

Laparoscopic subtotal cholecystectomy a salvageable procedure in patients with comorbidities

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ABSTRACT

Aim: Our aim of study to show the feasibility and outcomes of laparoscopic subtotal cholecystectomy in presence of difficult calot's triangle anatomy, even in presence of comorbidities.

Materials & Methods: This study involved a retrospective analysis of patients managed by laparoscopic subtotal cholecystectomy from January 2014 to December 2019. Here we analyzed the demography, indications, associated comorbidity, complications, management and their outcomes.

Results: During this study period 53 cases underwent LSTC (laparoscopic subtotal cholecystectomy), Median age of patients was 52 years (range 31-76 years). 33 (62.26%) frozen calot's triangle was the main peroperative findings in these cases. The infundibulum of gall bladder was mainly managed by endosuturing of the stump (n=21) rest of cases managed by an Endo GIA (n=7), serial metallic clipping (n=2) and in 4 cases stump was left unsutured with one subhepatic drain placement, 1 case omentum sutured over the cystic duct stump another 1 case of cholecystoduodenal fistula was repair with vicryl 3-0. There were (n=18) type I, (n=24) type II, (n=11) type III laparoscopic subtotal cholecystectomy done in our study. Two (3.77%) patients had postoperative morbidity. 1 (1.88%) case had a postoperative bile leak which was successfully managed by ERC and stenting. None of the case had a wound infection or intra abdominal collection; there was no mortality and no bile duct injury. The median postoperative stay was 4 days (range 2-16 days). The mean follow up duration was 60 months and the outcome was excellent in all the patients.

Abbreviation: ERC (Endoscopic Retrograde Cholangiography), LSC (Laparoscopic Subtotal Cholecystectomy), GB (Gall Bladder),

Conclusions: In scenario of difficult calot's triangle, laparoscopic subtotal cholecystectomy is an effective and safe option, which shows excellent postoperative recovery and ensures a satisfactory functional outcome for the patient gall stone disease even in presence of comorbidities.

Clinical Significance:

KEYWORDS

Laparoscopic cholecystectomy, Laparoscopic Subtotal cholecystectomy, difficult cholecystectomy.

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INTRODUCTION

In recent era laparoscopic cholecystectomy is the gold standard treatment of symptomatic gall stones disease. ^[1, 2, 3] However, hostile Calot's triangle and obliterated cystic plate make the dissection difficult around the infundibulum, which may lead to bile duct injury as a most dreaded complication of cholecystectomy and conversion of procedure ultimately leads to loss of all benefits of laparoscopic cholecystectomy. In 1955 Maddipati first time introduced subtotal cholecystectomy as a replacement for cholecystectomy to avoid injury at Calot's triangle in presence severe adhesion around Calot's triangle.^[4] Laparoscopic subtotal cholecystectomy specially indicated in scenario of severe inflammation around infundibulum or portal hypertension to prevent the injury to important structures by leaving the Hartmann's pouch.^[5, 6,7] This is well reported that LSC (laparoscopic subtotal cholecystectomy) has been found a safe and feasible alternative option to avoid conversion to open incision in presence of frozen or hostile Calot's triangle.^[8,9] In this retrospective study, we present our substantial experience with of laparoscopic cholecystectomy in a tertiary care hospital in northern India and discussed demography, indication, comorbidities, management their complications and outcomes.

MATERIALS & METHODS

This is a retrospective study of 2159 patients underwent laparoscopic cholecystectomy at our tertiary institute, between January 2014 and December 2019. The study included elective laparoscopic cholecystectomy. The case notes for patients who underwent LSC were retrieved and analyzed for demographic data, indications, comorbidities, operative findings, and the duration of hospitalization, complications and outcomes. The patients were counseled and consent taken prior to the surgery and patient

investigated with all preoperative blood investigation, X ray chest and ECG and USG abdomen. In the presence of specific indications Magnetic resonance cholangiopancreatography (MRCP) or CECT abdomen was also performed to confirm the findings. LSC was performed according presence of preoperative findings of a difficult Calot's or due to severe inflammation/distorted anatomy/ or portal hypertension in order to avoid biliovascular injuries we leave the gall bladder infundibulum or gall bladder bed in case of obliterated cystic plate. Follow up data was obtained from outpatient follow up cards, postal and telephonic communication.

