

LAPAROSCOPIC CHOLECYSTECTOMY FOR GALLSTONES: A COMPARISON OF OUTCOME BETWEEN ACUTE AND CHRONIC CHOLECYSTITIS

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Background: Laparoscopic cholecystectomy (LC) is now a common method of treating symptomatic gallstones, and it is increasingly being requested by the informed general public. Our aim was to evaluate the role of LC for cholelithiasis and to establish its outcome and the effect of gender on the results.

Patients and Methods: Between September 1994 and June 1999, all patients who underwent LC for cholelithiasis were retrospectively reviewed. They were classified as having acute or chronic cholecystitis (AC or CC).

Results: There were 791 patients with CC (633 females, 158 males) and 204 patients with AC (124 females, 80 males). Conversion to open cholecystectomy was needed in 0.76% and 11.8% of the patients with CC and AC, respectively ($P<0.00$). Four percent of the female patients with AC needed conversion as compared to 23.8% in the males ($P<0.00$). The low conversion rate in CC limited gender comparison. Median operation time in the patients with CC was 53 ± 16 minutes as compared to 74.5 ± 35.7 minutes in those with AC ($P<0.00$). Operation time in the male patients with CC and AC was significantly higher than in the female patients, even after excluding the converted cases ($P<0.00$). Median postoperative stay for patients with CC was 1.33 ± 0.9 days as compared to 1.9 ± 1.34 days in patients with AC ($P<0.00$). No statistical significance in the hospital stay was found between males and females (in CC and AC). There was no mortality in the series. There were three bile duct injuries in the patients with CC. In patients with successful LC, gallbladder perforation occurred in 18% and 31% of CC and AC patients, respectively ($P<0.003$). Missed stones occurred in 1.4% and 3.3% of the patients with successful LC for CC and AC, respectively. Bile collection, which was treated with open drainage, occurred in four patients with CC and one patient with AC.

Conclusion: LC for symptomatic cholelithiasis is safe and feasible; it should be the first choice before resorting to open surgery. In patients with AC as compared to CC, there is an increased conversion rate, longer operation time, longer hospital stay, and higher incidence of gallbladder perforation without an increase in the incidence of bile duct injuries (BDI). Male patients have a longer operation time and higher conversion rate than female patients.

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Key Words: Chronic cholecystitis, acute cholecystitis, laparoscopy, cholecystectomy.

From the early reports on the results of laparoscopic cholecystectomy (LC),^{1,2} the procedure has been found to be superior to open cholecystectomy (OC), with less morbidity and mortality,³ and has, therefore, become the treatment of choice for chronic cholecystitis (CC).^{4,5} Acute cholecystitis (AC) was initially considered a relative contraindication for LC,^{6,7} but subsequent reports have documented the safety of LC in AC.⁸⁻²⁸ Very few reports have discussed the effect of gender on the course of LC in

AC and CC.²⁹ In this report, we review our experience in LC for both CC and AC. The difference in the outcome, including conversion rate, operation time, hospital stay, complications and the effect of gender, is emphasized.

Patients and Methods

Between September 1994 and June 1999, retrospective evaluation of all patients who underwent LC by the authors was carried out. Based on clinical data, laboratory investigations, ultrasonographic findings, laparoscopic and postoperative histologic confirmation, the patients were classified as having either AC or CC. We adopted the American technique of LC,² but used diathermy for coagulation instead of laser. Nasogastric tube, urinary catheter or intraoperative cholangiography were not used

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TABLE 1. Causes of conversion in laparoscopic cholecystectomy for chronic and acute cholecystitis.

Causes	Male	Female
Chronic cholecystitis		
Trocar went through the intermuscular plane	1	–
Bleeding from the cystic artery	1	1
Stone found in the main bile duct	1	–
Short cystic duct	1	–
Instrumental	–	1
Acute cholecystitis		
Excessive oozing	4	2
Suspected duodenal injury	1	1
Suspected colonic injury	1	–
Trocar-induced aortic injury	1	–
Difficult dissection and obscured anatomy	9	2
Bleeding from the cystic artery	3	–

routinely. If the gallbladder was found to be tense, then the fundus was punctured and aspirated. The epigastric port was usually used to extract the gallbladder and was extended if necessary. All patients were given preoperative antibiotics of the cephalosporine group. If perforation and leak of bile or stone occurred in empyema or gangrene of the gallbladder, then antibiotics were usually continued for 1-3 days. Operation time in minutes was calculated from the time of entering the abdomen to the end of the last suture. Postoperative stay was calculated as postoperative number of nights spent in the hospital. The statistical significance was assessed using the Yates corrected chi-squared test and the two-sample test for the comparison of the two means. *P*-value was taken as significant if less than 0.5.

