



## Sub-Total Cholecystectomy - An Audit of Clinical Practice in a Tertiary Referral Hospital

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### Abstract

**Introduction:** Laparoscopic Cholecystectomy (LC) is the gold standard operative management for symptomatic gallstone disease. When the 'critical view of safety' cannot be obtained during dissection of Calot's triangle, conversion to open cholecystectomy, fundus-first LC or Laparoscopic Sub-Total Cholecystectomy (LSTC) may be considered.

This study evaluated the short and long-term results of patients who underwent a LSTC in a university teaching hospital over a 5-year period to determine whether it is a safe procedure to perform during difficult laparoscopic cholecystectomies.

**Methods:** Data was collected prospectively on all patients who underwent LSTC over a 5-year period. A literature review was also undertaken using the Medline database of all studies published in English from 1950 until 2018 using the terms 'sub-total cholecystectomy,' 'partial cholecystectomy,' 'difficult cholecystectomy' and 'fundus-first cholecystectomy'.

**Results:** Fifty-eight patients underwent LSTC between 2013 and 2018. There was no recorded mortality in any of the 58 patients over the 2-year follow-up period. In addition there were no bile duct injuries or significant bleeding in any of the patients in this study.

In 92% of patients LSTC was the definitive surgical management of their condition.

**Conclusion:** The authors believe that LSTC should be considered as part of the treatment algorithm when faced with complicated gallbladder disease. The authors advise that conversion to open cholecystectomy and fundus-first cholecystectomy should be avoided in the setting of severe acute cholecystitis.

**Keywords:** Total cholecystectomy; Sub-total cholecystectomy; Fundus-first cholecystectomy; Hostile gallbladder

### Introduction

Since the first Laparoscopic Cholecystectomy (LC) was performed by Erich Muhe in 1985 this procedure quickly became the gold standard operative management for symptomatic gallstone disease [1]. Since its introduction; however LC has been associated with an increased incidence of bile duct injury [2].

LC was initially considered unsafe and harmful in the setting of acute cholecystitis, but it is now frequently performed in patients with this condition. The incidence of bile duct injuries can be as high as 1.5% in the setting of acute cholecystitis [3].

Performing a safe LC requires meticulous dissection of Calot's triangle. This becomes difficult in the presence of acute or chronic inflammation, dense omental adhesions or gangrene of the gallbladder, resulting in higher rates of bile duct injury [4].

When the 'critical view of safety' cannot be obtained during dissection of Calot's triangle, conversion to open surgery has traditionally been recommended to reduce the risk of bile duct injury [4]. Conversion to open cholecystectomy however does not always improve exposure to Calot's triangle and reduce common bile duct injury and ironically it may actually result in increased post-operative pain, delayed mobility and prolonged hospitalization [5].

In the case of a difficult LC surgeons may opt to continue laparoscopically using alternative approaches to avoid conversion to open. Fundus-first LC or Laparoscopic Sub-Total Cholecystectomy (LSTC) are two such alternative techniques that may be considered when faced with a 'hostile

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gallbladder' to avoid conversion to open cholecystectomy.

Fundus-first cholecystectomy is considered by many expert surgeons to be an unsafe procedure that can be associated with extreme vasculobiliary injuries when performed in the setting of severe inflammation of the gallbladder [6]. This procedure should therefore no longer be recommended when faced with a 'hostile' gallbladder.

Open cholecystectomy might also be considered when faced with a difficult LC, however the newer generation of surgeons may have limited experience with open cholecystectomy and in addition conversion to open does not guarantee better visualization and a safer dissection, and hence open cholecystectomy may actually increase patient morbidity.

Sub-total cholecystectomy is an additional procedure that might be considered in severe cholecystitis. Open sub-total cholecystectomy was first described by Hans Kehr in 1898 and Laparoscopic Sub-Total Cholecystectomy (LSTC) has been performed since 1993 [7,8]. LSTC may be considered in cases of severe inflammation of the gallbladder where the risk of iatrogenic injury is considered to be unacceptably high if laparoscopic total cholecystectomy is pursued [9].

