ORIGINAL ARTICLE

Gall Bladder Retrieval in Laparoscopic Cholecystectomy

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ABSTRACT

Background: Gall bladder retrieval during laparoscopic cholecystectomy is crucial as it influences trocar site hernia (TSH), keloid formation, hypertrophic scarring, and postoperative port site pain. **Methods:** This retrospective study aims to evaluate postoperative pain, TSH, keloid, and hypertrophic scar formation six months after gall bladder retrieval through the right lumbar port using the 5-5-5-10 technique. The study includes records and videos of patients who underwent laparoscopic cholecystectomy at Aswan University Hospital's general surgery department. **Results:** Among 977 patients, 93.1% were female with a mean age of 44.3±11.9 years. The mean operative time was 104.2±32.4 minutes. Postoperative pain had a mean VAS score of 2.5±1.1. The average follow-up was 28.5 ± 12 months. At six months, the mean cosmetic appearance score was 3.9±1. Keloid formation occurred in 2.9% of cases, and hypertrophic scarring was seen in 2%, mainly at the right lumbar port. No TSH cases were reported. **Conclusion:** Gall bladder extraction through the right lumbar port offers superior cosmetic outcomes and a lower incidence of complications like TSH. The 5-5-5-10 technique is recommended for future procedures.

INTRODUCTION

Laparoscopic cholecystectomy (LC) is an effective solution for gallstones. It provides a quick return to normal activities, less pain, and minimum scarring after a minimally invasive surgery [1]. It is acknowledged as the gold standard of care for both symptomatic and asymptomatic gallstones as well as benign gall bladder (GB) disease.

This technique has evolved since Hans Christian Jacobaeus's pioneering laparoscopic operation in 1910 [2]. Professor Muhe's first laparoscopic cholecystectomy in 1985 marked a milestone in GB disease management, significantly lowering postoperative pain, infection risk, and incisional hernia [3].

Compared to open cholecystectomy, laparoscopic procedures boast several advantages, including decreased discomfort, shorter hospital stays, enhanced cosmetic outcomes, and a quicker resumption of routine and sports activities [4-8].

Compared to open surgery, these advantages are derived from fewer disruptions of the muscles and less tissue injury, which results in less discomfort and ileus. Pain remains a common postoperative issue, often influencing the decision to stay overnight in the hospital [9].

Blood vessel rupture from peritoneal distension, nerve traction, trauma from port insertion and gall bladder retrieval, and pneumoperitoneum using CO2 to maintain the intra-abdominal pressure are some of the factors that cause pain following laparoscopic cholecystectomy [10]. The first 48 hours following surgery are typically dominated by incisional pain, which is allegedly more severe than visceral pain [11].

Gall bladder retrieval, a critical step in laparoscopic cholecystectomy, affects postoperative port site pain. The surgeon's preference will determine the port used for GB extraction. Although the epigastric port incision is more noticeable, abdominal wound problems like hypertrophic and keloidal scars are common. Tissue damage and port site infection have an impact on the esthetic result of the scar. After retrieving a significant and challenging GB, the umbilical port incision tends to look more cosmetically appealing, blending into an umbilical skin crease. There are no established guidelines specifying the optimal port site incision for gallbladder (GB) extraction concerning postoperative port site pain. The selection of the port site for GB extraction after laparoscopic cholecystectomy often relies on the surgeon's discretion and preference rather than standardized recommendations. [11-14]

As far as we are aware, no research has looked at the rate of complications following GB removal from the right lumber port. Therefore, the purpose of this study is to assess the rate of complications following GB extraction through the right lumber port in patients who underwent a four-port laparoscopic cholecystectomy, including port site pain, infection, TSH, port site scar, or keloid.

Methods

Study Design

The study conformed to the widely accepted GCP standards and met with the most recent edition of the Declaration of Helsinki. It also met with all relevant national rules and regulations and was approved by the local ethics committee. This study was designed as a single-group quasi-experimental investigation in accordance with the Transparent Reporting of Evaluations with Nonrandomized Designs (TREND) Statement checklist [15].

