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Original Article

Comparative Study of Port Site Infection Rate in Laparoscopic Cholecystectomy during Removal of Specimen with or without Using Endobag in a Medical College Hospital

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Abstract

Background: *Port Site Infection (PSI) remains an important complication following laparoscopic cholecystectomy, particularly during gallbladder specimen retrieval. The role of endobag use in reducing infection, especially in cases with gallbladder perforation and bile spillage, is still debated.*

Objective: *To compare the rate of port site infection during gallbladder specimen removal with and without the use of an endobag in laparoscopic cholecystectomy.* ***Methods:*** *This prospective randomized comparative study was conducted in the Department of Surgery at Kumudini Women's Medical College from October 2024 to October 2025. A total of 56 patients undergoing elective laparoscopic cholecystectomy were included and divided into two groups: Group A (non-perforated gallbladder retrieval without endobag) and Group B (perforated gallbladder retrieval with endobag), each containing 28 patients. Statistical analysis was performed using SPSS version 26.* ***Results:*** *The mean age of patients was 41.4 ± 10.2 years. Female predominance was observed (80.4%). Port site infection occurred in 3.6% of Group A and 14.3% of Group B. Bile spillage was significantly higher in Group B (39.3%) compared to Group A (7.1%), and was significantly associated with port site infection (p=0.012). Mean hospital stay was longer in Group B.* ***Conclusion:*** *Port site infection is significantly associated with gallbladder perforation and bile spillage during specimen retrieval. Although endobag use is common in perforated cases, infection risk remains higher in these patients. Careful surgical technique to prevent perforation is crucial in reducing postoperative infection.*

Key words*: Laparoscopic cholecystectomy, port site infection, endobag, bile spillage, gallbladder perforation, surgical site infection.*

Introduction: Laparoscopic cholecystectomy (LC) is considered the gold standard treatment for symptomatic gallstone disease and chronic calculous cholecystitis because of its minimal invasiveness, shorter hospital stays, reduced postoperative pain, faster recovery, and improved cosmetic outcomes compared with open cholecystectomy.[1] Despite these advantages, laparoscopic procedures are not entirely free from complications, among which port site infection (PSI) remains an important postoperative concern. PSI can increase patient morbidity, prolong hospital stay, raise healthcare costs, and reduce patient satisfaction following surgery.[2]

Port site infection after LC usually occurs due to contamination of the extraction port during gallbladder retrieval. During removal of the gallbladder specimen, bile spillage, infected bile, gallstones, pus, or contact of the inflamed gallbladder with the wound edges may lead to bacterial contamination of the trocar site.[3]

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The umbilical and epigastric ports are the most commonly affected sites because they are frequently used for specimen extraction. Risk factors associated with PSI include acute cholecystitis, gallbladder perforation, obesity, diabetes mellitus, prolonged operative time, intraoperative bile spillage, and improper sterilization techniques.[3,4]

To reduce wound contamination during specimen retrieval, various extraction devices such as commercially available endobags, sterile surgical gloves, improvised plastic bags, and indigenous retrieval systems have been introduced. The endobag acts as a protective barrier between the gallbladder specimen and the abdominal wall during extraction, thereby reducing contamination of the port site.[1,5] However, routine use of endobags remains controversial because of increased operative cost, additional operative time, technical difficulties during extraction, and the requirement of enlargement of the fascial incision in some cases.[6]

Several studies have attempted to compare the incidence of PSI following gallbladder retrieval with and without the use of an endobag. A prospective comparative study by Vergadia et al. demonstrated that the incidence of port site infection was lower in patients where an endobag was used compared to direct extraction without a bag.[7] Similarly, Bharath et al. reported that gallbladder retrieval without an endobag was associated with higher rates of bile and stone spillage, which subsequently increased the risk of postoperative wound infection.[8]

Conversely, some authors have questioned the routine necessity of retrieval bags in uncomplicated elective LC. Majid et al. found that omission of the retrieval bag did not significantly increase wound infection rates in uncomplicated cases, while reducing postoperative pain and minimizing the need for enlargement of the extraction incision.[1] A meta-analysis by La Regina et al. also concluded that current evidence does not strongly support the routine use of retrieval bags solely for prevention of wound infection in elective LC. Therefore, the decision to use an endobag often depends on surgeon preference, intraoperative findings, availability of resources, and institutional protocols.[9]

In developing countries and resource-limited medical college hospitals, the additional expense of commercial endobags may not always be affordable. Consequently, many surgeons continue to retrieve the gallbladder directly through the port site without protective devices. Although this approach reduces procedural cost, concerns remain regarding increased rates of PSI and wound contamination. Since postoperative wound infection negatively affects recovery and patient outcomes, identifying a cost-effective and safe retrieval technique is clinically important.[10]

Recent studies conducted in Asian populations have shown varying frequencies of PSI following LC, indicating that local surgical practices, sterilization standards, patient factors, and retrieval methods may influence infection rates.[8] However, limited data are available from medical college hospitals comparing the incidence of port site infection during specimen retrieval with and without the use of an endobag.

