical) |                    |



Figure 15.5: Submental lymphadenitis (above), & Cervical lymphadenopathy of Hodgkin's disease (below).

Table 15.4: CAUSES OF LYMPHADENOPATHY
<ul style="list-style-type: none"> <li>• <b>Acute inflammation</b> <ul style="list-style-type: none"> <li>• Common infections of the upper aerodigestive tract: <ul style="list-style-type: none"> <li>• Tonsillitis</li> <li>• Pharyngitis</li> <li>• Laryngitis</li> <li>• Parotitis</li> <li>• Dental abscess</li> </ul> </li> <li>• Common superficial infections of head &amp; neck: <ul style="list-style-type: none"> <li>• Acne</li> <li>• Furuncle/abscess</li> <li>• Infected wounds</li> <li>• Infected skin malignancies</li> </ul> </li> <li>• Infectious mononucleosis (glandular fever, Epstein-Barr virus infection)</li> <li>• Toxoplasmosis</li> <li>• Cytomegalovirus infection</li> <li>• Actinomycosis</li> <li>• Cat-scratch disease</li> </ul> </li> </ul>
<ul style="list-style-type: none"> <li>• <b>Chronic inflammation</b> <ul style="list-style-type: none"> <li>• Tuberculosis</li> <li>• Sarcoidosis</li> <li>• Histiocytosis X</li> </ul> </li> </ul>
<ul style="list-style-type: none"> <li>• <b>Lymphomas</b> <ul style="list-style-type: none"> <li>• Hodgkin's</li> <li>• Non-Hodgkin's</li> </ul> </li> </ul>
<ul style="list-style-type: none"> <li>• <b>Metastatic carcinoma</b> <ul style="list-style-type: none"> <li>• Carcinomas of the upper aerodigestive tract</li> <li>• Skin tumors of the head &amp; neck: <ul style="list-style-type: none"> <li>• Squamous cell carcinoma</li> <li>• Basal cell carcinoma</li> <li>• Melanoma</li> </ul> </li> <li>• Rarely, carcinoma at other body sites</li> </ul> </li> </ul>

sign), one should examine not only the arm, breast & chest (bronchus) but also the abdomen right down to the testis.

### PERCUSSION

#### Laryngocele

This may be revealed by the tympanic note, as it is connected with the larynx through a narrow neck; the swelling becomes more apparent when the patient blows his nose.

### AUSCULTATION

#### Bruit

A bruit may be heard over an aneurysm or carotid body tumor.

(d) Examine the lungs for tuberculosis.

#### **Examination of the drainage area**

- (1) Submental node → Chin, central part of the lip, gingiva, floor of the mouth & tip of the tongue.
- (2) Submandibular nodes → Palate, tongue, floor of the mouth, lower lip, cheek, gingiva, nose & antrum.
- (3) Jugular chain → Tongue, mouth, pharynx, larynx, upper esophagus & thyroid gland.
- (4) Tonsillar node → Tonsil; the tonsillar node lies below the angle of the mandible at the junction of the facial vein with the internal jugular vein.
- (5) Supraclavicular nodes → If the supraclavicular (Virchow's) nodes are enlarged (Troisier's

# Module 16

## Salivary Glands

### PAROTID GLAND

### HISTORY

#### Swelling

Enquire along the same line as given in module 3, asking for site, mode of onset, duration, associated symptoms, progress, disappearance, multiplicity, systemic effects & previous treatment.

#### Site

- (1) In acute parotitis the whole gland is swollen.
- (2) Most pleomorphic adenoma begins in the portion of gland that lies just anterior & superior to the angle of mandible.
- (3) Adenolymphoma (Warthin's tumor) arises in the lower part of parotid gland at the level of lower border of mandible.

#### Mode of onset

In acute parotitis there is sudden increase in size of both the parotid glands with considerable pain, occurring in a dehydrated patient with poor oral hygiene.

#### Duration

- (1) A slow growing lump with long history (of months or years) is generally pleomorphic adenoma. When such a lump suddenly starts growing rapidly & becomes painful, it is highly suggestive of malignant transformation (mixed parotid tumor).
- (2) Adenolymphoma (Warthin's tumor) is also a slow-growing, painless lump.
- (3) Rapidly enlarging lump within a short span of time, with pain, are mostly malignant tumors.

#### Multiplicity

- (1) In Mikulicz's syndrome there is generalized enlargement of all major salivary glands including lacrimal glands.
- (2) If this is associated with dry eyes & generalized arthritis the condition is called Sjogren's syndrome.

#### Associated pain

- (1) Acute parotitis is always painful.
  - (a) Mumps is the commonest cause of bilateral acute parotitis.
  - (b) Pain is continuous & throbbing, & radiates to the ear & over the side of head.
  - (c) Pain increases on eating & speaking.
- (2) In parotid abscess there is brawny edematous swelling of parotid region with throbbing pain.
- (3) In obstruction of parotid duct with calculus or stricture, the swelling increases in size & becomes tense & painful during meals.

#### Systemic symptoms

- (1) Ask about general malaise, fever & rigors, indicating an infective cause of the swelling.
- (2) Ask about anorexia & weight loss, indicating a malignant origin.

#### Sinus or fistula

Watery discharge from an opening in the region of the parotid gland or its duct, particularly during meals, is significant of a parotid fistula.

### LOCAL EXAMINATION

#### Swelling

Examine the swelling systematically noting its site, size, shape, surface, edge, number, temperature,

tenderness, consistency, fluctuation, compressibility, pulsatility, & mobility etc. (as discussed in module 3).

**Inspection**

- (1) Parotid gland lies below, behind & slightly in front of the lobule of the ear. A swelling of the parotid gland thus obliterates the normal depression just below the lobule of ear.
- (2) Ask the patient to open the mouth & inspect the pharynx with the help of a torch. Enlargement of the deep lobe of parotid gland is occasionally seen as an apparently enlarged tonsil due to its displacement.

**Palpation**

**(1) Tenderness**

- (a) In parotitis & parotid abscess the gland is invariably very tender.
- (b) Pleomorphic adenoma & adenolymphoma are non-tender, while carcinoma is slightly tender.

**(2) Consistency**

- (a) In acute parotitis it is brawny, ie firm but indentable.



Figure 16.1: Parotid tumors; pleomorphic adenoma (above), & mucinous carcinoma (below).

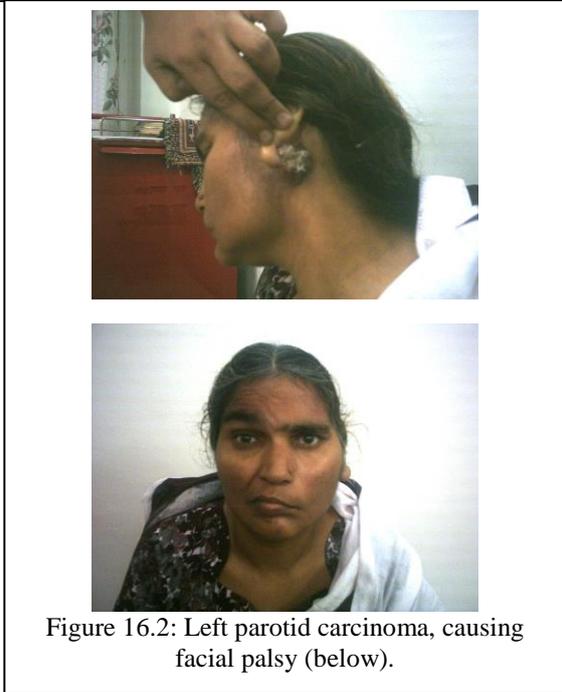


Figure 16.2: Left parotid carcinoma, causing facial palsy (below).

- (b) In chronic parotitis & pleomorphic adenoma, the gland feels rubbery hard.
- (c) Adenolymphoma feels soft, that often fluctuates.
- (d) In carcinoma it is firm to hard.

**(3) Fixity to masseter muscle**

Ask the patient to clench the teeth &, test the mobility of the swelling over the contracted masseter muscle, in two planes.

**(4) Skin over the swelling**

- (a) In acute parotitis the skin is reddish-brown, warm, smooth & shiny.
- (b) In parotid abscess the skin becomes warm & brawny edematous (pitting). Fluctuation of the swelling occurs late due to strong parotid fascia.
- (c) In malignancy the skin can be infiltrated by the tumor, demonstrated by pinching the skin over the lump.

**(5) Bimanual examination**

- (a) This is necessary for palpation of the deep lobe.
- (b) Place one index finger inside the mouth just in front of tonsil & behind the 3rd molar tooth & one finger externally behind the ramus of the mandible. Feel the lump

the between these two fingers.

### Duct

Parotid (Stensen's) duct starts just deep to the anterior border of the gland & runs superficial to the masseter muscle, & then it curves inwards to open on the buccal surface of the cheek opposite the crown of the upper second molar tooth.

### Inspection

Ask the patient to open the mouth, retract the cheek with spatula & inspect with the help of a torch.

- (1) In parotitis there will be redness of the ampulla.
- (2) In acute suppurative parotitis, gentle pressure over the gland will cause purulent saliva to come out of the orifice of the duct.
- (3) Similar pressure may find blood to come out in case of malignant growth of the gland.

### Palpation

- (1) The duct can be felt where it rounds over the masseter muscle by rolling the finger over the taut masseter muscle.
- (2) Terminal part of the duct is best palpated bidigitally between the index finger inside the mouth & the thumb over the cheek.
- (3) Calculus can be felt, if present, in more than 50% of cases.

### Fistula

If there is a parotid fistula, note its site: whether in relation to the gland or the duct (masseteric or premasseteric).

### Facial nerve

Facial nerve is not involved in a benign tumor of the parotid gland, but is involved in a malignant growth.

- (1) Nasolabial fold is less marked on the affected side.
- (2) Ask the patient to shut the eyes → There will be inability to close the eye on the affected side, & on attempting to do so the eyeball will roll upwards. This is due to paralysis of orbicularis oculi muscle.
- (3) Ask the patient to move the eyebrows upwards → Affected side remains immobile, due to paralysis of occipitofrontalis muscle.
- (4) Ask the patient to frown → There will be no frowning, due to paralysis of corrugator

supercilii.

- (5) Ask the patient to show the teeth → Angle of the mouth will be drawn to the normal side.
- (6) Ask the patient to puff out the cheeks → Paralyzed side bellows out more than the normal side.

### Lymph nodes

Lymph nodes of the neck must be examined as a routine.

- (1) The preauricular, parotid & submandibular groups of lymph nodes are mostly involved.
- (2) Preauricular lymphadenitis must be differentiated from parotitis.
  - (a) The swelling lies immediately in front of the tragus & inflammatory edema tends to extend over much of the surface marking of the parotid gland, but the normal depression is not obliterated.
  - (b) It is usually very mobile, as it lies outside the capsule of parotid gland.
  - (c) Look for a primary focus of infection, eg in eyebrow, eyelid, conjunctiva or external auditory meatus.

### Movements of the jaw

Jaw movements may become restricted if the growth is malignant & has involved the peri-articular tissue of temporomandibular joint.

## SUBMANDIBULAR SALIVARY GLAND

### HISTORY

As in the case of parotid gland, patients present with swelling of submandibular gland. Enquire along the same line as described above.

- (1) Appearance of a swelling in the submandibular region with colicky pain at the time of meals is diagnostic of calculus in submandibular duct.
  - (a) Swelling appears before, & persists after the pain.
  - (b) Pain is a dull ache, which occasionally radiates to ear or into tongue.
  - (c) Both symptoms appear, or worsen, before & during eating. Afterwards the pain goes

- away before the swelling.
- (d) If the gland becomes irreparably damaged the swelling persists between meals & dull aching pain may also become constant.
  - (e) Patient may get temporary relief by pressing on the gland, which may produce foul-tasting fluid in the mouth (purulent saliva).
  - (f) With superadded infection, the patient complains of severe, continuous, throbbing pain, which is exacerbated by eating.
- (2) Otherwise swelling in this region is more often due to lymphadenopathy rather than salivary gland tumors.
  - (3) Pleomorphic adenoma presents as a slow-growing painless lump, whereas carcinoma presents as rapidly growing, painful mass.
  - (4) Numbness of anterior two-thirds of tongue indicates infiltration of lingual nerve, & is diagnostic of carcinoma.



Figure 16.3: Submandibular gland; pleomorphic adenoma (above), & cystadenoma (below).

### LOCAL EXAMINATION

- (1) An enlargement of the submandibular salivary gland causes a swelling beneath & in front of the angle of the mandible.
  - (2) Examine the swelling systematically noting its site, size, shape, surface, edge, number, temperature, tenderness, consistency, fluctuation, compressibility, pulsatility, & mobility etc. (as discussed in module 3).
- (1) Note whether each orifice looks inflamed or swollen due to impaction of a stone in the duct.
  - (2) Occasionally a stone may be impacted in the ampulla just deep to the orifice & can be seen if inspected carefully.
  - (3) In cases of salivary gland infection, slight pressure on the gland (from outside) will cause pus to exude from the respective orifice.
  - (4) If a stone is impacted in one duct, saliva will be seen flowing or ejecting from the other orifice while the blocked orifice remains dry.
    - (a) Put two dry swabs one on each orifice, & instill some lemon juice on the dorsum of patient's tongue.
    - (b) A minute later, ask the patient to move the tongue up & take out the swabs.
    - (c) Swab on the orifice of the blocked duct will remain dry.

### Inspection

#### Lemon test

In suspected cases of a stone in the submandibular salivary duct, the patient may be asked to suck a little lemon or lime juice. The swelling appears or, if present already, enlarges.

#### Multiplicity

In Mikulicz's disease submandibular salivary glands along with the parotid glands & lacrimal glands may be enlarged. Otherwise majority of the swellings in this region are due to enlarged lymph nodes.

#### Orifices of submandibular (Wharton's) ducts

The orifices, situated on either side of the frenulum linguae, are inspected with the help of a torch.

### Palpation

Palpation must be done very carefully as lymph node swellings are quite common in this region.

#### Tenderness

- (1) In uncomplicated submandibular gland calculi, the gland is usually tender when it is tense (ie before & during eating).

- (2) In submandibular sialitis, the gland is invariably tender. In advanced cases, the whole gland turn into multilocular abscess, this may then point onto the skin.
- (3) Pleomorphic adenoma is non-tender, while carcinoma is slightly tender.

**Consistency**

- (1) In uncomplicated submandibular gland calculi, the gland feels rubbery hard.
- (2) Pleomorphic adenoma & carcinoma feels firm to hard.

**Multiplicity**

- (1) Nodular swelling either discrete or matted is suggestive of lymphadenopathy.
- (2) In case of submandibular salivary gland enlargement, it is one swelling & not a few nodular swellings.

**Mobility**

Assess fixity of the lump with skin, mylohyoid muscle, tongue or mucosa of the floor of mouth.

**Fixity to mylohyoid muscle**

Ask the patient to push tongue against the roof of mouth, thus tensing the muscles of the floor of mouth → Test mobility in 2 planes.

**Bimanual palpation**

Submandibular salivary gland is best palpated bimanually, as it consists of 2 parts: a larger superficial (cervical) part beneath, & a smaller deep (buccal) part above the mylohyoid muscle.

**Clinical techniques**

- (1) Patient's head is flexed & inclined somewhat to the affected side, in order to relax the musculature.
- (2) Patient is then asked to open the mouth, & one index finger is placed on the floor of mouth medial to the alveolus & lateral to the tongue & is pressed on the floor of mouth as far back as possible.
- (3) Other finger palpating from outside is placed just medial to the inferior margin of the mandible, & is pushed upwards.

**Clinical findings**

- (1) This helps to palpate both the superficial & deep lobes of the submandibular salivary gland, as well as the full course of its ducts.
- (2) Presence of a calculus in the duct can be appreciated.
- (3) It also differentiates an enlarged submandibular salivary gland from enlarged submandibular lymph nodes. The finger inside the mouth can feel the deep part of the salivary gland but not the lymph nodes, as the former is situated above the mylohyoid muscle & the latter below the muscle.

# Module 1 >

## Peripheral Arterial System

### ISCHEMIA OF LIMB

### HISTORY

#### Age & sex

- (1) Atherosclerosis occurs in elderly, & affects men more often than women.
- (2) Diabetic arteriopathy also occur in elderly.
- (3) Buerger's disease (thromboangiitis obliterans) is commonly seen in men from 20 to 40 years of age.
- (4) Raynaud's disease occurs in young women.

#### Limbs affected

- (1) Buerger's disease & atherosclerotic gangrene commonly affect the lower limbs.
- (2) Raynaud's disease mainly affects the upper limbs. A gangrene of the finger can be due to Raynaud's disease, cervical rib, scalenus anticus syndrome & Morvan's disease (painless whitlow in syringomyelia).

#### Unilateral or bilateral

- (1) In Buerger's disease & Raynaud's disease the affection is usually bilateral.
- (2) Atherosclerotic gangrene may be unilateral to start with but often ends as a bilateral disease.
- (3) Gangrene due to embolism is mostly unilateral.
- (4) Diabetic gangrene may be unilateral or bilateral.

#### Mode of onset

- (1) Intermittent claudication may begin suddenly

or insidiously (more common).

- (2) Gangrene due to atherosclerosis, Buerger's disease & Raynaud's disease occur spontaneously & gradually.
- (3) Embolic gangrene starts suddenly & the patient feels severe pain radiating down the course of the artery.
- (4) Diabetic gangrene may start from minor trauma such as caused by careless paring of the toe nail or mild infection.

#### Pain

This is the usual presenting complain. Enquire about all the features of pain (as given in module 1 & 9), especially noting its site, character, radiation, whether it increases on walking or exercise, whether it disappears when the exercise stops, whether it becomes worse on application of warmth, & whether it is intermittent claudication or continuous rest pain.

#### Intermittent claudication

- (1) This is a cramp-like pain felt in muscles, occurring in cases of moderate arterial obstruction:
  - (a) Brought on by walking, which prevents the patient from walking further (distance walked is called claudication distance).
  - (b) Not present on taking the first step.
  - (c) Relieved by standing still.
- (2) Walking distance gradually shortens, then become static, & finally begins to increase (as collaterals develop).
- (3) The pain is due to accumulation of acidic anaerobic metabolites due to inadequate blood flow.
- (4) Site of pain depends on the level of arterial

obstruction:

- (a) In aortoiliac obstruction → Both buttocks, thighs, & calves.
  - (b) In iliac obstruction → Unilateral thigh & calf.
  - (c) In femoropopliteal obstruction → Unilateral calf.
  - (d) In distal obstruction → Unilateral calf & foot.
- (5) Severity of the disease can be assessed by Boyd's grading:
- (a) Grade I → As the patient continues to walk, the metabolites increase the muscles blood flow & sweep away the P substance produced by exercise &, the pain disappears.
  - (b) Grade II → Pain continues, but the patient can still walk with effort.
  - (c) Grade III → Pain compels the patient to take rest.

