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Original Research Article

TO CORRELATE THE LEVEL OF CRP IN ACUTE CHOLECYSTITIS IN PREDICTING DIFFICULT LAPAROSCOPIC CHOLECYSTECTOMY AS ELECTIVE PROCEDURE

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ABSTRACT

Cholecystectomy is the surgical removal of gallbladder. It is a common treatment of symptomatic gallstones and other gall bladder conditions. It can be performed laparoscopically or by a more invasive open method. Certain biochemical tests may be helpful to surgeons in knowing the pathological condition of gall bladder before removal. C-reactive protein is one of the inflammatory marker identified as a predictor of such complications. CRP, named for its capacity to precipitate the somatic C-polysaccharide of Streptococcus pneumoniae, was the first acute-phase protein to be described and is an exquisitely sensitive systemic marker of inflammation and tissue damage. The following study is a prospective study which was conducted in the department of general surgery at Pt. B.D. Sharma PGIMS, Rohtak after approval from Hospital Ethical Committee. All patients with Acute cholecystitis and cholelithiasis admitted in a single unit of Pt. B.D Sharma PGIMS Rohtak undergoing LC during one year was included in this study. This study was conducted in the department of general surgery at Pt. B. D. Sharma PGIMS, Rohtak, Haryana on 102 patients in which a pre operative blood sample was taken and sent for CRP value. CRP level increased significantly with increased difficulty of dissection, mean CRP for simple cholecystectomy cases is 15.11 mg/dl while mean CRP for difficult cholecystectomy is 37.92mg/dl and mean CRP for laparoscopic converted to open cases is 61.8 mg/dl. Our study showed that CRP is a potent predictor of difficult laparoscopic cholecystectomy and its conversion preoperatively. According to our study patients with high CRP preoperatively have a higher chance of complication intraoperatively and high chances of conversion to open.

INTRODUCTION

Cholecystectomy is the surgical removal of gallbladder. It is a common treatment of symptomatic gallstones and other gall bladder conditions. It can be performed laparoscopically or by a more invasive open method. Laparoscopic cholecystectomy is the procedure of choice for the majority of patients with gallbladder disease because it is associated with less postoperative pain, rapid turnover of patients, early discharge, faster return to normal activity than after open cholecystectomy.[1] Some patients require open surgery and it has been a traditional marker of difficult laparoscopic cholecystectomy. Severe inflammation makes laparoscopic dissection technically more demanding, with a higher gallbladder wall perforation rate and spillage of the infected bile into the peritoneal cavity.[2] With increasing experience in laparoscopic surgery and advancement of technology many of the difficulties due to anatomical and patient factors could be dealt with laparoscopically.[3]

Certain biochemical tests may be helpful to surgeons in knowing the pathological condition of gall bladder before removal. C-reactive protein is one identified as a predictor of such complications. CRP, named for its capacity to precipitate the somatic C-polysaccharide of Streptococcus pneumoniae, was the first acute-phase protein to be described and is an exquisitely sensitive systemic marker of inflammation and tissue damage. The acute-phase response comprises the nonspecific physiological and biochemical responses of endothermic animals to most forms of tissue damage, infection, inflammation, and malignant neoplasia. In particular, the synthesis of a number of proteins is rapidly upregulated, principally in hepatocytes, under the control of cytokines originating at the site of pathology.[4]

C-reactive protein (CRP) is an acute-phase protein with a half-life of 19 h.[5] It is an acute-phase reactant synthesized and secreted by the liver, largely in response to interleukin-6 and other pro-inflammatory cytokines. CRP binds to various ligands including phospholipids exposed on bacterial surfaces, damaged and dying eukaryotic cells, and cellular nuclear debris. Once bound, CRP activates the classical complement cascade, binds Fcγ receptors and stimulates phagocytosis.[6,7]

Preoperative prediction of difficult laparoscopic cholecystectomy and the risk of conversion is of great help for both to the patient who can plan his work and the surgeon who can also schedule his time and team accordingly, anticipation of difficult laparoscopic cholecystectomy and conversion can help in consenting patient and preparing them for longer stay and complication. The Primary aim of this study was to Correlate the level of CRP in Acute Cholecystitis in predicting difficult Laparoscopic Cholecystectomy as elective procedure.