Therefore, the present study aims to compare the rate of port site infection in patients undergoing laparoscopic cholecystectomy during gallbladder specimen removal with and without the use of an endobag in a medical college hospital. The findings of this study may help determine whether routine use of an endobag is beneficial in reducing postoperative wound infection and improving surgical outcomes in laparoscopic cholecystectomy.

Objectives

The main objective was to compare the rate of port site infection in patients undergoing laparoscopic cholecystectomy during gallbladder specimen removal with and without the use of an endobag in a Medical College Hospital.

Methodology & Materials

This prospective study was conducted in the Department of Surgery at Kumudini Women's Medical College over a period of two years from October 2024 to October 2025. The study was designed to compare the rate of port site infection in laparoscopic cholecystectomy during removal of gallbladder specimens with or without the use of an endobag.

A total of 56 patients undergoing elective laparoscopic cholecystectomy for symptomatic gallstone disease were included in the study. Patients fulfilling the inclusion and exclusion criteria were enrolled after obtaining informed written consent. The patients were randomly allocated into two groups, each consisting of 28 patients.

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- **Group A**: Non-perforated gallbladder retrieval without endobag
- **Group B:** Perforated gallbladder retrieval with endobag

All operations were performed under general anesthesia using the standard four-port laparoscopic cholecystectomy technique. In Group A, the gallbladder specimen was removed directly through the epigastric or umbilical port without perforation and without the use of an endobag. In Group B, where intraoperative gallbladder perforation occurred with bile or stone spillage, the specimen was retrieved using a sterile endobag to minimize wound contamination and port site infection.

Perioperative precautions including irrigation and suction of spilled bile or stones were undertaken where necessary. Standard aseptic techniques and prophylactic antibiotics were used in all patients according to departmental protocol.

Inclusion Criteria

1. Patients diagnosed with symptomatic cholelithiasis planned for elective laparoscopic cholecystectomy
2. Patients aged above 18 years
3. Patients willing to participate in the study and provide informed consent

Exclusion Criteria

1. Patients with acute cholecystitis, empyema gallbladder, or gallbladder malignancy
2. Patients with uncontrolled diabetes mellitus
3. Immunocompromised patients
4. Patients requiring conversion to open cholecystectomy
5. Patients with pre-existing port site or skin infection
6. Patients unwilling to participate in the study

Data were collected using a structured data collection sheet. Demographic characteristics, operative findings, duration of surgery, gallbladder perforation, bile spillage, method of specimen retrieval, and postoperative complications were documented. Particular attention was given to the development of port site infection.

Patients were followed up during the postoperative hospital stay and subsequently on the 7th and 14th postoperative days. Port site infection was diagnosed clinically by the presence of pain, redness, swelling, tenderness, discharge, or pus formation at the trocar site. Ethical approval for the study was obtained from the Ethical Review Committee of Kumudini Women's Medical College. Confidentiality of patient information was maintained throughout the study.

Statistical Analysis: All data were recorded systematically in preformed data collection form and quantitative data was expressed as mean and standard deviation and qualitative data was expressed as frequency distribution and percentage. Statistical analysis was carried out by using Statistical analysis was done by using SPSS (Statistical Package for Social Science) Version 23. A p-value of less than 0.05 was considered statistically significant. Confidentially was strictly maintained.

Age Group (Years)	Group A n (%)	Group B n (%)
20–30	5 (17.9)	4 (14.3)
31–40	8 (28.6)	9 (32.1)
41–50	10 (35.7)	8 (28.6)
51–60	4 (14.3)	5 (17.9)
>60	1 (3.6)	2 (7.1)
Mean ± SD	41.4 ± 10.2	

Table 1 shows the age distribution of the study population. The majority of patients in both groups belonged to the 41–50 years age group, comprising 35.7% in Group A and 28.6% in Group B. The mean age of the study population was 41.4 ± 10.2 years**.**

Figure 1: Gender Distribution of the Study Population (n=56)

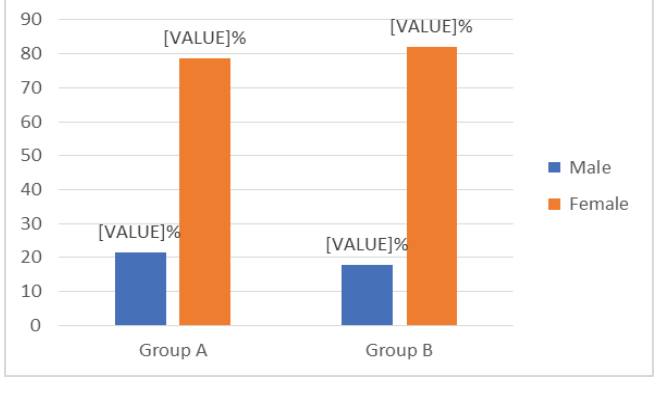

Figure 1 demonstrates the gender distribution of the study participants. Females were predominant in both groups, accounting for 78.6% in Group A and 82.1% in Group B.

