

# Laparoscopic Subtotal Cholecystectomy - A Safe Approach in Difficult Cholecystectomy

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## ABSTRACT

### BACKGROUND

Laparoscopic cholecystectomy (LC) has been recognized as the "gold standard" for the treatment of gallstone disease. The normal response to a difficulty in the safe dissection of Calot's triangle is conversion to open surgery. Even after conversion, in majority of cases the only option is open subtotal cholecystectomy. With the advent in the expertise in laparoscopic surgery, laparoscopic subtotal cholecystectomy has been described as a safe and effective alternative to conversion to open surgery in difficult gall bladder, in selected cases.

### METHODS

A retrospective study of all the cholecystectomies was conducted and number of difficult gall bladders encountered, and the conversion rate was assessed. Patients who underwent laparoscopic subtotal cholecystectomy were reviewed and a detailed analysis of the cases with regard to indications, role and effectiveness were studied.

### RESULTS

A total of 354 patients underwent laparoscopic cholecystectomy in the time period. Of these, 40 were difficult cholecystectomies. Of the 40, 28 (70%) patients underwent conversion to open surgery, while 12 (30%) patients underwent laparoscopic subtotal cholecystectomy. The conversion rate is 7.9%. The rate of laparoscopic subtotal cholecystectomy is 3.38%. In the 28 patients converted to open surgery, 8 (28.57%) patients underwent open subtotal cholecystectomy. Among the 12 patients of LSC, 2 (20%) patients underwent LSC type 1 while 10 (80%) patients underwent LSC type 2.

### CONCLUSIONS

Laparoscopic subtotal cholecystectomy can be used to avoid catastrophic bile duct and vascular injuries and hence reduce the rates of conversion. Hence, laparoscopic subtotal cholecystectomy (LSC) is a safe and feasible alternative.

### KEYWORDS

Cholecystitis, Cholelithiasis, Calot's Triangle, Cholecystectomy, Laparoscopic Cholecystectomy, Laparoscopic Subtotal Cholecystectomy

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## BACKGROUND

Laparoscopic cholecystectomy (LC) has been recognized as the "gold standard" for the treatment of gallstone disease.<sup>1</sup> The first laparoscopic cholecystectomy was done by Philippe Moret in March 1987.<sup>2</sup> Standard cholecystectomy requires safe dissection of the Calot's triangle. This becomes difficult in the presence of acute or chronic inflammation, dense omental adhesions or gangrene of the gall bladder, resulting in higher rates of bile duct injury.<sup>3</sup> The normal response to this scenario is conversion to open surgery, but this does not necessarily improve exposure or aid in cystic duct exploration.<sup>4</sup> Moreover, open surgery is associated with increased post-operative morbidity. In majority of cases with frozen Calot's triangle, where the identification of the duct is almost impossible, the only option left is a subtotal cholecystectomy. Asher Hirshberg<sup>5</sup> stated "It is better to remove 95% of the gall bladder than 101% i.e. together with a piece of bile duct." Partial of subtotal cholecystectomy has been popularized in United States by Max Thorek (1880-1960) and thus some call it the Thorek's procedure.<sup>5</sup> With the advent in the expertise in laparoscopic surgery, laparoscopic subtotal cholecystectomy (LSC) has been described as a safe and effective alternative to conversion to open surgery in difficult gall bladder, in selected cases.<sup>6-10</sup>

## METHODS

This is a retrospective study conducted among patients who underwent laparoscopic cholecystectomy during the period January 2013 to January 2015. The total number of cholecystectomies, number of difficult gall bladders encountered, and the conversion rate were assessed. The patients who underwent laparoscopic subtotal cholecystectomy were reviewed and a detailed analysis of the cases with regard to indications, role and effectiveness were studied.

