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Original Article

Management of difficult gallbladder and comparison of laparoscopic subtotal cholecystectomy with open subtotal cholecystectomy

Bahtiyar Muhammedoglu[1], Muhammet Kadri Colakoglu[2], Vehbi Sikrikci[3], Volkan Oter[4]

[1]Necip Fazil City Hospital, Department Of General Surgery, Gastrointestinal Surgeon, Kahramanmaras, Turkey
[2]Recep Tayyip Erdogan University Faculty of Medicine, Department of General Surgery, Assistant Professor, Rize, Turkey
[3]Necip Fazil City hospital, Department of Gastroenterology, Gastroenterologist Surgeon, Kahramanmaras, Turkey
[4]Health of Science Universit, City Hospital, Department of Gastroenterological Surgery, Ankara, Turkey

Abstract

Aim: Laparoscopic cholecystectomy is the optimal surgical treatment for benign gallbladder diseases. Under curtain conditions it is very hard to distinguish the Calot triangle and it becomes difficult to perform safe cholecystectomy. Subtotal cholecystectomy is a salvage option in such conditions. The aim of this study is to compare the results of open and laparoscopic subtotal cholecystectomy in difficult gallbladder management.

Material and Methods: In this retrospective study results of all consecutive patients who were performed subtotal cholecystectomy between July 2014 and August 2017 were collected and laparoscopic and open methods were compared.

Results: Forty-five of 396 laparoscopic cholecystectomy cases underwent subtotal cholecystectomy during the study period. Subtotal cholecystectomy was performed laparoscopically in 27 of 45 patients (Group I), and open method in 18 patients (Group II). Convertion rate was %34.1. No significant difference was observed in terms of both preoperative and postoperative laboratory results. There was no difference between two groups in terms of ERCP history. The rate of open operation was statistically higher in acute cases. The duration of surgery was significantly higher in laparoscopic group but length of hospital stay was significantly higher in open group. Total cost was higher in group 2 but this result did not reach statistical significance. Total bile leak rate was 2.2%.

Conclusion: Laparoscopic subtotal cholecystectomy is a safe and appropriate method which can be compared with open subtotal cholecystectomy in difficult gallbladder management.

Keywords: Laparoscopy; difficult gallbladder; management; cholecystectomy.

INTRODUCTION

Inflammation of the gallbladder (acute cholecystitis) is a clinical condition that is common in surgical practice and the best treatment option is surgery. Minimal invasive surgery (laparoscopic cholecystectomy) is the optimal surgical treatment for benign gallbladder diseases (1). However, there is a fact that laparoscopic surgery can be difficult in the presence of inflammation in the gallbladder and the fear of harming the biliary system is experienced by every surgeon in the presence of acute or chronic inflammation. Firm adhesions, edema, inability to distinguish the Calot triangle and naming of anatomical structures, and the fact that these technical details become more difficult in the two-dimensional plane during laparoscopy give the surgeon a hard time.

This clinical situation brings up two questions that need to be answered. First one is the timing of surgery. Whether the cholecystectomy procedure should be performed in the early or late period in the presence of inflammation is still remains to be answered (2). The only reason of this discussion continues is the balance of advantages and disadvantages of both early and late surgery periods. The second question is the surgeon's decision when he or she faces a difficult gallbladder. Should the surgeon continue

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Corresponding Author: Volkan Oter, **Health of Science Universit, City Hospital, Department of Gastroenterological Surgery, Ankara, Turkey, E-mail:** otervolkan@gmail.com

the surgery laparoscopically or should he or she undergo a conventional open surgery? It is reasonable to conversion to open surgery within the principle of "first do no harm" (3). However, the advantages of laparoscopic procedure cannot be easily ignored and it is also a fact that surgeons who are newly trained are actually more unfamiliar to open cholecystectomy (4). This has led to surgeons creating laparoscopic safety protocols for difficult gallbladder and a emergency escape route, laparoscopic subtotal cholecystectomy (LSC) (5).

