



Research Article

Outcome of Perforated Gallbladder during Laparoscopic Cholecystectomy

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ABSTRACT

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**Background:** Laparoscopic cholecystectomy (LC) has become the standard treatment for symptomatic cholelithiasis. Bile duct injury and accidental gallbladder perforation with spillage of bile and stone are common complications of LC. This study was carried out to assess the early complications of gallbladder perforation during LC, and identify the risk factor of that perforation.

**Objectives:** to evaluate the early complications which may occur after the perforation of the gallbladder during laparoscopic cholecystectomy and to determine the risk factors which are associated with the perforation of the gall bladder.

**Subjects and methods:** A prospective comparative study on 192 patients who underwent LC between August 2012 to January 2014 in Baghdad teaching hospital. Data were collected, Patients with and without gallbladder perforation were compared in terms of gender, age, anatomic difficulty, the experience of the surgeon, omental and other organ adhesions to the gall bladder.

**Results:** fifty-five patients had a perforation of GB during LC, 46 patients had GB perforated during dissection of gallbladder bed from hepatic fossa. The mean operative time and duration of postoperative hospitalization were longer in the perforated group, perforation occurs more frequently in acute cholecystitis compared to chronic cholecystitis. There were significant risk factors related to gallbladder perforation which include male gender, AC, adhesion around the gallbladder, and experience of the surgeon.

**Conclusion:** accidental gallbladder perforation leading to longer operative and hospital time which loss the advantage of LC. The male gender, AC, and experience of the surgeon had the main risk factors of the perforated gallbladder.

Introduction

Laparoscopic cholecystectomy not only is the cornerstone of the management of biliary disease and cholecystitis but is one of the commonest operations in both elective and emergency surgery. It offers an unquestionable advantage over open cholecystectomy to the patient and the health care system. (1) It was introduced in the late 1980s and quickly gained popularity among patients with symptomatic gallstones. (2) It has a clear advantage over the

traditional approach with decreased morbidity, less pain, and quicker recovery; however, it remains associated with a three- to five-fold increase in bile duct injury (BDI). (3,4) Moreover, the traditional absolute contraindications for laparoscopic cholecystectomy in certain specialized situations have largely been resolved and rendered relative, including the presence of acute cholecystitis, a history of previous abdominal surgery, morbid obesity, pregnancy, cirrhosis, and even situs inversus totali. (5,6) Operative conversion

from Laparoscopic cholecystectomy to open cholecystectomy is 1%-15%. (7) Two previous reviews agreed on only two important risk factors when considering conversion, namely, male gender and old age. (7,8) Acute cholecystitis, a gallbladder wall thickness > 3 mm and a history of previous surgeries is all predictive factors for conversion. (9)

Critical View of Safety (CVS) is considered one of the most important methods to prevent bile duct injury; it is advised by many international societies and has been the standard of care. The critical view of safety was brought by Strasberg and colleagues in 1995, and since that time, its usage to reduce the risk of BDI and has spread around the world. Achievement of the CVS consists of three criteria: Recognition of only two structures entering the gallbladder Dissection of the base 1/3 of the gallbladder off its fossa. Clear dissection of the hepatocystic triangle from all tissue except the cystic artery and cystic duct. (10)

The frequency of complications associated with laparoscopic cholecystectomy differs from 0.5 to 6%. Minor complications (biliary and non-biliary) are usually managed conservatively while serious complications like biliary and vascular are increased mortality and morbidity rate. The most major complications which increase mortality rate are injury of the common bile duct and its incidence of 0.1-0.6%, injuries of large blood vessels 0.04-1.22% depending on the study. (11)

One of the prevailing complications of LC, which is less addressed in the literature, is gallbladder perforation. The rate of gallbladder perforation differs from 1.3% to 40%. Gallbladder perforation can lead to gallstone spillage and, in many cases, an unsuccessful retrieval of the stones. Most of the spilled stones remain clinically with no symptomatic, but 0.04% to 19% of the cases lead to adverse events. Intraabdominal abscess formation is the most widespread complication. (12,13)