Many different techniques for LSTC have been described; these include excising or leaving the posterior wall of the gallbladder and closing or leaving open the remnant gallbladder stump [9]. Numerous publications have reported the feasibility, safety and acceptable results of LSTC [9]. The technique of LSTC performed during this study is described in Table 1.

This study evaluated the short and long-term results of patients who underwent a LSTC in a district general hospital over a 5-year period to determine whether it is a safe procedure to perform during difficult laparoscopic cholecystectomies avoiding the traditional conversion to open with its inherent complications or the fundus-first cholecystectomy which is increasingly considered to be an unsafe procedure.

## Methods

Data was collected prospectively on all patients who underwent LSTC by two upper GI surgeons in a university teaching hospital and tertiary referral centre over a 5-year period from January 2013 until January 2018. Demographic data included number of patients, gender, patient age range and Body Mass Index (BMI) range. Operative data included; length of surgery, emergency versus elective surgery, use of intra-operative cholangiography, whether the cystic duct was left open or closed, and whether drains were utilized. Post-operative data included presence/absence of a bile leak, the duration of the leak, duration of post-operative stay, length of time before drain removal, and whether the patient required a post-operative Endoscopic Retrograde Cholangiopancreatography (ERCP) ± stent placement.

**Table 1:** The technique of LSTC performed during this study.

<b>Step 1</b>	Intra-operative assessment - 'hostile gallbladder'
<b>Step 2</b>	Open gallbladder and remove all visible gallbladder calculi
<b>Step 3</b>	Resect anterior portion of gallbladder. Leave a strip of the posterior wall of the gallbladder attached to the liver bed
<b>Step 5</b>	Attempt to perform an Intra-Operative Cholangiogram (IOC)
<b>Step 5</b>	Avoid persistent dissection in Calot's triangle
<b>Step 6</b>	Place at least two large bore drains (to create a controlled bile leak)

A literature review was undertaken using the Medline database of all studies published in English from 1950 until 2018 using the terms 'sub-total cholecystectomy', 'partial cholecystectomy', 'difficult cholecystectomy' and 'fundus-first cholecystectomy'.

With the results from this study and the literature review a detailed discussion of the role of LSTC was undertaken and a conclusion with suggestions for the management of difficult cholecystectomies based on the conclusions drawn from this study is presented so that the reader might consider the use of LSTC when faced with a difficult cholecystectomy.

## Results

Fifty eight patients underwent LSTC between 2013 and 2018. 36% of patients were male and 64% female with age ranges between 18 and 81 years. Patients had BMIs of between 21 and 50 kg/m<sup>2</sup>. The duration of surgery ranged from 49.8 min to 184 min. In 63% of cases severe acute cholecystitis with dense adhesions was demonstrated intra-operatively, in 8% a gangrenous gallbladder was present and in 11% and 18% of cases an intra-hepatic gallbladder or empyema of the gallbladder was demonstrated respectively during laparoscopy.

67% of patients did not have a bile leak and 33% of patients had a post-operative bile leak. The cystic duct was left open in 68% of patients and closed in the remaining 32% of patients. There was no significant difference in the presence or duration of bile leak between those in whom the cystic duct was left open and in those in whom it was closed. In all 38 patients the posterior wall of the gallbladder was left *in-situ*.

In the 19 patients who developed a bile leak, 54% of these resolved within 5 days, 28% resolved within 10 days and 18% resolved within 15 days of surgery.

82% of patients had an uncomplicated post-operative recovery. Of the 19 patients who developed a post-operative bile leak 10 required an ERCP and insertion of a CBD stent. Of note only 6 of the 10 patients who underwent an ERCP had stones extracted. All CBD stents were removed within 3 months of insertion.

Drains were placed in all 58 patients. 54% of patients had drains removed within 5 days, 28% within 10 days and 18% within 15 days.

