

Subtotal Cholecystectomy: A Safe Approach in Difficult Cholecystectomy

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Abstract

Background: Subtotal cholecystectomy is a surgical procedure designed for situations where a traditional cholecystectomy becomes difficult or unsafe due to anatomical variations or severe inflammation of the gallbladder. This approach is intended to manage challenging cases while minimizing the risks associated with complications. The procedure involves removing as much of the gallbladder as safely as possible, to avoid injury of critical structures like the common bile duct or hepatic artery. This is often necessary when it is difficult to clearly identify and dissect the anatomy of calot triangle clearly and cannot achieve the critical view of safety.

Aim of Study: Investigate the safety and efficacy of subtotal cholecystectomy in challenging cases by examining outcomes of patients who undergo this procedure.

Patients and Methods: Prospective cohort observational study at Ain Shams University Hospitals and Itay Elbaroud General Hospital on 20 patients between December 2023 and July 2024.

Results: The age ranged from 21 to 68 years with a mean value of 52.8 (± 12.7) years. 11 (55%) patients were males, and 9 (45%) patients were females. Regarding type of operation, 16 (80%) patients underwent laparoscopic operation and 4 (20%) patients converted to open operation. Regarding comorbidities, diabetes mellitus (DM) was present in 4 (20%) patients, hypertension was present in 8 (40%) patients and ischaemic heart disease was present in 3 (15%) patients. Regarding diagnosis, acute cholecystitis was present in 9 (45%) patients, chronic cholecystitis was present in 3 (15%) patients, gallbladder empyema was present in 5 (25%) patients, history of cholangitis was present in 1 (5%) patient and Mirizzi's syndrome was present in 2 (10%) patients. The Operative time ranged from 45 to 105min with a mean value of 68.5 (± 19.87) min. HB was slight-

ly decreased in postoperative than preoperative while leukocytes and CRP were significantly higher postoperative than preoperative. AST, and ALT were significantly higher postoperative than preoperative while ALP, GGT, and bilirubin were insignificantly different between preoperative and postoperative. The length of hospital stay ranged from 2 to 12 days with a mean value of 4.5 (± 2.4) days.

Conclusion: The subtotal cholecystectomy was found to be a modified technique (bail-out procedure) that aims to overcome complications in complex and severely inflamed cases and improve patient outcomes. Also, it was found to be a relatively safe approach with minor complications.

Key Words: Subtotal cholecystectomy – Complicated cholecystitis.

Introduction

THE biliary system is responsible for the production, storage and transportation of bile which plays a vital role in maintaining digestive balance and metabolic functions within the body. Dysfunction or blockage in the biliary system can lead to various health issues [1].

Any condition such as severe inflammation, adhesions or congenital anomalies that cause distortion of the anatomy making the cholecystectomy difficult. The management of difficult cholecystectomies poses unique challenges, these challenges can lead to complications such as bile ducts injury that causing leakage, vascular injury that causing bleeding, wound infection or recurrence due to portion of the gall bladder that being left [2].

Hence, the aim of our study was to assess the safety and efficacy of subtotal cholecystectomy in challenging cases by examining the outcomes of patients who undergo this procedure, Subtotal cholecystectomy has emerged as an alternative technique designed to navigate difficult cholecystectomies

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aiming to reduce complications and minimize the rate of CBD injury [3].

Subtotal cholecystectomy was first described in 1955 by G.F. Maddening when he found that total cholecystectomy could not be safely performed in four of his patients. In 1993, laparoscopic subtotal cholecystectomy was performed successfully on six of his patients with severe inflammatory changes and there no complications were reported [4,5].

Patients and Methods

Our study was a Prospective cohort observational study that recruited 20 patients who underwent subtotal cholecystectomy at Ain Shams University Hospitals and Itay Elbaroud General Hospital between December 2023 and July 2024. All our patients signed an informed consent and approval from the Institutional Review Board was obtained and all the data were kept on a protected computer.

