RESEARCH ARTICLE

Laparoscopic subtotal cholecystectomy (LSC): a comparison of "Fenestrating" versus "Reconstituting" types

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Abstract

Objective: To compare the outcomes of Fenestrating and Reconstituting subtypes of laparoscopic subtotal cholecystectomy in technically difficult cases.

Method: The retrospective study was conducted at the Department of Surgery, Khyber Teaching Hospital, Peshawar, Pakistan, from August 1, 2023, to July 31, 2024, and comprised data of patients who underwent Fenestrating or Reconstituting laparoscopic subtotal cholecystectomy between January 1, 2014, and December 31, 2023, for gallstone disease. Postoperative length of hospital stay, frequency of bile leak, bile collections, requirement of endoscopic retrograde cholangiopancreatography and reoperations were the parameters noted and compared. Data was analysed using IBM® SPSS® Statistics 26.0.

Results: Of 1,579 patients, 78(4.9%) had undergone laparoscopic subtotal cholecystectomy. Of them, 6(7.7%) cases were i excluded due to incomplete records, and the final sample comprised 72(92.3%) patients; 44(61.2%) females and 28(38.8%) males with mean age 56.91±16.28 years. Overall, 43(59.7%) patients were in the Fenestrating group and 29(40.3%) in the Reconstituting group. Mean postoperative hospital stay was significantly different between the groups ($p<0.05$), while the frequency of bile leak, bile collection, requirement of endoscopic retrograde cholangiopancreatography and the rate of reoperations were not significantly different between the groups ($p>0.05$).

Conclusion: Compared to the Fenestrating type, the Reconstituting type of laparoscopic subtotal cholecystectomy resulted in reduced postoperative hospital stay.

Key Words: Laparoscopic, Subtotal cholecystectomy, Fenestrating, Reconstituting.

(JPMA 74: 1914; 2025) **DOI: https://doi.org/10.47391/JPMA.25-21836**

Introduction

Laparoscopic cholecystectomy (LC) is considered the gold-standard technique for cholelithiasis. In comparison to open cholecystectomy, it offers several advantages, including reduced length of hospital stay (LOS), decreased chances of wound infection and incidence of bile duct injury (BDI), and better cosmesis.[1] Safety in LC has always been a major concern, and for that several strategies have been devised to minimise the chances of BDI. The most popular technique is the demonstration of critical view of safety (CVS) during dissection.[2] Achievement of CVS is not always possible due to certain reasons, including but not limited to scarring, inflammation and altered anatomy.[3] In such instances, the hepatobiliary triangle is unidentifiable, and, hence, prone to bile duct injuries.

In addition to CVS, other techniques have been described to ensure safety to the biliary structures. Those include fundus first technique[4], lateral dorsal infundibular approach[5] and laparoscopic subtotal cholecystectomy (LSC).[6,7] Of these, LSC has proved to be a safe bailout procedure over the past three decades, and several guidelines have recommended the same for difficult cases.[8] In this technique, no attempt is made to dissect the 'difficult' hepato-cystic triangle, and only part of the gallbladder is removed laparoscopically, with either closure of the remnant gallbladder, called the Reconstituting type, or leaving the stump open, which is called the Fenestrating type.[09]

The current study was planned to compare the outcomes of Fenestrating and Reconstituting subtypes of LSC in technically difficult cases.

Materials and Methods

The retrospective study was conducted at the Department of Surgery, Khyber Teaching Hospital, Peshawar, Pakistan, from August 1, 2023, to July 31, 2024, and comprised data of patients who underwent Fenestrating or Reconstituting LSC between January 1, 2014, and December 31, 2023, for gallstone disease. Data of cases in whom conversion to open cholecystectomy had to be performed were excluded, and so were cases with missing data.