OPERATIVE PROCEDURE

The patients were placed in supine reverse trendelenburg right up position and surgeon operated from the left side of the patient. Four ports were placed, two 12 mm ports placed, one in umbilicus, another in epigastric region and two other 5mm ports placed in right subcostal (mid clavicular line), another 5 mm port in right anterior axillary line. First camera port usually placed by open method, in few cases we also adopt to use Veress needle on Palmer's point specially in presence of previous surgical scar at the umbilical region. Abdominal pressure was kept on 15 mmHg, however in situation where we were operating severe cardiac or lung comorbidities we use to maintain the abdominal pressure between 10-11 mmHg. Following the camera port placement, assessment of the right upper quadrant of the abdomen is done followed by meticulous dissection around the gall bladder to define the anatomy, all the adhesions usually taken with scissor, harmonic scalpel or monopolar cautery. Failure to achieve critical view of safety (CVS) or dissection on cystic plate in spite of all possible efforts, decision of laparoscopic subtotal cholecystectomy was taken

and of type of procedure adopted according to presence of anatomy. As defined by palanivelu et al,^[6] in LSC type-1 GB (gall bladder) dissected from the liver bed, an opening made on the GB fundus on anhepatic surface with a monopolar hook diathermy, all stones extracted, infected bile/pus aspirated and stones collected in a endobag. This is followed by diathermy splitting of the GB into two halves, maximum possible GB is excised leaving remaining behind the posterior wall of the GB attached to the liver and cauterized with monopolar cautery, infundibulum incised circumferentially, cystic duct milked/ irrigated with infant feeding tube to assured the clearance, remaining stump also

Figure. 1

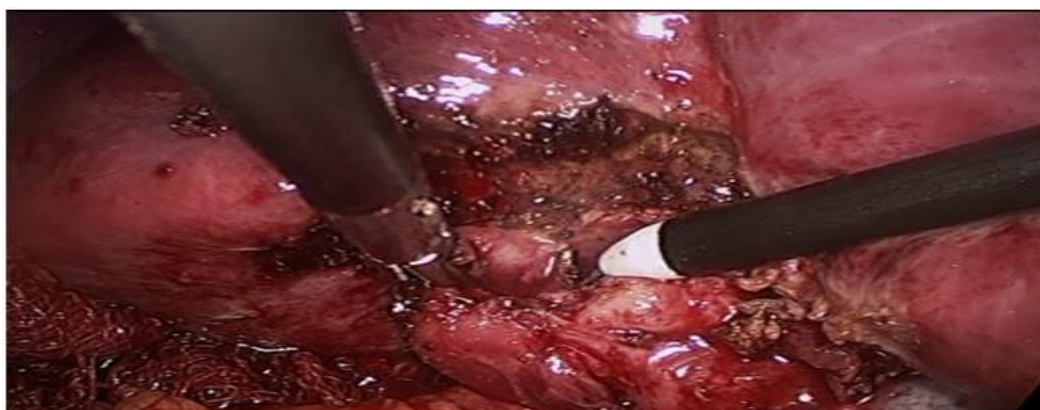
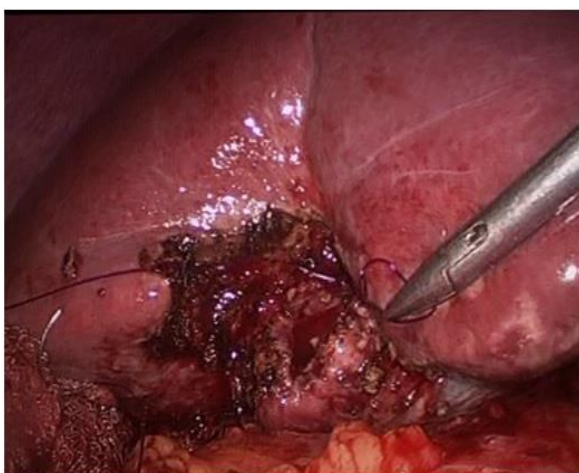


Figure .1: Type II LSC showing cauterization of gall bladder mucosa monopolar cautery on spray mode.

Figure. 2a



fulgurated with monopolar cautery on spray mode [Figure.1] and closed intracorporeally suturing with 3-0 vicryl or PDS 3-0/endo linear stapler/progressive clipping. [Figure.2a, 2b] After a thorough irrigation/lavage with saline, a right subhepatic negative suction drain was often placed in just near to closed stump to detect the postoperative bile and drainage of irrigated saline. Drain usually removed after the 48-72 hours of surgery, except in one case where post operative bile leak occurred. All our patients who underwent LSC were followed in OPD with follow up card and contacted on phone and call them on special situation.

Figure. 2b



Figure. 2a and 2b: Type II LSC showing closer of remaining infundibulum with PDS 3-0 suture.