Inclusion criteria:

- Patients preoperatively were expected to have or diagnosed by difficult cholecystectomy (Acute cholecystitis [empyema, perforated or gangrenous GB], extensive adhesions and Mirizzi syndrome)
- Intraoperative decision that total cholecystectomy carries a high risk of biliary and vascular injury.
- Age within the specified range 18 to 70 years.
- Patients who provide informed consent to participate in the study.

Exclusion criteria:

- Uncontrolled coagulopathy or bleeding disorders.
- Severe cardiopulmonary instability.
- Severe underlying medical conditions that make surgery high-risk (ASA 4 or 5 or 6).

Method:

All cases were performed under the supervision of an experienced surgeons at Ain Shams University Hospitals and Itay Elbaroud General Hospital.

Preoperative patient data: Including demographics, comorbidities, clinical presentation and preoperative diagnosis were recorded.

Intraoperative data: Such as the surgical technique used, operative time, and any intraoperative difficulties and complications were documented.

Postoperative data, including length of hospital stay, complications, and follow-up data till full recovery were collected.

Principles of Subtotal Cholecystectomy either laparoscopic or open (LSC):

If total cholecystectomy cannot be completed even after attempting fundus first approach and the critical view of safety still cannot be achievable. (Fig. 1).

The dissected portion of the GB was excised and removed. (Fig. 2).

The gall bladder stump at the infundibulum was closed by purse string, simple suturing using vicryl (2-0) or hemoclipped to avoid injury of critical structures. (Figs. 3,4A,B).

The remnant mucosa of the posterior wall of the GB at the liver bed was ablated using monopolar diathermy or advanced bipolar.

In some cases that we expected to be more susceptible or reliable to have CBD obstruction or stricture due to large numbers of stones that we found or severe adhesions probably due to mirizzi syndrome), Typically a T-shaped tube or small drain was left in our stump at the time of surgery to allow external drainage of bile into a controlled route while the original pathology was resolving as well as retrieval of common bile duct stones to keep it patent and prevent stricture. Imaging of the biliary tree (cholangiogram) was performed via the tube to assess the CBD intraoperatively or postoperatively (approximately 10 days later).

Finally, an intraabdominal (subhepatic) tubal drain was inserted.

Statistical analysis:

Statistical analysis was done by SPSS v26 (IBM Inc., Chicago, IL, USA). Shapiro-Wilks test and histograms were used to evaluate the normality of the data distribution. Quantitative parametric data were presented as mean and standard deviation (SD) and were compared by paired *t*-test. Quantitative non-parametric data were presented as median and interquartile range (IQR) and were compared by Wilcoxon test. Qualitative variables were presented as frequency and percentage (%) and were compared by Chi-square test. A two-tailed *p*-value <0.05 was considered statistically significant.

Open



Fig. (1): Fundus first approach.

Laparoscopic



Fig. (2): Gallbladder stump after subtotal cholecystectomy at the level of the infundibulum and excision of the dissected portion of the gall bladder.

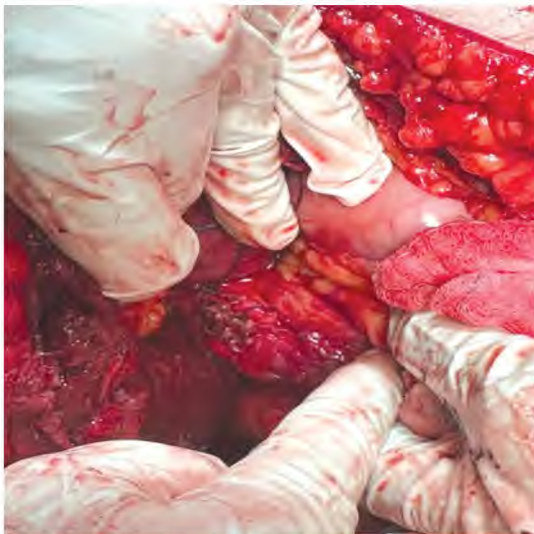
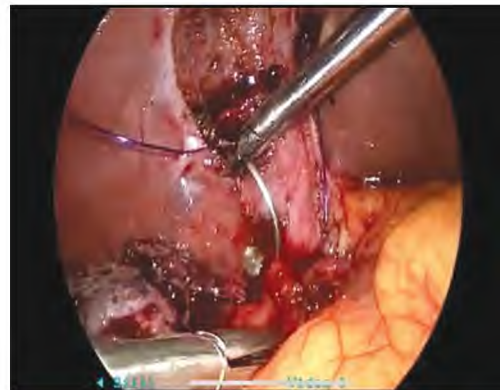


