

## The Role of Pre-Op Ultrasound Abdomen in Predicting Perioperative Difficulties in Gallstone Disease

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**Abstract:** Ultrasound (USG) abdomen is an important diagnostic modality in the diagnosis of gallstone disease. The present study aims to determine reliable pre-operative ultrasonographic parameters which may predict the degree of difficulty in performing laparoscopic cholecystectomy. This study presents analysis of 100 consecutive cases of cholelithiasis undergoing elective cholecystectomy at Department of Surgery, G.R. Medical College & J.A. Group of Hospitals, Gwalior (M.P) during the period of one year from November 2012 to November 2013 studied in a prospective manner. The patients were fasting overnight for the maximal distention of the gallbladder. The pre-operative ultrasonography was done with 3.5 Mhz probe on Dasonics spectra colour Doppler ultrasound on B mode, Gray-scale, real time scan. The mean gallbladder wall thickness in the study was 2.9 mm (maximum - 5.6 mm and minimum - 1.8 mm). Eighteen (18%) patients with gallbladder wall thickness more than 4 mm. There were eighteen (18%) patients with contracted gallbladder, and the remaining 82 patients had either gallbladder of normal volume that is approx. 50 ml or more. Six (6 %) patients with gallstone impacted at the neck of gallbladder or Hartman's pouch. Only 2 patients had common bile duct diameter greater than 6 mm. Out of total 100 cases, nine (9%) cases were converted to open procedure. Significant correlation was found between the independent ultrasonographic parameters (that is gallbladder wall thickness, contracted gallbladder, stone impaction at the neck of gallbladder) with the difficult laparoscopic cholecystectomy and their subsequent conversion to open cholecystectomy. Pre-operative ultrasonography is a good predictor of difficulty in laparoscopic cholecystectomy in majority of the cases and should be used, as a screening procedure. The most valuable assessment the ultrasound can give is gall bladder wall thickness, gall bladder size, CBD diameter and CBD stones and any abnormal anatomy of the biliary tract if present. Thick gallbladder wall is a finding, which may show that more adhesions may be found during surgery.

**Keywords:** Laparoscopic cholecystectomy, open cholecystectomy, USG

### INTRODUCTION

Gallstone disease is the pathologic state of stones or calculi within the gall bladder lumen and biliary tree. A common digestive disorder worldwide, worldwide occurrence varies from 6-20%. The highest incidence is seen in Sweden, where 50% of the people have gall stones by the age of 70 years [1].

Patients with asymptomatic gallstones develop complications at an annual rate of 1-2%. In symptomatic patients, the complication rate increases to 1-3% [2]. Symptoms of gallstones can be non-specific and include: biliary pain, abdominal pain associated

with nausea and vomiting. Complications of gallstone disease include: acute cholecystitis, chronic cholecystitis, choledocholithiasis with or without cholangitis, cholecystoenteric fistula, gallstone ileus, gallstone pancreatitis, and perhaps carcinoma of the gall bladder (GB) [3].

The definitive management of symptomatic gallstones is surgical [4]. The two surgical approaches are open cholecystectomy (OC) and laparoscopic cholecystectomy (LC) [5]. It is helpful to determine the risk of conversion of an LC to OC beforehand [6]. This may allow the patients to be better prepared for the

surgery and to plan their absence from work [7]. Also, such prediction may allow a surgeon to be better prepared, to take extra precautions to reduce intraoperative complications and to convert from LC to OC at an earlier stage. The problem lies in pre-operative identification of the subset of patients with symptomatic cholelithiasis who may turn up in difficult laparoscopic cholecystectomy and may subsequently require conversion to open cholecystectomy. It may therefore, be useful to determine reliable pre-operative factors which may predict the duration of surgery and degree of difficulty in performing LC; and may predict conversion of laparoscopic to OC.

**MATERIALS & METHODS**

100 consecutive cases of cholelithiasis undergoing elective cholecystectomy at Department of Surgery, G.R. Medical College & J.A. Group of Hospitals, Gwalior (M.P.) during the period of one year from November 2012 to November 2013 were studied in a prospective manner. The selected patients were explained well about the procedure and written informed consent was obtained about participating in the study as well as for the surgical procedure. The patients were informed about the chance of conversion to open cholecystectomy.

Pre-operative history and clinical examination of all patients was recorded. Pre-operative transabdominal sonography was performed in all the patients. The patient was fasted overnight to see for maximal distension of the gall bladder. The ultrasonography was done on B mode, grey scale and real time scan with 3.5 MHz probe.

The study group was subjected to laparoscopic cholecystectomy under general anesthesia. The surgeons were trained laparoscopic surgeons. Per-operative degree of difficulty was defined depending on objective variables which included

- Presence and degree of adhesions with gall bladder and in Calot’s triangle
- Injury to gall bladder and other neighbouring structures
- Requirement of drain placement
- Blood loss > 100 ml.
- Total duration of surgery (calculated from start of abdominal port placement to the closure of port sites) > 60 min.
- Conversion to open cholecystectomy

The analysis of various variables (pre-operative, clinical, sonological and per-operative) was done using various statistical tests of significance (t-test, chi square and ANOVA) for association with duration of surgery, per-operative difficulty and need for conversion to open cholecystectomy.

**RESULTS**

In the studied group, the most common age group was 30-39 yr (36% patients) with mean age being 39.8 yrs. Females were more commonly affected as compared to the males (Female: Male=11.5:1). History of pain abdomen was the most common symptom being present in 93% of the patients and 9% of patients had a history of acute cholecystitis in the past.