The leading causes of gallbladder perforation during LCs are injury to the gallbladder during diathermy dissection from the gallbladder fossa and traction injury to Hartmann's pouch. Less frequent mechanisms include slippage of the endoclip from Hartmann's pouch and tearing of the gallbladder as it is taken away from the umbilical port site. (14)

Gallbladder perforation causes an increase in the time of surgery and prolongation of postoperative hospital stay and, an increase in the total hospital costs, this leads to a reduction of the advantages of LC compared with classic laparotomy. The average operative time was longer in the perforated group this was likely due to the time needed for abundant irrigation to get a clear aspiration and retrieve the gallstones. The postoperative hospital stay was also prolonged in the perforated group, as a result of increased pain and ileus, with constipation. There are a few studies on the correlation between gallbladder perforation and pain, which may result from irritation of the peritoneum due to the spillage of bile juice and gall stones. (15)

Statistically significant risk factors that lead to gallbladder perforation are the experience of the surgeon and the difficulty of the surgery (acute cholecystitis, adhesions in the right upper abdomen, pain before surgery >96 hours, and palpable gallbladder

preoperatively). Patient factors include fatty patients, older age, and male gender. (16)

Although that recent technical approaches and procedures were applied to dissect the gallbladder free from the liver bed such as ultrasonic dissector, harmonic scalpel diathermy, and laser instead of the standard dissection with monopolar electrocautery, but are not helpful to minimize the risk of gallbladder perforation during the surgery. (17,18).

## Subjects and Methods

This is a comparative prospective study of one hundred and ninety-two patients who underwent laparoscopic cholecystectomy during eighteen months from August 2012 to January 2014 in Baghdad teaching hospital 2nd surgical unit.

A data form includes history and physical examination, hematological and biochemical profile. Any co-morbid conditions were recorded as well.

All difficulties during laparoscopic cholecystectomy were recorded, which included abnormal anatomy, adhesions around the gallbladder, bleeding, gallbladder wall thickness, multiples stones or single stone, stone impaction, and the difficulties met in the removal gallbladder from the liver bed. Also, we recorded whether any difficulties were met during removal of the gallbladder from the epigastric port, All patients with gallbladder perforation, bile was aspirated and irrigation of gallbladder bed done, removal of spilled stone, however complete removal of spilled stones were not successful in some patients. Four ports procedure were used in laparoscopic cholecystectomy, most gallbladders were removed from the epigastric port, with all cases of perforated gallbladder tube drain was inserted. All cases received 3rd generation cephalosporin immediately preoperatively.

Any complications which occurred postoperatively due to bile leak and spilled stones were recorded during the hospital stay and then after for thirteen days.

Patients were divided into two groups: those with gallbladder perforation during laparoscopic cholecystectomy (55 patients) and those without perforation (137 patients). Both groups were compared in terms of gender, age, the type of inflammation found whether acute or chronic cholecystitis, omental, and other organ adhesions to the gallbladder.

The learning curve was arranged by dividing the patients into two groups:

Group one: those operated upon during the first nine months of study.

Group two: those operated upon during the second nine months. Early complications, operative time, the hospital stay is compared between perforated and non-perforated groups.

**Statistical analysis:** Categorical variables were analyzed using a chi-square, mean standard deviation was also expressed. P-value of < .05 was taken as statistically significant for all tests.

Ethical approval was obtained from Al-Risafah Health Directorate.

## Results

One hundred and ninety-two laparoscopic cholecystectomies were performed, fifty-five patients sustained gallbladder perforation during laparoscopic cholecystectomy, so the rate of perforation was (28.6%). Perforation of GB during laparoscopic primary occurred in

46 patients (83.6%) during dissection of GB from its bed in hepatic fossa, also perforation might occur in 7 patients (12.7%) during extraction of gallbladder through a small epigastric port, there were 2 (3.6%) patients with bile spillage during traction of gall bladder by the assistant.

Chronic calculus cholecystitis (172 patients) was the most common diagnosis in both groups. Forty-four Perforated vs 128 nonperforated gallbladders and the P-value was 0.07, there were only 20 patients with acute cholecystitis, eleven perforated vs nine nonperforated gallbladders and the perforation was more prevalent in the acute cholecystitis group as compared to chronic cholecystitis (p 0.001).