Whether performed early or late, the surgeon may always experience a severe inflammation in gallbladder while performing laparoscopic cholecystectomy (LC). Although there are different definitions in the literature, subtotal (or partial) cholecystectomy is a salvage option that where the anatomy of the biliary system can not be fully identified and it is very likely to damage the biliary system so surgeon chooses to leave behind a portion of the gallbladder associated with the biliary tree and it can be performed both laparoscopic or traditional open method.

As it is known, difficult gallbladder is seen more frequently in recurrent attacks, in male patients, after endoscopic retrograde cholangiopancreatography (ERCP) and previous surgeries. In the clinics where ERCP is performed frequently, increasing the rate of difficult gallbladder, requires a management to provide safe cholecystectomy. Especially the effects of laparoscopic subtotal cholecystectomy are presented in several case series before. In this paper we aim to figure out the management of difficult gallbladder and compare our results between laparoscopic subtotal cholecystectomy and open subtotal cholecystectomy (OSC).

MATERIAL and METHODS

In this retrospective study we extracted all consecutive patients who were performed cholecystectomy between July 2014 and August 2017, by single surgeon, from our institutions digital database. During this period a total of 396 patients underwent cholecystectomy.

In these patients, difficult gallbladder identification criterias were determined in three stages. In the first stage, positive Murphy sign in physical examination with white blood cell (WBC) elevation and the inability of acute cholecystitis clinic to regress despite medical treatment was evaluated. In the second stage, results of ultrasound (USG), and computed tomography (CT) images were evaluated (destructive cholecystitis, Mirizzi syndrome, pericholecystic abscess, sac perforation / suspicion, wall thickness≥ 4 mm). Third stage was determined as evaluation of gallbladder during surgery. While the first two stages were alarming for difficult gallbladder, the main decision was reached in the third stage. Absence of progression within first 30 minutes of surgery, significant gallbladder edema, failure to determine Hartman pouch and cystic duct transition point, failure of dissecting cystic channel and firm adhesions which prevent the identification of Calot triangle were the main perioperative criterias for surgeon to define difficult gallbladder.

In the light of these criterias, among patients performed cholecystectomy, it was determined that a total of 45 patients underwent subtotal cholecystectomy because of difficult gallbladder. Among these patients, subtotal cholecystectomy that was completed laparoscopically was defined as group I and completed with open method was defined as group II. If ERCP was applied, surgical treatment was planned in the first 72 hours after ERCP or after 6 weeks (if ERCP lasts longer than 30 minutes). Only six patients were operations be performed between these two periods (first 72 hours to 6 weeks) because of their comorbid disease. After the treatment of preoperative comorbid diseases was completed, these 6 patients had to be operated during this time period because of the long preoperative approval from the required departments. However, since none of these six patients underwent subtotal cholecystectomy, statistical data were not affected.

We have analyzed the indications for surgery, the rate of conversion to open surgery, perioperative results, early complications, preoperative and postoperative necessity of ERCP, necessity of percutaneous drainage, the necessity of relaparotomy, overall cost and duration of hospital stay for both groups. Exclusion criteria were gallbladder cancer, sepsis and periampullary diseases. The study protocol was approved by the institutional review board and the informed consent was waived for this study, for its retrospective nature.

The Surgical Technique for Subtotal Cholecystectomy

There are various approaches in the literature for LSC. Recently, Strasberg et al created a nomenclature by dividing the surgical procedures into fenestrating and reconstituting sub-types (6). First, an imaginary straight line was drawn between the Hartman pouch and fundus of gall bladder. The upper and lower part of the gallbladder was dissected towards the posterior side, from the point near liver bed. Dissection was performed using various energy devices. Dissection of the fundus postponed for traction. If the fundus is dissected, the liver falls down and blocks the dissection of the gallbladder. The non-dissected distance on the posterior wall was identified as "convenience distance". The proximity of this distance facilitates gall bladder surgery. Hartman Pouch was separated from the gallbladder using energy devices from its starting point. When the gallbladder was opened, free flowing bile and pus were aspirated from the surgical area. The convenience distance field, which we have determined at the posterior end of the gallbladder, was separated from the hartman pouch using hook or energy devices. Then, the posterior wall of the sac was dissected from the liver bed and proceeds towards the fundus and LSC is completed. If the posterior of the gallbladder is too adherent (if the convenience distance is large), it was left unexposed and the mucous membranes in this area were irritated by electrocautery. The gallbladder stump was washed with saline, and then it was closed with single sutures using 3.0 maxon sutures. Subtotal resected gallbladder and stones are removed using endobag. A suction drain was

placed to the operation field and the operation was ended.