### Rest pain

- (1) This is severe continuous throbbing pain felt in muscle, occurring in cases of severe arterial obstruction:
  - (a) Present at rest, throughout day & night.
  - (b) Made worse by lying down, or elevation of foot, & at night.
  - (c) Relieved by hanging the foot out of bed, or by sleeping in a chair.
  - (d) Affected part becomes very sensitive & any movement or pressure causes an acute exacerbation.
- (2) The pain is due to ischemic changes in the somatic nerves. It is the cry of the dying nerves.
- (3) It usually affects the most distal part first ie starting from the tip of the toes & gradually extending proximally.
  - (a) In established gangrene the pain will be felt at the junction of living & dead tissues.
  - (b) Following superficial gangrene the resultant ischemic ulcer is very painful. It often gets slowly deeper & deeper, & shows no sign of healing. It discharges thin serous exudates which is sometimes purulent.

### Effects of external temperature

- (1) Application of warmth will increase the symptoms of arterial occlusion.

- (2) Raynaud's phenomenon ie intermittent attack of pallor or cyanosis is often seen in Raynaud's disease. In Raynaud's disease each attack is comprised of following stages;
  - (a) Local syncope → Affected part becomes cold & white with tingling & numbness. This is due to spasm of digital arteries.
  - (b) Local asphyxia → White part turns blue with burning sensation. This is due to slowing of circulation & accumulation of reduced hemoglobin.
  - (c) Local recovery → Bluish discoloration gradually disappears & the digits regain normal color. This is due to release of spasm of digital arteries.
  - (d) Local gangrene → Attacks of syncope, asphyxia & recovery are repeated till the final stage, in which patches of superficial ulceration & gangrene appear at the finger tips.

### Associated symptoms

- (1) There may be numbness, pins, needles & other types of paresthesiae in the skin of affected area. This is due to shunting of blood from skin to muscles.
- (2) Failure to achieve an erection (impotence) can occur in male patients in cases of aortoiliac obstruction (Leriche's syndrome).
- (3) Assess the involvement of other major arteries. Ask specifically about fainting, transient black out, blurred vision, weakness or paresthesiae in the upper limb or abdominal pain.

### Past & associated medical history

- (1) Patient with arterial occlusion may give a history of previous cardiac attacks or embolic syndromes.
- (2) Patient may have associated diabetes mellitus.
- (3) Superficial thrombophlebitis can occurs in high proportion of cases of Buerger's disease. This is characterized by swelling, redness & minor pain in the affected part.
- (4) There may be a history of exposure to cold (frost bite).

### Substance abuse

Excessive smoking has been incriminated as causing thromboangiitis obliterans & worsening

atherosclerotic disease.

**Family history**

There may be familial predisposition. So enquire about the cause of death of parents & siblings, or the presence of any arterial disease symptoms.

**CLINICAL EXAMINATION**

- (1) Considerable constitutional disturbances may be observed in severe acute ischemia from embolus & in gas gangrene. There may be lowering of the blood pressure & increase in the pulse rate in both these conditions.
- (2) In chronic ischemia there is not much constitutional disturbances.

**LOCAL EXAMINATION**

**Exposure**

Always expose both the normal & affected limbs in full & put them side by side. This will help you in detecting & comparing even the minor clinical clues.

**Inspection**

**Nutritional changes in skin**

Inspect the limb carefully for the following superficial (cutaneous) signs of ischemia;

- (1) Thinning & shininess of the skin.
- (2) Diminished growth of hair.
- (3) Loss of subcutaneous fat.
- (4) Trophic changes in the nails which become brittle & show transverse ridges.
- (5) Minor ulceration in the pressure areas such as heel, malleoli, ball of the foot, & tips of the toes.

**Change in color (cutaneous circulation)**

This is the most noticeable feature of an ischemic limb, especially in a fair skinned patient.

- (1) First inspect for color changes with the patient lying supine & the limbs in horizontal position;
  - (a) Marked pallor is a remarkable feature of sudden arterial obstruction eg in embolism or in Raynaud's disease.



Figure 17.1: Chronic arterial insufficiency (above); venous insufficiency (below).

(b) Congestion & purple-blue cyanosed appearance are characteristic features of severe ischemia & pre-gangrenous stage.



Figure 17.2: Acute arterial insufficiency (above); Raynaud's disease (below).

**(2) Buerger's postural test**

- (a) If the color appears normal in a suspected ischemic limb, ask the patient to elevate the limb straight off the couch (without bending the knees). It will become pallor in ischemia.
- (i) Legs of a normal individual even if they be raised by 90° remain pink.
  - (ii) In an ischemic limb elevation to a certain degree will cause marked pallor. The angle between the limb & the horizontal plane at which such pallor appears is called Buerger's angle or the vascular angle.
  - (iii) A vascular angle of less than 20° indicates severe ischemia.
- (b) If the color appears normal even in an elevated position, then support the patient's leg with your hand & ask him/her to do alternating flexion & extension of the ankle & toes to the point of fatigue. In an ischemic limb, the sole will become cadaveric pallor & the veins on the dorsum of foot will become empty & guttered.
- (c) Ask the patient to sit up & hang the legs out of couch. It will become bluish-purple in ischemia (due to congestion).

**Capillary filling time**

After elevating the legs, the patient is asked to sit up & hang the legs down by the side of the couch.

- (1) A normal leg will remain pink as it was during elevated position.
- (2) In ischemia, the leg will first become pink from pallor. This change of color takes place slowly & is called the capillary filling time. In severe ischemia it takes about 15 to 30 seconds to become pink.
- (3) Then the ischemic limb again changes color & becomes flushed purple-red. This is due to the filling of the dilated skin capillaries with deoxygenated blood.

**Venous refilling**

- (1) After keeping the limb elevated for a while if it is then laid flat on the bed, there will be normal refilling of the veins within 5 seconds. But in ischemic limb it will be delayed.
- (2) If a normal limb is raised to about 90° there will be gradual collapse or guttering of the veins. But in ischemic limb the veins are seen

collapsed either in the horizontal position or as soon as it is lifted to even 10-15° above the horizontal level.

**Pressure areas**

- (1) Carefully inspect all the pressure or potential trauma areas of walking or bed-rest, which are the first sites to show evidence of trophic changes, ulceration or gangrene.
- (2) These areas include sacrum, heel, malleoli, head of the fifth metatarsal, tips of the toes & ball of the foot.
- (3) Pressure necrosis is manifest by;
  - (a) Skin thickening.
  - (b) Erythema, or purple or blue discoloration.
  - (c) Blistering.
  - (d) Ulceration.
  - (e) Patches of black, dead skin.



Figure 17.3: Sacral bed sore (above); neuropathic ulcer (below).

**Gangrenous area****(1) Extent & color**

- (a) Determine the extent of gangrene to ascertain the level of arterial occlusion.
- (b) In gas gangrene, besides the typical odor of sulphurated hydrogen, the muscles also



Figure 17.4: Impending gangrene (above); frank dry gangrene (below).

change their color to brick red, green or even black according to the stage of the disease.

## (2) Type

- (a) Dry gangrene in which the part becomes mummified.
- (b) Wet & putrefying as seen in diabetic gangrene.
- (c) Gas gangrene.

## (3) Line of demarcation

- (a) This is often seen between the dead (gangrenous) part & the normal (living) area of the limb.
- (b) In gangrene due to all the conditions this line of demarcation is poorly marked except in ainhum. In this condition there is a linear deepening groove at the base of the little or the fourth toe, which is the pathognomonic feature.

## (4) Limb proximal to the gangrene

- (a) Always examine the limb above the gangrenous area.
- (b) This may be congested, edematous or pale, which indicates the possibility of later involvement of this area.

- (c) There may be black patches, which indicate skip lesions.

## Palpation

### Skin temperature

- (1) This is best felt with the back of the fingers.
- (2) Always remember to expose the limbs for 5 minutes before assessing, to compare the two limbs & to feel the whole of the affected limb.
- (3) Find out the zone where the temperature changes from the normal warm temperature to cold skin of the ischemic site.

### Capillary refilling

- (1) Tip of the nail or the pulp of a toe or a finger is pressed for 2 seconds & the pressure is released. The time taken for the blanched area to turn pink after the pressure has been released is a crude indication of capillary blood flow.
- (2) This time will be definitely longer in case of ischemic limb.

### Venous refilling (Harvey's sign)

- (1) Two index fingers are placed side by side on a vein. The fingers are now pressed firmly & the finger nearer the heart is moved proximally keeping the steady pressure on the vein so as to empty the short length of the vein between the two fingers. The distal finger is now released. This will allow venous refilling to be observed.
- (2) This is poor in ischemic limb & is increased in arteriovenous fistula.

### Pressure areas

- (1) In case of erythema over any of the pressure areas, press it for 10-15 seconds & then release the pressure;
  - (a) Erythema of pressure sore will persist.
  - (b) Erythema of inflammation will transiently turn blanche.
- (2) In case of ischemic ulceration examine it as given in module 4.

### Gangrenous area

Assess the type of gangrene, ie dry, wet or gas.

- (1) In dry gangrene the part will be hard & shriveled.
- (2) In wet gangrene the part will be edematous with or without crepitation.
- (3) In gas gangrene there will be characteristic gaseous crepitus. This is due to presence of gas within the muscles.

***Limb above the gangrenous area***

- (1) Always remember to palpate the limb above the gangrenous area as a routine.
- (2) Tenderness along the line of the blood vessel indicates recent thrombosis.
- (3) Pitting on pressure suggests edema which may be due to inflammatory condition & thrombophlebitis.

***Peripheral arterial pulsations***

- (1) Always check all pulses of a limb & do not make interpretation on the basis of one pulse. Dorsalis pedis pulse can be normal in femoral stenosis due well developed collateral circulation.
- (2) Always compare the pulsation of the same artery on the other side.
- (3) Practice feeling the pedal pulses in normal patients.
- (4) When in doubt whether a lower limb pulse is really being felt, or whether your own arterial beat is being appreciated by the finger pulp, simultaneously palpate the patient's radial pulse; if the later synchronizes with the doubtful pulse, it must be the patient's pulse.

***Clinical techniques***

***(1) Dorsalis pedis artery***

- (a) Toes are grasped lightly in one hand so as to steady the foot. Fingers of the other hand are slide along the groove between first & second metatarsals, upwards towards the ankle.
- (b) The pulse is felt just lateral to the extensor hallucis longus tendon, over the intermediate cuneiform or navicular bones. It is absent in 14% of cases.



Figure 17.5: Dorsalis pedis pulse.



Figure 17.6: Posterior tibial pulse.

***(2) Posterior tibial artery***

This is felt against the calcaneum, about 2 cm below & behind the medial malleolus ie midway between it & the tendo Achilles.

***(3) Anterior tibial artery***

This if felt just above the level of ankle joint, midway between the two malleoli.

***(4) Peroneal artery***

It replaces anterior tibial artery in 5% individuals. This is felt 1 cm medial to lateral malleolus.

***(5) Popliteal artery***

- (a) In a supine patient, flex the knee to 135° with the heel resting on the couch, so that the muscles around the popliteal fossa are relaxed.



Figure 17.7: Popliteal pulse, supine (above) & prone (below).

- (i) Place your thumbs on the tibial tuberosity & your fingers over the lower part of popliteal fossa against the posterior aspect of tibial condyles.
- (ii) Now move your fingers from side to side until you feel the popliteal pulsation.
- (b) Another technique in a supine patient is to keep patient's leg straight. Now place one hand behind the knee with the finger tips along the midline of popliteal fossa, & hyperextend the knee against this hand & the couch with your other hand.
- (c) In a prone patient, feel along the line of popliteal artery with the finger tips of both hands.

**(6) Femoral artery**

This is felt just below the inguinal ligament at midinguinal point (midway between anterior superior iliac spine & pubic symphysis), against the femoral head & psoas major tendon.

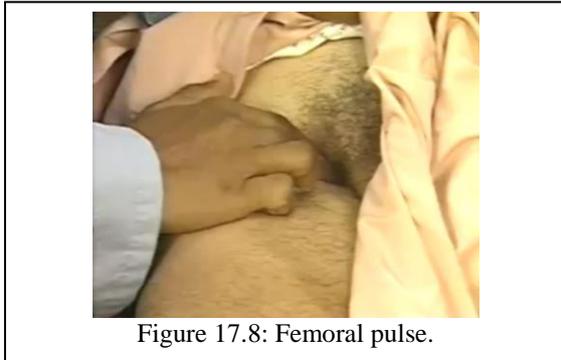


Figure 17.8: Femoral pulse.

**(7) Radial & ulnar arteries**

These are felt anteriorly at the wrist against the lower end of radius & ulna respectively.

**(8) Brachial artery**

This is felt in front of the elbow just medial to the biceps tendon.

**(9) Subclavian artery**

This is felt just above the middle of clavicle.

**(10) Carotid artery**

This is felt in the neck at the level of cricoid cartilage against the carotid tubercle ie anterior tubercle of transverse process of C6 vertebra.

**(11) Superficial temporal artery**

This is felt just in front of the tragus of ear against the root of zygoma.

**Clinical findings**

- (1) While examining the artery the following points should be noted;
  - (a) Pulse → Its volume & tension.
  - (b) Condition of the arterial wall → Whether atheromatous or not.
  - (c) Thrombosis of the vessels → When the artery is thrombosed it feels midway between firm & soft & one can feel something within the artery. It must be remembered that in Buerger's disease not only the distal arteries but also the veins are thrombosed.
- (2) Disappearance of arterial pulsation below the level of occlusion is the rule.
  - (a) The only exception is the presence of good collateral circulation when the pulse may be diminished but does not disappear.
  - (b) An apparently normal peripheral pulse may disappear after exercising the patient to the point of claudication. This disappearing pulse is a sign of unmasking the preliminary stage of arterial occlusion. The disappearing pulse reappears after a minute or two following cessation of exercise.
- (3) An expansile arterial pulsation indicates presence of aneurysm.
- (4) When there is embolus in an artery, the artery becomes firm & tender.
  - (a) Soft, non-tender, non-pulsatile artery means that the embolus has lodged higher up.
  - (b) In embolism, the pulse can usually be traced down to the point where it meets the obstruction. Here there is often a small tender swelling & the pulse is lost below.
- (5) When the pulse is feeble or absent, you can mistake your own pulse with that of the patient.
  - (a) In that case palpate your own superficial temporal artery & compare with the doubtful pulse of the patient.
  - (b) You can also compare the patient's radial artery with the doubtful pulse of the patient's lower extremity.

**Special clinical tests**

The following tests are not performed routinely, & are only indicated in special circumstances.

**(1) Crossed leg test (Fuchsig's test)**

- (a) This is performed to detect popliteal

- pulsation.
- (b) The patient is asked to sit with the legs crossed one above the other so that the popliteal fossa of one leg will lie against the knee of the other leg. The patient's attention is diverted by taking history.
  - (c) Crossed leg will show oscillatory movements of the foot which occur synchronously with the pulse of the popliteal artery.
  - (d) If the popliteal artery is blocked, the oscillatory movement will be absent.
- (2) **Cold & warm water test**
- (a) This is performed to provoke the arteriospasm in a suspected case of Raynaud's disease.
  - (b) The patient is first asked to put the hand into ice-cold water; this will initiate the attack & the hand becomes white. The patient is then asked to dip the hand in warm water; the hand will become blue due to cyanotic congestion.
- (3) **Elevated arms test**
- (a) This is performed when thoracic outlet syndrome is suspected.
  - (b) The patient is asked to abduct the shoulders to 90° degrees & at the same time the upper limbs are fully externally rotated.
  - (c) Now the patient is instructed to open & close the hands for a period of 5 minutes.
    - (i) A normal individual can perform this without any difficulty.
    - (ii) The patient with thoracic outlet syndrome will complain of fatigue & pain in forearm muscles, paresthesiae of the forearm, & tingling & numbness sensation in the fingers. Majority of these patients fail to complete this test due to pain & distress, & they drop their arms.
    - (iii) In cervical disc syndrome the patient will feel pain in the neck & shoulders, though little distress is felt in the forearm & hand.
- (4) **Allen's test**
- (a) This is performed to know the patency of radial & ulnar arteries.
  - (b) The patient is asked to clench the fist tightly. The clinician presses on the radial

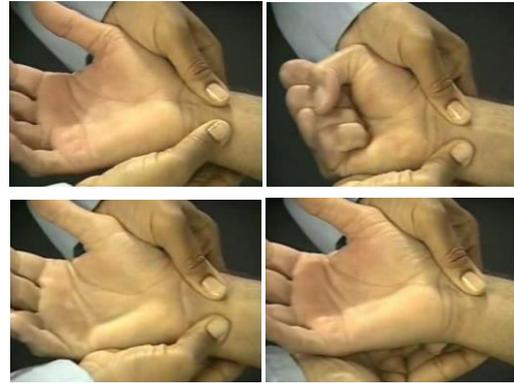


Figure 17.9: Sequential demonstration of Allen's test (from above left).

- (c) & ulnar arteries at the wrist. After 1 minute the patient is asked to open the fist. The palm appears white.
  - (c) Now pressure on the radial artery is removed & the change in color of the hand is noted. If the radial artery is blocked the color remains white, but if it is patent the palm assumes normal color.
  - (d) Now the pressure on the ulnar artery is removed.
  - (e) Now the test is repeated & the pressure on the ulnar artery is first removed keeping pressure on the radial artery. If the ulnar artery is blocked the hand remains white, but if it is patent the palm assumes normal color.
- (5) **Branham's or Nicoladoni's sign**
- (a) This is performed when arteriovenous fistula is suspected.
  - (b) A pressure on the artery proximal to the fistula will cause reduction in size of swelling, disappearance of bruit, fall in pulse rate, & the pulse pressure returns to normal.
- (6) **Costoclavicular compressive maneuver**
- (a) This is performed when thoracic outlet syndrome is suspected.
  - (b) Patient's radial pulse is felt, & is then asked to throw the shoulders backwards & downwards as an exaggerated military position.
    - (i) This will compress the subclavian artery between the clavicle & the first

rib leading to reduction or disappearance of the radial pulse.

- (ii) Simultaneously a subclavian bruit may be heard.

(7) **Hyper-abduction maneuver**

- (a) This is performed when pectoralis minor syndrome is suspected.
- (b) Patient's radial pulse is felt, & the affected arm is passively hyperabducted.
- (i) This will cause reduction or disappearance of the radial pulse due to compression by the pectoralis minor tendon in pectoralis minor syndrome.
- (ii) An axillary bruit may be heard near the position where pectoralis minor tendon crosses the axillary artery.

(8) **Adson's test**

- (a) This is performed when cervical rib or scalenus anticus syndrome is suspected.
- (b) Patient's both radial pulses are felt simultaneously after pulling both the arms downwards. This will cause diminution or obliteration of the pulse on the affected side.
- (c) Another way to perform this test is to ask a sat patient to take in a deep breath & turn the face to the affected side. Radial pulse is felt, which will be diminished or obliterated.



Figure 17.10: Demonstration of Adson's test.

### Auscultation

- (1) Make it your routine to listen along the course of all major arteries, especially in a suspected case of ischemia. Do not exert too much pressure with the bell of stethoscope, otherwise

it would obliterate the artery & cause an artificial bruit.