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Submission complete: 10-09-2024 **First Revision received:** 31-12-2024

Acceptance: 17-09-2025 **Last Revision received:** 16-09-2025

The primary outcome measures included 30-day mortality, postoperative LOS, bile leak (quantified amount via subhepatic drains), bile collection (documented through ultrasonography), requirement of additional procedures, including reoperation, percutaneous drainage of collection and endoscopic retrograde cholangiopancreatography (ERCP). Other variables included referral to specialist hepatobiliary surgery centre for further treatment, and BDIs documented via ERCP or magnetic resonance cholangiopancreatography (MRCP) during follow-up.

Data was analysed using IBM® SPSS® Statistics 26.0. Fischer's exact test was applied for comparison of categorical variables, and t test was applied for postoperative LOS comparison between the Fenestrating and Reconstituting groups. P<0.05 was considered significant.

Results

Of 1,579 patients, 78(4.9%) had undergone laparoscopic subtotal cholecystectomy. Of them, 6(7.7%) cases were i excluded due to incomplete records, and the final sample comprised 72(92.3%) patients; 44(61.2%) females and 28(38.8%) males with mean age 56.91±16.28 years. Intraoperative and histopathological findings were noted in detail (Table 1).

Overall, 43(59.7%) patients were in the Fenestrating group and 29(40.3%) were in the Reconstituting group. Mean postoperative LOS was 4.142.1 days (range: 1-13 days). In the Fenestrating group it was 5.2±4.3 days, whereas in the Reconstituting group it was 3.1±2.6 days (p=0.0215). The frequency of bile leak, bile collection, requirement of ERCP and the rate of reoperations were not significantly different between the groups (p>0.05) (Table 2).

Table-1: Intraoperative and histopathological findings.

Findings	n	%
Acute oedematous cholecystitis	37	51.38
Empyema Gallbladder	10	13.88
Mucocoele of the Gallbladder	6	8.33
Gangrene of Gallbladder	5	6.94
Chronic Cholecystitis with fibrosis	11	15.27
Malignancy	3	4.16

Table-2: Comparison of postoperative outcomes.

Outcomes	Fenestrating n (%)	Reconstituting n (%)	p Value
Bile Leakage	21 (48.83)	8 (27.58)	0.089
Bile Collection	4 (9.30)	2 (6.89)	1.000
ERCP as second procedure	4 (9.30)	0 (0%)	0.143
Reoperation	1 (2.3)	0 (0)	1.000

* Calculated with Fischer's Exact Test
ERCP: Endoscopic retrograde cholangiopancreatography.

ERCP was advised for persistence of bile leak beyond 2 weeks in 4(5.6%) patients; all in the Fenestrating group, and all having Strasberg Type A leaks from the cystic duct remnant. In 2(50%) of these patients, small calculi were retrieved from the common bile duct. There was no mortality in the cohort. In the Fenestrating group, 1(2.3%) patient was re-operated for biliary peritonitis resulting in severe sepsis, and required ventilatory support for 2 days in the intensive care unit (ICU). Besides, 1(3.4%) patient in the Reconstituting group developed pulmonary embolism (PE) and was treated with low-molecular-weight heparin successfully. No major BDI was noted in either group.

Discussion

Laparoscopic surgery has been recommended for gallstone disease as the preferred procedure[10] and is often described as the gold-standard treatment.[11] In LC cases that cannot be completed safely due to various factors, such as scarring and fibrosis in the hepato-cystic triangle, inflammation and adhesions, LSC has been recommended as a safe bailout procedure. In the current series, 4.9% of the patients were converted to LSC. Boyd et al. showed the frequency of LSC to be 4%, but with an additional 3.2% laparoscopic-converted-to-open-cholecystectomy (LCOC).[12] The current series did not take into account the frequency of LCOC. Though it did not have any predetermined criteria for the allocation of the Fenestrating and Reconstituting groups, the study depended mainly on the surgeon's choice and the feasibility of the intraoperative conditions. There were 59.7% patients who underwent Fenestrating type LSC, and the rest were in the Reconstituting group, comparable to van Dijk et al., who reported 53% of the cases being in The Fenestrating group.[13]

The morphological and histological patterns found in the current series reflect the commonest reasons for adopting a bailout procedure. The same pattern has been described in various studies, including case series and systematic reviews.[14-17] Other reasons for adopting the subtotal approach, not found in the current series, are liver cirrhosis, Mirizzi's syndrome and intrahepatic gallbladder.[16,18,19]

