

Original Research Article

An Innovative Stump Stenting Technique for Dissection of Cholecystocystic Stump after Subtotal Cholecystectomy in Difficult Gallbladders to avoid complications associated with the Residual Gallbladder Stump. A Prospective Study

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Abstract

Background: The management of difficult gallbladders often need some innovative techniques and cannot always be done by standard antegrade dissection as there can be dense assimilated adhesions due to recurrent chronic inflammatory process causing distortion in the anatomy of calot's triangle, thereby increasing the risk of biliovascular injuries. So the only bail out option in such situation becomes subtotal cholecystectomy by some other techniques to avoid biliary and vascular injuries. But the residual cholecystocystic stump following subtotal cholecystectomy is associated with certain complications like stump cholecystitis, stump calculi and post cholecystectomy syndromes. **Objectives:** To avoid the complications of residual cholecystocystic stump, we go one step beyond subtotal cholecystectomy by stenting the residual GB stump with feeding tube or guide wire which delineates the orientation of cystic as well as common bile duct and facilitates further dissection of cholecystocystic stump to an optimum extent which completely abolishes the residual cholecystocystic stump and also makes it complete cholecystectomy and no further residual stump and its associated complications. **Methods:** The study conducted in postgraduate department of surgery Government Medical College Jammu and in a corporate hospital of Jammu over a period of three years from January 2018 to January 2021. A total of 83 patients of difficult gallbladders associated with frozen and distorted calot's triangle were included in the study. **Results:** During postoperative period and follow up period in our study of 83 patients of difficult gallbladders with frozen calot's triangle, we have a bile leak in five patients, in two due to missed CBD stone and consequently slipping of cystic duct clips. ERCP with clearance of CBD stones were done followed by stenting of CBD and patient settled within 3-5 days. Rest of three were from accessory duct which also settled spontaneously within 3-7 days. No major bile duct injury occurred. Port site infection occurred in 8 patients, 3 confirmed as atypical mycobacterial infections. 11 patients had systemic complications which settled with expectant management. Two elderly patients of perforated gallbladders died due to systemic complications. Rest of the patients had uneventful and smooth recovery.

Conclusion: Stenting of residual cholecystocystic stump followed by dissection is a viable, effective and safe option to convert subtotal cholecystectomy into complete cholecystectomy and to avoid the long term complications associated with residual gallbladder stump.

Keywords: Cholecystocystic stump, laparoscopic completion cholecystectomy, stump cholecystitis, subtotal cholecystectomy.

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Introduction

Subtotal Cholecystectomy is defined as leaving behind any portion of gallbladder other than cystic duct when structures at calot's triangle cannot be identified and the critical view of safety cannot be achieved [1]. Difficult gallbladder is a scenario in which a cholecystectomy by standard traditional antegrade dissection technique [2] may incur an increased surgical risk as compared with modified alternative techniques which avoids direct approach to unfavourable calot's triangle [3, 4, 5]. In majority of cases with frozen calot's triangle the critical view of safety cannot be achieved due to dense adhesions and distorted anatomy and any inadvertent effort by standard antegrade dissection technique may lead to common bile duct or vascular injury,

so only option left is some alternative dissection technique with subtotal cholecystectomy to avoid biliovascular injury. Asher Hirschberg stated, it is better to remove 95% of the gallbladder (i.e., subtotal cholecystectomy) than 101% (i.e., together with a piece of the bile duct) [6]. Subtotal cholecystectomy is not a substitution of total cholecystectomy but a justifiable bail out rescue procedure in complex and difficult gallbladders with frozen calot's triangle where there is a complete distortion of anatomy and visual road block and any inadvertent misadventure in this area either by open or laproscopically may be associated with misidentification and disastrous biliovascular injuries. Beginning with antegrade external dissection at Calot's triangle with complete cholecystectomy is considered as a gold standard technique to achieve a safe cholecystectomy, but this technique may not be feasible in difficult gall bladders with frozen and distorted calot's triangle as critical view of safety cannot be achieved and there is a potential risk of bile duct injury which is unfortunately a biggest tragedy for the patient which may occur when one venture into a frozen calot's triangle with

