Section: General Surgery

Original Research Article

COMPARATIVE STUDY OF PARAMETERS OF GALLBLADDER RETRIEVAL FROM EPIGASTRIC AND UMBILICAL PORT IN LAPAROSCOPIC CHOLECYSTECTOMY

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ABSTRACT

Background: Gallbladder retrieval is the final step of laparoscopic cholecystectomy and may influence postoperative outcomes such as pain, wound infection, incisional hernia, bleeding, and ease of extraction. The optimal retrieval port remains controversial, with both epigastric and umbilical ports commonly used in clinical practice. The objective is to compare the outcomes of gallbladder retrieval through the epigastric and umbilical ports during laparoscopic cholecystectomy in terms of ease of retrieval, retrieval time, postoperative pain, port-site bleeding, wound infection, and incisional hernia. **Materials and Methods:** A prospective comparative study was conducted among 60 patients undergoing elective laparoscopic cholecystectomy. Patients were divided into two equal groups according to the retrieval port used: Epigastric Port (n=30) and Umbilical Port (n=30). Outcomes assessed included ease of retrieval, retrieval time, postoperative pain using the Visual Analogue Scale (VAS), port-site infection, bleeding, incisional hernia, gallbladder rupture, and stone spillage. Statistical analysis was performed using the Chi-square test, Fisher's exact test, and independent samples t-test. **Results:** Gallbladder retrieval was rated as easy in 80% of patients in the epigastric group compared with 66.7% in the umbilical group, although the difference was not statistically significant (p=0.31). The mean retrieval time was significantly shorter in the epigastric group (6.8±1.9 minutes) than in the umbilical group (8.1±2.3 minutes; p=0.02). Postoperative pain at 6 hours and 24 hours was significantly lower in the umbilical group (VAS 4.8±1.0 and 3.8±1.0, respectively) compared with the epigastric group (VAS 5.9±2.1 and 4.9±1.1; p=0.001 for both). Cosmetic satisfaction was significantly higher in the umbilical group (4.4±0.7 vs. 3.6±0.9; p=0.001). Gallbladder rupture and stone spillage occurred only in the epigastric group (6.7% each), though these differences were not statistically significant. Rates of port-site infection, bleeding, and incisional hernia were comparable between groups. **Conclusion:** Both epigastric and umbilical ports are safe and effective options for gallbladder retrieval during laparoscopic cholecystectomy. The epigastric port offers faster retrieval and greater technical ease, whereas the umbilical port is associated with significantly lower postoperative pain, superior cosmetic satisfaction, and a trend toward fewer retrieval-related complications. Port selection should be individualized according to surgeon preference, patient characteristics, and operative findings.

INTRODUCTION

Laparoscopic cholecystectomy (LC) is the gold-standard treatment for symptomatic gallstone disease and is one of the most commonly performed surgical procedures worldwide. Compared with open cholecystectomy, LC offers several advantages, including reduced postoperative pain, shorter

hospital stay, earlier return to normal activities, and improved cosmetic outcomes.[1,2] Although the procedure has become highly standardized, certain technical aspects continue to vary among surgeons, particularly the choice of port used for gallbladder retrieval following completion of dissection.[3]

Gallbladder retrieval is the final step of LC and may significantly influence postoperative outcomes. Inappropriate extraction techniques can lead to bile spillage, port-site infection, postoperative pain, wound complications, incisional hernia, and increased operative time.[4,5] The gallbladder is commonly retrieved through either the umbilical or epigastric port, each having distinct advantages and limitations. Umbilical retrieval is often favoured because the scar is concealed within the umbilicus and the incision can be easily extended when required. However, concerns have been raised regarding higher rates of surgical site infection and incisional hernia due to the anatomical weakness and bacterial colonisation of the umbilical region.[6,7]

Conversely, retrieval through the epigastric port allows controlled extraction under direct vision and may reduce wound contamination and hernia formation. Nevertheless, manipulation of the rectus muscle and fascia may result in increased postoperative pain and less favourable cosmetic outcomes.[8,9] Several randomized controlled trials and comparative studies have investigated the relative merits of these two retrieval sites, but the findings remain inconsistent. While some studies have demonstrated lower postoperative pain with umbilical retrieval, others have reported reduced infection rates, shorter retrieval time, and lower hernia incidence with epigastric retrieval.[10-15] Recent systematic reviews and meta-analyses have similarly failed to establish a clear superiority of either approach.[16-18]

Given the conflicting evidence and the absence of universally accepted guidelines, further comparative evaluation is warranted. Therefore, the present study was undertaken to compare gallbladder retrieval through the epigastric and umbilical ports during laparoscopic cholecystectomy with respect to ease of retrieval, postoperative pain, wound infection, port-site bleeding, and incisional hernia.

