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Safety, Effectiveness, Grading Of Operative Difficulty And Timing Of Laparoscopic Cholecystectomy For Gallbladder Empyema: Single Institutional Study

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ABSTRACT

Background: Empyema of the gallbladder is one of the frequently encountered severe forms of acute cholecystitis. It usually starts with acute cholecystitis progressing to a fulminant nature, with biliary stasis and obstruction of cystic duct. This results in a surgical emergency and needs immediate optimisation and urgent removal of the gallbladder to reduce the risk of sepsis with resulting morbidity and mortality. Patients with gallbladder empyema require urgent cholecystectomy or cholecystostomy tube drainage of pus, based on the severity of symptoms and clinical presentation at the time of admission.

Aim: To determine and grade the degree of intra-operative difficulty in managing.

To choose the various modalities of management, such as laparoscopic cholecystectomy, laparoscopic subtotal cholecystectomy, laparoscopic tube cholecystostomy and open cholecystectomy.

Patients and Methods: A prospective observational study of 50 patients to observe the safety, effectiveness, and feasibility of laparoscopic cholecystectomy for empyema gall bladder for 2 years. Preoperative investigations, intra-operative findings, duration of surgery, grading of difficulty during surgery, post-operative recovery, and number of days in the hospital are analysed.

Results: By grading the severity of the pathology by intra-operative findings the surgeon can anticipate the difficulty of performing the procedure and decide which is the safe modality to choose for the patient. Post-operative complication rates are irrespective of approach either laparoscopic or open, is higher for empyema gall bladder. Surgeons who undertake laparoscopic approaches should have a low threshold to convert to open procedures when they encounter technical difficulties.

Conclusion: Surgeons who undertake laparoscopic approaches should have a low threshold to convert to open procedures when they encounter technical difficulties. Thus, this study shows that the laparoscopic approach is safe and effective in the management of empyema gallbladder.

Keywords: *Empyema, comorbid, Laparoscopic cholecystectomy, Intraoperative grading*

1. INTRODUCTION

Laparoscopy for gallbladder diseases, has been now widely practised for the management of more complicated gallbladder diseases including acute empyema gall bladder, Previous surgery, or biliary obstruction due to stones or extramural compression in the common bile duct are some of the common causes for obstruction[1] Recent advances in imaging techniques and equipment advances, variability in approaches to procedures based on surgeons skills and experience determines the outcomes in gallbladder disease management especially emergency diagnosis like empyema. [2] There are many scoring systems practised to assess the patient pre-operatively, still there is no intraoperative classification of findings at laparoscopic surgery[3]. Biliary leakage resulting from perforation GB in case of acute empyema of the gall bladder, incidental injuries happen due to the acute nature with peri colic adhesion, and anatomical anomaly. [4]With blind application of the Veress needle or trocar there is an element of risk in injuring the surrounding visceral or vascular structures. Patients with comorbidities like diabetes or on immunosuppression, and the elderly may exhibit few symptoms and signs, which may delay the diagnosis.[5] Our study, conducted in the department of General Surgery, Karpaga Vinayaga Institute of Medical Sciences & Research Centre, outlines a new scoring system for operative findings at laparoscopic cholecystectomy to allow grading of the findings and standardise the degree of cholecystitis.

2. MATERIAL AND METHOD

This is a prospective observational study of 50 adult patients, admitted to our surgery department with a diagnosis of empyema gall bladder, based on history, clinical examination, and radiology findings. Only those patients who underwent Laparoscopic Cholecystectomy, and perioperative findings confirmed empyema of the gall bladder, for 2 years from January 2022 to December 2023 in the Department of General Surgery, Karpaga Vinayaga Institute of Medical Sciences and Research Centre, a sub-urban tertiary teaching hospital. Preoperative investigations, intra-operative findings, duration of surgery, grading of difficulty during surgery, post-operative recovery, and number of days in the hospital are analysed, and the data collected are documented using Microsoft Excel.