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distorted anatomy, so in this situation it is not advisable to collide with it directly but instead take alternative routes. So other techniques which may be adopted in such situations are: - 1. Fundus First Retrograde Dissection Technique, 2. Intraluminal Guided Retrograde Dissection Technique and 3. Transection of the gallbladder just above the infundibulum with antegrade and retrograde dissection technique and after any of the above total or subtotal cholecystectomy whatever is feasible. Even though subtotal cholecystectomy is a bail out procedure in difficult gallbladders but residual gallbladder stump (RGB) left intentionally following subtotal cholecystectomy may be associated with long term post operative complications like recurrent stones in residual GB stump, stump cholecystitis, biliary pancreatitis, recurrent cystic duct stones, obstructive jaundice which may necessitate repeat surgery in later stages, thereby increasing the morbidity and mortality [7, 8, 9, 10]. The basic aim of this technique is to avoid immediate as well as long term complications associated with residual cholecystocystic stump. This procedure is just one step beyond subtotal cholecystectomy. It is very challenging after subtotal cholecystectomy to continue dissection around residual cholecystocystic stump due to dense adhesions and distorted anatomy and it is also not prudent to leave it as such because of immediate and long term complications associated with it and if general physical parameters of the patient allows we should proceed with the definitive procedure to ablate the residual GB stump with the below mentioned technique. As intra operative cholangiogram [11] delineates biliary anatomy and can show any filling defect in the biliary system and guides the surgeon for further management if needed. But it is time consuming and extra equipments like C-Arm is required and it does not act as a physical guide intra operatively. In contrast to this, the cannulation of cholecystocystic stump either with guide wire or feeding tube after subtotal cholecystectomy will give the information of orientation and extent of the cystic duct and CBD and further road map for safe, effective and meticulous dissection of the residual stump and it will also give rough idea about the extent and direction of the cystic duct and CBD and further can proceed with the safe dissection around the stump keeping in mind the perceptual normal and anomalous biliovascular anatomy. After cannulation, the residual stump is dissected by meticulous hydrodissection, blunt dissection or by use of safe energy device like bipolar electrocautery or Harmonic scalpel and then cystic duct is clipped, or suture ligated.

Material and methods

This study comprises of the patients operated in postgraduate department of surgery Government Medical College Jammu and in a corporate hospital of Jammu and Kashmir, India over a period of three years from January 2018 to January 2021 and further follow up of six months. A total of 83 patients of difficult gallbladders with frozen and distorted calot's triangle were admitted through emergency and OPD and selected for the procedure. Patient selection is only on the basis of intra operative findings of frozen calot's triangle, distorted anatomy and dense assimilated adhesions with complete visual road block. All other patients in whom safe complete laparoscopic cholecystectomy could be performed by standard calot's first approach were excluded from the study. Details of data recorded includes- demographics, history, clinical findings and severity, blood counts, liver function tests, renal function tests, radiological findings,

timing of cholecystectomy, duration of surgical procedure, conversion rate, complication rate, length of hospital stay, mortality, any other relevant investigation and follow up.

All patients received prophylactic antibiotics as per our surgical site infection prevention protocol. The position of the four ports are as for standard laparoscopic cholecystectomy, and are umbilical (10mm), subxiphoid (10mm), one 5mm over right midclavicular line and 5mm over right mid axillary line. Pneumoperitoneum created. Initial diagnostic laparoscopy was done findings confirmed and intraoperative decision is made to proceed as routine or other innovative technique. The subtotal cholecystectomy was done either by fundus first retrograde dissection technique, longitudinal split technique of GB, intraluminal guided retrograde dissection technique and transection technique just above Hartmann's pouch as standard antegrade dissection technique is not possible due to frozen and distorted anatomy at calot's triangle.

Technique:-

Step 1. Completion of subtotal cholecystectomy.

Step 2. After completing the subtotal cholecystectomy, GB stump is fixed or held and its stenting is done either with infant feeding tube no.5 or a guidewire is passed and over it feeding tube is passed and hence stenting of cholecystocystic stump and CBD is completed and is confirmed by aspiration of bile, which means cystic duct is patent and tube is within the lumen of CBD and gives perception about the orientation of cystic duct and CBD i.e. the length and direction of cystic duct and CBD and then fixed in place.

Step 3. Dissection around residual cholecystocystic stump is initiated ultracautiously by magnetizing dissection very close to the stump by hydrodissection, peanut dissection, sharp dissection and by use of safe electrosurgical devices. Approximately minimum 5mm long cystic duct below the cholecystocystic junction is dissected out.

Step 4:- Ligation of cystic duct. After dissecting out GB Stump and cystic duct up to 5-10 mm and then it can be transfixed, ligated or clipped.