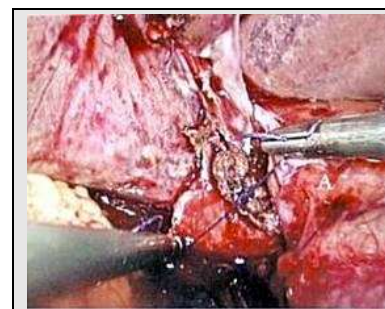
### Operative Technique

Laparoscopic subtotal cholecystectomy (LSC) is of two types namely, Type 1 and Type 2.<sup>11,12</sup> LSC Type I: Cystic Duct and Cystic Artery are dissected and clipped and cut. Anterior wall of the gallbladder is excised leaving behind the posterior wall of the gallbladder attached to liver, the mucosa is ablated. LSC. Type II: Calot's triangle is not dissected. Cystic duct and Cystic Artery are not clipped. Incision over the infundibulum is taken circumferentially. Whole gallbladder is dissected from its liver bed. Mucosa of left over infundibulum (2 to 4 mm) is ablated and the infundibulum is loosely sutured. Dilip Gode et al classified a new variant of LSC known as LSC Type III.<sup>13</sup> Calot's triangle is not dissected. Cystic duct and Cystic Artery are not clipped. Incision on the infundibulum is taken anteriorly. The contents of gallbladder are removed. The anterior wall of the gallbladder is excised, leaving behind the posterior wall. The mucosa of the posterior wall along with the mucosa of infundibulum is

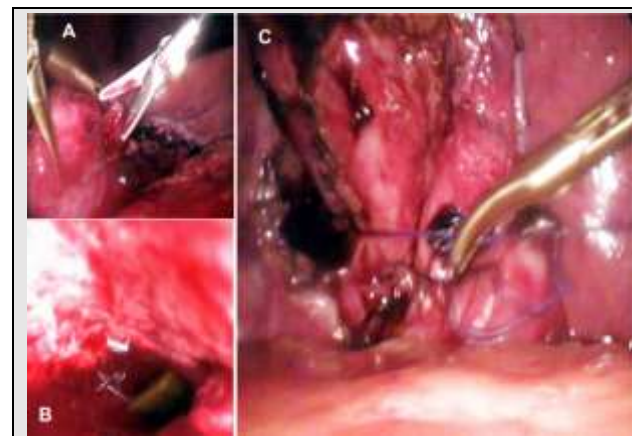
ablated. Infundibulum is loosely sutured.

## RESULTS

A total of 354 patients presenting with acute or chronic calculus cholecystitis underwent laparoscopic cholecystectomy in this time period. The history of the patients was reviewed. Preoperative investigations done were liver function tests (LFT), ultrasonography of the abdomen and Magnetic Resonance Cholangiopancreatography (MRCP). In this, 40 (11.2%) were difficult cholecystectomies. Of the 40, 28 (70%) patients underwent conversion to open surgery, while 12 (30%) patients underwent laparoscopic subtotal cholecystectomy. The conversion rate is 7.9% (Table 1). The rate of laparoscopic subtotal cholecystectomy is 3.38%. In the 28 patients converted to open surgery, 8 (28.57%) patients underwent open subtotal cholecystectomy. In the 10 patients who underwent laparoscopic subtotal cholecystectomy, there were 6 males and 4 females, hence a M:F ratios of 3:2.



**Figure 1. LSC Type 1**



**Figure 2. A. Cholecystostomy Being Performed. B. Impacted Stone at the Neck. C. Knotting of the Infundibulum**

The mean age was 46.55 years (26-72 yrs). The laboratory investigations in all the patients were within normal limits. The ultrasonography reports of all the patients who underwent laparoscopic cholecystectomy are summarized in Table 2. Among the 10 patients, 2 (20%) patients underwent LSC type 1 (Figure 1) while 10(80%) patients underwent LSC type 2 (Figure 3) (Table 3). All the patients were operated with a standard 4 port technique. No extra ports are used in any of the patients. The average

operative time was 72±15 mins. The estimated blood loss was 80±8 ml. the average time to resume diet was 24±6 hrs. Post-operative period was uneventful in all the patients. None of the patients had post-operative bile leak or complications and the drains, when placed were removed 48 hrs. after surgery. Patients were discharged on day 4 to 6 post-operative.

