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Perforation of Gall Bladder During Laparoscopic Cholecystectomy and its Associated Factors

Venkatesham B[1]

[1]Assistant Professor, Department of General Surgery, Kalinga Institute of Medical Sciences, Bhubaneswar, Odisha, India.

Abstract

Background: Gallbladder perforation (GP) is a rare but potentially fatal disease; its presentation can vary and therefore is a dilemma for early diagnosis. It is usually a complication of acute cholecystitis with or without gallstones. Most perforations are subacute, causing a pericholecystic abscess. Acute free perforation with bile peritonitis and chronic perforation with an internal biliary fistula are rare. The fundus of the gallbladder is the most common site of perforation because of its poor blood supply.**Material and Methods:**This is a prospective study conducted in the department of General Surgery, Kalinga Institute of Medical Sciences over a period of 1 year. All the patients who underwent an elective cholecystectomy were enrolled. In case of GP during the operation, the management was generally alike: free bile was aspirated, the soiled areas were irrigated with physiological saline until clear, and spilled stones were retrieved whenever possible. These patients continued to receive intravenous and peroral antibiotics for 1 week in most instances.**Results:**In the present study, perforation occurred in 10 patients out of 31 (77%) patients with multiple stones on preoperative ultrasound and in 3 out of 9 patients (23%) with single stone. Depending upon the size of the stone on ultrasound perforation occurred in 9 out of 28 patients (69%) when size of stone was up to 10mm, 2 out of 9 patients (15%) when size was 11 to 20 mm, 1 out of 2 patients when size was 21-30 mm and 1 out of one patient when the size was >30mm. The most common mode of perforation during laparoscopic cholecystectomy in 4 cases (30.7%) out of 13 perforations occurred during grasping, in 6 cases (46.1 %) perforation occurred during dissection from liver bed and in 3 cases (23%) perforation occurred during dissection in Calot'striangle.**Conclusion:**Gallbladder perforation represents a special diagnostic and surgical challenge. Early classification and appropriate management are crucial. Based on these findings, we would recommend that during the learning curve of LC, surgical trainees should be closely supervised when undertaking this procedure in all patients presenting with acute cholecystitis or having a strong history of acute cholecystitis.

Keywords: Gallbladder perforation, Laparoscopic cholecystectomy, Calot's Triangle.

Corresponding Author: Dr. Venkatesham B. Assistant Professor, Department of General Surgery, Kalinga Institute of Medical Sciences, Bhubaneswar, Odisha, India

Introduction

In general surgery practice, cholecystectomy is the second most commonly performed abdominal operation.[1] Laparoscopic cholecystectomy has some advantages over the conventional technique, including better cosmetic results, lesser postoperative pain, a shorter hospital stays, and early return to daily activities.[2] Besides, cholecystectomy is not a risk-free procedure and may cause severe complications, including bile duct injury, bleeding, abscess, and pancreatitis.[3]

Gallbladder perforation (GP) is a rare but potentially fatal disease; its presentation can vary and therefore is a dilemma for early diagnosis. It is usually a complication of acute cholecystitis with or without gallstones.[4] Most perforations are subacute, causing a

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pericholecystic abscess. Acute free perforation with bile peritonitis and chronic perforation with an internal biliary fistula are rare. The fundus of the gallbladder is the most common site of perforation because of its poor blood supply.[5] Because of the infrequent and rare occurrence of gallbladder perforation.[6]

GP which is a common intraoperative complication during cholecystectomy, has been reported to occur with a high incidence of 10%-33%. The risk factors and consequences of GP have also been studied.[7] It has been advocated that male sex, a history of acute cholecystitis or previous laparotomies, the use of a laser, an inflamed or nonvisualized gallbladder, and a difficult operation increase the risk of GP.[8] In addition, bile and stone spillage have rarely been reported to lead to severe problems. GP does not worsen the outcomes of the procedure, but it has been stated that lost stones after GP may infrequently cause secondary complications, including pain, fever, or intraabdominal abscesses, because they are a potential nidus of infection and bile spillage may lead to chemical peritonitis.[9]

However, most of the information present in the literature may be misleading because the data is mostly based on retrospective information, and it is probable that GPs were not recorded in the operation documents because GP is generally believed to be harmless, with no adverse consequences in most instances. Thus, to understand the incidence of perforation of gall bladder during laparoscopic cholecystectomy and its associated factors.

