

# Evaluation of predictive factors for conversion of laparoscopic cholecystectomy

Dr. Nityasha<sup>1</sup>, Dr. Satish Dalal<sup>2</sup>, Dr. Vikrant Sharma<sup>3</sup>,  
Dr. Amandeep Saharan<sup>4</sup>, Dr. Vipul Bakshi<sup>5</sup>

<sup>1,2</sup>Professor, Department of General Surgery, Pt. B. D. Sharma PGIMS, Rohtak.

<sup>3,4,5</sup>Junior Resident, Department of General Surgery, Pt. B. D. Sharma PGIMS, Rohtak

---

## ABSTRACT

**Background:** Laparoscopic cholecystectomy has now become the gold standard of cure for symptomatic gallstone disease. Difficulties may sometimes be faced during this operation which require conversion to an open procedure. So preoperative prediction of the risk of conversion is an important aspect of planning of laparoscopic surgery.

**Method:** We carried out a prospective study on 60 patients of symptomatic cholelithiasis where laparoscopic cholecystectomy was carried out. Difficulty during surgery was assessed in terms of presence or absence of various risk factors like age, sex, body mass index (BMI), past history of acute cholecystitis, ultrasonography findings etc

**Results:** Upper abdominal tenderness, past history of acute cholecystitis and thickened wall of gall-bladder on USG were found to be associated with increased chances of difficulties during laparoscopic cholecystectomies.

**Conclusion:** It was concluded that upper abdominal tenderness, past history of acute cholecystitis and thickened wall of gall bladder were associated with increased difficulties and subsequent conversions during laparoscopic cholecystectomies.

**Key Words:** Gallstones, Open cholecystectomy, Laparoscopic cholecystectomy (Lap Chole).

---

## INTRODUCTION

Laparoscopic cholecystectomy is indeed now the GOLD STANDARD, for treatment of symptomatic cholelithiasis and has dramatically replaced the conventional open cholecystectomy.<sup>1</sup> Many centres now perform the laparoscopic cholecystectomy as a day care operation and almost all the centres discharge patients on first post-operative day. Difficulty faced during operation may require elective or emergency conversion to open procedure or laparotomy. Patients may have to be kept for longer period than normal for observation after difficult operations. Conversion to open cholecystectomy is neither a failure nor a complication, but an attempt to avoid complications. Thus, pre-operative prediction of the risk of conversion is an important aspect of planning laparoscopic surgery. With the help of accurate prediction, high risk patients may be informed beforehand and they may have chance to make arrangements regarding their professional and family commitments.

## MATERIALS AND METHODS

A prospective study was conducted on 60 patients (n=60) taken up for laparoscopic cholecystectomy for symptomatic cholelithiasis in Department of General Surgery, Pt B.D. Sharma PGIMS, Rohtak. A detailed proforma was developed to record information on demographics including patient's age, sex, body mass index (BMI), presentation, previous attack of acute cholecystitis (upper abdominal pain, fever, leucocytosis), presence of upper abdominal tenderness at the time of surgery and all relevant investigations including ultrasonographic findings of gall bladder. Difficulty during surgery was assessed in term of presence or absence of these risk factors. The type of difficulties associated with these risk factors were also analysed.

Difficulty in Surgery was assessed in Terms of :

- Presence of dense adhesions per-operatively.
- Biliary tract injury or gastro-intestinal injury during operation.
- Amount of bleeding.
- Increased operating time.
- Conversion to Laparotomy or open cholecystectomy.

## RESULTS

Laparoscopic cholecystectomy was attempted in 60 patients during the time period of one year at Department of General Surgery, Pt B.D. Sharma PGIMS , Rohtak. Of the 60 patients included in the study, 20 patients had difficult surgery of which three patients required conversion to open cholecystectomy. Among the 20 patients who had difficult operations, 10 were in old age group and five out of ten elderly patients (50%) had a difficult operation. However, Age was not found to be a statistically significant factor in predicting difficulty in operation ( $p=0.277$ ). Four out of 11 male patients (36.4%) included in the study had difficult operations while 16 of the 49 females (32.7%) had difficulty in surgery. Hence, Male sex was not found to be significant factor in predicting difficulty in operation ( $p=1.000$ ). Three out of six obese patients (50%) studied had a difficult operation. While 17 of 54 patients (31.48%) non obese patients had a difficult operation.

History of acute cholecystitis was found to be highly significant predictor of difficulty in laparoscopic cholecystectomy ( $p<0.021$ ). Six out of nine patients (66.7%) with a past history of acute cholecystitis had difficult surgeries, as compared to 14 of 51 patients (27.5%) who did not have such history. Hence, patients with such past history were found to have 5.3 times more risk of having a difficult operation. Upper abdominal tenderness at the time of surgery was found to be significantly associated with difficult operations ( $p=0.0084$ ). 10 out of 17 such patients (58.8%) had difficult operations while 10 of rest 43 (23.3%) having no such sign at the time of surgery had difficult operation. Significant association was found between gall bladder thickness  $>3$  mm and difficulty in laparoscopic cholecystectomy ( $p<0.0001$ ). 17 out of 20 patients (85%) with thickened gall bladder wall presented difficulties during laparoscopic cholecystectomy as compared to only three out of 40 patients (7.5%) with normal gall bladder wall thickness.