- (a) A systolic bruit over an artery is due to turbulent blood flow beyond stenosis.
- (b) Systolic murmur can also be heard over an aneurysm.
- (c) A bruit is also heard on the renal artery in case of hypertension due to renal artery stenosis.
- (d) A continuous machinery murmur may be heard over an arteriovenous fistula.
- (2) Measure blood pressure in both arms to exclude subclavian or innominate artery disease.
- (3) **Reactive hyperemia test**
- (a) This is performed to determine the severity of arterial ischemia.
- (b) Inflate the sphygmomanometer cuff around the limb to 250 mmHg for 5 minutes, followed by deflation. Now note the time of appearance of cutaneous red flush. It is 1-2 seconds in a normal limb, but will be delayed in arterial occlusive disease & may never appear in a severely ischemic limb.

### NEUROLOGIC EXAMINATION

- (1) Sensation of the gangrenous area is often lost, while on the border line of gangrene the skin becomes hyperesthetic.
- (2) Movement of the gangrenous area is lost in acute ischemia, often within 4-6 hours of onset.
- (3) In case of superficial ulceration, exclude other disorders of the central nervous system eg hemiplegia, transverse myelitis, syringomyelia, tabes dorsalis etc.

### GENERAL EXAMINATION

- (1) Atherosclerosis is a generalized disease & the patient must be examined thoroughly to exclude ischemic heart disease, cerebrovascular disease, hypertension, renal artery stenosis etc.
- (2) In embolic manifestation, the heart is examined for the presence of cardiac murmur, which may indicate certain lesion to cause embolus formation.
- (3) Diabetes is often accompanied by atherosclerosis.

# Module 18

## Peripheral Venous System

### VARICOSE VEINS OF LOWER LIMB

#### HISTORY

##### Age

Commonly occur in middle-age group, although it can affect individuals of any age groups.

##### Sex

Females are affected more commonly than males, in the ratio of 10:1.

##### Occupation

- (1) Individuals involved in jobs with prolonged standing are prone to develop varicose vein eg bus conductors, traffic policemen etc.
- (2) It may also occur in individuals involved in excessive muscular contractions eg Ricksaw-pullers, athletes etc.

#### Symptoms

##### Pain

- (1) This is an aching sensation felt in the whole of the leg or in the lower part of the leg according to the position of the varicose vein.
- (2) This is particularly worse towards the end of the day when the patient stands up for a long time, & is relieved by lying down for 15-30 minutes.
- (3) Patient may complain of bursting pain while walking, which indicates deep vein thrombosis (DVT).
- (4) Night cramps may also be present.

##### Other symptoms

- (1) Ankle swelling towards the end of the day.
- (2) Itching of the skin of the leg.
- (3) Restless legs.
- (4) Unsatisfactory cosmetic appearance.
- (5) Varicose ulcer on the medial malleolus (see module 4).
- (6) There may be asymptomatic varicose veins on one side & severe symptoms with very few visible varicose veins on the other side.
- (7) Patients may have symptoms suggesting DVT, eg feeling difficulty in standing or walking.
- (8) Patients may have symptoms suggesting a source of secondary varicose vein, eg constipation or a pelvic lump.

##### Past & associated medical history

- (1) Any history of major limb trauma, serious medical illness or previous major operation? These may cause DVT resulting in varicose veins.
- (2) Enquire about any previous treatments for the varicose veins?

##### Obstetric history

- (1) Enquire about the details of previous pregnancies. Pregnancy under the influence of estrogen & progesterone cause smooth muscle in the vein wall to relax, thus predisposing varicose veins.
- (2) Ask whether the patient suffered from 'white leg' during the previous pregnancies.
- (3) Ask whether the patient had taken contraceptive pills for quite a long time, as this may-cause deep vein thrombosis.

**Family history**

Varicose veins may have a familial predisposition.

**CLINICAL EXAMINATION**

**Exposure**

Always expose both the normal & affected limbs in full, from the level of umbilicus to toes, & put them side by side. This will help you in detecting & comparing even the minor clinical clues.

**Inspection**

- (1) Ask the patient to stand & inspect carefully.
- (2) Always inspect both the front & back of limbs, & record the inspection findings on a drawing of the leg.

**Varicose veins**

**(1) Great, small or both saphenous vein(s)**

- (a) In case of great saphenous vein a large venous trunk is seen on the medial side of the leg starting from in front of the medial malleolus to the medial side of the knee & along the medial side of the thigh upwards to the saphenous opening.
- (b) In case of short saphenous vein the dilated venous trunk is seen in the leg from behind the lateral malleolus upwards in the posterior aspect of the leg & ends in the popliteal fossa.
- (c) Both venous trunks receive tributaries in its course.

**(2) Distribution**

- (a) Widespread in one or both legs.
- (b) Restricted to a single varix eg saphena-varix.

**(3) Size**

- (a) Varices of major tributaries of saphenous veins or saphenous veins themselves are large (5-15 mm in diameter).
- (b) **Reticular varices** are 1-3 mm in diameter, lying immediately beneath the skin & present as small varicosities.
- (c) Smaller varices, 0.5-1 mm in diameter, in the skin are referred as **thread veins** or dermal flares, & are usually purple or red in color.

**Causes of lower limb varicose veins**

**(1) Primary varicose veins**



Figure 18.1: Varicose veins; great saphenous (left & upper right), & small saphenous left leg (lower right).

- (a) Congenital paucity of valves.
- (b) Increased hydrostatic pressure, eg from standing for long periods.
- (c) Pregnancy → Relaxation of smooth muscle in the vein wall due to estrogen & progesterone.

**(2) Secondary varicose veins**

- (a) Destruction of valve → Deep vein thrombosis.



Figure 18.2: Reticular varices (left), & thread veins (right).

- (b) Obstruction of venous outflow
  - (i) Tumors eg fibroid, ovarian cyst, & carcinoma of cervix, uterus, ovary or rectum.
  - (ii) Pregnancy.
  - (iii) Abdominal lymphadenopathy.
  - (iv) Ascites.
  - (v) Iliac vein thrombosis.
  - (vi) Retroperitoneal fibrosis.
- (c) High pressure flow → Arteriovenous fistula.

**Ankle & leg appearances**

- (1) Generalized swelling of the leg is mostly due to deep vein thrombosis.
- (2) Calf muscle increases in size, & there may be some ankle edema.
- (3) Ankle becomes narrower due to contraction of the skin & subcutaneous tissues. Combination of a narrow ankle & prominent calf is referred as a 'champagne bottle leg.'



Figure 18.3: champagne bottle, left leg.

**Skin changes**

- (1) Local redness is usually due to superficial thrombophlebitis.
- (2) Generalized congestion & blue discoloration due to deep vein thrombosis is referred as phlegmasia cerulea dolens. In such severe venous obstruction the arterial pulses may gradually disappear & venous gangrene may ensue.
- (3) Skin complications due to varicose veins may range from mild eczema to severe ulceration;



Figure 18.4: Phlegmasia cerulea dolens, left leg.

- (a) Initially, there is *brown pigmentation* due to hemosiderin deposition. This particularly affects the gaiter area of leg, just above the malleoli.
- (b) *Atrophie blanche* may also develop, & venous ulceration may develop in these areas.
- (4) Scar may be seen at the lower part of the leg



Figure 18.5: Brown pigmentation & lipodermatosclerosis (above), & atrophie blanche (below).



Figure 18.6: Venous ulcer.



Figure 18.7: Saphena varix.

which may be due to healed venous ulcer or previous operation for varicose veins.

#### **Complications of varicose veins**

- (1) Hemorrhage
- (2) Superficial thrombophlebitis
- (3) Pigmentation
- (4) Eczema
- (5) Lipodermatosclerosis
- (6) Venous ulceration
- (7) Calcification of vein
- (8) Periostitis, in case of long-standing ulcer over the tibia.
- (9) Equinus deformity also occurs in cases of long-standing ulcer. When the patient finds that walking on the toes relieves pain, so he continues to do so & ultimately the Achilles tendon becomes shorter.

#### **Palpation**

The aim is to locate the incompetent valves communicating the superficial & deep veins.

#### **Morrissey's cough impulse test**

- (1) With the patient still standing, laid your fingers on the thigh over the saphenous opening, with pulp of your middle finger resting on the long saphenous vein. Patient is asked to cough forcibly. A fluid thrill is imparted to the finger if the sapheno-femoral valve is incompetent ('saphena varix').
- (2) Similarly a bruit may be heard on auscultation.

#### **Brodie-Trendelenburg test**

This test is performed to determine the incompetency of the saphenofemoral junction & other communicating systems.

#### **Clinical techniques**

- (1) In both methods, the patient is first placed in



Figure 18.8: Demonstration of Brodie-Trendelenburg test; varicose veins (upper), emptying of veins (middle), & gradual filling of veins while the pressure is maintained (lower).

the recumbent position & the legs are raised to empty the veins; this may be hastened by milking the veins proximally.

- (2) Now compress the saphenofemoral junction with your thumb or apply a tourniquet just below the saphenofemoral junction.
- (3) Ask the patient to stand up quickly;
  - (a) In the first method, the pressure is released. The test will be positive if the varices fill very quickly by a column of blood from above, indicating incompetency of the saphenofemoral junction.
  - (b) To test the communicating system, the pressure is not released but maintained for about one minute. Gradual filling of the veins during this period indicates incompetency of the communicating veins, mostly situated on the medial side of lower half of the leg allowing the blood to flow from the deep to the superficial veins. This is also considered as a positive Trendelenburg test.
- (4) In varicosities of short saphenous vein same test is done by pressing the sapheno-popliteal junction.

#### ***Tourniquet test (modified Trendelenburg test)***

##### ***Clinical techniques***

- (1) Tourniquet is tied round the thigh or the leg at different levels after the superficial veins have been made empty by raising the leg in recumbent position.
- (2) Patient is now asked to stand up, & observations made.

##### ***Great saphenous vein***

- (1) If the veins above the tourniquet fill up & those below it remain collapsed it indicates presence of incompetent communicating vein above the tourniquet.
- (2) Similarly if the veins below the tourniquet fill rapidly whereas veins above the tourniquet remain empty, the incompetent communicating vein must be below the tourniquet.
- (3) Thus by moving the tourniquet progressively down the leg or using several tourniquets at once, one can determine the position of the incompetent communicating vein.
- (4) Incompetent communicating sources in the long saphenous vein are the saphenofemoral

junction, the mid-thigh perforator (Dodd), the gastrocnemius perforators (Boyd) & the lower leg perforators (Cockett).

##### ***Short saphenous vein***

- (1) Application of the tourniquet to the upper thigh has the paradoxical effect of increasing the strength of the reflux as shown by faster filling time. This is pathognomonic of varices of the short saphenous system.

##### ***Mechanism***

Application of the upper thigh tourniquet blocks off the great saphenous system which is carrying most of the superficial venous return & thus thrown into greater prominence the retrograde leak for the saphenous-popliteal junction.

- (2) Saphenopopliteal junction is marked with a pen with the patient standing. Short saphenous vein is emptied by elevation of the leg, firm thumb pressure is applied to the ink mark, & the patient is asked to stand. On release of the pressure, the vein will fill immediately.
- (3) There is no other incompetent perforating vein in the short saphenous system.

##### ***Perthes' test***

- (1) The affected lower limb is wrapped with elastic bandage, & the patient is asked to walk around.
- (2) Severe cramp is complained of if there is deep vein thrombosis.

##### ***Modified Perthes' test***

- (1) This test is primarily intended to know whether the deep veins are normal or not.
- (2) A tourniquet is tied round the upper thigh tight enough to prevent any reflux down the vein, & the patient is asked to walk quickly with the tourniquet in place.
- (3) If the communicating & deep veins are normal the varicose veins will shrink whereas if they are blocked the varicose veins will be more distended.

##### ***Fegan's method***

- (1) This is performed to indicate the sites of perforators.
- (2) In standing posture the sites of excessive bulges within the varicosities are marked.
- (3) The patient now lies down, & the affected limb is elevated to empty the varicose veins.
- (4) Now palpate along the line of the marked varicosities carefully & finds out gaps or pits in

the deep fascia which transmit the incompetent perforators. They are felt as circular openings with sharp edges; marked them.

### Pratt's test

- (1) This test is performed to know the positions of leg perforators.
- (2) Firstly an Esmarch elastic bandage is applied from toes to the groin. This causes emptying of the varicose veins.
  - (a) A tourniquet is then applied at the groin.
  - (b) The tourniquet is kept in position & the elastic bandage is taken off.
  - (c) The same elastic bandage is now applied from the groin downwards.
- (3) At the positions of the perforators 'blow outs' or visible varices can be seen. These are marked with a skin pencil.

### Signs of chronic venous hypertension

- (1) Examine for pitting edema or tenderness at the lower part of the leg.
- (2) Palpable indurations may be felt in the skin & subcutaneous tissues, referred as lipodermatosclerosis. This particularly affects the gaiter area of leg, just above the malleoli, & may be the precursor of venous ulceration.
- (3) In case of ulceration examine it in details as given in module 4.

#### DIFFERENTIAL DIAGNOSIS OF LEG ULCERS

- 1) Peripheral arterial disease
- 2) Diabetes
- 3) Neuropathy
- 4) Autoimmune disease (rheumatoid disease, systemic sclerosis, SLE)
- 5) Trauma
- 6) Malignant ulcers (basal cell carcinoma, squamous cell carcinoma, malignant melanoma)
- 7) Infective

### Percussion

#### Schwartz test

This test is performed with the patient standing, usually just after cough impulse test (for patient's convenience & to save time).

- (1) If the most prominent parts of the varicose veins are tapped, an impulse can be felt by the

finger at the saphenous opening.

- (2) Sometimes the percussion wave can be transmitted from above downwards & this will imply absent or incompetent valves between the tapping finger & the palpating finger.

### Auscultation

In case of varicose veins due to arteriovenous fistula a continuous machinery murmur may be heard.

### DON'T FORGET TO EXAMINE

Examination for peripheral venous disease does not finish with the inspection, palpation, percussion & auscultation of the diseased vein. Many of the candidates get failed in the final clinical exam by forgetting these (especially in the short cases component of exam). Always remember to examine the followings.

#### (1) Regional lymph nodes (inguinal nodes)

These are enlarged in cases of venous ulceration, especially if this is infected.

#### (2) Contralateral limb

It should be examined for the presence of varicose veins & to exclude deep vein thrombosis, incompetent perforators & venous ulcer.

#### (3) Examination for peripheral arterial disease

In cases of leg ulceration, it is necessary to exclude peripheral arterial disease.

#### (4) Neurological examination

#### (5) Examination of abdomen

This includes rectal, vaginal & scrotal examination. Sometimes a pregnant uterus or intrapelvic tumor (eg fibroid, ovarian cyst, cancer of cervix or rectum) or abdominal lymphadenopathy (eg metastasis from testicular tumor) may cause pressure on the external iliac vein & becomes responsible for secondary varicosity.

### DEEP VEIN THROMBOSIS (DVT)

#### HISTORY

- (1) The patient is mainly or entirely confined to

- bed due to serious medical illness eg cerebrovascular accidents, or have recently undergone major abdominal, pelvic or hip operation.
- (2) The usual complain is pain & swelling of the leg.
  - (3) There may be slight fever.
  - (4) If the patient has already had pulmonary embolism he may complain of chest pain, dyspnea & hemoptysis.

### CLINICAL EXAMINATION

Whole of both lower limbs should be fully exposed, removing the patient's clothes as well as bedclothes.

### Inspection

- (1) Swelling of the leg is the most important feature. This is mainly found just around the ankle or little higher up.
- (2) Swollen leg may become very much painful & is called phlegmasia alba dolens.
- (3) When all the deep veins become blocked, the skin becomes congested & blue, which is called phlegmasia cerulea dolens.
- (4) Carefully look for the relative prominence of veins on the dorsum of foot, & visible veins (not varicosed) coursing the upper third of tibia on the affected side, useful signs of popliteal vein thrombosis.

### Palpation

- (1) Palpate the instep & follow this up by finger stroking around the depression below the medial malleolus.
- (2) Examine the ankle for pitting edema.
- (3) **Homan's sign**
  - (a) Passive forceful dorsiflexion of the foot with knee extended will elicit tenderness in the calf. This is due to traction on thrombosed posterior tibial vein.
  - (b) Care must be taken to be gentle in manipulation lest it may dislodge a clot & cause pulmonary embolism.
  - (c) A false positive test may be found in women who wear high-heeled shoes, with a consequent shortening of tendo Achilles.

### (4) Moses' sign

- (a) Ask the patient to draw up the knee & lie quietly. Commencing near the tendo Achilles, grasp the calf &, while retracting it from tibia, squeeze it gently.
  - (b) Proceed upward in this way, until you reach the main muscle mass, to ascertain whether the soleus is tender. Then alter your grip to compress the main muscle belly forwards.
  - (c) Tenderness elicited in this way strongly suggests posterior tibial vein thrombosis.
- (5) Palpate the popliteal space for tenderness (of popliteal vein thrombosis) with the leg extended resting comfortably on bed.
  - (6) Palpate for tenderness of femoral vein thrombosis. Place tip of your index finger over saphenous opening & draw the finger downwards along the course of femoral vein.
  - (7) Measurements often reveal swollen calf muscles.

### SUPERFICIAL VEIN THROMBOSIS (THROMBOPHLEBITIS)

This is an inflammatory condition & occurs after intravenous transfusion or in varicose veins.

- (1) Pain is the main feature.
- (2) Patient may run temperature.
- (3) Skin appears inflamed.
- (4) Vein feels hard & tender.
- (5) Spontaneous thrombophlebitis may sometimes be migratory (thrombophlebitis migrans), which may be associated with Buerger's disease, polycythemia, polyarteritis, visceral carcinoma etc.
- (6) Sometimes it may be idiopathic.

# Module 19

## Lymphatic System

### LYMPHADENOPATHY

### HISTORY

In general, enquire along the same lines as given for any lump in module 3.

### Age

- (1) Tuberculous lymphadenopathy & syphilis are diseases of the young age.
- (2) Acute lymphadenitis can occur at any age.
- (3) Primary malignant lymphomas occur at young age.
- (4) Secondary malignant (metastatic) lymphadenopathy occurs in old age.

### Duration

- (1) Short in acute lymphadenitis.
- (2) Long in chronic lymphadenitis, eg tuberculosis.

### Symptoms

#### Swelling

This is the usual presenting complain, in one or more of the known anatomical sites of lymph nodes.

#### Pain

Is the involvement of the lymph nodes painful?

- (1) The nodes are painful in both acute & chronic lymphadenitis.
- (2) The nodes are painless in syphilis, primary malignant lymphomas & secondary carcinoma.

#### Fever

- (1) Evening rise in temperature is a characteristic feature of tuberculosis.

- (2) In filariasis a periodic fever (especially during the full or new moon) is very common.
- (3) In Hodgkin's disease intermittent bouts of remittent fever (pel-Ebstein fever) is characteristic.

#### Loss of appetite & weight

This is often complained of in case of tuberculosis & malignant lymphadenopathy.

#### Pressure effects

Patient may complain of pressure effects due to enlarged lymph nodes.

