

## Surgical Audit

# LAPAROSCOPIC CHOLECYSTECTOMY IS THE CURRENT STANDARD INTERVENTION

By

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**Aim:** *This retrospective study evaluated laparoscopic cholecystectomy (LC) results in King Abdulaziz University Hospital, Jeddah, Saudi Arabia.*

**Methods:** *From December 2001 to March 2004, 337 patients (286 females and 51 males) with cholecystitis underwent cholecystectomy. Demographic, clinical characteristics of patients included comorbidity, clinical presentation ultrasonography, pathological examination, hospital stay, conversion rate to open cholecystectomy (OC), complications were collected and analyzed. Preoperative endoscopic retrograde cholangiopancreatography (ERCP) was performed for 16 (4.8%) patients.*

**Results:** *Cholecystectomy were performed more often in females than in males. Glutamate oxaloacetate transaminase (SGOT), glutamate pyruvate transaminase (SGPT), Gamma glutamyl transferase (GGT), alkaline phosphatase were high in [n=25 (7.4%), n=42 (12.5%), n=35 (10.4%), n=51 (15.1%)] of cases. Most common presenting symptoms and signs were biliary colic (n=240, 71.2%); Murph's sign (n=55, 16.3%); history of jaundice (n=42, 12.5%) sonography showed gall bladder stones (n=282, 83.7%); and pathology diagnosed chronic cholecystitis (n=210, 62.3%). ERCP were normal in 4 (1.2%) and sphincterotomy performed in 12 (3.6%) cases. Conversion rate was (1.5%) in 5 patients. Complication rates were 1.5% due to bile leakage (n=2, 0.6%), acute pancreatitis (n=1, 0.3%), fever (n=1, 0.3%), cardiac problems (n=1, 0.3%).*

**Conclusion:** *Laparoscopic cholecystectomy is a good alternative to open cholecystectomy with acceptable morbidity. Conversion to open cholecystectomy at the appropriate time prevents complications.*

**Keywords:** *Cholecystitis, ERCP, Complications.*

## INTRODUCTION

Laparoscopic cholecystectomy (LC) was first performed in France in 1987 by Mouret.<sup>(1)</sup> In 1989; Reddick.<sup>(2)</sup> popularized this procedure in the United States. By late 1990 to early 1991, laparoscopic cholecystectomy had become widespread.<sup>(3)</sup> The rate of cholecystectomy in North America increased from 30% to 60%.<sup>(4)</sup> In the United States, 600,000 cases of laparoscopic cholecystectomies are performed annually.<sup>(5)</sup> Laparoscopic cholecystectomy has subsequently been recognized as new "gold standard" for treatment of gallstone disease.<sup>(6)</sup> Short hospitalisation period, rapid return to normal activity, less post-operative pain, more acceptable cosmetic results, lesser morbidity

and mortality rates, are the principle advantages of this technique.<sup>(7)</sup> Increased surgical experience and technical innovations have extended indications for laparoscopic approach to patients with complicated disease processes.<sup>(8)</sup>

Most cholecystectomies are performed on people with uncomplicated biliary colic.<sup>(9)</sup> severe complications of gallbladder disease, such as acute cholecystitis, acute biliary pancreatitis, acute cholangitis, are potentially life-threatening conditions that require hospital care. Between (5-26%) of patients undergoing elective laparoscopic cholecystectomy will require conversion to open procedures. A common reason for conversion is inability to clearly identify biliary anatomy.<sup>(10)</sup>

Exact prevalence of gallbladder pathologies is still unknown in Saudi Arabia as majority of studies have entertained surgical techniques and interventions especially laparoscopic procedures.<sup>(11-13)</sup> Reports from Saudi Arabia have suggested that problem is very common.<sup>(14)</sup> A very large study from 14 hospitals of country's Eastern province had reported that the frequency of cholecystectomies has increased by 98%, a finding not explained by 67% increase in population or 87% increase in other operation rates.<sup>(12)</sup>

This retrospective study aimed to review clinical presentations, sonography and pathological finding of gall bladder in cholecystectomy patients admitted to the Department of Surgery at King Abdulaziz University Hospital, Jeddah, Saudi Arabia during period of 3 years and 4 months. Incidences of convergence to open cholecystectomy, postoperative complications, hospital stay duration were recorded and analyzed. Correlation between demographic data, clinical presentations, laboratory, radiology and pathological finding were also studied.

