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RESEARCH ARTICLE
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IMPACT OF ENDOGLOVES ON PORT SITE INFECTION RATE IN LAPAROSCOPIC CHOLECYSTECTOMY

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ABSTRACT

Background: Laparoscopic cholecystectomy is the most common procedure performed to rectify Cholecystitis or Cholelithiasis. In laparoscopic cholecystectomy, four small incisions made in the anterior abdominal and gallbladder containing stones is removed. But there are chances of port site infection. Endogloves have been introduced to reduce the chance of infection

Methodology: A Quasi experimental study was done at Services Hospital, Lahore from July 2019 to Jan 2020, after approval from ethical review board of institute. A sample size of 360 cases was calculated by EpiInfo (7.2.5) with 160 cases each in group A (with endogloves) and group B (without endogloves). Patients were randomly divided into two groups by using lottery method. In group A, patients underwent laparoscopic cholecystectomy by using endogloves. In group B, patients underwent conventional laparoscopic cholecystectomy without endogloves. After surgery, patients were shifted to post-surgical wards and were discharged from there after 24 hours. Then patients were followed-up in OPD for 7 days. Wound site was evaluated for presence or absence of port site infection. All this information will be recorded on proforma. Data was analyzed in SPSS 26 to calculate means and standard deviations for age, BMI, and symptom duration, and frequencies for gender and port site infection. A chi-square test was conducted for port site infection, with significance set at $p \leq 0.05$.

Results: In endogloves group, the mean age of patients was 50.29±15.78 years and without endogloves group was 50.44±15.05 years. The port site infection was found in 1 (0.6%) patient with endogloves while in 12 (7.5%) without endogloves. Significant difference has been obtained between both groups ($P<0.05$).

Conclusion: This study showed that the use of endogloves during laparoscopic surgery significantly reduces the port site infection as compare to without endogloves laparoscopic surgery.

Keywords: Endogloves, Port site infection, Laparoscopy, Cholecystectomy.

INTRODUCTION

Laparoscopic cholecystectomy has been introduced as the surgical treatment of cholelithiasis. It has provided many advantages over traditional open cholecystectomy.(1) However, despite its minimal invasiveness there are postoperative complications. Either these are superficial or deep complications, which may include tissue injury, organ injury, vascular injury, air embolism. The post operative

complications include emphysema, port-site infection (PSI), although rare, but can still occur. PSI can lead to prolonged hospital stay, increased healthcare costs, and patient discomfort.
The laparoscopic cholecystectomy is now being done with endogloves to decrease the incidence of port site infection. It is a novel surgical technique in which the sterile gloves is inserted into the trocar cannula during laparoscopic surgery. This technique aims to minimize the risk of PSI by creating a sterile barrier between the surgeon's hand and the abdominal cavity.(2) Studies have shown that mean duration of surgery with and without endo-bag was significantly reduced ($p<0.05$). The pain intensity and the incidence of infection in the first two weeks after surgery were less, but no association was determined directly.(3)

The efficacy of endogloves in reducing PSI, has been explored in various surgical specialties. Still there is a lack of conclusive evidence specifically in laparoscopic cholecystectomy. This study aims to address this gap by comparing the incidence of PSI in patients undergoing laparoscopic cholecystectomy with and without the use of endogloves.
By determining the impact of endogloves on PSI rates, this study will help in optimizing surgical techniques and minimizing postoperative complications. This information can help surgeons make informed decisions about the use of endogloves in their practice, to prevent the complications and improve the patient outcome.

LITERATURE REVIEW

Laparoscopic surgeries, while offering numerous advantages, have been associated with complications, due to abdominal access via laparoscopic trocars. These complications can include visceral and vascular injuries, air embolism, subcutaneous emphysema, port-site infections, incisional hernia, and even postoperative metastasis.(4)
Laparoscopic cholecystectomy has become the global standard for treating symptomatic gallstone disease. Traditionally, this procedure involved four ports. However, a growing trend towards minimizing the number and size of port sites has emerged, with several studies reporting positive outcomes.(5)

The primary goal of laparoscopy is to reduce surgical trauma by using a minimally invasive technique, leading to decreased postoperative pain and improved cosmetic outcomes.(6, 7) Among general surgeons, the globally favored laparoscopic method for cholecystectomy is the 4-trocar technique. This method generally involves the use of two trocars, typically 5 to 10 mm in size, with placement varying depending on the specific approach employed.(8)

Common complications of laparoscopic cholecystectomy include bile leakage, injury to the common bile duct, bleeding, retained gallstones, and wound infections.(9) Although these complications and their risk factors have been widely researched, there is limited analysis focused on the risk factors for perioperative complications within the modern setting of an Acute Care Surgery (ACS) service, which operates under a team-based model with rotating primary surgeons. (10) While laparoscopic surgery offers numerous advantages, such as reduced postoperative pain, faster mobilization, quicker return to work, and minimal scarring, it also carries risks, including postoperative surgical site infections.(11) PSI can lead to increased pain and prolonged hospital stays, adding to the hospital staff's workload and reducing the cost-effectiveness of this minimally invasive approach. According to the Centers for Disease Control and Prevention (CDC), surgical site infections are classified into two categories: incision-site and organ-space infections. Incision-site infections are further divided into "superficial," affecting only the skin and subcutaneous tissue, and "deep," involving the fascia and muscle layers. In our study on PSI following laparoscopic cholecystectomy, only the incisional category was considered and applied.(12)

