

# Predictive Role of Preoperative Ultrasonography in Laparoscopic Cholecystectomy

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## ABSTRACT

Laparoscopic cholecystectomy is now accepted as the new gold standard for the treatment of symptomatic gallbladder disease. The present study was conducted to look for some preoperative predictor factors in ultrasound that can give surgeons some idea about the potential difficulties and complications that can be encountered during the course of laparoscopic cholecystectomy that may require conversion to open cholecystectomy.

**Keywords:** Difficult, Laparoscopic cholecystectomy, Prediction, Preoperative ultrasonographic prediction.

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## INTRODUCTION

Preoperative ultrasonography is a useful screening investigation in candidates undergoing laparoscopic cholecystectomy. Apart from the usual diagnostic information, operative difficulties can be well predicted by it in more than 50% of cases.<sup>1</sup> In these patients, surgeons can take up appropriate measures for adequate assistance in the operating room. On preoperative ultrasound findings, surgeons can be aware of the potential problems during laparoscopic cholecystectomy and maintain a reasonable threshold of conversion if technical problems arise.<sup>2</sup>

## MATERIALS AND METHODS

The present study was done on 50 patients with gallbladder disease requiring elective laparoscopic cholecystectomy in the Department of General Surgery, Mahatma Gandhi Medical College & Hospital, Jaipur, Rajasthan,

India, from October 2014 to November 2016. The criteria for selection were as follows.

## Inclusion Criteria

All patients with symptomatic gallbladder disease, patients of all ages, and both sexes were included in the study.

## Exclusion Criteria

Patients with carcinoma of gallbladder, jaundice, or abnormal liver function tests, cirrhosis, common bile duct stones, empyema gallbladder, acute pancreatitis, history of more than two abdominal surgeries, portal hypertension, cholangitis, and pregnant women were excluded from the study.

Due approval was taken from Institutional Ethical Committee before undertaking the study. The selected patients were then informed about the procedure and written informed consent was taken. Patients were also informed about the possible conversion to open cholecystectomy preoperatively.

The following investigations were done: Hemogram, blood sugar, renal function tests, liver function tests (serum bilirubin, serum alkaline phosphatase, serum glutamic oxaloacetic transaminase, serum glutamic pyruvic transaminase, and prothrombin time), serum amylase, lipase, and chest X-ray.

The following ultrasonographic parameters were used:

- Wall thickness of gallbladder <4 or >4 mm.
- Impacted stone at the neck of the gallbladder.

Various intraoperative parameters were taken to decide the actual difficulty which was faced while doing laparoscopic cholecystectomy (Table 1).

## RESULTS

Comparison of Impacted Stone at Neck of Gallbladder with Difficult Cholecystectomy.

**Table 1:** Intraoperative scoring factors

Easy	Time taken <60 minutes; no bile spillage; no injury to duct, artery
Difficult	Time taken 60–120 minutes; bile/stone spillage; injury to duct; no conversion
Very difficult	Time taken >120 minutes; conversion

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**Table 2:** Comparison of impacted stone at neck of gallbladder with difficult cholecystectomy

Category	Number of difficult cases on surgery (n%)	Number of easy cases on surgery (n%)	Total (n%)
Number of cases with impacted stone at gallbladder neck	4 (8%)	1 (2%)	5 (10%)
Number of cases with no impacted stone at gallbladder neck	18 (36%)	27 (54%)	45 (90%)
Total	22 (44%)	28 (56%)	50 (100%)

Out of 5 cases with impacted stone preoperatively, 4 cases were found difficult/very difficult intraoperatively. Out of 45 cases with no impacted stone at neck of gallbladder, 18 cases were found difficult/very difficult intraoperatively (Table 2).

### Comparison of Impacted Stone at Gallbladder Neck with Conversion to Open Procedure

Out of 5 cases with impacted stone on ultrasound preoperatively, 1 case was needed to be converted to open. Out of 45 cases with no impacted stone at the neck of gallbladder, 2 cases were needed to be converted to open (Table 3).

