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FREQUENCY OF PORT SITE INFECTION IN LAPAROSCOPIC CHOLECYSTECTOMY AFTER GALLBLADDER REMOVAL WITH ENDOBAG

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ABSTRACT:

Background: Laparoscopic cholecystectomy is a minimally invasive procedure for gallbladder removal. Surgeons commonly use retrieval bags such as endogloves for gallbladder extraction to prevent surgical site contamination from bile or stone spillage. Port-site infection is a potential complication and this study aimed to determine its frequency when using an endobag.

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Methods: This descriptive case series was conducted at the Department of General Surgery, LRH, Peshawar, from May 25, 2022, to November 25, 2022. A total of 172 patients with cholecystitis aged 18–60 years were included. Gallbladders were extracted using endogloves through an umbilical incision. Patients were followed-up for 30 days to document port-site infections according to a predefined operational definition.

Results: The mean age of patients was 42.145±6.91 years, with a mean duration of complaints of 6.127±2.10 months and a mean procedural duration of 51.494±15.37 minutes. The study included 40.1% male and 59.9% female patients. Port-site infections occurred in 6.4% of patients.

Conclusions: The use of surgical gloves as retrieval bags for gallbladder extraction during laparoscopic cholecystectomy is a safe, cost-effective, and simple technique that significantly reduces morbidity.

KEYWORDS: Cholecystitis, Laparoscopic cholecystectomy, Endobag, Port site infection, Gallbladder extraction, Minimally invasive surgery.

INTRODUCTION

Since its introduction in the 1990s, laparoscopic cholecystectomy has become the standard approach to gallbladder resection.(1) This surgical procedure, characterized by its minimal invasiveness, involves removal of the gallbladder through small openings, providing a less invasive option than conventional open surgery. This technique is effective in addressing various conditions, including chronic or acute cholecystitis, symptomatic gallstones, biliary dyskinesia, acalculous cholecystitis, gallstone pancreatitis, gallbladder cancer, and polyps, all of which can be treated with open cholecystectomy.(2) Nevertheless, open surgical approaches are primarily used when gallbladder cancer is detected.

Approximately 20 million Americans are annually affected by gallstones, resulting in a significant number of cholecystectomies. Research indicates that while 10–15 percent of the gallstone-affected population remains asymptomatic, approximately 20% of these individuals experience biliary colic. In the group exhibiting symptoms, 1–4% of patients present with various complications, such as acute cholecystitis, pancreatitis, and certain bile duct abnormalities.(3) Compared with men, females are more susceptible to developing gallstones, with age being one of the contributing factors. Among women aged 50–65 years, 20% and

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5% of men are estimated to develop gallstones, respectively. Cholesterol constituted the largest proportion of stones (75%), with 25 percent being pigmented.(4) Regardless of the underlying cause, physical symptoms of the disorder are generally similar.

Potential complications include tissue damage to the surrounding areas, bleeding, and development of infection.(5) Post-surgical bleeding from the liver is common because of its nature as the body's most extensively vascularized organ. Consequently, skilled surgeons who are familiar with typical blood vessel patterns encounter significant blood loss during the procedure. Adverse outcomes included inadvertent injury to the common bile duct or hepatic duct during the surgery.(6) Injury to these two structures could necessitate an additional operation to divert bile directly into the intestinal system. Such procedures typically require the expertise of a hepatobiliary surgeon with specialized training.(6)

During surgical procedures, efforts are made to prevent bile and stone spillages from contaminating the operative area. Surgeons aim to avoid rupturing the gallbladder while detaching it from the liver bed and extracting it from the peritoneum. Depending on the surgeon's assessment, a retrieval bag may be used to extract the gallbladder through an incision made using a trocar.

Research conducted by La Regina et al. revealed that surgical port-site infections following laparoscopic cholecystectomy, a procedure involving gall bladder removal over the endobag using extended ablation techniques, occurred at a rate of 4.2%.(7)

Multiple factors contribute to the development and spread of infection after surgery. Researchers have explored various approaches for addressing these infections. However, there is the risk of overreliance on antibiotics as a universal solution, which can lead to their excessive and inappropriate use, resulting in the emergence of antibiotic-resistant microorganisms. This study focuses on cost-effective methods and techniques for specimen collection from a local population. This study aimed to evaluate the frequency of infection at port sites after laparoscopic cholecystectomy, a procedure in which the gallbladder is extracted using an endobag.

Objective:

To determine the frequency of port site infections in laparoscopic cholecystectomy after gallbladder removal using an endobag.

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Material and Methods:

Study design: Descriptive Case Series.

Setting:

Department of General Surgery, LRH, Peshawar.

Duration of study:

This study was conducted from 25th May 2022 to 25th November 2022.