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Table 2: Operative Findings and Postoperative Outcomes (n=56)

Variables		Group A (n=28)	Group B (n=28)	p-value
Mean duration of surgery (minutes)		48.6 ± 8.4	58.2 ± 10.1	<0.05
Bile spillage	Present	2 (7.1%)	11 (39.3%)	<0.05
	Absent	26 (92.9)	17 (60.7)	
Port site infection	Present	1 (3.6%)	4 (14.3%)	<0.05
	Absent	27 (96.4)	24 (85.7)	
Mean hospital stay (days)		2.1 ± 0.6	3.0 ± 0.9	<0.05

s= significant

Table 2 presents the operative findings and postoperative outcomes among the study groups. The mean duration of surgery was higher in Group B (58.2 ± 10.1 minutes) compared to Group A (48.6 ± 8.4 minutes). Bile spillage and port site infection were more common in Group B than Group A, and the differences were statistically significant (p<0.05). The mean hospital stay was also longer in Group B.

Table 3: Clinical Features of Port Site Infection (n=5)

Clinical Features	Frequency	Percentage (%)
Redness	5	100%
Pain/Tenderness	4	80%
Swelling	3	60%
Serous discharge	2	40%
Pus discharge	1	20%

Table 3 illustrates the clinical features of port site infection. Redness was present in all infected cases (100%), followed by pain/tenderness (80%), swelling (60%), serous discharge (40%), and pus discharge (20%).

Table 4: Association Between Bile Spillage and Port Site Infection (n=56)

Bile Spillage	Port Site Infection Present n (%)	Port Site Infection Absent n (%)	P-value
Present	4 (30.8%)	9 (69.2%)	0.012
Absent	1 (2.3%)	42 (97.7%)	

s= significant

Table 4 shows the association between bile spillage and port site infection. Port site infection occurred more frequently in patients with bile spillage (30.8%) compared to those without bile spillage (2.3%). This association was statistically significant (p=0.012).

Table 5: Overall Postoperative Complications (n=56)

Complications	Group A (n=28)	Group B (n=28)
Port site infection	1 (3.6%)	4 (14.3%)
Fever	2 (7.1%)	3 (10.7%)
Port site pain	4 (14.3%)	7 (25.0%)
Seroma	1 (3.6%)	2 (7.1%)
No complications	20 (71.4%)	12 (42.9%)

Table 5 demonstrates the overall postoperative complications between the two groups. Port site infection, fever, port site pain, and seroma were more frequent in Group B, whereas the majority of patients in Group A had no postoperative complications.

Discussion

Laparoscopic cholecystectomy is currently regarded as the gold standard treatment for symptomatic gallstone disease because of its minimal invasiveness, reduced postoperative pain, shorter hospital stays, and faster recovery. However, port site infection remains an important postoperative complication that may increase patient morbidity and prolong recovery. The present prospective study was conducted to evaluate the rate of port site infection during gallbladder specimen retrieval with or without the use of an endobag in laparoscopic cholecystectomy. In the present study, the mean age of the study population was 41.4 ± 10.2 years, and the majority of patients belonged to the 41–50 years age group. This finding is consistent with previous studies where gallstone disease was more prevalent in middle-aged adults. A recent observational study from Bangladesh reported a mean age of 41.6 years among patients undergoing LC, which closely resembles the current findings.[11] Similar findings were reported by Bharath et al., where most patients were in the fourth and fifth decades of life. Female predominance was observed in both groups in the current study, accounting for 80.4% of the total population. This observation is consistent with previous studies conducted by Vergadia et al., Bharath et al., and Maharjan et al., who also reported higher prevalence of gallstone disease among females. The increased incidence in females may be related to hormonal influences, obesity, and dietary factors.[7,8,12] The present study demonstrated that the mean duration of surgery was higher in Group B (58.2 ± 10.1 minutes) compared to Group A (48.6 ± 8.4 minutes), which was statistically significant. Similar observations were reported by Bharath et al., where operative time was slightly prolonged in casesrequiring endobag retrieval.[8] The increased operative duration in perforated gallbladder cases may be due to bile spillage, suction-irrigation procedures, and careful retrieval using an endobag. Bile spillage was significantly more common in Group B (39.3%)

