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Comparative Evaluation of Surgical Outcomes Utilizing Umbilical versus Epigastric Access for Specimen Retrieval in Laparoscopic Cholecystectomy

Subrat Kumar Pradhan [1], Manabhanjan Bhimasingh Kanhar [2], Himansu Shekhar Mishra *[3], Debi Prasad Chattarjee [4]

[1]Assistant Professor, General Surgery, Bhima Bhoi Medical College and Hospital, Balangir, Odisha, India.
[2]Associate Professor, Department of Surgery, Sri Jagannath Medical College and Hospital, Puri, Odisha, India.
[3]Assistant Professor, Department of Surgery, SCB Medical College and Hospital, Cuttack, Odisha, India.
[4]Senior Resident, Department of General Surgery, SCB Medical College and Hospital, Cuttack, Odisha, India.

*Corresponding Author: Dr. Himansu Shekhar Mishra; *himansumishra83@gmail.com*

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Abstract

Introductions: Laparoscopic cholecystectomy represents the established therapeutic modality for symptomatic cholelithiasis. Postoperative analgesia requirements and the duration of postoperative hospitalization are significantly influenced by the extent of pain experienced by patients. During this procedure, the gallbladder (GB) can be extracted via either the umbilical or the epigastric port site. Excessive manipulation during GB retrieval is a potential contributor to postoperative pain. ***Methods:*** A retrospective, observational study was conducted on 120 patients with symptomatic gallstone disease requiring laparoscopic cholecystectomy between January 2024 and December 2024. Exclusion criteria encompassed patients with perforated GB necessitating emergency intervention, those with GB carcinoma requiring elective laparoscopic radical cholecystectomy, and cases where laparoscopic surgery was converted to open cholecystectomy. Participants were randomly assigned to two equal groups (n=60 each): Group A, where GB retrieval was performed through the epigastric port, and Group B, where GB retrieval was performed through the umbilical port. The primary and secondary outcomes assessed included intraoperative duration, postoperative pain intensity (measured using a standardized pain scale), incidence of wound infection, and the development of port site hernia. ***Results:*** Statistical analysis revealed no significant inter-group differences in intraoperative time, the incidence of wound infection, or the development of port site hernia. However, patients in Group B, where the GB was retrieved through the umbilical port, reported significantly lower postoperative pain scores compared to Group A. ***Conclusion:*** While the choice of umbilical versus epigastric port for GB retrieval in laparoscopic cholecystectomy does not significantly impact intraoperative duration, wound infection rates, or port site hernia formation, umbilical port retrieval is associated with a statistically significant reduction in postoperative pain.

Keywords: ***Laparoscopic cholecystectomy, umbilical port, epigastric port, postoperative pain, port site hernia, wound infection.***

Introduction

Laparoscopic cholecystectomy represents the established therapeutic modality for symptomatic cholelithiasis [1]. Postoperative pain following this procedure is a multifactorial phenomenon, significantly impacting the duration of inpatient hospitalization and the requirement for parenteral analgesia [2]. Contributing factors to this pain include postoperative fluid accumulation in the gallbladder fossa, iatrogenic trauma during trocar insertion, pneumoperitoneum induced by carbon dioxide insufflation, and manipulation at the port sites, particularly during gallbladder retrieval [2,3].

The gallbladder can be extracted via either the epigastric or the umbilical port [4-6]. While some investigations have favored epigastric extraction due to procedural efficiency stemming from consistent telescope positioning and enhanced surgeon ergonomics, other studies suggest the umbilical route is associated with reduced postoperative port-site pain [7]. Notably, port-site pain typically exhibits greater intensity compared to other sources of discomfort, especially within the initial 48 postoperative hours [8].

Laparoscopic cholecystectomy carries inherent risks of intraperitoneal gallstone and bile spillage, as well as potential port-site contamination during gallbladder extraction. In cases of gallbladder inflammation, edema, or empyema, enlargement of the extraction port may be necessary, consequently elevating the risk of surgical site infection and port-site hernia formation [9]. The umbilical port is a recognized site for incisional hernias. Consequently, certain studies advocate for gallbladder extraction through the epigastric port [11-12].

