Original Research Article

Bile spillage during laparoscopic cholecystectomy: Risk factors and increased post-operative morbidity

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Abstract

Introduction: Laparoscopic cholecystectomy has become the "gold standard" for the management of symptomatic cholelithiasis. Bile spillage is common due to perforation during dissection of the gallbladder bed, injury during retraction with grasping forceps and during specimen retrieval. We evaluated the risk factors and presumed that bile spillage increases the risk of immediate post-operative morbidity. **Method**: 60 Patients of symptomatic cholelithiasis admitted to JNMCH, Aligarh for laparoscopic cholecystectomy from 04/2021 to 09/2021, were prospectively included. We compared those who had bile spillage during the operation to those who did not. Our aim was to find out the risks of bile spillage and rate of early post operative complication due to bile spillage in both the groups. **Results**: Bile was spilled intraoperatively in 36 patients (60.0%), with hydrops noted in 5 (8.3%) and empyema in 10 (16.6%) of them. In 9 (15%) out of 60 patients, BS was accompanied by stone spillage. Patients with BS were older and were more frequently male. Conversion to open was more likely in operations with BS (14% vs 4%). Bile spillage was associated with a higher risk of postoperative abdominal pain, tenderness, paralytic ileus and SSI rate (8 % vs 2%, p = 0.001) and longer hospital stay (median of 3 vs 2 days, p < 0.001). **Conclusion**: Bile spillage should be anticipated in presence of risk factors and is associated with increased risk of post operative morbidity. Surgeons should try to avoid it during laparoscopic cholecystectomy.

Key words: Laparoscopic cholecystectomy, Bile spillage, Gall Bladder Perforation, Surgical Site Infections

Introduction

Cholecystectomy, since it was first done by Langenbucuch[1] in 1882 has seen many changes in its evolution. Cholecystectomy by the laparoscopic method was first performed by ErichMuhe[2] in 1885, is now the gold standard the in treatment of symptomatic cholelithiasis. Particular attention has been paid to the risk factors predicting difficult laparoscopic cholecystectomy to the prevention of intraoperative complications necessitating conversion to laparotomy procedure or that cause postoperative problems. Some recent case reports have included intraoperative perforation of the gallbladder among the possible complications to be taken into consideration.Bile spillage (BS) occurs frequently following gall bladder perforation intraoperatively during the separation of gall bladder from gall bladder fossa and specimen extraction, yet its impacton postoperative outcomes remains less studied area. Bile spillage could give rise to early or distant postoperative complication[3-6]. Which is quite common after laparoscopiccholecystectomy[7-10]. Bile spillage may lead to chemical peritonitis; these events might be the cause of infections of the surgical wound. In addition, the patient disappointment, they often cause subsequent readmissions[11-13]. Therefore, we wanted to examine whether BS can be predicted with presence of pre-operative risk factors and its association with an increased risk of immediate post-operative morbidity compared to those who do not have bile spillage during laparoscopic cholecystectomy.

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Method

Total 60 patients, who were scheduled for standard 4-portlaparoscopic cholecystectomy for symptomatic cholelithiasis and admitted to theDepartment of Surgery, JNMC, AMU, Aligarh, were prospectively included in the study. Whereas patients who underwent open cholecystectomy or converted from laparoscopic to open, associated CBD stone, fever, were excluded.As a result, we included patients with biliary disease needing surgery like symptomatic cholelithiasis and past history of gallstone pancreatitis. Approval by the ethical committee was obtained. A detailed history and all the relevant information from like age gender,comorbidities(body mass index, ASA class, diabetes mellitus) of the patient were obtained. All the laparoscopic cholecystectomies were done by a single surgeon and the intraoperative findings were documented immediately after surgery.All the patients were thoroughly assessed clinically during their postoperative hospital stay and during a follow-up appointment in the OPD that was scheduled weekly after dischargefor upto 1 month. Pain was assessed by VAS (Visual Analogue Scale).Our study aims to identify risk factors associated with bile spillage and the rate of immediate post-operative morbidity following bile spillage intraoperatively.Post-operative morbidity classified as immediate (abdominal pain, post opeartive ileus) andlate (surgical site infection,as superficial, deep and organ/space infections involving intra-abdominal tissues and organs). Organ/space infections were confirmed with imaging studies. Our secondary endpoint wasto observe length of hospital stay.