One patient developed a small post-operative abscess in the gallbladder fossa that settled with antibiotics, 6 patients developed post-operative pain. In 5 patients this settled with analgesia; however one patient underwent a re-laparoscopy with no abnormality demonstrated. One patient developed a biloma that was drained under ultrasound guidance. There was no recorded mortality in any of the 58 patients over the 2-year follow-up period. There were no bile duct injuries or significant bleeding in any of the patients in this study despite the presence of severe cholecystitis, gangrenous gallbladders or empyema of the gallbladder with the technique of LSTC.

**Table 2:** Summary of results from prospective audit on LSTC.

<b>Patient Demographics:</b>	
<b>Number</b>	58 (36% male, 64% female)
<b>Age</b>	18-81 years
<b>BMI</b>	21-50 (kg/m <sup>2</sup> )
<b>Duration of Surgery</b>	49.8-184 minutes
<b>Indications for LSTC</b>	Acute cholecystitis with dense adhesions- 63%
	Gangrenous gallbladder- 8%
	Intra-hepatic gallbladder- 11%
	Empyema of the gallbladder- 18%
<b>Bile leak</b>	39 patients- No
	19 patients- Yes (10 required ERCP and stent, 1 required ERCP and sphincterotomy, 8 did not require ERCP)
<b>Duration of bile leak</b>	55% - 3 days, 36% - 9 days, 9% - 15 days
<b>Cystic duct</b>	Open 68%, Closed 32%
<b>Drains placed</b>	100%
<b>Duration of drain</b>	54% - 5 days
	28% - 10 days
	18% - 15 days
<b>Recovery</b>	81% uncomplicated
	19% ERCP + stent (all stents removed within 3 months)
<b>Follow-up (24months)</b>	92% LSTC definitive procedure
	8% Completion Cholecystectomy due to on-going pain

Patients were reviewed for 2 years post-operatively at clinic where a clinical history and examination were performed and liver function tests analyzed. In 92% of patients LSTC was the definitive surgical management of their condition and these patients have not experienced any further symptoms related to gallstone disease. However 8% of patients required a completion cholecystectomy due to on-going symptoms of pain in the absence of abnormal liver function tests (Table 2).

## Discussion

LC is now accepted as the gold standard management of patients with symptomatic cholelithiasis. Patients with a 'hostile gallbladder' still pose a challenge for laparoscopic management. Identification and isolation of the cystic duct-Hartmann's Pouch junction is the key to safe cholecystectomy. The operative view and approach to Calot's triangle are of great importance, but can be impaired by severe inflammation and adhesions between the gallbladder and surrounding organs, and fibrosis between the gallbladder bed and the liver [10].

The traditionally held mantra was that conversion to open surgery facilitated direct visualization and better manipulation and therefore allowed performance of a total cholecystectomy whilst avoiding bile duct injury. Conversion to open surgery does not however always provide better results [10]. Many expert surgeons believe that conversion to open surgery does not guarantee avoidance of a vasculobiliary injury [11]. Surgery is dependent on the operator's skill and experience, and some surgeons, in particular the newer generation, who perhaps have limited experience in open cholecystectomy, may find open cholecystectomy equally or perhaps even more challenging than the laparoscopic approach.

We accept that in certain situations, conversion to open

cholecystectomy is necessary, for example in situations where there is uncontrollable hemorrhage, however in the case of a hostile gallbladder it is suggested that open surgery may not provide better visualization and a safer dissection, and could actually increase patient morbidity.

Open sub-total cholecystectomy has proven to be a safe procedure when faced with a severely inflamed and fibrotic gallbladder where one cannot safely delineate the anatomy of Calot's triangle [11]. With increasing laparoscopic experience LSTC has become a safe and feasible alternative procedure to open cholecystectomy when faced with a 'hostile gallbladder' [12].

The safety of sub-total cholecystectomy is demonstrated in the study by Bornman et al. [13] where this procedure was performed in 18 high-risk patients with cholecystitis with severe fibrosis or inflammatory changes that prevented safe dissection of Calot's triangle. All 18 patients had portal hypertension and sub-total cholecystectomy was performed to prevent massive blood loss from the gallbladder bed. All 18 patients survived the procedure without significant morbidity or mortality [13].