Fig. (3): After closure of the gall bladder stump with simple running suture using (vicryl 2-0).



(A)



(B)

Fig. (4A,B): Closure of the gall bladder stump.

Results

Our study recruited 20 patients, the age ranged from 21 to 68 years with a mean value of 52.8 (± 12.7) years. 11 (55%) patients were males, and 9 (45%) patients were females which indicating a higher prevalence of difficult and acute gall bladder diseases in males than females while chronic cholecystitis is more common in females than males. Regarding type of operation, 16 (80%) patients underwent laparoscopic operation and 4 (20%) patients converted to open operation. Table (1).

Regarding diagnosis, nine patients present with acute cholecystitis, three patients with chronic cholecystitis, (accidentally found to be difficult during the operation due to severe adhesions and inflammation (liver cirrhosis, pervious abdominal operations), anatomical variations (short cystic duct) or a type of mirizzi syndrome), five patients with gallbladder empyema, one patient with history of cholangitis, and two patients with Mirizzi's syndrome, Table (1). The Operative time ranged from 45 to 105min with a mean value of 68.5 (± 19.87) min. Table (1).

Total amount of intraoperative blood loss ranged from 100 to 400ml with a mean value of 155 (± 82.56) ml. Total amount of drain ranged from 100 to 400ml with a mean value of 255 (± 116.42) ml. Length of drain usage ranged from 3 to 7 days with a mean value of 4.7 (± 1.525) days, Table (1). Follow-up of CBC, CRP and liver enzymes showed that leukocytes and CRP were significantly higher postoperative than preoperative (p -value < 0.001), while HB was slightly decrease in postoperative than preoperative (p -value = 0.0249), AST and ALT were significantly higher postoperative than preoperative (p -value < 0.05) while ALP, GGT and bilirubin were insignificantly different between preoperative and postoperative, Table (2).

Table (1): The Operative time ranged from 45 to 105min with a mean value of 68.5 (± 19.87) min.

	N=20
<i>Age (years):</i>	
Mean \pm SD	52.8 \pm 12.7
Range	21-68
<i>Sex:</i>	
Male	11 (55%)
Female	9 (45%)
<i>Type of operation:</i>	
Laparoscopic	16 (80%)
Open	4 (20%)
<i>Comorbidities:</i>	
DM	4 (20%)
Hypertension	8 (40%)
Ischaemic heart disease	3 (15%)
<i>Diagnosis:</i>	
Acute cholecystitis	9 (45%)
Chronic cholecystitis	3 (15%)
Gallbladder empema	5 (25%)
History of cholangitis	1 (5%)
Mirizzi's syndrome	2 (10%)
<i>Operative time (min):</i>	
Mean \pm SD	68.5 \pm 19.87
Range	45-105
<i>Total amount of intraoperative blood loss (ml):</i>	
Mean \pm SD	155 \pm 82.56
Range	100-400
<i>Total amount of drain (ml):</i>	
Mean \pm SD	225 \pm 116.42
Range	100-400

Regarding complications, retained stones in CBD were present in one (5%) patient, so MRCP done followed by post ERCP with stent insertion in CBD, wound infection was present in two (10%) patients that managed by culture and sensitivity from infected wound and broad spectrum antibiotic, postoperative fever was present in one (5%) patient that managed conservatively by analgesics, antipyretics and postoperative bleeding was present in two (10%) patients which was mild bleeding that managed conservatively and followed-up by serial abdominal US and monitored HB level, Table (1).