MATERIALS AND METHODS

The following study is a prospective study which was conducted in the department of general surgery at Pt. B.D. Sharma PGIMS, Rohtak after approval from Hospital Ethical Committee. All patients with Acute cholecystitis and cholelithiasis admitted in a single unit of Pt. B.D Sharma PGIMS Rohtak undergoing LC during one year was included in this study. Exclusion criteria are as follows: High BMI (>35), Proven congenital anomaly of gallbladder, Previous abdominal surgery, any conditions increasing CRP (IBD, autoimmune disease, lupus, RA, lung disease, vasculitis, recent infections etc.), Immunocompromised patients. This descriptive analysis of LC with special reference to CRP and difficult dissection in Acute Cholecystitis patients was done for a period of 1 year in the department of general surgery, Pt. B D Sharma PGIMS Rohtak, under single unit. Acute cholecystitis is defined as inflammation of the gallbladder that occurs due to occlusion of the cystic duct or impaired emptying of the gallbladder, often this impaired emptying is due to stones or biliary sludge. Difficult laparoscopic cholecystectomy is mainly defined by intra operative findings such as dense adhesion at calot's triangle, bleeding, contracted and fibrotic GB, gangrenous GB, previous upper abdominal surgery etc. which either leads to significant increase in duration of laparoscopic cholecystectomy or to conversion. Exclusion criteria were high BMI (>35), proven congenital anomaly of gallbladder, previous abdominal surgery, any conditions increasing CRP and immunocompromised patients. CRP was done for each patient.

RESULTS

This study was conducted in the department of general surgery at Pt. B. D. Sharma PGIMS, Rohtak, Haryana on 102 patients in which a pre-operative blood sample was taken and sent for CRP value. This study was prospective in nature and done over a period of one year. The following observation and results were recorded from the study:

- On comparing age with number of cases, the maximum number of cases are from 4th and 5th decade with mean age in this study is 40 years.
- Out of 102 total cases 77 cases are of female and 25 cases are of male with female to male ratio is 3.08:1.

Type of Operation

	No. of Cases	Percentage
Simple Cholecystectomy	70	68.6%
Difficult Cholecystectomy	26	25.5%
Conversion to Open	6	5.9%
Total	102	100%

Out of total 102 cases 70 cases (68.6%) are of simple cholecystectomy. Difficult cholecystectomy was found in 26/102 cases (25.5%). Our study shows conversion to open rate of 6/102 cases that is 5.9%.

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CRP level and type of operation

	Mean
Simple Cholecystectomy (N=70)	15.11
Difficult Cholecystectomy (N=26)	37.92
Conversion to Open (N=6)	61.8

CRP level increased significantly with increased difficulty of dissection, mean CRP for simple cholecystectomy cases is 15.11 mg/dl while mean CRP for difficult cholecystectomy is 37.92mg/dl and mean CRP for laparoscopic converted to open cases is 61.8 mg/dl.

Duration of Surgery (Minutes)

	Mean
Simple Cholecystectomy (N=70)	39.5
Difficult Cholecystectomy (N=26)	98.07
Conversion to Open (N=6)	110

Duration of surgery increased with increased difficulty in dissection and the relation is found to be significant. Mean duration of surgery for simple cholecystectomy is 39.5 minutes while for difficult cholecystectomy it is 98.07 minutes, highest mean duration of surgery is 110 minutes for laparoscopic converted to open cholecystectomy.

Duration of post op stay (days)

	Mean
Simple Cholecystectomy (N=70)	2.05
Difficult Cholecystectomy (N=26)	2.80
Conversion to Open (N=6)	4.83

Post-operative stay increased with increased difficulty of dissection and mean duration for simple cholecystectomy is 2.05 days while for difficult cholecystectomy it is 2.80 days and for laparoscopic converted to open it is 4.83 days which is showing significant relation.

Distribution of age according to type of operation

Age Group	Type of Operation		
	Simple Cholecystectomy (N=70)	Difficult Cholecystectomy (N=26)	Conversion to Open (N=6)
10-20	3	-	-
21-40	42	14	1
41-59	23	10	5
60 and above	2	2	-
Total	70	26	6

This table shows maximum cases from the age group 21-40 years (57/102). Maximum number of difficult laparoscopic cholecystectomy cases is also from the 21-40 years age group, but no significant association of increasing age with difficulty in our study.

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Distribution of sex according to type of operation

Gender	Type of Operation		
	Simple Cholecystectomy (N=70)	Difficult Cholecystectomy (N=26)	Conversion to Open (N=6)
Male	15	6	4
Female	55	20	2
Total	70	26	6

This table shows that there is no significant association between sex and difficult dissection intraoperatively.

CRP Level

There is a significant association of CRP levels with type of operation. 21/26 DLC cases shows CRP value greater than 23.59mg/dl, while 5/6 cases of laparoscopic converted to open shows CRP value greater than 61.8mg/dl and 49/70 cases of simple cholecystectomy shows CRP value lesser than 23.59mg/dl.