3. RESULTS:

In our study, we had 26 out of 50 patients who were obese out of which 18 were female and 8 were male. This obesity contributed to facts such as an increased incidence of gallstones, associated risk factors such as type 2 diabetes mellitus, difficulty in port position, and increased risk of conversion, as all patients converted to open were obese and delayed in the recovery of patients postoperatively. A new grading system was proposed to assess the difficulty faced in cholecystectomy laparoscopically,considering the following parameters.Each parameter carries 1 point except adhesions covering >50% of the gall bladder and time to identify the cystic duct and artery>90 mins, which have 2 points each. Intraoperative difficulties are graded as shown in Table 1

Table 1: GRADING OF INTRAOPERATIVE DIFFICULTY

S.No	Parameters for grading	Grade
1.	ADHESION COVERING >50%OF GALL BLADDER	2
2.	BMI >30	1
3.	PREVIOUS ABDOMINAL SURGERY	1
4.	UNABLE TO GRASP THE GB WITH TRAUMATIC FORCEPS	1
5.	STONE>1 CM IMPACTING THE HARTMANS POUCH	1
6.	BILE OR PUS OUTSIDE THE GB	1
7.	TIME TO IDENTIFY THE CYSTIC DUCT AND ARTERY >90 MINS	2

Intraoperative Parameters for Scoring Difficulties.

In our study, almost all patients had omentum covering the gall bladder, masking the gall bladder, with one patient having the transverse colon covering the gall bladder. Adhesiolysis is done with the help of electrocautery, and when encountering dense adhesions, we applied HYDRODISSECTION with the help of suction forceps. Intraoperative parameters are scored as mild, Moderate, and severe, as shown in Table 2

Table 2: Scoring for degree of difficulty

GRADING OF INTRAOPERATIVE DIFFICULTY	DEGREE OF DIFFICULTY	Score
I	MILD	<2
II	MODERATE	2-4
III	SEVERE	5-7
IV	EXTREME	8-10

In our study, we found out that 28 patients of the study population had omentum covering less than 50% of the gallbladder.4 patients had the gallbladder covered entirely. Prolonged operative time was needed to find the correct plane of dissection to ensure no injury to vital structures. Such cases needs surgeon of expertise with a high learning curve to identify the plane. In our study, 14 of our patients had frozen Calot's triangle, out of which two underwent laparoscopic tube cholecystostomy (Figure 1),

Figure 1: Showing Cholecystostomy Empyema Gall bladder

10 underwent laparoscopic subtotal cholecystectomy (Figure 2)

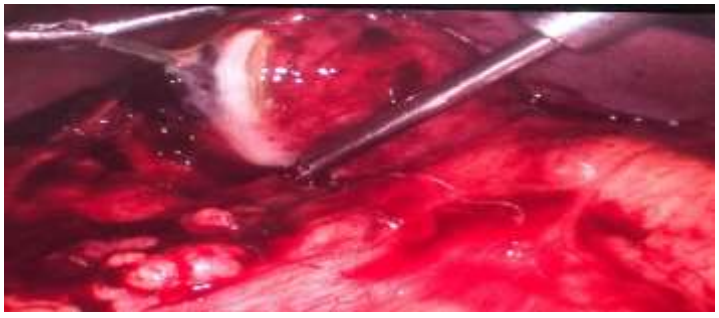

Figure 2. Subtotal Cholecystectomy Done for Empyema of Gall Bladder

And 2 patients underwent open cholecystectomy. Due to excessive fibrosis and inflammation around the Calot's triangle, trying to identify the plane identify the vital structures, such cystic duct and artery, becomes very difficult. In most such cases, the cystic artery becomes fibrosed and usually cannot be identified. Such decisions regarding either procedure were made by the amount of adhesions covering the gall bladder. If almost the entire gall bladder got frozen, we tried to identify the fundus alone and proceeded with laparoscopic tube cholecystostomy. For patients in whom<50 % of the gall bladder was visible, the option was laparoscopic subtotal cholecystectomy.In our study, we chose 4 modalities of management of empyema gall bladder. Among the 50 patients, 2 patients underwent laparoscopic cholecystostomy, 10 patients underwent laparoscopic subtotal cholecystectomy, 36 patients underwent laparoscopic total cholecystectomy, and in 2 patients, the procedure was converted to open. The most common complications noted in our study were uncontrollable bleeding, even after careful use of electrocautery, and compression by gauze collection < 30 ml and no obvious collection in postoperative ultrasound. 1 female patient underwent mortality due to postoperative atelectasis and sepsis. (Table 3)