Prior to the skin incision allthe patients received a dose 3rdgeneration cephalosporin most commonly ceftriaxone.Operative area was prepared with same povidone-iodine solution in all the patients.

Descriptive statistical analysis was expressed in terms of frequency, mean and standard deviation. The frequencies were compared with Pearson's chi-square test for categorical variables. The continuous variables were compared with the t-test. P-value less than 0.001 was considered statistically significant. Statistical analysis was done by using computer program SPSS (Statistical Package for Social Sciences version) 25.0.

Results

In the present study,60 patients were studied and underwent laparoscopic cholecystectomies for symptomatic gall stone disease were included. Overall, bile was spilled in 36patients (60%).The surgeon was able to retrieve all spilled gallstones in all of those cases followed by saline irrigation.

Table 1shows relationship between bile spillage and age,bile spillage present in 24 patients (66.7% of total patients with BS) of age >50 years old,12 patients (33.3% of total patients with BS) of age 26 to 50 years, based on this data bile spillage is common in old age patients and it was statistically significant(X2=21.1 p value<0.001)

Table 2 shows the association of those who had BS during surgery to the gender, bile spillage present in 24 patients (66% of total patients with BS) of male gender ,12 patients (33.3% of total patients with BS) of female genderbased on this data bile spillage was common in male patients and it is statistically not significant (X2=1.66 p value>0.001).

Table 3 shows the association of those who had BS during the operation to the BMI <30 or >30, 22 patients (36.6 % of total patients) have BMI <30, 24 patients (40 % of total patients) have BMI >30,it showed that the bile spillage was slightly more common in patients with BMI >30 but it is statistically not significant (X2=0.2535 p value>0.001).

Table 4 shows the association between those who had BS during the operation to diabetic mellitus, 5 patients (8.3 % of total patients)with diabetes mellitus had bile spillage, 13 patients (21.6 % of total patients) with diabetes were having no bile spillage, and this data showed that statistical not significant (X^2= 0.35 p value= 0.614).

Table5 shows the relationship of those who had BS during theoperationto ASA class, ASA class 2 has 21 patients whom bile spillage bile was present, ASA class 1 had bile spillage in12 patients (19.04 % of total patients),8 patients (13.3 % of total patients) with bile spillage belongs toASA class 1.

Table 6 shows the association of BS during the operation to post operative abdominal pain. Severe pain in 24 patients (66% of total patients with BS), moderate pain in 9 patients (25% of total patients with BS),mild pain in 3 patients (8.3% of total patients with BS) based on this data isright abdominal pain common in patients with bile spillage and it was statistically significant (X2=23.4 p value<0.001).

Table 6 shows the comparison of those who had BS during the operation to post operative paralytic ileus. Paralytic ileus in 27 patients (75% of total patient s with BS), paralytic ileus in 12 patients (50% of total patients with no BS), based on this data paralytic ileus is common in patients with bile spillage and it is significant (X2=3.959 p value<0.05).

Table 7 shows the association of BS during the operation to post operative length of hospital stay.Increasedpost operative length of hospital stay(3days vs 2days) in 27 patients (75% of total patient s with BS), increased post operative hospital stay(3days vs 2days) in 3 patients (12.50% of total patients with no BS), based on this data increased post operative hospital stay(3days vs 2days) is common in patients with bile spillage and it is significant (X2=22.5p value<0.001).

Table 7 shows the association of BS group during the operation to post operative port siteSSI, SSI had seen in 30 patients (83% of total patients with BS), SSI in 3 patients (12.50% of total patients with no BS) , based on this data SSI is common in patients with bile spillage and it is significant (X2=29.19 p value<0.001).

Table1: Showing association of bile spillage with age

S. No.	Age	Bile Spillage			Ch^2- Value	P- Value
		Present	Absent	Total		
1	<= 25 Year	0 (0%)	6 (25%)	6 (10%)	21.111	P < 0.001
2	26-50 Year	12 33.3%)	15 (62.5%)	27 (45%)		
3	> 50 Year	24 (66.7%)	3 (12.5%)	27 (45%)		
4	Total	36 (100%)	24 (100%)	60 (100%)		

