Original article

The Prevalence and Outcome of Bile Spillage during Elective Laparoscopic Cholecystectomy

Sushil Dhungel, Rupesh Mukhiya, Kamal Koirala, Bibechan Thapa, Mahipendra Tiwari

Abstract

Introduction: Laparoscopic cholecystectomy (LC) has a low risk for postoperative infective complications. The incidence of iatrogenic gall bladder perforation leading to spillage of bile and stones seems to be higher ranging between 5 and 40%. Studies have also shown an increased incidence of complications like surgical site infection (SSIs) after bile spillage. This study aims to assess the prevalence and outcome in bile spillage during LC.

Methods: A cross-sectional study was conducted at KIST Medical College and Teaching Hospital. All the patients who underwent elective LC from February 2018 to March 2020 were studied. A total of 187 patients were enrolled. The required data was entered in the proforma by reviewing the patient's medical records. The data was entered and analyzed using the SPSS version 26. Descriptive statistics and chi-square test were carried out.

Results: The prevalence of bile spillage was 29.4%. The prevalence of SSIs among the bile spillage and non-bile spillage groups was 10.9% and 8.3% respectively. There was no significant association between SSIs and bile spillages (p value 0.584). There is no significant association post operative use of antibiotics and SSIs among patients with bile spillage (p value = 0.163).

Conclusion: The prevalence of bile spillage during LC was higher when compared to other national and international studies. However, the rate of SSIs among bile spillage was lower. Bile spillage during LC doesn't cause SSIs post-operatively and use of postoperative antibiotics among bile spillage patients doesn't prevent SSI during elective LC thus use of antibiotics in such cases should be limited.
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Keywords: Antibiotics; Bile spillage; Cholecystectomy; Surgical site infections.

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Introduction

Laparoscopic cholecystectomy (LC) is the gold standard treatment for gallstone disease.[1-4] LC has a low risk for postoperative infective complications.[4] The incidence of iatrogenic gall bladder perforation leading to spillage of bile and stones during LC seems to be higher ranging between 05 and 40%.3,5 But studies have also shown an increased incidence of complications like surgical site infection (SSIs) undermining the advantages of LC in accidental gallbladder perforation.[6,7] When the bile spillage is properly aspirated and the peritoneum irrigated, and appropriate antibiotics administer perioperatively, operative and postoperative courses are similar to the unperforated gallbladder.[6]

A proper guideline for the management of bile spillage is lacking.[8,9] Though it is common occurring intraoperative complications, clear consensus is lacking among surgeons. Some report, the administration of a single dose of antibiotic after the intraoperative gallbladder perforation as a prophylactic therapy[6,10] while others report post-operative prophylactic antibiotics.[11] The study aims to assess the outcome and role of antibiotics in bill spillage during LC.

Methods

A cross-sectional study was conducted at KIST medical college and teaching hospital after taking ethical approval (IRC ref no: 20781791). All the patients who underwent elective LC for the period of two years from February 2018 to March 2020 were studied. Patients under the age of 18 years and those whose LC was converted into open cholecystectomy were excluded from the study.

A total of 187 patients who underwent elective LC meeting our exclusion and inclusion criteria were enrolled in the study. The required data was entered in the proforma by reviewing the patient's medical records and operative notes retrospectively during the data collection period of three months. Patient medical records were obtained from the medical records section. All the cases were divided into bile spillage and non-bile spillage groups according to intraoperative findings. Demographic profile, pre-operative diagnosis, rate of infective complications like SSIs, site of SSIs, use of postoperative antibiotics, total duration of antibiotic therapy, and duration of hospital stay was studied for both the groups and compared. The data was entered and analyzed using the SPSS version 26. Descriptive statistical tests were used to generate results in the form of frequencies, percentages, mean, median, and standard deviation. A Chi-square test was carried out to generate a level of significance (p-value), a p-value less than 0.05 was regarded as significant.

