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Gallbladder Specimen Retrieval: Assessing Outcomes with Epigastric and Umbilical Ports

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ABSTRACT

Background
This study compares the outcomes of gallbladder removal using epigastric versus umbilical port placements in laparoscopic cholecystectomy. The objective is to evaluate differences in surgical efficacy, patient recovery, and cosmetic results between these two port locations.

Methods
A retrospective analysis was conducted involving 200 patients who underwent laparoscopic cholecystectomy with either an epigastric or umbilical port placement for gallbladder extraction. Patient demographics, postoperative pain, scarring, postoperative infection, port site hernia, requirement of analgesia, retrieval difficulty and cosmetic outcomes were assessed. The epigastric port group involved placing the extraction port in the epigastric region, while the umbilical port group utilized the umbilicus for gallbladder removal.

Results
The study included a total of 200 patients, with 100 patients in each group. The analysis revealed that both techniques were effective in performing laparoscopic cholecystectomy with similar operative times and low conversion rates. Data from both the groups were collected and analyzed. The average age of the patients was 44.52 years in group A and 44.52 years in group B with male to female ratio of approximately 1:2 in both groups. The visual analog scale (VAS) for pain showed an average of 2.3 in group A and 4.3 in group B with post-operative port site infections which were observed to be 1% in group A and 3% in group B. The incidence of port site hernia was found to be 1% in group A and 4% in group B. In 64% of patient of group A and 88% of patients in group B there was no scarring noted post operatively. Cosmetic outcomes were better in group B with 97% being satisfied as compared to only 90% of the patients in group A. Requirement of analgesia was found to be higher in group A than group B. There was a higher retrieval difficulty in the cases of umbilical port(group B).

Conclusion
Gallbladder removal via the epigastric port in laparoscopic cholecystectomy offers advantages over the umbilical port approach in terms of postoperative pain, surgical site infection, port site hernia, retrieval time, and patient satisfaction. Both techniques are safe and effective; however,

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the umbilical port placement may provide superior results in minimizing visible scars and cosmetic outcomes. Future studies with larger sample sizes and long-term follow-up are recommended to confirm these findings and further evaluate the benefits of port placement techniques.

Keywords: Laparoscopic cholecystectomy, gallbladder removal, umbilical port, epigastric port, postoperative recovery, cosmetic outcomes.

INTRODUCTION

Laparoscopic cholecystectomy is the most common general surgical procedure performed worldwide as it is minimally invasive with shorter hospital stay and faster return to normal activities. Laparoscopic cholecystectomy, first introduced in the late 1980s, represents a significant advancement in the field of abdominal surgery. E Muhe of Boblingen, Germany carried out the first laparoscopic cholecystectomy in 1985. Dr Tehemton Erach Udwadia carried out the first laparoscopic cholecystectomy in India in May 1990. The prevalence and incidence of gallstones were 6.1%, and 0.47 per 100 person-years, respectively, and that gallstone frequency increases with age. Gallstone disease is widespread, with over 700,000 cholecystectomies performed annually in the U.S., resulting in costs around $6.5 billion. The prevalence is particularly high among American Indians, where 60-70% are affected, while it is notably lower among Hispanics of mixed Indian heritage. In developed countries, about 10-15% of white adults have gallstones. The condition is less common in Black Americans, East Asians, and people from sub-Saharan Africa.

In developed nations, cholesterol gallstones are the most common type, with 15% being black pigment stones. East Asians, on the other hand, often develop brown pigment stones in the bile ducts, which are linked to biliary infections or parasites, or in the intrahepatic ducts (hepatolithiasis). This procedure involves the use of a laparoscope—a thin, flexible tube equipped with a camera and light source—along with specialized surgical instruments. The laparoscope is inserted through small incisions in the abdominal wall, allowing the surgeon to view the internal structures on a monitor and perform the operation with precision. Post-operative pain after laparoscopic cholecystectomy arises due various reasons like incision pain, insufflation of co2 gas, stretching of abdominal muscles, gas retention, and referred pain due to diaphragmatic irritation, hematoma and bruising. Pre-operative patient education, use of local anesthesia at incision sites, transverse abdominal blocks, minimizing residual gas insufflation, usage of post-operative antibiotics and aseptic dressing might reduce post-operative pain, infection and discomfort. In laparoscopic cholecystectomy either of these ports is used to extract gall bladder specimen. We undertook this study to compare post-operative pain, infection, scar, cosmetic outcome, port site hernia, retrieval difficulties and usage of analgesia while retrieval of gall bladder via epigastric versus umbilical port.

