Feasibility and safety in difficult laparoscopic cholecystectomies; a single surgeon experience

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Abstract

Background: laparoscopic cholecystectomy is commonly used for the treatment of gallstones.
Objective: To determine the feasibility and safety of difficult laparoscopic cholecystectomies.
Methodology: This cross sectional study was based on retrospective collection of data from patient records, including 323 patients with difficult laparoscopic cholecystectomies was conducted in Department of Surgery, Sharif Medical City Hospital, and Rasheed Hospital, Lahore from June 2010 to December 2019. Difficult cholecystectomy was defined on intraoperative findings based on Nassar intraoperative scoring system. Feasibility was defined as successful accomplishment of procedure without complication and safety was defined as having no intraoperative or postoperative complications.
Results: There were 75 (23.21%) male and mean age was 48±8 years. Class I difficulty was observed in 185 (57.3%) patients, class II difficulty in 83 (25.7%) patients, class III difficulty in 44 (13.6%) patients and class IV difficulty in 11 (3.4%) patients. Mean duration of surgery and mean hospital stay were 98.87±11.76 minutes and 1.91±1 days, respectively. Conversion to open cholecystectomy was done in 10 (3.1%). The procedure was feasible in 313 (96.9%) patients. Overall complications were seen in 19 (5.9%) patients. The complications included Common Bile Duct injury in 1 (0.31%) patient, intraoperative bleeding in 1 (0.3%) patients, bile leakage in 2 (0.62%) patients, postoperative jaundice in 3 (0.93%) patients, superficial infections in 10 (3.1%) patients and deep infections in 2 (0.62%) patients. Safety of laparoscopic surgery was seen in 304 (94.1%) patients.
Conclusion: Laparoscopic cholecystectomy in difficult situations was found to be feasible and safe in majority of patients. However, it was associated with a longer operative time.
Keywords: Difficult laparoscopic cholecystectomy; Acute cholecystitis; Mucocele; Safety

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Introduction

Currently, laparoscopic cholecystectomy is comprehensively acknowledged as the gold standard for the cure of gallstones.[1,2] Success story of laparoscopic surgery in non-inflamed gall bladder is famous to everyone.In the past, laparoscopic surgery was outlawed in cases of acute cholecystitis.[3,4] With the increasing expertise and introduction of modern gadgets, laparoscopic tactics were endeavored in patients with acute cholecystitis to add benefit of minimal invasive surgery in such patients.[3] Though, the conversion rate of laparoscopic cholecystectomy for acute cholecystitis was pointedly greater in the past (24.4-49%).[5,6] In the beginning, its practice was only certified at early stages of acute cholecystitis because higher risk of complication and lack of expertise to deal technical troublesefficiently were remained the two main culprits that entirely banned the entry of laparoscope in abdomen of acute cholecystitis.[7,8] Bile duct injuries are serious complication of laparoscopic cholecystectomy and in laparoscopy, the site of injury is more proximal.[9,10,11] Risk of biliary ducts injury is found to be double in patient with acute cholecystitis as compared to patients without acute cholecystitis.[8] The incidence of vascular injury during laparoscopic surgery falls between 7 -47%.[12,13]

The level of expertise required in operating acute cholecystectomy is also higher. Operative time and conversion rate for Surgeons with training in laparoscopic surgery were noticeably lesser than for the non-trained surgeons i.e. (1.7% vs 8.5%, p = 0.0004) and (111 vs 104 minutes, p = 0.04), respectively.[14] Current statistics reported a catholic array of conversion (4.9–20%) from laparoscopic to open cholecystectomy and highlighted the causative factors that encompassed the untrained surgeons.[15]

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The gross gallbladder pathology is characterizedinto three groups' i.e. acute inflammation, chronic inflammation and gall bladder with no inflammation. Mucocele, empyema gall bladder, gangrene and perforation of gall bladder are the complications of acute cholecystitis. Acutely inflamed edematous gall bladder usually found adherent to omentum, small and large gut; making its dissection more difficult and dangerous at same time. Dense adhesion and complicated acute cholecystitis are still considered contraindicated for laparoscopic surgery. However, if the talents to handle the angry gall bladder are availed then laparoscope can be the attempted as first option for such cases and this can be helpful for the patient in terms of lesser pain, early recovery, and lesser scar.[12] The purpose of this study was to determine the feasibility and safety of laparoscopic surgery in difficult cholecystectomy.