Statistical Analysis

The normality of distribution of continuous variables was tested by Shaphiro Wilk test. Student t test was used for comparison of two independent groups of variables with a normal distribution and Mann-Whitney U test was used for comparison of two independent groups of variables with a non-normal distribution. Chi-square test was applied to assess relationship between categorical variables. Statistical analysis was performed with SPSS for Windows version 24.0 and a P value < 0.05 was accepted as statistically significant.

RESULTS

Forty-five of 396 laparoscopic cholecystectomy cases underwent subtotal cholecystectomy during the study period. Subtotal cholecystectomy was performed laparoscopically in 27 of 45 patients (Group I – LSC), and open method in 18 patients (Group II – OSC). The ages of the 45 people included in the study ranged from 29 to 84 years and the mean age was 58.09 ± 15.55. (57.89±16.28 for group I and 58.39±14.83 for group II). Male patients were 48% and 61% in groups, respectively. No significant difference was found between groups in terms of age and gender (p= 0.917 and p= 0.393).

All patients were evaluated with difficult gallbladder identification criterias that were mentioned above in three stages. Of the 45 patients who met the criteria for difficult gallbladder, four patients operation started with laparotomy, 14 patients converted to laparotomy during the surgery and 27 patients operation ended laparoscopically as mentioned before. Convertion rate was %34.1 (14/41).

The laboratory values were compared between laparoscopic and open groups retrospectively. (Table 1). Preoperative and postoperative values were analyzed for each group. Only amylase value evaluated preoperatively. Postoperative evaluation was performed on the day of discharge. When two groups were compared in terms of laboratory values, no significant difference was observed in terms of both preoperative and postoperative values. Only preoperative values of direct bilirubin in group I were significantly higher than group II.

Two groups were also compared according to preoperative imaging results (Table 2). In both groups, two patients were operated because of gallbladder perforation. Remaining cases were some forms of acute and chronic cholecystitis. It is observed that the rate of open operation was statistically higher in acute cases (p= 0.006). Table 2 also shows the final pathology results of specimens. The results of the latest pathology were consistent with preoperative evaluation. Table 3 shows the type of operation and preoperative ERCP requirements. There was no difference between two groups in terms of ERCP history and leaving posterior wall.

The duration of surgery was significantly higher in laparoscopic group (group 1) but length of hospital stay was significantly higher in open group (group 2). Total cost was higher in group 2 but this result did not reach statistical significance. (Table 4).

Only one patient who underwent laparoscopic subtotal cholecystectomy (group 1) had approximately 250 cc bile in drain, on the first postoperative day. Total bile leak rate was 2.2%. ERCP and endoscopic sphincterotomy were performed on the 2nd day. On the following day, drainage decreased to 50 cc and then it was completely stopped. No patient required percutaneous drainage or reoperation. There was no complication of remnant stump during the mean follow-up period of three months.

