

BOWEL INJURIES DURING LAPAROSCOPIC CHOLECYSTECTOMY.

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ABSTRACT

OBJECTIVE: To determine the frequency, site, cause, presentation, management & mortality of the bowel injuries during laparoscopic cholecystectomy (LC).

DESIGN: Descriptive case-series.

PLACE & DURATION OF STUDY: This is a prospective analysis of laparoscopic cholecystectomies performed at Surgical Unit I, Civil Hospital Karachi. A total of 1246 LCs were performed from 1st September 1997 to 15th June 2005.

PATIENTS & METHODS: There were 1246 patients in the study, who underwent LC. The inclusion criteria for LC were: patients of all ages & both sexes, symptomatic gallstone disease, recurrent attack while waiting for interval LC, normal levels of blood complete picture & liver function tests, & ultrasound abdomen demonstrating gallstone disease.

RESULTS: There were 2 cases of bowel injury, ie a frequency of 0.16%. One was serosal injury to colon & the other was duodenal perforation. Both were detected peroperatively, & managed by converting the procedure to open and primary closure of injury; duodenal closure was reinforced with omental patch. Postoperatively, the patient with colonic injury recovered well, but the patient with duodenal injury developed duodenal fistula which was managed conservatively. There was no mortality. Both cases of bowel injury were among the first 50 of the 1246 case-series.

CONCLUSION: At 0.16%, the frequency of bowel injuries during laparoscopic cholecystectomy is small; the risk of such injury is more during the learning curve. Timely detection during the operation results in successful outcome, with little or no mortality.

KEY WORDS: Bowel injuries. Laparoscopy. Laparoscopic cholecystectomy. Cholelithiasis. Gall bladder.

INTRODUCTION

With the advent of Laparoscopic Cholecystectomy (LC) in France in 1987, the management of biliary disease has dramatically changed. Currently, LC is the gold standard treatment of gallstones.^{1,2} It has gained favour among surgeons and popularity among patients as it offers minimal surgical trauma, reduced hospital stay and early resumption of normal working activity.^{3,4} But, the procedure time is prolonged^{5,6} & injuries to intra-abdominal viscera occur with rates of 0.03-0.5.³ Bowel injury is an uncommon but severely hazardous complication.⁷ It is associated with a high morbidity & mortality rate.⁸

The time at which laparoscopy induced bowel perforations are recognized is significant. Early perforation develops during or directly after surgery; late perforation arise a couple of days later. The later is probably caused by local inflammation as a reaction to damage inflicted during laparoscopic dissection. Insertion of a Veress needle or a trocar may damage the bowel during creation of pneumoperitoneum. The coagulator or grasping forceps may cause bowel injury during the operation.^{8,9} Patients at risk include those with adhesions or a previous laparotomy. This study aims at assessing the bowel injuries of LC. Our series of 1246 patients treated in one surgical unit over eight years period, represents a homogeneous experience: indications, technique, criteria for converting the procedure and the treatment of complications are well standardised.

PATIENTS & METHODS

This descriptive case-series study includes 1246 patients who underwent LC for symptomatic gallstones at Surgical unit-1, Civil Hospital Karachi. This study was done prospectively from 1/9/1997 to 15/6/2005.

The inclusion criteria for LC were: patients of all ages & both sexes, symptomatic gallstone disease, recurrent acute cholecystitis while waiting for interval LC, normal levels of blood complete picture (CP) & liver function tests (LFTs), & ultrasound abdomen (US) clearly demonstrating gallstone disease, with absence of any signs suggesting

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acute cholecystitis. The history, physical examination, US abdomen, & labs suggesting any of the following condition were excluded: acute cholecystitis, bile duct calculous, obstructive jaundice, cholangitis, acute pancreatitis, portal hypertension, gallbladder malignancy, sepsis, & severe cardiopulmonary disease or any other anesthetic risk.

A thorough record of patients' data was performed, including the history & clinical examination, laboratory investigations, ultrasound abdomen, x-ray chest & any other imaging study (if done), operative details, postoperative course and follow-ups of 6 months. The variables noted & analysed includes: the demographic data, body weight, presenting complaint, previous history of any abdominal surgery, associated medical disease, abdominal tenderness, abdominal ultrasound, operative technique, operative details, postoperative course & follow-ups. In cases of bowel injuries, following variables were noted: site of injury, time of diagnosis, cause, association with any preoperative variable, management, complication, outcome and experience of the surgeon.