Methodology

This cross sectional study was based on retrospective collection of data from records of patients and was conducted in the Department of Surgery, Rasheed Hospital, Sharif Medical City Hospital, Lahore from June 2010 to December 2019 by the same surgeon. This study 323 patients with difficult laparoscopic cholecystectomy. Difficult laparoscopic cholecystectomies were defined and classified on the classification system described by Nassar et al.[16] Presence of adhesion of omentum, transverse colon, and/ or duodenum with fundus of gallbladder were labelled as Class I difficulty. Class II difficulty was labelled if there were adhesions with Calot's triangle making dissection difficult to find out cystic duct and artery. If the difficulty was found in dissection of gallbladder bed, or there is hemorrhage from liver during dissection of gall bladder, it was labelled as Class III difficulty. A difficulty in gall bladder exploration due to adhesion or technical problems was labelled as Class IV difficulty. Feasibility was labelled as 'yes' if the procedure was successfully accomplished by laparoscopic surgery. Feasibility was assigned if there is no complications associated with the procedure. We excluded all the patients below 18 years of age, not fit for general anesthesia and patient with choledocholithiasis, suspicion of hepatobiliary malignancy and laparoscopic cholecystectomies with intra operative finding of normal non-inflamed cystic gall bladder.

Demographic features, history and physical examination were noted. Intraoperative findings of patients those underwent difficult laparoscopic cholecystectomy after clinical and radiological (ultrasound) evaluation of hepatobiliary system were recorded. The data was entered into SPSS version 20, computer program and analyzed accordingly. Study variables were analyzed by simple descriptive statistics. Mean and standard deviation were calculated for numerical variables like age. Frequency and percentage were calculated for gender, co-morbid conditions, clinical diagnosis, intraoperative findings and post-operative outcome of difficult laparoscopic cholecystectomies. Ethical approval was sought from Ethical Committee of Hospital.

Results

Characteristics of patients and gall bladder disease areshown in Table I. The male to female ratio was 1:3.3. The most common operative finding of difficult cholecystectomies was acute cholecystitis with omental adhesion i.e. 68.73%. Operative findings and outcome of difficult laparoscopic cholecystectomies are shown in table II and III.

Table I: Characteristics of patients and gall bladder disease (n=323)

Variable		No. of patients (%)
Age (years)	Mean±SD	48.87±8.76
	Range	35 - 73
Gender	Male	75 (23.21%)
	Female	248 (76.78%)
Co-morbid conditions	Hypertension	108 (33.43%)
	IHD	55 (17.02%)
	Diabetes mellitus	111 (34.36%)
	BMI > 30 kg/m^2	15 (4.64%)
Past history of	Acute pancreatitis	10 (3.09%)
	Obstructive jaundice	6 (1.85%)
	ERCP procedure	16 (4.95%)
	Any abdominal surgery	74 (22.91%)
Clinical diagnosis	Acute cholecystitis	129 (39.93%)
	Chronic cholecystitis	98 (30.34%)
	Acute on chronic cholecystitis	105 (32.50%)

Table II: Operative findings of difficult cholecystectomies (n=323)

Variable		No. of patients(%)
Acute cholecystitis with adhesion	Omentum	148 (45.8%)
	Duodenum	34 (10.5%)
	Transverse colon	3 (0.93%)
	Other	0
Mucocele (Impacted gall bladder neck stone)		138 (42.72%)
Empyema gall bladder		102 (31.57%)
Shriveled fibrosed gall bladder		65 (20.12%)
Frozen calot`s triangle		5 (1.54%)
Anatomical variation in cystic duct	Short cystic duct	70 (21.67%)
	Absent cystic duct	3 (0.92%)
	Low union of cystic duct with common hepatic duct	45 (13.93%)
Perforated gall bladder & biliary peritonitis		3 (0.92%)
Mirrize syndrome		6 (1.85%)
Gall bladder fossa bleeding		1 (0.30%)
Emphysematous cholecystitis		0
Gangrenous gall bladder		10 (3.09%)
Cholecytogastric&cholecysto duodenal fistula		0

