Is a difficult gallbladder worth removing in its entirety? – Outcomes of subtotal cholecystectomy

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Abstract

Background: Laparoscopic Cholecystectomy one of the commonest procedures performed worldwide isn't spared from the risks of disastrous iatrogenic complications. In patients with obscured anatomy, the idea of performing a safe total cholecystectomy can be hindered with a high risk of biliovascular injuries. In such a situation STC (subtotal cholecystectomy) comes to the rescue, where the diseased organ can be tackled fairly, without any further damage. Aims and Objectives: The primary aim was to look at the immediate and long-term outcomes of subtotal cholecystectomy. Subgroup analysis was done based on demographics, indications and surgical approach. Materials and Methods: We reviewed our prospectively maintained computerized operation database over nine years. STC was defined as leaving behind any portion of gallbladder other than the cystic duct. They were subclassified as per the description given by Palanivelu. Patients were evaluated with laboratory and radiological assessment. Results: A total of 70 out of 602 patients (11.6%) underwent STC. Dense adhesion at the calot’s was the most important reason for STC. Subtype B was the most common. Nine patients (12.85%) had a bile leak in the postoperative period. There were no biliary/vascular injuries and 30-day mortality was zero. 22.8% developed SSI (surgical site infection). Over a median follow up of 38 months (range 5-98), clinical examination, LFT and USG revealed no abnormality in any of the patients. Conclusion: Subtotal cholecystectomy is a useful alternative during difficult gallbladder surgery. It should be considered early into the procedure preferably prior to conversion to an open procedure. Biliovascular injuries can be avoided and the Immediate and long-term outcomes are acceptable. Keywords: Biliary injuries, laparoscopic cholecystectomy, subtotal cholecystectomy

INTRODUCTION

Laparoscopic cholecystectomy remains one of the most common procedures performed worldwide. Although laparoscopy has eased the management of gallstone disease, it comes with a price of biliovascular injuries. Advancements and research have failed to eliminate the disastrous event of a biliovascular injury. Be it the various described approaches[1] or the refinement of endoscopic vision and the recently introduced indocyanine green imaging; rates of biliovascular injuries are same.

In patients with dangerous anatomy (sessile gallbladder [GB], short/ wide cystic duct and biliovascular anomalies) or dangerous pathology (Mirizzi syndrome, empyema...
gallbladder and frozen Calot), the idea of performing a safe total cholecystectomy can be hindered with a high risk of biliovascular injuries. In such a complicated gallstone disease, conversion to an open procedure need not aid in further anatomic delineation and is not spared from bile duct injuries. Booij et al. have described bile duct injuries in spite of conversion to an open procedure.

In such a difficult situation, subtotal cholecystectomy (STC) comes to rescue, where the diseased organ can be tackled fairly without any further damage. Madding coined the term in his series of three cases in 1955 and Bornman and Terblanche described the safety of the procedure, and four decades later since its first description, Michalowski et al. described the steps of laparoscopic STC. So far, there is no standard definition of STC acceptable worldwide. Various definitions of STC have been proposed. Lidsky et al. defined it as the inability of a surgeon to safely divide the cystic duct. There are also various classifications given on the types of STC by Palanivelu et al. and Shin et al. Recently, Strasberg et al. divided it into ‘fenestrating’ and ‘reconstituting’ types. However, none of the above-mentioned definitions are accepted universally. As the procedure is done as salvage in the presence of unfavourable conditions, it is difficult to define a standard universal technique.

STC is now a well-accepted procedure in difficult cases; however, data on long-term outcome are scarce. In the current study, we evaluate our data of STC performed over a period of 9 years.

SUBJECTS AND METHODS

A retrospective descriptive study was planned. The prospectively maintained computerised operation database at our department from January 2009 to December 2017 was studied. All patients who underwent cholecystectomy for gallstone disease were analysed. STC in our study was defined as leaving behind any portion of gallbladder other than the cystic duct. They were subclassified as per the description given by Palanivelu et al.,[7] [Figure 1] in which the Type A was defined as leaving behind the posterior wall of the gallbladder, Type B [Figure 2] leaving behind the Hartmann/distal body of the gallbladder and Type C a combination of the above two types. Based on the operative notes, STC was retrospectively divided into fenestrating and reconstituting types as proposed by Strasberg et al.[9] The follow-up data of patients who met the above definition were acquired and patients were subjected to liver function test (LFT) and ultrasonography (USG) of the abdomen irrespective of complaints.

The primary aim of the study was to look at the immediate- and long-term outcomes of STC. Subgroup analysis was done based on demographics, indications and surgical approach. Prior approval of the Institutional Ethics Committee was obtained. Data entry was done using MS Excel, and WinPepi software version 3.85 Brixton health, Wales, RegionPlaceHolder, United Kingdom was used for statistical analysis.