Results

Of 791 patients with CC, there were 633 females (age range 18-78, median 41.8 years) and 158 males (age range 14-63, median 43.7 years). Of 204 patients with AC, there were 124 females (age range 20-73, median 38 years) and 80 males (age range 24-75, median 49.1 years).

Conversion to Open Cholecystectomy (Table 1)

Conversion was carried out in six patients with CC (0.76%) and in 24 patients with AC (11.8%) (*P*<0.00). In patients with AC, five female (4%) and 19 male (23.5%) patients underwent conversion (*P*<0.000). The low conversion rate in CC limited a gender comparison.

Operation Time (Table 2)

There were significant statistical differences between patients with CC and those with AC before and after excluding the converted cases (*P*<0.000), and between male and female patients in CC and AC before and after excluding the converted case (*P*<0.000 and 0.002, respectively).

Postoperative Stay

Postoperative stay ranged from 0.5-10 days (mean and SD of 1.33±0.9 days) for patients with CC, and from 0.5-10 days (mean and SD of 1.9±1.34 days) for patients with AC. There were significant differences between patients with AC and CC before and after excluding the converted cases (*P*<0.000), but there was no significant difference between males and females before and after exclusion of the converted cases in both CC and AC.

Complications (Table 3)

There was no mortality in the series. There were three cases of bile duct injuries (BDI) in the patients with CC. Two patients underwent Roux-en-Y hepaticojejunostomy, and the third patient underwent repair with rotated cystic duct stump over a *T* tube. In patients with AC who had successful LC, gallbladder perforation occurred in 31.1% (35 female, 21 male), spilled stones in 12.2% (14 female, 9 male), and missed stones in 3.3% (2 female, 4 male), while in the patients with CC who had successful LC, 18% (110 females, 29 males) had gallbladder perforation, 8.8% (54 female, 16 males) had spilled stones, and 1.4% (8 females, 3 males) had missed stones. There were no significant statistical differences in perforation rate between female and male patients in CC (*P*<0.77) or AC (*P*<0.6). No problems related to missed stones were reported.

Veress needle-induced omento-pneumatocele occurred in two patients and was punctured laparoscopically. Early in the study, a male patient with AC who had a 10 mm trocar-induced aortic injury underwent immediate open repair followed by OC. During Hasson open technique in a male patient with AC, the sigmoid colon was injured while opening the posterior rectus sheath. The small tear was repaired immediately by widening the umbilical incision, followed by successful LC. Incisional hernia through the epigastric port occurred in two patients where the fascia of the 10 mm incision was not closed. Intraperitoneal bleeding from the superior epigastric vessels occurred in one case, and was treated conservatively by blood transfusion. Shoulder pain was reported in 43% (338/785) of the patients with CC, and 51% (93/180) of the patients with AC. Within three months of surgery, three female patients presented with intra-abdominal tumors. Two of them were found to have colonic tumors and the third patients was found to have gastric carcinoma. All underwent surgery within a few weeks. Clinically significant bile leak, which was treated by open drainage, occurred in five patients, four of them after CC (0.5%) and one after AC (0.55%). Endoscopic retrograde cholangiopancreatography (ERCP) carried out in 3 of the 4 cases with CC found an accessory cystic duct in two of the cases and a slipped clip in the other. The fourth case did not undergo ERCP, but during open surgery no cause could be detected. In AC, the cause was an infected subdiaphragmatic and subhepatic

TABLE 2. Comparison of operation time in patients with chronic and acute cholecystitis, and between male and female patients with CC and AC.