RESULTS

In our study 2159 patients subjected to LC (laparoscopic cholecystectomy), 2106 patients underwent complete LC. In the remaining 53 patients complete LC could not be possible due to severe inflammation around calot's triangle and GB bed or chances of bleeding due portal hypertension. 53 patients with all above findings underwent successful LSC and no case needed conversion to open procedure due to severe peroperative adhesion. Out of 53, 22 (41.50%) patients were females and 31(58.49%) were males and their median age being 52 (range 31-74) and 53 (range 27-76) 53 years respectively (**Table 1**). All 53 patients posted for surgery on elective basis. Out of 53 patients in 21(39.62%) biliary colic was main presentation followed by 16 (30.18%) jaundice, 13 (24.52%) cholangitis, 4 (7.54%) biliary pancreatitis and 1 (1.88%) patient was a follow through case of severe acute pancreatitis with external pancreatic fistula (**Table 2**). Out of 53 patients 30 (56.60%) were having some comorbidities, 3 cases had chronic liver disease, 3 cases had hypertension, 3 cases had type 2 diabetes mellitus, 5 cases had Type 2 diabetes mellitus and hypertension, 3 cases had Type 2 diabetes mellitus and hypothyroidism, 9 cases had severe cardiovascular disease, 1 case had portal hypertension, hypertension and Type 2 diabetes mellitus, and each case hemophilia B, beta thalassemia, incisional hernia and ovarian cyst (**Table 3**).

All the patient who underwent LSC referred to us came with abdominal ultrasonography (USG abdomen) which revealed GB stones in 53 cases which also review in our institute which shows 25 (47.16%) multiple stones, 17 (32.07%) single stones, 9 (16.98%) cholelithiasis with contracted gall bladder, 2 (3.77%) thick wall gall bladder. Of 53 LSC 14 (26.41%) patients detected to have common bile duct (CBD) stones. USG abdomen reveals CBD stones in 13 (24.52%) patients, in

one patient USG unable abdomen to diagnosed CBD stones which later diagnosed on MRCP (Magnetic resonance cholangiopancreatography). (MRCP) was performed in 16 (30.18%) patients. The MRCP accurately diagnosed the all 14 case of choledocholithiasis, 1 follow through case of severe acute pancreatitis with external pancreatic fistula, 1 case of thick wall GB. Computed tomography (CT) scans were conducted in 8 (15.09%) patients; of these, 2 were diagnosed to have gallbladder perforation, 2(3.77%) cases shown findings of acute cholecystitis, 2(3.77%) thick wall GB, 1(1.88%) had contracted GB cholelithiasis, 1(1.88%) case diagnosed to have choledocholithiasis. 18 (33.96%) cases underwent LSC type-1, 24(45.28%) case for LSC type-2 and rest of 11(20.75%) patients underwent for type III LSC. 53 patients who underwent LSC had the following preoperative indications for operation, 24 (45.28%) chronic cholelithiasis, 18 (33.96%) case of resolved acute cholecystitis, 4 (7.54%) cases of resolve acute pancreatitis, 2 (3.77%) GB perforation, 2(3.77%) Thick wall GB, 1 (1.88%) Mirizzi syndrome and 2(3.77%) symptomatic cholelithiasis known case of portal hypertension. Of 53 14(26.41%) patients have diagnosed to have CBD stones, all underwent ERC (endoscopic retrograde cholangiography) preoperatively, CBD stones clearance was achieved in 13 (92.85%), in one (7.14%) where the ERC failed to clear the CBD procedure ended by placing CBD stenting to relieve the obstruction and later this case managed by LSC with laparoscopic exploration of CBD with stones clearance and primary CBD closure with vicryl 3-0 over the plastic CBD stent. As for our strategy all the CBD stent kept till surgery in view to get the benefit CBD stent in case of post repair bile leak and, after 2 weeks of surgery stent removed endoscopically. In case of type II

and type III LSC there were total 35 (66.03%) neck stumps needed to closed, most of 21(60%) stumps sutured with vicryl 3-0 or PDS 3-0, followed by 7(20%) with linear stapler application, 2(5.71%) cases managed by progressive liga clips application, 4(11.42%) cases left unsutured (cystic duct already obliterated and no bile seen during surgery coming from stump) in 1 (2.85%) case omentum sutured over the neck stump and another 1(2.85%) case who had cholecystoduodenal, duodenal fistula repair with vicryl 3-0. In all types of LSC remaining gall bladder mucosa

cauterized with monopolar cautery. Out of 53 only 1 case had postoperative bile leak which managed by ERC and CBD stent placement. Average operative time was 90 minutes (range 60-240 minutes), average blood loss was 15 cc (5-40 cc) and median hospital stay of patients was 4 days (range 2-16 days). All the patients were followed in our OPD and by telephonic conversation maximum follow up 60 months. Some specific occasion they also called for OPD visit, none of the patient shown any problems of retained CBD stone, bile duct stricture, or symptomatic residual GB till now.