MATERIALS AND METHODS

Study Design and Setting: This prospective comparative observational study was conducted in the Department of General Surgery, Teerthanker Mahaveer Medical College and Research Centre, Moradabad, Uttar Pradesh, India, after obtaining approval from the Institutional Ethics Committee.

Study Population: A total of 60 patients diagnosed with symptomatic cholelithiasis and scheduled for elective laparoscopic cholecystectomy were enrolled in the study. Written informed consent was obtained from all participants prior to surgery.

Inclusion and Exclusion Criteria

Patients aged ≥18 years with symptomatic gallstone disease undergoing elective laparoscopic cholecystectomy were included. Patients with acute cholecystitis, gallbladder malignancy, previous upper abdominal surgery, bleeding disorders, pregnancy, or conversion to open cholecystectomy were excluded from the study.

Group Allocation: Participants were divided into two groups according to the gallbladder retrieval port used. Group E comprised 30 patients who underwent gallbladder retrieval through the epigastric port, while Group U included 30 patients in whom retrieval was performed through the umbilical port.

Surgical Procedure: All patients underwent standard four-port laparoscopic cholecystectomy under general anaesthesia. Following complete dissection of the gallbladder from the liver bed, specimen retrieval was performed through the designated port. Standard perioperative antibiotic prophylaxis and postoperative care protocols were followed for all patients.

Data Collection

Data were collected using a predesigned structured proforma. Demographic and clinical characteristics were recorded preoperatively. Intraoperative variables included ease of gallbladder retrieval, retrieval time, gallbladder rupture, stone spillage, and port-site bleeding. Postoperative outcomes assessed included pain using the Visual Analogue Scale (VAS), wound infection, and incisional hernia during follow-up. Patients were monitored during hospital stay and at subsequent outpatient visits for evaluation of postoperative complications.

Outcome Measures

The outcomes assessed included ease of gallbladder retrieval, retrieval time, postoperative pain measured using the Visual Analogue Scale (VAS) at 6 hours and 24 hours, port-site bleeding, wound infection, gallbladder rupture during retrieval, stone spillage, cosmetic satisfaction, and incidence of incisional hernia during follow-up.

Statistical Analysis

Data were entered into Microsoft Excel and analysed using SPSS software version 26 (IBM Corp., Armonk, NY, USA). Categorical variables were expressed as frequencies and percentages and analysed using the Chi-square test or Fisher's exact test, as appropriate. Continuous variables were expressed as mean ± standard deviation (SD) and compared using the independent samples t-test. A p-value of <0.05 was considered statistically significant.

RESULTS

The baseline demographic characteristics, including age, gender distribution, and comorbidities, were comparable between the epigastric and umbilical groups. [Figure 1] indicating adequate homogeneity of the study population.

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Table 1: Comparison of Outcomes Between Epigastric and Umbilical Groups

Outcome Parameter	Epigastric (n=30)	Umbilical (n=30)	p-value
Ease of Access (Easy %)	24 (80%)	20 (66.7%)	0.31
Retrieval Time (minutes, Mean ± SD)	6.8 ± 1.9	8.1 ± 2.3	0.02*
Post-operative Pain (VAS 6 hrs, Mean ± SD)	5.9 ± 2.1	4.8 ± 1.0	0.001*
Post-operative Pain (VAS 24 hrs, Mean ± SD)	4.9 ± 1.1	3.8 ± 1.0	0.001*
Port-Site Infection	4 (13.3%)	1 (3.3%)	0.35
Incisional Hernia	1 (3.3%)	0 (0%)	1.00
Port-Site Bleeding	2 (6.7%)	1 (3.3%)	1.00
Stone Spillage	2 (6.7%)	0 (0%)	0.49
GB Rupture During Retrieval	2 (6.7%)	0 (0%)	0.49
Port-Site Pain	5 (16.7%)	1 (3.3%)	0.19
Cosmetic Satisfaction (Mean ± SD)	3.6 ± 0.9	4.4 ± 0.7	0.001*

*Statistically significant ($p<0.05$). Data are presented as n (%) or mean ± SD. VAS = Visual Analogue Scale; GB = Gallbladder; SD = Standard Deviation.