Table III: Outcome of difficult laparoscopic cholecystectomies (n=323)

Operative outcomes		No. of patients (%)
Mean duration of surgery (Mean±SD)	Laparoscopic	48.87±8.76 min.
Visceral injury	Duodenal perforation	0
	Liver injury	0
	Bowel injury	0
Common bile duct injury		1 (0.31%)
Right hepatic artery injury		0
Massive Bleeding (>500CC)	Intra operative	1 (0.31%)
	Post-operative	0
Postoperative jaundice		3 (0.93%)
Bile leakage		2 (0.62%)
Surgical site infection	Superficial	10 (3.1%)
	Deep / ORGAN (collection)	2 (0.62%)
Mean hospital stay (days)		1.91±1.01
Mortality		0

Based on the operative findings, the difficult laparoscopy was labelled as Class I in 185 (57.4%) patients, Class II in 83 (25.7%) patients, Class III in 44 (13.6%) patients and Class IV in 11 (3.4%) patients. Feasibility was labelled as yes in 313 (96.9%) patients. The overall complications were observed in 19 (5.9%) patients. (Table - III) Safety of the procedure was labelled as yes in 304 (94.1%) patients.

Discussion

In our study the mean age of the patients was 48.87+8.76 years (Range: 35-73 years). In a study by Neri V et al,[17] mean age of patients was 58.8 years (range 24-86). KuldipS ,et al,[18] described that average age of patients was 49 years (range 22-84 years). In a study by Bat O,[19] the mean age of the patients was 55.5±15.2 years (range: 24-86). In a study by Malik AM,[20] overall mean age of patients was 39.88±8.66 years (range: 29-65 years). The results of various studies show a variation in age groups of study population. As per our data, patients with middle age group may present with difficulties in laparoscopic surgery.

Because gall stones are more common in female population as compared to male gender, there were 76.78% female and 23.21% males (M:F; 1:3.3) in our study. Similarly, female predominance was observed in a study by Neri V et al[17] i.e 74% with male to female ratio of 1:2.9. In another study by Kuldip S, et al,[18] there were 64.73% females and 35.26% males (M: F; 1:1.8).[14] In a study by Bat O,et al,[19] there were 42.46% males and 57.53% females (M: F; 1:1.3). So, the results of the study validate the fact that gall stone disease is more common among female population.

In our study, diabetes mellitus (34.36%), hypertension (33.43%) were the common co-morbid conditions along with ischemic heart disease (17.02%) and obesity (MBI >30kg/m^2in 4.64%). Similarly, in a study by Malik AM, et al,[20] diabetes mellitus was the commonest co-morbid condition i.e 4.59% patients followed by ischemic heart disease (3.84%), chronic obstructive pulmonary disease (3.20%) and hypertension (1.17%). In our study, the frequency of co-morbid conditions is higher than other studies because, we did not excluded patients on basis of comorbid conditions.

In our study, past history of acute pancreatitis was noted in 39.93% patients, obstructive jaundice in 1.85% and previous any abdominal surgery in 22.91% patients. In a study by Bat O, et al[19] history of

acute pancreatitis was found in 16.4% cases.

During surgery, we found omental adhesions were the commonest finding (45.8% patients) followed by duodenal adhesions (10.5%). In a study by Bat O, et al[19] adhesion of omentum, transverse colon, duodenum to the fundus of the gallbladder were found in 60.2% patients. In a study by Malik AM,et al,[20] acute cholecystitis with adhesion was found in 2.56% patients. In our study, intra operative findings of mucocele, empyema gallbladder and shriveled fibrosed gall bladder were noted in 42.72%, 31.57% and 20.12% patients, respectively.However, in another study by KuldipS, et al,[18] empyema and contracted gall bladder intra operative pathologies were noted in 20.33% and 21.71% cases, respectively. In a study by Malik AM,[20] mucocele with adhesion, empyema gall bladder and small fibrosed gall bladder with adhesion was found in 2.78%, 3.41% and 4.59% patients, respectively.

