Laparoscopic Cholecystectomy In Acute Cholecystitis – Experience From A Single Centre
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INTRODUCTION
The biliary diseases constitute a major portion of digestive tract disorders, among these, cholelithiasis being the forerunner causing general ill health and requiring surgical intervention for total cure. It is estimated that in India, as well as in this part of the country, cholelithiasis is very common. Females are three times more prone to develop gallstone disease than men. As the age advances, prevalence increases from four percent in the third decade of life to twenty-seven percent in the seventh decade of life. Langenbuch’s open cholecystectomy remained the gold standard for symptomatic cholelithiasis for over a century. However, in the last decade, the introduction of the laparoscopic technique to perform cholecystectomy has revolutionized this procedure.

The first laparoscopic cholecystectomy was performed in 1985 by Muhe. Reddick and Oslen, however, devised the currently used method for laparoscopic cholecystectomy performing their first case in September 1988.

Laparoscopic cholecystectomy achieves the goal of shorter recovery time, decreased expense, less postoperative pain and improved cosmesis. In the early years of minimally invasive surgery acute cholecystitis was considered to be a relative contraindication to laparoscopic cholecystectomy because of inflammatory changes. Laparoscopic cholecystectomy is more likely to be successful and complication-free if it is performed within 72 hours of presentation. Acute cholecystitis is the acute inflammation of the gallbladder which, in 90-95% of patients, is due to obstruction of the cystic duct by a gallstone. The combination of cystic duct occlusion and altered biliary lipid composition appears to initiate the cascade of events which culminate in the mucosal release of inflammatory agents from the gallbladder. Although bacteria are cultured in approximately 50% of patients, these organisms generally are thought to play a secondary role in the pathogenesis of cholecystitis.
On the basis of etiopathogenesis, acute cholecystitis is of two types, acute calculous and acute acalculous cholecystitis; 90-95% of cases of acute cholecystitis are related to gallstone obstruction of the cystic duct. The pathogenesis of most cases is probably chemical or ischemic rather than infectious. Impaction of a stone in the cystic duct leads to changes in the concentration and composition of bile. Acute acalculous cholecystitis accounts for about 5% of all cases of acute cholecystitis. It usually occurs in critically ill patients, after trauma, burns, long-term parenteral nutrition, major nonbiliary operations and cardiopulmonary bypass. The cause of acute acalculous cholecystitis remains unclear, although gallbladder stasis and ischemia have been most often implicated as causative factors.

Right upper quadrant pain is the most common complaint which is colicky and persists for a longer time. Other common symptoms include nausea, vomiting and fever. On physical examination, focal tenderness and guarding are usually present inferior to the right subcostal margin. A lump may be present in the right upper quadrant and Murphy’s sign may also be elicited. A mild leukocytosis is usually present (12,000 to 14,000 cells/mm³). In addition, mild elevation in serum bilirubin, alkaline phosphatase, transaminases and amylase may be present. Ultrasound is the most useful investigation. Findings suggestive of acute cholecystitis include thickening of gall bladder (> 4mm), pericholecystic oedema, presence of stone(s) and sonographic Murphy’s sign. Complications of acute cholecystitis include empyema, emphysematous cholecystitis, and perforation of the gallbladder.

Laparoscopic cholecystectomy is more likely to be successful and complication free if it is performed within 72 hours of presentation. Acute inflammation associated with acute cholecystitis creates an oedematous plane in the submucosa of the gallbladder, which facilitates its dissection from the liver bed. As a general rule, with patients who have acute cholecystitis, perform laparoscopic cholecystectomy as soon as convenient, within in the first 72 hours. There is no benefit to attempting to ‘cool off’ the gallbladder before proceeding to the operating room. Laparoscope or no laparoscope, the message remains the same: ‘for acute cholecystitis, get it while it is hot’. Laparoscopic cholecystectomy for acute cholecystitis has been reported with technical success and this is what forms the basis of this study.

**MATERIAL AND METHOD**

The present study was carried out in patients of acute cholecystitis, operated at A.S.C.O.M.S. from May 2003 till December 2008. Before the procedure, fully informed consent was taken. Additionally, patient’s consent for conversion to an open procedure was obtained. All the patients who were admitted with acute cholecystitis during the study period were included.

**METHODOLOGY OF CASE STUDY**

After admission each case was thoroughly examined, investigated and evaluated and put on conservative treatment to control nausea, vomiting, fever and dehydration. The following line of management was undertaken.

