

## Prediction of Difficult Laparoscopic Cholecystectomy Based on Assessment of Gall Bladder Stone Size

Ashwani Kumar<sup>1\*</sup>, Sarabjit Singh<sup>2</sup>, Ashish Chhabra<sup>3</sup>

<sup>1\*</sup>Assistant Professor, <sup>3</sup>Associate Professor,  
Department of General Surgery, Guru Gobind Singh Medical College and Hospital, Faridkot, Punjab, India.

<sup>2</sup>Assistant Professor,  
Department of Paediatric Surgery, Guru Gobind Singh Medical College and Hospital, Faridkot, Punjab, India.

### ABSTRACT

**Background:** Laparoscopic cholecystectomy has changed the treatment protocol of the patients with gallbladder stones drastically. On the basis of ultrasound findings, surgeons can select the cases appropriate for their skills aiming at reducing operative complications and minimizing the waste of operating time available. In patients undergoing laparoscopic cholecystectomy, presence of some of the reliable predictive factors conversion or complications will be extremely useful. Hence, we planned the present study to assess the gall bladder stone size as a predictor of difficult Laparoscopic Cholecystectomy.

**Materials & Methods:** The present study included prospective assessment of the patients that reported with the chief complaint of symptomatic Gallstone Disease from 2014 to 2015. After clinical assessment, routine investigations and abdomen ultrasonography, elective surgery was performed in all the patients. A total of 112 patients were included in the present study. Recording of the complete demographic details of the patients, along with the detailed record of all the haematological parameters and results of other biochemical functional tests was done before starting of the surgery. All the records were separately recorded and analyzed by SPSS software.

**Results:** Cases with single large gallstone >20mm had higher rate of conversion to open cholecystectomy. Conversion rate

amongst cases with contracted gall bladder was 66.6% and without contracted gall bladder was 8.4% Gall bladder wall thickness >4mm had higher rate of conversion to open cholecystectomy. Sensitivity was 95.9%, positive predictive value was 91.3% and p value was 0.006.

**Conclusion:** Single large gallstone and gall bladder wall thickness are risks factors and predictors for conversion to open cholecystectomy.

**Keyword:** Gall Bladder, Laparoscopic, Open Cholecystectomy.

### \*Correspondence to:

**Dr. Ashwani Kumar,**  
Assistant Professor,  
Department of General Surgery,  
Guru Gobind Singh Medical College and Hospital,  
Faridkot, Punjab, India.

### Article History:

**Received:** 05-03-2017, **Revised:** 26-03-2017, **Accepted:** 14-04-2017

### Access this article online

Website: <a href="http://www.ijmrp.com">www.ijmrp.com</a>	Quick Response code 
DOI: 10.21276/ijmrp.2017.3.3.016	

### INTRODUCTION

Laparoscopic cholecystectomy has revolutionized the treatment protocol of the patients with gallbladder stones. In 1987, Mouret bought the concept of laparoscopic cholecystectomy. Open cholecystectomy has been rapidly changed and replaced by this line of treatment which has now become the gold standard.<sup>1</sup> Laparoscopic cholecystectomy offers following advantages:

- Reduction in the time of hospitalization,
- Decrease in associated morbidity,
- Short recovery time,
- Better cosmesis

Various studies focusing on the assessment of above mentioned parameters have observed minimal changes.<sup>2</sup> However, there seems to be higher incidence of associated bile duct injuries with the laparoscopic cholecystectomy in comparison with the open cholecystectomy procedures. On the basis of ultrasound findings,

surgeons can select the cases appropriate for their skills aiming at reducing operative complications and minimizing the waste of operating time available. Patients with long-standing disease and previous bouts of cholecystitis or pancreatitis are at higher risk of experiencing a difficult procedure or conversion and may be at increased risk of bile duct injury or injury to the adjoining viscera.<sup>3</sup> In patients undergoing laparoscopic cholecystectomy, presence of some of the reliable predictive factors conversion or complications will be extremely useful. Patients can be selected for laparoscopic cholecystectomy and high-risk procedures and possible complications so that patients can be mentally prepared and can adjust their expectations accordingly.<sup>4,5</sup> Hence, we planned the present study to assess the gall bladder stone size as a predictor of difficult Laparoscopic Cholecystectomy.