Current guidelines from the Society of American Gastrointestinal and Endoscopic Surgeons (SAGES) indicate that the choice of gallbladder extraction site is at the surgeon's discretion. Given that gallbladder extraction constitutes the terminal phase of laparoscopic cholecystectomy and represents a potential contributor to postoperative pain, and considering the equipoise between epigastric and umbilical port utilization based on surgeon preference, this study aims to prospectively evaluate various outcomes including postoperative pain, surgical site infection, port-site hernia incidence, and intraoperative duration associated with umbilical versus epigastric port gallbladder extraction [13-16].

We aimed to evaluate various aspects like post-operative pain, SSI, port site hernia, intraoperative time in umbilical port or epigastric port gall bladder extraction.

Methods

This observational cohort study retrospectively enrolled patients undergoing elective laparoscopic cholecystectomy at a tertiary referral center, SCB Medical College and Hospital, Cuttack, between January and December 2024. The study population comprised all consecutive patients meeting the predefined inclusion criteria:

Inclusion criteria: Age >18 years and symptomatic cholelithiasis necessitating laparoscopic intervention.

Exclusion criteria: encompassed patients <18 years of age, those undergoing emergency cholecystectomy for perforated gallbladder, radical cholecystectomy for gallbladder carcinoma, or procedures converted to open surgery.

Eligible participants (n=120) were non-randomly allocated into two groups: Group A (n=60) where the gallbladder was extracted via the epigastric port, and Group B (n=60) where extraction occurred through the umbilical port. The primary outcome measures were intraoperative duration, postoperative pain (assessed using the Visual Analog Scale at 12, 24, and 48 hours postoperatively), surgical site infection, and port-site hernia incidence. Statistical analysis was performed using SPSS version 20.

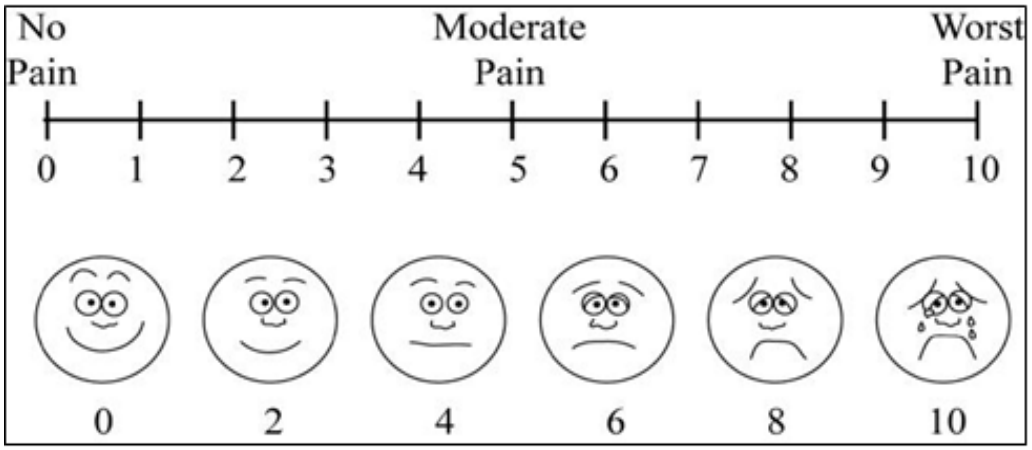

Figure1: Visual analogue score for pain.

Results

Statistical analysis of the comparative cohort study reveals no significant intergroup differences in demographic distribution (sex; p = 0.6) or intraoperative duration (p = 0.8). Furthermore, the incidence of postoperative wound infection and port-site hernia was comparable and negligible in both cohorts.

Patients in Group B (gallbladder extraction via umbilical port) exhibited a statistically significant (p = 0.003) reduction in postoperative pain at 12 hours compared to Group A (gallbladder extraction via epigastric port), as evidenced by a higher proportion of patients reporting lower pain scores (0-3).

Postoperative Pain (24 Hours): This trend of reduced pain in Group B was even more pronounced at 24 hours post-surgery, demonstrating a highly statistically significant difference (p < 0.0001) with a substantially greater number of patients in Group B reporting minimal pain (0-3).

Postoperative Pain (48 Hours): At 48 hours post-surgery, Group B continued to demonstrate significantly lower postoperative pain (p = 0.0003), with a markedly higher number of patients experiencing minimal pain (0-3) compared to Group A (Table 1).

Table 1: A comparison of demographic characteristics and postoperative pain scores between patients undergoing gallbladder extraction via the epigastric port versus the umbilical port.