Patients were put on nil orally, intravenous fluids, broad spectrum antibiotics, analgesics and antipyretics. All patients were subjected to standard laparoscopic cholecystectomy within 72 hours of admission.

**OPERATIVE TECHNIQUE**

All patients were asked to void before surgery. The patients were given general anaesthesia and placed in the supine position on the operating table. An orogastric tube was inserted to decompress the stomach. The abdominal skin was prepared and towelled and a pneumoperitoneum was established by blind puncture using a Veress needle through a small incision 1 cm in length below the umbilicus with the patient in 15°-Trendelenburg position. The anterior abdominal wall was elevated during needle insertion. Confirmation of the intraperitoneal location of the needle was made by the saline drop test; the peritoneal cavity was insufflated using carbon dioxide. The usual preset intra-abdominal pressure used was 11mm Hg with a flow rate of 2.1 litres per minute. The initial amount of gas used for insufflation was 1.2-1.5 litres.

Primary port placement: While elevating the abdominal wall manually, a 10mm canula was inserted through the incision used for the Veress needle. The telescope was placed through the primary canula and peritoneoscopy was performed. The patient was placed in a reverse Trendelenburg position and the table tilted to the left to allow a clear view of the gallbladder area.

Secondary port placement: An epigastric 10 mm port was placed in the midline entering the peritoneal cavity again under direct vision to the right of the falciform ligament. And a 5mm port was placed under direct vision in the midclavicular line just below the right costal margin. A
fourth port was inserted in the anterior axillary line just below the costal margin. Instruments used to perform the dissection were passed through the epigastric port.

Dissection was begun high in the neck of the gallbladder and was kept close to the gallbladder until the anatomy was well-defined. A clear view of the cystic duct was obtained before the application of the clips, which were placed as close to the gallbladder as possible under direct vision. When a short cystic duct was present, an endoloop or ligature was used around the cystic duct instead of a clip. Following division of the cystic duct, the cystic artery was divided between clips. The gallbladder was dissected off the liver bed using monopolar cautery and dissection was started behind Hartmann's pouch. The gallbladder was not completely removed from its liver bed and by leaving the fundus attached, the liver was elevated and the gallbladder fossa was carefully inspected for accessory bile ducts and bleeding. Using irrigation and suction the liver bed was closely scrutinized and dealt with as necessary. The cystic duct and cystic artery were also inspected at this stage to ensure that the clips were in position. A large grasping forceps was inserted through the epigastric port, to hold the neck of the gallbladder which was then extracted. If stones were large, they were crushed within the gallbladder. After removal of the gallbladder, the bed was inspected once again. In case of excessive oozing, a haemostatic agent (Surgicel®) was spread over the bed. In case of bleeding or bile spillage, a suction drain was passed into the peritoneal cavity through the 5mm port and placed under the liver over the gallbladder fossa. The ports were removed under vision. The table was straightened and the gas was expelled from the peritoneal cavity. The skin incisions were closed by 2-0 silk sutures. These incisions were injected subcutaneously with 0.5 percent bupivacaine.

Postoperatively intravenous fluids were continued up to 8 hours after surgery and antibiotics till next day morning. Patients were monitored for the following:

- Pulse, blood pressure, temperature and respiratory rate.
- Appearance of bowel sounds.
- Passage of flatus.
- Biliary peritonitis, ileus, jaundice.
- Colour of discharge from drain.
- Quantity of discharge from drain.
- Number of days after which the drain was removed

**OBSERVATIONS**

The age of the patients ranged from 24 years to 80 years. The majority of the patients (88; 62.85%) in our series belonged to the third and fourth decade of life. The majority of patients were females (62.85%) and males contributed 37.15%, with a female-to-male ratio of 1.7:1.

Pain in the right hypochondrium, nausea and or vomiting were present in 100% of patients. Elevation of body temperature more than 100º F was found in 80%. On per abdomen examination, tenderness in the right hypochondrium was present in 100%; Murphy’s sign was elicited in 71.42% and a tender lump in the right hypochondrium in 14.28%.

Only 8 (5.71%) cases had a haemoglobin less than 10gm/dl. A TLC above 10,000/mm$^3$ was found in 100%. A mild increase in bilirubin was present in 11.42%. There was a mild increase in the transaminases SGOT/SGPT in 11.42% and alkaline phosphatase was elevated in 17.4%. On ultrasonography (USG), edema of the gallbladder with wall thickness >4 mm was revealed in 100%. Distended gallbladder with USG Murphy’s sign was seen in all cases. In 40 patients (28.57%), pericholecystic fluid was seen and a mucocele was seen in 8.57%. Gallstones were seen in all patients; stones were multiple in 36 (25.71%) cases and single in 104 (74.28%) cases. Stones were impacted at the neck in 120 (85.71%) cases.