## MATERIALS & METHODS

The present study was conducted in the Department of Surgery of the Guru Gobind Singh Medical College and Hospital, Faridkot, Punjab (India) and included prospective assessment of the patients that reported with the chief complaint of symptomatic Gallstone Disease from 2014 to 2015. Ethical approval was taken from the institutional ethical committee and written consent was obtained in after explaining in detail the entire research protocol. Before proceeding for the surgery, patients were informed about the possibility of conversion to open cholecystectomy. After clinical assessment, routine investigations and abdomen ultrasonography, elective surgery was performed in all the patients. All the surgeries of the present study were performed by same operating surgeon. Inclusion criteria for the present study included:

- Patients with symptomatic gall stone disease
- Patients with history of any other systemic illness,
- Patients without any known drug allergy,
- Patients fit for general anaesthesia,
- Patients with history of any form of bleeding disorder,
- Patients with absence of any kind of pulmonary obstructive disease

After meeting the inclusion and exclusion criteria, a total of 112 patients were included in the present study. Recording of the complete demographic details of the patients, along with the detailed record of all the haematological parameters and results of other biochemical functional tests was done before starting of the

surgery. Ultrasonography of the abdomen was done in all patients before surgery and following parameters were recorded;

- 1) Wall thickness of the gall bladder
- 2) Size of the stone
- 3) Contracted or distended gall bladder
- 4) Peri-cholecystic fluid collection

All the records were separately recorded and analyzed by SPSS software. Chi-square test and student t test were used for the assessment of level of significance.

## RESULTS

Cases with single large gallstone >20mm had higher rate of conversion to open cholecystectomy. Stone in infundibulum causes difficulty in retraction during dissection of calot's triangle. Sensitivity was 97.9%, positive predictive value is 92.3% and p value was 0.000 Conversion rate amongst cases with stone >20mm was 71.4% and stone <20mm was 7.6%. Contracted gall bladder was associated with higher rate of conversion to open cholecystectomy. Sensitivity was 97.7%, positive predictive value was 91.5% and p-value was 0.002. Conversion rate amongst cases with contracted gall bladder was 66.6% and without contracted gall bladder was 8.4% Gall bladder wall thickness >4mm had higher rate of conversion to open cholecystectomy. Sensitivity was 95.9%, positive predictive value was 91.3% and p value was 0.006. Conversion amongst the cases with gallbladder wall thickness >4mm was 50% and those < 4mm was 8.6%.

**Table 1: Gall bladder stone size**

Size bladder stone size	Frequency	Percent
<20mm	105	93.8%
≥20mm	7	6.2%
<b>Total</b>	<b>112</b>	<b>100%</b>

**Table 2: Contraction of Gall Bladder**

Contraction	Frequency	Percent
No	106	94.6%
Yes	6	5.4%
<b>Total</b>	<b>112</b>	<b>100%</b>