Patients who attended the outpatient general surgery clinic at Aswan University Hospital between December 2019 and December 2022 were the subjects of the study, which was approved by the institutional review board of the faculty of medicine at Aswan University. Using the 5-5-5-10 approach for LC, we retrospectively examined the medical records of patients who had LC and were operated upon at our institute over the specified period. The study included all patients—male or female, 18-years of age or older—who came to the centre and underwent LC.

To be included in the study's analysis, subjects must have had LC utilizing the 5-5-5-10 approach, had the GB extracted from the right lumber port, have a complete recorded video of the procedure available, and have complete follow-up data available.

Procedure

The four-port approach 5-5-5-10 must be used as the operating strategy for cholecystectomy, and the surgical results must be recorded. The right lumber port, which was more lateral than the conventional one, is where the gallbladder should have been removed. Records were searched for information on the results and length of the operation, procedural challenges, problems, and conversion. In addition, the duration of hospital stay and the operation time were noted as proxy indicators for early problems and surgical difficulty. Immediately following surgery, complications were noted, and regular follow-up was examined. The demographic information comprised the

incidence, BMI, history of prior abdominal surgeries, presence of comorbidities, and surgical indications.

We looked at the wound infection, postoperative scarring, and pain score records. In our hospital, the visual analog scale (VAS) was used to calculate postoperative pain with a range of 0 to 10, port site pain and was recorded in each patient's file at 0, 6, 12, and 24 hours after surgery. Also, the Likert scale of 5, with 1 denoting a poor appearance and 5 denoting the best cosmetic appearance, was used to identify the cosmetic look of the resulting scar in the patients' records throughout the 6-month follow-up.

Objectives:

The primary outcome variable was to evaluate the new technique regarding the rate of postoperative 6-month keloid or hypertrophic scar. The secondary outcome variables were the success of the operation, duration, complications (such as infection, seroma, hematoma, PSI, TSH), and the cosmetic appearance of the scars by the Likert scale.

Statistical analysis

A sample size calculation was not done because this study was only preliminary descriptive. Based on the variable distribution's normality test, continuous data were reported as mean ± SD (standard deviation) or median + IQR (interquartile range). We employed percentages and numbers for qualitative data. The statistical analyses were conducted using SPSS software (Statistical Package for the Social Sciences, version 25.0, SSPS Inc, Chicago, IL, USA).

RESULTS

The data of 977 individuals who had LC between December 2019 and December 2022 were analyzed for this study.

Baseline characteristics

As seen in Table 1,

Table 1: Baseline characteristics

Indication	n	%
Chronic calculator cholecystitis	865	88.5%
Acute calculator cholecystitis	48	4.9%
Gallstone pancreatitis	16	1.6%
Adenomyomatosis of the GB	15	1.5%
Gangrenous GB	9	0.9%
Mucocele of the GB	9	0.9%
Symptomatic gallbladder polyps	9	0.9%
Pyocele of the GB	4	0.4%
Perforated GB	2	0.2%
Numerical variables		
	Age	BMI
Valid number	977	977
Mean	44.3	32.7
Standard deviation	11.9	4.8
Median	44.0	32.5

Interquartile Range	19.0	7.9

The patients' average age was 44.3±11.9 years. 910 cases, or 93.1%, were female. A mere 30 instances (3.1%) were considered normal weight, 307 cases (31.4%) were classified as "overweight," and 640 cases (65.5%) as "obese". The BMI was 32.7±4.8 kg/m2 on average. Just 104 people, or 10.6%, had diabetes mellitus. 500 instances (51.2%) were classified as ASA II, 453 as ASA I (46.4%), and only 24 as ASA III cases (2.5%).
Regarding the reason for the surgery, 2 (0.2%) patients had a perforated GB and 865 (88.5%) patients had chronic calcular cholecystitis. Table 1 displays other indications.

Operative details:

The novel (5-5-5-10) LC procedure was used in all patients. With the exception of the lumbar port (10 mm), all of the ports were 5 mm wide.