The majority of the patients (108; 77.14%) were operated within 72 hours of admission, while 32 patients (22.86%) were operated within 48 hours of admission. During surgery [Figures 1-5], adhesions of various intensity were found in all patients (100%), distended gallbladder in 108 (77.14%), oedema of wall in 136 (97.14%), inflamed gallbladder in 140 (100%), pericholecystic oedema in 60 (42.85%) and pericholecystic abscess in 40 (28.57%) patients. Mucocele was present in 12 (8.57%), empyema of gallbladder in 96 (68.57%). All the patients had gallstones. A stone was impacted at the neck in 120 patients (97.14%). Significant bleeding from the liver bed occurred in 48 (34.28%) and a short cystic duct was encountered in 8 (5.71%) cases. Gallbladder inflammation involved only fundus and body in 100 patients and was extending up to neck in 32 and up to the cystic duct in 8 patients.
Mean operating time was 69.2 ± 8.9 minutes, with most patients in the operating-time group of 61-90 minutes. Mean duration of anaesthesia was 84.5 ± 8.3 minutes, with most of patients in the time group of 76-105 minutes.

Postoperatively, abdominal pain occurred in 12 (8.57%), fever in 16 (11.42%), basal pneumonitis in 4 (2.85%), biliary fistula in 4 (2.85%) patients and faecal fistula in 1 (0.71%) patient. Mean hospital stay was 5.4 ± 3.7 days. The majority of patients (127; 90.7%) was discharged in less than 4 days.

**Figure 1**
Fig. 1: INFLAMED GANRENOUS GALLBLADDER

**Figure 2**
Fig. 2: DISSECTED CALOT’S TRIANGLE WITH LARGE CYSTIC LYMPH NODE OF LUND

**Figure 3**
Fig. 3: CYSTIC DUCT CLIPPED & BEING DIVIDED

**Figure 4**
Fig. 4: PERSISTANT OOZING FROM INFLAMED LIVER BED BEING SUCKED
Laparoscopic surgery has radically changed the field of general surgery and with the mounting experience its applications are expanding rapidly. The pioneers of laparoscopic cholecystectomy initially considered acute cholecystitis to be a contraindication for laparoscopic surgery. However, with growing experience, passionate attempts have been made to treat acute cholecystitis with laparoscopic surgery.

Most of the patients in the present study were in their third and fourth decade of life (62.85%), with a female-to-male ratio of 1.7:1.0. Lo et al. (1996) reported that in their series, the majority of patients were in their fourth and fifth
decade of life, with a female-to-male ratio of 1.0:0.7. In accordance with our series, Shaheed et al. (2004) reported that in their series, the majority of patients were in the age group or 23-55 years, with females comprising 73.7%.

The main clinical presentations in our series of patients were right upper quadrant pain in 140 (100%), nausea and or vomiting in 140 (100%), temperature >100°F in 112 (80%), tenderness in the right hypochondrium in all (100%), Murphy's sign in 100 (71.42%) and tender lump in 20 (14.28%) patients. These findings were in accordance to the various studies including those by Flower et al. (1991) and Lo et al. (1996) who reported pain in the right hypochondrium in 100%, temperature >100°F in 70% and tenderness in the right hypochondrium in 100% of patients of acute cholecystitis in their series.

Jarvinen et al. (1980) reported the results of the laboratory investigations of their patients which revealed a TLC >10,000/cu mm in 100%, serum bilirubin >2.1 mg/dl in 34%, transaminases >40 units/L in 31% and alkaline phosphatase >280 units/L in 16 (20%) of patients. In our series, results of laboratory investigations were almost similar with regard to TLC >10,000/cu mm in 100% and alkaline phosphatase >280 units/L in 24 (17.14%) patients. However, a mild increase in transaminases was seen in only 16 (11.4%) and a mild increase in serum bilirubin in 16 (11.4%) of patients.