MATERIALS AND METHODS

This Prospective study was conducted in Siva Hospital, Nagercoil, Kanyakumari district on 200 patients for a period of 1 year from December 2022 to December 2023, who underwent standard laparoscopic cholecystectomy using four ports and its retrieval by either umbilical or epigastric port .

Inclusion Criteria

- All patients between the age group of 20 years to 70 years

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- All patients who are planned for elective laparoscopic cholecystectomy

Exclusion criteria

All patients with coagulopathies, gallbladder malignancy, renal failure, complicated cholelithiasis, pancreatitis, bile duct involvement, and unwilling patients.

Data Collection Procedure

These patients were included in the study and divided into two groups. 100 patients, in whom gall bladder retrieval was done via epigastric port, were designated as Group A and the other 100 patients in whom gall bladder retrieval was done via umbilical port were designated as Group B. on regular post-operative follow up they were examined clinically and outcomes were analysed.

Statistical Analysis

The data was collected, analyzed and fed in SPSS(Statistical package for social analysis) software for statistical analysis. Detailed statistical analysis was done including percentage, frequency and the results were tabulated.

RESULTS

Among 200 patients in our study survey, 70(35%) patients of the total population fall under the age group of 20- 40 years, 135(65%) of the total population fall under the age group of 40-70 years. Of this, group A comprised of 21 male and 79 females and group B comprised of 19 males and 81 females and 6 in group II. The patients were randomly selected in the operation theatre for gall bladder extraction via epigastric port (designated as group A with n = 100 patients) and gall bladder extraction via umbilical port (designated as group B with n = 100 patients). In the current study age, sex and the site of retrieval of gall bladder were documented in Table-1. Post-operative pain score, post-operative wound infection and port site hernia were documented and analyzed for each group. Post-operative pain was calculated using Visual Analog Scale (VAS), documented as Table-2. Each group was given intravenous paracetamol infusion 1g every 8^{th} hourly as post-operative analgesia. Intravenous Tramadol was used as an additional analgesic in a dose of 1mg/kg every 8^{th} hourly was given in patients with significant pain of VAS 5 or more. Post-operative port site pain was assessed for every patient of both the groups at 1, 6, 12, 24 hours with a visual analog scale ranging from 0 to 10. Our study showed a contrast result a trial performed by Hajibandeh S, Hajibandeh S, Clark MC, Barratt OA, Taktak S, Subar D, Henley N[(1)] and Siddiqui NA, Azami R, Murtaza G, Nasim S[(2)] in which post-operative pain is higher among patients in whom gall bladder was retrieved via epigastic port. Post-operative wound infection was analyses in each group in Table-3. Check dressing was done post-operatively on day 2 in each group. In presence of wound infection i.e. serosanguineous discharge with presence of pus during the initial dressing, a swab culture or discharge fluid is sent for pus culture for antibiotic sensitivity and specificity and were treated accordingly. According to a study performed by Sasmal PK, Mishra TS, Rath S, Meher S, Mohapatra D[(3)] post-operative wound infection is frustrating to both the patient and doctor. It can be avoided by strictly following the commandments of cleaning and sterilizing the laparoscopic instruments with proper sterilizing agents. Post-operative port site hernia have been monitored in each patient for duration of 1 year and recorded accordingly. Patients in whom gall bladder was retrieved from

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the umbilical site have 3% incidence of port site hernia. 36% of the patients developed scarring after retrieval of gall bladder through epigastric port whereas 12% of the patients developed scarring after gall bladder removal through umbilical port. Patients with extraction of gall bladder via umbilical port have 99% better cosmetic outcome.

Our study denotes that the mean age of patients in group A was 44.52 while in group B is 44.54 years. The female to male ratio is 2:1 in each group.

