SURGICAL INFECTIONS

Dr. Muhammad Shamim

Assistant Professor, Baqai Medical University

INFECTION…..

- Humanity has three great enemies:

  Fever, famine and war,

  Of these by far the greatest,

  By far the most terrible is fever.

William Osler

1849-1919

PATHOGENESIS OF INFECTION

- Surgical procedures, Trauma →Local invasion
- Host Defense: Mast cells → Inflammatory mediators that inc. cap. permeability.
- Complement, Fibrinogen, Opsonins → Neutrophils marginate and move out by Chemoattractants → Phagocytosis
- Phagocytic cells and Bacterial products form PUS.
  - Hypoxic and Acidotic environment
- Primary determinant of infection: Density of Bacteria vs. Efficiency of Host

Factors that Increase Incidence of Surgical Infections

- **LOCAL**
  1. Wound Hematoma
  2. Necrosis
  3. Foreign Body
  4. Obesity
- **SYSTEMIC**
  1. Age
  2. Shock
  3. DM
  4. Malnutrition, Alcoholism
  5. Immunotherapy
  6. Steroids
  7. Chemotherapy

PREVENTION OF INFECTION

- Surgical Asepsis
- Perioperative Antibiotics
- Debridement, Irrigation, Bleeding control, Dirt and FB removal.
- Preserve Oxygenation and Perfusion
- Classification system of Wounds

Classification of Surgical Wounds

Clean	Gram-Positive	OR, Team, Pt skin	3%	Hernia, Thyroid
Clean Contami-nated	Poly-Microbial	Endogen-colonization	5%-15%	Gastrecto my, CBD, colon
Contami-nated	Poly-Microbial	Gross colonization	15%-40%	Spill in GI, perf. PUD
Dirty	Poly-Microbial	Established inf.	40%	Abd. Abscess, dead bowel

Surgical Asepsis

- Clean wound infection is the Indicator of overall Sterile Technique in OR
- Limit preoperative Hospitalization
- Cleansing
- Hair removal
- OR time
- Hemostasis
- Drains: Closed-suction, separate stab
- Personnel, Respiration, Attire, Scrubbing, Gowns

Perioperative Antibiotics- Prophylactic

- Prophylactic antibiotics should exist at time of contamination.
  - Clean- contaminated and Contaminated.
  - In clean, required only when Foreign Body is inserted
  - Dirty: fascial closure, wet-to-dry dressing and delayed primary closure in 4-5 days
- Preoperative, close to cutting time, long half- life, selected against specific pathogens, and for 2 postoperative doses

Management of Established Infection

- Community-Acquired and Hospital-Acquired postoperative (Nosocomial) infections
- Peritonitis vs. Intraperitoneal Abscess
- Choices for Antibiotic selection
- Sensitivity, in vitro vs. clinical responsiveness
- Factors to choose: counts, tissue environment, antibiotic concentration, organs that metabolize drug and toxicity
- Re-evaluation

Antibiotic Resistance

- Definition: formerly sensitive antibiotic become unresponsive
  - Genetic mediators or spontaneous chromosomal mutation
  - Sustained use of conventional drug
- Most surgical infections need Drainage or Debridement
- Antibiotics only Adjuvant
- Don’t use preventive drug for extended period

Common Infections

Soft tiss.cellulitis	Group A *strep.*	Nafcillin/ oxacillin
Breast abscess	staphylococcus	Nafcillin/ oxacillin
Synth.vasc.graft	staphylococcus	Nafcillin/ oxacillin
Hip prosthesis Heart/valve pros.	Staph,viridans, enterococcus	Sensitivity needed
Biliary tract	E.coli, kleb.,enter	Azactam,cefazoli
Peritonitis	E.coli.bacteroides	3d generation or.
Hosp acq pneum.	Pseud.serratia	Cipro,amikacin
Catheter	Staph,enterobac	Sensitivities
UTI	Pseud.serratia	Sensitivities
Candidiasis	candida	Ampho,ketocon
Pneumocystis	p.Carini	bactrim

Community-Acquired Infections

- Skin and soft tissue infections
- Breast abscess
- Perirectal abscess
- Gas gangrene
- Tetanus
- Hand infections
- Foot infections
- Biliary tract infections
- Acute peritonitis
- Viral infections

Hospital-Acquired Infections

- Pulmonary infections
- UTI
- Wound infections
- Intraabdominal infection
- Empyema
- Foreign body-associated infection
- Fungal infections
- Multiple organ failure

Skin and Soft Tissue Infection

- Presents with spreading Cellulitis.
  - Blanching erythema caused by *streptococcus* group A.
  - *Staphylococcus* causes Pus.
- Necrotizing streptococcal gangrene rare and manifested by nonblanching erythema.
  - Needs extensive surgical debridement
- Staph respond to cloxacillin and if MRSA need vancomycin.