**Table 3: Gall Bladder Wall Thickness Distribution**

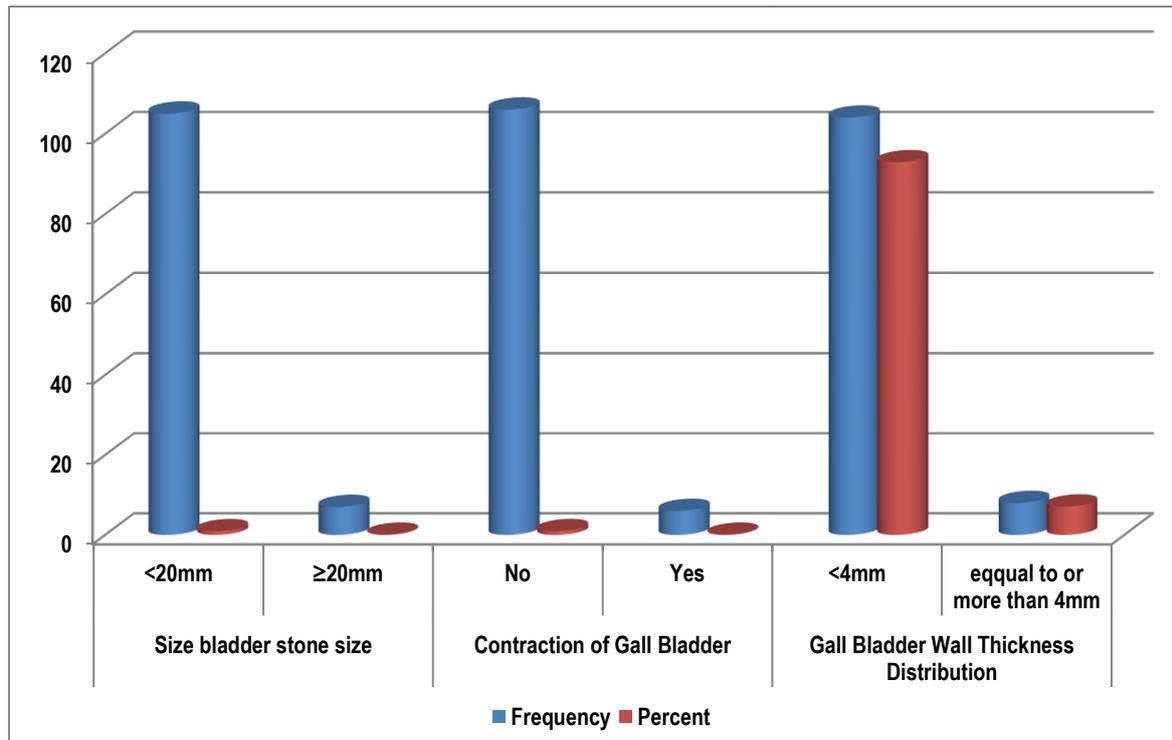
Gall Bladder Wall Thickness	Frequency	Percent
<4mm	104	92.9
≥4mm	8	7.1
<b>Total</b>	<b>112</b>	<b>100%</b>

**Table 4: Prediction of laparoscopic conversion on the basis of Gall bladder stone size**

Size of Stone	Prediction		Total	Chi Sq.	P value
	Laparoscopic	Conversion			
<20mm	97	8	105	26.043	0.005*
>20mm	2	5	7		
<b>Total</b>	<b>99</b>	<b>13</b>	<b>112</b>		

\*: Significant

Graph 1: Distribution of patients on the basis of various gall bladder parameters



## DISCUSSION

Acute cholecystitis has been found to be an independent factor for conversion; the conversion rate range from 10% to 50%. Some studies have mentioned previous abdominal surgery especially upper abdomen as a risk factor for increase conversion rate.<sup>6</sup> Post-operation adhesions pose problem in creating a pneumoperitoneum and also present the need for adhesiolysis before the gall bladder is visualized. Many studies have shown that raised total leucocytes count is a risk factor for predicting conversion.<sup>7, 8</sup> This can be probably attributed to persisting acute inflammation with oedema of the gall bladder making surgery difficult. More over patient with raised count in cases of acute cholecystitis are likely to have a complicated gall bladder. Ultra sonographic finding of contracted gall bladder have been considered by many author as a potential factor for conversion.<sup>9, 10</sup> Hence, we planned the present study to assess the gall bladder stone size as a predictor of difficult Laparoscopic Cholecystectomy.

In the present study, we observed that various gall bladder parameters were positively associated with the difficulty of laparoscopic cholecystectomy (p-value < 0.05) (Table 4). Kama et al<sup>11</sup> and Liu et al<sup>12</sup> in their studies found gall bladder wall thickness to be the most important sonographic risk factor of conversion to open cholecystectomy. Similarly other studies also show association between gall bladder wall thickness and rate of conversion.<sup>13, 14</sup> Different thickness level 3mm, 4mm, 6mm had being studied. Gall bladder wall thickness is related to the inflammation or fibrosis that follows attack of previous cholecystitis, increase thickness is associated with difficult dissection of gallbladder from its bed, this makes grasping and manipulation of gallbladder difficult which makes dissection of Calot's triangle difficult.<sup>15, 16</sup> In contrast, Carmody et al in their study conclude that detailed pre-operative ultrasound evaluation of the gall bladder is of little value for screening difficult cases.<sup>17</sup>

Agrawal et al<sup>18</sup> also found no significant association between gallbladder wall thickness and rate of conversion, however in this study it was found to be a significant risk factor for conversion of laparoscopic to open cholecystectomy (p-value < 0.05). Schrenk et al in their study reported shrunken gall bladder as an independent risk factor for conversion with other variables.<sup>19</sup> Another study by Kama et al also reported contracted gallbladder as a risk factor for conversion.<sup>11</sup>

Jansen et al<sup>20</sup> reported their study that gallstone size 20mm or more was associated with increased risk of conversion explaining that large stone are likely to get impacted at the Hartmann's pouch thereby making dissection of Calot's triangle difficult. Other studies also reported single large stone as a risk factor for conversion.<sup>21, 22</sup> In this study too single large gallstone 20mm and above was a risk factor for conversion.