Variables		**Group A**	**Group B**
No. of Patients		100	100
Age	Range (years)	20-70	20-70
	Mean age	44.52	44.54
Sex	Male	21 (21%)	19 (19%)
	Female	79 (79%)	81 (81%)
Table-1 Comparison between baseline variables			

In group A mean VAS score is 2.3 and in group B it is 4.6, with significant P value <0.05.

Variables	**Group A(Epigastric port)**	**Group B(Umbilical port)**
Mean Vas	2.3	4.6
Table-2 Post-operative pain scale after removal of gall bladder via epigastric vs. umbilical port		

Post-operative wound site infection in group A is 1% whereas in group B is 3%.

Variables	**Group A(epigastric port)**	**Group B(Umbilical port)**
Port site infection	1 (1%)	3(3%)
Table-3 Postoperative port site infection after gall bladder retrieval via epigastric and umbilical ports		

In group A 1% of the patients developed post-operative port site hernia whereas in Group B 4% developed post-operative port site hernia.

Variables	**Group A(Epigastric port)**	**Group B(Umbilical port)**
Hernia	1(1%)	4(4%)
Table 4 Post-operative port site hernia in epigastric vs umbilical ports		

In group A 36% of the patients noted scarring post operatively whereas in group B only 12% noted scarring.

Variables	**Group A (Epigastric port)**	**Group B(Umbilical port)**
Scarring	**36%**	**12%**
Cosmetic outcomes	**90%**	**99%**
Table 5 Post-operative scarring and cosmetic outcomes in epigastric vs umbilical ports		

DISCUSSION

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Laparoscopic cholecystectomy stands out as a highly effective and minimally invasive technique for treating gallbladder conditions. Its primary advantages over traditional open surgery include reduced postoperative pain, shorter recovery time, minimal scarring, and a quicker return to normal activities. This procedure is particularly indicated for managing symptomatic gallstones, acute or chronic cholecystitis, choledocholithiasis, gallbladder polyps, and in some cases, gallbladder cancer.

The choice between the two methods depends on various factors including the size of the gallbladder, the patient's anatomy, the desired cosmetic outcomes, and the surgeon's preference. Each method has its benefits and potential drawbacks, and the decision should be based on the specific circumstances of the surgical procedure and the patient's needs.

In the present study, age was evenly distributed in each groups is 35+_9. 25 in group A and 34+_10.22years in group B (44.52 years in group A and 44.54 years in group B). This mean age resembled close to the study based on Anand et al[(4)]. So age is considered to be an important risk factor for asymptomatic cholelithiasis. The likelihood of finding asymptomatic gallstones rises with age, often due to incidental findings during imaging for unrelated issues or routine screenings. The prevalence in older adults can range from 10% to 20%, reflecting a higher incidence in this age group. Age-related chronic conditions such as diabetes mellitus and hyperlipidemia are significant risk factors for gallstone formation. These conditions can alter bile composition and gallbladder function, promoting stone development. Aging affects gallbladder motility, leading to bile stasis and an increased risk of stone formation. Additionally, biliary sludge, which can precede gallstone formation, is more common in older individuals. Hormonal shifts, particularly during menopause, can influence the risk of gallstones. Estrogen therapy used in postmenopausal women also contributes to this risk. Obesity, prevalent in older adults and rapid weight loss can both increase the risk of gallstones. Obesity is associated with higher cholesterol levels in bile, while rapid weight loss can lead to increased cholesterol saturation and decreased gallbladder motility. Dietary patterns in older adults, such as low fiber intake and high consumption of cholesterol-rich foods, contribute to gallstone formation.

Female population is at a higher risk of developing asymptomatic cholelithiasis both in India and around the world. In the present study, female population or sex were at an increased risk of developing asymptomatic cholelithiasis than males. They constituted 79% of the study population in group A and 80% of the study population in group B. Female-specific risk factors for cholelithiasis include hormonal influences, reproductive history, obesity, dietary habits, and certain medical conditions. Estrogen, whether from hormonal therapy, oral contraceptives, or pregnancy, plays a significant role in increasing the risk of gallstones. According to a study performed by Stinton LM, Shaffer EA[(5)]. one of the non-modifiable risk factor for gall stone disease is female gender with increasing age.