Common Soft Tissue Infection

cellulitis	Skin break	streptococcus	Diffuse erythema	Sys. antibiotics
Furuncle, carbuncle	Skin glands /crypts	staphylococcus	Induration erythema, pus	I&D, sys antibiotics
Hidradenitis supp	Apocrine sweat gl.	staphylococcus	Abscess, pus.axilla/ groin	I&D, wide debridement/graft.
Lymphangitis	Lymphatics	streptococcus	Swelling, erythema distal ext.	Cleansing wound, sys ABX
Gangrene	Virulent enzymes	synergistic	Necrosis crepitatio	Debrid. IV ABX

Breast Abscess

- Staphylococcal soft tissue infection.
- Postpartum with Galactocele
- Pain, swelling, & redness.
- Aspiration with needle for Diagnosis
- Incision and Drainage is the Treatment
- Antibiotics alone are not enough

Perirectal Abscess

- Crypts of anorectal canal, that suppurate
- Tender masses
- Drained under GA
- Broad-Spectrum Antibiotics to prevent bacteremia
- Occasionally fecal diversion needed if advanced

Gas Gangrene

- Clostridial soft tissue inf. include cellulitis and myonecrosis. *Clostridium perfringens*
- Contaminated objects: nail puncture,
- Brown watery discharge from wound and marked tenderness
- Palpable crepitance.
- X-rays show GAS
- Immunization, and adequate surgical debridement prevents gangrene.
  - Immediate radical surgical debridement.
  - Penicillin, flagyl and clindamycin.
  - Hyperbaric oxygen??

Tetanus

- Lockjaw caused by tetanospasmin secreted by *clostridium tetani.*
  - 2 days to several weeks incubation,
  - then prodromal symptom complex
- Jaw stiffness, muscular contractions, tonic spasms and respiratory arrest
- Key: debridement and cleansing of devitalized tissue with immunization program
  - Tetanus-prone wounds need toxoid; immune globulin needed when no recent immunization
  - Penicillin

Hand Infections

- **Paronychia:** staph. infection of fingernail at nail border. Simple drainage.
- **Felons:** deep infection of pulp space of terminal phalynx. Penetrating injuries. drainage
- **Subungal abscess, deep paronychia**
- Neglected infections lead to **Tenosynovitis.**
- **Deep-space compartments infection**: Thenar, Midpalmar, and Hypothenar. All need I & D, then ABX
- **Human bites**: polymicrobial. Irrigation,debridement, elevation and systemic antibiotics. No closure.

Foot Infections

- Direct Trauma or mechanical / metabolic derangements in Diabetes (neuropathy)
- Cleansing best to prevent it
- Established infection: FB or osteomyelitis.
  - X-rays and bone scans.
  - Debridement and ABX
- Diabetes: neuropathy, bone deformity, and vascular compromise.
  - Cultures, ABX,
  - Debridement and Drainage.
  - External support.

Biliary Tract Infection

- Obstruction of biliary tree. Cystic and CBD
  - *Klebsiella, E.coli* and Enterococcus
  - Surgical intervention for drainage
- Acute cholecystitis: obstruction cystic duct, bacteria entrapped, empyema and sepsis.
  - Undrained results in gangrene and perforation.
  - Early surgery
- Ascending cholangitis: fever, leukocytosis and jaundice.
  - Surgical intervention. T-tube or sphincterotomy

Acute Peritonitis

- Perforation of hollow viscus. Primary rare.
- Acute pain, fever and leukocytosis.
- Tenderness with rebound and rigidity.
- Upright films: gas under diaphragm
- Perforated PUD: might have previous hx. Peritonitis can be purely chemical initially. Repair + or – definitive operation
- Perforated appendix: Symptoms. Abx. Appendectomy and Drainage if abscess

Acute Peritonitis

- Colonic perforation: Cancer or Diverticulitis.
  - Virulent because of colonic microflora high density. Systemically toxic.
  - Volume resuscitation, ABX, and Surgery.
    - Manage perforation and drain pus. Left Colon needs diversion
- Other sources might need a laparotomy to reach a specific diagnosis

Viral Infections

- Usually medical.
- Occupational hazard to health care workers in contact with patients with hepatitis or HIV
- DNA virus **hepatitis B**, via blood or body fluids.
  - 5% carriers progress to end-stage liver disease or hepatocellular carcinoma.
  - Vaccine
- RNA virus **hepatitis C**.
  - Carriers in 60%. chronic active hepatitis, cirrhosis.
  - No vaccine
- **HIV** retrovirus: only strategy is prevention.

