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Evaluation of intra-operative gall bladder scoring for predicting conversion of laparoscopic to open cholecystectomy-A prospective observational study in a tertiary care centre in North India

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Abstract

Introduction: Laparoscopic cholecystectomy has become the gold-standard treatment for symptomatic cholelithiasis replacing open cholecystectomy. Surprisingly, it has variable outcomes and conversion rates. This single centre, prospective study uses the intra-operative scoring system, devised by Michael Sugrue et al to grade difficulty of laparoscopic cholecystectomy intraoperatively. This score has also been used to predict conversion rates.

Methods: A prospective observational cross-sectional study was undertaken in Department of General Surgery, Indira Gandhi Medical College, Shimla, Himachal Pradesh; enrolling all patients undergoing laparoscopic cholecystectomy for symptomatic cholelithiasis and acute mild gall stone induced pancreatitis from October 1, 2019 to September 30, 2020. Case reporting forms and intra-operative severity scoring system devised by Michael Sugrue et al were used. Demographics about the patient and other variables were recorded and intra-operative score was compared with the variables and conversion rates.

Results: A total of 640 patients were enrolled in the study, in which laparoscopic cholecystectomy was attempted, with a mean age of 44.84 years (range 10 to 82 years). The mean duration of surgery was 33.56 minutes. 545 patients (85.2%) had moderate difficulty (score 2-4) in surgery, 39 patients had mild difficulty (score<2), 47 patients had severe difficulty (score 5-7) while 9 patients had extreme difficulty (score 8-10). The conversion rate in this study came out to be 4.2%. Most of these converted surgeries belonged to severe difficulty group (70.4%) (P-value<0.001).

Conclusion: This study provides a simple intra-operative scoring system to grade difficulty of laparoscopic cholecystectomy. Using this score for predicting difficulty and conversion into open surgery allows appropriate planning of laparoscopic cholecystectomy. In patients having high intra-operative difficulty score, early conversion to open cholecystectomy is done to avoid complications, morbidity and mortality.

Keywords: difficult laparoscopic cholecystectomy; intra-operative scoring system; conversion rate of laparoscopic into open cholecystectomy

Introduction

Cholelithiasis is one of the most frequently encountered disease and the major cause of abdominal morbidity throughout the world [1]. Its incidence is rising globally due to changes in the dietary habits and increased sedentary life style. The prevalence of cholelithiasis in India is estimated to be 2–29% [2]. Laparoscopic cholecystectomy has replaced open cholecystectomy as treatment of choice for symptomatic gall stone disease [3]. It has its benefits and complications. However, around 5-10% of laparoscopic cholecystectomies get converted into open surgeries. The major risk factors of conversion being obscure anatomy, aberrant anatomy or bleeding complications [4]. Various pre-operative risk factors have been developed which predict conversion of laparoscopic cholecystectomy into open cholecystectomy. An intra-operative score of predicting difficult laparoscopic cholecystectomy was developed by Michael Sugrue et al [5]. This intra-operative score helps to identify patients requiring conversion from laparoscopic to open cholecystectomies saving significant time and avoiding/decreasing intraoperative complications. In this study, we have used this intra-operative score to predict difficult laparoscopic cholecystectomies and their conversion rate into open surgery.

Methods

A prospective observational cross-sectional study was undertaken in Department of General Surgery, Indira Gandhi Medical College, Shimla, Himachal Pradesh over a period of one year from October 1, 2019 to

September 30, 2020. All patients undergoing laparoscopic cholecystectomy for symptomatic cholelithiasis and acute mild gall stone induced pancreatitis were included in the study after due consent. Case reporting forms were used for data entry and intra-operative severity scoring system devised by Michael Sugrue et al [5] was used [Table 1]. Patients were taken up for laparoscopic cholecystectomy and the surgery was performed by consultants using a uniform technique of laparoscopic cholecystectomy involving 4 ports, with the surgeon and assistant positioned as in the standard North American approach.

As and when required, laparoscopic surgery was converted into open. The post-operative period was watched for any complications and patients discharged when deem fit. All the data was collected, analysed and entered into excel spread sheet. Chi-Square test was used to study difference in distribution of discrete variables. Expression of continuous variables was as Mean + SD or Median + Interquartile range. Significance of difference in continuous variables was analysed using Student T test, Fisher's Exact test or Wilcoxon Signed Rank test depending on distribution of variables. Data was analysed using Epi- info version 7.2.4.0, with P-value <0.05 to be considered as statistically significant.