On univariate analysis, the age of patients was sixteen to seventy-three, there was no difference in the demographics, medical & past surgical history between the perforated & unperforated gallbladder except that the rate of gallbladder perforation in men was (52.6%) whereas the rate of gallbladder perforation in women was (22.72%) (p 0.001) table 1.

**Table 1:** Preoperative Clinical Characteristics associated with Accidental Gallbladder Perforation

|                  | perforated  | non perforated | Total | P value |
|------------------|-------------|----------------|-------|---------|
| Age (yr)         | 55.15± 16.8 | 49.69± 15.03   |       | 0.073   |
| Male             | 20 (52.6%)  | 18 (47.3%)     | 38    | 0.001   |
| female           | 35 (22.72%) | 119 (77.27%)   | 154   |         |
| DM               | 5           | 17             | 22    | 0.418   |
| hypertensive     | 1           | 36             | 37    | 0.324   |
| Surgical history | 7           | 40             | 47    | 0.34    |

*P. value less than 0.05 is statistically significant*

Regarding the clinical outcome and postoperative complications between perforated & unperforated gallbladder groups, the mean operative time was significantly longer in the perforated group (P 0.017), mean hospital time was also significantly longer in the perforated group (P 0.001) table 2.

**Table 2:** Clinical Outcomes and Postoperative Complications.

|                           | Perforated | Non perforated | P- value |
|---------------------------|------------|----------------|----------|
| Headache                  | 1(1.8%)    | 10(7.2%)       |          |
| nausea & vomiting         | 5(9.09%)   | 25(18.2%)      |          |
| Fever                     | 4(7.2%)    | 25(18.2%)      |          |
| Ileus                     | —          | —              |          |
| Trocare site infection    | 2          | —              |          |
| Mean operative time (min) | 75(60-90)  | 45(35-55)      | 0.017    |
| Mean hospital time (hr.)  | 24         | 48             | 0.001    |

*P. value less than 0.05 is statistically significant*

As regard surgeons' experience, the patients were divided into two groups, one group had laparoscopic cholecystectomy during the first nine months of the study period & 2nd group in the second nine months, a significant number of perforations occurred among the first group (P 0.004) table 3.

**Table 3:** Rate of perforation in related to experience of surgeons.

|           | perforated | Non perforated | Total | P Value |
|-----------|------------|----------------|-------|---------|
| 1st 9 mon | 34         | 46             | 80    | 0.004   |
| 2nd 9mon  | 21         | 91             | 112   |         |

*P. value less than 0.05 is statistically significant*

The risk factor of operative findings causing perforation of the gallbladder during laparoscopic cholecystectomy revealed.

omentum adhesion had a significant risk factor of accidental perforation of the gallbladder during laparoscopic cholecystectomy (P 0.002), while the other had no significant correlation with accidental perforation of gallbladder table 4.

**Table 4:** Operative Findings with or Without Accidental Gallbladder Perforation.

|                               | perforated | Non perforated | P value |
|-------------------------------|------------|----------------|---------|
| Omentum adhesion              | 19         | 28             | 0.034   |
| Calot's triangle obliteration | 13         | 10             | 0.1     |
| Stone impaction               | 6          | 20             | 0.393   |

*P. value less than 0.05 is statistically significant*

## Discussion

The rate of gallbladder perforation was 28.6% in our study which was within was not differ too much from others studies Fitzgibbons et al, Siewert et al (18,19) which about 3-33%. The gallbladder wall perforation by traction and repeated handling, or it may be also accidentally perforated by cautery during freeing it from the hepatic fossa, which was the most common cause of gallbladder perforation in the present study, which was also similar to other studies (20). Many studies have shown that in the case of acute cholecystitis the incidence of gallbladder perforation increased because of friability of its wall due to the inflammatory process and easy to tear under the stress of traction and dissection(17,20) which agree with our study, that acute cholecystitis was a significant risk factor of perforation in comparison to chronic cholecystitis (P0.001), so it's one of limitation of LC in acute cholecystitis.