## PATIENTS AND METHODS

Retrospective analysis of 337 patients records, aged (mean±SD, 40.20±12.67 years) who had cholecystectomy for treatment of cholecystitis in the Department of Surgery, at King Abdulaziz University Hospital, Jeddah, Saudi Arabia between December 2001 and March 2004 was carried out. Diagnosis of cholecystitis was established using clinical features, laboratory and radiological results. Demographic and clinical data included age, sex, nationality, body mass index, comorbidity, symptoms and signs at time of admission, complete blood picture, liver functions, abdominal ultrasonography results, operative procedure [laparoscopic cholecystectomy (LC) or opened cholecystectomy (OC)] and conversion rate to open cholecystectomy, intraoperative findings and pathological examination results were collected from patients records and analyzed.

Patients were admitted to hospital one day prior to surgery. Abdominal sonography was performed within 24 hours before surgery after a 12-hour fast. LC was performed under general anaesthesia. Operations were performed using a standard 4-puncture technique.<sup>(2)</sup> Patients were placed in a supine position, the surgeon and the cameraman were placed on left side with the assistant on right side of patient, one dose of second generation cephalosporin was routinely given. CO<sub>2</sub> pneumoperitoneum was created by closed technique except in cases of previous upper abdominal surgery when it was created by open technique, the preferred site of insufflation was the umbilicus, abdominal pressure was not allowed to exceed 14 mmHg then patients were put on 15 degrees of anti-trendelenburg and left tilt position.

Monopolar electrocautery was used in all cases. Calot's triangle identified clearly. Usually gall bladder was generally extracted through the umbilical port. Drainage was used in cases of difficult dissection and was rarely required. Intraoperative cholangiogram (IOC) was never used because of our policy of using selective preoperative endoscopic retrograde cholangiography (ERCP).<sup>(15)</sup> Laparoscopic techniques recommended by Asbun et al.<sup>(16)</sup> were generally followed during operative procedure. Several difficult dissections were completed by removing the gallbladder from liver initially to identify junction of gallbladder to cystic duct. Preoperative ERCP with removal of possible common bile duct stones was performed in patients suspected of having choledocholithiasis. Ultrasonography evidence of a dilated common bile duct or presence of common bile duct stones, serum elevations in alkaline phosphatase, transaminase, or bilirubin were indications for preoperative ERCP. After laparoscopic cholecystectomy, pathology of gall bladders was reviewed. Patients were followed up in outpatient clinic a week, a month and six months after surgery.

Statistical analysis: The mean and SD of collected data and percentage were calculated. Data values were statistically analyzed by chi-square test using SPSS software version 12 to compare clinical, laboratory, ultrasonography and pathological findings. A p value less than 0.05 were considered significant.

## RESULTS

Demographic data of participated patients are shown in Table 1. In this study, there were more females than males [n = 286 (84.9%) versus n = 51 (15.1%)], non-Saudi than Saudi patients [n = 196 (58.2%) versus n = 141 (41.8%), p<0.01]. No associated diseases were found in 252 (74.8%) cases while the remaining 85 (25.2%) cases were suffering from co-morbidities. The associated diseases were diabetes (n=50, 58.8%); hypertension (n=20, 23.5%); cardiac (n=10, 11.7%); renal (n=2, 2.4%); tuberculosis (n=1, 1.2%), bronchial asthma (n=1, 1.2%); sickle cell anaemia (n=1, 1.2%). Majority of cases suffered from typical biliary colic (n = 240, 71.2%) while Murph's sign was found in 55 (16.3%) cases, jaundice in 42 (12.5%) cases, Table 1.

Mean serum levels of liver functions are shown in Table 2. It was found that levels of glutamate oxaloacetate transaminase (SGOT), glutamate pyruvate transaminase (SGPT), gamma glutamyl transferase (GGT), alkaline phosphatase were elevated in 25 (7.4%), 42 (12.5%), 35 (10.4%), 51 (15.1%) cases, respectively.

Sonography was done for all participants. The majority of patients showed had gall bladder stones (n = 282, 83.7%); acalculous cholecystitis (n = 55, 16.3%); common bile duct dilatation (n = 8, 2.8%); cirrhotic liver (n=1, 0.3%) of those with calculous cholecystitis. The most common pathological

finding of cases was chronic cholecystitis (n = 210, 62.3%), followed by chronic cholecystitis and focal cholesterosis (n = 85, 25.2%); chronic cholecystitis with granulomatosis (n = 4, 1.2%), chronic cholecystitis with foci of pseudo pyloric metaplasia (n = 4, 1.2%); chronic cholecystitis with foci of moderate dysplasia (n=3, 0.9%); chronic cholecystitis and adenomyosis (n=1, 0.6%); adenocarcinoma of gall bladder with liver extension (n=1, 0.3%) and gangrenous cholecystitis (n=1, 0.3%). Normal gall bladder were found in 27 patients (8%) .Preoperative ERCP was done in 4.7% of cases; with normal cholangiogram in 4 (1.2%) and sphincterotomy in 12 ( 3.6%) Table 3.