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compared to Group A (7.1%) in the present study. Gallbladder perforation and bile leakage are recognized risk factors for postoperative wound infection. Comparable findings were reported by Vergadia et al. who found increased wound contamination in patients with gallbladder perforation and stone spillage.[7] La Regina et al. also emphasized that contamination during gallbladder extraction may contribute to postoperative surgical site infection.[9] Similar observations were reported in the recent Nepalese study, where spillage of bile, pus, or stones during LC increased the frequency of port site infection. The rate of port site infection in the current study was higher in Group B (14.3%) compared to Group A (3.6%), and the difference was statistically significant. Similar results were observed by Bharath et al., who reported increased port site infection in patients undergoing conventional extraction without adequate protective retrieval methods.[8] Vergadia et al. also reported reduced port site infection rates with the use of endobag-assisted retrieval.[9] Ullah et al. demonstrated that the use of endobags significantly minimized wound contamination and postoperative infection during gallbladder retrieval.[14] In the present study, redness was the most common clinical manifestation of port site infection, followed by pain, swelling, and serous discharge. Similar clinical features were documented in studies conducted by Maharjan et al.[13] These symptoms are typical indicators of superficial surgical site infection following laparoscopic procedures. A statistically significant association was found between bile spillage and port site infection (p=0.012) in the present study. Patients with bile spillage showed markedly higher infection rates than those without spillage. This finding supports the observations of Majid et al., who identified gallbladder perforation and infected bile as major contributors to wound contamination.[1] Similarly, Sood et al. reported that reducing contamination during gallbladder retrieval decreases postoperative wound infection and port site morbidity.[15] The present study also demonstrated longer hospital stay in Group B compared to Group A. Increased postoperative complications and wound-related morbidity may explain the prolonged hospitalization. Comparable findings were reported by Bharath et al. and Fajardo Gómez et al., who found that infectious complications contribute to delayed recovery after laparoscopic cholecystectomy.[8,16] Although several studies support the routine use of endobags, some authors have questioned their necessity in uncomplicated laparoscopic cholecystectomy. Majid et al. concluded that specimen retrieval without an endobag may be safe in selected uncomplicated cases.[1] Likewise, the meta-analysis by La Regina et al. suggested insufficient evidence to recommend mandatory routine use of retrieval bags in all elective laparoscopic cholecystectomy cases.[9] However, the present study indicates that in perforated gallbladder cases with bile spillage, the use of an endobag may reduce wound contamination and postoperative port site infection. Port site complications may also depend on the extraction site. Anand et al. and Sood et al. reported that epigastric port retrieval may reduce the risk of infection and port site hernia compared to umbilical extraction.[15,17] Another systematic review by Hajibandeh et al. demonstrated similar findings regarding reduced postoperative morbidity with appropriate specimen retrieval techniques.[18] The findings of the current study are particularly important in resource-limited settings such as medical college hospitals in Bangladesh, where cost-effective surgical practice is essential. Although commercial endobags increase procedural expenses, their selective use in perforated gallbladder cases may help minimize postoperative complications and improve patient outcomes.

Limitations of the study

The present study had certain limitations. The sample size was relatively small, and the study was conducted in a single center. Furthermore, long-term follow-up for late port site complications such as incisional hernia was not assessed. Larger multicenter studies with longer follow-up periods are recommended to further validate these findings.

Conclusion

This prospective study demonstrates that port site infection remains an important postoperative complication following laparoscopic cholecys tectomy, particularly in cases associated with gallbladder perforation and bile spillage during specimen retrieval. In this study, the overall incidence of port site infection was higher in patients where gallbladder retrieval was associated with perforation and use of an endobag compared to non-perforated cases without endobag use. The findings also indicate that bile spillage is significantly associated with an increased risk of port site infection, highlighting its role as an important intraoperative risk factor. Patients with bile spillage showed a higher rate of wound contamination and postoperative infection compared to those without spillage. Additionally, operative time and hospital stay were relatively longer in the group with perforated gallbladder retrieval.

Although port site infection occurred in both groups, the overall complication profile was more favorable in non-perforated cases. These results emphasize the importance of careful surgical technique to avoid gallbladder perforation and minimize bile spillage during specimen retrieval. The selective use of an endobag in difficult or perforated cases may help reduce contamination and improve postoperative outcomes.

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In conclusion, meticulous operative technique and prevention of gallbladder perforation are key factors in reducing port site infection after laparoscopic cholecystectomy. The use of an endobag may be beneficial in selected high-risk cases, particularly when gallbladder perforation or bile spillage occurs during specimen extraction.

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