Section: General Surgery

Original Research Article

CLINICAL STUDY ON FACTORS LEADING TO GALLBLADDER PERFORATION DURING ELECTIVE LAPAROSCOPIC CHOLECYSTECTOMY

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Received *: 10/06/2025*
Received in revised form *: 24/07/2025*
Accepted *: 15/08/2025*

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DOI: 10.70034/ijmedph.2025.3.611

Source of Support: Nil,
Conflict of Interest: None declared

Int J Med Pub Health
2025; 15 (3); 3337-3340

ABSTRACT

Background: Gallbladder perforation (GBP) is a frequent intraoperative complication during laparoscopic cholecystectomy (LC), reported in 10–33% of cases. It can lead to bile spillage, stone loss, prolonged operative time, and increased postoperative morbidity. Identifying risk factors is essential to reduce occurrence and improve outcomes. The objective is to determine the frequency and risk factors of GBP during elective LC and evaluate postoperative outcomes.

Materials and Methods: A prospective observational study was conducted on 196 patients undergoing elective LC for symptomatic cholelithiasis over 18 months. Parameters evaluated were USG findings, intraoperative details, and postoperative outcomes were analyzed.

Results: GBP occurred in 31 patients (15.8%). Significant risk factors included multiple stones with distended GB, WES complex, previous laparotomies, higher degree of operative difficulty, gross adhesions, acute inflammatory changes, use of traumatic grasper, and difficult Calot's triangle. GBP cases had significantly longer hospital stays (3.13 vs. 1.32 days) and more drain usage (2.61 vs. 0.02 days).

Conclusion: GBP is associated with specific preoperative and intraoperative factors. Careful preoperative assessment, meticulous dissection, and avoidance of traumatic instruments may reduce risk.

Keywords: Gallbladder perforation, Laparoscopic cholecystectomy, Risk factors, Bile spillage.

INTRODUCTION

The gallbladder is a pear-shaped organ located in the right upper abdomen, primarily involved in storage, concentration and release of bile. Cholecystectomy is 2nd most common procedure of abdomen in general surgery.[1] Most popular minimally invasive surgical procedure for treating symptomatic gallstones is laparoscopic cholecystectomy.[2] Compared to open surgery, laparoscopic cholecystectomy has a number of advantages, including less postoperative pain, a shorter recovery period and hospital stay, better cosmetic outcomes, and fewer postoperative infectious complications because of the smaller incision and diminished tissue damage.[3]

Laparoscopic cholecystectomy (LC) has become the gold standard for managing symptomatic and complicated gallstone disease. Numerous issues have arisen as a result of laparoscopic cholecystectomy, including an increased risk of biliary system injuries, intraoperative iatrogenic gall bladder perforation (IGBP), which causes bile and stones to spill, and port site issues.[6-7]

There are fewer variables of risk that raise risk of (GP), GBP in patients having laparoscopic cholecystectomy is typically unpredictable. It has been discovered that gallbladder perforation (GBP), a common intraoperative complication following cholecystectomy, occurs at a rate of 10% to 33%.[8,9] Some factors proposed to raise GP risk include AC,

male sex, prior laparotomies, an inflamed or non-visualized gallbladder, and a challenging surgical procedure.[10-12]

Gallstone illnesses affect about 20% of females and 5% of males, and they are more common in females than in males. 75 percent of gallstones are caused by cholesterol. Numerous circumstances, including dissection, direct tool penetration, severe retraction, and evacuation of a trocar site inflated gallbladder, might result in gallbladder perforation.

MATERIALS AND METHODS

The study was conducted on patients attending the surgical outpatient department at TMMC&RC, Moradabad for 18 months

Study Design: Longitudinal study design.

Duration: 18 months

Sample Size: 196 patients

Inclusion Criteria

-Age ≥18 years

-Both genders

-Symptomatic cholelithiasis fit for elective LC

Exclusion Criteria

-CBD stones

-Chronic renal/liver/heart diseases

-Immunocompromised patients

-Conversion to open cholecystectomy

Methodology: After approval from CRC and IEC (given by TMMC&RC), all patients coming to the surgical OPD were included based on inclusion and exclusion criteria. Informed consent was taken. History taking, physical and local examination were done. Basic laboratory investigations including CBC, blood group, blood glucose, HbA1c, liver and renal function tests, coagulation profile, viral markers, and USG were performed. Operative details were recorded, including degree of difficulty, intraoperative findings, and occurrence of GBP. Postoperative outcomes included surgical site infection (SSI), fever, intra-abdominal collection, hospital stay, and drain duration.