Table 1: Demographics, indications, Peroperative findings, complications and outcomes in patients underwent laparoscopic subtotal cholecystectomy (N=53)

Age (years)	Median Age Male Female	52 (31-76) 53 (27-76) 52 (31-74)
Sex	Male Female	31(58.49) 22(41.50)
Timing of surgery	Elective Emergency	53(100) 0
Preoperative Indications 24 (45.28) 18 (33.96) 4 (7.54) 2 (3.77) 2(3.77) 2(3.77) 1 (1.88)	Chronic cholelithiasis Resolve acute cholecystitis Resolve acute pancreatitis GB perforation Thick wall GB Mirrizi syndrome Symptomatic cholelithiasis in a known case of portal hypertension	24(45.28) 18(33.96) 4(7.54) 2(3.77) 2(3.77) 1(1.88) 2(3.77)
Peroperative findings	Frozen Calot's triangle Empyema Thick wall GB GB perforation Cholecystoduodenal fistula Mirrizi syndrome Portal hypertension	33 (62.26) 8 (15.09) 4 (7.54) 4 (7.54) 1 (1.88) 1(1.88) 2(3.77)
Choledocholithiasis n=14	CBD stones Stone cleared + stented Stone not cleared + stented	13 (24.52) 13 (92.85) 1 (7.14)
GB stump management n=35(66.03)	Stump closure with suture Linear endo stapler application Progressive clip application Stump left unsutured Omentum sutured over the neck stump Stump closer with duodenal fistula repair	21(60) 7(20) 2(5.71) 4(11.42) 1 (2.85) 1 (2.85)
Type of LSC	Type I Type II Type III	18(33.96) 24(45.28) 11(20.75)
Postoperative bile leak	Yes No	1(1.88) 52(98.11)
Operating time (minutes)	90 (60-240)	
Average blood loss (cc)	15 cc (5-40 cc)	

Length of post op hospital stay (Days)	4 days (2-16 days)	
OPD follow up (Months)	60 Months	

Table 2: Main clinical presentation in a patient of laparoscopic subtotal cholecystectomy (n=53)

Biliary colic	21(39.62)
Jaundice	16 (30.18)
Cholangitis	13 (24.52)
Biliary pancreatitis	4 (7.54)
Follow through case of severe acute biliary pancreatitis with external pancreatic fistula	1 (1.88)

Table 3: Underlying comorbidities in patients who underwent laparoscopic subtotal cholecystectomy n=30(56.6).

Chronic liver disease	3
Hypertension	3
Type 2 diabetes mellitus	3
Type 2 diabetes mellitus and hypertension	5
Type 2 diabetes Mellitus and hypothyroidism	3
Cardiovascular disease	9
Portal hypertension, Type 2 diabetes mellitus and hypertension	1
Hemophilia B	1
Beta thalasaemia	1
Incisional hernia and Ovarian cyst	1

DISCUSSION

Laparoscopic cholecystectomy is the gold standard treatment for gall stones disease. In recent era this is a common laparoscopic procedure performed by general surgeon all over the world. However, presence of difficult Calot's triangle or collaterals around infundibulum might make this procedure hazardous and cause bile duct injuries or conversion of procedure. The incidence of bile duct injury in laparoscopic cholecystectomy is about 0.25-0.5% and even higher in presence of difficult Calot's triangle^[10] It is well reported that an incidence of bilio-vascular injury could not be avoided by conversion of procedure in to open even it might increase with an open approach, this is also well reported that conversion does not necessarily improve the exposure of hepatobiliary anatomy, however, it increases postoperative pain, morbidity and

ultimately loss of all benefits of laparoscopic surgery.^[11] Because of lesser exposure of open surgery by newer surgeons in compare to older surgeon this is very difficult to handle the situation of conversion by newer surgeon especially in higher BMI. Subtotal cholecystectomy first described by Maddipati in 1955, as a salvage procedure in cases of technically difficult total cholecystectomy, in his described technique, he used to making the opening at the GB fundus down to 1 cm from the cystic duct followed by dissection of remaining GB wall.^[11] In Chowbey P K et al^[12] common peroperative findings of frozen Calot's triangle contracted GB, empyema or gangrene of the GB, Mirizzi's syndrome leads to conversion of procedure as laparoscopic subtotal cholecystectomy.^[12] In our evaluation also

frozen Calot's 33 (62.26%) was the most common peroperative finding force us to do laparoscopic subtotal cholecystectomy followed by other findings like 8 (15.09%) Empyema, 4 (7.54%) Thick wall GB, 4 (7.54%) GB perforation, 1 (1.88%) cholecystoduodenal fistula, 1(1.88) Mirrizi syndrome, 1(1.88%) Portal hypertension, 1(1.88%) Mucocel. Dilip gode et al, ^[13] had described three types of laparoscopic subtotal cholecystectomy (LSC) type I, II & III LSC.