The intra-operative score was used to grade difficulty of cholecystectomy as mild (score 1), moderate (score 2-4), severe (score 5-7) or extreme (score 8-10) and the score was correlated with various variables like age, gender, BMI, co-morbidities, ultrasonographic findings, total leukocyte count, conversion rate into open surgery, duration of surgery, post-operative complications and duration of hospital stay.

Table 1: Intra-operative scoring used by Michael Sugrue, derived from Sugrue et al. World Journal of Emergency Surgery (2015) 10:14 [5]

Gallbladder appearance			
Adhesions < 50% of GB			1
Adhesions burying GB			3
		Max	*3*
Distension/Contraction			
Distended GB (or contracted shrivelled GB)			1
Unable to grasp with atraumatic laparoscopic forceps			1
Stone ≥1 cm impacted in Hartman's Pouch			1
Access			
BMI >30			1
Adhesions from previous surgery limiting access			1
Severe Sepsis/Complications			
Bile or Pus outside GB			1
Time to identify cystic artery and duct >90 minutes			1
		Total *Max*	*10*
Degree of difficulty			
A Mild	<2		
B Moderate	2–4		
C Severe	5–7		
D Extreme	8–10		

Results

A total of 640 patients were enrolled in the study in which laparoscopic cholecystectomy was attempted, with a mean age of 44.84 years (range 10 to 82 years). 509 were female and 131 were male making the female to male ratio of 3.9:1. Around 25% of the patients had co-morbidities in the form of diabetes mellitus, hypertension, respiratory or psychiatric illnesses. Based on ultrasonographic findings, 63.9% patients had multiple calculi in the gall bladder, 27.2% had single calculus while 7.2% has positive WES sign. Gall bladder was thickened (>4 mm) in 9 patients. Based on intra-operative scoring, 545 patients (85.2%) had moderate difficulty (score 2-4) in surgery, 39 patients had mild difficulty (score<2), 47 patients had severe difficulty (score 5-7) while 9 patients had extreme difficulty (score 8-10). This is depicted in Figure 1.

Out of the 640 attempted laparoscopic surgeries, 27 got converted into open surgery, making conversion rate of 4.2%. Most of these converted surgeries belonged to severe difficulty group (70.4%), making this observation to be statistically significant (P-value<0.001). Most important factors leading to conversion were adhesions around GB, frozen Calot's anatomy and aberrant anatomy.

Out of total 9 patients in extreme difficulty group, 6 patients underwent conversion into open surgery (66.6%) (P-value<0.001). This is depicted in Figure 2.

The mean duration of surgery was 33.56 minutes. The duration of surgery was more in patients of higher difficulty score. (P-value<0.0001) The patients who belonged to higher difficulty grade had greater percentage of post-operative complications like fever or wound sepsis, leading to prolongation of hospital stay (P-value<0.001).