In our series, we used abdominal ultrasonography to confirm the diagnosis of acute cholecystitis. Ultrasonography revealed an oedematous gallbladder in 35 (100%), gallbladder wall thickness >4mm in 35 (100%), distended gallbladder in 35 (100%), USG Murphy's sign in 35 (100%), pericholecystic fluid in 40 (28.57%) and mucocele in 12 (8.5%) patients. Gallstones were detected in all 35 (100%) patients. Stones were multiple in 36 (25.71%) and solitary in 104 (74.28%) patients. These findings are in accordance to that of Lo et al. (1996) who reported that in their series USG of the abdomen was also used to confirm the diagnosis of acute cholecystitis. USG findings in their patients revealed thickened gallbladder wall in 82%, oedematous gallbladder in 88.8%, distended gallbladder in 96.3%, Murphy's sign in 85%, pericholecystic fluid in 8% and presence of gallstone in 100%. Saleh et al. (2005) reported that in their series USG findings of thickening of gallbladder wall, pericholecystic fluid collection, and impacted stone in the gallbladder neck were regarded as sonological features suggestive of acute cholecystitis.

After confirming the diagnosis, patients were subjected to laparoscopic cholecystectomy within 72 hours of admission. In our series, the majority of patients (108; 77.14%) were operated within 72 hours of admission, while 32 (22.8%) were operated within 48 hours of admission and the operation was completed successfully in 136 (97.14%) patients. This was the time required to further investigate and resuscitate patients, which included intravenous fluids, antibiotics, analgesics and correction of electrolyte imbalance. In accordance with our series Flower et al. (1991) reported their experience of laparoscopic cholecystectomy in patients of acute cholecystitis operated on within 72 hours of admission and operation was completed safely and successfully in most of these patients. Hunter et al. (1998) reported in their study that optimal timing of laparoscopic cholecystectomy in acute cholecystitis is more likely to be successful and complication-free if it is performed within 72 hours of presentation - “get it while it is hot”.

In our series, the operation revealed multiple findings in many patients. Adhesions were present in 35 (100%), distended gallbladder in 35 (100%), oedema of the wall in 136 (97.14%), inflamed gallbladder in 35 (100%), pericholecystic abscess in 40 (28.57%), pericholecystic oedema in 60 (42.85%), mucocele in 12 (18.57%) and gallbladder empyema in 96 (68.57%), presence of stones in 35 (100%), stone impacted at neck in 120 (97.14%), significant bleeding from the liver bed in 48 (34.28%) and short inflamed cystic duct in 8 (5.71%) patients.

Adhesions were mainly omental, with a few patients showing duodenum or transverse colon adherent to gallbladder. Adhesions were easier to separate in the patients operated within 24 to 48 hours. Gall bladder inflammation involved only fundus and body in 100 (71.42%), extended up to the neck in 32 (22.86 %) and up to cystic duct in 8 (5.71%) patients. Inflammation had resulted in gangrene of the fundus of the gallbladder in four (2.85%) patients. The above findings show that, no matter how severe the attacks of acute cholecystitis, cystic duct and Calot’s triangle remain relatively free of inflammation. Only in 4 (2.85%) patients the anatomy in Calot’s triangle was disturbed and could not be delineated clearly. In four cases (2.85 %) a stone was found impacted in the cystic duct. Lo et al. (1996), in their series of 27 cases of acute cholecystitis, presented their operative findings as severe adhesions in 17 (62.9 %), distended gallbladder in 24 (88.88%), gallbladder containing turbid bile/pus in 24 (88.8%), and gallstones in 27 (100%)
patients. Whereas Kum et al. (1998) reported operative findings of severe adhesions in 20% patients, stone/bile spillage in 28% and significant blood loss in 50% of patients.

Lo et al. (1996) reported modifications in the operative technique in their series of 27 cases, including gallbladder decompression in 21 (77.7%), use of a 5th canula in two (6.5%), use of sutures to control the cystic duct in six (22.2%), use of closed suction drainage in 23 (85.1%) patients and a conversion rate of 7.4%. Singh et al. (2006) reported in their experience of laparoscopic cholecystectomy for difficult cases, which included patients with acute cholecystitis, a conversion rate of only 0.57%, which is much lower than reported in many other series. In our series, modifications of operative technique included gallbladder decompression in 22 (69%), closed suction drainage in 136 (97.14%), use of haemostatic agent (Surgicel®) for the liver bed in 48 (24.30%) and conversion to open technique in four (2.85%) cases. In 4 patients (2.85%), the inflammation had involved the cystic duct, which resulted in partial avulsion of the cystic duct that was managed by applying additional clips near the cystic duct/common bile duct junction. Inflammation had resulted in gangrene of the gallbladder fundus in four patients. In 4 patients the cystic duct was wide and ligated by 2-0 silk. Inflammation and adherence of the gallbladder to the liver bed resulted in significant bleeding from the liver bed which was adequately controlled by cautery. In view of persistent oozing from the liver bed, haemostatic agents (Surgicel®) were applied. Closed suction drainage was placed in the gallbladder bed and passed out through the 4th port in those patients in whom bile spillage or significant oozing of blood occurred from the liver bed. In our study, no patient required the use of a 5th port.