Wound infection remains one of the most frequent complications associated with nearly all open surgeries, and this risk extends to laparoscopic procedures as well. Although port site infections are

less common in laparoscopic surgeries, they can still lead to adverse outcomes and heightened morbidity.(13)
The complications due to surgical procedure is minimal as compare to the open cholecystectomy, but these complications can still be avoided by using advance techniques. The laparoscopic cholecystectomy with endoglove has reduced the chance of port site infection as observed in certain clinical trials. (14)

METHODOLOGY

A Quasi experimental study was conducted in Surgical unit at Services Hospital, Lahore from July 2019 to Jan 2020, after taking ethical approval from IRB of Institute. A sample size of 320 was calculated by Epi Info(7.2.5) with 160 cases in group A receiving endogloves and 160mcases in group B without endogloves. Inform consent was obtained and patients who fulfilled the inclusion criteria were recruited through convenient sampling technique. Patients of age range 18-75 years of either gender undergoing elective laparoscopic cholecystectomy for cholelithiasis and cholecystitis were included. Demographics including name, age, gender, BMI and duration of symptoms were recoded. Patients were randomly divided in two groups by using lottery method. In group A, patients underwent laparoscopic cholecystectomy by using endogloves. In group B, patients underwent conventional laparoscopic cholecystectomy without endogloves. All surgeries were done by a single senior surgeon having at least 4 years residence experience with assistance of researcher. All surgeries were done under general anesthesia. After surgery, patients were shifted in post-surgical wards and were discharged from there after 24 hours. Then patients were followed-up in OPD for 7 days. After 7 days, wound site was evaluated for presence or absence of port site infection. All this information was recorded on proforma.

Data was analyzed using SPSS 26. Where Mean and standard deviation were determined for quantitative variables like age, BMI and duration of symptoms. Frequency and percentage was given for qualitative variables like gender and port site infection. Chi square test was applied to both groups for port site infection. P-value ≤ 0.05 was taken as significant.

RESULTS

In this study the mean age of patients in group A was 50.29±15.78 years and in group B, mean age was 50.44±15.05years. The age range was 25-75 years in both groups. In group A there were 72 males while 88 females. In group B, there were 79 males while 81 females as shown in figure 1.
The mean BMI of patients was 27.27±5.51kg/m² in group A and in group B, mean BMI was 27.92±4.98kg/m2. The BMI range was 19.10-37.05kg/m2 in both groups this is shown in table 1.
The mean duration of symptoms was 5.69±2.72 years in group A mean duration of symptoms was 5.71±2.87years in group B. The duration of symptoms ranged from 1year to 10 years in both groups. Port site infection developed in 13 (4.1%) patients, out of which 1 (0.6%) patients from group A while 12 (7.5%) were from group B. A significant difference has been observed between both groups for port site infection i.e. p-value=0.002.
Data was stratified for age. In patients aged 25-40 years, no infection observed in group A while in 4 patients infection occurred in group B. In patients aged 41-55 years, with endogloves, infection observed in 1 patients while without endogloves, in 2 patients ($p>0.05$). In patients aged 56-75 years, with endogloves, no infection observed while without endogloves, in 6 patients infection occurred.
In male patients, no infection observed in group A while in group B, 3 patients developed infection ($p>0.05$). In female patients, with endogloves, infection observed in 1 patients while without endogloves, in 9 patients.
In normal BMI patients, with endogloves, infection observed in 1 case while without endogloves, in 3 patients. In obese patients, with endogloves, no infection observed while without endogloves, in 8 patients. In morbidly obese patients, with endogloves, no infection observed while without endogloves, in 1 patient infection occurred.

Data was stratified for duration of symptoms. With duration 1-5 years, with endogloves, no infection observed while without endogloves, in 5 patients infection occurred. With duration 6-10 years, with endogloves, infection observed in 1 patients while without endogloves, in 7 patients. The association of port site infection in group A and B are shown in table 2.

Table 1: Descriptive statistics of Body mass index in groups with and without Endogloves

BMI (Kg/m2)	Groups	
	With endogloves	**Without endogloves**
n	**160**	**160**
Mean	27.27	27.92
SD	5.41	4.98
Minimum	19.10	19.10
Maximum	37.05	37.05

Table 2: Association of Factors with port site infection in patients undergoing laparoscopic cholecystectomy with and without endogloves.