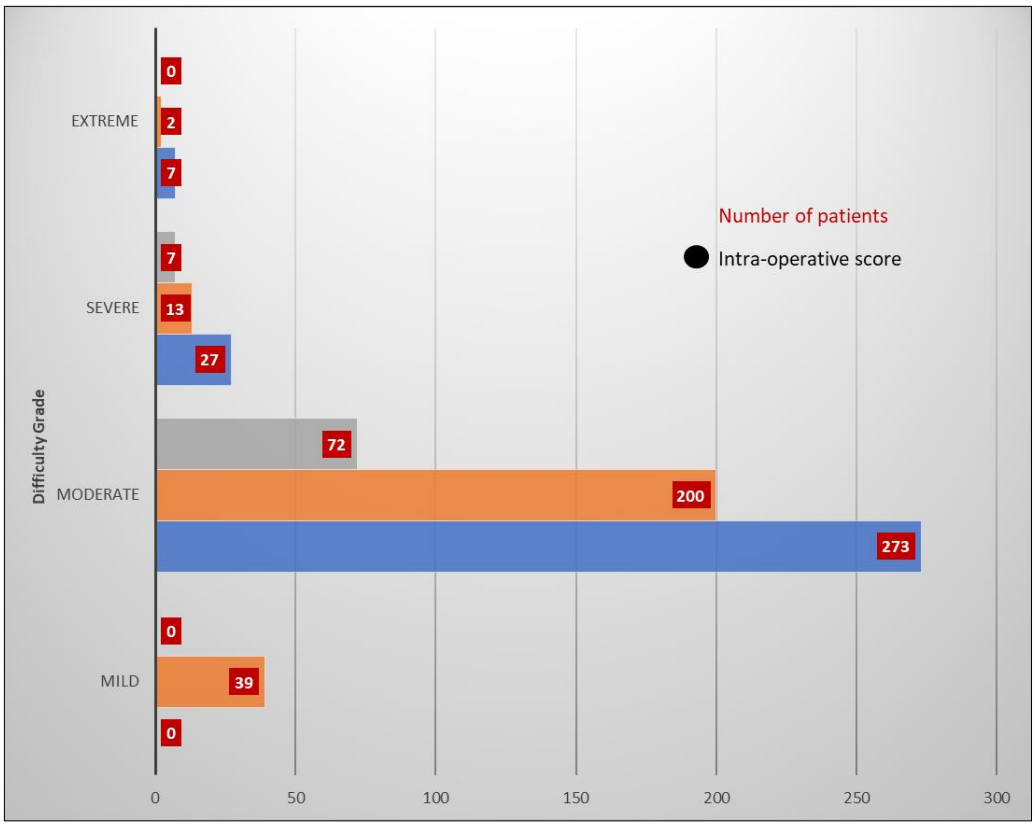

Fig 1: Intra-operative score of difficulty of laparoscopic cholecystectomy

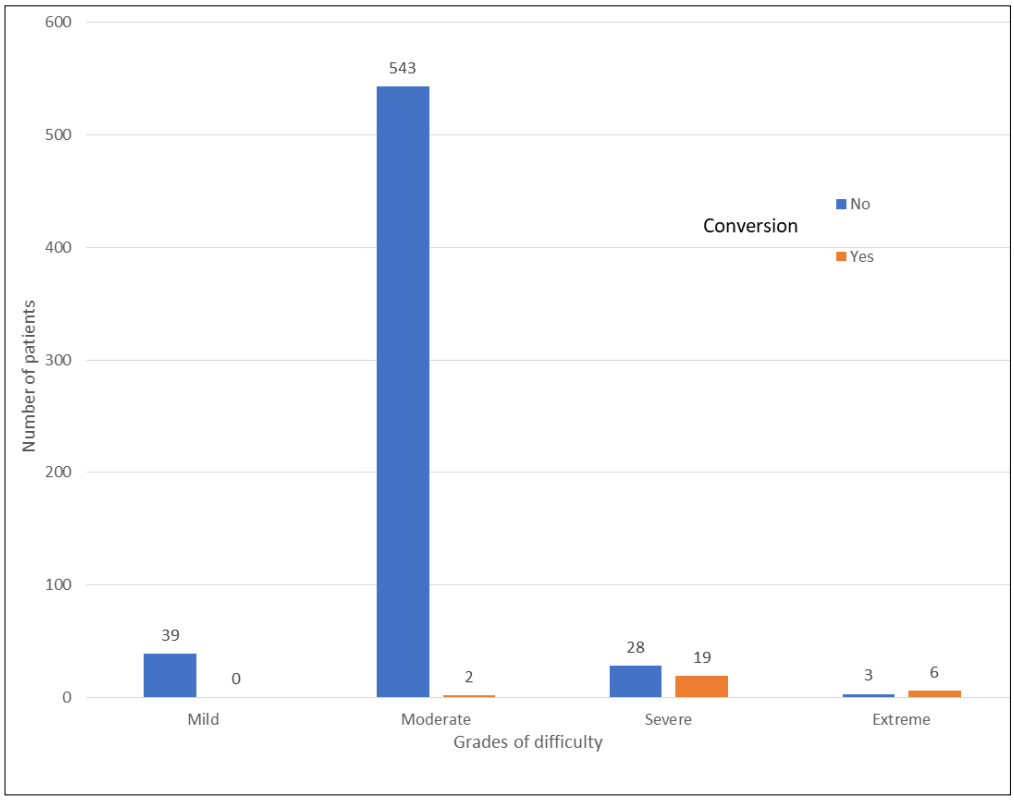

Fig 2: Comparison of difficulty grade and conversion rate

Discussion

Cholecystectomy is presently one of the most common laparoscopic surgery performed worldwide and there is a very high incidence of variations and intraoperative difficulties which have been documented and reported and thereby scoring systems can be used to assess the difficulty level. At times, it has been seen that the degree of difficulty is difficult to predict and there has been numerous documentations of various pre-operative scoring

methods but no study has been done for intra-operative scoring system like done by Michael Sugrue [5] and our study has been done with a hypothesis to validate the findings of this study.

