



THE PREDICTIVE VALUE OF C-REACTIVE PROTEIN (CRP) AS A MARKER FOR DIFFICULT LAPAROSCOPIC CHOLECYSTECTOMY OR ITS CONVERSION

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ABSTRACT

Background: For the majority of patients with gallbladder problems, laparoscopic cholecystectomy (LC) is the recommended operation since it is associated with less pain and a quicker return to regular activities than open cholecystectomy. Laparoscopic cholecystectomy can be easy or difficult, and conversion to open surgery is frequently seen as an indication of a difficult treatment (2–7%). The exact ratio of when to choose an open treatment versus how long a surgeon should continue with a laparoscopic procedure is not well defined. When a laparoscopic cholecystectomy is performed for more than two hours, perioperative problems are four times more likely to occur than during 30- to 60-minute procedures.

Objective: To evaluate the predictive value of CRP in identifying laparoscopic cholecystectomy complications or the necessity of switching to an open operation.

Study design: A cross-sectional study

Place and Duration: This study was conducted at XXX Hospital from June 2022 to June 2023.

Methodology: This study encompassed all individuals with cholelithiasis who were admitted to a specific hospital unit and underwent laparoscopic cholecystectomy. For all the participants, CRP was done. Patients with a proven congenital anomaly of gallbladder, any other situation increasing CRP, a high BMI (>35), or previous abdominal surgery were not included in this research. Moreover, immunocompromised patients were also excluded. SPSS version 26 was used for statistical analysis.

Results: There were a total of 180 people involved in this research. The mean age of the patients was 50.41 years. There were a total of 146 females and 34 males. The most common complaint was pain

in the abdomen, which was present in 97.2% of participants. A total of 132 patients had simple cholecystectomy, 39 had difficult cholecystectomy, and 9 converted to open cholecystectomy. The level of CRP increased with the increase in difficulty of dissection.

Conclusion: According to the current research, preoperative CRP levels are a reliable indicator of potential difficulties during laparoscopic cholecystectomy as well as the possibility of an open surgery being necessary.

Keywords: C-reactive protein, laparoscopic cholecystectomy, open surgery

INTRODUCTION

For the majority of patients with gallbladder problems, laparoscopic cholecystectomy (LC) is the recommended operation since it is associated with less pain and a quicker return to regular activities than open cholecystectomy [1, 2]. Laparoscopic cholecystectomy can be easy or difficult, and conversion to open surgery is frequently seen as an indication of a difficult treatment (2–7%) [3]. It is helpful to anticipate the need for conversion so that patients can be informed and ready for any problems or extended hospital stays. Severe inflammation increases the technical difficulty of the laparoscopic dissection and increases the danger of gallbladder wall perforation and contaminated bile leakage into the peritoneal cavity [4].

The exact ratio of when to choose an open treatment versus how long a surgeon should continue with a laparoscopic procedure is not well defined. When a laparoscopic cholecystectomy is performed for more than two hours, perioperative problems are four times more likely to occur than during 30- to 60-minute procedures. If dissection becomes difficult, the surgeon should opt to convert as soon as possible when working with a high-risk patient; this shortens the duration of the surgery and minimises morbidity [5].

There is a higher chance of having to have an open cholecystectomy if the patient is male, older than 60 to 65 years old, has had upper abdominal surgery before, has severe acute cholecystitis as seen on clinical and ultrasonography tests when they are admitted, or has a white blood cell count (WBC) of 10,000 or more per mm³ [6]. An inflammatory infiltration may change the shape of Calot's triangle, which makes it more likely that the bile duct will be damaged. Severe inflammation also plays a major role in major problems that arise in the postoperative phase [7].

According to recent studies, certain biochemical tests can help surgeons determine the gallbladder's pathological condition prior to removing it. C-reactive protein (CRP) is one such indicator of problems [8]. CRP is the first acute-phase protein to be discovered and is a highly sensitive systemic marker of tissue damage and inflammation. Because its synthesis rate determines the concentration of CRP in circulation, which reflects the severity of the pathogenic process, CRP is a valid measure of the degree of inflammation.

An extremely useful non-specific biochemical biomarker of inflammation is the CRP concentration. Its measurement plays a major role in (a) tracking the efficacy of treatments for inflammation and infections, (b) screening for organic disease, and (c) identifying concurrent infections in immunocompromised individuals and in particular diseases with absent or limited acute-phase responses [9].

The median CRP value in young, healthy adult volunteers who donate blood is 0.8 mg/L; the 90th and 99th percentiles are 3.0 and 10 mg/L, respectively. Nevertheless, these values can grow 10,000 times, from less than 50 µg/L to over 500 mg/L, in response to an acute-phase stimulus [10]. The goal of this study was to find out how well CRP can predict problems that might happen during a laparoscopic cholecystectomy or the need to switch to an open surgery.

METHODOLOGY

This study encompassed all individuals with cholelithiasis who were admitted to a specific hospital unit and underwent laparoscopic cholecystectomy. For all the participants, CRP was done. The Ethical review committee approved this research.

Exclusion criteria: Patients with proven congenital anomaly of gallbladder, any other situation increasing CRP, a high BMI (>35), and previous abdominal surgery were not included in this research. Moreover, immunocompromised patients were also excluded.

SPSS version 26 was used for statistical analysis. The Chi-square test was used to compare the groups based on the numerical (%) representation of the categorical data. Quantitative data were shown as mean and standard deviation, and the student's t-test was used to compare them. The probability was considered statistically significant if it was less than 0.05. With a 95% confidence level, 180 participants were found to be the sample size.