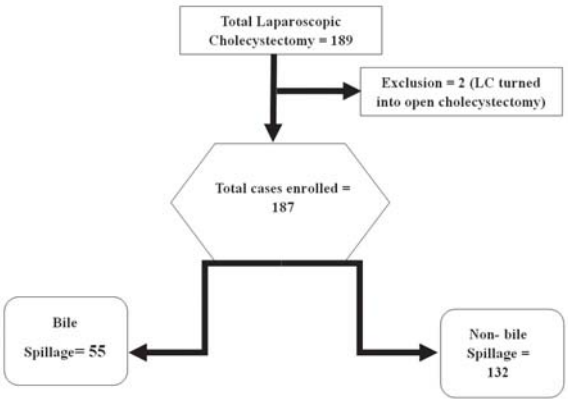

Figure 1. Flowchart of patient selection

Results

The total number of elective LCs performed during the study period was 187. Among all the patients, bile spillage occurred among 55 (29.4%) patients. The stone with bile spillage occurred in 24 (12.8%) of patients.

Among all, the mean age of the patients was 45.9 +/- 13.8 years [range 21-76 years] and a majority of 84 (44.9%) were from the age group of 41 to 60 years. Among patients with bile spillage, the mean age was 46.3+/- 13.5 years [range 26-75 years]. Among patients with non-bile spillage, the mean age was 45.8 +/- 14 years [range 21-76 years].

Among patients with bile spillage, 23 (41.8%) of patients belonged to the age group of 41 to 60 years. Among all, female predominance was observed at 132(70.6%). Female predominance was also observed in patients with bile spillage at 36 (65.5%). There was no significant association between age group and bile spillage (p-value 0.847) and gender and bile spillage (0.379) (**Table 1**).

Table 1. Demographic features of patients with bile spillage and non-bile spillage during laparoscopic cholecystectomy.

Demographic features	Bile spillage (N=55)	Non-Bile spillage (N= 132)	Total	P value
Age				
20- 40 years	22 (40%)	50 (37.9%)	72 (38.5%)	0.847
41 to 60 years	23 (41.8%)	61 (46.2%)	84 (44.9%)	
More than 60 years	10 (18.2)	21 (15.9%)	31 (16.6%)	
Gender				
Male	19 (34.5%)	36 (27.3%)	55 (29.4%)	0.379
Female	36 (65.5%)	96 (72.7%)	132 (70.6%)	

Among patients with bile spillage, 40 (72.7%) patients were operated on for symptomatic cholelithiasis. There was no significant association between pre-operative diagnosis and bile spillage (p-value 0.914) (**Table 2**).

Table 2. Preoperative diagnosis of patients with bile spillage and non-bile spillage during laparoscopic cholecystectomy.

Pre-operative Diagnosis	Bile spillage (n=55)	Non-Bile spillage (n= 132)	Total	P value
Symptomatic cholelithiasis	40 (72.7%)	102 (77.3%)	142 (75.9%)	0.914
Acute calculus cholecystitis	6 (10.9%)	9 (6.8%)	15 (8%)	
Gall bladder polyp	4 (7.3%)	8 (6.1%)	12 (6.4%)	
Chronic calculus cholecystitis	2 (3.6%)	3 (2.3%)	9 (4.8%)	
Acute Biliary Pancreatitis	2 (3.6%)	7 (5.3%)	5 (2.7%)	
Gall bladder sludge	1 (1.8%)	3 (2.3%)	4 (2.1%)	

Among all LCs, SSIs was noted in 17 (9.1%). Among patients with bile spillage, the SSIs occurred in 06 (10.9%) while in patients with non-bile spillage it was recorded in 11 (8.3%) (**Table 3**). There was no significant association between SSIs and bile spillage (p value 0.584). All the SSIs were superficial SSIs only and no deep SSIs or intraabdominal infections were recorded. Among all SSIs, the majority occurred at an umbilical port site which was 11 (64.7%). Only umbilical port site SSIs was observed in 09 (52.9%). SSIs of one of the working ports only was observed in 05 (29.4%) while multiple port SSIs were noted in 02 (11.8%) patients.

Among patients with bile spillage with SSIs, umbilical port SSIs was observed in 05 (83.3%) patients with one as part of multiple port site SSIs while among patient with non-bile spillage, the umbilical port SSIs was observed in 06 (54.5%) with one as part of multiple port site SSIs.

