ORIGINAL RESEARCH ARTICLE

A Prospective Study to Predict the Preoperative Risk Factors for Conversion of Laparoscopic to Open Cholecystectomy

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ABSTRACT

Introduction: It was in mid 1980's that laparoscopic cholecystectomy was introduced for symptomatic cholelithiasis. Later with few years of study, it became the gold standard for managing cases of symptomatic cholelithiasis. There have been various evidences in the literature that have shown that the incidence of conversion to open case is 2% to 22%. The aim of the present study was to evaluate the various risk factors associated with the conversion of laparoscopic cholecystectomy to open cholecystectomy.

Material and methods: The present prospective study was conducted in the department of surgery, Guru Gobind Singh Medical College, Faridkot, Punjab. The study was conducted from March 2014 to August 2015. The study included all the symptomatic patients with gall stone disease. After the surgery, patients were divided into two groups, firstly those who completed laparoscopic cholecystectomy and secondly those who were converted into open cholecystectomy. The following factors were assessed for each patient. They were age, gender, BMI, level of TLC and alkaline phosphatase. All the data was recorded in a tabulated form and analysed using SPSS software. Data was expressed as percentage of total data. Chi square test was applied as a test of significance and p value of less than 0.05 was taken as significant.

Results: There were 95 patients in Group I and 5 patients in Group II who were less than 50 years of age. There were 40 patients in Group I and 8 patients in Group II who were greater than or equal to 50 years to age. There were a total of 86 females and 13 males in laparoscopic group and 8 females and 5 males in Group II. There were a total of 6 patients with history of surgery. There were 2 patients in Group I and 6 patients in group II who had the history of upper abdominal surgery. Sensitivity amongst patients with history of upper abdominal surgery is 97.9%.

Conclusion: From this study we can conclude that parameters like age, sex, obesity, history of upper abdominal surgery, raised total leukocyte count, raised alkaline phosphatise and contracted gall bladder are risk factors and predictors for conversion to open cholecystectomy.

Keywords: Cholecystectomy, Cholelithiasis, Laparoscopic

INTRODUCTION

It was in mid 1980's that laparoscopic cholecystectomy was introduced for symptomatic cholelithiasis.[1] Later with few years of study, it became the gold standard for managing cases of symptomatic cholelithiasis.[2-6] Now a days there are more than 90% of the cholecystectomies that are performed laparoscopically and have well mentioned advantages.[7] Laparoscopic cholecystectomy offers various advantages over open cholecystectomy like short duration of hospital stay, better recovery, lesser morbidities and better recovery with less postoperative pain.[5] In order to further improve the outcome of the laparascopic cholecystectomy, single port laparoscopic cholecystectomy is converted to mini laparoscopic techniques but no new studies have been conducted to evaluate the advantages of this newer technique. But there are still certain cases that require open cholecystectomy and cannot be managed laparoscopically.[8]

There have been various evidences in the literature that have shown that the incidence of conversion to open case is 2% to 22%.[9,10] All the patients should be informed preoperatively and there should be adequate assessment of the preoperative risk factors for the estimation of the chance of conversion of a laparocopic case to an open case. Various risk factors have been identified for the conversion to open case like extensive dense adhesions that impair the visibility in calot's triangle, which is the most common reason. Other reason such as acute cholecystitis has been noted in 14% to 50% of the cases. In 12% of the cases there was a presence of contracted gall bladder that made the

grasping and dissection difficult. Gall bladder empyema and gangrenous bladder have been reported reasons in few other cases. Operative risk factors correspond to 8% and 15% of cases and these include haemorrhage, any kind of injury to bile duct.[9] Identification of these risk factors before the procedure can prevent possible conversion to open cholecystectomy and this would be beneficial for both surgeons and patients. The aim of the present study was to evaluate the various risk factors associated with the conversion of laparoscopic cholecystectomy to open cholecystectomy.

MATERIAL AND METHODS

The present prospective study was conducted in the department of surgery, Guru Gobind Singh medical college, Faridkot, Punjab. The study was conducted from March 2014 to August 2015. The study included all the symptomatic patients with gall stone disease. The study was approved by the institutional ethical committee and all the subjects were informed about the study and a written consent was obtained from all. Patients with bleeding disorder, belonging to ASA III or IV, having generalised peritonitis were excluded from the study. Patients with heart disease and gall bladder carcinoma were also excluded from the study. After the surgery, patients were divided into two groups, firstly those who completed laparoscopic cholecystectomy and secondly those who were converted into open cholecystectomy. The following factors were assessed for each patient. They were age, gender, BMI, level of TLC and alkaline phosphatase. On ultrasonography contraction of gall bladder was assessed. Each entity was given a score of 1 e.g. age more than 50 years was regarded as 1, BMI of more than 30 was also taken as 1. Stone size > 20 mm and history of upper abdominal surgery were taken as 1. A detailed medical history was obtained from each patient with complete information about the demographics.