Publications reporting outcomes, including conversion to open surgery, are hard to compare as currently there is no grading or scoring of intra-operative findings at surgery and there are some well-reported models of grading and classification systems. Various studies have been done which have documented severity scoring systems but they have focused on prediction of outcomes from clinical and preoperative investigations rather than operative findings. Randhawa et al [6] in their study predicted BMI >27.5, previous hospitalization due to acute attack, palpable GB as significant clinical parameters. Nikhil Gupta et al [7] defined history of previous hospitalization due to acute cholecystitis, palpable GB as the statistically significant parameters. Vivek et al [8] in their study defined male gender, previous attack of acute cholecystitis, previous upper abdominal surgery as clinically significant parameters. Use of an intraoperative scoring system is helpful as it may provide a trigger to prompt earlier conversion, as there has been increasing pressure to perform acute index admission surgeries.

The mean age of laparoscopic cholecystectomy in our study was 44.84 years and it was found that people > 60 years of age had high difficulty score with significant P-value. A. Hu et al [9] in their meta-analysis "Risk factors for conversion of laparoscopic cholecystectomy to open surgery" evaluated studies and found that older age (>60 years) was an important risk factor for conversion of laparoscopic cholecystectomy. In present study, the conversion rate was found to be 4.2%, which was comparable to previous studies determining the conversion rates. The conversion rate was more in severe and extreme difficulty group making the comparison statistically significant. The patients with high risk of conversion and higher difficulty score had high rates of post-operative complications and longer duration of hospital stay, and the association was significant statistically.

However, the current scoring system has some limitations. It has not been validated in a large series and has some subjectivity in terms of the percentage of the gallbladder covered by adhesion. Also, it is difficult to objectively define the amount of adhesions from previous abdominal surgery. In addition, adhesions may vary in tenacity and vascularity. Another limitation is that fistulation of the gallbladder, which would be associated with extreme difficulty and a high rate of conversion was not included in the score, given its rarity and potential to skew a simple scoring system. However, these are difficult to define objectively and as such have omitted from the scoring system [10]. It is, however, simple to calculate and provides a score out of ten. Another limitation is that it does not particularly take into account intra-operative bleeding. The actual amount of bleeding is hard to measure objectively outside a clinical trial. Other international scoring systems have facilitated advances in clinical and research into different areas of surgery. Some scoring systems, like some of the previously published gallbladder related reports, have focused on prediction of outcomes from clinical and preoperative investigations rather than operative findings [5].

A key to optimising outcomes in cholecystectomy is a laparoscopic approach, albeit with a slightly increased risk of bile duct injury, and the latest Tokyo consensus emphasize that conversion to open is not a complication and in fact may be safer than pursuing the laparoscopic route in individual cases [11]. Bailout is an important option as surgeons may not possess the experience required for a complex open case. Conversion is not always a crime [12]. The current prospective study adds to the debate about the benefits of both scores and grades of difficulty in cholecystectomy and how this may help in predicting early conversion and preventing morbidity.

Conclusion

Laparoscopic cholecystectomy is the gold standard treatment for patients with symptomatic cholelithiasis. There is a learning curve for laparoscopic cholecystectomy and it is highly operator dependent. Laparoscopic surgery has slightly more complications though it has advantages like short hospital stay, rapid return to normal activity and work, has less post-operative pain and is cosmetic. The conversion rate from laparoscopic cholecystectomy to open cholecystectomy is about 5%. Some of the risk factors for conversion are gallbladder wall thickness more than 4 mm, previous attack of acute cholecystitis, obesity, male sex, instrumental failure, difficult anatomy at Calot's triangle and adhesions. The conversion rate to open cholecystectomy is decreased with experience of the surgeon. Using intra-operative risk factors for predicting difficulty and conversion into open surgery allows appropriate planning of laparoscopic cholecystectomy. In patients having high intra-operative difficulty score, early conversion to open cholecystectomy is done to avoid complications, morbidity and mortality.

Abbreviations

%: percentage
BMI: Body Mass Index
et al: and others
GB: Gall Bladder
mm: millimetre
P-value: Probability value
SD: Standard Deviation
WES: Wall Echo Sign

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