In this study, male patients were significantly more susceptible to gallbladder perforation few studies have concentrated on the male gender as a risk factor for gallbladder perforation during LC. although the cause for this was not able to be explained, one study also reported that an increased risk of gallbladder perforation in male patients, and the surgeon should know about that factor (18). Mostly because of multiple adhesions around the gallbladder due to late presentation. In our study, the age of patients had no risk factor of gallbladder perforation (p 0.073), like many other studies, only one study that considers the elderly patients had a risk factor of gallbladder perforation and its complications (21). Past medical and past abdominal surgical history had not changed the rate of perforation of the gallbladder in our study, which agrees with other studies (22). However, there was a report of previous surgical intervention in the causation as the cause of gallbladder perforation (23). which disagrees with our study, most of these surgeries were CS, appendicectomies, hysterectomy through pfansitil incision, and paraumbilical hernia repair.

It was noticed in our study that the average operative time was prolonged in the perforated groups, and this was due to the time required for copious irrigation to obtain a clear aspiration and retrieve the gall stones. The postoperative hospital stay was also prolonged in the perforated group, which may be due to increased pain, resulting from irritation of the peritoneum due to the spillage of bile and gallstones. The result is similar to studies by Bas and et al (20). The postoperative ileus did not occur in our study due to good irrigation of the peritoneum with normal saline and aspiration of all spilled bile. SoSuh et al (15) showed the ileus occurred in 42.4% of

perforated GB, which is considered a significant complication of perforation due to irritation of the peritoneum. Other postoperative complications like fever, headache, nausea, and vomiting can occur, but not specific to the perforated gallbladder. In our study 2 patients developed port site infection while in Suh et al (15) study showed significant no. of trocar site infection (p 0.004), that disagree with that study, this was possible used prophylactic perioperative antibiotics in all patients, It has been argued that the antibiotics usage before surgery prevents the adverse event of gallbladder perforation because many patients with a bile leak have positive bile cultures, and if the peritoneal cavity is not properly cleansed, the risk of infection remains (23).

The experiences of the surgeon were the main risk factor of gallbladder perforation as in our study which showed that LC done in the first nine months had a higher rate of perforation compared to LC done in the second nine months (p 0.004), such findings agree with the work done by B. Aytac and et al (24). All Laparoscopic cholecystectomies were done in this study by the same surgical team (residents' doctor) supervised by a senior, and thus they gained more experience with time by establishing the correct plane in dissecting the gallbladder from the liver by diathermy.

In our study there were 6 patients with stone impaction who developed GB perforations and 20 patients with stone impaction did not develop perforations, so gallbladder with stone impaction does not significantly influence the incidence of gallbladder perforation in spite the grasping or traction of gallbladder make difficult. Calots triangle obliteration made Laparoscopic Cholecystectomy long and difficult operation, but does not increase the rate of perforation in our study; this was agreed with suh et. al. (15). In our study, the adhesion around the gallbladder by omentum or other organs had a significant risk factor of perforation of gallbladder, this because the plane of discussion was difficult and field of operation was obscure by bleeding, such finding was similar to study done by Bas et al (20).

Late complications caused by gallbladder perforation include intraperitoneal abscess, fistula formation in the abdominal cavity and the wall, small bowel obstruction as a result of adhesions, and identification of gallstones inside the hernia sacs (25). There is a reported case of a patient presenting with acute appendicitis secondary to retained gallstones after 8 years from operation (26). Sometimes the spilled gallstones confuse a malignancy, making the patient spend time and money for unnecessary examinations, as well as the psychological trauma associated with the incorrect diagnosis of malignancy in ensuing years (27) these complications are rare in the majority of patients with spilled bile and stones. one of limitation in our study was poor follow up of patients.

## Conclusion

Accidental gallbladder perforation leading to longer operative and hospital time which loss the advantage of LC. The male gender, AC, and experience of the surgeon had the main risk factors of the perforated gallbladder. The outcome as serious complications after intraoperative spillage of gallbladder contents during laparoscopic cholecystectomy is low. Because infective complications are rare following gallbladder perforation, conversion to laparotomy is not routinely indicated.

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## Conflict of Interest

No conflict of interest.

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