

USG in Gall Bladder Disease Prediction of Difficult Laparoscopic Cholecystectomy

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Abstract: Introduction: Laparoscopic cholecystectomy (LC) is the gold standard for the elective treatment of symptomatic gallstones. The laparoscopic approach on the other hand, is more controversial in the setting of acute cholecystitis (AC), however, the precise role as well as the potential benefits of laparoscopic cholecystectomy in the treatment of acutely inflamed gall bladder has not been clearly established through large clinical series. This study is designed to compare the USG SCORE and Intra-operative score for difficult Laparoscopic Cholecystectomy (LC), so that conversion to open cholecystectomy can be anticipated at early stage avoiding complications. Methods: It is Prospective study carried out at Department of General Surgery MGM medical college and hospital Aurangabad. A total of 600 patients presenting with symptomatic gall stone disease from June 2009 to December 2012 were included in the study. Patient was assessed preoperatively with history, clinical examination, detailed USG and Intra-operative findings scores were compared with each other (Table No: 1, 3). Results: Total 600 patients underwent LC. 140 patients had difficult Laparoscopic Cholecystectomy. Most common age group was 31-40 yrs followed by 41-50yrs with 68 % female population (Table no.2, 3). In USG 11.3% cases were having gall bladder wall thickening with 6-7% patients having impacted stone in Hartman's pouch and peri gall bladder fluid collection. Conclusion: Ultrasonography is important tool not only for diagnosis of gall bladder pathology but for anticipating difficulties preoperatively which helped to plan for intra-operative management.

Keywords: Gall Bladder; Usg; Laparoscopic Surgery; Difficult Laparoscopic Cholecystectomy; Callot's Triangle.

Key Messages: USG can form the basis for prediction of difficult Laparoscopic cholecystectomy there changing type of laparoscopic procedure for patient benefit preventing any further complication and morbidity in patients

1. Introduction

Gallstone disease occurs in 3% to 20% of the population worldwide, the majority of whom remain asymptomatic [1]. It is well known that the management of gallstones is changing gradually over a period of time with the development of surgical science. Laparoscopic cholecystectomy (LC) is the gold standard for the elective treatment of symptomatic gallstones. The laparoscopic approach on the other hand, is more controversial in the setting of acute cholecystitis (AC), however, the precise role as well as the potential benefits of laparoscopic cholecystectomy in the treatment of acutely inflamed gall bladder has not been clearly established through large clinical series.

In difficult situation the conversion rate is still very high ranging from 0.36% to 11.5% [2]. This study is designed to compare the USG SCORE and Intra-operative score for difficult Laparoscopic Cholecystectomy, so that conversion to open cholecystectomy can be anticipated at early stage avoiding complications. At present there is no scoring system present to predict difficulty during laparoscopic cholecystectomy. We designed one such scoring system predicting degree of difficulty in laparoscopic cholecystectomy.

Table 1: Factors and Scores

	Factors	Scores
Clinical Total score- 9	Obesity	2
	Previous GI tract surgeries	
	Upper GI tract surgeries	3
	Lower GI tract surgeries	2
USG Total score- 20	3.Repeated attacks of acute cholecystitis	2
	Acute cholecystitis	3
	Empyema	3
	Thick wall (more than 3 mm)	3
	Portal hypertension with periportal cavernoma	5
	Cirrhosis of liver	3
Intra-operative Total score- 28	Adhesions of gall bladder	
	To Omentum	2
	To viscus (intestine, colon)	3
	Intrahepatic GB or cirrhosis	3
	Perforation	3
	GB mass	5
	Mirizzi's syndrome	7
Cholecysto-duodenal fistula	5	

Laparoscopic surgery has certain technical limitations like loss of three-dimensional perception, a relatively limited and fixed view of operative field, indirect contact with intra abdominal structures, and limited tactile feedback during dissection and manipulation of tissues. This makes operation difficult sometimes and leads to conversion to open cholecystectomy. The definition of "difficult laparoscopic cholecystectomy (LC)" is inconsistent. The term difficult cholecystectomy refers to multiple technical intra-operative

difficulties that increases the risk complications and significantly prolongs operation time [3, 4].

2. Methods

Ethical approval for the study was obtained from the local research ethics committee. It was Prospective study carried out at Department of General Surgery MGM medical college and hospital Aurangabad in patients admitted in surgical wards. A total of 600 patients presenting with symptomatic gall stone disease from June 2009 to December 2012 were included in the study. Every patient included in the study was subjected to the following assessments which were regarded as risk factors for laparoscopic cholecystectomy patients' characteristics, complaints, history and clinical examination and detailed USG study.