Step 5:- Irrigation of GB Bed. Copious normal saline wash and Irrigation of GB bed and its surroundings is done to remove any debris, clots and the haemostasis is confirmed, saline is sucked out and a white dry gauze piece is placed at GB bed for five minutes and pneumoperitoneum is decreased so as to confirm any bile leak from the gallbladder fossa and its surroundings.

Step 6:- Placement of drain. Subhepatic drain is placed which is usually removed after 24-48 hours, depending on the output.

Results

A total of 83 patients operated by this technique, among which 47 were males and 36 were females. Age group varied from 41-76 years. Majority of the patients were above 57 years of age.

Most of these patients have a long history of recurrent attacks of cholecystitis (57 patients). 17 patients were admitted through emergency as gallbladder perforation, thirteen patients underwent lower abdominal surgeries in past, one operated for hydatid liver and one patient operated for liver abscess nineteen years back. 27 patients had associated co morbid conditions. 47 patients were ASA-1 and 38 patients were ASA-2. All patients were comparable in demographic data, clinical, laboratory and radiographic parameters.

Table 1: Patient Characteristics

Age	41-76	58.5±17.5
Male/female	47:36	56.62%:43.37%
Recurrent cholecystitis	58	69.87%
Diabetes	21	25.30%
Hypertension	27	32.53%
Hypothyroidism	7	8.43%
COPD	13	15.66%
Upper abdominal surgery	3	3.6%
Lower abdominal surgery	17	20.48%
ASA-1	49	59.03%
ASA-2	34	40.96%

Table 2: Laboratory Data

Hemoglobin (gm/dl)	7.6-11.8 (9.7+/-2.1)
White blood cell count	5.2-13.9 (9.5+/-4.4)
Platelets count	135-250 (192.5+/-57.5)
Serum urea	27-54 (40.5+/-13.5)
Serum creatinine	0.7-2.1 (1.4+/-0.7)
Serum bilirubin	0.2-1.8 (1+/-0.8)
Serum alkaline phosphate	164-192 (178 +/-14)
SGOT (IU/L)	28-56 (42+/-14)
SGPT (IU/L)	13-45 (29+/-16)
Total proteins(gm/dl)	6.2-8.1 (7.15+/-0.95)
Serum albumin (gm/dl)	2.5-4.5 (3.5+/-1)
Serum amylase	45-86 (65.5+/-20.5)
PTI	84-98 (91+/-7)

Table 3: Intraoperative findings

Frozen and distorted calot's triangle	83
Perforated gallbladder	11 (13.25%)
Fibrosed and contracted gallbladder.	23 (27.71%)
Inflamed thick walled gallbladder.	18 (21.68%)
Gangrenous gallbladder	5 (6.02%)
Empyema gallbladder	7 (8.43%)
Mucocele of gallbladder	3 (3.61%)
Mirizzi's syndrome type 1 and 2	2 (2.40%)
Cholecystoduodenal fistula	1 (1.20%)
Chronic cholecystitis with liver cirrhosis	3 (3.61%)
Chronic cholecystitis with giant stones >4 cm.	5 (6.02%)
Xanthogranulomatous cholecystitis	1 (1.20%)
Small fibrosed GB containing only stones.	4 (4.81%)

Table 4: Surgical outcome

Laparoscopic cholecystectomy	56 (67.46%)
Lap converted to open cholecystectomy	8 (9.63%)
Open cholecystectomy	19 (22.89%)
Successful stenting of cholecystocystic stump	67 (80.72%)
Failure of stenting of cholecystocystic stump	16 (19.27%)
Operation time (min)	45-90 (67.5+/-22.5)
Hospital stay (days)	2-5 (3.5-1.5)
Return to normal activities (days)	3-5 (4+/-1)
Complications	24 (28.91%)
Port site infection	8 (9.63%)
Biliary leak	5 (6.02%)
Systemic complications	11 (13.25%)
Mortality	2 (2.40%)