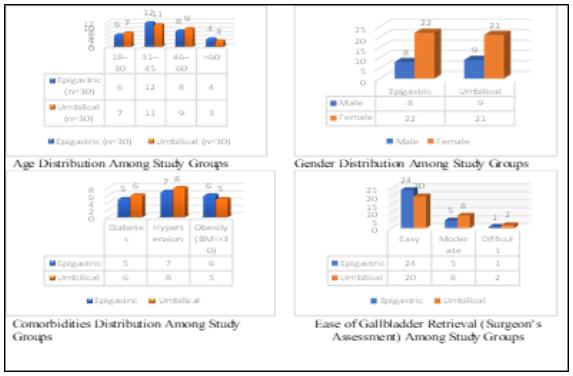

Figure 1: Comparison of Baseline Demographic Characteristics, Comorbidities, and Ease of Gallbladder Retrieval Between the Epigastric and Umbilical Port Groups

With respect to the primary study objective, gallbladder retrieval was assessed as easy in 80.0% of patients in the epigastric group compared with 66.7% in the umbilical group; however, the difference was not statistically significant (p=0.31). [Table 1, Figure 1] Retrieval time was significantly shorter in the epigastric group (6.8±1.9 minutes) than in the umbilical group (8.1±2.3 minutes; p=0.02), indicating greater procedural efficiency with the epigastric approach.

Postoperative pain scores were significantly lower in the umbilical group at both 6 hours (4.8±1.0 vs. 5.9±2.1; p=0.001) and 24 hours (3.8±1.0 vs. 4.9±1.1; p=0.001) compared with the epigastric group. Cosmetic satisfaction was also significantly higher among patients undergoing umbilical retrieval (4.4±0.7 vs. 3.6±0.9; p=0.001).

Regarding postoperative complications, port-site infection (13.3% vs. 3.3%), port-site bleeding (6.7% vs. 3.3%), incisional hernia (3.3% vs. 0%), port-site pain (16.7% vs. 3.3%), stone spillage (6.7% vs. 0%), and gallbladder rupture during retrieval (6.7% vs. 0%) were numerically more frequent in the epigastric group. However, none of these differences reached statistical significance (all p>0.05). Overall, the epigastric approach offered faster retrieval, whereas the umbilical approach was associated with significantly lower postoperative pain and better cosmetic satisfaction, with comparable complication rates between the two techniques.

DISCUSSION

The present prospective comparative study evaluated gallbladder retrieval through the epigastric versus umbilical port in patients undergoing elective laparoscopic cholecystectomy. The findings demonstrate that while both approaches are safe and feasible, each carries distinct advantages: the epigastric port affords greater speed and technical ease of extraction, whereas the umbilical port is associated with significantly lower postoperative pain and superior cosmetic satisfaction.

The finding of significantly shorter retrieval time with the epigastric approach (6.8±1.9 vs. 8.1±2.3 minutes; p=0.02) is consistent with several previous reports. The anatomically direct trajectory from the subhepatic space to the epigastric port may facilitate more straightforward extraction of the specimen, avoiding the acute angulation frequently encountered at the umbilical port.[10,11] Additionally, the firmer fascial support at the epigastric site permits better gripping and more controlled traction during retrieval.[12] Sundbom and Gustavsson similarly reported that the epigastric approach reduced operative time and facilitated specimen extraction, particularly for larger or thickened gallbladders.[13]

In the present study, retrieval was rated as easy in 80% of the epigastric group versus 66.7% of the umbilical group, a clinically meaningful but statistically non-significant difference (p=0.31). This trend favouring the epigastric approach may reflect the direct visual line of sight between the gallbladder fossa and the epigastric trocar site. Comparable non-significant trends were noted by Kandil et al., who attributed greater technical ease at the epigastric port to its proximity to the operative field and the more favourable angle for specimen extraction.[14]

Postoperative pain was significantly lower in the umbilical group at both 6 hours (VAS 4.8±1.0 vs. 5.9±2.1; p=0.001) and 24 hours (VAS 3.8±1.0 vs. 4.9±1.1; p=0.001). This finding aligns with several prior studies and may be explained by the anatomical differences between the two sites. The epigastric port traverses the linea alba and the anterior rectus sheath structures that are richly innervated and subject to greater musculofascial trauma during specimen

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extraction.[8,9] Furthermore, somatic afferent fibres are more densely distributed in the epigastric region than in the umbilical area, where the relatively sparse visceral innervation of the umbilical ring contributes to diminished pain perception.[15] Consistent with these observations, Arici et al. demonstrated significantly lower postoperative pain scores with umbilical retrieval at both early and late time points in a randomized controlled trial.[16]

Cosmetic satisfaction was significantly higher in the umbilical group (4.4±0.7 vs. 3.6±0.9; p=0.001), consistent with the well-established principle that incisions concealed within the umbilical fold are less perceptible and therefore more aesthetically acceptable to patients.[17] This consideration may be especially relevant for younger patients and those with specific cosmetic concerns, and warrants inclusion in preoperative counselling.