Sample size: 172

The sample size was calculated by the WHO sample size software using a 95% confidence interval, 3% margin of error, and expected frequency of port site infection in laparoscopic cholecystectomy after gallbladder removal by 4.2% with Endobag.7

Sampling technique:

Non-probability consecutive sampling

Inclusion Criteria:

- Age 18 to 60 years
- Both gender
- Cholecystitis as per operational definition

Exclusion Criteria:

- Acute cholecystitis confirmed by ultrasonography abdomen
- Empyema or mucocele gallbladder
- Patients with deranged liver function tests

Data Collection Procedure:

Patients who met the inclusion criteria were admitted to the Department of General Surgery, LRH, Peshawar, Brazil. Demographic data and history were relevant to the duration of complaints, sex, and duration of the procedure. Written informed consent was obtained from all patients after approval from the hospital's ethics committee.

All patients were administered ceftriaxone (1 g) at the time of induction and two doses were administered at an interval of 12 h. After laparoscopic cholecystectomy, the laparoscope was placed through the epigastric port and the endogloves through the umbilical port. The gallbladder was removed using endogloves through an umbilical incision. All patients were

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followed for 30 days, and port site infection was noted according to the operational definition and recorded on a specially designed proforma.

Data Analysis:

Data were analyzed using a statistical analysis program (SPSS:V25). Frequencies and percentages were computed for qualitative variables such as sex and port-site infection. The mean ±SD was presented for quantitative variables such as age, duration of complaints, and duration of the procedure. Portsite infections were stratified according to age, sex, duration of complaints, and duration of the procedure. A post-stratification chi-square test was applied, and statistical significance was set at $p \leq 0.05$.

RESULTS:

Age range in this study was from 18 to 60 years with mean age of 42.145±6.91 years, mean duration of complaints 6.127±2.10 months and mean duration of procedure was 51.494±15.37 minutes as shown in Table-I.

The proportions of male and female patients were 40.1% and 59.9%, respectively (Table II).

Port site infection was observed in 6.4% of the patients (Table III).

The stratification of port site infection with respect to age, sex, duration of complaints, and duration of the procedure is shown in Tables IV, V, VI, and VII, respectively.

Table- I: Mean±SD of patients according to age, duration of complaints and duration of procedure

n=172

Demographics		**Mean±SD**
1	Age(years)	42.145±6.91
2	Duration of complaints (months)	6.127±2.10
3	Duration of Procedure (mins)	51.494±15.37

Table- II: Frequency and %age of patients according to gender

n=172

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Gender		Frequency	%age
	Male	69	40.1%
	Female	103	59.9%
	Total	172	100%

Table- III: Frequency and %age of patients according to port site infection n=172

Port Site Infection		Frequency	%age
	Yes	11	6.4%
	No	161	93.6%
	Total	172	100%

Table- IV: Stratification of Port Site Infection with respect to age.

Age (years)		Port Site Infection		p-value
		Yes	No	
	18-40	3(6.1%)	46(93.9%)	0.926
	41-60	8(6.5%)	115(93.5%)	
Total		11(6.4%)	161(93.6%)	

Table- V: Stratification of Port Site Infection with respect to gender.

Gender		Port Site Infection		p-value
		Yes	No	
	Male	8(11.6%)	61(88.4%)	0.023
	Female	3(2.9%)	100(97.1%)	
Total		11(6.4%)	161(93.6%)	

Table- VI: Stratification of Port Site Infection with respect to duration of complaints.

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Duration of complaints (months)	Port Site Infection		p-value
	Yes	No	
1-6	5(5.2%)	92(94.8%)	0.449
>6	6(8%)	69(92%)	
Total	11(6.4%)	161(93.6%)	

Table- VII: Stratification of Port Site Infection with respect to duration of procedure.

Duration of procedure (mins)	Port Site Infection		p-value
	Yes	No	
≤60	1(0.9%)	111(99.1%)	0.000
>60	10(16.7%)	50(83.3%)	
Total	11(6.4%)	161(93.6%)	

Discussion:

All surgical interventions have inherent risks and complications. A recent innovation in this field is the advent of laparoscopic and minimally invasive surgery. Extensive studies have shown a decrease in the occurrence of port site infections and other wound-related issues following laparoscopic procedures. As this less invasive surgical approach becomes more widespread, the problem of dislodged gallstones is becoming increasingly prevalent owing to the higher likelihood of bile spillage during laparoscopic surgery than during traditional open surgery.(8)

Prior research indicates that particular circumstances increase the risk of gallbladder rupture during laparoscopic cholecystectomy. Patients with acute inflammation of the gallbladder have fragile tissues that can easily be torn. The presence of thick adhesions encircling the gallbladder may complicate dissection. Furthermore, a distended, pressurized gallbladder that has not undergone decompression is at higher risk of perforation.(9,10)

