ORIGINAL ARTICLE

Evaluation of port site infection following laparoscopic cholecystectomy for gallstones

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Abstract

Biliary spillage in laparoscopic cholecystectomy can occur during separation of the gall bladder from liver bed or during forced extraction of gall bladder from trocar site. A study outlining port site infection in laparoscopic cholecystectomy patients who had biliary spillage has not been performed in our general population. This study would provide knowledge, ideas and protocols that may have important role in the laparoscopic management of gallstones.

Aims and Objectives: To determine the frequency of port site infection and to compare the frequency of port site infection following laparoscopic cholecystectomy with and without intra-operative biliary spillage.

Material and Methods: This descriptive study was conducted in patients admitted at Department of General Surgery at PAEC General Hospital, Islamabad for laparoscopic cholecystectomy, full filling the study criteria were enrolled in the study. All patients underwent laparoscopic cholecystectomy and were followed for 30 days post-laparoscopic cholecystectomy for the assessment of port site infection as per operational definition.

Results: The frequency of port site infection was 13(10.0%), involving epigastric port in 11(8.5%) and umbilical port in 2(1.5%) of the patients. The frequency of port site infection was higher in patients who had biliary spillage in comparison to those who had no biliary spillage (52.6% vs 2.7%, p-value <0.001).

Conclusion: This study highlights the association between biliary spillage during laparoscopic cholecystectomy and an increased risk of port site infection.

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Introduction:

Laparoscopic cholecystectomy has become the standard treatment for symptomatic cholelithiasis.[1] Multiple clinical trials have marked it as a safe procedure despite there being the ever present risk of the biliary tree injury.[2,3]

Laparoscopic cholecystectomy is often compared with open cholecystectomy which has been known to be linked with a higher occurrence of iatrogenic gall bladder perforation.[4] The protracted outcome of spilled bile and gallstones are unknown.[5]

Gall bladder rupture leading to biliary spillage can occur during any step of laparoscopic cholecystectomy, especially during separation of the gall bladder from liver bed or during forced extraction of gall bladder from trocar site.[3] When this occurrence takes place, lavage of the operative area is done with saline and salvage of as many gallstones as possible, is done. Biliary spillage due gall bladder rupture can lead to complications such as port site infection or adhesions.[5]

Causative factors leading to wound infection in traditional open cholecystectomy have been broadly studied upon and observed in various studies,[6] though the same cannot be said for laparoscopic cholecystectomy which has not been thoroughly assessed or observed in the same

capacity.

In a study by Alam et al., 108 patients underwent laparoscopic cholecystectomy. A total of 12(11.1%) patients developed port site infection.

Port site involved was epigastric in 7(6.5%) patients, followed by umbilical port in 5(4.6%) patients.[7] Al-Naser et al performed laparoscopic cholecystectomy in 889 patients. The port site -infection rate in their study was 4.5%, higher rates were observed in male patients (8.9%), in acute cholecystitis (10.4%), when spillage of bile, stones or pus occurred (30%), and at epigastric port (80%).[8]

A study outlining port site infection in laparoscopic cholecystectomy patients who had biliary spillage has not been performed in our general population.

This study would provide knowledge, ideas and protocols that may have important role in the laparoscopic management of gallstones. We wanted to know our own experience regarding the intraoperative rupture of gall bladder leading to port site infection during laparoscopic cholecystectomy.

Aim and Objectives:

1. To determine the frequency of port site infection following laparoscopic cholecystectomy.

2. To compare the frequency of port site infection following laparoscopic cholecystectomy with and without intra-operative biliary spillage.

Material and Methods:

Study design: Descriptive study.

Setting: Department of General Surgery at Pakistan Atomic Energy Commission (PAEC) General Hospital, Islamabad.

Duration of study: 01st October, 2022 to 31st March 2023.

Sample Size: Sample size was 130, calculated by WHO calculator 1.1 with the following assumptions.

a. Confidence Level = 95%

b. Anticipated population proportion = 11.1%[7]

c. Absolute Precision required = 5.5%

Sampling Technique: Non probability consecutive sampling.