	Range	Mean±SD	Range	Mean±SD	P-value
	Chronic cholecystitis (n=791)		Acute cholecystitis (n=204)		
Total	25-152*	53±16	23-183	74.5±35	0.000
After excluding converted cases (n=6 in CC, 24 in AC)	25-152	53±15	23-183	68±31	0.000
Chronic cholecystitis	Male (n=158)		Female (n=633)		
Total	25-152	61±21	25-117	51±14	0.000
After excluding converted cases (n=4M, 2F)	25-152	60±20	25-100	51±14	0.000
Acute cholecystitis	Male (n=80)		Female (n=124)		
Total	30-183	89±40	23-183	65±30	0.000
After excluding converted cases (n=19M, 5F)	30-183	79±38	23-183	63±27	0.002

*Operation time is given in minutes.

TABLE 3. Complications of successful laparoscopic cholecystectomy for acute, chronic and converted cases.

	Management	SAC	SCC	OC
Severe subcostal wound infection with incisional hernia later on	Repair			1M
Umbilical wound infection	Antibiotics and ROS	4 (2M, 2F)	1M	1F
Umbilical stitch sinus	ROS	1F	1M	
Epigastric wound infection	Antibiotics	2F		
Omento-pneumatocele	Laparoscopic puncture	1M	1F	
Epigastric incisional hernia	Repair	1F	1F	
Bile collection	Open drainage	1F	4 (3F,1M)	
Epigastric vessels injury	Blood transfusion	1F		
Right pleural effusion with basal pneumonia	Antibiotics	1M		
Missed tumors	Surgery within 3 months		3F	
Subcutaneous ecchymosis		3 (2F,1M)	5 (3F, 2M)	
Trocar-induced aortic injury	Open repair			1M
Blade-induced sigmoid injury	Laparoscopic repair			
Bile duct injury	Open surgery		3F	
Missed stones		3.3%	1.4%	
Shoulder pain		51%	43%	
Gallbladder perforation		31.1%	18%	

SAC=symptomatic acute cholecystitis; SCC=symptomatic chronic cholecystitis; OC=open cholecystectomy.

collection. These cases were followed for 1-2 years by liver function test and ultrasonography with no evidence of late BDI.

Discussion

Our study demonstrates the safety and feasibility of LC in both CC and AC patients. Since the early reports on the procedure from France and America,^{1,2} LC has been found to be superior to OC, with less mortality and morbidity,³ and has become the treatment of choice for CC.^{4,5} AC was initially considered a contraindication for LC, especially in severe attacks or if the gallbladder wall thickness was more than 4 mm.^{6,7} It is well recognized, however, that in AC, there is an increased rate of conversion to OC when compared to CC.^{15,22,25,30,31} In our series, it was 0.76% in CC vs. 11.8% in AC ($P<0.00$). Conversion should not be

looked at as a complication⁵ but as a safety net.³⁰ Operation time in AC was longer than in CC (74.5±35.7 minutes vs. 53.5±16 minutes, respectively), and the difference was highly significant ($P<0.000$).

Hospital stay in AC is reported to be significantly longer than in CC.¹⁵ We had similar results of 1.9±1.34 and 1.33±0.9 nights in AC and CC, respectively ($P<0.000$). The difference was still significant even after excluding the converted cases and those who developed bile leak and collection (10 patients in CC and 25 patients in AC).

Gallbladder perforation with spillage of bile and/or stones is more common in AC than in CC.²⁵ It has been reported in up to 58% of the patients who underwent LC for AC.²⁸ In our series, the perforation rate was significantly higher ($P<0.003$) in successful LC for AC than in CC (31.1% and 18%, respectively). Cases of lost stones have been reported in up to 40% of LC,³² but only about 0.08% develop stone-related clinical problems,³³ which include intraperitoneal abscess, cutaneous umbilical sinus, systemic infection, fibrosis, adhesions, fistulas and migration to other sides.³²⁻³⁸ We had no problems with the 3.3% missed stones. In OC, it is less of a problem because they can be retrieved more easily.