Parameters		Group A (gallbladder extracted via epigastric port)	Group B (gallbladder extracted via umbilical port)	P value
Sex	Male	20	18	0.6
	Female	40	42	
Intraoperative time (min)	<45	8	6	0.8
	45-60	40	42	
	>60	12	12	
Wound infection	Present	0	0	
Port site hernia	Present	2	2	
Post operative pain after 12 hours (VAS)	0-3	4	12	0.003
	4.-7	40	44	
	8-10	16	4	
Post operative pain after 24 hours (VAS)	0-3	6	20	0.0001
	4-7	38	38	
	8-10	16	2	
Post operative pain after 48 hours (VAS)	0-3	30	50	0.0003
	4-7	26	10	
	8-10	4	0	

P value <0.05 was considered statistically significant.

Discussion

Laparoscopic cholecystectomy represents the established surgical intervention for symptomatic cholelithiasis. Compared to open cholecystectomy, this minimally invasive approach demonstrates a statistically significant reduction in postoperative pain and surgical site infection [17-19]. However, port site pain frequently contributes to extended postoperative hospitalization. Consequently, the anatomical location of the port utilized for gallbladder specimen extraction constitutes a critical variable influencing the magnitude of postoperative pain [20].

Evidence suggests a statistically significant elevation in postoperative pain scores associated with the surgical access site utilized for gallbladder (GB) retrieval compared to non-retrieval port sites [21]. Furthermore, certain investigations indicate a comparative increase in pain intensity following GB extraction via the epigastric port versus the umbilical port [17,21]. Concurrently, these studies have demonstrated a greater incidence of technical challenges during GB retrieval through the umbilical port, resulting in a statistically significant prolongation of the time required for specimen extraction compared to the epigastric approach.

A retrospective analysis indicated a statistically significant positive correlation between epigastric port placement and an elevated incidence of surgical site infections (SSIs) [22]. This observation was attributed to a heightened propensity for hematoma development at the epigastric access site, potentially resulting from direct incision through the fascial sheath. Conversely, a separate study reported an 8% SSI rate at the umbilical port following laparoscopic surgery, with 89% of these infections occurring specifically in the context of laparoscopic cholecystectomy [23]. The authors hypothesized that this may be attributable to the substantial microbial load harbored within the umbilicus, potentially inadequately addressed by standard antiseptic skin preparation protocols. However, the intraoperative utilization of endobags for gallbladder retrieval has been demonstrated to correlate with a reduced incidence of port site infections [24]. Furthermore, the spillage of gallstones and bile represents a recognized complication in laparoscopic cholecystectomy. Current best practices for mitigating the risk of peritoneal contamination from these sources emphasize the routine deployment of endobags during specimen extraction [25].

Prior investigations have yielded heterogeneous findings regarding the comparative efficacy of umbilical versus subxiphoid/epigastric port sites for gallbladder retrieval during laparoscopic cholecystectomy. While some studies reported comparable postoperative pain outcomes [26,27], others indicated a protracted operative duration and elevated risk of port-site hernia associated with umbilical extraction, with no observed difference in postoperative pain or infection rates between umbilical and epigastric approaches [28].

Conversely, our study demonstrated no statistically significant difference in intraoperative time, surgical site infection incidence, or port-site hernia development between epigastric and umbilical port gallbladder extraction. Notably, however, our findings suggest a statistically significant reduction in postoperative pain following gallbladder extraction via the umbilical port compared to the epigastric port.

A recognized limitation of this study is the utilization of the visual analogue scale (VAS) for pain assessment, a subjective measure potentially subject to inter-individual variability.

Conclusion

Laparoscopic cholecystectomy employing the umbilical port for gallbladder specimen extraction demonstrates a statistically significant reduction in postoperative pain scores without a concomitant increase in the incidence of surgical site infection, port-site hernia formation, or operative duration.

Declarations

Ethics approval and consent to participate

Not Applicable

Data Availability

Available on corresponding author upon request to the corresponding author.

Conflicts of Interest

None

Funding Statement

No funding was received.

Conflict of interest

None declared

Authors contributions

All authors made substantial contributions to the reported work, including in the areas of conception, study design, execution, data collection, analysis, and interpretation. They participated in drafting, revising, and critically reviewing the article, gave final approval for the version to be published, agreed on the journal for submission, and accepted responsibility for all aspects of the work.

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