Regarding types of operation performed , laparoscopic cholecystectomy was performed in 330 (97.9%) of cases, open cholecystectomy in 2 cases (0.6%). Conversion was required in 5 (1.5%) cases. No postoperative complications

were found in 325 (98.5%) cases while 2 (0.6%) cases developed bile leak from cystic duct stump; 1 (0.3%) acute pancreatitis; 1 (0.3%) cardiac problems and 1 (0.3%) postoperative fever. Mean duration of hospital stay was (5.13 ± 3.59 days) Table 4.

In this study, cases with acalculous cholecystitis 55 (16.3%) were observed mostly in elderly critically ill elderly patients in which sonography showed thickened gall bladder wall (n=11,20%); distended gall bladder (n=43,78.2%); or common bile duct dilatation (n=1, 1.8%). Pathology examination revealed normal gall bladders (n=5,9%), chronic cholecystitis (n=40,72.87%), chronic cholecystitis and focal cholesterosis (n=7,12,7%); chronic cholecystitis with foci of pseudo pyloric metaplasia (n=2,3.63 ); chronic cholecystitis and adenomyosis (n=1,1.8%) Table 5.

**Table 1. Demographic characteristics and clinical presentations of patients.**

Items	Patient numbers (n=337)
<b>Age (years) (mea± SD)</b>	40.20±12.67
<b>BMI (kg/m2) (mea± SD)</b>	29.61±8.80
<b>Gender (number, % of total)</b>	
Female	286 (84.9%)
Male	51 (15.1%)
<b>Nationality (number, % of total)</b>	
Non-Saudi	196 (58.2%)
Saudi	141 (41.8%)
<b>Associated diseases (number, %)</b>	
<b>No diseases (% of total)</b>	252 (74.8%)
<b>Co morbidity (% of total)</b>	85 (25.2%)
Diabetes (% of co morbidity)	50 (58.8%)
Hypertension (% of co morbidity)	20 (23.5%)
Cardiac (% of co morbidity)	10 (11.7%)
Renal (% of co morbidity)	2 (2.4%)
Tuberculosis (% of co morbidity)	1 (1.2%)
Bronchial asthma (% of co morbidity)	1 (1.2%)
Sickle cell anemia (% of co morbidity)	1 (1.2%)
<b>Symptoms and signs (number, %)</b>	
Biliary colic (% of symptomatic)	240 (71.2%)
Murph's sign (% of symptomatic)	55 (16.3%)
Jaundice (% of symptomatic)	42 (12.5%)

**Table 2. Results of laboratory investigations in all patients.**

Items	Reference range	Mean $\pm$ SD (Number, %)
Total protein (g/L)	64-82	76.12 $\pm$ 11.04
Total bilirubin (umol/L)	0-17	13.39 $\pm$ 27.65
Direct bilirubin (umol/L)	0-5	7.74 $\pm$ 30.59
Cholesterol (mmol/L)	0.0-5.2	5.98 $\pm$ 5.53
Triglyceride (mmol/L)	0.3-2.6	2.22 $\pm$ 3.01
SGOT (mmol/L)	5-50	27.94 $\pm$ 25.14
Higher than normal (>50 mmol/L)		25 (7.4%)
SGPT (mmol/L)	5-55	38.31 $\pm$ 88.17
Higher than normal (>50 mmol/L)		42 (12.5%)
Gamma- glutamyl transferase (U/L)	5-85	39.86 $\pm$ 55.59
Higher than normal (>85 U/L)		35 (10.4%)
Alkaline phosphatase (U/L)	50-136	100.64 $\pm$ 60.86
Higher than normal (>136 mmol/L)		51 (15.1%)

Glutamate oxaloacetate transaminase (SGOT), glutamate pyruvate transaminase (SGPT).