During LC, many surgeons do not consider lost stones as a cause for conversion.^{10,34,37} A large survey from the UK reported that only 17.9% of 396 surgeons who performed LC found it mandatory to retrieve split stones.³⁹ Certain steps are suggested if perforation occurs. These include using clips or endoloop to close the perforation, irrigating the abdominal cavity, retrieving the stones in a bag if available, giving antibiotics for a few days, and performing stone chemical and bacteriological analysis which could determine the fate of the stone and bile culture. It has also been suggested that conversion should be considered if a large number of unretrieved stones are split.^{33,34,37}

Mortality in LC is reported to be less than that in OC.³ In a review of 114,005 cases from the US, an overall related mortality of 0.06% was reported.⁴⁰ In LC for AC, mortality was reported in 0%-0.9% of the cases.^{9,21,24,28} In our series, we had no mortality. The problem of bile duct injuries (BDI), however, is reported more frequently in LC than in OC. It is more frequently diagnosed during OC, thus repair can be carried out immediately with better results.⁴¹ With increased experience in LC, the incidence of BDI

decreases,³⁰ and the difference in BDI between LC and OC is not statistically significant.⁴² In a review article, the incidence of BDI in OC ranged from 0.0%-0.5%, while in LC a range of 0.0%-18%, with a mean of 0.3%, was reported in studies involving over 300 cases in a multicenter series.⁴³ Some authors consider AC a risk factor,²⁵ and an incidence of 0.4% has been reported,²⁴ but others have reported no such incidence.^{23,28,44}

We had no clinically detected cases of BDI in the patients with AC, but there were three female cases (3/785, 0.38%) in the patients with CC. Two patients underwent Roux loop hepatico-jejunostomy and the third patient had the cystic duct stump remnant rotated over a *T* tube. We feel that AC offers protection from diathermy injury due to the associated swelling, decreasing the conduction of diathermy to the duct system. There is also the fact that cases of AC are usually done by experienced surgeons who are usually more careful and slower in the dissection of the Calot triangle area.

Missed pathology (particularly tumors) during LC is a rare but well-recognized problem. It is thought to be due to the loss of tactile sensation and the increased rate of LC, thus patients with atypical pain due to causes other than the gallstones are operated upon.⁴⁵⁻⁴⁷ We had three female patients who presented within 2-3 months of LC with carcinoma of the stomach which was missed during previous endoscopy, a patient with cecal carcinoma who presented with acute small bowel obstruction, and another with rectal tumor who presented with rectal bleeding. Could these tumors have been diagnosed earlier if OC had been carried out instead of LC? It has been suggested that in patients with atypical biliary pain, especially those over 50 years of age, investigations to exclude colonic tumors is necessary.⁴⁶⁻⁴⁷ Major retroperitoneal vessel injury has been reported in 0.05% of these cases,⁴⁸ and bowel injury in 0.1%-0.3%. We experienced one case of each of the above complications, and the patient with vascular injury underwent laparotomy. Hernia through the 10 mm cannula insertion was reported in 0.1%-0.3% of cases, and to minimize it, it is recommended that the fascial defect created by 10 mm or larger trocars should be closed whenever possible.⁵⁰ A larger survey from the UK found that 12.2% of the surgeons do not close the fascial defects.³⁹ We had two such complications where the fascial defect was not closed in a 10 mm epigastric trocar site.

Very few reports have discussed the effect of gender on the course of LC in CC and AC and reported higher conversion rates in males in both CC and AC.^{11,27,29,51} Delay in seeking medical advice on the part of males, or the possibility of a different disease pattern has been suggested.⁵¹ In our study, there was a significant difference in conversion rates in AC ($P<0.000$) between females and males (5/124, 4% and 19/80, 24%, respectively). Operation time in male patients was significantly higher ($P<0.000$) than in female patients (89±40 and 65±30 minutes, respectively). The difference was still highly significant

after excluding the converted cases (19 males and 5 females). In our study, the number of converted cases in the patients with CC was too small to draw any gender conclusions.

LC for symptomatic cholelithiasis is safe and feasible, and should be considered as a first choice before open surgery. In patients with AC as compared to CC, there is an increased conversion rate, longer operation times, longer hospital stay, and higher incidence of gallbladder perforation, with no increase in bile duct injury. Male patients have longer operation times and higher conversion rate.

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