Peri-cholecystic fluid collection has been studied by various people and found to be a risk factor for difficult laparoscopic cholecystectomy.<sup>23, 24</sup> Rattner et al in their study found that raised serum alkaline phosphatase was a risk factor for conversion to open cholecystectomy.<sup>22</sup> Study done by Bass et al shows that laparoscopic cholecystectomy is less costly and more cost effective than open cholecystectomy in both sexes and all age groups.<sup>25</sup> In another study done by de Pouvourville et al, the actual cost of surgery is more in laparoscopic cholecystectomy but the total cost including hospital stays, post-operative medicines, and loss of productivity was higher in open cholecystectomy, thus laparoscopic cholecystectomy was more cost effective than open cholecystectomy.<sup>26</sup> Tayeb et al presented the multivariate model of risk factors independently associated with conversion. Patient with ultrasonographic signs of inflammation (Gall bladder wall thickness > 3mm, oedematous wall, peri-cholecystic fluid collection, and USG Murphy's sign) were 8.5 times more likely to be converted to open cholecystectomy compared to patient who underwent successful laparoscopic.<sup>27</sup>

**CONCLUSION**

From the above results, the authors concluded that single large gallstone and gall bladder wall thickness are risks factors and predictors for conversion to open cholecystectomy. The ability to pre-operatively predict which cases of laparoscopic cholecystectomy will be difficult or which cases are likely to be converted to open cholecystectomy will benefit both the surgeon and the patient. Surgeon can prepare for a longer duration of surgery and patient could be forewarned about the chances of conversion to open cholecystectomy, patient selection for laparoscopic cholecystectomy can also be streamlined e.g. patient with other co-morbidity with high risk factors may not be a suitable candidate for laparoscopic cholecystectomy if patient cannot tolerate prolong duration of surgery.