Table 2: showing association of bile spillage with gender

S. No.	Sex	Bile Spillage			Ch^2- Value	P- Value
		Present	Absent	Total		
1	Male	24 (66.7%)	12 (50%)	36 (60%)	1.666	P > 0.05
2	Female	12 33.3%)	12 (50%)	24 (40%)		
3	Total	36 (100%)	24 (100%)	60 (100%)		

Table 3: showing association of bile spillage with BMI

S. No.	BMI	YES BS	NO BS	chi squre	p value
1	<30	22	13	0.2535	0.614
2	>30	24	11		

Table4: showing association of bile spillage with diabetes

S. No.	Diabetic	Bile spillage	No bile spillage	chi squre	p value
1	YES	5	13	0.35	0.55
2	NO	15	27		

Table 5: showing association of bile spillage with ASA class

S.N+A63:F66	ASA	No bile spillage BI	Bile spillage	Chi squre	P VALUE
1	CLASS 1	8(13.3)	12(19.04)	0.0169	0.99
2	CLASS 2	15(25)	21(35.0)		
3	CLASS 3	2(3.3)	3(5%)		

Table 6: showing association of bile spillage with post operativeabdominal pain

S. No.	Abdominal Pain/Tenderness	Bile Spillage			Ch^2- Value	P- Value
		Present	Absent	Total		
1	Mild	3 (8.3%)	15 (62.5%)	18 (30%)	23.472	P < 0.001
2	Moderate	9 (25%)	6 (25%)	15 (25%)		
3	Severe	24 (66.7%)	3 (12.5%)	27 (45%)		
4	Total	36 (100%)	24 (100%)	60 (100%)		

Table 7: showing association of bile spillage with postoperative paralytic ileus

S. No.	Paralytic Ileus	Bile Spillage			Ch^2- Value	P- Value
		Present	Absent	Total		
1	Yes	27 (75%)	12 (50%)	39 (65%)	3.956	P < 0.05
2	No	9 (25%)	12 (50%)	21 (35%)		
3	Total	36 (100%)	24 (100%)	60 (100%)		

Table 8: showing association of bile spillage with port site SSI

S. No.	SSI	Bile Spillage			Ch^2- Value	P- Value
		Present	Absent	Total		
1	Yes	30 (83.3%)	3 (12.5%)	33 (55%)	29.191	P < 0.001
2	No	6 (16.7%)	21 (87.5%)	27 (45%)		
3	Total	36 (100%)	24 (100%)	60 (100%)		

Table 9: showing association of bile spillage with postoperative hospital stay

S. No.	Hospital Stay		Bile Spilage			Ch^2- Value	P- Value
			Present	Absent	Total		
1	2 Days		9 (25%)	21 (87.5%)	30 (50%)	22.5	P < 0.001
2	3 Days		27 (75%)	3 (12.5%)	30 (50%)		
3	Total		36 (100%)	24 (100%)	60 (100%)		

Discussion

Intraoperative GP occurred in 36 cases (60%) in total of the 60 patients. Certain situationare related to higher risk of gall bladder perforation.The perforation of the gallbladder was higher in the cases probably because of the techniques utilized. As all the LC require the gallbladder wall to be grasped with forceps and moved aside for the critical view which may tear the gall bladder wall due to repeated traction and grasping the fundus and infundibulum.

The gallbladder may also be perforated during its dissection from the gall bladder fossa by the electrocautery, which was the most frequent cause of perforation in our patients.Another reason of GB perforation may be due to friable tissue due to acute inflammation of gall bladder which is more susceptible to tear.

Bile leakage and gallstone spillage may also be caused by slippage of cystic duct clips when after the sectioning of the cystic duct the gallbladder is traction to proceed to cholecystectomy.

Lastly, perforation of the gallbladder may occur when the surgeon removes the gallbladder from the abdominal cavity through a small trocar site.Our results revealed that the bile leak due to intraoperative gall bladder perforation was associatedsignificantly witha greater percentage of male patients, increasing age, diabetic and ASA grade 2 group of patients, and BMI>30. A similar association was noted in a Canadian multicentre study by Litwin DE[14] et alfound that greater risk of intraoperative gall bladder perforation in male sex old age and weight, Jones et found a similar association.

Jasim et al[15] study on bile spilled during laparoscopic cholecystectomy showed that the mean age was 38.6 years and female were 84% while males were 16%.