Table 2: Operative and postoperative details

	Duration of procedure (mins)	Hospital-stay, days	Follow up, months	PO-VAS	6m-Cosmotic-Likert
Valid number	977	977	977	977	977
Mean	104.2	1.1	26.51	2.5	3.9
Standard deviation	32.4	0.6	12.01	1.1	1.0
Median	101.0	1.0	26.00	2.0	4.0
Interquartile Range	54.0	0.0	21.00	2.0	2.0

Table 2 shows that the median (IQR) of the duration of operation was 101.0 (54.0) minutes, and the mean ± SD was 104.2±32.4 minutes. There were no cases that required to be redone or changed to open surgery, indicating a 100% success rate for the procedure. The hospital stay lasted 1.1±0.6 days on average ± SD, with a median (IQR) of 1 (0).
In our analysis, four cases (0.4%) of potential injury were found; these cases involved the transverse colon and mesentery and only required an examination of the injury site in the absence of any other problems.

Postoperative follow-up:

Using the VAS, the mean postoperative pain was 2.5±1.1, and the median (IQR) was 2.0 (2). Within one month of the operation, there were only 5 instances (0.5%) with seroma, 8 cases (0.8%) with hematoma, and 7 cases (0.7%) with port-site infection.
A follow-up time of 26.5 ± 12.0 months was averaged. The follow-up period was 7–12 months for 156 cases (16.0%), 13–24 months for 257 cases (26.3%), and 25–47 months for 564 cases (57.7%).

Six-month cosmetic evaluation of the scars:

The mean score of cosmetic appearance using the 5-Likert scale was 3.9±1 with a median (IQR) of 4.0(2). Only 28 cases (2.9%) experienced Keloid: 13 (1.3%) were epigastric (Figure 1),

Figure 1: Keloid at the epigastric port only.

10 (1.0%) were umbilical, and 5 (0.5%) were in all ports' sites (Figure 2).

Figure 2: Keloids at all ports, the 5mm umbilical port keloid is hidden within the umbilical crease.

Also, another 20 (2%) had hypertrophic scar at the right lumbar port site (Figure 3).

Figure 3: The more lateral placement of the right subcostal port makes its scar hidden, notice that these photos are taken from the right side of the patient to show this scar.

None has experienced trocar site hernia (TSH) during the study's follow-up period.

Discussion

One laborious component of LC is the removal of the gallbladder. Notwithstanding the diverse methodologies put forth to augment the secure extraction of the gallbladder, problems arising during its retrieval remain unresolved. Widening the port site is usually required, which increases the risk of bleeding, hematoma, infection, pain after surgery, and unsightly scarring. Cholangitis, obstructive jaundice, asymptomatic cholelithiasis, acalculous cholecystitis, gallbladder dyskinesia, gallbladder polyps larger than 10 mm in diameter, biliary colic, acute cholecystitis, choledocholithiasis, gallstone pancreatitis, and porcelain gallbladder are common indications for cholecystectomy [16].

In this retrospective study, a new approach to GB retrieval from the right lumbar port was evaluated, focusing on its effectiveness and safety. All cases underwent laparoscopic cholecystectomy with the (5-5-5-10) technique.

The current study's findings indicate that all cases were successfully completed, necessitating neither a second surgery nor an open procedure. The length of hospital stay was 1.11±0.6 days on average ± SD, and 1 (0) was the median (IQR). During the first month following surgery, only 5 instances (0.5%) developed seroma, 8 hematomas (0.8), and an additional 7 port-site infections (0.7). A follow-up time of 26.5 ± 12 months was averaged. The follow-up period was 7–12 months for 156 cases (16.0%), 13–24 months for 257 cases (26.3%), and 25–47 months for 564 cases (57.7%). During the follow-up phase of the study, TSH was not experienced by any of the cases.