RESULTS

The frequency of bowel injury is 0.16 percent. A total of 1246 LCs were evaluated in this study. Bowel injury was found in only two cases, reported as peroperative complication (Table I). Both injuries occurred during the first 50 cases of the 1246 series LCs, i.e. during the learning curve. **Case 1:** In a 45 years old female patient, iatrogenic duodenal perforation occurred while coagulating a bleeding point on omentum; this bleeding occurred during separation of omental adhesions over GB. The duodenal injury was recognised immediately. Procedure was converted to open cholecystectomy; the hole was closed with vicryl 2/0 and omental patch applied over it. After two days she developed duodenal leak (fistula), which was managed conservatively by application of ostomy bag over the fistula and care of the fistulous opening. The fistulous output decreased to zero in 18 days, and the closure of duodenal hole was confirmed by x-rays with gastrograffin meal. The patient was discharged on 23rd postoperative, and no further complication occurred in the six month follow-up period. This was case no. 17 of the total of 1246 LCs. There were no preoperative risk factors.

Case 2: In a 35 years old female patient, iatrogenic serosal injury of colon occur at hepatic flexure while separating the adhesion between colon and fundus of GB. The

TABLE I:
BOWEL INJURIES DURING LC: FREQUENCY

Site of injury	No. during learning curve (LC = 50)	No. during skill curve (LC = 1196)	Overall (LC = 1246)
Duodenum	1	0	1
Colon	1	0	1
Frequency during learning curve: 4%			
Frequency during skill curve: 0%			
Frequency, overall: 0.16%			

TABLE II:
BOWEL INJURIES DURING LC: DIAGNOSIS, CAUSE & MANAGEMENT

Site of injury	Time of diagnosis	Cause	Adhesions	Preoperative risk factors	Management	Mortality
Duodenum	Peroperative	Diathermy burn	Present	No	Conversion to laparotomy	No
Colon	Peroperative	Avulsion with grasping forceps	Present	No	Conversion to laparotomy	No

injury was recognised immediately. The procedure was converted to open cholecystectomy, and the colonic injury was repaired in two layers with vicryl 2/0. The patient recovered well, and was discharged on the 11th postoperative day. No further complication occurred in the six month follow-up period. This was case no. 36 of the total of 1246 LCs. There were no preoperative risk factors.

DISCUSSION

Frequency

In this study, the frequency of bowel injury is 0.16%; there was one case of duodenal injury (0.08%), & one case of colonic injury (0.08%). Voort¹⁰ in an analysis of 28 independent studies, evaluating 329935 laparoscopic procedures, has found the incidence of bowel injury as a complication of laparoscopy was 0.13% & that for bowel perforation was 0.22%. The incidence of serious bowel injuries during LC ranges from 0-5%.^{11, 12} Other reported incidences include: Singh¹³ 0.17% duodenal injury, Shrenk¹⁴ 0.21% bowel injury, Bishoff¹⁵ 0.2% bowel perforation and 0.6% bowel abrasion, Kwon¹⁶ 0.6% bowel injury, Shamiyeh¹⁷ 0.87% bowel injuries, and McKeman¹⁸ 0.16% bowel injuries.

Cause & predisposing factors

Either the small or large bowel can be damaged by the inadvertent introduction of Veress needle or sharp-tipped trocar, by forcible undue dissection while freeing adhesions to gain access to GB or by thermal burns.¹⁴ The usual causes of injury to the bowel wall were thermal burns, sharp dissection, and needle punctures.^{7, 14, 19} Approximately 40% of the bowel injuries

were access related & caused by either a trocar or a veress needle.^{7, 20} About 26% of lesions were thermal injuries; the coagulator is a well known cause.⁹ There are three ways to create a pneumoperitoneum: Veress needle insufflation, direct trocar insertion & Hasson's open procedure. It has been suggested that the open might be slightly safer. In our study we never use Veress needle for creation of pneumoperitoneum; we used the technique of sequential clipping and elevation of all layers of the abdominal wall during the insertion of the Hasson cannula for safer entry into the peritoneal cavity.²¹ Our policy worked well, and we did not experienced any bowel or vascular injury from access. To prevent injury equipment should be checked on a regular basis. Movements of the coagulator & sharp instruments should be followed assiduously by the camera to avoid damage occurring out of view.^{15, 22, 23} Steps to minimize the occurrence of this complication include proper use of the laparoscope and cautery equipment, good anesthesia and gas distension of the abdomen, correct positioning of the patient and clear visualization of the operative field.²⁴ Separation of dense adhesions can also result in bowel injuries.^{7, 16} In both of our cases, this was the leading cause; in one the injury occur due to diathermy burn, while the other is due to avulsion with grasping forceps. Voort¹⁰ in an analysis of 28 independent studies has found: in 68.9% instances of laparoscopy induced bowel injury, the patient had adhesions or had undergone previous laparotomy. Injury can occur during insertion of a trocar or a Veress needle into a bowel loop adherent to the anterior abdominal wall or misadventure