### Comparison of Gallbladder Wall Thickness with Difficulty in Laparoscopic Cholecystectomy

Out of 48 cases with wall thickness of gallbladder <4 mm, 19 cases were found difficult/very difficult intraoperatively. Also, 2 cases which were having wall thickness >4 mm on preoperative ultrasound were found difficult/very difficult intraoperatively (Table 4).

### Comparison of Gallbladder Wall Thickness with Conversion of Open Procedure

Out of 2 cases with gallbladder wall thickness >4 mm, 1 case ended up in open procedure, and out of 48 cases with wall thickness <4 mm, 2 cases were needed to be converted to open procedure (Table 5).

**Table 4:** Comparison of gallbladder wall thickness with difficulty in laparoscopic cholecystectomy

Category	Number of cases found difficult on surgery (n%)	Number of cases found easy on surgery (n%)	Total (n%)
Number of cases with wall thickness <4 mm	19 (38%)	29 (58%)	48 (96%)
Number of cases with wall thickness >4 mm	2 (4%)	0	2 (4%)
Total	21 (42%)	29 (58%)	50 (100%)

**Table 3:** Comparison of impacted stone at gallbladder neck with conversion to open procedure

Category	Number of cases converted to open (n%)	Number of cases not converted to open (n%)	Total (n%)
Number of cases with impacted stone at gallbladder neck	1 (2%)	4 (8%)	5 (10%)
Number of cases with no impacted stone at gallbladder neck	2 (4%)	43 (86%)	45 (90%)
Total	3 (6%)	47 (94%)	50 (100%)

## DISCUSSION

Laparoscopic cholecystectomy is an operative procedure that has spread widely and rapidly through the surgical community.<sup>3</sup> In large part this has been driven by patient demand. Several recent studies have demonstrated the safety of this procedure and it is now believed by many to be the treatment of choice for symptomatic cholelithiasis.<sup>4</sup> Laparoscopic cholecystectomy offers advantages of decreased postoperative pain, decreased hospital stay, and an earlier return to normal activity.<sup>5</sup> Improved pulmonary functions in immediate postoperative period with laparoscopic cholecystectomy compared with conventional cholecystectomy have been well demonstrated.

In our study, a strong statistical correlation was found between preoperative ultrasound prediction factors and difficult laparoscopic cholecystectomy.<sup>6</sup> Gallbladder wall thickness is one of the ultrasonic parameter most extensively studied for the gall stone disease. Gallbladder wall thickness can be most accurately measured with a high degree of accuracy with ultrasonography. Usually 95% of the patients have sonographic wall measurements that correlate to within 1 mm with the measurements taken at the time of surgery. It is generally agreed that a sonographic/pathologic wall thickness of 4 mm constitutes the upper limit of normal and may serve as a demarcation between thin-walled and thick-walled gallbladder. In our study, we have arbitrarily divided wall thickness

**Table 5:** Comparison of gallbladder wall thickness with conversion to open procedure

Category	Number of cases converted to open (n%)	Number of cases not converted to open (n%)	Total (n%)
Number of cases with gallbladder thickness >4 mm	1 (2%)	1 (2%)	2 (4%)
Number of cases with gallbladder wall thickness <4 mm	2 (4%)	46 (92%)	48 (96%)
Total	3 (6%)	47 (94%)	50 (100%)

measured on ultrasound examination into two groups: <4 mm and >4 mm.