Inclusion criteria is age: 18-65 years. Both genders undergoing laparoscopic cholecystectomy.

Exclusion criteria: Tenderness in right hypochondrium, increased by deep inspiration on physical examination. Diabetes on the basis of history. Immunosuppression on the basis of history. Cardiac disease on the basis of history.

The above conditions may act as confounders, and if included may introduce bias in the study results.

Data collection procedure: This study was performed after approval from CPSP and permission from the hospital ethical committee. Patients admitted at Department of General Surgery at PAEC General Hospital Islamabad for laparoscopic cholecystectomy, full filling the study criteria were enrolled in the study.

Strict exclusion criteria were followed to control bias in the study. Written informed consent was taken from all the patients. At study entry, baseline data such age and gender were recorded. All patients underwent laparoscopic cholecystectomy under general anesthesia by a consultant general surgeon having at least 2 years' experience in general surgery. All patients were followed for 30 days post-laparoscopic cholecystectomy for the assessment of port site infection as per operational definition.

Data analysis: Data were analyzed with statistical analysis program (IBM-SPSS version 22. Frequencies and percentages were computed for categorical variables like gender, infected port site, gall bladder rupture and port site infection. Mean±SD were computed for quanti-

Table 1: Descriptive statistics for quantitative variable i.e., age range: 18-65 years

Variable	N	SD	Mean
Age (years)	130	46.68	12.09

Table 2: Descriptive statistics for qualitative variable

Variable		Frequency	Percentage
Gender	Male	30	23.1%
	Female	100	76.9%
Age (years)	<50	79	60.8%
	>50	51	39.2%
Billiary spillage	No	111	85.4%
	Yes	19	14.6%
Port site infection	No	117	90.0%
	Yes	13	10.0%
Infected port site	None	117	90.0%
	Epigastric	11	8.5%
	Umblical	02	1.5%
	Subcostal	0	0.0%

Table 3: Stratification of port site infection by gender, age, biliary spillage and infected port site

		Port Site Infection		p-value
Variable		**No**	**Yes**	
Gender	Male	27(90.0%)	3 (10.0%)	1.000
	Female	90(90.0%)	10 (10.0%)	
Age (years)	< 50	70 (88.6%)	9 (11.4%)	0.510
	> 50	47 (92.2%)	4 (7.8%)	
Biliary Spillage	No	108 (97.3%)	3 (2.7%)	0.000
	Yes	9 (47.4%)	10 (52.6%)	
Infected port site	None	117 (100.0%)	0 (0.0%)	0.000
	Epigastric	0 (0.0%)	11 (100.0%)	
	Umbilical	0 (0.0%)	2 (100.0%)	
	Subcostal	0 (0.0%)	0 (0.0%)	

tative variables like age. Frequency of port site infection was stratified with regards to age, gender, infected port site and gall bladder rupture. Post stratification Chi square test was applied to see effect of these, keeping p-value < 0.05 as significant. Frequency of port site infection was also compared between patients with and without biliary spillage by applying Chi square test, keeping p-value < 0.05 as significant. All the data were presented in the form of tables and graphs.

Results:

This descriptive study was performed in Department of General Surgery at Pakistan Atomic Energy Commission (PAEC) General Hospital, Islamabad.

A total of 130 patients who underwent laparoscopic cholecystectomy were enrolled in this study to determine the frequency of port site infection. Descriptive statistics for quantitative variable (age) are shown in table 1. The mean age of the patients was 46.68±12.09 years with an age range of 18-65 years. Descriptive statistics for qualitative variables are shown in table 2. Gender distribution showed that 30(23.1%) were male patients and 100(76.9%) were female patients. Age distribution showed that 79(60.8%) patients were < 50 years old and 51(39.2%) patients were > 50 years old. Biliary spillage was observed in 19(14.6%) patients. The frequency of port site infection was 13(10.0%), involving epigastric port in 11(8.5%) of the patients and umbilical port in 2(1.5%) of the patients.