Indications	No. of Cases
Dense Omental/Visceral Adhesions with Frozen Calot's (with no previous history of abdominal surgery)	12* (42.8%)
Dense Post-Operative Adhesions	8 (28.7%)
Bleeding from Cystic Artery	3 (10.7%)
Bleeding from Liver Bed	2 (7.1%)
Suspected Biliary Injury	2 (7.1%)
Mirizzi's Type 2	1 (3.6%)

**Table 1. Indications for Conversion to Open Cholecystectomy in 28 Cases**

\*8 cases underwent open subtotal cholecystectomy

Findings
Case 1 Contracted gallbladder, wall thickness 9 mm, 3 calculi, largest measuring 9 mm, CBD 4.5 mm,
Case 2 Diffuse GB wall thickening, single calculi measuring 13 mm. CBD 5 mm.
Case 3 GB wall 5-7 mm, single calculi measuring 6 mm, CBD 4 mm, no pericholecystic collection.
Case 4 Mildly distended GB with wall thickness 7 mm, single calculi measuring 8 mm, CBD 4.4 mm.
Case 5 GB wall thickness 4 mm, Sludge Present. CBD 2.8 mm with stent in situ
Case 6 GB wall thickness 5 mm, Multiple calculi measuring around 2-6 mm. CBD 3.8 mm
Case 7 Cirrhosis of liver. Diffuse GB wall thickening. Single calculi measuring 15 mm. CBD 5.4 mm.
Case 8 GB wall thickness 4 mm, 3 calculi, largest measuring 10 mm. CBD 4 mm.
Case 9 Mildly distended GB with wall thickness 4.7 mm, single calculi 8 mm. CBD 4 mm.
Case 10 GB wall 4-6 mm, multiple calculi, largest measuring 4 mm. CBD 5.4 mm.
Case 11 GB wall thickness 5.8 mm, 5 calculi measuring around 4-6 mm, largest measuring 5 mm with pericholecystic collection, CBD 3.5 mm
Case 12 Mildly distended GB with wall thickness 2.6 mm. CBD is 2.6 mm with stent in situ.

**Table 2. Laparoscopic Subtotal Cholecystectomy, USG Reports in 12 Cases**

GB- Gall Bladder, CBD- Common Bile Duct

Types	Indication	Cases	Total
Laparoscopic Subtotal Cholecystectomy Type -1	Thick walled Contracted Gall Bladder	1 (50%)	2
	Cirrhosis of Liver with Adhesion of Gall Bladder to liver Bed	1 (50%)	
Laparoscopic Subtotal Cholecystectomy Type -2	Dense Adhesions at Calot's Triangle	6(60%)	10
	Impacted Stone at Neck and Dissection not possible at Hilum	2(20%)	
	Post ERCP and Stenting for common Bile Duct Stones	2(20%)	

**Table 3. Laparoscopic Subtotal Cholecystectomy Types**

## DISCUSSION

Laparoscopic cholecystectomy is the standard of treatment for gall stone disease, replacing open surgery. Safe dissection of the structures in Calot's triangle is considerable challenge during both laparoscopic and open surgery. Fibrosis and inflammation in Calot's triangle makes dissection of cystic duct hazardous and increases the risk of major biliary injury. In severe inflammatory reaction, even conversion to open cholecystectomy does not clarify anatomy. During open surgery, partial cholecystectomy with drainage of gall bladder stump is occasionally used when the tissues in Calot's triangle prove hostile.<sup>13</sup> The same principles

are adapted to laparoscopy. The present results show that laparoscopic subtotal cholecystectomy is a safe and feasible alternative to conversion to open surgery when performing dissection of Calot's triangle is deemed unsafe.

The primary reasons for conversion include factors such as difficulties in dissecting the tissues of Calot's triangle, an unclear anatomy, bleeding from the gall bladder fossa and bile duct injury.<sup>14,15</sup> in the early edematous phase that occurs within 3-4 days from symptom onset, a plane exists between the gall bladder and surrounding viscera that assists in dissection.<sup>16</sup> Conversely, scarring and dense fibrotic adhesions render performing dissection more difficult in the delayed phase, increasing the conversion rate. Many reports thus recommend surgery early within 3-4 days after symptom onset.<sup>17-19</sup> However many patients are actually referred after this early period and therefore undergo elective surgery.