Type I: Where the dissection and clipping of cystic duct and cystic artery is possible and anterior wall of GB removed and remaining posterior wall cauterized.

Type II: Dissection and clipping cystic duct and cystic artery is not possible because of sever inflammation around calot's triangle, fundus and body of GB dissected on cystic plate, remaining mucosa of infundibulum ablated with cautery and manage by suture repair or clipped/endostapler application.

Type III: Here both dissection around calot's triangle and cystic plate is difficult, anterior wall GB removed and remaining posterior GB wall is cauterized, mucosa of infundibulum is ablated and manage by suture repair or clipped/endostapler application. It is well reported that subtotal cholecystectomy is a safe and effective option in difficult cases gall stone disease to avoid any iatrogenic complications and 3 to 8% of patients who underwent for cholecystectomy may require any extent of subtotal cholecystectomy. ^[14, 15] Here we also adopt this procedure laparoscopically in 53 cases where laparoscopic subtotal cholecystectomy underwent according to dilip gode et al respectably 18(33.96%) type I, 24(45.28%) type II, 11(20.75%) type III we also advocate routine closure of the infundibulum stump or GB neck remnant in 35(66.3%) cases in type II, type III laparoscopic subtotal cholecystectomy in most of

cases stump closer done with suture followed by endo GIA stapler application, progressive clip application, omentum sutured over the stump seem similar to study done by hosni mubarak Khan et al. ^[16]. In laparoscopic subtotal cholecystectomy we had to leave some part of gall bladder neck that why there is always concern of symptomatic residual gall bladder with retained stump stones with stump inflammation, pass out of gall stones into CBD was an important concern in a case of subtotal cholecystectomy. ^[17] According to Henneman D et al, the incidence of recurrent symptomatic GB disease is about 5% of patients. ^[18] However, in our data no there was no suggestive history of postoperative pass out stones and none of our case found to have any neo gall bladder formation or residual stones in the GB remnant in the last 6 years of maximum follow up, where we follow all cases of type II and type III LSC with liver function test and USG abdomen. Another reported concern is unexpected finding of gall bladder cancer in LSC patient which is about 0.2-0.8%. ^[19, 20]. In final histopathological report of patients who underwent for laparoscopic subtotal cholecystectomy, 35 cases found to have chronic cholecystitis, 11 cases xanthogranulomatous cholecystitis, 2 cases acute on chronic cholecystitis. And 1 case finally diagnosed to have moderately differentiated adenocarcinoma. Especially in case of thick wall GB malignancy all the effort was routinely made and excluded by getting CT or diffusion weight MRI done and managed by anticipatory extended cholecystectomy approach and peroperative frozen section. ^[21,22] In our study out of 53, total 30(56.60%) patients had comorbidities including severe cardiac comorbidities ,however all cases were well managed by better preoperative optimization and low pressure pneumoperitoneum during procedure. In our study no patient had any intraabdominal collection or port site infections undergoing LSC, 1 case had postoperative bile which was

successfully managed by ERC and stenting, no procedure related mortality occurred in postoperative period. In our study, duration of hospital stay was slightly longer in compare other study, because inclusions of more complicate cases and associate comorbidities which require longer postoperative monitoring and management. In this study, we described the demography, presentation, evaluation and surgical management and their outcomes of 53 patients who underwent for LCS at our center with satisfactory outcomes in most of the patients after laparoscopic subtotal cholecystectomy.

CONCLUSION

Laparoscopic cholecystectomy is a gold standard treatment for gall stone disease, presence of difficult anatomy or frozen calot's triangle make the procedure hazardous and significantly increase the rates of bile duct injuries and conversion of procedure. However, laparoscopic subtotal cholecystectomy is valuable and safe options for general surgeons to deal with this situation even in patient with severe comorbidities also and avoid the chance of bile duct injury, reducing the conversion rate of procedure and keeping all benefits of minimal invasive surgery.

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