- (1) Swelling of face & neck due to venous & lymphatic obstruction by the enlarged superior mediastinal group of lymph nodes or lymph nodes at the root of neck.
- (2) Enlarged retroperitoneal & para-aortic lymph nodes in Hodgkin's disease may cause edema & venous congestion of lower limbs.
- (3) Dyspnea may be complained of in case of enlargement of mediastinal group of lymph nodes due to pressure on trachea or bronchus.
- (4) Dysphagia may be complained of when esophagus is compressed.

#### First affected group

In case of generalized lymphadenopathy, it is necessary to know which group of lymph nodes was first affected. This may give a clue to the diagnosis.

- (1) Cervical group of lymph nodes is first affected in many cases of Hodgkin's disease, & tuberculosis.
- (2) Inguinal group of lymph nodes is first affected in filariasis, & lymphogranuloma inguinale.

#### Primary focus

Whenever the lymph nodes are enlarged, it is necessary to enquire about the symptoms suggesting affection of the primary focus in the drainage area of the lymph nodes. This should be done particularly in acute & chronic lymphadenitis. An insignificant abrasion or inflammation in the drainage area may lead to lymphadenitis.

### Past history

Enquire specifically about any previous history of syphilis, tuberculosis & primary or secondary carcinoma.

- (1) A patient who presents with enlarged cervical lymph nodes may give a past history of tuberculosis & the diagnosis becomes easy.
- (2) A patient with enlarged cervical lymph nodes may give history of previous lung tuberculosis.
- (3) A patient with penile or testicular carcinoma may present with lump in the abdomen, which is nothing but enlarged iliac group of lymph nodes.
- (4) Enlargement of epi-trochlear & suboccipital groups of lymph nodes may elude the clinician if he/she does not ask the past history of primary syphilis, as these lymph nodes may be enlarged in the secondary stage of syphilis.

### Family history

- (1) Sometimes tuberculosis runs in families & should be asked for.
- (2) Lymphosarcoma & other types of lymphomas have also shown a tendency to run in families.

## LOCAL EXAMINATION

### Inspection

#### Swellings

Inspection of the swellings is along the same line as given in module 3, noting features like site, size, shape, surface, edge, overlying skin, pulsation, cough impulse, number, & pressure effect.

#### (1) Site

- (a) Swellings at the known anatomical sites of the lymph nodes should be considered to have arisen from them unless some outstanding clinical findings prove their origin to be otherwise.

- (b) It will not only give an idea as to which group of lymph nodes is affected, but also the diagnosis;
  - (i) Tuberculosis & Hodgkin's disease affect the cervical nodes, initially.
  - (ii) Lymphogranuloma inguinale & filariasis affect the inguinal nodes.
  - (iii) Secondary stage of syphilis involves the epi-trochlear & occipital groups.

#### (2) Number

- (a) Swellings are usually multiple at any known lymph node site.
- (b) Single or multiple groups of nodes may become involved.
- (c) Generalized lymphadenopathy is known to occur in Hodgkin's disease, tuberculosis, lymphosarcoma, lymphatic leukemia, brucellosis & sarcoidosis.

#### (3) Skin over the swelling

- (a) In acute lymphadenitis the skin becomes inflamed with redness, edema & brawny induration.
- (b) In chronic lymphadenitis the skin over the swelling does not show such angriness.
- (c) Skin over tuberculous lymphadenitis & cold abscess remains 'cold' in the true sense till they reach the point of bursting when the skin becomes red & glossy.
- (d) Over a rapidly growing lymphosarcoma the skin becomes tense, shining, with dilated subcutaneous veins.
- (e) In secondary carcinoma, though the skin remains free in the early stage, yet it becomes fixed to the swelling at later stage



Figure 19.1: Cervical lymphadenopathy.

when the disease has gone beyond the scope of surgery.

- (f) Not infrequently a scar, a sinus or an ulcer may be present by the side of or over the swelling. Scar often indicates previous bursting of cold abscess or a previous operation. If present examine it in details as given in module 4.
- (g) Ulceration & sinus formation may also be found in lymphogranuloma inguinale.

#### (4) Pressure effects

Careful inspection must be made of the whole body to detect any pressure effect due to lymphadenopathy.

- (a) Edema of the upper & lower limb may occur due to enlargement of axillary & inguinal groups of lymph nodes, respectively.
- (b) Swelling & venous engorgement of face & neck may occur due to pressure effect of lymph nodes at the root of the neck.
- (c) Nearby nerves may become involved due to enlarged lymph nodes, eg hypoglossal nerve may be involved from enlarged upper group of cervical lymph nodes due to Hodgkin's disease or secondary carcinoma.
- (d) Dyspnea & dysphagia may be complained of due to pressure on the trachea & esophagus, respectively.

#### Palpation

- (1) Palpate the swelling systematically noting its temperature, tenderness, site, size, shape, surface, edge, consistency, fluctuation, translucency, cough impulse, reducibility, compressibility, pulsatility, & mobility as discussed in module 3.
- (2) It must be remembered that normal lymph nodes without enlargement are not palpable.
- (3) Scheme of palpation of various groups of axillary & cervical lymph nodes are given in detail in modules 7 & 15, respectively.

#### Consistency

- (1) Soft (fluctuating) in cold abscess.
- (2) Elastic & rubbery in Hodgkin's disease.
- (3) Firm, discrete & shotty in syphilis.
- (4) Stony hard in secondary carcinoma.
- (5) Variable consistency in lymphosarcoma —

soft, firm & hard in places depending on the rate of the growth.

#### Lymph nodes' matting

Adjacent nodes become matted together in cases of periadenitis. This is characteristically present in tuberculous lymphadenopathy, & also found in metastatic lymphadenopathy.

#### Fixity to surrounding structures

- (1) The enlarged lymph nodes should be carefully palpated to know if they are fixed to the skin, the deep fascia, the muscles, the vessels, the nerve etc.
- (2) Any primary malignant growth of the lymph nodes be it lymphosarcoma, reticulosarcoma, histiosarcoma or secondary carcinoma is often fixed to the surrounding structures — first with the deep fascia & underlying muscles, followed by adjoining structures & ultimately the overlying skin.
- (3) Metastatic inguinal lymphadenopathy (eg from carcinoma of penis) may infiltrate the femoral vessels & causes fatal hemorrhage.
- (4) Upper deep cervical lymph nodes when involved secondarily from any carcinoma of its drainage area may involve the hypoglossal nerve & cause hemiparesis of the tongue which will be deviated towards the side of lesion when asked to protrude it out.
- (5) Patient may complain of dyspnea or dysphagia due to pressure on the trachea/bronchus or esophagus by enlarged lymph nodes from Hodgkin's disease, lymphosarcoma or secondary carcinoma.

#### DRAINAGE AREA EXAMINATION

Make it your routine to examine the drainage area whenever you found lymphadenopathy at any site. This will be of diagnostic value in cases of metastatic & inflammatory lymphadenopathy.

- (1) Cervical & supraclavicular nodes (see module 15).
- (2) Axillary lymph nodes
  - (a) Ipsilateral upper limb.
  - (b) Ipsilateral half of the skin of trunk, extending from the clavicle to the level of umbilicus (including the breasts).
- (3) Inguinal lymph node
  - (a) Ipsilateral lower limb.

- (b) Skin of the lower part of the abdomen below the level of the umbilicus.
- (c) Penis & scrotum.
- (d) Perineum, vulva & anus.
- (e) Buttock & lower part of the back.
- (f) Terminal parts of the anal canal, urethra & vagina.

### DON'T FORGET TO EXAMINE

Examination of lymph nodes should not finish with the examination of one lymph node region & its drainage area. Always remember to examine the followings.

- (1) **Other regional lymph nodes**
  - (a) Lymph nodes in other parts of the body should always be examined in any case of lymph node involvement.
  - (b) This may reveal cases of generalized involvement of lymphatic system, eg Hodgkin's disease, lymphosarcoma, lymphatic leukemia, tuberculosis, brucellosis & sarcoidosis.
- (2) **General examination**  
Malnutrition, cachexia, anemia & weight loss are often seen in cases of tuberculous lymphadenitis, & primary & secondary malignant lymphadenopathies.
- (3) **Examination of abdomen**
  - (a) This includes rectal, vaginal & scrotal examination.
  - (b) Hepatosplenomegaly & mesenteric & iliac lymphadenopathy may be found in Hodgkin's disease.
- (4) **Examination of lungs**  
In cases of cervical lymphadenopathy it is necessary to exclude pulmonary tuberculosis & primary or secondary malignant lesions.
- (5) **Syphilitic stigmas in syphilis.**
- (6) **Parotid & lacrimal glands in sarcoidosis.**

### LYMPHEDEMA

It is defined as abnormal limb swelling due to accumulation of high protein interstitial fluid (ISF), secondary to defective lymphatic drainage in the

presence of (near) normal net capillary filtration. It is confined to the epifascial space.

### HISTORY

#### Age

- (1) Primary lymphedema may occur at any age, but is divided into 3 groups on the basis of age of onset.
  - (a) Congenital → Onset < 2 years of age.
  - (b) Praecox → Onset 2-35 years of age.
  - (c) Tarda → Onset after 35 years of age.
- (2) Secondary lymphedema occur in middle & old age.

#### Sex

- (1) Primary lymphedema occur more in females than males.
- (2) Secondary lymphedema is also more common in females, eg following radical mastectomy or due to involvement of iliac & inguinal nodes from malignant tumors of the uterus, vagina or ovary.

#### Geography

Lymphedema following filariasis (elephantiasis) is more common in tropical & subtropical countries.

#### Symptoms

##### (1) Swelling

- (a) The presenting complaint is slowly progressive swelling of the limb &/or genitalia over several years.
- (b) Secondary lymphedema may appear in a few weeks & progress rapidly.

##### (2) Other symptoms

- (a) Constant dull ache, even severe pain or cramp.
- (b) Pins & needles, burning & bursting sensations.
- (c) Sensitivity to heat.
- (d) Skin problems, eg dehydration, flakiness, weeping, excoriation & breakdown.
- (e) Athlete's foot.
- (f) Acute infective episodes.
- (g) Backache & joint problems.
- (h) Immobility, leading to obesity & muscle wasting.
- (i) General tiredness & debility.

#### Past medical & surgical history

Enquire specifically to find a cause of secondary

lymphedema;

- (1) Parasitic infection (filariasis).
- (2) Fungal infection (tinea pedis).
- (3) Exposure to foreign body material (silica particles).
- (4) Primary lymphatic malignancy.
- (5) Metastatic spread to lymph nodes.
- (6) Radiotherapy to lymph nodes.
- (7) Surgical excision of lymph nodes.
- (8) Trauma (particularly degloving injuries).

#### DIFFERENTIAL DIAGNOSIS OF SWOLLEN LIMB

##### Non vascular or lymphatic disorders

###### A) General disease states

- 1) Cardiac failure
- 2) Hepatic failure
- 3) Hypoproteinemia due to nephrotic syndrome, malabsorption, protein losing enteropathy
- 4) Hypothyroidism (myxedema)
- 5) Allergic disorders, including angioedema & idiopathic cyclic edema
- 6) Prolonged immobility & lower limb dependency

###### B) Local disease processes

- 1) Ruptured Baker's cyst
- 2) Myositis ossificans
- 3) Bony or soft tissue tumors
- 4) Arthritis
- 5) Hemarthrosis
- 6) Calf muscle hematoma
- 7) Achilles tendon rupture

###### C) Others

- 1) Retroperitoneal fibrosis
- 2) Gigantism
- 3) Drugs: Corticosteroids, estrogens, progestogens, monoamine oxidase inhibitors, methyl dopa, hydralazine, nifedipine
- 4) Trauma
- 5) Obesity

##### Venous disorders

- 1) Deep venous thrombosis
- 2) Post thrombotic syndrome
- 3) Varicose veins
- 4) Klippel Trenaunay syndrome
- 5) External venous compression

##### Arterial disorders

- 1) Ischemia reperfusion
- 2) Arteriovenous malformation
- 3) Aneurysm

#### CLINICAL CLASSIFICATION (BRUNNER)

- 1) **Subclinical (latent)** → There is excess interstitial fluid & histological abnormalities in lymphatics & lymph nodes, but no clinically apparent lymphedema.
- 2) **Grade I** → □ Edema pits on pressure & swelling largely, or completely disappears on elevation & bed rest.
- 3) **Grade II** → □ Edema does not pit & does not significantly reduce upon elevation.
- 4) **Grade III** → □ Edema is associated with irreversible skin changes, ie fibrosis, papillae.

(9) Superficial thrombophlebitis.

(10) Deep venous thrombosis.

#### Family history

- (1) Congenital primary lymphedema may be familial (Milroy's disease).
- (2) Praecox primary lymphedema may also be familial (Meige's disease).

#### LOCAL EXAMINATION

##### Inspection & palpation

- (1) Lymphedema characteristically involves the foot;
  - (a) Loss of ankle contour, through infilling of the submalleolar depressions.
  - (b) Buffalo hump on the dorsum of foot.
  - (c) Toes appear square.
  - (d) **Stemmer's sign**  
Skin on the dorsum of the toes cannot be



Figure 19.2: Lymphedema, right leg.



Figure 19.3: Filariasis, right leg.

- pinched due to subcutaneous fibrosis.
- (2) The proximal extent is usually to the knee level, but less commonly the whole leg is affected.
- (3) Initially it will pit & the swelling is down in morning.
- (4) Later, there will be fibrosis, dermal thickening & hyperkeratosis.
- (5) Chronic eczema, dermatophytosis, onychomycosis, fissuring, verrucae & papillae are frequently seen in advanced disease.
- (6) Lymphangiomas may be present, which are dilated dermal lymphatics that blister & weeps onto the skin surface;
  - (a) Lymphangioma circumscriptum → < 5 cm across.
  - (b) Lymphangioma diffusum → More widespread.
  - (c) Lymphedema ab igne → Form a reticulate



Figure 19.4: Lymphangioma, tongue.



Figure 19.5: Stewart-Treves syndrome.

- pattern of ridges.
- (7) Ulceration, non-healing bruises, & raised purple-red nodules should lead to suspicion of malignancy. Lymphangiosarcoma in post mastectomy lymphedema is termed Stewart-Treves syndrome.
- (8) Lymph nodes draining the lymphedematous area will not be enlarged in primary lymphedema, but may be big & hard if they are infiltrated with tumor.

# Module 20

## Nervous System

### HISTORY

#### Presenting complaint

- (1) Ask about the symptoms:
  - (a) What are they?
  - (b) Which part of the body do they affect? Are they localized or more widespread?
  - (c) When did they start?
  - (d) How long do they last for?
  - (e) Were they sudden, rapid or gradual in onset? Is there a history of trauma?
  - (f) Are the symptoms static or deteriorating, or are there exacerbations and remissions?
  - (g) Does anything trigger the symptoms, eg exercise, sleep, posture or external stimuli such as light or smell?
- (2) Ask about any associated symptoms (other features of neurological disease):
  - (a) Headache.
  - (b) Numbness, pins and needles, cold or warmth.
  - (c) Weakness, unsteadiness, stiffness or clumsiness.
  - (d) Nausea or vomiting.
  - (e) Visual disturbance.
  - (f) Altered consciousness.
  - (g) Psychological changes, eg agitation, tearfulness, depression or elation, sleep disturbance.
  - (h) For children ask about performance at school.
- (3) Try to understand how the symptoms may affect the patient's life; ask about activities of daily living?

#### Past & associated medical history

Some neurological problems can present years after a causative event.

- (1) Enquire about other medical problems, past and present. These may give clues to the diagnosis. For example:
  - (a) A person in atrial fibrillation may be producing multiple tiny emboli.
  - (b) There may be vascular problems or recurrent miscarriage to suggest antiphospholipid syndrome.
  - (c) There may be diabetes.
- (2) Ask about pregnancy, delivery and neonatal health.
- (3) Ask about any infections, convulsions or injuries in infancy, childhood or adult life. Particularly ask about head or spinal injury, meningitis or encephalitis.

#### Drug history & substance abuse

- (1) Note smoking and drinking habits. Alcohol is a significant neurotoxin, both centrally and peripherally.
- (2) Ask about drugs including prescribed, over-the-counter and illicit. This includes complementary and alternative medicines.

#### Family history

Consider if there may be a genetic basis or predisposition. For example:

- (1) A cousin with Duchenne muscular dystrophy or Becker muscular dystrophy would be very important for a boy who cannot run like his peers.
- (2) Huntington's chorea is unusual in that it is a familial disease that does not present until well

into adult life.

- (3) A family history of, eg type 2 diabetes, cerebral aneurysm, neuropathies, epilepsy, migraine or vascular disease may be important.

### Socio-economic history

- (1) Ask about occupation and what it involves.
  - (a) There may be exposure to toxins.
  - (b) Is repetitive strain injury likely?
  - (c) Is there prolonged visual work which may predispose to tension headache or migraine?
  - (d) The job may involve driving but the patient has admitted to convulsions.
  - (e) He may work at heights or in a dangerous environment.
- (2) Ask about marital status. Has there been recent bereavement or divorce which may have affected symptoms?
- (3) Ask about sexual orientation and consider likelihood of sexually transmitted infection, eg syphilis, HIV.

### Review of Systems

The systematic enquiry is very important here. For example:

- (1) Loss of weight and appetite may suggest malignancy and this may be a paraneoplastic syndrome.
- (2) Gain in weight may have precipitated diabetes.
- (3) Polyuria may suggest diabetes. Difficulty with micturition or constipation may be part of the neurological problem but was not volunteered in the general history. In men, enquire about erectile dysfunction.

## CLINICAL EXAMINATION

The neurological examination is required under following circumstances:

- (1) Patients presenting with symptoms suggestive of a neurological problem (eg head injury, spinal injury):
  - (a) To determine whether in fact neurological dysfunction exists.
  - (b) To identify which component(s) of the neurological system are affected (eg motor,

sensory, cranial nerves, or possibly several systems simultaneously).

- (c) To determine the precise location of the problem (eg peripheral or central nervous system; region and side of the brain affected).
- (2) Screening for the presence of discrete abnormalities in patients at risk for the development of neurological disorders. Diabetic patients, for example (particularly those with long standing poor control), may develop peripheral nerve dysfunction.
- (3) Routine screening/documentation of baseline function for those who are otherwise healthy. Simply observing the patient during the course of the usual history taking (ie watching them walk, get up and down from the exam table, etc.) may well suffice.

## CRANIAL NERVE (CN) TESTING

As each half of the body has its own cranial nerve, both right and left sides must be checked independently.

**Table 20.1: COMPONENTS OF NEUROLOGICAL EVALUATION**

- 1) Mental status testing (see module 2)
- 2) Cranial nerves
- 3) Sensory function
- 4) Muscle strength, tone and bulk
- 5) Reflexes
- 6) Cerebellar function
- 7) Gait

### Cranial nerve 1 (olfactory)

Formal assessment of ability to smell is generally omitted, unless there is a specific complaint.

#### Clinical techniques

- (1) Each nostril should be checked separately. Push on the outside of the nares, occluding the side that is not to be tested.
- (2) Have the patient close their eyes. Make sure that the patient is able to inhale and exhale through the open nostril.
- (3) Present a small test tube filled with something that has a distinct, common odor (eg ground coffee) to the open nostril. The patient should be able to correctly identify the smell.

Alternatively, you can use an alcohol pad, or spirit or perfume soaked swabs.