Laparoscopic cholecystectomy becomes more challenging in overweight male patients because of more abdominal wall fatty tissue increased liver mass which exerts greater tension on the gall bladder during surgery.In our study, iatrogenic gall bladder perforation occurred most commonly during dissection of the gall bladder, may be due to technical fault or use of electrocautery in all of the patients.Followed by extraction of gall bladder from the abdominal cavity,due to large stone which causes difficulty in extraction of GB by repeated grasping and traction. To prevent this GB can be placed in a specimen bag before crushing or extracting stones forceps or enlargement of fascial port site.Our study in 60 patients following laparoscopic cholecystectomywe tried to find out the immediate and late post operative morbidity due to bile spillage intraoperatively and it showed that BS during laparoscopic cholecystectomy is a risk factor fordevelopment of immediate postoperative morbidity (severe post opeartive abdominal pain, paralytic ileus) and port site SSI. Most of the time operating surgeons considered BS insignificant during laparoscopic cholecystectomy. There have been a few studies looking into the impact of spilled bile or gallstones on postoperative outcomes after laparoscopic cholecystectomy[16-18]. In our study postoperative severe abdominal pain, paralytic ileus persisting more than 24 hours were considered statistically significant (p value <0.05, suggesting bilespillage haspositive association.A recent study of Anuj Parajuli[19] supports our study as bile spillagebecause of perforation has higher prevalence of port site SSI.Study conducted by Pankaj K[20] et al on the patients having spillage of bile duringlaparoscopic cholecystectomy and its short-term outcome. They found that post-operative abdominal pain and post operative ileus >24 hourswas significantly associated with bile spillage group.Some studies showed opposite results as we have like Sarli[1] et al examined 1,127 patients who underwent laparoscopic cholecystectomy for gall stone disease. They reported that bile was spilled in only 11.6% of them and found no difference in postoperative complication rates between patients with and without BS. They concluded that adequate prophylactic antibiotic therapy and generous peritoneal irrigation might be sufficient to eliminate the potential risk of postoperative infections.

In spillage patients of our study, 30 (83.3%) had port site infection while 6(16.7%) had no port site infection. The p value was <0.001 which was statically significant suggesting spillage of bile is associated with post operative port site infection. In the study conducted by Jasim[15] et al, 3(8.8%) patients developed port site infection. Similar results were found by Pankaj K[20] et al, Peponis T[21] et al found that bile spillage is associated with SSI.

On the other hand, a study by the Mayo Clinic advocated that the risk of intra-abdominal abscesses increases if bile is spilled in the abdomen [6]. The authors reported a BS rate of 29% and recommended peritoneal irrigation in all operations with BS. Another more recent study by Jain et al studied 113 patients out of whom 18 had BS. The authors concluded that BS by itself is not associated with SSI.

Postoperative stay was 2days in 9 patients with bile spillage as compared to 21 patients without bile spillage and 3 days in 27 patients with bile spillage as compared to 3 patients without bile spillage, with a p-value 0.001which was statically significant. The reason for longer postoperative hospital stay in our study was postoperative pain and paralytic ileus which were managed conservatively by antibiotics and pain killers (NSAIDs).

In a study by Jasim[15] et al mean postoperative hospital stay was 2 days. So, in this study mean postoperative hospital longer than other studies probably due to different protocols for discharging the patient.

On the other hand, a study conducted by Pankaj K[20] et al mean postoperative stay was 2.59 days ranging from 2 to 8 days with a p-valueof 0.097, statically insignificant.

Rate of BS in our study, was higher(6 out of 10 patients) than previous studieson bile spillage during laparoscopic cholecystectomy.This is possibly due to the correlation of BS to surgery complexity.

No patient in our study developed jaundice and intrabdominal abscess but some of them developed fever which was not significant and resolved on taking medications.

Most important step to prevent complications due to bile spillage is meticulous removal of all stones and thorough irrigation of peritoneal cavity with normal saline so that the possibility of infections after laparoscopic cholecystectomies with BS may decrease.

All the postoperative complications should be explained to the patients and their relatives.And long term follow up is mandatory in these patients unlike other laparoscopic cholecystectomy without bile spillage because of possibility of delayed complications.

Conclusions

Intraoperative bile spillage has very low risk of serious complications.BS is associated with early postoperative morbidity (like severe abdominal pain, paralytic ileus), longer hospital stay, SSI and surgeons should take extra caution to avoid it during laparoscopic cholecystectomy.

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