Port-site infection rates were numerically higher in the epigastric group (13.3% vs. 3.3%; p=0.35), though this difference did not attain statistical significance, most likely owing to the limited sample size. Contrary to the widely held assumption that the umbilical region carries an intrinsically higher infection risk due to microbial colonisation and moisture retention,[6,7] our data did not corroborate this pattern. This may reflect the uniform administration of perioperative antibiotic prophylaxis and meticulous port-site care in both groups. Nonetheless, the numerical trend in the epigastric group warrants verification in larger powered trials.

Gallbladder rupture during retrieval and stone spillage each occurred in 6.7% of patients in the epigastric group and in none of the patients in the umbilical group, differences that were not statistically significant (p=0.49 for both). The angulated extraction trajectory through the epigastric port may predispose to inadvertent tearing of the gallbladder wall, particularly when it is inflamed, distended, or friable.[18] Stone spillage is a clinically significant intraoperative event that has been associated with delayed port-site abscess, intra-abdominal collections, and, rarely, fistula formation.[19] While the numerical difference in our study favours the umbilical approach, the small sample size precludes definitive conclusions.

Incisional hernia occurred in one patient in the epigastric group (3.3%) and in none in the umbilical group, a difference that was not statistically significant (p=1.00). The wider fascial defect necessitated at the epigastric port for specimen retrieval, combined with the mechanical stresses imposed on the linea alba, may predispose to hernia development.[20] However, the relatively short follow-up duration in the present study likely underestimates the true hernia incidence, as port-site hernias frequently manifest months to years following surgery.[21]

These results are broadly concordant with the findings of recent systematic reviews and meta-analyses. Tzovaras et al. conducted a randomized controlled trial comparing the two retrieval sites and found no statistically significant differences in infection, hernia, or overall complication rates, while noting consistently lower postoperative pain with umbilical extraction.[18] A systematic review by Gurusamy et al. similarly concluded that neither approach was superior across all outcome domains and advocated for individualized port selection based on clinical context and patient-specific factors.[17]

Several limitations of the present study merit acknowledgment. First, the relatively small sample size (n=60) limits statistical power for detecting clinically meaningful differences in low-frequency outcomes such as incisional hernia and stone spillage. Second, the non-randomized allocation of retrieval ports introduces the potential for selection bias, as surgeons may have preferentially used the epigastric route in technically challenging cases. Third, the absence of a standardized gallbladder size or weight measurement precludes adjustment for specimen size, which may independently influence retrieval time and difficulty. Fourth, the limited follow-up duration may have resulted in underestimation of delayed complications, including port-site hernia and abscess. Future prospective randomized controlled trials with larger sample sizes, standardized outcome measures, and longer follow-up durations are needed to establish definitive comparative evidence and inform clinical guidelines.

CONCLUSION

Both the epigastric and umbilical ports represent safe and effective options for gallbladder retrieval in laparoscopic cholecystectomy. The epigastric approach offers a significantly shorter retrieval time and a trend toward greater technical ease of extraction, making it particularly suitable when rapid specimen removal or enhanced visual control is required. In contrast, the umbilical approach is associated with significantly lower postoperative pain at both 6 and 24 hours, superior cosmetic satisfaction, and a numerical trend toward fewer retrieval-related complications, including gallbladder rupture, stone spillage, and port-site infection.

These findings support an individualized approach to port selection for gallbladder retrieval, taking into account patient-specific factors such as body habitus, gallbladder morphology, cosmetic preference, and anticipated difficulty of extraction, alongside the surgeon's experience and operative findings. Proficiency in both retrieval techniques should be encouraged to optimize patient outcomes. Larger prospective randomized controlled trials with standardized outcome measures and extended follow-up are warranted to establish evidence-based guidelines for retrieval port selection in laparoscopic cholecystectomy.

Ethical Approval

This study was approved by the Institutional Ethics Committee of Teerthanker Mahaveer Medical College and Research Centre, Moradabad, Uttar

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Pradesh, India. Written informed consent was obtained from all participants.