### Cranial nerve 2 (optic)

This nerve carries visual impulses from the eye to the optical cortex of the brain by means of the optic tracts.

#### (1) Visual acuity

##### Clinical techniques

- Each eye is tested separately. If the patient uses glasses to view distant objects, they should be permitted to wear them.
- A Snellen chart is the standard, wall mounted device used for this assessment. Patients are asked to read the letters or numbers on successively lower lines (each with smaller images) until you identify the last line which can be read with 100% accuracy. Each line has a fraction written next to it. 20/20 indicates normal vision. 20/400 means that the patient's vision 20 feet from an object is equivalent to that of a normal person viewing the



Figure 20.1: Snellen chart for measuring visual acuity.



Figure 20.2: Hand held visual acuity card.

same object from 400 feet. In other words, the larger the denominator, the worse the vision.

- There are hand held cards that look like Snellen charts but are positioned 14 inches from the patient. These are used simply for convenience. Testing and interpretation are as described for the Snellen.
- If both charts are unavailable, and the patient has visual complaints, some attempt should be made to objectively measure visual acuity. Can the patient read news print? The headline of a newspaper? Distinguish fingers or hand movement in front of their face? Detect light? Failure at each level correlates with a more severe problem.

#### (2) Visual field testing

Specific areas of the retina receive input from precise areas of the visual field. This information is carried to the brain along well defined anatomic pathways. Holes in vision (referred to as visual field defects) are caused by a disruption along any point in the path from the eyeball to the visual cortex of the brain.

##### Clinical techniques

- The examiner should be level nose to nose with the patient, separated by approx. 8 to 12 inches.
- Each eye is checked separately. The examiner closes one eye and the patient closes the one opposite. The open eyes should then be staring directly at one another.
- The examiner should move their hand out

towards the periphery of his/her visual field on the side where the eyes are open. The finger should be equidistant from both persons.

- (d) The examiner should then move the wiggling finger in towards them, along an imaginary line drawn between the two persons. The patient and examiner should detect the finger at more or less the same time.
- (e) The finger is then moved out to the diagonal corners of the field and moved inwards from each of these directions. Testing is then done starting at a point in front of the closed eyes. The wiggling finger is moved towards the open eyes.
- (f) The other eye is then tested.

#### **Significance**

Meaningful interpretation is predicated upon the examiner having normal fields, as they are using themselves for comparison.

- (a) If the examiner cannot seem to move their finger to a point that is outside the patient's field, don't worry, as it simply means that their fields are normal.
- (b) Remember, this test is rather crude, and it is quite possible to have small visual field defects that would not be apparent on this type of testing.

### **(3) Pupils**

The pupil has afferent (sensory) nerves that travel with CN2. These nerves carry the impulse generated by the light back towards the brain. They function in concert with efferent (motor) nerves that travel with CN3 and cause pupillary constriction. (See under CN3 for clinical techniques).

### **Cranial nerves 3, 4 & 6 (oculomotor, trochlear & abducent)**

CN3 is responsible for most of the extra-ocular movement. Its function is assessed in concert with CN4 & CN6, the other nerves responsible for controlling eyeball movement. CN4 controls the superior oblique muscle, which allows each eye to look down and medially. CN6 controls the lateral rectus muscle, which allows each eye to move laterally. CN3 controls the muscles which allow motion in all other directions. The mnemonic "SO4



Figure 20.3: CN 3, 4 & 6 testing.

–LR6–All The Rest 3” may help remind you which CN does what.

#### **Clinical techniques**

##### **(1) Extraocular movements testing**

- (a) Ask the patient to keep their head in one place. Then direct them to follow your finger while moving only their eyes.
- (b) Move your finger out laterally, then up and down.



Figure 20.4: Right CN3 lesion; patient's right eye is deviated laterally, there is ptosis of the lid, and the right pupil (middle picture) is more dilated than the left.



Figure 20.5: CN6 palsy; patient is unable to move left eye lateral of midline.

- (c) Then move your finger across the patient's face to the other side of their head. When it is out laterally, move it again up and down. You will roughly trace out the letter "H", which takes both eyeballs through the complete range of movements.
- (d) At the end, bring your finger directly in towards the patient's nose. This will cause the patient to look cross-eyed and the pupils should constrict, a response referred to as accommodation.
- (e) CN3 also innervates the levator palpebrae superioris muscle which raises the upper eye lid. This can first be assessed by simply looking at the patient. If there is CN3 dysfunction, the eyelid on that side will cover more of the iris and pupil compared with the other eye. This is referred to as ptosis.

**Note:** Disorders of the extraocular muscles themselves (and not the CN which innervate them) can also lead to impaired eye movement. For example, in a patient who has suffered a traumatic left orbital injury, the inferior rectus muscle become entrapped within the resulting fracture, preventing the left eye from being able to look downward (figure 20.6).

## (2) Pupillary light reflex testing

The response of pupils to light is controlled by afferent (sensory) nerves that travel with CN2 and efferent (motor) nerves that travel with CN3. These innervate the ciliary muscle, which controls the size of the pupil. Testing is performed as follows:

- (a) It helps if the room is a bit dim, as this will cause the pupil to become more dilated.
- (b) Using any light source (flashlight, ophthalmoscope, etc), shine the light into one eye. This will cause that pupil to constrict, referred to as the direct response.

- (c) Remove the light and then re-expose it to the same eye, though this time observes the other pupil. It should also constrict, referred to as the consensual response. This occurs because afferent impulses from one eye generate an efferent response that is sent to both pupils.
- (d) If the patient's pupils are small at baseline or you are otherwise having difficulty seeing the changes, take your free hand and place it above the eyes so as to provide some shade. This should cause the pupils to dilate additionally, making the change when they are exposed to light more dramatic. If you are still unable to appreciate a response, ask the patient to close their eye, generating maximum darkness and thus dilatation. Then ask the patient to open the eye and immediately expose it to the light. This will (hopefully) make the change from dilated to constricted very apparent.

## Interpretation

- (a) Under normal conditions, both pupils will appear symmetric. Direct and consensual response should be equal for both.
- (b) Asymmetry of the pupils is referred to as anisocoria. There may be no underlying neuropathology; in this setting, the direct and consensual responses should be preserved.
- (c) A number of conditions can also affect the size of pupils.
  - (i) Medications/intoxications which cause generalized sympathetic activation will result in dilatation of both pupils.



Figure 20.6: Entrapment of left inferior rectus.

- (ii) Other drugs (eg narcotics) cause symmetric constriction of the pupils.
  - (iii) Eye drops known as mydriatic agents are used to paralyze the muscles, resulting marked dilatation of the pupils. They are used during a detailed eye examination, allowing a clear view of the retina.
  - (iv) Any process which causes increased intracranial pressure can result in a dilated pupil that does not respond to light.
- (d) In afferent nerve lesion, neither pupil will respond when light is shined in the affected eye.
- (e) In efferent nerve lesion, the pupil will appear dilated at baseline and will have neither direct nor consensual pupillary responses.

### Cranial nerve 5 (trigeminal)

#### Assessment of CN5 sensory function

The sensory limb has 3 major branches, each covering roughly 1/3 of the face. They are: ophthalmic, maxillary, & mandibular. Assessment is performed as follows:

- (1) Use a sharp implement (eg broken wooden handle of a cotton tipped applicator). The patient should be able to clearly identify when the sharp end touches their face. Of course, make sure that you do not push too hard as the face is normally quite sensitive.
- (2) Ask the patient to close their eyes so that they receive no visual cues.
- (3) Touch the sharp tip of the stick to the right and left side of the forehead, assessing the ophthalmic branch.
- (4) Touch the tip to the right and left side of the cheek area, assessing the maxillary branch.
- (5) Touch the tip to the right and left side of the jaw area, assessing the mandibular branch.
- (6) The ophthalmic branch also receives sensory input from the surface of the eye. To assess this component:
  - (a) Pull out a wisp of cotton.
  - (b) While the patient is looking straight ahead, gently brush the wisp against the lateral aspect of the sclera.
  - (c) This should cause the patient to blink.



Figure 20.7: Sensory testing of ocular surface.

Blinking also requires that CN7 function normally, as it controls eye lid closure.

#### Assessment of CN5 motor function

The motor limb of CN5 innervates the temporalis and masseter muscles, both important for closing the jaw. Assessment is performed as follows:

- (1) Place your hand on both temporalis muscles, located on the lateral aspects of the forehead. Ask the patient to tightly close their jaw, causing the muscles beneath your fingers to become taught.
- (2) Then place your hands on both masseter muscles, located just in front of the temporomandibular joints. Ask the patient to tightly close their jaw, which should again cause the muscles beneath your fingers to become taught. Then ask them to move their jaw from side to side, another function of the masseter.

### Cranial nerve 7 (facial)

This nerve innervates many of the muscles of facial expression.

#### Clinical techniques

- (1) First look at the patient's face. It should appear symmetric:
  - (a) There should be the same amount of wrinkles apparent on either side of the forehead.
  - (b) Nasolabial folds should be equal
  - (c) Corners of the mouth should be at the same height.

If there is any question as to whether an apparent asymmetry is new or old, ask the patient for a picture (often found on NIC or driver's license) for comparison.
- (2) Ask the patient to wrinkle their eyebrows and then close their eyes tightly. CN7 controls the muscles that close the eye lids (as opposed to



Figure 20.8: Right UMN CN7 lesion; note preserved ability to wrinkle forehead. Left corner of mouth, however, is slightly lower than right. Left naso-labial fold is slightly less pronounced compared with right.

CN3, which controls the muscles which open the lid). You should not be able to open the patient's eyelids with the application of gentle upwards pressure.

- (3) Ask the patient to smile. The corners of the mouth should rise to the same height and equal amounts of teeth should be visible on either side.
- (4) Ask the patient to puff out their cheeks. Both sides should puff equally and air should not leak from the mouth.

#### **Clinical interpretation**

- (1) CN7 has a precise pattern of innervation, which has important clinical implications.
  - (a) The right and left upper motor neurons (UMNs) each innervate both the right and left lower motor neurons (LMNs) that allow the forehead to move up and down.
  - (b) However, the LMNs that control the muscles of the lower face are only innervated by the UMN from the opposite side of the face.
- (2) Thus, in CN7 lesion, the pattern of weakness or paralysis observed will differ depending on

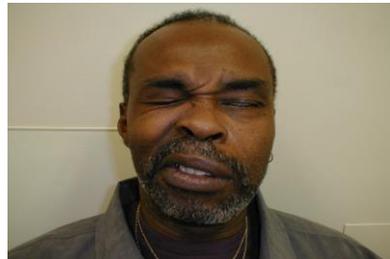
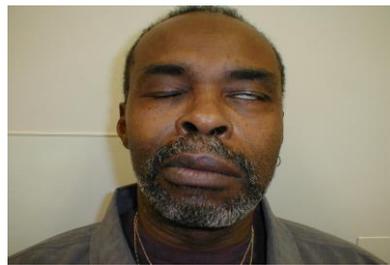


Figure 20.9: Left LMN CN7 lesion; note loss of forehead wrinkle, ability to close eye, ability to raise corner of mouth, and decreased naso-labial fold prominence on left.

whether the UMN or LMN is affected.

- (a) **UMN dysfunction:** This might occur with a central nervous system event, such as a stroke. In right UMN lesion, the patient would be able to wrinkle their forehead on both sides of their face, as the left CN7 UMN cross innervates the right CN7 LMN that controls this movement. However, the patient would be unable to effectively close their left eye or raise the left corner of their mouth.
- (b) **LMN dysfunction:** This occurs most commonly in Bell's palsy, an idiopathic, acute CN7 peripheral nerve palsy. In right LMN lesion, the patient would not be able to wrinkle their forehead, close their eye or

- raise the corner of their mouth on the right side. Left sided function would be normal.
- (3) This clinical distinction is very important, as UMN vs LMN lesion carry different prognostic and treatment implications.
- (a) Bell's palsy (LMN lesion) tends to happen in patient's over 50 and often responds to treatment with acyclovir (an anti-viral agent) and prednisone (a corticosteroid). Over the course of weeks or months there is usually improvement and often complete resolution of symptoms.
- (b) Assessment of acute UMN lesion would require quite a different approach (eg neuroimaging to determine the etiology).
- (4) CN7 is also responsible for carrying taste sensations from the anterior 2/3 of the tongue.

### Cranial nerve 8 (vestibulocochlear)

CN8 carries sound impulses from the cochlea to the brain. Prior to reaching the cochlea, the sound must first traverse the external canal and middle ear.

#### Clinical techniques

##### (A) Crude assessment

Auditory acuity can be assessed very crudely on physical exam as follows:

- (1) Stand behind the patient and ask them to close their eyes.
- (2) Whisper a few words from just behind one ear. The patient should be able to repeat these back accurately. Then perform the same test for the other ear.
- (3) Alternatively, place your fingers approximately 5 cm from one ear and rub them together. The patient should be able to hear the sound generated. Repeat for the other ear.

##### (B) Precise quantification

- (1) It is necessary whenever there is a subjective decline in acuity, & it requires special equipment and training.
- (2) The cause of subjective hearing loss can be assessed in 2 phases: conductive and sensorineural.
  - (a) The conductive phase refers to the passage of sound from the outside to the level of CN8. This includes the transmission of sound through the external canal and middle ear.

- (b) Sensorineural refers to the transmission of sound via CN8 to the brain.

#### Weber test

- (1) Grasp the 512 Hz tuning fork by the stem and strike it against the bony edge of your palm, generating a continuous tone.
- (2) Hold the stem against the patient's skull, along an imaginary line that is equidistant from either ear.
- (3) The bones of the skull will carry the sound equally to both the right and left CN8. Both CN8s, in turn, will transmit the impulse to the brain.
- (4) The patient should report whether the sound was heard equally in both ears or better on one side than the other (referred to as lateralizing to a side).



Figure 20.10: Weber test.

#### Rinne test

- (1) Grasp the 512 Hz tuning fork by the stem and strike it against the bony edge of your palm, generating a continuous tone.
- (2) Place the stem of the tuning fork on the mastoid bone, the bony prominence located immediately behind the lower part of the ear.
- (3) The vibrations travel via the bones of the skull to CN8, allowing the patient to hear the sound.
- (4) Ask the patient to inform you when they can no longer appreciate the sound. When this occurs, move the tuning fork such that the tines are placed right next to (but not touching) the opening of the ear. At this point, the patient should be able to again hear the sound. This is because air is a better conducting medium than bone.



Figure 20.11: Rinne test.

### Clinical interpretation

- (1) In the setting of a conductive hearing loss (eg wax in the external canal), the Weber test will lateralize (ie sound will be heard better) in the ear that has the subjective decline in hearing. This is because when there is a problem with conduction, competing sounds from the outside cannot reach CN8 via the external canal. Thus, sound generated by the vibrating tuning fork and traveling to CN8 by means of bony conduction is better heard as it has no outside "competition." You can transiently create a conductive hearing loss by putting the tip of your index finger in the external canal of one ear. If you do this while performing the Weber test, the sound will be heard on that side.
- (2) In the setting of a sensorineural hearing loss (eg a tumor of CN8), the Weber test will lateralize to the ear which does not have the subjective decline in hearing. This is because CN8 is the final pathway through which sound is carried to the brain. Thus, even though the bones of the skull will successfully transmit the sound to CN8, it cannot then be carried to the brain due to the underlying nerve dysfunction.
- (3) In the setting of conductive hearing loss, bone conduction (BC) will be better than air

conduction (AC) when assessed by the Rinne test. If there is a blockage in the passageway (eg wax) that carries sound from the outside to CN8, then sound will be better heard when it travels via the bones of the skull. Thus, the patient will note BC to be better than or equal to AC in the ear with the subjective decline in hearing.

- (4) In the setting of a sensorineural hearing loss, air conduction will still be better than bone conduction (ie the normal pattern will be retained). This is because the problem is at the level of CN8. Thus, regardless of the means (bone or air) by which the impulse gets to CN8, there will still be a marked hearing decrement in the affected ear. As AC is normally better than BC, this will still be the case.

### Cranial nerve 9 & 10 (glossopharyngeal & vagus)

These nerves are responsible for raising the soft palate of the mouth and the gag reflex, a protective mechanism which prevents food or liquid from traveling into the lungs. As both nerves contribute to these functions, they are tested together.

### Clinical techniques

#### (1) Testing elevation of the soft palate

- (a) Ask the patient to open their mouth and say, "ahhhh," causing the soft palate to rise upward.
- (b) Look at the uvula, a midline structure hanging down from the palate. If the tongue obscures your view, take a tongue depressor and gently push it down and out of the way.
- (c) The uvula should rise up straight and in the midline.



Figure 20.12: Left CN9 dysfunction (post stroke); uvula pulled over towards right.



Figure 20.13: Left peritonsillar abscess; uvula pushed towards the right.

### Interpretation

If CN9 on the right is not functioning (eg in the setting of a stroke), the uvula will be pulled to the left. The opposite occurs in the setting of left CN9 dysfunction. Be aware that other processes can cause deviation of the uvula. A peritonsillar abscess, for example, will push the uvula towards the opposite (ie normal) tonsil.

### (2) Testing the gag reflex

- (a) Ask the patient to widely open their mouth. If you are unable to see the posterior pharynx, gently push down with a tongue depressor.
- (b) In some patients, the tongue depressor alone will elicit a gag. In most others, additional stimulation is required. Take cotton tipped applicator and gently brush it against the posterior pharynx or uvula. This should generate a gag in most patients.

Gag testing is rather noxious. Some people are particularly sensitive to even minimal stimulation. As such, I would suggest that you only perform this test when there is reasonable suspicion that pathology exists. This would include two major clinical situations:

- (a) If you suspect that the patient has suffered a stroke. These patients may complain of/be noted to cough when they swallow, or they may suffer from recurrent pneumonia. Both of these events are signs of aspiration of food contents into the airways. These patients may also have other cranial nerve abnormalities as lesions affecting CN9 and 10 often affect CNs 11 and 12, which are anatomically nearby.

- (b) Patient's suffering from sudden decreased level of consciousness. In this setting, the absence of a gag might indicate that the patient is no longer able to reflexively protect their airway from aspiration. Strong consideration should be given to intubating the patient, providing them with a secure mechanical airway until their general condition improves.
- (3) CN9 is also responsible for taste originating on the posterior 1/3 of the tongue. As this is rarely a clinically important problem, further discussion is not included.
- (4) CN10 also provides parasympathetic innervation to the heart, though this cannot be easily tested on physical examination.

### Cranial nerve 11 (spinal accessory)

CN11 innervates the muscles which permit shrugging of the shoulders (trapezius) and turning the head laterally (sternocleidomastoid).

### Clinical techniques

- (1) Place your hands on top of either shoulder and ask the patient to shrug while you provide resistance. Dysfunction will cause



Figure 20.14: Testing trapezius.



Figure 20.15: Testing sternocleidomastoid.

weakness/absence of movement on the affected side.

- (2) Place your open left hand against the patient's right cheek and ask them to turn into your hand while you provide resistance. Then repeat on the other side. The right sternocleidomastoid muscle (and thus right CN11) causes the head to turn to the left, and vice versa.