DISCUSSION

Medicine is an ever changing art and needs to be shared with the progeny. Since the advent of laparoscopy, a new beginning started in the art of surgical craft. Many innovations and technical modifications are on the way for the satisfaction of the patient and the surgeon dealing with minimal access procedures. Laparoscopic cholecystectomy has revolutionized the whole globe and does not need any special mention.

At the beginning surgeons would feel comfortable dealing with simple gall bladders but with increase in expertise and introduction of newer armamentarium, difficult gallbladders are being subsequently dealt with. As of now, laparoscopic cholecystectomy can safely be declared as the gold standard for dealing with any kind of benign gallbladder disorder. However, before going to deal with the inflamed gallbladder, the skill of the surgeon, experience in laparoscopic techniques and thorough knowledge of risk factors are collectively important for a safe outcome. Even in the present era, the laparoscopic surgeon, amidst such a substantial advance in laparoscopy, should have a low threshold for conversion to open technique in case of difficulty.

Every gall bladder is a book in itself which needs to be read time and again for a better and safe outcome because of so many anatomical variations.

However, we believe difficulty is a relative term and there are certain general principles that need to be followed before embarking on laparoscopic cholecystectomy. The aim of the operating surgeon should not only be giving the benefits of minimal access surgery but also avoiding the operative complications and lessen the post-operative morbidity.

The laparoscopic cholecystectomy is one of the common procedures performed globally so the errors are commonly reported. The beginners should start with the simple cases and the ideal patient would be the one who is not obese, with no history of previous upper abdominal surgery, without features of cholecystitis, without previous ERCP.

As the learning curve of the surgeon graphically increases, he can then deal with the difficult cases. We recommend the learning should be taken in a step ladder pattern. The patient having thick wall gallbladder, chronic cholecystitis, mucocele, inflamed calot's triangle, previous upper abdomen surgeries, mirizzi's syndrome can be managed subsequently.

'Safety saves' is a golden principle in handling any surgical or operative procedure. A good navigator knows the trick of saving himself from the tides of misfortune. The risk is a part of surgical play and cannot be avoided but dealt with meticulously. The risk factors can be called predictors of difficulty while performing the surgery.

We through our study aim to predict difficult laparoscopic cholecystectomy by calculating preoperatively C - reactive protein, to forecast the technical problems during the surgery. In our study difficult laparoscopic cholecystectomy is defined on the basis of intraoperative findings such as calot's triangle anatomy, gallbladder wall thickness, adhesions, bleeding, peri gallbladder collection.

The aim of the study is to evaluate CRP as a reliable preoperative factor to predict difficult laparoscopic cholecystectomy and its conversion. Also, it may benefit patients because they can be informed of the possibility of complications and conversion to open procedures. The patient can be mentally prepared and can adjust his or her expectations accordingly. In addition, the surgeon can directly perform the classical open cholecystectomy in the patient with presumed difficult surgery thus saving operating time and conversion rate.

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AGE

In our study (57/102) of the patients presented in 3rd and 4th decade of life that is 55.9% of total patients and the majority of difficult laparoscopic cholecystectomies (14/26) that is 53.8% are also in this age group.

Randhawa et al in 2009 in their study reported an age range from 9 to 71 years with mean age of 44.37 years. Maximum cases in this study were in the age group 30- 50 years (54.4%).[8]

Wagih G et al in 2010 in their experience of 340 laparoscopic cholecystectomies had an average age of 41.9 years.[9]

The reason of occurrence of gall stone disease in 3rd and 4th decade of life may be because this is the most active part of human life in which one engage fully in achieving his presumed plans in future life to come. So any disease during this period will get medical attention well in time.

Age is recognized as a risk factor of conversion. Comparing the age with operative difficulty, we found that difficulty level increased as the age increased but with no significant association.

Fried et al and Sanabria et al,[10,11] in their study also didn't find association with the conversion rate. This varied opinion could be attributed to surgeon's experience and expertise. Increased difficulty level may be attributed to recurrent mild attacks of cholecystitis leading to adhesions and fibrosis.

SEX

Among patient factors, the male gender has been recognized as a risk factor for a more severe disease in those with symptomatic cholelithiasis. There are also reports of male gender among the factors that determine technical difficulty in performing open or laparoscopic cholecystectomy.[12,13]

Kartal A et al in 2001 in their study find about the fibro-suppressive effects of estrogen in females on peritoneal inflammatory conditions could provide low fibrosis and scar formation around gallbladder and make laparoscopic cholecystectomy easier in women.[12]

Male is considered an independent risk factor in many series like Kama et al, Fried et al, Sanabria et al and others.[19,11,14,15]

Liu et al and Randhawa et al did not find sex to be associated with conversion or predicting difficulty while operating.[16,8]

We in our study had 27 male patients out of which 7 had difficult laparoscopic cholecystectomy and 4 patients were converted to open. There is no significant association of male gender to difficult laparoscopic cholecystectomy in our study.