The results of our study also confirm the safety and efficacy of LSTC. Of the 58 patients who underwent LSTC during the 5 year study period, 63% had severe acute cholecystitis with dense adhesions, 8% had a gangrenous gallbladder, 11% an intra-hepatic gallbladder and 18% had empyema of the gallbladder. Despite the presence of 'hostile gallbladders' where the critical view of safety could not be established, no patient had significant intra-operative bleeding, bile duct injury, and there was no patient mortality, and in 92% of patients LSTC was the definitive management of the gallstone disease.

The authors of this study suggest that when surgeons are faced with a 'hostile gallbladder' they should consider LSTC when the

critical view cannot be established and when it is not considered safe to continue with a laparoscopic total cholecystectomy. This rationale is recommended as LSTC has been shown to reduce bile duct injury, severe intra-operative hemorrhage and conversion to open surgery.

## Conclusion

As the standard of care shifts to the management of acute cholecystitis during the index admission, the incidence of complicated cholecystectomy has increased.

These authors of this study recommend the use of LSTC given its safety and feasibility when utilized in complicated cholelithiasis to avoid conversion to open cholecystectomy with its potential for increased patient morbidity or fundus-first cholecystectomy which can be associated with extreme vasculobiliary injuries when performed in the setting of severe acute cholecystitis. We would suggest that fundus-first cholecystectomy should be avoided and in addition this procedure should be considered to be an unsafe procedure.

The authors believe that LSTC should be considered as part of the treatment algorithm when faced with complicated gallbladder disease.

## References

1. Litynski GS. Erich M and the rejection of laparoscopic cholecystectomy (1985): A surgeon ahead of his time. *JLS*. 1998;2(4):341-6.
2. 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.
3. Tornqvist B, Stromberg C, Persson G, Nilsson M. Effect of intended intra-operative cholangiography and early detection of bile duct injury on survival after cholecystectomy: Population based cohort study. *BMJ*. 2012;345:e6457.
4. Beldi G, Glattli A. Laparoscopic subtotal cholecystectomy for severe cholecystitis. *Surg Endosc*. 2003;17(9):1437-9.
5. Lawes D, Motson RW. Anatomical orientation and cross-checking-the key to safer laparoscopic cholecystectomy. *Br J Surgery*. 2005;92(6):663-4.
6. Strasberg SM, Gouma DJ. 'Extreme' vasculobiliary injuries: Association with fundus-down cholecystectomy in severely inflamed gallbladders. *HPB (Oxford)*. 2012;14(1):1-8.
7. Farrow CD. Sub-total cholecystectomy; its rationale, technique and post-operative evaluation. *J Am Osteopath Assoc*. 1959;58(5):286-91.
8. Bickel A, Shtamler B. Laparoscopic Subtotal Cholecystectomy. *J Laparoendosc Surg*. 1993;3(4):365-7.
9. Elshaer M, Gravante G, Thomas K, Sorge R, Al-Hamali S, Ebdewi H. Subtotal cholecystectomy for difficult gallbladders: A systematic review and meta-analysis. *JAMA Surg*. 2015;150(2):159-68.
10. Ji W, Li LT, Wang ZM, Quan ZF, Chen XR, Li JS. A randomised controlled trial of laparoscopic versus open cholecystectomy in patients with cirrhotic portal hypertension. *World J Gastroenterol*. 2005;11(16):2513-7.
11. Johansson M, Thune A, Nelvin L, Stiernstam M, Westman B, Lundell L. Randomised clinical trial of open versus laparoscopic cholecystectomy in the treatment of acute cholecystitis. *Br J Surg*. 2005;92(1):44-9.
12. Supit C, Supit T, Mazni Y, Basir I. The outcome of laparoscopic subtotal cholecystectomy in difficult cases. *Int J Surg Case Rep*. 2017;41:311-4.
13. Bornman PC, Terblanche J. Subtotal cholecystectomy: For the difficult gallbladder in portal hypertension and cholecystitis. *Surgery*. 1985;98(1):1-6.