Table (2): Bilirubin were insignificantly different between preoperative and postoperative

	Preoperative	Postoperative	<i>p</i> -value
<i>HB (g/dl):</i>			
Mean \pm SD	13.28 \pm 1.21	12.44 \pm 1.06	0.249*
Range	11.3-15.4	11-14.2	
<i>Leukocytes ($10^9/L$):</i>			
Mean \pm SD	8.2 \pm 3.19	12.7 \pm 2.6	$< 0.001^*$
Range	4-13	8-16	
<i>CRP (mg/dL):</i>			
Mean \pm SD	0.71 \pm 0.25	1.61 \pm 0.35	$< 0.001^*$
Range	0.3-1.1	0.6-2.1	
<i>AST (U/L):</i>			
Mean \pm SD	24.8 \pm 10.54	54.45 \pm 20.74	$< 0.001^*$
Range	7-38	21-97	
<i>ALT (U/L):</i>			
Mean \pm SD	29.55 \pm 13.82	65.2 \pm 27.21	$< 0.001^*$
Range	9-55	24-126	
<i>GGT (U/L):</i>			
Mean \pm SD	26.2 \pm 9.923	31.5 \pm 10.956	0.1171
Range	6-42	8-51	
<i>Bilirubin (mg/dl):</i>			
Mean \pm SD	1.075 \pm 0.395	1.125 \pm 0.199	0.2422
Range	0.4-1.7	0.9-2	
<i>ALP (IU/L):</i>			
Mean \pm SD	83.6 \pm 29.08	81.35 \pm 28.72	0.807
Range	39-118	37-115	

Discussion

Laparoscopic cholecystectomy is one of the most common surgical procedures done worldwide and it is the gold standard treatment for gall bladder diseases [6] subtotal cholecystectomy not only provides the advantage of maintaining the benefits of minimally invasive surgery, but it also resolves the problem in a single procedure, making this technique an ideal tool in complex cases [7].

Studies about subtotal cholecystectomy have shown promising results in patients with various forms of cholecystitis [8].

In the current study, the overall mean age was 52.8 years. 11 (55%) patients were males, and 9 (45%) patients were females which indicating a higher prevalence of difficult and acute gall bladder diseases in males than females while chronic cholecystitis is more common in females. Most of patients underwent laparoscopic operation (80%), with acute cholecystitis (65%) was the main cause of cholecystitis followed by chronic disease (35%).

Similar data were concluded by Hernández Centeno et al., [9] carried out a retrospective study on 18 patients were performed subtotal cholecystectomy due to difficult cholecystectomy. Age ranged from 21 to 71 years, with an average of 48 years. However, there was 11 (61.11%) females and 7 (38.89%) males. Four patients were programmed as an open (22.2%) procedure and 14 patients were programmed laparoscopic (77.8%).

Same result was obtained by Tang et al., [10] who stated that Laparoscopic was performed on (74%), the mean age was 50 years and there were 43 (50%) males.

Also, Tay et al., [11] reported that the mean age was 63, they found that (60.7%) were males and (91.1%) patients were attempted laparoscopically.

In our study, The Operative time ranged from 45 to 105min with a mean value of 68.5 (± 19.87) min. While result obtained by Tay et al., [11] found that the mean duration of operation was 150 min. Also, ElGohary et al., [12] reported that the mean operative time was 135min.

In the current study, the mean amount of intraoperative blood loss 155 ± 82.56 ml. The mean amount of drain 255 ± 116.42 ml. The mean length of drain usage 4.7 (± 1.525) days.

In the same line, Tay et al. [11] showed that men blood loss was 170ml. In contrast, Bawahab et al., [13] revealed that the mean volume of drained fluid was 49.84 (± 34.30) ml. Also, the drain was removed after a mean time of 2.63 (± 1.05) days.

In the current study, hemoglobin (HB) was slightly lower postoperative than preoperative while

Leukocytes and C-reactive protein (CRP) were significantly higher postoperative than preoperative.