Aim:

Aim of the present study were to reveal the incidence and risk factors for and outcomes after intraoperative GP during elective laparoscopic surgery.

Material and Methods

This is a prospective study conducted in the department of General Surgery, Kalinga Institute of Medical Sciences over a period of 1 year. All the patients who underwent an elective cholecystectomy were enrolled. In case of GP during the operation, the management was generally alike: free bile was aspirated, the soiled areas were irrigated with physiological saline until clear, and spilled stones were retrieved whenever possible. These patients continued to receive intravenous and peroral antibiotics for 1 week in most instances. The placement of a drain and conversion to open surgery were decided by the operating surgeon. The patients were generally discharged from the hospital on the next day, but longer hospitalization was sometimes necessary.

Inclusion criteria:

Patients of both sexes between 18-70 years of age with symptomatic gall stone disease with gall stones documented on ultrasonography.

Exclusion criteria:

Presence of jaundice, Acute pancreatitis, Presence of stones in common bile duct, Gall bladder mass and carcinoma, Severe coagulopathy, Conversion to open cholecystectomy.

Results

The number of perforation was more in the age group of 51-70 (53.8%) followed by 31-50 (38.4%) in [Table 1].

In the present study, perforation occurred in 4 out of 17 male patients (30.7%) and 9 out of 23 females (69.2%) in [Table 2].

In the present study, perforation occurred in 10 patients out of 31 (77%) patients with multiple stones on preoperative ultrasound and in 3 out of 9 patients (23%) with single stone in [Table 3].

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Table 1: Distribution of Age among patients with Gall Bladder Perforation

Age group (Year)	Total No. of Patients	No. of Patients with Perforation	Percentage
11- 30	4	1	7.6
31- 50	17	5	38.4
51- 70	19	7	53.8
Total	40	13	100

Table 2: Distribution of Gender among patients with Gall Bladder Perforation

Gender	Total No. of Patients	No. of Patients with Perforation	Percentage
Male	17	4	30.7
Female	23	9	69.2
Total	40	13	100

Table 3: Gall Bladder Perforation and Ultrasound findings

Ultrasound Findings	Total No. of Patients	No. of Patients with Perforation	Percentage
Single	9	3	23
Multiple	31	10	77
Total	40	13	100

Table 4: Size of stones of patients

Size of stones	Total No. of Patients	No. of Patients with Perforation	Percentage
≤ 10 mm	28	9	69
11- 20 mm	9	2	15
21- 30 mm	2	1	7
> 30 mm	1	1	7
Total	40	13	100

Depending upon the size of the stone on ultrasound perforation occurred in 9 out of 28 patients (69%) when size of stone was up to 10mm, 2 out of 9 patients (15%) when size was 11 to 20 mm, 1 out of 2 patients when size was 21-30 mm and 1 out of one patient when the size was >30mm in [Table4].

Table 5: GB wall thickness of patients

GB wall thickness	Total No. of Patients	No. of Patients with Perforation	Percentage
≤2 mm	25	10	77
2.1- 3 mm	11	1	7.6
3.1- 4 mm	2	1	7.6
4.1- 5 mm	1	1	7.6
>5 mm	1	0	100

In the patients with gall bladder wall thickness up to 2mm, 10 out of 25 (77%) showed perforation, out of total 1 patient with gall bladder wall thickness between 4.1 – 5 mm, 1 patient (7.6%) had perforation in [Table5].