**REFERENCES**

- Mouret P. From the first laparoscopic cholecystectomy to frontiers of laparoscopic surgery; the future perspective. *Dig Surg.* 1991;8:124-125.
- Daradkeh SS, Suwan Z, Abukhalaf M. Pre-operative ultrasonography and prediction of technical difficulties during laparoscopic cholecystectomy. *World J Surg.* 1998;22:75-77.
- 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.
- Chumillas MS, Ponce JL, Delgado F, Viciano V. Pulmonary function and complications after laparoscopic cholecystectomy. *Eur J Surg.* 1998;164:433-437.
- Vittimberga FJ, Foley DP, Meyers WC, Callery MP. Laparoscopic surgery and the systemic immune response. *Ann Surg.* 1998;227(3):326-334.
- Bickel A, Rappaport A, Kanievski V, Vaksman I, Haj M, Geron N, Eitan A (1996) Laparoscopic management of acute cholecystitis; Prognostic factors for success. *surg endosc* 10:1045-49.
- Zisman A, Gold-Deutch R, Zisman E, Nefri M, Halpern Z, Lin G, Halevy A (1996) Is male gender a risk factor for conversion of laparoscopic into open cholecystectomy? *surg endosc* 10:892-94.
- Licciardello A, Arena M, Nicosia A, Di Stefano B, Cali G, Arena G, Minutolo V. Pre-operative risk factors for conversion from laparoscopic to open cholecystectomy. *Euro. Rev. for med and pharm sciences* 2014; 18:60-66.
- Satish KB, Umesh KC, Gopal G, Yudhir S, Anuj D. Evaluation of risk factors in conversion of laparoscopic cholecystectomy in cases of acute cholecystitis. *Int J of cont. med. Research.* 2015; 2(2); 205-09.
- Kaplan M, Sulman B, Lyikoshar HI, Yalcin HC, Yilmaz U. The reasons and risk factors for conversion to open in laparoscopic cholecystectomy. *The new medicine* 2007;24:146-151.
- Kama NA, Kologlu M, Dogsnay M, Reise, Atli M, Dolapei M; A risk score for conversion from laparoscopic to open cholecystectomy. *Am J surg.* 2001:181.520-25.
- Lui CL, Fan ST, Laiéc Lo CM, Chu-KM; Factors affecting conversion of laparoscopic cholecystectomy to open surgery. *Arch surg.* 1996 jan 13.1(1)98-101.
- Freid GM, Barkun JS, Sigman HH et al. Risk factors in elective laparotomy in patient undergoing laparoscopic cholecystectomy. *Am J surg.* 1994; 167:35-41.
- Nachnani J, Supe A; Preoperative prediction of difficult laparoscopic cholecystectomy using clinical and ultrasonographic parameters. *Indian Journal of Gastroenterology* 2005;24:16-18.
- Daradkeh SS, Suwan Z, Abu-khalaf M: Preoperative ultrasonography and prediction of technical difficulties during laparoscopic cholecystectomy. *World j surg.* 1998; 22-7.
- Santambrogio R, Montorbi M, Bianci P, Opocher E, Schubert L, Verga m et al; Technical difficulties and complication during laparoscopic cholecystectomy: Predictive use of preoperative ultrasonography. *World J* 1996;20:978-82.
- Carmody E, A.M. Arenson, S.Hanna. Failed or difficult laparoscopic cholecystectomy: Can pre-operative ultrasonography identify potential problems? *J clin ultrasound* 1994;22(6); 391-6.
- Nikhil A, Sumitoj S, Sudhir K. Pre-operative prediction of difficult laparoscopic cholecystectomy: A scoring method. *Niger J surg* 2015 jul-dec; 21(2); 130-133.
- Schrenk P, Wuisetschlagen, Wayand W. Laparoscopic cholecystectomy – Cause of conversion in1300 patients and analysis of risk factors. *Surgen dosc* 1995;925-28.
- Jansen S, Jorjensen J, Hunt D. Preoperative ultrasound to predict conversions in laparoscopic cholecystectomy. *Surg. laparosc endosc* 1997 april; 7(2) 121-23.
- Ishizaki Y, Miwa K; Conversion of elective laparoscopic cholecystectomy to open cholecystectomy between 1993 and 2004. *B.J. surg.* 2012; 937(8):987-91.
- Rattner DW, Ferquson C, Warshaw AL. Factors associated with successful laparoscopic cholecystectomy for acute cholelcystitis. *Ann surg.*1993,217,233-6.
- Wevers KP, Van Westreenar HL, Patun GA. Laparoscopic cholecystectomy in acute cholecystitis; C- reactive protein level combined with age predicts conversion. *Surg laparosc endosc percutan tech* 2013; 23:163-166.
- Majeski J. Significance of preoperative USG measurement of gall bladder wall thickness. *Amsurg*2007;73(9); 926-29.
- Eric B, Bass, Henry A, Keith D et al; Cost effectiveness of laparoscopic cholecystectomy versus open cholecystectomy. *Am j surg.*1993;165:466-7.
- De Pouvour Ville, Ribet R, Fendrick M et al; A prospective comparison of cost and morbidity of laparoscopic versus open cholecystectomy. *Hepatogastroenterology* 1997; 44(13):35-9.
- Tayeb M, Raza A, Khan MR et al. Conversion from laparoscopic to open cholecystectomy; Multivariate analysis of preoperative factors. *Journal of post graduate medicine* 2005; 51:17-20.

**Source of Support:** Nil. **Conflict of Interest:** None Declared.

**Copyright:** © the author(s) and publisher. IJMRP is an official publication of Ibn Sina Academy of Medieval Medicine & Sciences, registered in 2001 under Indian Trusts Act, 1882. This is an open access article distributed under the terms of the Creative Commons Attribution Non-commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

**Cite this article as:** Ashwani Kumar, Sarabjit Singh, Ashish Chhabra. Prediction of Difficult Laparoscopic Cholecystectomy Based on Assessment of Gall Bladder Stone Size. *Int J Med Res Prof.* 2017; 3(3):76-79. DOI:10.21276/ijmrp.2017.3.3.016