DURATION OF SURGERY

In our study out of 102 patients undergoing laparoscopic cholecystectomy, simple cholecystectomy was performed in 70 patients with mean duration of surgery is 39.5 minutes. Difficult cholecystectomy was encountered in 26 patients with mean duration of surgery is 98.07 minutes and conversion to open happened in 6 laparoscopic surgeries with mean duration of surgery is 110 minutes.

In our study there is significant association of duration of surgery with difficulty encountered intraoperatively in terms of adhesions, peri GB collection, bleeding, thickened GB wall, altered anatomy of calot's triangle.

Bansal et al, reported longer duration of surgery is due to time required for removal of inflammatory pericholecystic adhesion, intra-operative gallbladder decompression and longer learning curve.[17]

Bat O. et al reported severe adhesions in calot's triangle are the most serious problem among all DLC cases. They have longer operation time and higher conversion rate.[18]

POST OPERATIVE STAY

In our study the mean postoperative stay in days for simple cholecystectomy is 2.05 days while in difficult laparoscopic cholecystectomy the mean postoperative stay is 2.8 days and in cases of conversion to open the mean postoperative stay is 4.83 days.

This result shows a significant relationship between increasing difficulty and duration of post-operative stay.

Popkharitov A et al performed a study of timing of surgery for AC. Three groups were compared, acute (72 hours), intermediate (4-7 days), and delayed (8 days) and no significant differences could be found in postoperative hospital stay between the three groups.[19]

Cao AM et al performed meta-analysis on early vs delayed laparoscopic cholecystectomy in AC and found significantly reduced total hospital stay and mean hospital costs in early surgery compared with delayed surgery.[20]

CRP

In our study of 102 cases of laparoscopic cholecystectomy 70/102 cases are simple cholecystectomy without any intraoperative difficulty (bleeding, adhesions, peri GB collection, thickened GB wall, abnormal calot's triangle) with mean CRP level is 15.11 mg/l. In 26/102 cases of difficult laparoscopic cholecystectomy (having any one intraoperative difficulty) the mean CRP was found to be 37.92 mg/l and in 6 cases out of 102 which are converted to open having mean CRP in range of 61.8 mg/l.

We noticed significant association between increasing difficulty and CRP levels in our study.

Mok et al. reported that CRP of 200 appears to be the best cut off point for predicting for gangrenous gallbladder.[21]

Asai et al reported a significant correlation between high risk bactofilin and advanced age, high levels of CRP, and the evidence of significant gall bladder infection. In their study, the cut-off value was found to be 134 mg/L for bactofilin.[22]

Andrei et al concluded that CRP measurement does not influence management of patients with AC. To improve the quality of care and to minimize health care provider costs, Fit patients with more advanced

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forms of AC and higher values of CRP should have their operation performed earlier than patients with mild AC and a lower concentration of CRP.[23]

Díaz-Flores A et al concluded that Preoperative CRP with values ≥11 mg/dL was associated with the highest odds (OR = 17.9) of presenting DLC.[24]

In our study 5/6 cases of LC converted to open had CRP value greater than 61.8mg/l showing significant association of CRP levels with difficulty in dissection. DLC had 21/26 cases having CRP greater than 23.59mg/l showing significant association in predicting DLC preoperatively.

Esin et al, concluded that CRP, a well-known acute phase reactant that increases rapidly in various inflammatory processes, can be accepted as a strong predictor in classifying grades of the disease, and treatment can be reliably planned according to this classification.[25]

In a study for AC by Schäfer et al., CRP level on admission along with American Society of Anesthesiology grade, duration of symptoms, age and WBC count on admission were found to be determinants of surgical approach-laparoscopic or open.[26]

CONVERSION

Conversion to open cholecystectomy in our study was resorted to in 6 patients (5.9%) undergoing laparoscopic cholecystectomy, which is in accordance to the literature (2% - 11%).[27,28]

In our study cases undergoing conversion has more operating time and more post-operative stay in hospital. In all the cases undergoing conversion there is association of intra operative difficulty parameters. No significant association of either sex with conversion seen.

Ishizaki Y et al in his study on LC found conversion rate to be 7.5 %.[29]

CONCLUSION

Our study showed that CRP is a potent predictor of difficult laparoscopic cholecystectomy and its conversion preoperatively. According to our study patients with high CRP preoperatively have a higher chance of complication intraoperatively and high chances of conversion to open.

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