RESULTS

There were a total of 180 people involved in this research. The mean age of the patients was 50.41 years. There were a total of 146 females and 34 males. The most common complaint was pain in the abdomen, which was presented to 97.2% of participants. The second most common complaint was vomiting, which was presented by 74.4% of participants. Table 1 shows the number of patients divided by type of cholecystectomy.

Table No. 1: types of cholecystectomy

Type	N	%
Simple cholecystectomy	132	73.3
Difficult cholecystectomy	39	21.6
Conversion to open cholecystectomy	9	5.1

This research shows that the level of CRP increased with the increase in difficulty of dissection. Table number 2 shows the comparison of variables in different types of cholecystectomy.

Table No. 2: comparison of variables in different types of cholecystectomy

Variables	Simple cholecystectomy	Difficult cholecystectomy	Conversion to open cholecystectomy
Mean duration of surgery (mins)	31.1	54.6	84.3
Mean CRP level (mg/L)	22.2	46.5	83.6
Mean duration of stay after surgery (days)	2.1	3.4	5.4

Table number 3 shows the levels of CRP in simple, difficult, and laparoscopic converted to open cholecystectomy.

Table No. 3: levels of CRP in simple, difficult, and laparoscopic converted to open cholecystectomy.

	CRP<22	CRP>22
Simple cholecystectomy	76	56
Difficult cholecystectomy	8	31
	CRP<46	CRP>46
Conversion to open cholecystectomy	2	7

DISCUSSION

At first, surgeons felt more comfortable operating on simpler gallbladders. But thanks to increased training and the development of cutting-edge instruments, surgeons can now successfully operate on difficult gallbladders [11]. Currently, laparoscopic cholecystectomy is without a doubt the method of choice for treating a variety of benign gallbladder diseases [12].

The goal of this study is to predict possible technical problems that might happen during a hard laparoscopic cholecystectomy by measuring CRP levels before the surgery. The goal of this study is to describe a difficult laparoscopic cholecystectomy by looking at things that happen during the surgery, such as the thickness of the gallbladder wall, adhesions, bleeding, peri-gallbladder collection, and the structure of Calot's triangle. The study also wants to see if CRP is a good way to tell ahead of time if a laparoscopic cholecystectomy will be hard and how likely it is that the procedure will have to be changed to an open one. Informing patients about the possibility of difficulties and the necessity of open surgery may also be a benefit of this strategy.

The patient can set their expectations appropriately and be emotionally ready. In addition, if the surgeon believes that the surgery would be difficult, he or she can choose to perform a typical open cholecystectomy right away, which will shorten the operating time and lower the chance of conversion. The length of the procedure is positively correlated in this study with intraoperative problems such as adhesions, peri-gallbladder collection, hemorrhage, thicker gallbladder wall, and Calot's triangle architecture.

Bansal et al. say that the longer surgery times are due to a longer learning curve, decompressing the gallbladder during surgery, and having to deal with inflammatory pericholecystic adhesions [13]. According to our study, the duration of stay following a simple cholecystectomy is 2.10 days, but the average postoperative stay following a difficult laparoscopic cholecystectomy is 3.4 days. The average length of stay following surgery is increased to 5.4 days in situations where conversion to open surgery is required. This result suggests that a longer length of stay following surgery and higher surgical difficulties are significantly correlated.

According to Mokk et al., a CRP level of 200 is the best cutoff for gangrenous gallbladder prediction [14]. Asai et al. used a cutoff value of 134 mg/L for bactobilia and found a strong link between a higher risk of bactobilia and things like being older, having higher CRP levels, and clear signs of a serious gallbladder infection [15]. Andrei et al., in contrast, came to the conclusion that CRP measurement had no bearing on how patients with acute cholecystitis are treated [16]. They recommend that individuals with more severe types of acute cholecystitis and higher CRP values should have surgery earlier than patients with milder cases and lower CRP concentrations in order to improve care quality and save costs for healthcare providers.

A preoperative CRP level of ≥ 11 mg/L was associated with the highest chances of having a difficult laparoscopic cholecystectomy (DLC), according to Díaz-Flores A et al. [17]. Overall, 7 of the 9 cases in our analysis that went from laparoscopic to open cholecystectomy had CRP values greater than 46 mg/L, suggesting a significant correlation between high CRP levels and challenging dissection. Of the 39 DLC cases, 31 had CRP values greater than 22 mg/L, indicating a strong correlation in preoperatively predicting challenging laparoscopic cholecystectomy.

Esin et al. say that C-reactive protein (CRP), a well-known acute-phase reactant that rises sharply in a number of inflammatory disorders, can be used to accurately measure how bad the disease is [18]. This classification allows for the reliable formulation of treatment programs. Schäfer et al. found that a number of parameters, including age, white blood cell count at admission, duration of symptoms, American Society of Anesthesiology grade, and CRP levels at admission, were predictive of the surgical method that was chosen, whether laparoscopic or open. According to the literature, between 2% and 11% of patients undergoing laparoscopic cholecystectomy decided to switch to open surgery [19,20].

CONCLUSION

According to the new study, CRP levels before surgery are a good way to tell if there might be problems during laparoscopic cholecystectomy or if an open surgery might be needed. Patients who have higher CRP levels prior to surgery are more likely to require conversion to open surgery and are more likely to experience intraoperative problems.

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Conflict in the interest

The authors had no conflicts related to their interest in the execution of this study.

Permission

Prior to initiating the study, approval from the ethical committee was obtained to ensure adherence to ethical standards and guidelines.

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