Gallbladder wall thickness >4 mm was predicted to be difficult gallbladders of all the 50 cases studied. Two (4%) patients were found to have gallbladder wall thickness >4 mm on ultrasound in our study, and both of these cases were actually difficult on surgery and 1 (2%) case out of 2 had to be converted to open procedure due to dense adhesions in the Calot's triangle. The sensitivity of the gallbladder wall thickness on ultrasound is 90.47% for predicting the difficult laparoscopic cholecystectomy, though the positive predictive value for difficult surgery is 39.58%.<sup>7</sup>

Stone impacted at the neck is another important parameter that shows a good predictive value.<sup>8</sup> Clinically, all of these 5 patients had palpable gallbladder. Of these 5 cases (10%), with the stone impacted at the neck, 4 (8%) cases were difficult on surgery and 1 out of 4 cases was converted to open procedure. The reason for the difficulty in surgery was that the impacted stone caused formation of mucocele and posed great difficulty in holding the infundibulum of gallbladder for retraction during dissection, leading to difficult surgery when continued. The impaction of the stone on ultrasonography is seen by conducting the ultrasonography in supine and reclining/erect position, the mobile stone will slide toward the fundus of the gallbladder. The fallacy of this test is in predicting the impaction at the neck of gallbladder which is full of gall stones, and the contracted gallbladder in which the stones do not move even if they are not impacted in the neck.

Various surgical parameters were taken for assessing the operative technical difficulty, namely the time taken for surgery was more than 120 minutes.<sup>9</sup> The laparoscopic cholecystectomy in expert hands should not take more than 45 to 50 minutes. The tear of gallbladder and spillage of stones occur in laparoscopic cholecystectomy in which there are dense adhesions with the surrounding structures and usually the tear occurs during dissection.<sup>10</sup> Since these surgeries were done by surgeons experienced in laparoscopic surgery of our institution, the learning curve statistics do not apply to this study.

## CONCLUSION

The study shows that the preoperative ultrasound evaluation can predict operative difficulty for laparoscopic cholecystectomy to a good extent and the patient can be counseled preoperatively. The impaction of stone at the neck of the gallbladder and the increased gallbladder wall thickness are good predictors of the potential operative difficulty and conversion to open procedure.

## REFERENCES

1. Kadell BM, Zimmerman P, Lu DSK. Radiology of the abdomen. In: Zinner MJ, editors. Maingot's abdominal operations, Vol. 1(10); 1997. pp. 3-115.
2. Dinkel HP, Kraus S, Heimbucher J, Moll R, Knupffer J, Gassel HJ, Freys SM, Fuchs KH, Schindler G. Sonography for selecting candidates for laparoscopic cholecystectomy: a prospective study. *AJR Am J Roentgenol* 2000 May;174(5):1433-1439.
3. Schietroma M, Carlei F, Ciuca B, Riseti A, Lannucci D, Leardi S, Muzi F, De Santis C, Di Placido R, Recchia CL, et al. Video laparoscopic cholecystectomy in acute cholecystitis: when, how and why? *Minerva Chir* 1997 May;52(5):515-522.
4. Palanivelu C. History of laparoscopic surgery, laparoscopic cholecystectomy. In: Gem digestive diseases foundation. 1st ed. Textbook of surgical laparoscopy, Vol. 3(6); 2002. pp. 121-138.
5. Sinai M. History of minimal invasive surgery. The Mount Sinai Medical Centre; 2007.
6. Braghetto I, Csendes A, Debandi A, Korn O, Bastias J. Correlation among ultrasonographic and videoscopic findings of the gallbladder: surgical difficulties and reasons for conversion during laparoscopic surgery. *Surg Laparosc Endosc* 1997 Aug;7(4):310-315.
7. Lal P, Agarwal PN, Malik VK, Chakravati AL. A difficult laparoscopic cholecystectomy that requires conversion to open procedure can be predicted by preoperative ultrasonography. *JLS* 2002 Jan-Mar;6(1):59-63.
8. Alponat A, Kum CK, Koh BC, Rajnakova A, Goh PM. Predictive factors for conversion of laparoscopic cholecystectomy. *World J Surg* 1997 Jul-Aug;21(6):629-633.
9. Dexter SP, Martin IG, Marton J, McMahon MJ. Long operation and the risk of complications from laparoscopic cholecystectomy. *Br J Surg* 1997 Apr;84(4):464-466.
10. 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):520-525.