In our study, frozen calot`s triangle and anatomical variation in cystic duct were found in 1.54% and 36.53% patients, respectively. In another study by Kuldip S, et al,[18] dense adhesions at Calot's triangle was encountered in 1.52% cases. In a study by Malik AM,[20] totally frozen calot`s triangle was reported in 2.78% cases. In our study, intra operative gall bladder fossa bleeding was the finding in 0.30% patients. So, there were a great variation in intraoperative findings among different authors due to different inclusion and exclusion criteria, and surgeon's own approach to address the disease. We classified the difficulty level using 4-point classification system described by Nassar, et al.[16] Majority of our patients (83%) patients were in Class I and II. Mostly adhesions are common in these classes. A meticulous dissection may be helpful in such circumstances. Mean duration of surgery 98±11 minutes was comparable to others studies, i.e. average 110 minutes by Neri V et al,[17], 76.7±4.6 and 130.4±5.7 minutes by Bat O,et al [19] and Malik M, et al. [20] Usually, it takes longer time to operate difficult laparoscopic cholecystectomy. However, we did not notice any anesthesia related complications in our study.

There was no visceral and right hepatic artery injury in our study however, intraoperative massive bleeding (>500cc) was observed in single case (0.30%). Similarly, in a study by Neri V et al, no injury to principal bile duct was reported. [13] Conversely, bile duct injury, bowel injury and intra operative hemorrhage was noted in 0.96%, 0.06% and 0.48% cases respectively, in a study by Kuldip S, et al.[17] Common bile duct injury, duodenal perforation and ligation of CBD were observed in 0.96%, 1.28% and 0.21% cases, respectivelyin a study by Malik AM.[20]

Laparoscopic surgery was converted into open in 3.09% cases in our study however no conversion to open exploration was reported in a study by Neri V et al.[17] In a study by Kuldip S, et al,[18] the procedure was converted into open cholecystectomy in 1.86% patients. In a study by Bat O,[19] Laparoscopic cholecystectomy was converted to laparotomy in 67.12% patients. In a study by Malik AM, laparoscopic cholecystectomy was converted into open in 3.2% cases.[20] The conversion rate varies among different surgeons. There is no hard and fast rule for conversion to open cholecystectomy. The only factor that should be kept in mind is safety of the patients. In our study, the feasibility of the procedure was 96.7% which is very promising results.

Post-operative bile leakage is an important complication which was observed in 0.61% patients and was managed conservatively. In a study by Malik AM, et al,[20] post-operative bile leakage and jaundice were noted in 0.64% and 0.53% cases, respectively.In a study by Kuldip S, et al,[18] surgical site infection was encountered in 0.20% cases. In a study by Bat O, et al, [19] surgical site infection was observed in 12.32% patients. In a study by Malik AM, et al,[20] surgical site infection was seen in 0.53% cases. The overall complication rate was 5.9% in our study, which is quite comparable to any other reported complication rate. We adopted standard operative techniques like fundus first methods and identification of contents of Callot's triangle, dissection with suction canula tip, meticulous hemorrhage control etc. A high safety profile (94.1%) was observed in our study.

In our study, mean hospital stay of patient who categorized in difficult laparoscopic cholecystectomy was 1.91±1.01 days. In a study by Neri V et al,[17] mean postoperative stay was 3 days with an average of 1 to 9 days. The mean hospital stay was 1.5 daysin a study by Kuldip S ,et al.[18] There was no mortality reported in our study. Similarly, no mortality was observed inanother study by Kuldip S, et al.[18] This study has certain limitations. It was a single center study based on experience of single surgeon.

Conclusion

A higher feasibility and safety profile was achieved in our study. A long operative time is a problem but it doesn't limit the usefulness of laparoscopic surgery in difficult situations. However, surgeons should be make wise decisions at right time to convert the laparoscopic surgery into an open if the patient's safety is compromised.

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