### Cranial nerve 12 (hypoglossal)

CN12 is responsible for tongue movement. Each CN12 innervates one-half of the tongue.

#### Clinical techniques

- (1) Ask the patient to stick their tongue straight out of their mouth.
- (2) If there is any suggestion of deviation to one side/weakness, direct them to push the tip of their tongue into either cheek while you provide counter pressure from the outside.

#### Interpretation

If the right CN12 is dysfunctional, the tongue will deviate to the right. This is because the normally functioning left half will dominate as it no longer has opposition from the right. Similarly, the tongue would have limited or absent ability to resist against pressure applied from outside the left cheek.

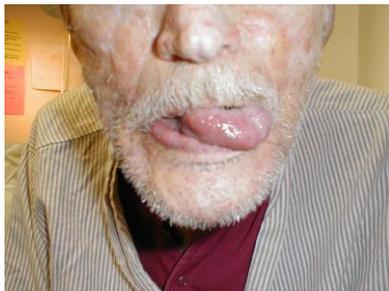


Figure 20.16: Left CN12 dysfunction. Stroke has resulted in left CN12 palsy. Tongue therefore deviates to the left.

### SENSORY EXAMINATION

Sensory testing of the face is discussed in the section on cranial nerves. Testing of the extremities focuses on the two main afferent pathways: spinothalamic and dorsal columns.

#### (1) Spinothalamic

These nerves detect pain, temperature and crude touch. They travel from the periphery, enter the spinal cord and then cross to the other side of the cord within one or two vertebral levels of their entry point. They then continue up that side to the brain, terminating in the cerebral hemisphere on the opposite side of the body from where they began.

#### (2) Dorsal columns

These nerves detect position (proprioception), vibratory sensation and light touch. They travel from the periphery, entering the spinal cord and then moving up to the base of the brain on the same side of the cord as where they started. Upon reaching the brain stem they cross to the opposite side, terminating in the cerebral hemisphere on the opposite side of the body from where they began.

### CLINICAL TECHNIQUES

#### Spinothalamic

The patient's ability to perceive the touch of a sharp object is used to assess the pain pathways.

- (1) Take a sharp, pointed object eg a disposable needle, & a non-sharp object (eg a swab stick).
- (2) Orient the patient by informing them that you are going to first touch them with the sharp implement. Then do the same with a non-sharp object. This clarifies for the patient what you are defining as sharp and dull.
- (3) Ask the patient to close their eyes so that they are not able to get visual clues.
- (4) Start at the top of the foot; touch the lateral aspect of the foot with either the sharp or dull



Figure 20.17: Testing spinothalamic.

tool, asking them to report their response. Move medially across the top of the foot, noting their response to each touch.

- (5) If they give accurate responses, do the same on the other foot. The same test can be repeated for the upper extremities, though this would only be of utility if the patient complained of numbness/impaired sensation in that area.
- (6) If needed examine both the anterior & posterior aspects of upper & lower limbs & trunk, in this way.

### Dorsal columns

#### (1) Proprioception

It refers to the body's ability to know where it is in space. Similar to the spinothalamic tracts, disorders which affect this system tend to first occur at the most distal aspects of the body. Thus, it is checked first in the feet and then, if abnormal, more proximally (eg the hands).

- (a) Ask the patient to close their eyes so that they do not receive any visual cues.
- (b) Grasp either side of the great toe. Orient the patient as to up and down. Flex the toe (pull it upwards) while telling the patient what you are doing. Then extend the toe (pull it downwards) while again informing them of which direction you are moving it.
- (c) Alternately deflect the toe up or down without telling the patient in which direction you are moving it. They should be able to correctly identify the movement and direction.
- (d) Both great toes should be checked in the same fashion. If normal, no further testing need be done in the screening exam.



Figure 20.18: Testing proprioception.

- (e) If the patient is unable to correctly identify the movement/direction, move more proximally (eg to the ankle joint) and repeat (eg test whether they can determine whether the foot is moved up or down at the ankle).
- (f) Similar testing can be done on the fingers. This is usually reserved for those settings when patients have distal findings and/or symptoms in the upper extremities.

#### (2) Vibratory sensation

- (a) Start at the toes with the patient seated. You will need a 128 Hz tuning fork.
- (b) Ask the patient to close their eyes so that they do not receive any visual cues.
- (c) Grasp the tuning fork by the stem and strike the forked ends against the heel of your hand, causing it to vibrate.
- (d) Place the stem on top of the interphalangeal joint of the great toe. Put a few fingers of your other hand on the bottom-side of this joint.
- (e) Ask the patient if they can feel the vibration. You should be able to feel the same sensation with your fingers on the bottom side of the joint.
- (f) The patient should be able to determine when the vibration stops, which will correlate with when you are no longer able to feel it transmitted through the joint. It sometimes takes a while before the fork stops vibrating. If you want to move things along, rub the index finger of the hand holding the fork along the tines, rapidly



Figure 20.19: Testing vibratory sensation.

dampening the vibration.

(g) Repeat testing on the other foot.

### (3) **Testing 2-point discrimination**

Patients should normally be able to distinguish simultaneous touch with 2 objects which are separated by at least 5 mm. While not checked routinely, it is useful test if a discrete peripheral neuropathy is suspected (eg injury to the radial nerve).

(a) Testing can be done with a paperclip, opened such that the ends are 5 mm apart.

(b) The patient should be able to correctly identify whether you are touching them with one or both ends simultaneously, along the entire distribution of the specific nerve which is being assessed.

### **Special testing for early diabetic neuropathy**

A careful foot examination should be performed on all patients with symptoms suggestive of sensory neuropathy or at particular risk for this disorder (eg diabetics). Loss of sensation in this area can be particularly problematic as the feet are a difficult area for the patient to evaluate on their own. Small wounds can become large and infected. Sensory testing as described above can detect this type of problem. Disposable monofilaments (known as the Semmes-Weinstein Aesthesiometer) are specially designed for a screening evaluation. These small nylon fibers are designed such that the normal patient should be able to feel the ends when they are gently pressed against the soles of their feet.

#### **Clinical techniques**

- (1) Have the patient close their eyes.
- (2) Touch the monofilament to 5-7 areas on the bottom of the patient's foot. Pick locations so that all of the major areas of the sole are assessed. Avoid calluses, which are relatively insensate.
- (3) The patient should be able to detect the filament when the tip is lightly applied to the skin.

### **CLINICAL INTERPRETATION**

#### **Patterns of spinothalamic impairment**

- (1) Patients should be able to correctly distinguish sharp sensation, indicating normal function of



Figure 20.20: **Monofilament testing:** Patients with normal sensation should be able to detect the monofilament when it is lightly applied (picture on left). If the force required to provoke a sensory response is strong enough to bend the monofilament (picture on right), then sensation is impaired.

the spinothalamic pathway.

### (2) **Mapping out regions of impaired sensation**

The examination described above is a screening evaluation for evidence of sensory loss. This is perfectly adequate in most clinical settings. Occasionally, the history or screening examination will suggest a discrete anatomic region that has sensory impairment. When this occurs, it is important to try and map out the territory involved, using careful pin testing to define the medial/lateral and proximal/distal boundaries of the affected region. As it is difficult to memorize the distributions of all peripheral nerves or spinal nerve roots, you can simultaneously consult a reference book to see if the mapped territory matches a specific nerve distribution.

### (3) **Diffuse distal sensory loss**

A number of chronic systemic diseases affect nerve function. The most common is diabetes mellitus.

- (a) When control has been poor over many years, the sensory nerves become dysfunctional.
- (b) This first affects the most distal aspects of the nerves and then moves proximally. Thus, the feet are the first area to be affected.
- (c) As it is a systemic disease, it occurs simultaneously in both limbs.

- (d) Exam reveals loss of ability to detect the sharp stimulus across the entire foot.
  - (e) As the examiner tests more proximally, he/she will ultimately reach a point where sensation is again normal. The more advanced the disease, the higher up the leg this will occur.
  - (f) Hands can be affected, though much less commonly than feet as the nerves traveling to the legs are longer and thus at much greater risk.
  - (g) This pattern of loss is referred to as 'Stocking or Glove' distribution impairment, as the area involved covers an entire distal region, much as a sock or glove would cover a foot or hand.
  - (h) Such deficits may be associated with neuropathic pain, a continuous burning sensation affecting the distal extremity.
- (4) **Peripheral nerve distribution**  
A specific peripheral nerve can become dysfunctional, eg as the result of trauma or infarction (another complication of diabetes). There will be a pattern of sensory impairment that follows the distribution of the nerve. Radial nerve palsy, for example, can occur if an intoxicated person falls asleep in a position that puts pressure on the nerve as it travels around the humerus. The resultant sensory loss would involve the back of the hand and forearm.  
**Note:** Pinning down the culprit nerve requires knowledge of nerve anatomy and innervation.
- (5) **Nerve root impairment**  
A nerve root (or roots) can be damaged as it leaves the cord. This will result in a sensory deficit along its specific distribution, which can in turn be identified on examination. The S1 nerve root, for example, can be compressed by herniated disc material in the lumbar spine. This would cause sensory loss along the lateral aspect of the lower leg and the bottom of the foot. Only the leg on the affected side would have this deficit.
- (6) Spinothalamic are also responsible for temperature discrimination. For practical reasons (ie it's often hard to find test tubes, fill them with the requisite temperature water, etc) this is omitted in the screening exam. The information from sharp stimulus testing as described above should suffice. Temperature

discrimination could be assessed as a means of verifying any abnormality detected on sharp/dull testing.

- (7) Testing of the sacral nerve roots, serving the anus and rectum, is important if patients complain of incontinence, inability to defecate/urinate, or there is otherwise reason to suspect that these roots may be compromised. In the setting of cauda equina syndrome, for example, multiple sacral and lumbar roots become compressed bilaterally (eg by posteriorly herniated disc or a tumor); the patient will be unable to urinate, there will be loss of anal sphincter tone, & the ability to detect pin pricks in the perineal area (saddle distribution) will also be diminished.

#### ***Patterns of dorsal column impairment***

##### **(1) Proprioception**

In dorsal column dysfunction (eg in diabetes), distal testing will be abnormal. This is similar to the pattern of injury which affects the spinothalamic tracts described above.

##### **(2) Vibratory sensation**

- (a) In dorsal column dysfunction, the patient is either unable to detect the vibration or they perceive that the sensation extinguishes too early (ie they stop feeling it even though you can still appreciate the sensation with your fingers on the underside of the joint).
- (b) The findings on vibratory testing should parallel those obtained when assessing proprioception, as both sensations travel via the same pathway.

### **MOTOR TESTING**

The muscle is the unit of action that causes movement. Normal motor function depends on intact upper and lower motor neurons, sensory pathways and input from a number of other neurological systems. Disorders of movement can be caused by problems at any point within this interconnected system.

### **MUSCLE BULK & APPEARANCE**

This assessment is somewhat subjective and quite

dependent on the age, sex and the activity/fitness level of the individual. A frail elderly person, for example, will have less muscle bulk than a 25 year old body builder. With experience, you will get a sense of the normal range for given age groups, factoring in their particular activity levels and overall states of health.

### ***Clinical techniques & interpretation***

- (1) Appropriately expose both the right & left lower or upper limbs simultaneously, for comparison with the other side.
- (2) Carefully inspect & palpate the major muscle groups of the upper and lower extremities.
- (3) Muscle groups should appear symmetrically developed when compared with their counterparts on the other side. They should also be appropriately developed, after making allowances for the patient's age, sex, and activity level.
- (3) There should be no muscle movement when the limb is at rest. Rare disorders (eg amyotrophic lateral sclerosis) result in death of the lower motor neuron and subsequent denervation of the muscle. This causes twitching of the fibers known as fasciculations, which can be seen on gross inspection of affected muscles.
- (4) Tremors are a specific type of continuous, involuntary muscle activity that results in limb movement.
  - (a) Parkinson's disease (PD), for example, can cause a very characteristic resting tremor of the hand (the head and other body parts can also be affected) that diminishes when the patient voluntarily moves the affected limb.
  - (b) Benign essential tremor, on the other hand, persists throughout movement and is not associated with any other neurological findings, easily distinguishing it from PD.
- (5) The major muscle groups to be palpated include: biceps, triceps, deltoids, quadriceps and hamstrings.
  - (a) Palpation should not elicit pain, unless there is underlying muscle inflammation. Myositis, for example, is a rare condition which causes patients to have diffuse muscle pain and weakness.
  - (b) Note the presence of any underlying mass or tumor within the muscle itself.
- (6) If there is asymmetry, note if it follows a particular pattern. Remember that some allowance must be made for handedness (ie right vs. left hand dominance).
  - (a) Does the asymmetry follow a particular nerve distribution, suggesting a peripheral motor neuron injury? For example, muscles which lose their LMN innervation become atrophic.
  - (b) Is the bulk in the upper and lower extremities similar? Spinal cord transection at the thoracic level will cause upper extremity muscle bulk to be normal or even increased due to increased dependence on arms for activity, mobility, etc. However, the muscles of the lower extremity will atrophy due to loss of innervation and subsequent disuse.
  - (c) Is there another process (suggested by history or other aspects of the exam) that has resulted in limited movement of a



Figure 20.21: **Muscle asymmetry:** While both legs have well developed musculature, the left has greater bulk.



Figure 20.22: **Diffuse muscle wasting:** Note loss muscle bulk in left hand due to peripheral denervation. In particular, compare left and right thenar eminences.

particular limb? For example, a broken leg that has recently been liberated from a cast will appear markedly atrophic.

**TONE**

When a muscle group is relaxed, the examiner should be able to easily manipulate the joint through its normal range of motion. This movement should feel fluid. A number of disease states may alter this sensation. For the screening examination, it is reasonable to limit this assessment to only the major joints, including: wrist, elbow, shoulder, hips and knees.

**Clinical techniques**

- (1) Ask the patient to relax the joint that is to be tested.
- (2) Carefully move the limb through its normal range of motion, being careful not to maneuver it in any way that is uncomfortable or generates pain.
- (3) Be aware that many patients, particularly the elderly, often have other medical conditions that limit joint movement. Degenerative joint disease of the knee, for example, might cause limited range of motion, though tone should still be normal. If the patient has recently injured the area or are in pain, do not perform this aspect of the exam.

**Clinical interpretation**

- (1) Normal muscle generates some resistance to movement when a limb is moved passively by an examiner. After performing this exam on a number of patients, you'll develop an appreciation for the range of normal tone.
- (2) Increased tone (hypertonicity) results from muscle contraction. At the extreme end is spasticity, which occurs when the upper motor neuron no longer functions; the affected limb is held in a flexed position and the examiner may be unable to move the joint. This is seen most commonly following a stroke, which results in the death of the upper motor neuron cell body in the brain.
- (3) Flaccidness is the complete absence of tone. This occurs when the lower motor neuron is cut off from the muscles that it normally innervates.

- (4) Disorders that do not directly affect the muscles, upper or lower motor neurons can still alter tone. Perhaps the most common of these is Parkinson's disease (PD), a disorder of the extra-pyramidal system (EPS). The EPS normally contributes to initiation and smoothness of movement. PD causes increased tone, generating a ratchet-like sensation (known as cog wheeling) when the affected limbs are passively moved by the examiner.

**STRENGTH**

As with muscle bulk (described above), strength testing must take into account the age, sex and fitness level of the patient. For example, a frail, elderly, bed bound patient may have muscle weakness due to disuse and not to intrinsic neurological disease. Interpretation must also consider the expected strength of the muscle group being tested. The quadriceps group, for example, should be much more powerful than the biceps.

**Table 20.2: Rating scale for muscle strength**

0/5	No movement.
1/5	Barest flicker of movement of the muscle, though not enough to move the structure to which it's attached.
2/5	Voluntary movement which is not sufficient to overcome the force of gravity. For example, the patient would be able to slide their hand across a table but not lift it from the surface.
3/5	Voluntary movement capable of overcoming gravity, but not any applied resistance. For example, the patient could raise their hand off a table, but not if any additional resistance were applied.
4/5	Voluntary movement capable of overcoming "some" resistance.
5/5	Normal strength.

'+' and '-' can be added to these values, providing further gradations of strength. Thus, a patient who can overcome "moderate but not full resistance" might be graded 4+ or 5-. This is quite subjective, with a fair amount of variability amongst clinicians. Ultimately, it's most important that you develop your own sense of what these gradations mean, allowing for internal consistency and interpretability of serial measurements.

**Clinical techniques & interpretation**

In the screening examination, it is reasonable to check only the major muscles/muscle groups. More detailed testing can be performed in the setting of discrete/unexplained weakness.

**(1) Intrinsic muscles of hand (C 8, T 1)**

- (a) Ask the patient to spread their fingers apart against resistance (abduction).
- (b) Then squeeze them together, with your fingers placed in between each of their digits (adduction).
- (c) Test each hand separately.
- (d) Interossei muscles, innervated by the ulnar nerve, control adduction and abduction of the fingers.

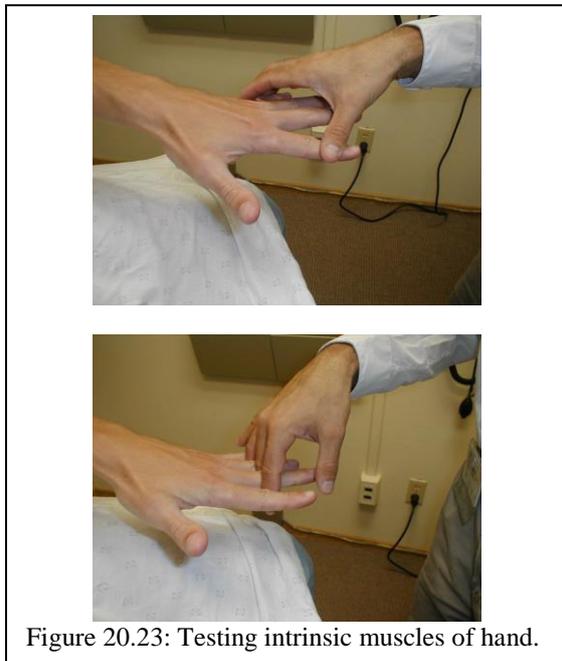


Figure 20.23: Testing intrinsic muscles of hand.

**(2) Flexors of the fingers (C 7, 8, T 1)**

- (a) Ask the patient to make a fist, squeezing their hand around two of your fingers. If the grip is normal, you will not be able to pull your fingers out. Test each hand separately.
- (b) Flexor digitorum profundus controls finger flexion, & is innervated by the median (radial 1/2) & ulnar (medial 1/2) nerves.

**(3) Wrist flexion (C 7, 8, T 1)**

- (a) Have the patient try to flex their wrist as you provide resistance. Test each hand



Figure 20.24: Testing flexors of fingers.

separately.

- (b) The muscle groups which control flexion are innervated by the median and ulnar nerves.



Figure 20.25: Testing wrist flexion.

**(4) Wrist extension (C 6, 7, 8)**

- (a) Have the patient try to extend their wrist as you provide resistance. Test each hand separately.
- (b) Extensor radialis muscles control extension and are innervated by the radial nerve.
- (c) Damage to the radial nerve results in wrist drop (loss of ability to extend the hand at the wrist). For example, the nerve can be



Figure 20.26: Testing wrist extension.

compressed against the humerus for a prolonged period of time when an intoxicated person loses consciousness with the inside aspect of the upper arm resting against a solid object (known as a “Saturday night palsy”).