Additionally, obesity, weight fluctuations, and lifestyle factors such as diet and physical activity further contribute to the risk. After laparoscopic cholecystectomy, patients may experience various types of pain including incisional pain around the surgical sites, referred pain in the shoulder due to diaphragm irritation, gas pain from residual carbon dioxide, muscular pain from strain during surgery, and potential postoperative adhesion pain. Biliary colic-like pain can occur if residual stones or bile duct irritation persists. Infections or complications may cause sharp, worsening pain around the incisions or within the abdomen.

Visual analog scale score ranges from 0 to 10 with 0 being no pain and 10 being the worst pain. In the current study, post-operative pain in terms of VAS in group A was 2.3 whereas in group B was 4.6. Post-operative pain was noted to be more in group B in our study. The study

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findings indicate that the epigastric port significantly reduces postoperative pain and improves extraction outcomes compared to other ports in laparoscopic cholecystectomy. Outcome i.e. postoperative port site pain was assessed with Visual Analog Scale (VAS) ranging from 0 to 10. Patients were educated about use of VAS preoperatively (either in clinic or in ward before surgery). Pain was assessed in every patient at both port sites at 1, 6, 12, 24 and 36 h postoperatively by a trained nurse who was blinded to the intervention. Our study showed similar results to a randomized controlled trial performed at Ann Ital Chir[6].

200 patients were randomized either into group A(n=100) i.e., GB removal through the epigastric or subxiphoid port or group B(n=100) i.e., GB removal through the umbilical port. The study has assessed that no surgical wound is immune to infections despite adequate antibiotics, sterilization and surgical techniques. Even though the incidence of Surgical site infections are lesser in laparoscopic cholecystectomy than open cholecystectomy, they prevail.

Umbilical port site infections occur in a small percentage of laparoscopic cholecystectomy cases, estimated to be around 1% to 5%. The incidence can vary based on surgical techniques, patient factors, and postoperative care. Spillage occurs in about 10% to 20% of cases, particularly when the gallbladder is inflamed or when stones are numerous or large. Spilled bile or stones can cause peritonitis, localized infections, adhesion formation, and extended recovery time. The endobag allows for the gentle and controlled extraction of the gallbladder, which can be particularly useful in cases where the gallbladder is inflamed or contains numerous stones.

In the current study, 3% of the study population in group B developed surgical site infection possibly due to contamination of the outer surface of the endobag, whereas epigastric port site infection is recorded to be 1%. The study showed similar results to a randomized trial performed by Sood S, Imisirovic A, Sains P, Singh kk, sajid Ms[7].

Port site hernia, while a rare complication of laparoscopic cholecystectomy, can occur due to factors such as inadequate closure, port size, and patient-specific conditions. Proper surgical technique, meticulous closure of port sites, and careful postoperative management are essential to minimize the risk. For symptomatic or complicated hernias, prompt surgical intervention is necessary to address and repair the hernia effectively. The umbilicus is usually considered a common site for acquired hernias in adults. Trocar site incisional hernia is an unusual complication after laparoscopic cholecystectomy, the incidence of which is reported to be approximately 1%-1.8%. Port site hernias after laparoscopic cholecystectomy can lead to serious complications including bowel obstruction, strangulation, infection, chronic pain, recurrence, and cosmetic concerns. Effective management involves prompt surgical intervention and preventive measures to minimize risk. In the current study, 4% of the study population belonging to Group B developed port site hernia whereas 1% of the study population of Group A developed hernia. Follow up of the patients were done for a period of 1 year post surgery. The mean time period for development of hernia in these patients were found to be 12 months. Our study showed similar results to a randomized trial performed by Kulkarni AA, Sharma G, Deo KB, Jain T[8] and Büyüker, F., Acar, M., Özsoy, M. S., Sermet, M., et al.[9].

The main weakness of the present study is that post-operative scar formation is more in group a than group B and shorter duration of follow up.

CONCLUSION

This study thus indicates that in laparoscopic cholecystectomy, gall bladder retrieval through the epigastric port is a better alternative to gall bladder retrieval via umbilical port in terms of post-

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operative pain, infection and hernia formation. Post-operative scar is found to be more with epigastric port, whereas umbilical port retrieval had better cosmetic outcome. This study has similar results as the study performed by Kaya C, Bozkurt E, Yazici P.[10]

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