during dissection of adhesions.^{8, 22} Even if previous open surgery or peritonitis are a possible cause of major complications, they should not be considered as a contraindication to LC, but require great care and precaution especially during initial access. In our experience 63 patients (5.06%) had undergone previous open operations: most were caesarean section (51 cases), but there were cases of appendicectomies (5 cases) and hysterectomy (7 cases). Previous lower abdominal surgery did not cause complications in any of the patients. We had not attempted LC in any patient with history of upper abdominal surgery. Yet another factor might be the experience of the surgeon. During the first part of the laparoscopic learning curve the risk of complications is greater.^{25, 26} In this study, both cases of bowel injuries occur during the learning curve (i.e. in the first 50 of 1246 case-series).

Site

Either the small or large bowel can be damaged.¹⁴ Voort¹⁰ found that the small bowel was most frequently damaged (55.8%), followed by large bowel (38.5%) and stomach (3.9%); small bowel injury occurred mainly on the antimesenteric border²⁷; its vulnerability might partly be due to adhesions to the anterior peritoneum. The duodenum is usually spared from Veress needle or trocar injury because of its posterior location. However, during dissection in the triangle of Calot, the duodenum is at risk for direct contact burn or energy conduction burn.¹⁹ Schafer²⁸ reported 9 bowel injuries in 14243 laparoscopies: small bowel (66.6%), and large bowel (33.3%). El-Banna⁷ reported 12 bowel injuries: duodenum (33.3%), small bowel (16.7%), and large bowel (50%). In this study, there were 2 bowel injuries: duodenum (50%), and colon (50%).

Presentation

In this study, both bowel injuries were recognised at the time of LC and treated immediately by converting the procedure to open cholecystectomy.^{14, 18} Most laparoscopy induced bowel injury was recognized during surgery & so could be repaired immediately, but about 10% was diagnosed after 48 hours.²⁰ Perforations that were diagnosed late generally resulted from thermal injury.^{7, 15, 19, 26, 27, 29, 30} Delay in diagnosis was from 48 hours up to 2 weeks^{7, 15, 19, 24, 26, 27, 28, 30} and was generally longer for large bowel than small bowel lesions.^{15, 26} Perforation may be delayed for several days with thermal injury and devascularisation, or necrosis due to me-

senteric or venous thrombosis. The patient presents with complications like sepsis, peritonitis, intraabdominal abscess, or enterocutaneous fistula.² Delayed perforation may also be detected by the radiological demonstration of extensive pneumoperitoneum and pneumomediastinum in a patient who underwent laparoscopic cholecystectomy.³¹

Management

In this study, both bowel injuries were dealt by converting the procedure to open cholecystectomy & primary repair of bowel injury.¹⁶ Duodenal repair was reinforced with omental patch, while colonic repair was done in 2 layers. Most bowel injuries (approximately 80%) were treated with either a conversion or a laparotomy, but laparoscopic suturing is more frequently being applied & may become the treatment of choice.^{28, 29, 32, 33} Successful laparoscopic repair can be achieved with autosuturing devices, or extracorporeal suturing via the umbilical incision.¹⁶ However, bowel perforation with delayed diagnosis is still mostly treated with a laparotomy in order to evaluate the entire abdomen.^{15, 32} Open operative management include simple closure or segmental resection.¹⁴ It has been suggested that burn spots & other serosal damage should be treated immediately to avoid serious morbidity.^{7, 15.}

Morbidity & mortality

The morbidity in this study is 50% as one case of duodenal injury, which was repaired primarily, developed postoperative duodenal fistula. There is no mortality in this study. Huscher¹ (0.22% mortality) and Schafer²⁸ (4.0% mortality), reported one death each. El-Banna reported 4 duodenal injuries of which 3 died.⁷ Intraoperative or early postoperative diagnosis and proper management of laparoscopic-induced bowel injuries can minimize morbidity and mortality and yield a better prognosis.⁷

CONCLUSION

At 0.16%, the frequency of bowel injuries during laparoscopic cholecystectomy is small; the risk of such injury is more during the learning curve. Timely detection during the operation results in successful outcome, with little or no mortality.

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