Laparoscopic cholecystectomy was performed in all these patients with standard four port method. Intra-operative findings were noted. Conversion to subtotal, partial or open cholecystectomy considered if there is difficulty in completing the procedure or possibility of any intra-operative complication. Individual patient score was calculated according to Clinical, USG and Intra-Operative finding of Gall bladder and associated factors (Table No.1) Statistical analysis was performed with Z test [21].

3. Results

Table 2: Age & Sex wise distribution

Sex	Frequency (%)
Male	192 (32%)
Female	408 (68%)
Total	600

Age Group (Yrs.)	No. of Patient	Percentage
<20	18	0.03
21-30	32	0.053
31-40	217	0.361
41-50	188	0.313
51-60	78	0.13
61-70	44	0.073
71 +	23	0.038

Total 600 patients underwent LC. 140 patients had difficult Laparoscopic Cholecystectomy. Most common age group was 31-40 yrs followed by 41-50yrs with 68 % female population (Table no.2, 3). In USG 11.3% cases were having gall bladder wall thickening with 6-7% patients having impacted stone in Hartman's pouch and peril gall bladder fluid collection. 1-2% patients were having liver cirrhosis with portal hypertension. 3-4 % patients were having dilated CBD with choledocholithiasis. Some patients were having more than one USG findings (Table no.4). During intra-operative period 11-12% patients were having thickened gall Bladder wall, in 3.6% patients Anatomy of Callot's triangle was obscured due to adhesions while 8% patients had impacted stones at GB neck.2-3% patients were found to have gangrene and perforation of gall bladder 11 % patients were having GB adhesions, rest 4-6 % patients had empyema and intrahepatic gall bladder (Table 6). 87% patients underwent total laparoscopic cholecystectomy (LC); Remaining 7% & 3% patient's undergone subtotal and

partial cholecystectomy along with laparoscopic CBD exploration (Table no.7). 5-6% patients had postoperative Fever. 2-3% patients developed port site infections. 0.6% patient developed post operative Jaundice which was managed by ERCP for choledocholithiasis and antibiotics. In this study we found 12 cases (2%) of perforated gall bladder. All these cases were treated by laparoscopic cholecystectomy. However few of them converted to laparoscopic subtotal cholecystectomy or laparoscopic partial cholecystectomy. None of them converted to open cholecystectomy. One patient who had perforation of gall bladder developed faecal fistula which was managed conservatively. 1- 2% patient developed biliary leak which was stopped spontaneously without any active intervention. There were no bile duct injuries or death in all the studied cases. The mean score of USG and Intra-operative period was 7.08 and 12.72 respectively. While mean score of USG was 6.2% in males and 10.23% in females. OT score was also more in Females.

Table 3: USG & Operative findings

Parameter	Ultrasonography Findings	Intra-operative Findings
Thick wall gall bladder	68(11.3%)	73(12.1%)
Impacted stone in HP	44(7.33%)	47(7.83%)
Liver cirrhosis	11(1.8%)	13(2.16%)
Portal hypertension	13(2.1%)	
Dilated CBD with stones	23(3.83%)	
Peri gall bladder fluid collection	39(6.5%)	
Splenomegaly	7(1.16%)	7(1.16%)

Adhesion to gall bladder	0	64(10.6%)
Gall bladder Perforation	-	12(2%)
Gangrenous gall bladder	-	18(3. %)
Mirizzi's Syndrome	-	3(0.5%)
Frozen Callot's	-	22(3.6%)
Gall bladder empyema	-	36(6%)
Intra hepatic gall bladder	-	23(3.83%)
Anatomical relation and variations+ stone in CHD-	-	5 +3(1.33%)
Mucocele of gall bladder	-	10(1.6%)
Posteriorly placed cystic artery	-	22(3.66%)
Gall bladder adherent to right HD	-	8(1.33%)