Table 3: Complications reported postoperatively

S.No	Complication Nature	SEX		Total
		Male	Female	
1	Post-operative sepsis	1	1	2
2	Suspicion of CBD injury	1	3	2
3	Inadvertent CBD injury	Nil	Nil	Nil

4. DISCUSSION

In our study, we did not include the operating time for the laparoscopic approach as its duration is longer for laparoscopy than open, as dissection with the help of suction irrigation, blunt forceps takes much longer than blunt finger dissection in an open procedure, with the advantage of tactile feedback. In our study, there is no real added morbidity or mortality with the laparoscopic approach and choosing the correct modality of management according to the severity and intra-operative findings reduces the operative time and damage to unnecessary structures nearby. By grading the severity of the pathology by intra-operative findings, the surgeon can anticipate the difficulty of performing the procedure and decide which is the safest modality to choose for the patient.[6]postoperative complication rates are irrespective of approach, either laparoscopic or open, are higher for empyema gall bladder. As surgical technology is advancing at a great pace, with added safety, there is an increased patient preference for laparoscopic cholecystectomy in most cases [7]. In our study, among 50 only one patients, we had to convert laparoscopic to open cholecystectomy and one patient from laparoscopic to open subtotal cholecystectomy, so the conversion rate was 5% in our study.,Compared with the other studies, the conversion rate of laparoscopic to open cholecystectomy ranged between 7% and 35% [8]. The main reason for the conversion, as in many research articles related to this, is dense adhesion due to infection from severe cholecystitis, or it needs a lot of diligence and expertise to distinguish anatomy to avoid conversion of laparoscopic to open cholecystectomy [9] We used in our observational study, an intraoperative scoring or grading system for the degree of difficulty during laparoscopic cholecystectomy, presented by Sugrue et al., but there are also other intraoperative scoring or grading system for the degree of difficulty during laparoscopic cholecystectomy as presented where Operative predictors identified here were, in part, consistent with those reported in other studies. The GB wall thickness of 3 mm or more also contributes significantly with a degree of difficulty as “difficult” for laparoscopic cholecystectomy as suggested by Gupta et al. and Randhawa et al. [10]The notable variables which were statistically significant with intraoperative difficulty were gender, primary diagnosis, type of intervention, ASA classification, and CBD diameter ($p<0.05$) similar other studies as statistically significant with intraoperative difficulty [11]In our study, although, the degree of difficulty “difficult” for laparoscopic cholecystectomy was higher among patients aged 45 years or older (83.4%) as compared to patients aged<40 years (16.6%) it was statistically non-significant ($p>0.05$) and our findings were supported by the other studies

Going through Literature references on similar subjects, it has been shown that the conversion rate ranges between 1% and 13% and in our study, the conversion rate was 5%, which is quite likely due to the smaller study population, still comparable to the available literature[12]. In our study, eight patients required conversion to open cholecystectomy, with 9% of these cases falling into the extreme intraoperative difficulty grade. None of the patients with lower intraoperative scores underwent conversion. This indicates a significantly higher conversion rate among difficult cases compared to easier ones, as determined by the intraoperative grading scale ($p < 0.05$). The grading system demonstrated a sensitivity of 100% in predicting the need for conversion from laparoscopic to open cholecystectomy.

5. CONCLUSION

In grading the difficulties of performing elective or emergency laparoscopic cholecystectomy and determining the severity of the disease, this intraoperative scoring system is effective and reliable. Additionally, it helps to decide the need for conversion from laparoscopic to open cholecystectomy in cases of severe cholecystitis. With its use, the postoperative course could be appropriately predicted so that counselling regarding the outcomes could be provided to the patients and relatives. We conclude, in our limited population study, that the preoperative scoring system was evaluated as effective and consistent in determining the difficult laparoscopic cholecystectomy

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