All the patients received pre-operative prophylactic antibiotics during the induction of anesthesia. Ceftriaxone was the most common antibiotic used for pre-operative prophylaxis. Among all the patients, postoperative antibiotics were received by 90 (48.1%) patients and the mean duration of use of post-operative antibiotics was 5.1 +/- 1.2 days [range 3-11 days].

Among patients with bile spillage, the post-operative antibiotics were used in 32 (58.2%) and the mean duration of use of the extended post-operative antibiotics was 3.0 +/- 2.8 days [range 3-11 days]. Among patients with non-bile spillage, the post-operative antibiotics were received by 58 (43.9%) (**Table 3**) and the mean duration of use of the post-operative antibiotics was 5.1 +/- 1.1 days [range 3-9 days]. Cephalosporin and metronidazole were the combinations most used as post-operative antibiotics after LC.

Table 3. Surgical site infection (SSIs) in patients with bile spillage and non-bile spillage during laparoscopic cholecystectomy.

		Bile Spillage (N=55)	Non-bile spillage (N=132)	Total	P value
SSIs	Yes	6 (10.9%)	11 (8.3%)	17 (9.1%)	0.584
	No	49 (89.1%)	121 (91.7%)	170 (90.9%)	

Among all patients, the mean duration of hospital stay after LC was 3.6 +/- 1.2 days [range 2 days-11 days]. Among patients with bile spillage, the mean duration of hospital stay after LC was 3.7 +/- 1.4 days [range 2 days-11 days]. Among patients with non-bile spillage, the mean duration of hospital stay after LC was 3.6 +/- 1.2 days [range 2-10 days].

Table 4 demonstrates that there is no significant association between post operative use of antibiotics with SSIs among patients with bile spillage (p value = 0.163).

Table 4. Surgical site infection (SSIs) and use of post operative in patients with bile spillage

		SSIs		Total	P value
		Yes	No		
Use of post operative antibiotics	Yes	1 (1.8%)	22 (40.0%)	23 (41.8%)	0.163
	No (Single dose at induction)	5 (9.1%)	27 (49.1%)	32 (58.2%)	
Total		6 (10.9%)	49 (89.1%)	55 (100%)	

Discussion

The prevalence of bile spillage was 29.4% The overall rate of SSIs was 9.1%. The rate of SSIs among the bile spillage and non-bile spillage groups was 10.9% and 8.3% respectively. There was no significant association between SSIs and bile spillage (p value 0.584). All the patients received pre-operative prophylactic antibiotics during the induction of anesthesia. The post-operative antibiotics were received by 58.2% and 43.9% of patients with bile spillage and non-bile spillage respectively. There is no significant association between post operative use of antibiotics with SSIs among patients with bile spillage (p value = 0.163).

The incidence of iatrogenic gall bladder perforation leading to spillage of bile and stones during LC seems to be higher ranges when compared to open cholecystectomy.[3,5] Spillage of bile and stones occurs during LC due to traction, dissection, and manipulation during extraction of

the gall bladder and is reported to be seen in 11% to 30% of cases.[11] Some studies estimate the rate to range from 05 to 40%.[5] In a study among 1001 patients who underwent LC, the rate of bile spillage was very high at 59% of patients while stone spillage was observed in 20.2%.[12] Few other studies have found the bile spillage to be 14.7%3, 19.8%,[10] and 33.3%.[13] A study conducted in a similar setting to ours in 2020 showed the rate of intraoperative bile spillage to be 20.8% and stone spillage to be 7.5%.[14] In our study, the rate of bile spillage was 29.4% of patients and the rate of stone spillage was 12.8% of patients.

A study showed that 72% were female and the mean age of all patients was 46.7 years.[14] Similar was true in our study where females consisted for 70.6% and the mean age was 45.6 years. A study showed that the patients with bile spillage were older and were more frequently male.[12] But our study didn't show a significant association between bile spillage with age or gender.