STATISTICAL ANALYSIS

All the data was recorded in a tabulated form and analysed using SPSS software. Data was expressed as percentage of total data. Chi square test was applied as a test of significance and p value of less than 0.05 was taken as significant.

RESULTS

This prospective study involved 112 cases of laparoscopic cholecystectomy.

Table 1 shows the age distribution of patients enrolled in the study. There were 95 patients in Group I and 5 patients in Group II who were less than 50 years of age. There were 40 patients in Group I and 8 patients in Group II who were greater than or equal to 50 years to age. Sensitivity of using age less than 50 years as a risk factor for conversion was 95.9% and that for greater than 50 years was 61.5%. Conversion rate among age group less than 50 years was 5%. The positive predictive value 95% and negative predictive value was 66.6%. On applying chi square test, the p value was 0.00 showing that age has a significant influence as a risk factor for conversion to open cases.

Table 2 denotes the BMI amongst the subjects. BMI of total 112 subjects was noted. There were 91.1% (n=102) subjects with BMI less than 30 and 8.9% (n=10) with BMI greater than or equal to 30. Conversion rate in cases with BMI >30 kg/m^2 was 70% and amongst patients with BMI < 30 kg/m^2 was 5.8%.

Table 3 shows the gender distribution of the subjects. There were a total of 86 females and 13 males in laparoscopic group and 8 females and 5 males in Group II. On total there were 94 females and 12 males. On applying chi

Age	Prediction		Total	CHI Square	P Value
	laparoscopic	conversion			
<50	95	5	100		
>/=50	4	8	12		
total	99	13	112	39.712	0.00

Table-1: Age distribution pictogram

BMI	Frequency	Percentage
<30	102	91.1
>/=30	10	8.9
Total	112	100

Table-2: BMI amongst the subjects

Age	Prediction		Total	CHI Square	P Value
	laparoscopic	conversion			
Male	86	8	94		
Female	13	5	12		
total	99	13	112	5.466	0.035

Table-3: Gender distribution amongst the subjects

square test p value was greater than 0.05, indicating that gender has no significant affect on the conversion to open case. The negative predictive value was 27.7%. Sensitivity of gender as a preoperative risk factor was 86.8% and specificity was 38.4%. The conversion rate amongst male was 27.7% and female was 8.5%.

Table 4 shows the number of patients with history of any previous upper abdominal surgery. There were a total of 6 patients with history of surgery. There were 2 patients in Group I and 6 patients in group II who had the history of upper abdominal surgery. Sensitivity amongst patients with history of upper abdominal surgery is 97.9% and specificity is 30.7%. Positive predictive value is 91.5% and negative predictive value is 66.6%. On applying Chi square test, P value was 0.002, indicating that there is significant relationship of history of previous abdominal surgery as a risk factor in conversion to open cholecystectomy.

Table 5 shows the distribution of serum alkaline phosphatase amongst patients of both groups. There were 96 patients in Group I and 7 patients in Group II with level less than 150IU/L. There were 3 patients in Group I and 6 patients in Group II with ALP levels >/=150IU/L. On applying Chi square test, the P value was 0.00, indicating that level of serum ALP act as a significant risk factor. Sensitivity in patients with ALP >/=150IU/L in actual outcome was 96.9% and specificity was 53.8% in these patients.

Table 6 shows the TLC count amongst the patients. There were 100 (89.3%) subjects with TLC <11000 and 12 subjects (10.7%) with TLC more than 11000.

Table 7 shows the cases with contraction of gall bladder. There were 106 cases which showed no contraction of bladder and 6 cases had bladder contraction, out of these 99 belonged to Group I and 13 belonged to Group II. On applying Chi square test the p value was 0.002 showing that preoperative prediction of contracted gall bladder as a risk factor.