Three types of pain have been discovered in LC: visceral, parietal, and shoulder tip pain. These pain categories have different time courses and intensities, with visceral and parietal pain being more common in the first 24 to 48 hours after surgery [10]. Visceral pain is mostly caused by the post-cholecystectomy wound within the liver, the pneumoperitoneum (which is linked to both local and systemic alterations), and the abdominal wall incision sites. The majority of pain (50–70%) is related to incisional sites, with the pneumoperitoneum (20–30%) and the "cholecystectomy wound" (10–20%) coming in second and third, respectively [17, 18].

The VAS score, ranging from 0 to 10, with 10 representing the worst pain, was utilized in this study. The mean postoperative pain was 2.5±1.1 with a median (IQR) of 2.0(2), which is lower than that reported in other studies of different retrieval ports [13, 17, 18]. The study's results indicate that the right lumber port is optimum with less pain.

Achieving scarless surgery is considered the ultimate goal in the field [18, 19]. Laparoscopic surgery offers the advantage of minimal scars on the abdomen, though visibility may increase when incisions are extended for challenging gall bladder retrieval cases. Some patients may experience complications such as hypertrophic scars or keloids, impacting cosmesis and causing related issues. These complications, including hypertrophic scars and keloids, are relatively common after abdominal surgeries [18, 20], with the postoperative port site scar influenced by tissue trauma and port site infection.

This study assessed the cosmetic appearance of port site scars six months postoperatively. The current study showed that the mean 6-month score of cosmetic appearance using the 5-Likert scale was 3.9±1 with a median (IQR) of 4.0(2). These results revealed better patients' satisfaction with the cosmetic appearance of the scars (Figure 4).

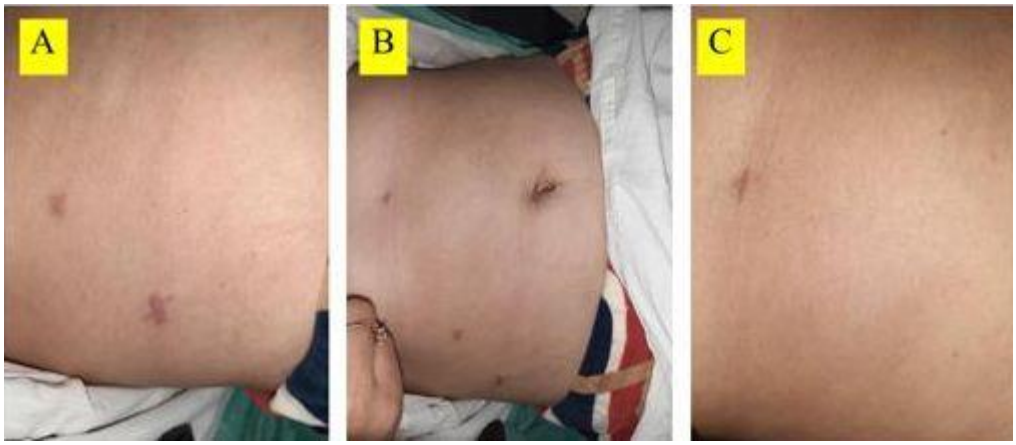

Figure 4: The more lateral placement of the right lumbar port makes its hypertrophic scar (Photo A: Right lateral view) somewhat invisible (Photo B: Front view), while the 5 mm ports show no hypertrophic scar (Photo B: Umbilical, and Right hypochondrial ports, & Photo C: Epigastric port).

Out of all cases, only 28 cases (2.9%) experienced Keloid: 13 (1.3%) were epigastric, 10 (1.0%) umbilical, and 5 (0.5%) were in all ports' sites with the lower rate at the right lumber port. Also, another 20 (2%) had hypertrophic scars at the right lumber port site, all of whom received standard scar reduction treatment.

Based on our experience in this study, it is essential to highlight some advantages of this port site for GB retrieval. Firstly, this port distinguishes itself by lacking ligament attachments in both the epigastric and umbilical ports. Consequently, the gallbladder avoids passing through these ligaments, minimizing the risk of gravel or stone impaction within these structures, particularly in scenarios where the retrieval bag may tear. Moreover, its closure is convenient and achievable with facial closure devices or the Madany closure technique [21]. Additionally, the port is located away from the rectus sheath, and it can be safely and efficiently dilated and extended, facilitating the retrieval of gallbladders with stones of varying sizes.