**(5) Elbow flexion (C 5, 6)**

- (a) Have the patient bend their elbow to 90° while keeping their palm directed upwards. Then direct them to flex their forearm while you provide resistance. Test each arm separately.
- (b) The main flexor (and supinator) of the forearm is the brachialis muscle (along with the biceps muscle). These muscles are innervated by the musculocutaneous nerve.



Figure 20.27: Testing elbow flexion.

**(6) Elbow extension (C 7, 8)**

- (a) Have the patient extend their elbow against resistance while the arm is held out (abducted at the shoulder) from the body at 90°. Test each arm separately.
- (b) The main extensor of the forearm is the triceps muscle, which is innervated by the radial nerve.

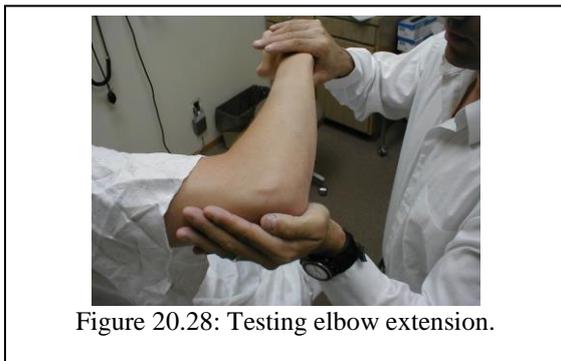


Figure 20.28: Testing elbow extension.

**(7) Shoulder adduction (C 5-T1)**

- (a) Have the patient flex at the elbow while the arm is held out from the body at 45°. Then provide resistance as they try to further adduct at the shoulder. Test each shoulder separately.
- (b) The main muscle of adduction is the pectoralis major, though the latissimus and others contribute as well.



Figure 20.29: Testing shoulder adduction.

**(8) Shoulder abduction (C 5, 6)**

- (a) Have the patient flex at the elbow while the arm is held out from the body at 45°. Then provide resistance as they try to further abduct at the shoulder. Test each shoulder separately.
- (b) The deltoid muscle, innervated by the axillary nerve, is the main muscle of abduction.



Figure 20.30: Testing shoulder abduction.

**(9) Hip flexion (L 2, 3, 4)**

- (a) With the patient seated, place your hand on top of one thigh and instruct the patient to lift the leg up from the table.
- (b) The main hip flexor is the iliopsoas muscle, innervated by the femoral nerve.



Figure 20.31: Testing hip flexion.

**(10) Hip extension (L5, S1)**

- (a) With the patient lying prone, direct the patient to lift their leg off the table against resistance. Test each leg separately.
- (b) The main hip extensor is the gluteus maximus, innervated by inferior gluteal nerve.

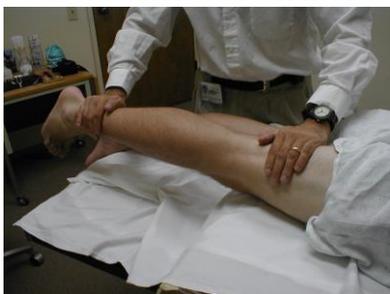


Figure 20.32: Testing hip extension.

**(11) Hip abduction (L 4, 5, S1)**

- (a) Place your hands on the outside of either thigh and direct the patient to separate their legs against resistance.
- (b) This movement is mediated by a number of muscles.



Figure 20.33: Testing hip abduction.

**(12) Hip adduction (L 2, 3, 4)**

- (a) Place your hands on the inner aspects of the thighs and repeat the maneuver.
- (b) A number of muscles are responsible for adduction. They are innervated by the obturator nerve.



Figure 20.34: Testing hip adduction.

**(13) Knee extension (L 2, 3, 4)**

- (a) Have the seated patient steadily press their lower extremity into your hand against resistance. Test each leg separately.
- (b) Extension is mediated by the quadriceps muscle group, which is innervated by the femoral nerve.



Figure 20.35: Testing knee extension.

**(14) Knee flexion (L 5, S 1, 2)**

- (a) Have the patient rest prone. Then have them pull their heel up and off the table against resistance. Each leg is tested separately.
- (b) Flexion is mediated by the hamstring muscle group, via branches of the sciatic nerve.

**(15) Ankle dorsiflexion (L 4, 5)**

- (a) Direct the patient to pull their toes upwards while you provide resistance with your hand. Each foot is tested separately.



Figure 20.36: Testing knee flexion.

- (b) The muscles which mediate dorsiflexion are innervated by the deep peroneal nerve.
- (c) The peroneal nerve is susceptible to injury at the point where it crosses the head of the fibula (laterally, below the knee). If injured, the patient develops “foot drop,” an inability to dorsiflex the foot.



Figure 20.37: Testing ankle dorsi-flexion.

**(16) Ankle plantar flexion (S 1, S 2)**

- (a) Have the patient “step on the gas” while providing resistance with your hand. Test each foot separately.
- (b) Plantar flexion and dorsiflexion can also be



Figure 20.38: Testing ankle plantar-flexion.

assessed by asking the patient to walk on their toes (plantar flexion) and heels (dorsiflexion).

- (c) The gastrocnemius and soleus, the muscles which mediate this movement, are innervated by a branch of the sciatic nerve.

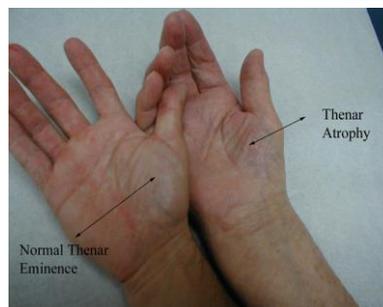
**Points to note**

It is generally quite helpful to directly compare right vs. left sided strength, as they should more or less be equivalent (taking into account the handedness of the patient). If there is weakness, try to identify a pattern, which might provide a clue as to the etiology of the observed decrease in strength. In particular, make note of differences between:

- (1) Right vs. left
- (2) Proximal muscles vs. distal
- (3) Upper extremities vs. lower
- (4) Or is the weakness generalized, suggestive of a systemic neurological disorder or global deconditioning

**Special testing for subtle weakness**

- (1) Subtle weakness can be hard to detect. Pay attention to how the patient walks, uses and holds their arms and hands as they enter the room, get up and down from a seated position, move onto the examination table, etc.
- (2) Pronator drift is a test for slight weakness of the upper extremities. The patient should sit with both arms extended, palms directed upward. Subtle weakness in either arm will cause slight downward drift and pronation of that limb (ie the arm will rotate slightly inward and down).



**Figure 20.39: Carpal tunnel induced atrophy:** Chronic, severe compression of the median nerve within the carpal tunnel has led to atrophy of the thenar muscles (hand on right).

Nerve	Sensory supply	Motor supply	Nerve roots	Clinical
Radial nerve	Back of thumb, index, middle, and ½ ring finger; back of forearm	Wrist extension and abduction of thumb in palmer plane	C6, 7, 8	At risk for compression at humerus, known as "Saturday night palsy"
Ulnar nerve	Palmar and dorsal aspects of little and ulnar ½ of ring finger	Abduction of fingers (intrinsic muscles of hand)	C7, 8 and T1	At risk for injury with elbow fracture. Can get transient symptoms when inside of elbow is struck ("funny bone" distribution)
Median nerve	Palmar aspect of the thumb, index, middle and ½ ring finger; palm below these fingers.	Abduction of thumb perpendicular to palm (thenar muscles).	C8, T1	Compression at carpal tunnel causes carpal tunnel syndrome
Lateral cutaneous nerve of thigh	Lateral aspect thigh		L1, 2	Can become compressed in obese patients, causing numbness over its distribution
Peroneal nerve	Lateral leg, top of foot	Dorsiflexion of foot (tibialis anterior muscle)	L4, 5, S1	Can be injured with proximal fibula fracture, leading to foot drop (inability to dorsiflex foot)

## REFLEX TESTING

Reflex testing incorporates an assessment of the function and interplay of both sensory and motor pathways. It is simple yet informative and can give important insights into the integrity of the nervous system at many different levels.

### **Physiology of reflexes**

- (1) Tendons connect muscles to bones, usually crossing a joint. When the muscle contracts, the tendon pulls on the bone, causing the attached structure to move.
- (2) When the tendon is struck by the reflex hammer, stretch receptors contained within it generate an impulse that is carried via sensory nerves to the spinal cord. At this juncture, the message is transmitted across a synapse to an appropriate lower motor neuron. An upper motor neuron, whose cell body resides in the brain, also provides input to this synapse.
- (3) The signal then travels down the lower motor neuron to the target muscle.
- (4) The sensory and motor signals that comprise a reflex arc travel over anatomically well characterized pathways. Pathologic processes affecting discrete roots or named peripheral nerves will cause the reflex to be diminished or absent. This can obviously be of great clinical significance. The Achilles Reflex (see below) is dependent on the S1 and S2 nerve roots. Herniated disc material (a relatively common process) can put pressure on the S1 nerve root, causing pain along its entire distribution (i.e. the lateral aspect of the lower leg). If enough pressure is placed on the nerve, it may no longer function, causing a loss of the Achilles reflex. In extreme cases, the patient may develop weakness or even complete loss of function of the muscles innervated by the nerve root, a medical emergency mandating surgical decompression. The specific nerve roots that comprise the arcs are listed for each of the major reflexes described below.
- (5) A normal response generates an easily observed shortening of the muscle. This, in turn, causes the attached structure to move.

**Table 20.4: Grading of reflexes**

0	No evidence of contraction
1+	Decreased, but still present (hypo-reflexia)
2+	Normal
3+	Super-normal (hyper-reflexia)
4+	Clonus: Repetitive shortening of the muscle after a single stimulation

### Technique

#### The reflex hammer

You will need to use a reflex hammer when performing this aspect of the exam. Regardless of the hammer type, proper technique is critical. The larger hammers have weighted heads, such that if you raise them approximately 10 cm from the target and then release, they will swing into the tendon with adequate force. The smaller hammers should be swung loosely between thumb and forefinger.



Figure 20.40: Small hammers (left); large hammer (right).

### Clinical techniques

- The muscle group to be tested must be in a neutral position (ie neither stretched nor contracted).
- The tendon attached to the muscle(s) which is/are to be tested must be clearly identified. The extremity should be positioned such that the tendon can be easily struck with the reflex hammer.
- If you are having trouble locating the tendon, ask the patient to contract the muscle to which it is attached. When the muscle shortens, you should be able to both see and feel the cord like tendon, confirming its precise location. You may, for example, have some difficulty identifying the biceps tendon within the antecubital fossa. Ask the patient to flex their forearm while you simultaneously palpate the fossa. The biceps tendon should become taut and thus readily apparent.
- Strike the tendon with a single, brisk, stroke. While this is done firmly, it should not elicit pain. Occasionally, due to other medical problems (eg severe arthritis), you will not be able to position the patient's arm in such a way that you are able to strike the tendon. If this occurs, do not cause the patient discomfort. Simply move on to another aspect of the exam.
- Sometimes the patient is unable to relax, which can inhibit the reflex even when all is neurologically intact. If this occurs during your assessment of lower extremity reflexes, ask the patient to interlock their hands and direct them to pull, while you simultaneously strike the tendon. This sometimes provides enough distraction so that the reflex arc is no longer inhibited.

#### Achilles reflex (S1, S2 – sciatic nerve)

- This is most easily done with the patient seated, feet dangling over the edge of the exam table. If they cannot maintain this position, have them lay supine, crossing one leg over the other in a figure 4, or, failing that, arrange the legs in a frog-type position.
- Identify the Achilles tendon, a taut, discrete, cord-like structure running from the heel to the muscles of the calf. If you are unsure, ask the patient to plantar flex (ie “step on the gas”), which will cause the calf to contract and the Achilles to become taut.
- Position the foot so that it forms a right angle with the rest of the lower leg. You will probably need to support the bottom of the foot with your hand.
- Strike the tendon directly with your reflex hammer. Be sure that the calf is exposed so that you can see the muscle contract. A normal reflex will cause the foot to plantar flex (ie move into your supporting hand).



Figure 20.41: Positions for checking Achilles reflex.

**Patellar reflex (L3, L4 – femoral nerve)**

- (1) This is most easily done with the patient seated, feet dangling over the edge the exam table. If they cannot maintain this position, have them lie supine.
- (2) Identify the patellar tendon, a thick, broad band of tissue extending down from the lower aspect of the patella. If you are not certain where it's located, ask the patient to extend their knee. This causes the quadriceps to contract and makes the attached tendon more apparent.
- (3) Strike the tendon directly with your reflex hammer. If you are having trouble identifying the exact location of the tendon (eg if there is a lot of subcutaneous fat), place your index finger



Figure 20.42: Patellar reflex testing; seated position (above) & supine position (below).

firmly on top of it. Strike your finger, which should then transmit the impulse.

- (4) For the supine patient, support the back of their thigh with your hands such that the knee is flexed and the quadriceps muscles relaxed. Then strike the tendon as described above.
- (5) Make sure that the quadriceps are exposed so that you can see muscle contraction. In the normal reflex, the lower leg will extend at the knee.

**Biceps reflex (C5, C6 – musculocutaneous nerve)**

- (1) This is most easily done with the patient seated.
- (2) Identify the location of the biceps tendon. To do this, have the patient flex at the elbow while you observe and palpate the antecubital fossa. The tendon will look and feel like a thick cord.
- (3) The patient's arm can be positioned in one of two ways:
  - (a) Allow the arm to rest in the patient's lap, forming an angle of slightly more than 90° at the elbow.
  - (b) Support the arm in yours, such that your thumb is resting directly over the biceps tendon (hold their right arm with your right, and vice versa).

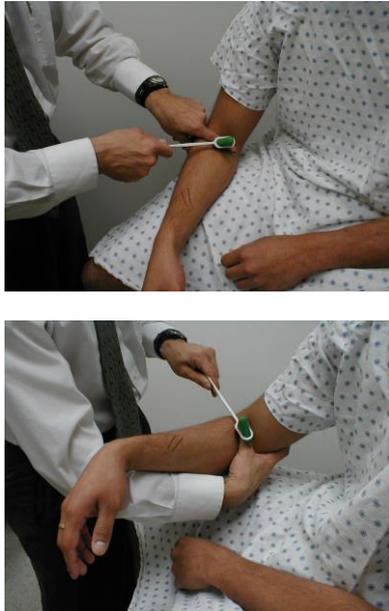


Figure 20.43: Biceps reflex testing; arm unsupported (above) & arm supported (below).

- (4) Make sure that the biceps muscle is completely relaxed.
- (5) It may be difficult to direct your hammer strike such that the force is transmitted directly on to the biceps tendon, and not dissipated amongst the rest of the soft tissue in the area. If you are supporting the patient's arm, place your thumb on the tendon and strike this digit. If the arm is unsupported, place your index or middle fingers firmly against the tendon and strike them with the hammer.
- (6) Make sure that the patient's sleeve is rolled up so that you can directly observe the muscle as well as watch the lower arm for movement. A normal response will cause the biceps to contract, drawing the lower arm upwards.

**Brachioradialis reflex (C5, C6 – radial nerve)**

- (1) This is most easily done with the patient seated. The lower arm should be resting loosely on the patient's lap.
- (2) The brachioradialis tendon cannot be seen or well palpated, which makes this reflex a bit tricky to elicit. The tendon crosses the radius (thumb side of the lower arm) approximately 10 cm proximal to the wrist.



Figure 20.44: Brachioradialis reflex testing.

- (3) Strike this area with your reflex hammer. Usually, hitting anywhere in the right vicinity will generate the reflex.
- (4) Observe the lower arm and bulk of the brachioradialis for a response. A normal reflex will cause the lower arm to flex at the elbow and the hand to supinate.

**Triceps reflex (C7, C8 – radial nerve)**

- (1) This is most easily done with the patient seated.
- (2) Identify the triceps tendon, a discrete, broad structure that can be palpated (and often seen) as it extends across the elbow to the bulk of the muscle, located on the back of the upper arm. If you are having trouble clearly identifying the tendon, ask the patient to extend their lower arm at the elbow while you observe and palpate in the appropriate region.
- (3) The arm can be placed in either of 2 positions:
  - (a) Gently pull the arm out from the patient's body, such that it roughly forms a right angle at the shoulder. The lower arm should dangle directly downward at the elbow.
  - (b) Have the patient place their hands on their hips.
- (4) Either of these techniques will allow the triceps to completely relax.
- (5) If you are certain as to the precise location of the tendon, strike this area directly with your hammer. If the target is not clearly apparent or the tendon is surrounded by an excessive amount of subcutaneous fat (which might dissipate the force of your strike), place your index or middle finger firmly against the structure. Then strike your finger.



Figure 20.45: Triceps reflex testing; arm supported (above) & arm unsupported (below).

- (6) Make sure that the triceps is uncovered, so that you can observe the response. The normal reflex will cause the lower arm to extend at the elbow and swing away from the body. If the patient's hands are on their hips, the arm will not move but the muscle should shorten vigorously.

#### **Babinski response**

The Babinski response is a test used to assess upper motor neuron dysfunction and is performed as follows:

- (1) Use the handle end of your reflex hammer, which is solid and comes to a point.
- (2) The patient may either sit or lie supine.
- (3) Start at the lateral aspect of the foot, near the heel. Apply steady pressure with the end of the hammer as you move up towards the ball (area of the metatarsal heads) of the foot.
- (4) When you reach the ball of the foot, move medially, stroking across this area.
- (5) Then test the other foot.
- (6) Some patients find this test to be particularly noxious/uncomfortable. Tell them what you are going to do and why. If it's unlikely to contribute important information (eg screening exam of the normal patient) and they are quite



Figure 20.46: Babinski response present.

averse, simply skip it.

#### **Clinical interpretation**

- (1) Disorders in the sensory limb will prevent or delay the transmission of the impulse to the spinal cord. This causes the resulting reflex to be diminished or completely absent. Diabetes induced peripheral neuropathy, for example, is a relatively common reason for loss of reflexes.
- (2) Abnormal lower motor neuron (LMN) function will result in decreased or absent reflexes. If, for example, a peripheral motor neuron is transected as a result of trauma, the reflex dependent on this nerve will be absent.
- (3) If the upper motor neuron (UMN) is completely transected, eg in traumatic spinal cord injury, the arc receiving input from this nerve becomes disinhibited, resulting in hyperactive reflexes. Of note, immediately following such an injury, the reflexes are actually diminished, with hyper-reflexia developing several weeks later. A similar pattern is seen with the death of the cell body of the UMN (located in the brain), as occurs with a stroke affecting the motor cortex of the brain.
- (4) Primary disease of the neuro-muscular junction or the muscle itself will result in a loss of reflexes, as disease at the target organ (ie the muscle) precludes movement.
- (5) A number of systemic disease states can affect reflexes. Some have their impact through direct toxicity to a specific limb of the system.
  - (a) Poorly controlled diabetes, as described above, can result in a peripheral sensory neuropathy.
  - (b) Extremes of thyroid disorder can also affect reflexes. Hyperthyroidism is associated with hyperreflexia, and

hypothyroidism with hyporeflexia.