In four patients, inflammation and dense adhesions in Calot’s triangle and adhesions between the gallbladder and gastro-duodenal junction resulted in a serosal tear in the stomach. In these patients, we converted to an open procedure, cholecystectomy was completed successfully and the stomach tear was sutured. So conversion rate in our series was only 2.85% which is on the lower side as compared to conversion rates reported in many series already mentioned.

The mean operative time for surgery in the present series was 69.2±8.9 minutes. The majority of the patients were in the operating time group of 61 to 90 minutes. Duration of operation in our series was less as compared to that reported in many other series. Rattner et al. (1993) reported in their study that successful laparoscopic cholecystectomy for acute cholecystitis took a mean of 87±22 minutes.

For laparoscopic cholecystectomy in acute cholecystitis, postoperative complications have been reported in the literature, which were comparable with those of our study. Wilson et al. (1991) reported the development of a low-volume duodenal fistula postoperatively in one of their patients, probably secondary to disruption of a small cholecystoduodenal fistula during dissection. The fistula resolved after six days of conservative treatment. Gharaibeh et al. (2001) reported a clinically significant bile leak in 0.55%, which was managed by drainage. Pain was reported in 51% patients who were managed conservatively. In our series, postoperative complications were pain in 12 (8.57%), fever in 16 (11.42%), basal pneumonitis in 4 (2.85%), biliary fistula in 4 (2.85%) and faecal fistula in 1 (0.71%) of the patients.

Abdominal pain, which was of increasing intensity as compared to the mild discomfort seen in other patients, responded to analgesics. Those patients who developed fever had low-grade fever, with no rigors or chills and fever subsided by antipyretics. Four patients who developed basal pneumonitis were treated by a five-day course of antibiotics in consultation with a chest physician. A biliary fistula occurred in four patients who presented with persistent and significant drainage of bile through the drain. The patients were managed conservatively and the fistula closed completely in two weeks.

One of our patients developed a faecal fistula and presented with pain in the abdomen, fever on the second postoperative day and discharge of feculent material through the epigastric port on the third postoperative day. This patient had dense adhesions and the fistula may have occurred as a result of the thermal injury to the colon during the separation of adhesions. This patient was managed conservatively and recovered completely in six weeks. In our study there was no death or need for reoperation.

In our series, the mean postoperative hospital stay was 5.5±3.7 days. The majority of our patients were discharged on the second postoperative day; 127 (90.7%) patients were discharged in less than four days. Among the remaining 13 patients, 8 (5.71%) were discharged within 10 days which included 4 who developed basal pneumonitis and 4 with conversion to open procedure. Five other patients were discharged after >10 days postoperatively. Among them 4
(2.85%) patients had developed a biliary fistula and were discharged after two weeks and one patient developed a faecal fistula and was discharged after six weeks. Postoperative hospital stay was in accordance with many reported series. Zucker et al. (1993)\(^9\) reported a mean hospital stay of 3.3 days for the laparoscopic group and 6.8 days for the patients with conversion to open procedure. Rattner et al. (1993)\(^4\) reported an average postoperative stay of two days in the successfully treated group and 6 days in the converted group.

We followed up our patients at the surgical outpatient clinic at weekly intervals for two to three months. None of our patients presented with any complaint during follow-up.

Our findings makes it clear that even though adhesions, inflammation, oedema, tensely distended gallbladder and friable tissue are found in cases of acute cholecystitis, it is still possible to complete laparoscopic cholecystectomy in most of the cases by passionate and meticulous dissection. It is relatively easy to get a plane of dissection in the initial few days of acute cholecystitis because acute inflammation associated with acute cholecystitis creates an oedematous plane which facilitates dissection of the gallbladder from the liver bed. We have also found that the anatomy of Calot’s triangle could be delineated clearly in most of the cases.

Laparoscopic cholecystectomy in cases of acute cholecystitis can be safely and successfully performed within 72 hours of presentation with a very low and acceptable conversion rate which was only 2.85 % in our series and we recommend that laparoscopic cholecystectomy should be the procedure of choice in the treatment of acute cholecystitis.

CONCLUSION

We recommend that laparoscopic cholecystectomy can be done safely and successfully within 72 hours of presentation.

There is no benefit to attempting to “cool off” the gallbladder. The message remains the same for acute cholecystitis: “get it while it is hot”.

References

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