DISCUSSION

Since 1987, when Philipe Mouret first performed the 1st laparoscopic cholecystectomy[11], it has been widely performed throughout the world. It is believed that around 80% of cholecystectomy is performed through laparoscopy in the west which is not the case in developing countries due to factors like cost, non availability of equipment, poor health infrastructure, etc. Nonetheless laparoscopic cholecystectomy has become the gold standard for treatment of symptomatic gall stone disease.[12] A large number of studies[13,14] have reported the conversion rate of laproscopic cholecystectomy to open cholecystectomy at 2 to 15%. Conversion to open cholecystectomy is not a setback to the surgeon but is considered a wise decision on the part of the operating surgeon. The risk of conversion to open cholecystectomy is related to various risk factors like the surgeon factor, equipment failure and more importantly patient's factors. A large number

History	Prediction		Total	CHI Square	P Value
	laparoscopic	conversion			
Yes	97	9	106		
No	2	4	6		
total	99	13	112	18.732	0.002

Table-4: History of previous abdominal surgery

ALP	Prediction		Total	CHI Square	P Value
	laparoscopic	conversion			
<150IU/L	96	7	103		
>/= 150 IU/L	3	6	9		
total	99	13	112	39.712	0.000

Table-5: level of serum alkaline phosphatase

TLC	Frequency	Percentage
<11000	100	89.3
>/=11000	12	10.7
Total	112	100

Table-6: Total leukocyte count amongst the subjects

Contraction	Prediction		Total	CHI Square	P Value
	laparoscopic	conversion			
Yes	2	4	6		
No	97	9	106		
Total	99	13	112	18.732	0.002

Table-7: Contraction of gall bladder

of clinical studies have reported patient's risk factors like age, sex, BMI and previous abdominal surgery. Ultrasound findings like contracted gall bladder, large single stone, gall bladder thickness and peri cholecystic fluid collection are associated with difficult laparoscopic cholecystectomy.[15] Haematological parameter like raised total leukocytes count and serum alkaline phosphatase are reported as risk factors for difficult laparoscopic cholecystectomy.[13,14]

In this study we had 112 cases, which had undergone elective laparoscopic cholecystectomy from 1st march 2014 to 31st august 2015. The study was conducted in the department of surgery, Guru Gobind Singh Medical College, Faridkot, Punjab. The operating surgeons were same throughout the study and each surgeon had the experience of more than 25 cases laparoscopic cholecystectomy. Variables were studied to find out the association of risk factors for difficult laparoscopic cholecystectomy or conversion to open cholecystectomy. Many studies have reported age as a risk factor for conversion. Some of these studies found age above 50 years, 60 years and 65 years as a risk factor for conversion. However in this study age above 50 years was a significant factor for conversion of laparoscopic to open cholecystectomy. The reasons were perhaps due to longer history of gallstones disease, increasing number of attack of cholecystitis[16] or due to increase co morbidities in older age group.[13] Various studies[17,18] have found male gender as a risk factor for conversion with probable reasons being due to more frequent association with severe diseases i.e. both acute and chronic cholecystitis and due to higher percentage of intra-abdominal and visceral adipose tissue than women. Men are also less likely to seek medical attention than women. In contrast other authors[19] did not find any significant relation between conversion and male gender, but in this study male gender was a significant factor for conversion of Laparoscopic to open cholecystectomy. Many studies[16,20] have found morbid obesity to be associated with increased risk of conversion. Various body mass index(BMI) level like BMI>27, BMI>30 and BMI>35 were studied. On the other hand, some studies found no such association. In this study BMI>30kg/m^2 was found to be associated with higher risk of conversion of laparoscopic cholecystectomy to open cholecystectomy. Obesity gives rise to technical difficulty in accessing the abdominal cavity due to thick abdominal wall, canula displacement, fat laden omentum and Falciform ligament and a heavy liver which is difficult to elevate.

A number of studies had reported previous upper abdominal surgery as a risk factor for conversion while some studies found no such association. However, in this study previous upper abdominal surgery was associated with higher rate of conversion. Post-operative adhesions pose a problem in creating pneumoperitoneum and also adhesiolysis is often needed to visualise the gall bladder. Many studies have shown raised total leucocytes (TLC) is a risk factor for predicting conversion. Various levels of TLC such as above 9,000/cumm, 10,000/cumm and 11,000/cumm had been studied. This can be attributed to persisting acute inflammation with oedema of the gall bladder making surgery difficult. Moreover, patient with raised TLC in cases of acute cholecystitis are likely to have a complicated gall bladder. In this study TLC > 11,000/cumm was a significant risk factor for conversion of laparoscopic to open cholecystectomy. Rattner et al in their study found that raised serum alkaline phosphatase (ALP) was a risk factor for difficult laparoscopic cholecystectomy. Similarly, other studies show that raised ALP reflects the severity of inflammation of the gall bladder and had identified it as a risk factor for conversion. [21-24]

CONCLUSION

The ability to preoperatively predict which cases of laparoscopic cholescystectomy will be difficult or undergo open treatment can prepare the surgeon for a longer duration of surgery and also the patient could be fore warned. From this study we can conclude that parameters like age, sex, obesity, history of upper abdominal surgery, raised total leukocyte count, raised alkaline phosphatise and contracted gall bladder are risk factors and predictors for conversion to open cholecystectomy.

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