Hospital-Acquired Infections

- Postoperative fever: pyrogens, interleukin-1
- Neutrophilia, hypoferremia, hypozincemia and increase C-reactive protein
- Identify pathogen-macrophage interaction before starting empiric antibiotics
- Primary focus of surgical infection must be identified and disrupted before administration of systemic antibiotics

Pulmonary Infection

Non-ventilator associated pneumonia

- from atelectasis.
- Poor tidal volumes due to anesthesia, analgesia and incisions.
- Ambulation, cough, deep breathing and nasotracheal suctioning. Spirometers.
- No need for laboratory or radiographic studies initially
- If fever persists CXR can show infiltrates,
- ABX

VAP

- Postoperative Pneumonitis
- Critically ill patients are vulnerable
- ET tube injures mucosa, promotes Bac. Proliferation
- Ventilator showers pulmonary tissues with multiresistant hospital-acquired flora.
- *Pseudomonas, Serratia.* predominate.
- Cx and ABX. Suctioning

Aspiration Pneumonia

- risk postoperatively
- Gastric distention and altered mental status.
- Decompression reduces the risk.
- Bronchoscopy is diagnostic and helpful
- Systemic oxygenation
- Antibiotics withheld until clinical and culture evidence identifies an organism

Urinary Tract Infection

- Due to indwelling Foley catheter
- Prevention : Aseptic placement, firm fixation, closed drainage system, daily care, removal soon.
- Quantitative diagnosis: 100,000 org/mL.
  - Still look for other reasons of fever, bacteriuria does not indicate sepsis
- *Pseudomonas and Serratia .*Enterococci and *candida.*
- Sensitivities needed

Wound Infections

- Look for the hands of man if postop fever.
- Tenderness, redness, heat, and induration
- Pus discharge
- Absence of healing ridge in wound
- Open the wound
- Pus evacuated, fibrin debrided, SCT cleaned
- Antibiotics are not an alternative to drainage

Intraabdominal Infection

- Most are Abscesses
  - Elective Gastrointestinal or Biliary Surgery. Dehiscence of anastomosis.
  - Initial laparotomy for infection or penetrating Trauma, have bacterial contamination and can develop abscess
- Tenderness, pain, fever, leukocytosis,and toxic septic state
- Contrast studies and CT for Diagnosis

- Difficult to diagnose: painful incision
- Localized tenderness: 30%
- Palpable masses: 10%
- Gastrograffin studies show filling defects, or leaks
- Fluoroscopic guidance, contrast through drains can show collections
- Ultrasound : inexpensive, bedside, non-invasive, but limitations after surgery.

- **CT** : >90 % accuracy in Diagnosis
  - Fast and most useful
  - Water-soluble contrast oral &/or IV to help distinguish abscesses from GI, vascular or urinary structures.
  - Limitations: adynamic ileus, ascites
- **Radionuclide scanning** after injection of indium-111-labeled leukocytes. Total body scan 1 day after injection

- **Drainage: primary treatment of abscess**
- Localized drainage under CT/US guidance, using percutaneous catheter
- Septic patients might need reexploration
- Polymicrobial: *E.coli, B.fragilis*. Complex synergistic relation
- ABX are only adjunct to drainage.
- Diversion, exteriorization or debridement of infected tissue

Pleural Empyema

- After Thoracotomy or Chest tube placement
- Association with a pneumonic process
- Tracheal or Esophageal resections
- Effusion on x-rays.
  - Loculated may be posterior in supine patients
- Ultrasound or CT. Needle thoracentesis for Diagnosis.
- *Staphylococcus*.
- Tube drainage, rib resection and thoracoplasty.

Foreign Body-Associated Infection

- IV peripheral, Swan-Ganz, Pacemakers, Arterial lines and Central lines are portals of entry to intravascular compartment
- Bacteria migrate from skin to IV compartment, then Bacteremia. Intimal injury and localized clot provide growth medium for bacteria.
- Placed under sterile techniques and changed after 72 hrs.
- Suspect it with positive blood cultures, especially staph. Culture catheter tip.

- Treatment consists of removal of FB
- Antibiotics sometimes 14 days (S.aureus) to prevent bacterial endocarditis
- Implanted vascular grafts and orthopedics joints infections are rare; but if it happens removal of the device is mandatory.
- May require alternate prosthetic implants . complex clinical problems. Antibiotic-impregnated beads

Fungal Infections

- Antibiotics wide use is the cause this opportunistic pathogens
- Immunosuppressed, chemotherapy, older and chronic debility are hosts
- Candida are the most common
- Treatment: debridement, Amphotericin B for invasive infections. Fluconazole is less toxic and less efficacious.

Pseudomembranous Colitis

- *Clostridium Difficile* after extensive use of Cephalosporins and Ampicillin
- Diarrhea, Pain, WBC, Pseudomembranes in Colon
- Enterotoxin
- D/C ABX, Oral Vancomycin or Flagyl

Multiple- Organ Failure (MOF)

- Proinflammatory products are extensive, systemic exposure occurs and septic state ensues. SIRS.
- Increase in cardiac output, reduction in PVR, hypermetabolism, and lactic acidemia.
- Left untreated, causes dysfunction of metabolic and vascular processes in vital organ systems, resulting in death
- Treatment entails support of organs.

THANK YOU