Stratification of port site infection frequency is shown in table 3. Stratification of port site infection frequency by age and gender yielded insignificant results. Stratification of port site infection frequency by biliary spillage yielded significant results. The frequency of port site infection was higher in patients who had biliary spillage during laparoscopic cholecystectomy in comparison to those who had no biliary spillage (52.6% vs 2.7%, p-value <0.001). Stratification of port site infection frequency by infected port site also yielded significant results. Frequency of port site infection was higher in epigastric port in comparison to umbilical and subcostal ports (8.5% vs 1.5% vs 0%, p-value < 0.001).

Discussion:

The standard treatment for symptomatic cholelithiasis is laparoscopic cholecystectomy.[1] Despite the constant risk of biliary tree injury, numerous clinical investigations have certified it as a safe operation.[2,3] During any stage of a laparoscopic cholecystectomy, particularly when the gall bladder is being driven out of the trocar site or separated from the liver bed, there is a risk of gall bladder rupture and biliary spillage.[3] As soon as this happens, the surgical site is lavaged

with saline and as many gallstones as feasible are salvaged.

Ruptures of the gall bladder can cause biliary leakage, which might result in adhesions or port site infection.[5] There are proven risk factors for increased incidence of SSI, including higher ASA grades,[9-11] emergency operations,[12] known diabetic status,[13-16] acute cholecystitis,[9,12-15] and intra-operative bile leakage.[12]

Additionally, studies have shown that a body mass index (BMI) of more than 30kg/m^2 increases the risk of SSI following laparoscopic cholecystectomy.[17] Females constituted nearly 77% of our study population. Many previous studies have shown that female gender is a risk factor for cholelithiasis.[18-20]

The present study aimed to determine the frequency of port site infection in patients undergoing laparoscopic cholecystectomy. The frequency of port site infection was 10.0%. Shakya et al.[21] had 4% SSI rates; Kaya et al.[22] reported 1.6%. In our study, the population consisted primarily of low-to middle-class families with crowded housing and inadequate sanitation, which could account for some of the greater frequency of port site infections. Although the gallbladder extraction procedure should have required the use of end bags, the majority of our patients come from lower socio-economic strata, and these are expensive and difficult to obtain. All the same, this study brought attention to our institution's higher infection rates following laparoscopic cholecystectomy, requiring the use of disposable ports subsequently.

The frequency of biliary spillage in our study was 14.6%. We found that port site infection was significantly higher in patients who had biliary spillage during laparoscopic cholecystectomy. This suggests that biliary spillage may be a risk factor for port site infection. Similar observation was reported by den Hoed et al.[12] Our investigation revealed that the epigastric port had a greater frequency of port site infections, which is consistent with earlier studies.[21,23,24] Because the umbilical port is often overlooked during bathing, it is thought of as "dirty" and may be at higher risk of infection. But our research did not allow us to come to this conclusion. We extracted gall bladder specimens through the epigastric ports in all of our patients which could be a possible explanation for the higher rates of infections in epigastric ports in the current study.

The single-center design of our study was one of its main drawbacks. Multicenter studies are needed to determine the frequency of port site infection in patients undergoing laparoscopic cholecystectomy. Our study's maximum follow-up time was one month, which would not have been sufficient to provide meaningful insight into the rates of port site infection and its consequences.

Conclusion:

This study highlights the association between biliary spillage during laparoscopic cholecystectomy and an increased risk of port site infection.

Additionally, the location of the port site itself plays a significant role, with the epigastric port demonstrating a higher susceptibility to infection compared to other sites. These findings emphasize the importance of careful surgical technique to minimize biliary spillage and proper post-operative care, especially for patients undergoing laparoscopic cholecystectomy to reduce the risk of port site infections.

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Role and contribution of authors:

Ayesha Saeed, collected the data, references and did the initial writeup, and also helped in result writing.

Sharmeen, helped in collecting the data and also helped in introduction writing, discussion.

Rizwan Ahmed Khan, helped in collecting the references and also helped in abstract writing.

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