Table 1. Comparison of laboratory values between laparoscopic and open groups

Variables‡	Group I	Group II	P
ALT (preop.)	37 [23 -123]	21.5 [14 -62]	0.168
ALT (postop.)	39 [19 -65]	28 [18 -62]	0.640
AST (preop.)	28 [23 -70]	27 [19 -38]	0.458
AST (postop.)	43 [30 -57]	29 [22 -46]	0.114
GGT (preop.)	120.5 [55 -185]	26 [16 -117]	0.059
GGT (postop.)	88.5 [40 -165]	47 [21 -193]	0.297
Amylase (preop.)	63 [45 -71]	63 [45 -71]	0.296
Total bilirubin (preop.)	1 [0.57 -1.95]	0.57 [0.4 -2.59]	0.283
Total bilirubin (postop.)	0.9 [0.6 -1.7]	0.6 [0.4 -0.8]	0.060
Direct bilirubin (preop.)	0.52 [0.28 -1.13]	0.19 [0.13 -0.61]	0.041*
Direct bilirubin (postop.)	0.47 [0.3 -0.93]	0.3 [0.2 -0.61]	0.214
White Blood Cell (preop.)	7.4 [6.01 -9.01]	9.04 [7.87 -11.72]	0.105
White Blood Cell (postop.)	8.35 [6.44 -11.27]	9.37 [8.46 -12.4]	0.118

* Significant at 0.05 level. ‡ Median [25%-75%]; Mann Whitney u test.

Table 2. Comparison of preoperative imaging and final pathology results

		Groups				
		Group I		Group II		
		n	%	n	%	P
Preoperative Imaging	Acute Cholecystitis with stones	12	44.4	11	61.1	0.006*
	Gallbladder Perforation	2	7.4	2	11.1	
	Chronic Cholecystitis	1	3.7	0	0.0	
	Chronic Cholecystitis with stones	12	44.4	5	27.8	
Final Pathology	Acute Cholecystitis	2	7.4	0	0.0	0.002*
	Acute Suppurative Cholecystitis	0	0.0	1	5.6	
	Chronic Active Cholecystitis	11	40.7	15	83.3	
	Chronic Active Ulcerous Cholecystitis	1	3.7	0	0.0	
	Chronic Cholecystitis with stones	10	37.0	0	0.0	
	Xanthogranulomatous Cholecystitis	3	11.1	1	5.6	
	Subacute Cholecystitis	0	0.0	1	5.6	

Table 3. Type of operation and preoperative ERCP requirements

Variables‡		Group I (n=27)	Group II (n=18)	P
Age		57.89±16.28	58.39±14.83	0.917
Gender	Female	14 (51.8 %)	7 (38.8%)	0.393
	Male	13 (48.1%)	11 (61.1%)	
Cholecystectomy	SC	17 (62.9%)	7 (38.8%)	0.212
	SCpw	10 (37%)	11 (61.1%)	
ERCP history	Yes	12 (44.4%)	4 (22.2%)	0.220
	No	15 (55.5%)	14 (77.7 %)	

‡ Mean±std.deviation; Student t test
|| n(%); Chi-square test
SC: Subtotal Colesistectomy
SCpw: Subtotal Colesistectomy leaving posterior wall

Table 4. Comparison of surgery time, length of hospital stay and total cost

Variables‡	Group I (n=27)	Group II (n=18)	P
Length of surgery (minute)	133 [88 -148]	73 [38 -88]	0.001*
Length of hospital stay (day)	5 [4 -9]	8 [6 -10]	0.019*
Cost (TL)	1312.5 [965.8 -2028.18]	2321.49 [1219.1 -3667.73]	0.081

* Significant at 0.05 level
‡ Median [25%-75%]; Mann Whitney u test
TL: Turkish lira

DISCUSSION

The treatment of benign gallbladder diseases is laparoscopic cholecystectomy and this treatment is now the gold standard. However, in surgical interventions, especially in acute or chronic cholecystitis, it is difficult for surgeon to define the anatomical structures and the risk of bile duct injury increases. In these cases, which may be a nightmare for the surgeon, the general approach is conversion to the open procedure. But there is also strong evidences that conversion to open surgery does not decrease rates of bile duct injury, especially for new surgeons who are unfamiliar with the open approach (7). The desire to continue laparoscopic surgery due to the patient's comorbidities, the lack of surgical experience in open cholecystectomy and the comfort level of the surgeon in laparoscopic procedure has led to an alternative method of laparoscopic subtotal cholecystectomy.