Furthermore, this site exhibits a reduced tendency for keloid formation and hypertrophic scarring [22]. Compared to the classic method, its more lateral placement results in a scar that is better hidden than other port sites (Figure 5).

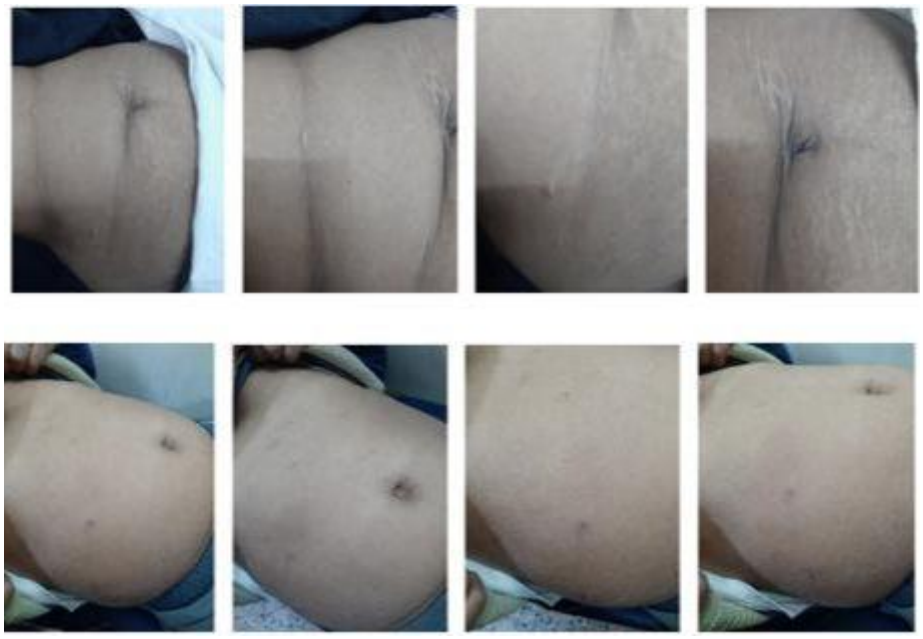

Figure 5: The cosmetic outcomes of our technique for two different cases from different views are superior to others.

It proves to be an ideal location for placing drains for GB bed drainage if needed. The study's results highlight reduced postoperative pain, enhanced patient satisfaction, and a more favorable cosmetic appearance.

However, it comes with the drawback of being closer to the hepatic flexure of the colon, posing a potential risk of injury to the viscera, specifically the colon, and mesentery during port insertion and closure. This risk arises because it is somewhat distant from the main surgeon positioned on the patient's left side. To mitigate this potential risk, a qualified assistant on the right side inserts and closes this port, or the surgeon changes his position to the right side to insert and close this port if he uses the fascial closure device. At the same time, Madany closure [21] is best done from the left side position of the main surgeon. Notably, four cases of possible injury were identified in our study, all involving the transverse colon and mesentery, requiring nothing more than an assessment of the injury site with no identified issues. Additionally, suppose the surgeon needs to open the gallbladder during retrieval to remove stones individually inside the retrieval bag, which protects the port site. In that case, he must transition to the patient's right side.

It is essential to acknowledge that the study has limitations, including the retrospective nature and the lack of a control group. However, the study has advantages like the large sample size and the long follow-up duration. This novel method will be tested in a randomized controlled trial against alternative approaches to bolster further the evidence supporting its efficacy and safety.

Conclusion

This study indicates that, while performing a laparoscopic cholecystectomy, using the right lumbar port for gall bladder extraction is a better alternative than using other ports when considering TSH and parameters including post-operative pain and scar appearance.

Disclosure

Mohie El-Din Mostafa Madany, Yasser Mohammed Seddeik Abd El Raheim, and Mohamed rabie Saad have nothing to disclose.

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