RESULTS

Statistical analysis was carried out using Statistical Package of Social Sciences (SPSS) software version 20.0 (SPSS Inc., Chicago, IL, USA). Chi square statistical analysis was used to assess the level of significance. The level of significance was adjusted at p-value being less than 0.05.

Out of 31 cases with GB perforation, 35.5% cases were 41-50yrs of age, with mean age being 42.87±15.75yrs; whereas in cases without GB perforation mean age was observed to be 45.36±15.87yrs, showing an insignificant relation (p-value>0.05) of GB perforation with age. In relation to gender distribution, male predominance was seen in cases with GB perforation (83.95%, whereas female predominance was seen in cases without GB perforation (86.7%), showing no significant relation (p-value>0.05) of GB perforation with gender. Most of the subjects with and without GB perforation (83.9% vs 81.2%) had BMI in range of 18.5-24.9 kg/m2, with mean BMI being 22.48±1.81 kg/m2 and 22.45±1.73 kg/m2 respectively, showing an insignificant relation (p-value>0.05) of GB perforation with BMI. Mean ALT levels were also comparable in cases with (91.13±28.83) and without (81.57±22.16) GB perforation, revealing no association (p-value>0.05) of GB perforation and ALT levels.

In cases with GB perforation, USG findings revealed that most of the cases (25.9%) had multiple stones with distended GB whereas in patients without perforation, 98.8% cases had Single stone with normal GB, showing a significant (p-value<0.05) relation of GB perforation with USG findings. In cases with and without GB perforation, 77.42% and 28.5% cases respectively underwent Previous Operations & Laparotomies, showing a significant (pvalue<0.05) relation of GB perforation with previous surgical history. Degree of difficulty was observed to be of Grade 3 in 80.6% cases with GB perforation; whereas most of the cases (46% and 48.5%) showed grade 1 and 2 level of difficulty in patients with no GB perforation, revealing a significant (p-value<0.05) association of GB perforation with degree of difficulty. [Table 1]

On assessing the intra-operative findings, we observed that presence of gross adhesions (93.5% vs 10.9%); acute inflammatory changes (80.65% vs 13.9%); use of traumatic grasper (64.5% vs 6.7%) and difficult calot triangle (100% vs 16.4%) were considerably more in cases with GB perforation as compared to those without GB perforation. [Table 2]

On assessing the post-operative findings, we observed that presence of surgical site infection (SSI) was seen in 3.6% cases with no perforation; whereas no case of SSI was reported in GB perforation cases. No case of prolonged post- op fever >3days and intra-abdominal abscess was reported in cases with and without GB perforation. Mean hospital stay was significantly (p-value<0.05) more in cases with GB perforation (3.13 days) than without perforation (1.32) days. Mean total days drain in-situ was significantly (p-value<0.05) more in cases with GB perforation (2.61 days) than without perforation (0.02 days). [Table 3]

Table 1

Risk Factor	GB Perforation (n=31)		No Perforation (n=165)		p-value
	Freq (n)	%	Freq (n)	%	
Age groups (yrs)					0.058
<20	0	0.0	4	2.42	
20–30	7	22.6	36	21.8	

31–40	5	16.1	31	18.8	
41–50	11	35.5	21	12.7	
51–60	4	12.9	35	21.2	
>60	4	12.9	38	23.0	
Mean age ± SD (yrs)	42.87 ± 15.75	–	45.36 ± 15.87	–	
Gender					0.911
Female	5	16.1	143	86.7	
Male	26	83.9	22	13.3	
BMI (kg/m²)					0.117
≥30	0	0.0	0	0.0	
Mean ± SD	22.48 ± 1.81	–	22.45 ± 1.73	–	
Mean ALT levels ± SD	91.13 ± 28.83	–	81.57 ± 22.16	–	0.057
USG findings					0.039*
Single stone, normal GB	0	0.0	163	98.8	
Single stone, distended GB	8	25.8	1	0.6	
Multiple stones, normal GB	0	0.0	1	0.6	
Multiple stones, distended GB	8	25.9	0	0.0	
WES Complex	15	48.4	0	0.0	
Previous Operations & Laparotomies					0.030*
No	7	22.6	118	71.5	
Yes	24	77.4	47	28.5	
Degree of Difficulty					0.001*
Grade 1	2	6.5	76	46.1	
Grade 2	4	12.9	80	48.5	
Grade 3	25	80.6	9	5.5	
Mean ± SD	2.74 ± 0.57	–	1.59 ± 0.59	–	