The blood loss during surgery, even though laparoscopic surgery was minimally invasive [14].

Surgery causes a stress response that activates the immune system, leading to an increase in leukocytes as part of the body's defense mechanism [15].

In contrast, Ashraf Butt et al., [16] reported that HB significantly decreased postoperative and leukocytes were significantly increased postoperative.

Supporting our results, Kohli et al., [17] carried out a prospective study on 50 patients divided equally into two groups: One underwent laparoscopic cholecystectomy and the other underwent open cholecystectomy, they found that CRP was significantly increased postoperative than preoperative in the laparoscopic cholecystectomy group.

In the present study, AST, ALT were significantly higher postoperative than preoperative while ALP, GGT, and bilirubin were insignificantly different between pre and postoperative. Similarly, Ashraf Butt et al., [16] revealed that ALT was significantly increased postoperative and ALP was not significantly different between postoperative and preoperative. However, Singal et al., [18] noted that in the laparoscopic cholecystectomy ALT, AST and serum bilirubin postoperative were significantly higher than preoperative while ALP was not significantly different. Also, Muhammedoglu et al., [19] reported that ALT, AST, GGT and total bilirubin were not significantly different between pre and postoperative in the laparoscopic subtotal group and open group.

In our study, the mean length of hospital stay was 4.05 ± 2.4 days. Supporting our results Muhammedoglu et al., [19] found that the mean length of hospital stay in the laparoscopic subtotal cholecystectomy group was 5 days. Also, Hernández Centeno et al., [9] showed that the mean length of hospital stay was 2.4 days. In same line, ElGohary et al., [12] reported that the mean length of hospital stay was 3.2 days.

Conclusion:

The subtotal cholecystectomy was found to be a modified technique (bail-out procedure) that aims to overcome complications in complex and severely inflamed cases and improve patient outcomes. Also, it was found to be a relatively safe approach with minor complications.

Subtotal cholecystectomy was considered to be a rescue procedure with low morbidity and mortality that provides effective and safe resolution of complex cases in one step approach.

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استئصال المرارة دون التام: نهج آمن فى استئصال المرارة الصعبة

الجهاز المرارى مسؤول عن إنتاج وتخزين ونقل الصفراء التى تلعب دوراً حيوياً فى الحفاظ على توازن الجهاز الهضمى ووظائف التمثيل الغذائى داخل الجسم. يمكن أن يؤدى الخلل أو الكتل فى الجهاز الصفراوى إلى مشاكل صحية مختلفة، مثل حصوات المرارة أو ضعف هضم الدهون.

يتكون الجهاز المرارى من الأعضاء والقنوات التى تساعد على إنتاج ونقل العضارة الصفراء. أى حالة مثل الالتهاب الشديد أو التليف أو التشوهات الخلقية التى تسبب تشوهاً فى التشريح تجعل عملية استئصال المرارة صعبة.

أثبتت الأبحاث السابقة والخبرة السريرية أن استئصال المرارة هو إجراء شائع وآمن بشكل عام لإزالة المرارة. يعتبر استئصال المرارة بالمنظار التقليدى هو المعيار الذهبى للحالات غير المعقدة، مع الحد الأدنى من مضاعفات ما بعد الجراحة وفترة تعافى قصيرة نسبياً.

الهدف من الدراسة: الهدف من هذه الدراسة هو التحقق من سلامة وفعالية استئصال المرارة الفرعى (دون التام) كنهج آمن لإستئصال المرارة الصعب وتقييم المضاعفات أثناء العملية وبعد العملية الجراحية المرتبطة باستئصال المرارة الفرعى (دون التام). ومدة الإقامة فى المستشفى ونتائج المتابعة فى حالات الستئصال المرارة الصعبة.

الإستنتاج: كان استئصال المرارة الفرعى (دون التام) عملية جراحية آمنة نسبياً فى حالات المرارة المعقدة مع حدوث مضاعفات طفيفة ولا يحتاج المريض بعدها إلى إجراء مرحلة ثانية من الجراحة.