Factor Score

	USG	OT
Male	6.2	8.2
Female	10.23	13
Mean score	7.08	12.72

4. Discussion

LC is considered as a gold standard for the treatment of symptomatic gallstones, but the procedure is technically more demanding than the classical OC especially in difficult cholecystectomy [2, 3]. The main aim of this study was to evaluate preoperative factors, which can reliably predict the chances of conversion to the open procedure and the complications during LC. Several studies have evaluated risk factors for difficult laparoscopic cholecystectomy on the basis of clinical preoperative findings, Ultrasonography and peri-operative findings [5, 6, 7]. A laparoscopic cholecystectomy was attempted in all patients. Intra-operative technical difficulties were encountered in 140 out of 600 patients. They were due to two main reasons, either

obscured anatomy of the Callot's triangle or absence of a dissection plane due to adhesions impacted stones, thickened gall bladder wall. Schrenk et al [8] and Fried et al [9] in 1300 patients reported Age >65, increased gall bladder wall thickness, repeated episodes of cholecystitis, obesity and male gender as risk factors of conversion to open cholecystectomy.

Authors found a good correlation between USG score and OT score in accordance with reports in other studies^{4,5}(Table No.9). Stone impaction at the Hartman's pouch caused difficulty in holding the gallbladder during dissection. The thickened and contracted gallbladder was difficult to dissect because it had dense adhesions with the surrounding structures and in Callot's triangle. Hutchinson [10], Liu [11] and Kama et al [12, 13] considered gallbladder thickness to be the most important USG risk factor of conversion to open cholecystectomy. We can anticipate all these difficulty prior to operative procedure with help of USG and can plan for the type of operative procedure to be performed for technically difficult gall bladder. USG is a very useful imaging modality in determining the intra operative technical difficulties in patients scheduled for laparoscopic cholecystectomy [15]. Gall bladder functions (by calculating the ejection fraction), gall bladder wall thickness and the presence of sludge, which can be determined by this method, are the most valuable parameters directing and deciding the outcome of laparoscopic surgery. In addition, USG examination has additional advantages, such as lack of ionizing radiation, no requirement of contrast material, easy applicability, and low cost [14, 15, 16].

Simpolous et al [18] in his retrospective analysis reported conversion rate to open cholecystectomy in 5.2%, of which 2.8% had no inflammation and 2.77% had acute inflammation of gall bladder also LC is effective and safe in patients with morbid obesity. He concluded that none of risk factors were contra indication to laparoscopic cholecystectomy. Morbid obesity was not associated with difficult surgery and increased risk for conversion as reported in other studies [12, 17, 18].

Laparoscopic subtotal and partial cholecystectomy helped to prevent open conversion and also avoided common bile duct injuries. LC could be considered in cirrhotic patients, provided that the operation is thought to be easily performed judging from the degree of development of collateral circulation around the hepatoduodenal ligament [20]. Inability to obtain adequate exposure of callot's triangle, bleeding that cannot be controlled laparoscopically and extensive intraperitoneal adhesions are considered to be factors for conversion to open cholecystectomy. No common bile duct injury was occurred or detected during this study period.

Table 4: Procedure Performed & complications

Procedure LC	No. Cases	Percentage
Total	522	87%
Subtotal	42	7%
Partial	18	3%
Lap CBD Exploration & cholecystectomy	18	3%
Conversion to open cholecystectomy	0	0

Complications.	No. Cases	Percentage
Fever	33	5.55%
Biliary leak	6	1%
Port site infection	13	2.16%
Faecal fistula	1	0.16%
Postoperative Jaundice	4	0.66%

Table 5: Statistical analysis

	Mean score		USG Score		OT score	
	Male	Female	Male	Female	Male	Female
Score mean	7.08 +/-	12.12	6.2 +/-	8.2 +/-	8.2 +/-	13.1 +/-
+/- SD	1.34	+/- 1.8	1.12	1.18	1.29	1.42
Z- value	62.01		30.11		51.02	
P- value	P=0.0005		P=0.0005		P=0.0005	

5. Conclusion

Preoperative USG examination of the GB is a good predictor of difficult cholecystectomy in majority of cases and should be used pre-operatively as a routine screening tool to delineate biliary tree anatomy and pathology. Preoperative risk factors can help to predict difficult gallbladder and conversion to other types of cholecystectomy. Laparoscopic subtotal and partial cholecystectomy for difficult gall bladder offers a simple and safe solution that prevents bile duct and other organ injuries and decreases the rate of conversion in anatomically difficult situations and allows removal of a difficult gallbladder without the need for conversion to open procedure in the majority of patients.