- (6) **Babinski response:** In the normal patient, the first movement of the great toe should be downwards (ie plantar flexion). If there is an upper motor neuron injury (eg spinal cord injury, stroke), then the great toe will dorsiflex and the remainder of the other toes will fan out.
- Newborns normally have a positive Babinski. It usually goes away after about 6 months.
  - Sometimes you will be unable to generate any response, even in the absence of disease. Responses must therefore be interpreted in the context of the rest of the exam.
  - If the great toe flexes and the other toes flair, the Babinski response is said to be present. If not (ie normal), it is recorded as absent.
  - Withdrawal of the entire foot (due to unpleasant stimulation), is not interpreted as a positive response.

### CEREBELLAR TESTING

The cerebellum fine tunes motor activity and assists with balance. Dysfunction results in a loss of coordination and problems with gait. The left cerebellar hemisphere controls the left side of the body and vice versa.

### CLINICAL TECHNIQUES & INTERPRETATION

There are several ways of testing cerebellar function. For the screening exam, using one modality will suffice. If an abnormality is suspected or identified, multiple tests should be done to determine whether the finding is durable. Gait testing, an important part of the cerebellar exam, is discussed separately (see next section).

#### (1) *Finger to nose testing*

- With the patient seated, position your index finger at a point in space in front of the patient.
- Instruct the patient to move their index finger between your finger and their nose.

(c) Reposition your finger after each touch.

(d) Then test the other hand.

#### **Interpretation**

The patient should be able to do this at a reasonable rate of speed, trace a straight path, and hit the end points accurately. Missing the mark, known as dysmetria, may be indicative of disease.

#### (2) *Rapid alternating finger movements*

- Ask the patient to touch the tips of each finger to the thumb of the same hand.
- Test both hands.

#### **Interpretation**

The movement should be fluid and accurate. Inability to do this, known as dysdiadokokinesia, may be indicative of cerebellar disease.

#### (3) *Rapid alternating hand movements*

- Direct the patient to touch first the palm and then the dorsal side of one hand repeatedly against their thigh.
- Then test the other hand.

#### **Interpretation**

The movement should be performed with speed and accuracy. Inability to do this, known as dysdiadokokinesia, may be indicative of cerebellar disease.

#### (4) *Heel to shin testing*

- Direct the patient to move the heel of one foot up and down along the top of the other shin.
- Then test the other foot.

#### **Interpretation**

The movement should trace a straight line along the top of the shin and be done with reasonable speed.

Realize that other organ system problems can affect performance of any of these tests. If, for example, the patient is visually impaired, they may not be able to see the target during finger to nose pointing. Alternatively, weakness due to a primary muscle disorder might limit the patient's ability to move a limb in the fashion required for some of the above testing. Thus, other medical and neurological conditions must be taken into account when interpreting cerebellar test results.

### GAIT TESTING

Ability to stand and walk normally is dependent on input from several systems, including: visual, vestibular, cerebellar, motor, and sensory. The precise cause(s) of the dysfunction can be determined by identifying which aspect of gait is abnormal and incorporating this information with that obtained during the rest of the exam. Difficulty getting out a chair and initiating movement, for example, would be consistent with Parkinson's disease. On the other hand, lack of balance and a wide based gait would suggest a cerebellar disorder. In each case, finding elsewhere in the exam should help point you in the right direction.

For the screening exam, simply observing while the patient walks into your office and gets up and down from the exam table will provide all of the relevant information. If there is suspicion of neurological disease (based on history, other exam findings, observation of gait) then more detailed testing should be performed. Proceed as follows:

- (1) Ask the patient to stand. If they are very weak or unsteady, make sure that you are in a position and capable of catching and supporting them if they fall. Take the help of a colleague if you need an extra pair of hands. If you are still unsure as to whether standing/walking can be performed safely, skip this area of testing. No test result is worth a broken hip!
- (2) Have the patient stand in one place. As mentioned above, make sure that you are capable/in position to catch and support them if they fall. This is a test of balance, incorporating input from the visual, cerebellar, proprioceptive, and vestibular systems. If they are able to do this, have them close their eyes, removing visual input. This is referred to as the **Romberg test**. Loss of balance suggests impaired proprioception, as it is this pathway which should provide input that allows the patient to remain stably upright.
- (3) Ask the patient to stand from a chair, walk across the room, turn, and come back towards you. Pay particular attention to:
  - (a) **Difficulty getting up from a chair:** Can the patient easily arise from a sitting position? Problems with this activity might suggest proximal muscle weakness, a balance problem, or difficulty initiating movements.

- (b) **Balance:** Do they veer off to one side or the other as might occur with cerebellar dysfunction?
  - (i) Disorders affecting the left cerebellar hemisphere (as might occur with a stroke or tumor) will cause patient's to fall to the left.
  - (ii) Right sided lesions will cause the patient to fall to the right.
  - (iii) Diffuse disease affecting both cerebellar hemispheres will cause a generalized loss of balance.
- (c) **Rate of walking:** Do they start off slow and then accelerate, perhaps losing control of their balance or speed (eg as might occur with Parkinson's disease)? Are they simply slow moving secondary to pain/limited range of motion in their joints, as might occur with degenerative joint disease?
- (d) **Attitude of arms and legs:** How do they hold their arms and legs? Is there loss of movement and evidence of contractures (eg as might occur after a stroke)?
- (4) **Heel to toe walking:** Ask the patient to walk in a straight line, putting the heel of one foot directly in front of the toe of the other. This is referred to as tandem gait and is a test of balance. Realize that this may be difficult for older patients (due to the frequent coexistence of other medical conditions) even in the absence of neurological disease.

#### MAKING SENSE OF NEUROLOGICAL FINDINGS

While compiling information generated from the motor and sensory examinations, the clinician tries to identify patterns of dysfunction that will allow him/her to determine the location of the lesion(s). What follows is one way of making clinical sense of neurological findings.

- (1) Is there evidence of motor dysfunction (eg weakness, spasticity, tremor)?
- (2) If so, does the pattern follow an upper motor neuron or lower motor neuron pattern?
  - (a) If it's consistent with a UMN process (eg weakness with spasticity), does this appear

to occur at the level of the spinal cord or the brain?

- (i) Complete cord lesions will affect both sides of the body.
  - (ii) Brain level problems tend to affect one side or the other.
  - (iii) It is, of course, possible for a lesion to affect only part of the cord, leading to findings that lateralize to one side (see below, under description of Brown Sequard lesion).
- (b) Is it consistent with an LMN process (eg weakness with flaccidity)? Does the weakness follow a specific distribution (eg following a spinal nerve root or peripheral nerve distribution)? Bilateral? Distal?
- (3) Do the findings on reflex examination support a UMN or LMN process (eg hyper-reflexia in UMN disorders; hyporeflexia in LMN disorders)?
  - (4) Do the findings on Babinski testing (assuming the symptoms involve the lower extremities) support the presence of a UMN lesion?
  - (5) Is there impaired sensation? Some disorders, for example, affect only the upper or lower motor pathways, sparing sensation.
  - (6) Which aspects of sensation are impaired? Are all of the ascending pathways (eg spinothalamic and dorsal columns) affected equally, as might occur with diffuse/systemic disease?
  - (7) Does the loss in sensation follow a pattern suggestive of dysfunction at a specific anatomic level? For example, is it at the level of a spinal nerve root? Or more distally, as would occur with a peripheral nerve problem?
  - (8) Does the distribution of the sensory deficit correlate with the “correct” motor deficit, assuming one is present? Radial nerve compression, for example, would lead to characteristic motor and sensory findings.

Information from the sensory, motor and reflex examinations should correlate with one another, painting the best picture of where the level of dysfunction is likely to exist. A few examples of injuries resulting in characteristic patterns of motor and sensory loss are described below:

**Example 1**

In the setting of a suspected acute spinal cord injury at the T10 vertebral level, for example, the

following might be identified on detailed neurological examination:

Sensation	Absence of ability to sense pin prick, vibration or proprioception below the level of the umbilicus.
Strength	No movement of the lower extremities (eg paralysis).
Tone	Initially, decreased. Over weeks, tone increases with progression to spasticity and contractures of the lower extremities.
Reflexes	Initially, absent achilles and patellar reflexes. After a few weeks, these will become hyperreflexia and demonstrate clonus.
Babinski	Toes will be up-going bilaterally (ie Babinski response will be present).

**Example 2**

**Partial cord transection (Brown-Sequard lesion):**

A knife injury, for example, might damage only the right half of the cord at the T10 level. This would result in the following findings on detailed exam:

Sensation	The patient would be unable to identify the pin stimulus on the left side of his body (remember that the spinothalamic cross soon after entering the cord) below the level of the injury. Vibratory sensation would be impaired on the right side of the body below the level of the injury, as these paths do not cross over until they reach the base of the brain.
Strength	The patient would be unable to move their right leg.
Tone	Initially, decreased in the right leg. Over weeks, tone increases, with progression to spasticity.
Reflexes	Initially, absent at the right patellar and achilles. After a few weeks becoming hyper-reflexia.
Babinski	Up-going toe on the right

**A few final comments about diagnosing neurologic disorders**

- (1) It is also important to note that the pace at which a particular disorder develops will have a dramatic effect on symptoms and exam findings.

- (a) Acute dysfunction (as might occur with a stroke) generally causes obvious symptoms as the loss of function is abrupt, allowing the patient no time to develop compensatory mechanisms.
  - (b) In contrast, disorders which occur more slowly tend to cause relatively subtle symptoms.
- (2) Patient presentation will also be affected by the size and location of the lesion. Larger lesions or those affecting critical areas of function tend to generate more overt problems.
- (3) Additionally, patients with pre-existing medical or neurological dysfunction may well tolerate new lesions poorly.

History taking & examination proforma

**Appendix 7**

***History taking & examination  
proforma***

Student's name	Roll No.	Year
Tutor's name	Remarks	Sign.

**Patient's data**

- Name \_\_\_\_\_
- Age (or date of birth) \_\_\_\_\_
- Sex \_\_\_\_\_
- Marital status \_\_\_\_\_
- Occupation (with duration) \_\_\_\_\_
- Religion \_\_\_\_\_
- Ethnic group \_\_\_\_\_
- Residence (with duration) \_\_\_\_\_
- Date of history & examination \_\_\_\_\_
- Date of admission \_\_\_\_\_
- Time of admission \_\_\_\_\_
- Mode of admission \_\_\_\_\_

**Present complaint(s)**

- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_



**History taking & examination proforma**

**Substance abuse**

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**Menstrual & obstetric history (in females)**

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**Family history**

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**Socio-economic history**

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**Review of systems**

**Alimentary system**

- Appetite, diet & weight \_\_\_\_\_
- Teeth & taste \_\_\_\_\_
- Swallowing \_\_\_\_\_
- Regurgitation, reflux & heartburn \_\_\_\_\_
- Vomiting & hematemesis \_\_\_\_\_
- Flatulence \_\_\_\_\_
- Abdominal pain \_\_\_\_\_
- Abdominal distension \_\_\_\_\_
- Defecation & stool \_\_\_\_\_
- Skin color \_\_\_\_\_

**History taking & examination proforma**

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**Respiratory system**

Cough \_\_\_\_\_  
Sputum & hemoptysis \_\_\_\_\_  
Dyspnea \_\_\_\_\_  
Chest pain \_\_\_\_\_

**Heart**

Dyspnea \_\_\_\_\_  
Chest pain \_\_\_\_\_  
Palpitation \_\_\_\_\_  
Cough & sputum \_\_\_\_\_  
Dizziness & headache \_\_\_\_\_  
Ankle swelling \_\_\_\_\_

**Peripheral vascular**

Intermittent claudication \_\_\_\_\_  
Rest pain \_\_\_\_\_  
Varices \_\_\_\_\_  
Ulceration \_\_\_\_\_  
Color changes \_\_\_\_\_

**Urinary**

Pain \_\_\_\_\_  
Edema \_\_\_\_\_  
Thirst \_\_\_\_\_  
Micturition & urine \_\_\_\_\_

**Genital**

Pain \_\_\_\_\_  
Discharge \_\_\_\_\_  
Intercourse \_\_\_\_\_  
Secondary sex characters \_\_\_\_\_

**Nervous system**

Mental state \_\_\_\_\_  
Cranial nerves \_\_\_\_\_  
Peripheral nerves \_\_\_\_\_

## History taking & examination proforma

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### Musculoskeletal system

Pain \_\_\_\_\_

Swelling \_\_\_\_\_

Limitation in movements \_\_\_\_\_

Walking \_\_\_\_\_

**Metabolism** \_\_\_\_\_

## GENERAL EXAMINATION

### General impression

- First impression \_\_\_\_\_
- Mental status \_\_\_\_\_
- Body habitus, build, posture & gait \_\_\_\_\_
- Facies \_\_\_\_\_

### Face

- Anemia \_\_\_\_\_
- Jaundice \_\_\_\_\_
- Cyanosis \_\_\_\_\_
- Hairs & contour \_\_\_\_\_
- Breath \_\_\_\_\_
- Teeth, gums & buccal mucosa \_\_\_\_\_
- Tongue \_\_\_\_\_

### Neck

- Neck veins \_\_\_\_\_
- Lymph nodes \_\_\_\_\_
- Thyroid gland \_\_\_\_\_

### Hands

- Nails \_\_\_\_\_
- Clubbing \_\_\_\_\_
- Skin \_\_\_\_\_
- Muscles & joints \_\_\_\_\_

### Hydration

- Dehydration \_\_\_\_\_
- Edema \_\_\_\_\_

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**Vital signs**

- Pulse \_\_\_\_\_
- Blood pressure \_\_\_\_\_
- Temperature \_\_\_\_\_
- Respiratory rate \_\_\_\_\_
- Pain \_\_\_\_\_

**CARDIOVASCULAR SYSTEM EXAMINATION**

**Inspection**

JVP \_\_\_\_\_

Apex beat \_\_\_\_\_

**Palpation**

Precordium \_\_\_\_\_

Carotid artery \_\_\_\_\_

Radial artery \_\_\_\_\_

**Auscultation**

Heart sounds \_\_\_\_\_

Additional sounds \_\_\_\_\_

**RESPIRATORY SYSTEM EXAMINATION**

**A) Inspection**

- 1) General comfort & breathing pattern \_\_\_\_\_
- 2) Use of accessory muscles \_\_\_\_\_
- 3) Posture \_\_\_\_\_
- 4) Abdominal wall movement \_\_\_\_\_
- 5) Symmetry & shape of chest \_\_\_\_\_
- 6) Any visible vein \_\_\_\_\_
- 7) In chest injury
  - a) Painful inspiration \_\_\_\_\_
  - b) Flail chest \_\_\_\_\_
  - c) Open sucking chest wound \_\_\_\_\_

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**B) Palpation**

- 1) Position of trachea \_\_\_\_\_
- 2) Chest excursion \_\_\_\_\_
- 3) Tactile vocal fremitus \_\_\_\_\_
- 4) In case of injury
  - a) Tenderness \_\_\_\_\_
  - b) Bony crepitus \_\_\_\_\_
  - c) Air crepitus \_\_\_\_\_
- 5) Evaluation of any lump or sinus \_\_\_\_\_
- 6) Rib counting \_\_\_\_\_

**C) Percussion** \_\_\_\_\_

**D) Auscultation**

- 1) Breath sounds \_\_\_\_\_
- 2) Added sounds \_\_\_\_\_
- 3) Vocal fremitus \_\_\_\_\_

**NEUROLOGICAL EVALUATION**

- 1) Mental status \_\_\_\_\_
- 2) Cranial nerves \_\_\_\_\_
- 3) Sensory function \_\_\_\_\_
- 4) Muscle strength, tone and bulk \_\_\_\_\_
- 5) Reflexes \_\_\_\_\_
- 6) Cerebellar function \_\_\_\_\_
- 7) Gait \_\_\_\_\_

**ABDOMINAL EXAMINATION**

**A) Inspection**

- 1) Contour of abdomen \_\_\_\_\_
- 2) Swelling \_\_\_\_\_
  - a) Movement on respiration \_\_\_\_\_
  - b) Cough impulse \_\_\_\_\_

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- c) Carnett's test \_\_\_\_\_
- 3) Cough sign \_\_\_\_\_
- 4) Skin & subcutaneous tissue \_\_\_\_\_
- 5) Umbilicus \_\_\_\_\_
- 6) Movements
  - a) Patient's movement \_\_\_\_\_
  - b) Respiratory movement \_\_\_\_\_
  - c) Peristaltic movement \_\_\_\_\_
  - d) Pulsatile movement \_\_\_\_\_

### **B) Palpation**

- 1) Tenderness \_\_\_\_\_
- 2) Guarding & rigidity \_\_\_\_\_
- 3) Masses \_\_\_\_\_
- 4) Visceras \_\_\_\_\_

### **C) Percussion**

- 1) Shifting dullness \_\_\_\_\_
- 2) Fluid thrill \_\_\_\_\_
- 3) Mapping solid visceras or abdominal masses \_\_\_\_\_
- 4) Tenderness \_\_\_\_\_

### **D) Auscultation**

- 1) Bowel sounds \_\_\_\_\_
- 2) Bruits \_\_\_\_\_

### **E) Don't forget to examine**

- 1) Supraclavicular fossa \_\_\_\_\_
  - 2) Hernial orifices \_\_\_\_\_
  - 3) Femoral pulses \_\_\_\_\_
  - 4) External genitalia \_\_\_\_\_
  - 5) Digital rectal examination \_\_\_\_\_
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**LUMP EXAMINATION**

**A) Inspection**

- 1) Site \_\_\_\_\_
- 2) Size, shape, surface \_\_\_\_\_
- 3) Edge \_\_\_\_\_
- 4) Overlying skin \_\_\_\_\_
- 5) Pulsation \_\_\_\_\_
- 6) Cough impulse \_\_\_\_\_
- 7) Number \_\_\_\_\_
- 8) Pressure effect \_\_\_\_\_

**B) Palpation**

- 1) Temperature \_\_\_\_\_
- 2) Tenderness \_\_\_\_\_
- 3) Site, size, shape \_\_\_\_\_
- 4) Surface & edge \_\_\_\_\_
- 5) Consistency \_\_\_\_\_
- 6) Fluctuation & indentation \_\_\_\_\_
- 7) Translucency \_\_\_\_\_
- 8) Cough impulse \_\_\_\_\_
- 9) Reducibility \_\_\_\_\_
- 10) Compressibility \_\_\_\_\_
- 11) Pulsatility \_\_\_\_\_
- 12) Mobility \_\_\_\_\_

**C) Percussion**

- 1) Resonance \_\_\_\_\_
- 2) Fluid thrill \_\_\_\_\_

**D) Auscultation** \_\_\_\_\_

**E) Regional lymph nodes** \_\_\_\_\_

**F) Neurovascular structures** \_\_\_\_\_

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**DIFFERENTIAL DIAGNOSIS**

- 1) \_\_\_\_\_
- 2) \_\_\_\_\_
- 3) \_\_\_\_\_

**DIAGNOSIS**

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**DIAGNOSTIC WORKUP**

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**OPERATIVE NOTES**

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