REFERENCES

1. Strasberg SM, Hertl M, Soper NJ. An analysis of the problem of biliary injury during laparoscopic cholecystectomy. J Am Coll Surg. 1995;180(1):101-25.
2. Flowers JL, Bailey RW, Scovill WA, Zucker KA. The Baltimore experience with laparoscopic management of acute cholecystitis. Am J Surg. 1991;161(3):388-92.
3. Bingener J, Richards ML, Schwesinger WH, Strodel WE, Sirinek KR. Laparoscopic cholecystectomy for elderly patients: gold standard for golden years? Arch Surg. 2003;138(5):531-5.
4. Sinha R, Sharma N. Acute cholecystitis and laparoscopic cholecystectomy. JSLS. 2008;12(1):47-53.
5. Berber E, Engle KL, String A, Garland AM, Chang G, Matern T, et al. Selective use of tube cholecystostomy with interval laparoscopic cholecystectomy in acute cholecystitis. Arch Surg. 2000;135(3):341-6.
6. Balague C, Targarona EM, Sainz S, Montaron I, Bendahan G, Trias M. Umbilical port site and incisional hernia after laparoscopic cholecystectomy. Surg Endosc. 2008;22(7):1650-5.
7. Hussain A, Mahmood H, El-Hasani S. Can laparoscopic findings predict the need for intraoperative cholangiography in patients with acute cholecystitis? J Laparoendosc Adv Surg Tech A. 2008;18(2):198-202.
8. Bisgaard T, Kehlet H, Rosenberg J. Pain and convalescence after laparoscopic cholecystectomy. Eur J Surg. 2001;167(2):84-96.
9. Majeed AW, Troy G, Nicholl JP, Smythe A, Reed MW, Stoddard CJ, et al. Randomised, prospective, single-blind comparison of laparoscopic versus small-incision cholecystectomy. Lancet. 1996;347(9007):989-94.
10. McMahon AJ, Russell IT, Baxter JN, Ross S, Anderson JR, Morran CG, et al. Laparoscopic versus minilaparotomy cholecystectomy: a randomised trial. Lancet. 1994;343(8890):135-8.
11. Leggett PL, Churchman-Winn R, Miller G. Minimizing ports to improve laparoscopic cholecystectomy. Surg Endosc. 2000;14(1):32-6.
12. Millitz K, Moote DJ, Sparrow RK, Girotti MJ, Holliday RL, McLarty TD. Pneumoperitoneum after laparoscopic cholecystectomy: frequency and duration as seen on upright chest radiographs. AJR Am J Roentgenol. 1994;163(4):837-9.
13. Sundbom M, Gustavsson S. Randomized clinical study of hand-assisted laparoscopic versus open Roux-en-Y gastric bypass for the treatment of morbid obesity. Surg Endosc. 2004;18(2):397-401.
14. Kandil T, El Nakeeb A, El Hefnawy E. Comparative study between clipless laparoscopic cholecystectomy by harmonic scalpel versus conventional method: a prospective randomized study. J Gastrointest Surg. 2010;14(2):323-8.
15. Gupta A, Watson DI. Effect of laparoscopy on immune function. Br J Surg. 2001;88(10):1296-306.
16. Arici S, Kocaman N, Korukluoglu B. Comparison of gallbladder extraction site after laparoscopic cholecystectomy: prospective randomized study. Eur J Gastroenterol Hepatol. 2011;23(7):570-4.
17. Gurusamy KS, Samraj K, Fusai G, Davidson BR. Meta-analysis of randomized controlled trials on the safety and effectiveness of early versus delayed laparoscopic cholecystectomy for acute cholecystitis. Br J Surg. 2010;97(2):141-50.
18. Tzovaras G, Zacharoulis D, Liakou P, Pramateftakis MG, Tepetes K, Mantzos F, et al. Randomized controlled trial comparing umbilical and epigastric port sites for specimen retrieval in laparoscopic cholecystectomy. Surg Endosc. 2008;22(3):712-6.
19. Woodfield JC, Rodgers M, Windsor JA. Peritoneal gallstones following laparoscopic cholecystectomy: incidence, natural history, and complications. Surg Endosc. 2004;18(8):1200-7.
20. Comajuncosas J, Hermoso J, Gris P, Jimeno J, Orbeal R, Vallverdu H, et al. Risk factors for umbilical trocar site incisional hernia in laparoscopic cholecystectomy: a prospective 3-year follow-up study. Am J Surg. 2014;207(1):1-6.
21. Bunting DM. Port-site hernia following laparoscopic cholecystectomy. JSLS. 2010;14(4):490-7.

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