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Table 6: Mode of Perforation of Gall Bladder

Cause of Perforation	No. of patients	Percentage
During Grasping	4	30.7
During Dissection in Calot's Triangle	3	23.0
During Dissection from liver bed	6	46.1
Total	13	100

The most common mode of perforation during laparoscopic cholecystectomy in 4 cases (30.7%) out of 13 perforations occurred during grasping, in 6 cases (46.1 %) perforation occurred during dissection from liver bed and in 3 cases (23%) perforation occurred during dissection in Calot'striangle in [Table6].

Discussion

Gallbladder perforation results due to persistent occlusion of the cystic duct by an impacted calculus, causing a rise in intracholecystic pressure, epithelial injury, release of phospholipases, degradation of cell membranes, and intense inflammatory reaction. Laparoscopic cholecystectomy can be performed for acute, gangrenous, and/or perforated cholecystitis, but a conversion may be necessary in case of difficulty like an unclear anatomy.[10] Infections, malignancy, trauma, drugs (e.g. corticosteroids), and systemic diseases such as diabetes mellitus and atherosclerotic heart disease are the predisposing factors.[11] In our study, comorbid disease was present.

Niemeier, in 1934, classified free gallbladder perforations into 3 types. Type I (acute) is associated with generalised biliary peritonitis, type II (subacute) consists of localised collection of fluid at the site of perforation, pericholecystic abscess and localised peritonitis, while type III (chronic) comprises formation of internal or external fistulae.[12]

Fundus is the most distal part with regards to blood supply and therefore this makes it the most common site for perforation which can occur as early as 2 weeks or several weeks after the onset of cholecystitis.[13] The ultrasonographic appearances of gallbladder perforation are diverse and non-specific. They include wall thickening (>3 mm), distension (largest diameter >3.5-4.0 cm), gallstones, coarse intracholecystic echogenic debris and bile duct dilatation. Distension of the gallbladder and edema of its wall may be the earliest detectable signs of imminent perforation. The 'hole sign' (a defect in the gallbladder wall) is the most specific finding.[13]

Although standard abdominal CT plays an important role in diagnosing gallbladder perforation, upper abdominal CT for acute cholecystitis, in which pericholecystic fluid is found by ultrasonography, may increase the rate of preoperative diagnosis of gallbladder perforation.[14] The advantage of MRCP is its superb ability to detect stones in the bile ducts, biliary dilatation, and the relationship of a pericholecystic fluid collection to the abdominal wall and gallbladder. This information can aid in surgical planning.[15]

Most of the type I gallbladder perforations were diagnosed intraoperatively, type II gallbladder perforations were diagnosed by enhanced abdominal CT, and type III gallbladder perforations were diagnosed during laparoscopic cholecystectomy converted to open cholecystectomy for cholelithiasis. Type I perforation, which presents with acute abdomen and features of peritonitis, was diagnosed in most of the patients intraoperatively after opening the abdomen, this might be due to the non-availability of enhanced abdominal CT as an emergency investigation tool in hospital. However, type II perforations were diagnosed by enhanced abdominal CT, which could be made available for the diagnosis due to the subacute nature of the disease allowing us time to investigate the patients.[16]

Cholecystectomy, drainage of abscess if it is present, and abdominal lavage are usually sufficient to treat gallbladder perforation. Cholecystectomy may be difficult in type III

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gallbladder perforations. If a cholecystectomy is performed, additional surgical procedures such as repair of the fistula may be required. Cholecystectomy can be performed after the infection is relieved by ultrasonography-guided percutaneous drainage in type II gallbladder perforations.[17]

Conclusion

Gallbladder perforation represents a special diagnostic and surgical challenge. Early classification and appropriate management are crucial. Based on these findings, we would recommend that during the learning curve of LC, surgical trainees should be closely supervised when undertaking this procedure in all patients presenting with acute cholecystitis or having a strong history of acute cholecystitis. This may reduce the higher risk of IGBP and hence the complications associated with bile and stone spillage.

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