Original Article

Factors influencing the outcome of laparoscopic cholecystectomy at Hospital Tuanku Ja'afar Seremban, Malaysia.

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Objectives: To identify pre-operative factors that predisposes to conversion of laparoscopic cholecystectomy.

Methodology: Patients with symptomatic cholelithiasis from a tertiary hospital were selected for this cross-sectional study. The patient data was obtained from the hospital online database. Patients aged ? 18 years with clinical diagnosis of symptomatic cholelithiasis who underwent laparoscopic cholecystectomy from January 2013 to December 2014 were included in the study. Those who underwent planned open cholecystectomy, patients with gallbladder polyps, acalculous cholecystitis and history of previous laparotomy were excluded from the study. Data were analyzed using chi-square test, Fisher's exact test and logistic regression.

Results: Two hundred patients fulfilled the inclusion criteria. Conversion to open cholecystectomy was seen in 28 patients (14%). Patients with acute cholecystitis were 3.4 times more likely and males were 2.5 times more likely to undergo conversion. The likelihood of conversion increased by 0.9 times for each year of increase in age. Patients with diabetes mellitus were 3.8 times more likely to undergo conversion. Hypertension was also a significant factor contributing to a conversion. After a logistic regression analysis, only three factors remained statistically independently significant: diabetes mellitus (95% CI: 0.1 to 0.6), acute cholecystitis (95% CI: 0.1 to 0.7) and male gender (95%CI: 0.7 to 0.9).

Conclusions: Decision to convert laparoscopic cholecystectomy to open should be taken earlier in a male patient with diabetes mellitus, acute cholecystitis and advancing age. (Rawal Med J 201;42:541-545)

Keywords: Cholelithiasis, laparoscopic cholecystectomy, conversion to an open surgical procedure, acute cholecystitis

INTRODUCTION

Laparoscopic cholecystectomy (LC) is now the most sought treatment for symptomatic cholelithiasis.[1] Even in Malaysia, this is the gold standard treatment for symptomatic cholelithiasis.[2,3] The standard surgical technique for LC in this hospital is done using four ports and the introduction of the infra-umbilical port is done by Hassan's technique.[4] LC is superior than open cholecystectomy in terms of rapid recovery, less post-operative pain and early ambulation.[5] Despite these findings, it has been proven that there is a possibility of conversion, in 1.5%-19% of patients.[6-7] In Malaysia, studies conducted showed that conversion rate was 15% to 16%.[2,8] Patients who underwent conversion had higher incidence of post-operative complications and longer hospital stays when compared to patients who had undergone either laparoscopic or open cholecystectomy alone.[8] Understanding that conversion of LC is a viable possibility and also detrimental to the patient, it is important to determine the risk factors that could result in conversion. Various studies have evaluated the correlation between certain risk factors to conversion. A study in 2009 concluded that age, acute cholecystitis and choledocholithiasis independently predicted conversion.[9] Another study in 2011 reported that age over 60 years, diabetes, previous supramesocolic abdominal surgery, ultrasound signs of cholecystitis, white cell count over $9x10^3$/dl, previous acute myocardial infarction and preoperative endoscopic retrograde cholangio-pancreatography (ERCP), intraoperative adhesiolysis were significantly associated with conversion.[10] The aim of this study was to identify pre-operative factors that predisposes to conversion of LC.

METHODOLOGY

All consecutive adult patients (age ? 18 years) with clinical diagnosis of symptomatic cholelithiasis[11] who have undergone LC from January 2013 to December 2014 were included in this cross-sectional study. The patients' data were obtained from the records from operative notes, patients' case files and the online patient database. Patients who underwent planned open cholecystectomy, patients with gallbladder polyps, acalculous cholecystitis and history of previous laparotomy were excluded from this study.[12] The study has been approved by hospital Ethics Committee.

The collected data was analyzed using chi-square test, Fisher's exact test and logistic regression. Chi-square test, and Fisher's exact test were used to find out the significant factors for conversion of LC. From the significant factors identified, logistic regression was used to determine their level of significance. The patients were evaluated for the following risk factors: age, sex, ethnicity, presence of symptoms of acute cholecystitis, biliary colic and its duration, clinical presentation of choledocolethiasis, Investigations, such as frequency of ERCP, patient comorbidities, total leukocyte pre-op, duration of operation and need for conversion. Measurement for quantitative data like age, it was divided into two age groups, more or equal to 50 years old and less or equal to 49 years old. Preoperative leukocyte count was using standard SI unit ($x10^9$/L), preoperative leukocyte counts that were lower than 11.0 $x10^9$/L were taken as normal and those that higher than 11.0 $x10^9$/L were taken as high. Duration of operation was recorded by hours and was categorized into operation less than one hour, operation lasted for one to three hours, operation more than three hours.

RESULTS

A total of 200 patients underwent an attempted LC. There were 63 male patients and 137 female patients. In terms of ethnicity, there were 122 Malay patients, 34 Chinese patients, 37 Indian patients, three patients from other Malaysian ethnic group and four foreigner patients. There were 103 patients with age more or equal to 50 and 97 patients with age less or equal to 49 years old. The mean age for the patients was 48.25, median is 50 and mode is 54. There were 45 patients with diabetes mellitus and 155 patients without diabetes mellitus. There were 75 patients with hypertension and 125 patients without hypertension. There were 33 patients with dyslipidemia and 167 patients without dyslipidemia. There were 79 patients has acute cholecystitis and 121 patients with no acute cholecystitis (Table 1). Of these, conversion to open cholecystectomy was in 28 patients (14%).