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References

- [1] Barbara L, Sma C, Maria A. A population study on the prevalence of gall stone disease; the Sirmione study. *Hepatology* 1987; 7:913-17.
- [2] Jethwani U, Singh G, Mohil RS, Kandwal V, Razdan S, Chouhan J, et al. Prediction of difficulty and conversion in laparoscopic cholecystectomy. *OA Minimally Invasive Surgery* 2013 Aug 01; 1(1):2.
- [3] Capizzi FD, Brulati FM, Boschi S, et al. Conversion rate in laparoscopic cholecystectomy evaluation from 1993 and current state. *Journal of Laparoscopic and Advanced Surgical Technique*. 2003; 13(2): 7-13.
- [4] Palanivelu C. Difficult Laparoscopic Cholecystectomy. In: Parthasarathi R, editor. *Art of Laparoscopic Surgery*. Textbook and Atlas. 1st ed. India: Jaya Publications; 2005. p. 607-634.

- [5] Corr P, Tate JJT, Lau WY, Dawson JW, Li AKC, Preoperative ultrasound to predict technical difficulties and complications of laparoscopic cholecystectomy. *Am J Surg* 1994; 168 (1): 54-56.
- [6] Escallon A, Rosales W, Aldrete JS. Reliability of pre and intraoperative tests for biliary lithiasis. *Ann Surg* 1985; 201: 680-687.
- [7] Liu CL, Fan ST, Lai EC, et al. Factors affecting conversion of laparoscopic cholecystectomy to open surgery. *Arch Surg* 1996; 131: 98-101.
- [8] Schrenk P, Woisetschlager R, Wayand WU. Laparoscopic cholecystectomy. Causes of conversion in 1,300 patients and analysis of risk factors. *Surg Endosc* 1995; 9: 25-28.
- [9] Fried GM, Barkun JS, Sigman HH, Joseph L, Clas D, Garzon J, et al. Factors determining conversion to laparotomy in patients undergoing laparoscopic cholecystectomy. *Am J Surg*. 1994 Jan; 167(1):35-41.
- [10] Hutchinson CH, Traverso LW, Lee FT. Laparoscopic cholecystectomy. Do preoperative factors predict the need to convert to open? *Surg Endosc*. 1994 Aug; 8(8):875-8.
- [11] Liu CL, Fan ST, Lai EC, Lo CM, Chu KM. Factors affecting conversion of laparoscopic cholecystectomy to open surgery. *Arch Surg*. 1996 Jan; 131(1):98-101.
- [12] Kama NA, Doganay M, Dolapci M, Reis E, Atli M, Kologlu M. Risk factors resulting in conversion of laparoscopic cholecystectomy to open surgery. *Surg Endosc*. 2001 Sep; 15(9):965-8.
- [13] Kama NA, Kologlu M, Doganay M, Reis E, Atli M, Dolapci M. A risk score for conversion from laparoscopic to open cholecystectomy. *Am J Surg*. 2001 Jun; 181(6):520-5.
- [14] Daradkeh SS, Suwan A, Abukhalaf M. Pre-operative ultrasonography and prediction of technical difficulties during laparoscopic cholecystectomy. *World J Surg* 1998; 22: 75-77.
- [15] Corr P, Tate JJT, Lau WY, Dawson JW, Li AKC, Preoperative ultrasound to predict technical difficulties and complications of laparoscopic cholecystectomy. *Am J Surg* 1994; 168 (1): 54-56.
- [16] Cooperberg PL, Gibney RG. Imaging of the gallbladder. *Radiology* 1987; 163: 605-613.
- [17] Jansen S, Jorgensen J, Caplehorn J, Hunt D. Preoperative ultrasound to predict conversions in laparoscopic cholecystectomy. *Surg Laparosc Endosc*. 1997 Apr; 7(2):121-3.
- [18] Simopoulos C, Polychronidis A, Botaitis S, Perente S, Pitiakoudis M. Laparoscopic cholecystectomy in obese patients. *Obes Surg*. 2005 Feb; 15(2):243-6.
- [19] Angrisani L, Lorenzo M, De Palma G, Sivero L, Catanzano C, Tesaro B, et al. Laparoscopic cholecystectomy in obese patients compared with non obese patients. *Surg Laparosc Endosc*. 1995 Jun; 5(3):197-9.
- [20] Fernandez NF, Schwesinger WH, Hilsenbeck SG, Gross GW, Bay MK, Sirinek KR, Schenker S: Laparoscopic cholecystectomy and cirrhosis: a case control study of outcomes. *Liver Transpl* 2000 May; 6(3): 340-4.20.
- [21] http://easycalculation.com/statistics/Z_test_p_value.php

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