**Table 3. Sonography, pathology, endoscopic retrograde cholangiopancreatography (ERCP) findings.**

Items	Patient numbers (%) (n=337)
<b>Sonography</b>	
Calcular cholecystitis	282 (83.7%)
Acalcular cholecystitis	55 (16.3%)
<b>Pathology</b>	
Normal	27 (8%)
Chronic cholecystitis	210(62.3%)
Chronic cholecystitis with focal cholesterosis	85 (25.2%)
Chronic cholecystitis with granulomatosis	4 (1.2%)
Chronic cholecystitis with foci of pseudo pyloric metaplasia	4 (1.2%)
Chronic cholecystitis with foci of moderate dysplasia	3 (0.9%)
Chronic cholecystitis with adenomyosis	2 (0.6%)
Adenocarcinoma of gall bladder with liver extension	1 (0.3%)
Gangrenous cholecystitis	1 (0.3%)
<b>ERCP</b>	
Not performed	321 (95.3%)
performed with normal cholangiogram	4 (1.2%)
performed with sphincterotomy	12 (3.6%)

**Table 4. Types of operations and postoperative complications.**

Items	Number of patients (%) (n=337)
Type of operation	
Laparoscopy	330 (97.9%)
Open	2 (0.6%)
Laparoscopy converted to open	5 (1.5%)
Operative complications	
No complications	325 (98.5%)
Complications	5 (1.5%)
Bile leak from cystic duct stump	2 (0.6%)
Acute pancreatitis	1 (0.3%)
Postoperative fever	1 (0.3%)
Cardiac problems	1 (0.3%)
Hospital stay duration (days)	
mean ± SD	5.13±3.59

**Table 5. Sonography and pathology results of patients with acalculary cholecystitis.**

Items	Patient numbers (%) (n=55)
Sonography	
Thicken wall gall bladder Wall	11 (20%)
Distended gall bladder	43(78.2%)
Common bile duct stone and dilatation	1 (1.8%)
Pathology	
Normal	5 (9%)
Chronic cholecystitis	40 (72.87%)
Chronic cholecystitis with focal cholesterosis	7 (12.7)
Chronic cholecystitis with foci of pseudo pyloric metaplasia	2 (3.63%)
Chronic cholecystitis with adenomyosis	1 (1.8%)

## DISCUSSION

Laparoscopic cholecystectomy is the most common surgical procedure performed in digestive tract.<sup>(17)</sup> Similar to previous studies<sup>(18-20,8)</sup> and compared to others,<sup>21</sup> our patients were young (mean age 40 years).It had been reported that 20% of adults over 40 years, 30% of those over 70 years have biliary calculi.<sup>(21,22)</sup> In consistence with

the findings of others,<sup>(18,19,23)</sup> the majority of our patients 84.9% were females. It has been reported that during reproductive years, female-to-male ratio is about 4:1, with sex discrepancy narrowing in older population to near equality.<sup>(22)</sup> The most common co-morbidity of our patients were diabetes & hypertension as they had alter lipid profiles. Risk factors to gallstone include obesity, diabetes, estrogens, pregnancy, haemolytic diseases and cirrhosis.<sup>(22)</sup>

Liver function tests including SGOT, SGPT, GGT, alkaline phosphatase were higher in 7.4%, 12.5%, 10.4%, 15.1% of our patients which explained by presence of common bile duct stones, associated liver enlargement and cirrhosis.

In this study, patients with gallstones represented 83.7%.Cholelithiasis affects approximately 10% of adult population in United States.<sup>(22)</sup>

Acalculous cholecystitis remains a controversial entity that accounts for 5% to 20% of cholecystectomies. Patients presenting with biliary pain but negative ultrasonography are common in surgical practice.<sup>(24)</sup> In this study, 55 (16.3%) patients had acalculous cholecystitis. The clinical entity of acalculous cholecystitis likely represents a number of pathophysiological processes of gallbladder, including inflammation, dyskinesia, outflow obstruction and impaired intrinsic gallbladder motility. It is, therefore, not surprising to find the controversy that exists regarding diagnosis, treatment of this disease.<sup>(24)</sup>

Cholesterosis of the gallbladder is a form of local disturbance of the lipid metabolism. A possible pathogenic mechanism of cholesterosis is stimulation of cholesterol acyltransferase by biliary cholesterol which leads to increased esterified cholesterol deposition in gallbladder mucosa.<sup>(25)</sup> More data has unequivocally predicted that venous, lymphatic stasis may be etiological factors causing disturbance in secretory or absorptive functions of gallbladder epithelium.<sup>(26)</sup> In this study, 85 patients (25.2%) had cholesterosis. In Riyadh, Saudi Arabia, Khairy et al.<sup>(19)</sup> showed 13.4% incidence. Published literature has revealed 0-28.6% incidence of cholesterosis of gallbladder.<sup>(27,28)</sup> Kmiot et al.<sup>(29)</sup> reported higher incidence of 62%. No obvious reason could be detected for such discrepancy.