In fact, subtotal cholecystectomy is an old known method. Definition of subtotal cholecystectomy, first described by Bonilla Naar A. (8) but popularized by Madding GF in 1955 (9). As a matter of fact, it is a method that completely emerges from the need and allows the surgeon to solve his / her bad condition with minimal damage. However, this alternative method brought new questions.

The first problem with the invitation of the method is the short and long-term problems that may occur in the remnant sac. There is no satisfactory data about the long-term results of LSC. Remnant cholecystitis and residual calculus in the common bile duct are the known long term complications of subtotal cholecystectomy. Kohga et al from Japan analyzed the long term complications of 59 patients with OSC and emphasized that the size of the remnant gallbladder calculated by magnetic resonance cholangiopancreatography was significantly associated with the occurrence of long-term complications (10). Tamura et al. showed no cases revealing cholecystitis, abscess or malignancy in the long term for remnant gallbladder tissue (11). On the other hand Concors et al reported 14 cases that undergone repeat cholecystectomy for symptomatic cholelithiazis in seven years period (12). The lack of long-term results in our study is a weakness but based on the results of previous studies, we believe that long-term results of subtotal cholecystectomy will be better than the long-term outcomes of patients with biliary tract injuries.

In some cases, the posterior wall of the gallbladder is highly adherent to the liver, and trying to separate this wall may cause serious bleeding in the liver bed. In these cases, the surgeon prefers to leave the posterior wall in place. There are opinions that this situation may or may not increase bile leakage. Shin et al. revealed that LSC have higher bile leak rates but leaving posterior wall have similar clinical outcomes when compared resecting posterior wall (13). Also they showed that leaving posterior wall decrease operation time and reduces amount of bleeding. While agreeing to the results of Shin et al. we did not compare our results according to posterior wall existence.

The most important dilemma of subtotal cholecystectomy in the early period is bile leakage especially when the cystic stump was left open. Different leakage rates have been reported in the literature. Elshaer M et al reported 18% leak rate but reoperation needed only 1.8% of cases. Management of the rest were successfully performed nonoperatively (14). Kohga et al also reported 10.4% bile leak rate and 4.1% residual calculus in common bile duct for early complications after SC (10). Our leak rate is very low (2.2%) but this is mostly related to less number of cases.

Our study showed that preoperative laboratory values do not have a great effect on surgical decision making. In our study, no significant difference was found between the two groups in terms of laboratory values. Only direct bilirubin was significantly higher in group I. However, we do not think this has a clinical significance. For this reason, only imaging studies remains for decision making for difficult gallbladder in the pre-operative period. However, despite the preoperative methods, only 4 patients were started with open method and the conversion rate was as high as 34.1%. This high rate is not surprising in difficult gallbladders. However, it shows that difficult gallbladder decision is given not by preoperative but mostly by intraoperative evaluation.

The lack of evaluation of the effects of early or late operation on the results is also a limitation of this article. There was no difference between the groups in patients who underwent ERCP. However, the effect of early or late period on the outcomes of subtotal cholecystectomy after ERCP is unknown.

Above all, shorter hospital stay and therefore lower cost are the advantages of LSC. Also LSC is a suitable alternative in the management of difficult gallbladders because of the same postoperative results compared to open surgery. Therefore, we think that laparoscopic method should not be completely excluded in patients who are thought to have difficult gallbladder and LSC is a suitable method for patients in whom the distal portion of the gallbladder could not be seen. We believe that experience of the surgeon is very important at this stage.

CONCLUSION

Laparoscopic subtotal cholecystectomy is a safe and appropriate method which can be compared with open subtotal cholecystectomy in difficult gallbladder management. The surgeon should make difficult gallbladder decision intraoperatively and consider laparoscopic subtotal cholecystectomy as an alternative and safe method.

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Bahtiyar Muhammedoglu ORCID:0000-0001-9890-6772
Muhammet Kadri Colakoglu ORCID:0000-0002-6283-943X
Vehbi Şıkrıkçı ORCID:0000-0002-5071-025X
Volkan Oter ORCID:0000-0002-0639-1917

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