19 patients had a contracted or distended gall bladder . 11 of these patients (57.9%) had difficult laparoscopic cholecystectomy as compared to 9 of other 41 patients (21.9%). This was found to be statistically significant ( $p=0.0060$ ).

**Table I- Factors analysed for difficulty in operation**

|   | Variables     | Difficulty rates(%) | p Value (univariate) | Odds ratio |
|---|---------------|---------------------|----------------------|------------|
| Age   | $\geq 60$ yrs | 50%                 | 0.277                | 2.33       |
|   | $<60$ yr      | 12.5%               |                      |            |
| Sex   | Male          | 36.4%               | 1.000                | 1.18       |
|   | Female        | 32.7%               |                      |            |
| Obesity                                     | Present       | 50%                 | 0.390                | 2.17       |
|   | Absent        | 31.5%               |                      |            |
| History of acute cholecystitis              | Present       | 66.7%               | 0.021                | 5.29       |
|   | Absent        | 27.5%               |                      |            |
| Upper abdominal tenderness                  | Present       | 58.8%               | .0084                | 4.71       |
|   | Absent        | 23.3%               |                      |            |
| Thickened gall bladder on USG               | Present       | 85%                 | $<0.0001$            | 69.9       |
|   | Absent        | 7.5%                |                      |            |
| Contracted or distended gall bladder on USG | Present       | 57.9%               | 0.0060               | 4.89       |
|   | Absent        | 21.9 %              |                      |            |

In our study three patients required conversion to open cholecystectomy, overall conversion rate being 5%. There was no emergency conversion in our study. All the three patients were converted electively. Reasons for conversion in the first two patients were dense adhesions and moderate bleeding being the reason of conversion in third patient.

## **DISCUSSION**

Several risk factors have previously been implicated as predictors of conversion to open cholecystectomy. Of the factors evaluated in our study, four factors namely, upper abdominal tenderness, a documented past history of acute cholecystitis, GB transverse diameter  $<2\text{ cm} / >5\text{ cm}$  (contracted/distended) and thickened gall bladder wall ( $>3\text{ mm}$ ) on preoperative ultrasound were found to be significant predictors.

### **Upper abdominal tenderness at the time of surgery**

It was in accordance to be significant predictor of conversion by Kama et al and few other studies.<sup>2</sup> The difficulties faced in such patients may be due to adhesions consequent to chronic inflammation. In our study it was found to be significantly associated with difficult operations ( $p=0.0084$ ). Adhesions ( $p=0.032$ ) and Intraoperative bleeding ( $p=0.0007$ ) was found to be significantly associated with presence of upper abdominal tenderness.

### **Past history of acute cholecystitis**

Patients with documented past history of acute cholecystitis were found to have 5.3 times more chances of difficult operation ( $p<0.021$ , odds ratio=5.3). History of acute cholecystitis was found to be significantly associated with adhesions ( $p<0.0001$ ), bleeding ( $p=0.013$ ) and increased operative time ( $p=0.001$ ). Of the three patients converted two had past history of attack of acute cholecystitis. After attacks of acute cholecystitis permanent dense adhesions may be formed at the Calot's triangle between gall bladder and liver causing difficulties in dissection and hence more bleeding due to omental and peritoneal adhesions. Sanabria et al have reported similar results in their study.<sup>3</sup> According to them, large gall stones impacted at the neck of the gall bladder (inherent to the mechanism of development of acute cholecystitis) and the resultant chronic inflammation after this complication of cholelithiasis often make laparoscopic cholecystectomy challenging.

### **Ultrasonographic parameters (gall bladder wall thickness and gall bladder diameter)**

Daradkeh et al studied the Overall Difficulty Scores (ODS) of Laparoscopic cholecystectomy.<sup>4</sup> Operative parameters to assess difficulty were duration of surgery, bleeding, dissection of Calot's triangle, dissection of gall bladder wall, adhesions, spillage of bile or stones and difficulty in gall bladder extraction. On multivariate analysis only gall bladder wall thickness and CBD diameter were found to be significant predictors of ODS. Some studies assessing ultrasonographic finding in terms of conversion have implicated a distended gall bladder as the major predictor of conversion while others have implicated a contracted gall bladder.<sup>5,6</sup>

In our study, thickened gall bladder wall was found to be a significant predictor of difficulty in laparoscopic cholecystectomy ( $p<0.001$ ). 85% of difficult patients had a thickened gall bladder wall as compared to 7.5% of easy patients. Thickened gall bladder wall was significantly associated with adhesions ( $p<0.002$ ), bleeding ( $p<0.0001$ ) and increased operating time ( $p<0.0001$ ). All the three converted patients had thickened gall bladder wall. Approximately 30% patients with thickened gall bladder wall had a positive history of acute cholecystitis. According to Fried et al patients with thickened gall bladder wall have eight times more chances of conversion to open cholecystectomy.<sup>7</sup> They have associated a thickened gall bladder wall with difficulties in exposure of biliary anatomy. These factors contributed to difficulties in retraction and increased chances of liver tears and bleeding from gallbladder bed, thus causing increased bleeding in these patients. Gall bladder size also predicted difficult laparoscopic cholecystectomy in our study. 19 patients in our study had a size  $<2\text{ cm} / >5\text{ cm}$  (contracted/distended) gall bladder as a predictor of difficulty. Gall bladder transverse diameter was found to be significant of laparoscopic cholecystectomy ( $p=0.0060$ ). This is in accordance to Velden et al findings.<sup>8</sup>