Gallstone spillage typically occurs during laparoscopic procedures when surgical instruments manipulate the gallbladder or when they are separated from the liver bed. Additionally, stones may spill if the clip on the cystic duct becomes loose, or if the gallbladder tears while being removed through the surgical port.(11)

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Individuals with wound infections may experience abdominal discomfort, which may or may not be accompanied by peritoneal irritation. These patients may also exhibit symptoms, such as nausea, vomiting, or loss of appetite. In some cases, the patients develop empyema or persistent fistulas that fail to heal.(12) The ambiguous nature of the symptoms often results in diagnostic challenges, as they frequently resemble those of more common disorders that cannot be distinguished solely through clinical history and physical assessment.

Abscess formation, a potential complication of laparoscopic cholecystectomy, has been reported to develop over a broad time span, occurring as early as 4 days after surgery and as late as 10 years after the procedure.(13) While previously thought harmless, lost gallstones are now recognized as a minor but notable cause of postoperative complications (0.08–0.3%).(14) The manifestation of these issues varies among patients, largely depending on the location and nature of complications. Common symptoms include abdominal discomfort, elevated body temperature, abdominal masses, intestinal blockage, and occurrence of sinus infections or fistulas.(13)

Our research demonstrated that utilizing an endobag was more effective in preventing wound infections. The traditional method of gallbladder removal is associated with a higher infection rate, as evidenced by studies showing 11 cases (6.4%) of infection, particularly in infected patients and those with comorbidities. In contrast, only 0.20% of cases in which the gallbladder was placed in surgical gloves experienced complications. Various standard endobags are commercially available for gallbladder extraction, offering safety but at a high cost.

Although these bags are safe for preventing contamination during gallbladder removal, their high cost is a significant drawback. Being single-use and disposable increases the financial burden on both the patients and hospitals. In our country, a cost-effective approach that is both convenient and safe should be adopted. Infected gallbladders should be removed using an endobag to prevent wound infection and stone spillage, and to address potential occult malignancies.

In this study, gallbladders were successfully retrieved from the abdominal cavity using an improvised 'endobag' made from a simple surgical glove, costing only Fifteen rupees compared to five to ten thousand rupees for commercial bags. These improvised endogloves

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offer several benefits: they are easy to create, sterile, economical, readily available, disposable, provide ample space for specimen manipulation, and minimize contamination risk throughout the procedure. We suggest this approach for routine use when retrieving gallbladders from the abdomen after liver bed dissection.

All the specimens were successfully retrieved without bag rupture or slippage. The use of a cuffed surgeon's glove with cut-off fingers and a transfixation suture through the metacarpal headline as a gallbladder receptacle in laparoscopic surgery has numerous advantages. Raj et al. and our team have found it not only economical, but also readily available and suitable for this task.(15) We conclude that the resilient circular rim of the cuff tends to remain open once introduced into the subhepatic space, facilitating easier gallbladder insertion.

Conclusion:

Our study concluded that using a surgical glove as an improvised endobag for gallbladder extraction during laparoscopic cholecystectomy was safe, cost-effective, and straightforward. This technique significantly reduces morbidity owing to the prevention of bile and stone spillage, minimized bacterial contamination, and risk of dissemination of malignant cells in cases of unsuspected gallbladder carcinoma. Their low cost and efficacy make them practical alternatives to commercial endobags, particularly in resource-limited settings.

Declarations

Data Availability statement

All data generated or analyzed during the study are included in the manuscript.

Ethics Approval and Consent to Participate

Ethical approval for this case report was obtained from the Ethical Board of the Lady Reading Hospital/Medical Teaching Institute, ensuring compliance with ethical standards and patient rights. Ref: No. 349/LRH/MTI.

Consent for Publication

Written informed consent was obtained from the participants.

Competing Interests

The authors declare that they have no competing interests.

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Author Contributions

1. Dr Waseem Ullah: Conceived the study idea, designed the methodology, and supervised the entire research process.
2. Dr Faseeh Muhammad: Patient recruitment, data collection, and ethical compliance.
3. Dr Muhammad Daud: Performed data analysis and statistical interpretation and contributed to the formulation of the results.
4. Dr. Muneeb Ur Rehman: Assisted in the study design and critically reviewed the manuscript for clinical relevance.
5. Dr AahanAttaullah: Managed patient follow-up and ensured the accuracy of clinical documentation.
6. Dr. Fazal Ahmad: Reviewed the literature and Finalized it.

   All authors reviewed and approved the final manuscript and took responsibility for its contents.

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