Difficult Laparoscopic Cholecystectomy: Role of Ultrasonography

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Introduction: *Laparoscopic cholecystectomy (LC) is now the standard procedure for the treatment of symptomatic gallbladder stones. Although laparoscopic cholecystectomy has numerous advantages it has increased risk of injury to common bile duct, duodenum, bowel, iliac vessels, high conversion rate in acute cholecystitis and difficulty in management of simultaneous CBD stones. Ultrasonography is the most common non-invasive, safe, and highly accurate screening test for cholecystitis and cholelithiasis. It can help the surgeons to get an idea of potential difficulty to be faced during laparoscopic surgery in that particular patient. The present study was thus conducted with the aim of evaluation of pre-operative ultrasound findings in predicting difficulties in laparoscopic cholecystectomy for cholelithiasis*

Materials & Methods: *A hospital based observational study was conducted at a tertiary care centre from Oct 2013 to Oct 2015. A total of 100 consecutive patients of calculous cholecystitis undergoing laparoscopic cholecystectomy were included in the study. All the patients underwent pre-op USG evaluation for possible difficulty during the laparoscopic procedure. Based on various sonographic findings, the pre-op assessment was labelled as easy or difficult. The results were compared with the observeddifficulty during Laparoscopic cholecystectomy.Statistical analysis was done using SPSS ver. 21.*

Results: *The predicted difficulty for laparoscopic cholecystectomy was seen in 35% subjects, out of which 3 cases actually had difficult laparoscopic procedure (sensitivity & specificity – 100% & 67%) while conversion to open procedure was required in one patient (sensitivity & specificity – 100% & 65.7%).*

Conclusion: *By careful preoperative USG by an experienced radiologist, difficult laparoscopic cholecystectomy can be predicted and that may help in proper pre-operative planning and counseling to reduce overall complications and morbidity.*

Recommendation: *Preoperative ultrasonography should be used as a screening procedure for prediction of difficulty in laparoscopic cholecystectomy. It can help surgeons to get an idea of the potential difficulty to be faced in that particular patient.*

Keywords: *Difficult Laparoscopic Cholecystectomy, Open Cholecystectomy, Ultrasonography*

I. Introduction

Cholecystitis is inflammation of the gall bladder that occurs most commonly because of an obstruction of the cystic duct due to cholelithiasis [1]. Gallstone disease prevalence in general population is 3% - 20% of the total population worldwide [2].

Physical examination may reveal fever, tachycardia and tenderness in the Right Upper Quadrantor epigastric region, often with guarding or rebound tenderness, Jaundice may be noted. It was only in the 1800s that surgical intervention for gallstone disease was initiated with creation of a "*permanent cholecystostomy*". Later in the century, Carl Johann August Langenbuch developed the technique of cholecystectomy which has become the gold standard for symptomatic cholelithiasis and remained so for over a century until the introduction of laparoscopic cholecystectomy in the 1980s [1].

Minimal invasive surgery brings a revolutionary change in the treatment of patients with gallbladder stones. Mouret introduced laparoscopic cholecystectomy in 1987 [3], which brought a radical change in the treatment of patients with gallstones. Laparoscopic cholecystectomy (LC) is now the standard procedure for the treatment of symptomatic gallbladder stones. Although laparoscopic cholecystectomy has numerous advantages including reduced hospitalization, decreased morbidity, short recovery time, and better cosmesis [4-5], it has increased risk of injury to common bile duct (CBD), duodenum, bowel, iliac vessels, high conversion rate in acute cholecystitis and difficulty in management of simultaneous CBD stones.[6-8]

The results of laparoscopic cholecystectomy are greatly influenced by the skill and experience of the surgeon performing the procedure and reflect acquisition of appropriate technical skills.The conversion of laparoscopic to open cholecystectomy usually reflects sound surgical judgment, and it should be considered as such, rather than a complication of the procedure.Open cholecystectomy remains a safe and effective procedure for the treatment of patients with symptomatic gallstones and is the gold-standard with which all other procedures must be compared.

Ultrasonography is the most common noninvasive, safe, and highly accurate screening test for cholecystitis and cholelithiasis. It can also help surgeons to get an idea of potential difficulty to be faced during surgery in that particular patient [8].

The present study was thus conducted with the aim of evaluation of pre-operative ultrasound findings in predicting difficulties in laparoscopic cholecystectomy for cholelithiasis.

II.   Materials & Methods

A hospital based Observational study was conducted at Department of General Surgery and in the Department of Radiodiagnosis from Oct 2014 to Oct 2015. Study subjects included 100 patients of calculous cholecystitis admitted during study period and undergoing laparoscopic cholecystectomy.

Inclusion criteria:

Patients of both gender, admitted in the surgery department with calculous cholecystitis and giving their informed consent.

Exclusion criteria:
1. Con-comittant CBD stones
2. Giant gallstones or suspected malignancy
3. Uncontrolled hypertension
4. High risk for general anaesthesia

A detailed history regarding duration of symptoms and clinical examination was done according to the case study proforma. Pre-operative assessment, laparoscopic/ open procedure and post-procedural care were carried out for every patient as per standard hospital protocols. USG was carried out for every patient and following parameters were assessed pre-operatively:

1.	Gall bladder wall thickness
2.	Number of stones
3.	Size of largest stone
4.	Gall stone location
5.	Gall bladder size
6.	Pericholecystic fluid/edema
7.	Emphysematous cholecystitis
8.	Biliary sludge/gravel

Based on the above sonographic findings, the pre-op assessment was labelled as easy or difficult. The results were compared with the observeddifficulty during Laparoscopic cholecystectomy.

Statistical Analysis

All the data was collected and entered in Microsoft excel sheet 2013 and statistical analysis was done using SPSS ver. 21.0.