Protocol of management

After confirming the diagnosis of GB stone, pre-operative common bile duct (CBD) stones were ruled out by LFT and appropriate imaging. Patients who had CBD stones were subjected to an attempt at endoscopic clearance and stenting. Those with failed endoscopic ductal clearance or very large CBD stones, who eventually required a CBD exploration/bilioenteric anastamosis, were excluded. All patients who required an STC had their gallbladder opened and remnant cleared of any stones during the surgery. The remnant mucosa was ablated using the coagulation mode of electrosurgery unit. The amount of gallbladder left behind was the minimum amount, in which a safe transection

Figure 1: Schematic illustration of types of subtotal cholecystectomy

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away from hilar structures could be performed. Objective measurement of the remnant was not performed.

RESULTS

Six hundred and forty-two patients [Figure 3] underwent cholecystectomy for gallstone disease at our department from 2009 to 2017. Forty patients who required a concomitant biliary-enteric drainage procedure were excluded. Of the 575 patients planned for laparoscopic cholecystectomy, 499 (86.7%) could be completed via laparoscopic approach. Our conversion rate was 11.4%, a majority 37/66 (40.9%) of which required a STC. In the remaining 10 patients, a STC could be accomplished laparoscopically. The remaining 27 patients were planned for open procedure in view of anticipated difficulty/advanced age and comorbidities precluding general anaesthesia. Among the patients planned for open cholecystectomy, 23/27 (85%) required a subtotal procedure. Eight of the 70 patients underwent STC as an emergency procedure. Seventy-two out of 602 (11.9%) patients planned for a cholecystectomy had undergone a pre-operative endoscopic CBD clearance and biliary stenting, 8 of whom required a STC.

Sexagenarians formed majority (37.1%) of our STC patients; males comprised 61% [Table 1]. Of the various reasons listed [Table 2], dense adhesions and inability to delineate the Calot’s triangle anatomy were the most common reasons for an STC. Among the rare reasons for STC, were atrophy hypertrophy complex causing hilar rotation and a branch of right hepatic artery running parallel to GB wall and entering the liver in another. In 52 patients, the remnant GB was tackled with interrupted sutures; in 12 patients, a purse string was used and an endoscopic cutting stapler was used for the rest 6 patients.

POLYGLACTIN 910 was used as the suture material. While a majority (48) of the patients underwent Type B as per the

| Table 1: Demographic profile of subtotal cholecystectomy patients |
|-------------------------|------------------|
| Age                     | n=70             |
| <40                     | 8                |
| 40-49                   | 10               |
| 50-59                   | 16               |
| 60-69                   | 26               |
| >70                     | 10               |
| Gender                  |                  |
| Male                    | 43               |
| Female                  | 27               |

| Table 2: Operative findings and tackling of remnant gall bladder |
|---------------------------------------------------------------|
| Indications for subtotal cholecystectomy                      | n=70 |
| Dense adhesions/frozen Calot’s                               | 44   |
| High insertion/short wide cystic duct                        | 5    |
| Intrahepatic GB                                               | 5    |
| GB perf/empyema                                               | 7    |
| Mirizzi                                                       | 4    |
| Collaterals on GB wall                                       | 3    |
| Others                                                        | 2    |
| Method of closure of remnant                                 |      |
| Interrupted suture                                           | 52   |
| Purse string suture                                          | 12   |
| Stapler                                                       | 6    |

GB: Gallbladder

| Table 3: Post operative complications compared based on Strasberg classification |
|----------------------------------------------------------------------------------|
| Reconstituting | Fenestrating |
|----------------|--------------|
| Total number (64) | 54 | 10 |
| Bile leak (9) | 6 | 3 |
| Surgical site infection (16) | 12 | 4 |

| Table 4: Subgroup analysis based on type of STC and closure |
|------------------------------------------------------------|
| Bile leak (9/70) | SSI (16/70) |
|-------------------|-------------|
| Subtype of cholecystectomy                                |            |
| A - 0/2          | A - 1/2     |
| B - 3/48         | B - 8/48    |
| C - 6/20         | C - 7/20    |
| Method of tackling remnant                               |            |
| Interrupted suture - 6/52                                | Interrupted suture - 12/52 |
| Purse string suture - 3/12                                | Purse string suture - 4/12 |
| Stapler - 0/6                                             | Stapler - 0/6 |

SSI: Surgical site infection
Palanivelu classification, two underwent Type A and the rest (20) Type C. Drains were placed in all but three patients. Using the Strasberg classification of STC, on classifying retrospectively, majority were of the reconstituting subtype. Six patients could not be classified as per the Strasberg definition [Table 3].

Nine patients (12.85%) had a bile leak in the post-operative period. Seven were managed conservatively with a wait-and-watch policy. Two patients required laparotomy. None of the patients who had undergone a pre-operative endobiliary stenting developed a bile leak. There were no biliary/vascular injuries and the 30-day mortality was zero. 22.8% developed surgical site infection (SSI). All patients with SSI had undergone an open approach or had to be converted to an open procedure. Two patients with chronic liver disease developed decompensation in the form of ascites which recovered.

On subgroup analysis [Table 4], 30% of Type C patients had a bile leak, which was significant when compared with 6.25% of Type B STC (P = 0.008). Fenestrating STC patients had higher chances of developing a post-operative bile leak (odds ratio [OR]: 3.42). Conversion to an open procedure and post-operative bile leak were risk factors for SSI. On comparing Type B and C, a Type C STC had a higher risk of bile leak and SSI (OR 6.4; 2.1). Stapling the remnant gallbladder was the safest option as it had no bile leak or SSI.