Age of patient, gender, acute cholecystitis, diabetes mellitus and hypertension were a significant factor for conversion of LC (Table 2). According to the Chi-square test and Fisher exact test, the significance values of the following factors; ethnicity, presence of biliary colic, duration of biliary colic, presence of choledocholithiasis, frequency of ERCPs done, presence of dyslipidemia, preoperative leukocyte count and duration of operation were more than 0.05, hence these factors are not significant (Table 2).

Table 1. Demographic features of the patients.

Variable	Number	Percentage
Gender		
Male	63	31.5
Female	137	68.5
Ethnicity		
Malay	122	61.0
Chinese	34	17.
Indian	37	18.5
Other Malaysian ethnicity	3	1.5
Foreigners	4	2.0
Age		
More or equal to 50	103	50.5
Less or equal to 49	97	49.5
Diabetes Mellitus		
Yes	45	29.0
No	155	71.0
Hypertension		
Yes	75	37.5
No	125	62.5
Dyslipidemia		
Yes	33	19.8
No	167	80.2
Acute Cholecystitis		
Yes	79	39.5
No	121	60.5

Table 2. P values for risk factors.

Variable	Converted	Not Converted	P-value
Sex			
Male	14	49	**0.023**
Female	14	123	
Ethnicity			
Malay	14	108	0.198
Chinese	7	27	0.275
Indian	7	30	0.339
Other Malaysian ethnicity	0	3	1.000
Foreigners	0	4	1.000
Age			
More or equal to 50	20	83	**0.023**
Less or equal to 49	8	89	
Diabetes Mellitus			
Yes	13	32	**0.001**
No	15	140	
Hypertension			
Yes	16	59	**0.021**
No	12	113	
Dyslipidemia			
Yes	6	27	0.421
No	22	145	
Acute Cholecystitis			
Yes	18	61	**0.004**
No	10	111	
Biliary Colic			
Yes	20	109	0.409
No	8	63	
Duration of Biliary Colic			
Less than six months	16	118	0.140
Six months to one year	11	39	
More than one year	1	15	
Choledocholethiasis			
Yes	6	36	0.952
No	22	136	
Frequency of ERCP Done			
No	20	120	0.329
Once	3	34	
More than once	5	18	
Preoperative Leukocyte Count			
High	6	33	0.638
Normal	17	119	
Duration of Operation			
Less than one hour	1	20	0.320
One to three hours	22	139	0.781
More than three hours	5	13	0.144
Total	28	172	

Table 3. Odd Ratios for the three independently significant factors.

	Odd Ratio	Confidence interval	Logistic regression p-values	Logistic regression confidence interval
Male	2.5	1.1 – 5.6	0.031	0.2 – 0.9
Presence of acute cholecystitis	3.3	1.4 – 7.5	0.005	0.1 – 0.7
Diabetes mellitus	3.8	1.6 - 8.7	0.003	0.1 – 0.6

On Logistic Regression analysis, when five factors that were statistically significant to conversion in univariate analysis, only three remained statistically independently significant: diabetes mellitus (95% CI: 0.1 to 0.6), acute cholecystitis (95% CI: 0.1 to 0.7) and male gender (95%CI: 0.7 to 0.9) (Table 3).

DISCUSSION

Age, gender, presence of acute cholecystitis, underlying diabetes mellitus and hypertension had significant relationship with the conversion of LC. Among these significant factors, male gender, diabetes mellitus and the presence of acute cholecystitis were the most statistically independent factors that significantly contributed to conversion.

As with hypertension, diabetes also has some positive correlation with difficulties encountered in LC. In diabetic patients, there may be several attacks of sub-acute inflammation causing more scarring and making LC more difficult.[13,14] Few studies have found diabetes as a predictor of difficult laparoscopic cholecystectomy.[15,16] Study done by Samer in 2002 did not find any increased risk of conversion in diabetic patients.[17] However, our current study showed that both hypertension and diabetes mellitus were associated with an increased risk of conversion.

Several other papers reported that advanced age was associated with the need to convert.[1-3] Elderly patients are more likely to have a longer history of gallbladder disease with more episodes of acute attacks causing fibrotic adhesions. Our results were similar to those of Sakpal in 2010, which stated that age above 50 years was linked with a higher rate of conversion.[18]

In some studies, male gender was not an independent predictor of conversion to open

cholecystectomy.[19] In our study, for no specific reasons male gender was found to be a statistically significant predictor to a LC conversion and these findings agreed with the results of a study that was done by Sakpal in 2010.[18]

There were limitations that were encountered during the research. All the surgeons in the study were trained upper GI surgeons with adequate expertise in laparoscopic procedures. However, we did not look at the surgeon factor in our study. This may be an important factor affecting the conversion rate observed in our patients. Secondly, BMI, an important factor that has been listed in various studies as a major risk factor for conversion, was not analyzed since the BMI of the patient was not recorded in the patient online database.

Hence, by statistically examining these risk factors, a clearer understanding can be made to avoid conversion. In addition, a basic check-list can also possibly be formulated that could suggest whether a patient would be more suited for a laparoscopic or open cholecystectomy. Assessment of the risk factors would allow surgeons to anticipate conversions earlier during operation, which would reduce the operative time and post-operative complications. Surgeons can also inform high risk patients of their predisposition to conversion.

CONCLUSION

Prediction of a difficult LC and of conversion to open cholecystectomy may be helpful. Patients with a high predicted risk of conversion could be operated on either by or under the supervision of a more experienced surgeon. Also, a high predicted risk of conversion may allow the surgeon to take an early decision to convert to open cholecystectomy when difficulty is encountered during dissection; this may shorten the duration of surgery and decrease the associated morbidity. Decision to convert LC to open should be taken earlier in a male patient with diabetes mellitus, acute cholecystitis and advancing age.

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