III.   Results

Mean age of study subjects was 48.3 years with male predominance (68%) (table 1). The predicted difficulty for laparoscopic cholecystectomy was seen in 65 subjects, out of which 33 cases actually had difficult laparoscopic procedure (sensitivity & specificity – 94.3% & 50.8%) while conversion to open procedure was required in one patient (sensitivity & specificity – 100% & 35.35%) (table 2,3).

IV.   Discusion

Laparoscopic Cholecystectomy (LC) is the procedure of choice for symptomatic cholelithiasis. The most common reasons for difficulty during LC are severe inflammation, dense adhesions and bleeding. [6] Severe inflammation and high vascularity as in the case of acute cholecystitis, lead to difficulty in defining the anatomy of Calot's triangle and is associated with increased risk of bleeding. Besides this, impacted stone at the neck may be associated with difficulty in gripping the inflamed and friable gallbladder. Dense adhesions also make it difficult to define the anatomy of the Calot's triangle. Separation of a gall bladder from the GB fossa is also more difficult in such patients.

Prediction of difficulty in laparioscopic cholecystectomy can be made reliably if the surgeon has the benefit of accurate preoperative predictive factors. Advantages of accurate prediction of difficulty in LC include appropriate patient information, adequate surgeon preparation and proper operation scheduling, efficient hospital admission and bed usage and administrative planning and selection of patients for surgeons in the early learning phase and resident training.

Accurate patient information and preoperative counseling regarding difficulty in surgery and chances of conversion to open allows the patient to make a better informed decision about the surgery. Similarly, prediction of difficult laparoscopic cholecystectomy preoperatively leads to better preparation on behalf of surgeon for a challenging procedure and chances of conversion. Early conversion in such patients is proved to decrease postoperative morbidity.[1,6,8] Difficult operation can also be scheduled early in the operation theatre day. Such patients should be operated by more experienced surgical team. Also surgeons in the early phase of their learning curve should refer such patients to more experienced centers.

Several studies have been done to asses predictive factors for difficulty/ or conversion of Laparoscopic to Open Cholecystectomy. In present study, out of the total 100 subjects, USG predicted difficulty in 65 subjects, out of which difficulty during laparoscopy was observed in 35 subjects (sensitivity -94.3%, specificity – 50.8, Accuracy – 66%). A study was conducted by Kulbhushan H et al. to determine whether the preoperative USG finding can predict the difficulty during the laparoscopic cholecystectomy and its conversion. Of the 400 cases, 24 (6.0%) were converted to open procedure. Of the 144 (36%) cases predicted to be difficult, 116 (29%) were technically difficult, of which 18 (4.5%) were converted to open procedure. Of the 256 (64%) cases predicted to be easy on ultrasonography, 19 (4.75%) were found to be difficult on surgery, of which only 6 (1.5%) had to be converted to open procedure [9]. In a study by Kappor et al. positive predictive value of ultrasonography for predicting difficult laparoscopic cholecystectomy is 80.95% [10].

In a study by Kama A et al., preoperative clinical, laboratory, and radiologic parameters of 1,000 patients who underwent laparoscopic cholecystectomy were analyzed for their effect on conversion rates. Overall 48 patients required conversion to open cholecystectomy (4.8%) [11].In a study by Rosen M et al., a total of 1,347 laparoscopic cholecystectomies were performed at the Cleveland Clinic from January 1996 to January 2000. Seventy-one (5.3%) laparoscopic cholecystectomies required conversion [12].In a study of 628 patients posted for elective LC, Sanabaria et al, had to convert 32 patients to OC (5.1%) [13]. In present study, 35% subjects had difficulty during laparoscopic procedure but only 1% patients required conversion to open procedure.

V.   Conclusion

Preoperative ultrasonography is a good predictor of difficulty in laparoscopic cholecystectomy in the majority of cases and should be used as a screening procedure. It can help surgeons to get an idea of the potential difficulty to be faced in that particular patient. Pre-operative prediction of difficult laparoscopic cholecystectomy may help in proper pre-operative planning and counseling of patients to reduce overall complications and morbidity.

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TABLES

Table 1. Baseline Data of the study subjects

Baseline Data (n-100)	N	%
Age Distribution (years)		
</= 30	18	18.0%
31-50	50	50.0%
51-70	31	31.0%
71-100	1	1.0%
Gender Distribution		
Female	68	68.0%
Male	32	32.0%
Predicted Difficulty on USG		
Yes	65	65.0%
No	35	35.0%
Difficulty during Surgery		
Yes	35	35.0%
No	65	65.0%
Conversion to Open Surgery		
Yes	1	1.0%
No	99	99.0%

Table 2. Predictive ability of USG for difficult laparoscopic Cholecystectomy

USG - Prediction of Difficulty	Difficulty During Surgery		Total
	No (n-65)	Yes (n-35)	
No	33	2	35
	94.3%	5.7%	100.0%
Yes	32	33	65
	49.2%	50.8%	100.0%
Total	65	35	100
	65.0%	35.0%	100.0%
Variable	%		
Sensitivity	94.3%		
Specificity	50.8%		
PPV	50.8%		
NPV	94.3%		
Accuracy	66.0%		

Table 3. Predictive ability of USG for conversion to open Cholecystectomy

USG - Prediction of Difficulty	Conversion to Open		Total
	No	Yes	

No	35	0	35
	100.0%	0.0%	100.0%
Yes	64	1	65
	98.5%	1.5%	100.0%
Total	99	1	100
	99.0%	1.0%	100.0%
Variable	**%**		
Sensitivity	100.00%		
Specificity	35.35%		
PPV	1.54%		
NPV	100.00%		
Accuracy	36.00%		