In the long term, 52 patients were assessed over a median follow-up of 38 months (range: 5–98) by clinical examination, LFT and USG. Except for 2 patients who had moderate epigastric pain, no abnormality was detected in any of the patients.

**DISCUSSION**

Although the rates of bile duct injuries are low in experienced hands, in the event of an untoward event, there is a huge financial, social and economic burden on the patient and the health care system. This study shows that an STC may be successful in avoiding such iatrogenic disasters.

Elderly males comprised a majority in our study group, which correlated with the world data, as advanced age and male sex were predictors of a difficult cholecystectomy.[14] The rate (11.6%) of STC was much higher compared to that reported (3.3%) by Chowbey et al.;[15] ours being a tertiary referral centre, we receive cases with anticipated difficulty; hence, the rates of STC in our series were higher. The most common reason for STC, i.e., dense adhesions due to chronic inflammation, correlated with the results of reviews conducted by Elshaer et al. and Henneman et al. independently.[12,13]

In the current study, majority of the patients planned for open cholecystectomy and those patients who were converted to open procedure required an STC. This suggests that conversion to an open procedure may not always aid in better anatomic delineation. Henneman et al. in their systematic review reported a conversion rate between 10% and 50%, indicating that conversion did not always give an upper hand.[13] A study conducted at Chandigarh, India, revealed the most important reason for conversion as a frozen Calot or a bile duct injury.[14] We had no incidence of bile duct injury. Large systematic reviews have confirmed very low rates of bile duct injuries in patients undergoing STC, confirming the benefit of the procedure.[12,13] Taking a decision for a STC early during the procedure can prevent the injury and very often, the unnecessary conversion.

Nine out of 70 (12.8%) developed a bile leak; of which seven patients did not need any intervention. These seven patients developed a controlled external biliary fistula. After ruling out retained calculi on cross-sectional imaging, they could be managed with watchful waiting. With no clinical deterioration and a gradually falling bilious drain output, endoscopic salvage could be deferred. In the two patients requiring an emergency laparotomy, endoscopic salvage was not feasible. One developed biliary peritonitis where we found a sloughed-off remnant gall bladder, for whom peritoneal lavage and drainage was done. The second patient had a subphrenic abscess not amenable to percutaneous drainage.

The risks of wound infection have been higher in cases of STC because a subtotal procedure was mainly performed in those with recurrent acute/chronic inflammation. In our study, none of the patients with a laparoscopic STC developed a wound infection. Meta-analysis by Elshaer et al. showed that laparoscopic STC had lower rates of intra-abdominal collections, SSI or reoperation rates.[12] Learning from our findings, we now evolve our practice of foregoing conversion and considering an STC via the laparoscopic approach whenever feasible in case of difficulty. It gives faster recovery, less chances of SSI and acceptable long-term outcomes.

In our study, A and C subtypes had high rates of SSI. Leaving behind the inflamed posterior wall in Type A and C may pose a risk of developing infectious complications. Similar findings were reported by van Dijk et al.[13] but Shin et al. found lower rates of infectious complication.
when the posterior wall of the GB was left behind.\textsuperscript{[8]} Subgroup analysis showed that laparoscopic approach had a lower rate of wound infection. Similar findings were confirmed by Elshaer \textit{et al.}\textsuperscript{[12]} The presence of bile leak was a risk factor for the development of SSI. In the current study, eight out of nine patients with a bile leak had wound infection.

We hypothesise that the chances of recurrence of calculus in the remnant gallbladder are low. Removing a majority of the distensible portion prevents any further stagnation/saturation of bile. It can be argued that a remnant GB might have been missed on ultrasonographic imaging. We, however, preferred not subjecting our patient to cross sectional imaging in the absence of any symptoms or biochemical abnormalities. In the general population, 80% of the diseased gallbladders are asymptomatic\textsuperscript{[14]} and it cannot be justified to subject them to any kind of investigation or treatment. Regarding the risks of neoplasia, the mere presence of gallstones is not a risk factor for malignancy. It may also be argued that with the removal of the offending agent, further inflammation may subside. There remains a risk of recurrent stone; however, it would be preferable to manage a remnant gallbladder than a biliary cripple.

Due to lack of a standard definition, the amount of GB left behind is variable; hence, the chances of development of recurrent calculi are variable. In the literature, cases of cholecystolithotomy falsely labelled as an STC are bound to have high rate of recurrent stones. We propose that the term STC is limited to the surgeries where the distensible part of the GB is removed. The idea of STC should be included as a part of regular training in laparoscopic cholecystectomy.

CONCLUSION

In conclusion, we state that STC is a useful alternative during a difficult GB surgery. It should be considered early into procedure preferably prior to conversion to an open procedure. Biliovascular injuries can be avoided, and the immediate- and long-term outcomes are acceptable. Further long-term studies are required to evaluate the outcomes of a remnant gallbladder.

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Conflicts of interest

There are no conflicts of interest.

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