In a study, 49.9% underwent LC for acute cholecystitis, 20.9% for symptomatic cholelithiasis or biliary colic, 12.8% for gallstone pancreatitis, and 16.4% for other indications.[12] But in another study, the majority of patients underwent LC for symptomatic cholelithiasis at 83%.[14] In our study majority of patients underwent LC for symptomatic cholelithiasis (75.9%) followed by acute calculus cholecystitis (8%). However, there was no significant association found between pre-operative diagnosis and bile spillage.

The infectious complication rate among bile spillage during elective LC was 8.7%.[12] In a study, the group with bile spillage had small increases in both minors (1.41% vs. 2.12%) and major (0.67% vs. 1.01%) complications. However, there was no difference in mortality and there was no clinically relevant difference in SSI rates after intraoperative bile spillage.[13] Contrary to this, another study concluded that intragenic gall bladder perforation with bill spillage is associated with a higher prevalence of port site SSI. The port site SSI was observed overall at 4.4%. Port site SSI among bile spillage was observed at 12.1% and non-bile spillage was observed at 2.3%.[14] Similarly in another study, SSIs in patients with bile spillage was 35.29%, and that among non-bile spillage was 11.76%. The difference in the rate of SSI between bile spillage and non-bile spillage group was statistically significant and the SSIs have mostly occurred in patients with spillage of bile during LC.[15] Bile spillage was associated with a higher SSI rate and longer hospital stay in another study.[12] In our study the SSIs among bile spillage was only 10.9% in contrast to 8.9% among the non-bile spillage group, that is SSIs in bile spillage were higher than non-bile spillage group. But, there was no significant association between SSIs and bile spillage.

SSIs are a significant postoperative complication that can result in considerable morbidity and mortality. The use of prophylactic antibiotics for various clean-contaminated surgical procedures is commonly used to reduce the risk of postoperative infective complications.[4] In our study, SSI was identified among 9.1% while the rate of SSIs among bile spillage and non-bile spillage groups was 10.9% and 8.3% respectively. There was no significant association between SSIs and bile spillage.

Elective LC has a low risk for postoperative infectious complications; still, most clinicians use persistent post-operative prophylactic antibiotics.[11] In a study, almost 50% received antibiotic treatment while the rates of infectious complications were comparable among patients receiving antibiotic agents or no antibiotic agents (8% vs. 9%). It was concluded that antibiotics after the spill of bile and spill of gallstones do not reduce the risk of overall infectious complications.[3] In our study, the overall use of post-operative antibiotics was observed among half of the patients. Among the bile spillage and non-bile spillage groups, the post-operative antibiotics were received by 58.2% and 43.9% of patients respectively.

Cefazolin was the most common antibiotic agent used for pre-operative prophylaxis. Metronidazole with a cephalosporin was the combination most used when an antibiotic agent was prescribed after the spill of bile or stones.[3] In our study, ceftriaxone was used most commonly as pre-operative prophylaxis while a combination of both cephalosporin and metronidazole was used mostly for postoperative prophylaxis.

An Indian study concluded that a single dose of ceftriaxone at the time of induction is adequate prophylaxis following elective LC and routine continued administration of antibiotics should be abandoned as it contributes to adverse reactions, drug resistance, and unnecessary financial burden.[11] Another study has concluded that single-dose antibiotic use is sufficient to prevent infectious complications in patients who had an iatrogenic perforation of the gallbladder during LC. Adding intravenous and/or oral antibiotics does not contribute to the prevention of infective complications in these patients.10 In our study too, all of them received a single dose of pre-operative prophylactic antibiotics..

Limitations of the study:
The limitation is that this study was conducted in only one health care setting. Because of the small sample size, the findings of this study may not be generalizable to other settings. Also confounding factors like co-morbidities, duration of surgery, intraoperative management of bile spillage and experience of surgeons were not addressed.

Conclusion

The prevalence of bile spillage during LC was higher when compared to other national and international studies. However, the rate of SSIs among bile spillage was lower. Bile spillage during LC doesn't cause SSIs post-operatively and use of postoperative antibiotics among bile spillage patients doesn't prevent SSI during elective LC thus use of antibiotics in such cases should be limited.

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