Factor	**Endogloves (Group A)**	**Without Endogloves (Group B)**	**P-Value**
Age 25-40 years	0%	2.50%	<0.05
Age 41-55 years	0.63%	1.25%	>0.05
Age 56-75 years	0%	3.75%	<0.05
Male Patients	0%	1.88%	>0.05
Female Patients	0.63%	5.63%	<0.05
Normal BMI	0.63%	1.88%	>0.05
Obese	0%	5%	<0.05
Morbidly Obese	0%	0.63%	>0.05
Duration 1-5 years	0%	3.13%	<0.05
Duration 6-10 years	0.63%	4.38%	<0.05

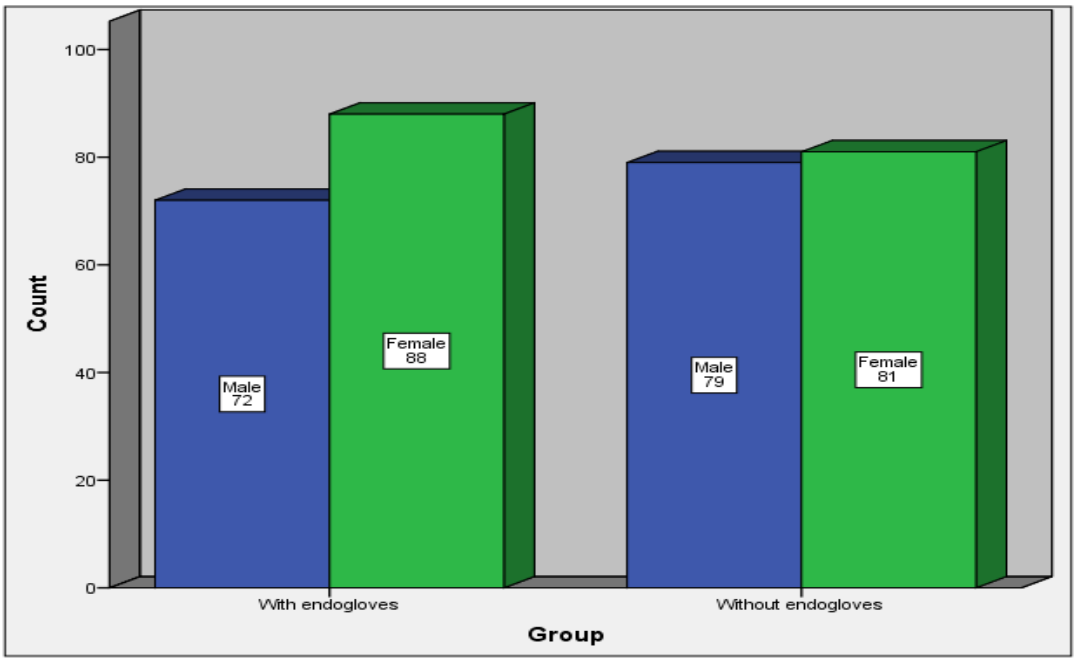

Figure 1: Frequency distribution of genders in groups with and without endogloves.

DISCUSSION

In this study, we assessed the role of EndoGloves in reducing port site infections among patients undergoing laparoscopic cholecystectomy. Patient demographics, including age and body mass index (BMI), were comparable between the two groups, which ensures that the results are not influenced by these variables. Group A, had a mean age of 50.29 years and mean BMI of 27.27 kg/m². In comparison group B the mean age was 50.44 years and mean BMI of 27.92 kg/m². This similarity in baseline characteristics supports the reliability of infection rate comparisons between groups. The surgical procedure and port site infection are more in this age due to other co morbid conditions. As in another study conducted by Q.A. Jan, et. al. the mean age was 48 years with SD ± 18.66.(15)

The primary finding from this study is a significant reduction in port site infections among patients in Group A. Only 0.6% (1 out of 163) of patients in the EndoGlove group developed an infection, while 7.5% (12 out of 159) of patients in the control group experienced port site infections. The statistical analysis revealed a highly significant difference between the two groups, with a p-value of 0.002, underscoring the potential of EndoGloves to reduce the risk of post-surgical infections at port sites. Our findings aligns with previous study where the difference in infection rates between the two groups was statistically significant (p=0.031).(1, 16)

In another study there were 5.28% of patients who underwent removal without endoglove developed an infection as compare to 0.20% of patients in whom gall bladder was removed with an endoglove.(17)

This difference highlights the clinical value of using EndoGloves in laparoscopic cholecystectomy. The use of a barrier device, like EndoGloves, appears to reduce the likelihood of port site contamination, likely by limiting direct contact with tissues and bodily fluids during instrument insertion and withdrawal. Given the implications of port site infections for patient recovery, including the need for additional interventions, prolonged hospital stays, and potential complications, implementing EndoGloves could contribute to improved patient outcomes and reduced healthcare costs.

CONCLUSION

Our findings suggest that EndoGloves are an effective preventive measure against port site infections in laparoscopic cholecystectomy. This study provides a rationale for the routine use of EndoGloves, potentially setting a new standard for infection control practices in minimally invasive surgery. Further research could build on these findings by exploring the effectiveness of EndoGloves in other laparoscopic procedures and assessing long-term patient outcomes.

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