Metaplastic epithelium in gallbladder can be divided into 2 major groups, gastric (pyloric gland, surface epithelial) and intestinal, although there is also a rare squamous variety.<sup>(30)</sup> In our cases, 4 cases (1.2%) showed chronic cholecystitis with granulomatosis, 4 cases (1.2%) chronic cholecystitis with pseudopyloric metaplasia foci, 3 cases (0.9%) chronic cholecystitis with moderate dysplasia foci, 2 cases (0.6%) chronic cholecystitis with adenomyosis, one case (0.3%) adenocarcinoma of gall bladder with liver extension, one case (0.3%) gangrenous cholecystitis. The rate of gall bladder carcinoma was 0.95% in Jeddah, Saudi Arabia,<sup>(18)</sup> close to that reported from USA. <sup>(31)</sup> In Jeddah, series metaplastic epithelium was found only in 3% of cases, of which 83% were associated with stones. These were classified into subtypes, 88% pyloric, 12% intestinal metaplasia.<sup>(18)</sup> Reports from West Saudi Arabia showed that pyloric gland metaplasia is most common and is found in 66%-84% of cholecystectomy specimens. Amazingly reports from West have shown carcinoma of gallbladder as most common malignancy of biliary tract, and the 5th most

common malignancy of gastrointestinal tract, with an incidence of 2.5 cases per 100,000 population per year.<sup>(32)</sup> Gall bladder carcinoma is found in 1% to 2% and 0.1% of open and laparoscopic cholecystectomies, and causes 6,500 deaths annually in USA.<sup>(33)</sup> Risk of carcinoma developing in patient with cholelithiasis is only 1%-3%, which higher when stones are larger than 3 cm in diameter.<sup>(18)</sup>

In this study, 97.9% of patients underwent laparoscopic cholecystectomy, 1.2% opened, 0.9% conversion mostly due to adhesions, which compares favourably with other reports.<sup>(20,8)</sup> Patient conditions, surgeons experience and technical factors can play role in decision for conversion. Studies done in Riyadh, Saudi Arabia reported conversion rate (23%) in acute cholecystitis, mostly due to increased gall bladder wall thickness, delay surgery.<sup>(34)</sup> Meanwhile, Bingener-Casey et al.,<sup>(8)</sup> Nachnani and Supe.<sup>(35)</sup> reported conversion rate (5.2%, 11.4%). The discrepancy may be due to the large number of acute cholecystitis involved in other studies, and the fact that increasing experience with laparoscopy decreased conversion rate.<sup>(8)</sup> Many reviews have reported male, acute cholecystitis history or obesity (BMI>30kg/m<sup>2</sup>) and thickened GB wall exceeding 3 mm were significant predictors for conversion from LC to OC.<sup>(36)</sup> Bingener-Casey et al.<sup>(8)</sup> reported difficult dissection, inability to define anatomy and bleeding were leading reasons for conversion. As reported by others,<sup>(34)</sup> our study showed no mortality or major morbidity of procedure of laparoscopic cholecystectomy. Although 1.5% of our patients showed complications due to bile leak from cystic duct stump, acute pancreatitis, postoperative fever and cardiac problems. Bile leak from cystic duct stump was managed with ERCP and stenting. Rate for common bile duct injury in laparoscopic cholecystectomy was reported to be 0.47%.<sup>(37)</sup>

Prevalence of common bile duct stones identified during LC is less than 5%.<sup>(38)</sup> They are associated with complications such as pancreatitis, cholangitis.<sup>(39)</sup> Management of coexisting common bile duct stones (CBDS) may be surgical or endoscopy followed by surgery. Gallbladder preservation has also been suggested, however it has not become universal.<sup>(40)</sup> A group of surgeons have recommended laparoscopic management of CBDS by intraoperative cholangiography or intraoperative ERCP and surgical removal of stones.<sup>(41)</sup> Recent studies suggest LC can be done safely, short hospitalization,<sup>(42)</sup> but minimal invasiveness but cost-effectiveness remain questionable.<sup>(43)</sup> In this series, incidence of ductal stones was 2.7% with dilated CBD, they were managed with ERCP and sphincterotomy. ERCP is the most popular bile duct imaging method even in elderly patients.<sup>(44)</sup> Routine preoperative ERCP is not recommended, due to low percentage of coexisting choledocholithiasis, the large number of negative investigations, the small but significant risk of associated morbidity and high additional costs.<sup>(39)</sup>

In conclusion, laparoscopic cholecystectomy has become the gold standard for the treatment therapy of gallstone disease. This technique was found to have distinct advantages such as shorter hospital stay, lesser postoperative complications, and good cosmeses. It is safe procedure if performed by a well trained surgeon.

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