Bile leakage was recorded more commonly in the Fenestrating LSC (48.83%) compared to Reconstituting" LSC (27.58%). In the current series, drain was placed routinely in all cases. Elshaer et al. noted that 40% patients

had bile leakage when the cystic duct or Hartman's pouch was left open (Fenestrating type), in contrast to 16.5% in cases where attempt was made to close the cystic duct or use the Hartman's pouch.[15] Similar findings were also noted in a recent meta-analysis by Hajibandeh et al.[20] The current study could not retrieve the quantification of the amount of bile leak in the records and the duration of leak in all cases.

In the current series, ERCP was done in 4(5.5%) cases for persistent drainage, all in Fenestrating LSC. Stones, previously undiagnosed, were retrieved in 2 cases, and stent was placed in all these 4 cases with sphincterotomy done. Elshaer et al. reported the ERCP rate to be 4% based upon data collected from 30 studies in their meta-analysis. They reported retained gallstones, persistent bile leak, common bile duct stricture and Mirizzi syndrome as the findings noted in ERCP. As cystic duct leak by definition is Strasberg type A leak, the recommended treatment is either expectant treatment via external drainage or reduction of intra-biliary pressure by ERCP, sphincterotomy and stenting.[15]

Subhepatic collection is an expected outcome of LSC, especially in the Fenestrating type, and this collection is most commonly bile and hematoma, and abscess formation less commonly.[21] The current study noticed subhepatic collection of bile in 9.3% patients in the Fenestrating group and 6.89% in the Reconstituting group. The collections were drained percutaneously under radiological guidance. One patient developed biliary peritonitis in the Fenestrating group, and re-laparoscopy had to be performed within 48 hours of the index surgery. The patient sustained sepsis and respiratory failure, and was shifted to the surgical ICU where he remained on the ventilator for 2 days and recovered completely. Similar findings about subhepatic collections have been reported in the literature with more collections reported in cases where the cystic duct or its remnant was left open compared to the scenario where closure was done.[16,22]

No mortality was observed in the current study, although other studies have reported mortality due to severe sepsis and biliary peritonitis[23], myocardial infarction[22] and multiorgan failure.[21] The mortality in the literature seems to be due to biliary peritonitis leading to further sequelae, ultimately causing death. The current study found one patient with biliary peritonitis who sustained sepsis and ventilatory failure, but survived. This can be attributed to drain failure, and suggests that nothing coming out in the drain should alarm the surgeon, especially if the local and systemic signs suggest deterioration.

Direct comparison of total cholecystectomy with subtotal cholecystectomy in the setting of acutely inflamed gallbladder has been rarely studied. One meta-analysis included 10 studies, showing that subtotal cholecystectomy results in fewer BDIs, but with increased risk of bile leakage, subhepatic collections and ERCP requirement.[24]

The current study has limitations owing to its retrospective design. Also, the data related to a period when the institution had adopted subtotal cholecystectomy, and went through a transition period of choice between LSC and LCOC. The current study did not compile LCOC data. Also, the sample size was not calculated. Randomised trials comparing LSC with LCOC, or different types of LSC, could be challenging because of ethical considerations and randomisation difficulties. Prospective multicentre cohort studies employing large number of patients, with prior sample size calculation, could be better alternatives. Also, the current study did not collect data regarding stone formation in the Reconstituting group. This aspect is of importance as there could be requirement for re-do surgery in the future in such cases.

Conclusion

Both Fenestrating and Reconstituting LSCs were found to be safe procedures, and the risk of BDIs was minimised in both groups. However, care needs to be taken as bile leaks and collections could result.

Disclaimer: None.

Conflict of Interest: None.

Source of Funding: None.

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AUTHOR'S CONTRIBUTION:
NA: Concept, data collection, analysis, drafting, review, final approval and agreement to be accountable for all aspects of the work.
MIK: Data analysis, review, final approval and agreement to be accountable for all aspects of the work.