**Table-01: Duration of surgery**

| S.No. | Duration of surgery | Frequency | Percent (%) |
|-------|---------------------|-----------|-------------|
| 1.    | < 45 minutes        | 10        | 10          |
| 2.    | 45-60 minutes       | 50        | 50          |
| 3.    | > 60 minutes        | 40        | 40          |

Out of 100 patients, 50 patients were operated between 45-60 minutes. 10 patients underwent surgery in less than 45 minutes, 40 patients underwent surgery in more than 60 minutes. The mean duration of surgery

was 59.52 minutes. In nine (9%) patients, the laparoscopic surgery was not progressing satisfactorily and was converted to open approach.

**Table-02: Conversion to open surgery**

| Conversion to open surgery | Frequency | Percent (%) |
|----------------------------|-----------|-------------|
| No                         | 91        | 91          |
| Yes                        | 9         | 9           |
| Total                      | 100       | 100.00      |

A total of 9 patients were converted to OC. The reasons for conversion were dense adhesions in the Calot's triangle and intraoperative bleeding. Eleven (11%) patients had a *maximum stone size of more than 2 cm* on sonography. Eighteen (18%) had *contracted gall bladder* on sonography and eighteen (18%) also

had *gall bladder wall thickness of 4 mm or more* on sonography.

A statistically significant correlation was obtained between *increased gall bladder wall thickness* on USG and increased duration of surgery due to

difficulty. Similarly *impacted stones* and *contracted GB* had statistically significant correlation with difficulty in surgery (p-values of <0.001 and 0.05 respectively). Rest of the studied ultra-sonographic variables - *Single GB*

*stone, Largest stone > 2 cm, Contracted GB, Wall echogenic shadow* did not show significant correlation with increased difficulty of surgery.

**Table-03: Correlation of Pre-operative ultra-sonographic parameters with increased difficulty of surgery**

| Variable                          | Patients with increased difficulty of surgery | p value |
|-----------------------------------|---|---------|
| Single GB stone                   | 13  | 0.36    |
| Impacted stones                   | 00  | <0.001  |
| Largest stone >2 cm               | 00  | 0.08    |
| Contracted GB                     | 03  | 0.05    |
| GB wall thickness >/equal to 4 mm | 05  | <0.001  |
| Wall echo shadow                  | 09  | 0.24    |

Various pre-operative ultrasound findings were analysed and were correlated with operative findings. The findings which significantly correlated with increased difficulty of surgery were *Impacted GB stones and Increased wall thickness*.

The variables which were not found to have any statistically significant correlation with increased difficulty of surgery were *Intra hepatic lesions* (p value-0.06), *Adhesions around GB/Calot's triangle* (p value-0.78), *Peritoneal/abdominal adhesions* (p value-0.9).

**DISCUSSION**

Cholecystectomy is the treatment for symptomatic cholelithiasis. Laparoscopic cholecystectomy remains the gold standard procedure. Laparoscopic approach can be technically difficult in some patients, which if identified pre-operatively or early during the surgery can certainly reduce the incidence of avoidable complication.

In this study, the prospectively recorded data of 100 consecutive patient of cholelithiasis admitted to our hospital for elective cholecystectomy, all done by experienced surgeons, was analysed. The pre-operative USG abdomen findings were correlated to the degree of difficulty encountered conversion to open surgery and the duration of surgery.

Hutchinson *et al.* in their study have attributed gall bladder wall thickness as an important factor in predicting difficult laparoscopic surgery. A similar trend has been observed in the present study, although it gained statistical significance when the GB wall thickness was  $\geq 4$ mm. Majority of earlier studies also state that the conversion rate is significant with gallbladder wall thickness more than 4mm.

The rate of conversion to open surgery was significantly higher (p < 0.05) in patients with impacted calculi in gall bladder as compared to those with non-impacted calculi. This is in agreement with Sant’Ambrogio *et al.* The high rate of conversion in gall bladder with impacted calculi can be explained by the

concurrent inflammation in Calot's triangle. Other sonological findings have failed to demonstrate any association.

This study also analysed various pre-operative ultrasonological findings and tried to correlate them with intra-operative findings. It was found that USG was accurately and significantly able to pre-operatively analyse issue like number, size, impaction of stones, wall thickness, erosion of stone into CBD and other structure and anatomical variations in cystic duct and CBD. However, USG was not significantly able to detect intra-abdominal adhesions, hepatitis, cirrhosis or intra hepatic lesions (haemangioma, small SOL) pre-operatively.

This study has shown an increase in mean duration and difficulty in surgery in patients with multiple stones, contracted gall bladder and increased bladder wall thickness, although a statistical significance could not be demonstrated except for increased duration of surgery when the wall thickness was  $\geq 4$ mm. However, the mean per-operative difficulty does not alter with size, impaction of calculi in gall bladder or wall echo shadow sign. Although USG is a sensitive and adequate imaging modality for assessing the gall bladder wall, calculi and cystic duct anatomy.

**CONCLUSION**

From this study we conclude that pre-operative ultrasonography is a good predictor of difficulty in laparoscopic cholecystectomy in majority of the cases and should be used, as a screening procedure. It can help surgeon to get an idea of the potential difficulty that he can face in that particular patient. The most valuable assessment the ultrasound can give is gall bladder wall thickness, gall bladder size, CBD diameter and CBD stones and any abnormal anatomy of the biliary tract if present. Thick gallbladder wall is a finding, which may show that more adhesions may be found during surgery.

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