### **Obesity**

Obesity was another factor evaluated but not found to be significant ( $p=0.390$ ) in prediction of difficulties in laparoscopic cholecystectomy. Only three out of 20 patients having difficulty in operation were obese and this was also due to presence of thickened gall bladder wall and dense adhesions. In Fried's study obesity was found to be a moderately successful predictor of conversion and the significance of this predictor decreased with increasing experience.<sup>7</sup> The problems faced by

them were those of short instruments, displacement of trocars with resultant extraperitoneal insufflations and subcutaneous emphysema. Such difficulties were not experienced in our study. This may be due to proper technique of trocar placement. In our study three patients required conversion to open cholecystectomy. Thus a conversion rate of 5% was observed. This is in accordance with the conversion rates observed in most recent series (3 to 5%).<sup>9,10,11</sup>

Though, upper abdominal tenderness, past history of acute cholecystitis, gall bladder transverse diameter and thickened wall of gall-bladder on preoperative ultrasound were found significant in univariate analysis, multivariate analysis concluded that only thickened gall bladder wall and gall bladder transverse diameter were significant factors in prediction of a difficult laparoscopic cholecystectomy.<sup>12</sup> Though being a well designed prospective study our study was limited by the small size of study group (n=60). This factor precluded a relevant multivariate analysis of risk factors.

## CONCLUSION

So it was concluded that upper abdominal tenderness, past history of acute cholecystitis, gall bladder transverse diameter and thickened wall of gall bladder are associated with increased chances of encountering difficulties in laparoscopic cholecystectomy. Increased bleeding may be expected in patients with a past history of acute cholecystitis and those with a thickened gall-bladder wall. This consequently increases the operating time of such patients. Our study design should however, be applied to a larger group of patients to further evaluate the validity of our results. This can contribute to the quest for surgical excellence and better patient care for one of the most commonly performed surgical procedures in the world.

## REFERENCES

- [1] Sarli A, Pietra N. Reduced postoperative morbidity after elective laparoscopic cholecystectomy. *World J Surg* 1997;8:872-8.
- [2] Kama NA, Kologlu M, Doganay M, Reis E. A risk score for conversion of laparoscopic cholecystectomy to open cholecystectomy. *Am J Surg* 2001;181:520-5.
- [3] Sanabria JR, Gallinder S, Croxford R, Strasberg SM. Risk factors in elective laparoscopic cholecystectomy for conversion to open cholecystectomy. *J Am Coll Surg* 1994;179:696-704.
- [4] Daradkeh SS, Suwan Z, Abu KM. Preoperative ultrasonography and prediction of technical difficulties during laparoscopic cholecystectomy. *World J Surg* 1998;22:75-7.
- [5] Liu CL, Fan ST, Lai ECS. Factors affecting conversion of laparoscopic cholecystectomy to open surgery. *Arch Surg* 1996;131:98-101.
- [6] Lal P, Aggarwal PN, Malik VK, Chakravarti AC. A difficult laparoscopic cholecystectomy that requires conversion to open procedure can be predicted by preoperative ultrasound. *J Soc Laparo Surg* 2002;6:59-63.
- [7] Fried GM, Brakun JS, Sigman HA. Factors determining conversion of laparotomy in patients undergoing laparoscopic cholecystectomy. *Am J Surg* 1994;167:35-41.
- [8] Vander Velden JJ, Berger MY, Bonjer HJ. Can sonographic signs predict conversion of laparoscopic to open cholecystectomy. *Surg Endosc* 1998;12:1232-45.
- [9] Brodsky A, Matter I, Sabo E, Cohen A, Abrahamson J, Elder S. Laproscopic cholecystectomy for acute cholecystitis : Can the need for conversion and probability of complication be predicted? A prospective study. *Surg Endosc* 2000;14:755-60.
- [10] Bedirli A, Sakrak O, Sozuer EM, Kerek M, Guler I. Factors effecting the complications in the natural history of acute cholecystitis. *Hepatogastroenterology* 2001;48:1275-8.
- [11] Abdulmohsen A, Al-Mulhim. Male Gender is not a Risk Factor for the Outcome of Laproscopic Cholecystectomy: A Single Surgeon Experience. *Saudi J Gastroenterol*. 2008;14(2):73-9.
- [12] Jansen S, Jorgensen J, Caplehorn J. Preoperative ultrasound to predict conversions in laparoscopic cholecystectomy. *Surg Laparosc Endosc* 1997;7:121-3.