Increasing laparoscopic experience and techniques have made laparoscopic subtotal cholecystectomy a feasible option. Laparoscopic Subtotal Cholecystectomy has successfully brought down the conversion rate to a very low in difficult patients where the only option was conversion to open.<sup>20</sup> Several recent studies have demonstrated the usefulness of laparoscopic subtotal cholecystectomy in difficult gall bladder. When performing subtotal cholecystectomy, dissecting and ligating the cystic duct are very difficult. Using methods to close the cystic duct and prevent postoperative bile leakage is thus crucial. Jun Kuwabara et al<sup>21</sup> stated that intraoperative cholangiography is useful for improving the safety of laparoscopic subtotal cholecystectomy.

One problem of laparoscopic subtotal cholecystectomy is that patients exhibiting complications of gall bladder cancer are not identified preoperatively. Gall bladder cancer is reportedly found unexpectedly in 0.2-0.8% of patients undergoing laparoscopic cholecystectomy.<sup>22</sup> If gall bladder wall is cut open in patients with gall bladder cancer, abdominal dissemination and remnant tumours are always observed. When even slight suspicion of cancer is present, based on the wall thickness and tumour markers it's better to perform open surgery. The rate of gall bladder cancer increases when the gall bladder is punctured intraoperatively and pancreatic juice leaks into the peritoneal cavity.<sup>22</sup> LSC should not be performed in patients with gallbladders with an increased wall thickness due to cancer, and gall bladder tumors must be excluded preoperatively. The use of LSC is thus restricted to patients with benign gall bladders in which dissecting the neck and wall is difficult.<sup>21</sup>

C. Palanivelu et al<sup>12</sup> out of 9864 patients 408 (4.13%) were considered difficult cholecystectomy (high risk). Out of 408, initially 21(0.21%) patients were converted to open. Subsequently 387 (3.92%) patients underwent LSC. In past 10 years only 1 (0.014%) patient was converted to open cholecystectomy out of 7000 cases. In a series conducted by Wu Ji et al<sup>23</sup> the indications for LSC in 168 were acute calculous cholecystitis, chronic calculus cholecystitis with cirrhotic portal hypertension, chronic calculous atrophic cholecystitis with severe fibrosis. They concluded by stating

LSC for patients with complicated cholecystitis is difficult, with a longer operation time, more operative blood loss and higher conversion and complication rates than LC. However, it is feasible and relatively safe. LSC is advantageous over open surgery, but it remains a non-routine choice. It is important to know the technical characteristics of LSC, and pay attention to perioperative bleeding and bile leak.

Michalowski K et al<sup>24</sup> 29 patients underwent LSC wherein the cystic duct was either sutured or ligated using an Endoloop. The posterior wall of the gallbladder was left intact to avoid excessive bleeding or damage to bile ducts in the gallbladder bed. They concluded stating LSC is a safe, relatively simple and definitive procedure allowing removal of a difficult gallbladder and reducing the need for open conversion or cholecystostomy in the majority of patients. Tamura A et al,<sup>9</sup> analysed perioperative and long-term postoperative data to determine the effectiveness of laparoscopic subtotal cholecystectomy (LSC). There were no serious intraoperative complications such as the bile duct injury, and a smaller proportion of procedures were intraoperatively converted to open laparotomy. It is considered that LSC is a safe, useful surgical procedure to the patients in whom the neck of the gallbladder is anatomically unclear due to cholecystitis or fibrosis although patients undergoing LSC-III should be monitored for cholelithiasis in remnant gallbladder tissue. LSC is often the procedure of choice for patients.

## CONCLUSIONS

When tissues in Calot's triangle are hostile it's always safe to keep away from the danger zone. Laparoscopic subtotal cholecystectomy can be used to avoid catastrophic bile duct and vascular injuries and hence reduce the rates of conversion. Hence, laparoscopic subtotal cholecystectomy (LSC) is a safe and feasible alternative.

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