Discussion

In difficult gallbladders with frozen and distorted calot's triangle, it is impossible to proceed with standard antegrade approach and dissection at calot's triangle which may risk misidentification and inadvertent biliovascular injury and in such situation the only bail out procedure is to proceed with subtotal cholecystectomy which may be associated with some early and late complications. In any surgical or operative procedure the basic gold principle is to keep oneself on the safe side i.e., always remember safety saves and a good navigator is one who knows the tricks of saving himself from the tides of misfortune. The risk is always an inherent part of surgical play and cannot be avoided but can be meticulously dealt with if anticipated in time and if one has an available experience and required equipments to deal with the presenting complications. The first subtotal cholecystectomy was performed by Madding in 1955 as a rescue procedure in technically difficult gallbladder by incising GB at fundus down to 1cm from cystic duct followed by excising the rest of the GB wall [12]. Thirty years later, Bornman and Terblanche described their experience of managing difficult gallbladder, in cases of severe cholecystitis and portal hypertension by performing subtotal cholecystectomy leaving behind strip of posterior wall and cystic duct was closed from within GB by purse string suture [13, 14, 15]. Since then subtotal cholecystectomy is being done by a lot of surgeons with minor modifications [16, 17, 18, 19]. So subtotal cholecystectomy is

an absolutely justifiable rescue procedure in difficult situations with some reservations as per the statement of Asher Hirshberg, it is better to remove 95% of the gallbladder (i.e., subtotal cholecystectomy) than 101% (i.e., together with the piece of the bile duct. In certain situations like cirrhotic liver with portal hypertension, inflamed thick walled gallbladder adherent to liver, fibrotic gallbladder or completely intra hepatic GB, there is increased chance of bleeding, here it is pertinent to leave behind wall of GB with its fulguration and mucosectomy. But reservations and concern of performing subtotal cholecystectomy is associated with the residual GB stump with lumen and long cystic duct which are sometimes associated with immediate and late complications. Our innovative technique of stenting the stump with guide wire and then feeding tube acts as a safe guide and further facilitates the meticulous dissection of residual GB stump and cystic duct remnant up to an appropriate extent followed by ligation or clipping of cystic duct thus converting the subtotal cholecystectomy to a laparoscopic total cholecystectomy. By this technique short term as well as long term complications are immediately ruled out as GB stump and long cystic duct remnant (>1cm) is eliminated by stent guided dissection. In our study of 83 Subtotal cholecystectomy, we were able to cannulate 61 residual stumps followed by successful dissection and rest are the case of empyema GB, xanthogranulomatous cholecystitis, giant GB stones and small fibrosed contracted gallbladders with no intraluminal bile in

all these cases residual GB with mucosa was completely ablated and subhepatic drain was placed in for 24 to 48 hours and then removed if no biliary drainage. It is construed that in such situation cystic duct is already obliterated by inflammatory process so no further proceedings required like clipping and ligation only place a subhepatic drain for further 24 to 48 hours observation. There is always variability in experiences and skills of different surgeons so no technique is comparable to experience. The incidence of difficult cholecystitis reported in literature is 10-15% of the total cases of acute cholecystitis [20]. This discrepancy depends upon the method used to classify the difficulty of the surgical procedure. The major reason to classify a cholecystectomy as difficult are the severity of the disease, the presence of adhesions with consequent anatomical alterations, the laparoscopic experience of the surgeon and the devices available for surgical treatment. Severe inflammation of calot's triangle can produce fibrosis with alteration of all anatomical landmarks and consequent risk of iatrogenic injury to the common hepatic duct, common bile duct and cystic duct [21, 22, 23]. According to Tokyo guide lines 2018, the degree of severity of acute cholecystitis correlates with an increased risk of bile duct injuries (BDI) [24]. BDI leads to increased hospital stay, increased morbidity and mortality rate and may require liver resections [25, 26]. Various techniques have been devised to avoid BDI and to obtain critical view of safety. It can be obtained by dissecting out fibrofatty tissue to expose the calot's triangle and lower one third of gallbladder only two structures entering the gallbladder without showing of CBD and CHD [27]. There are intra operative techniques to identify hepatobiliary system like intra operative cholangiogram, and intra operative fluorescent cholangiogram which allows fluorescent images of biliary system.

Conclusion

Subtotal cholecystectomy is basically a time tested bailout procedure in difficult gallbladders with frozen and distorted calot's triangle with complete visual road block and any inadvertent attempt to follow standard antegrade technique may lead to biliovascular injury. Even though there are reservations regarding residual cholecystocystic stump and its associated complications. The solution of which lies with any technique which rule out residual GB as well as cystic duct stump. Our innovative technique of stenting of cholecystocystic stump completely abolishes the residual GB lumen and extra cystic duct and its associated residual and future recurrent stones and their associated complications by making subtotal cholecystectomy to a complete cholecystectomy.

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