Table 2

Intra-operative findings		**GB Perforation (n=31)**		**No Perforation (n=165)**		**p-value**
		Freq (n)	**Perc (%)**	**Freq (n)**	**Perc (%)**	
Gross Adhesions	No	2	6.5	147	89.1	0.018*
	Yes	29	93.5	18	10.91	
Acute inflammatory changes	No	6	19.4	142	86.1	0.022*
	Yes	25	80.65	23	13.94	
Use of traumatic grasper	No	11	35.5	154	93.3	0.036*
	Yes	20	64.52	11	6.67	
Difficult Calots triangle	No	0	0	138	83.6	0.003*
	Yes	31	100	27	16.36	

Table 3

Intra-operative findings		**GB Perforation (n=31)**		**No Perforation (n=165)**		**p-value**
		Freq (n)	**Perc (%)**	**Freq (n)**	**Perc (%)**	
Surgical site infection	No	31	100	159	96.36	0.687
	Yes	0	0	6	3.63	
Prolonged post- op fever >3days	No	31	100	165	100	-
	Yes	0	0	0	0	
Intra abdominal collection/Abscess	No	31	100	165	100	-
	Yes	0	0	0	0	
Mean total hospital stay±SD (days)		3.13±.62		1.32±.73		0.014*
Mean total days drain insitu±SD (days)		2.61±.49		.02±0.22		0.013*

DISCUSSION

Cholecystectomy is 2nd most prevalent abdominal procedure in gen. surgery. One of the frequent surgical indications in the world is cholecystectomy. Laparoscopy has emerged as the preferred method for routine cholecystectomy because of its clear advantages for patients. It currently has a success rate of around 100%. Because LC lessens the stress of surgical access, patients can recover more quickly and comfortably and return to work more quickly. This is why the approach of minimum access surgery has been widely accepted. Thus, LC is currently a therapeutic reality that is gradually broadening its scope. Overall, the outcomes were positive, and under skilled hands, the treatment is safe with little risk of morbidity or death.[13-15]

Better cosmetic outcomes, less post-op pain, limited stay in hospital, & earlier returning to normal activities are some benefits of laparoscopic cholecystectomy over the traditional method. Furthermore, cholecystectomy is risky treatment and can result in serious side effects such pancreatitis, hemorrhage, abscess, and damage to the bile duct. There is no question that the rise in related problems is a direct result of the growing usage of LC in surgery. Operating surgeons have always been concerned about the most frequent complication, which is the iatrogenic perforation of GB & the leakage of stones & bile into the abdominal cavity. According to reports, the incidence of (GP), intra-op complication following CC, ranges from 10% to 33%.[16-18]

Acute cholecystitis, Male sex, use of laser, non-visualized/ inflamed GB, complex USG findings (multiple stones with distension, WES complex) and previous surgeries. Intraoperative challenges such as dense adhesions, acute inflammation, and difficult Calot's triangle strongly correlated with GBP occurrence & challenging procedure have all been suggested to raise the risk of GP.[19] Furthermore, there have been very few reports of serious issues resulting from bile and stone spills. Lost stones following GP may occasionally result in 20 problems, such as fever, pain, intra-abdominal abscesses, as they are possible source of sepsis & bile spilling may cause chemical peritonitis. However, GP does not affect the procedure's outcomes.[20] However, since the majority of the data in the literature is based on retrospective information, it is likely that GPs were not included in the operation documents because they are usually thought as benign and rarely have negative effects.

Cases were evaluated for demographic parameters; clinical examination; laboratory investigations (like CBC, LFT, KFT, viral markers, urine analysis, blood sugar); Radiographic investigations, USG whole abdomen). Patients were assessed intra and post-operatively. We also assessed risk factors of GBP during elective LC. Post operative morbidity, Surgical site infection, Prolonged post op fever for > 3 days, Hospital Stay and Intra Abdominal collection/abscess was evaluated.

CONCLUSION

GBP is a common intraoperative complication in LC, influenced by specific preoperative and intraoperative factors. Meticulous dissection, careful handling, and awareness of risk predictors can help reduce its occurrence and associated morbidity.

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