

Preoperative Factors Leading to Conversion to open Procedure in Laparoscopic Cholecystectomy

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ABSTRACT

Objectives: To identify and assess the role of factors for conversion of laparoscopic to open cholecystectomy.

Study Design: Cross sectional comparative study

Place and Duration: District Headquarters Hospital, Rawalpindi and Holy Family Hospital, Rawalpindi from January 2011 to December 2012.

Material and Method: 240 patients were included in the study. The variables studied were age, sex, obesity, diabetes, hypertension, previous attacks of acute cholecystitis and pancreatitis, biliary colics, history of jaundice, pain, fever, a high leukocyte count and ultrasound evidence of cholecystitis. Analysis of different parameters, including patient related, intra-operative factors and surgeon related were performed and test for significance applied when indicated.

Results: Thirty two (13.3%) operations were converted. Factors significantly associated with conversion were male gender, Pain in last 3 months, multiple calculi, gall bladder wall and WBC count.

Conclusion: Preoperative evaluation of such factors in patients due for laparoscopic cholecystectomy may help predict difficulties for the procedure, allow patients to be better informed about possible conversion or even elective choice to open procedure.

Key words: Conversion, Preoperative risk factors for laparoscopic cholecystectomy.

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Introduction

It is now established beyond dispute that laparoscopic cholecystectomy can be safely performed in the majority of acute cholecystitis cases, and when uneventfully completed, the advantages over open cholecystectomy are maintained.¹ Laparoscopic cholecystectomy is regarded as the gold standard treatment for gallstones. Conversion to open cholecystectomy is still common, and preoperative factors to predict conversion are useful in clinical practice.² Laparoscopic cholecystectomy has many advantages over the open technique such as reduced postoperative pain and complications, short hospital stay and better cosmetic results.³ Though with an increased incidence of iatrogenic injuries to the biliary tract and a long learning curve, conversion should not be regarded as a complication rather a prudent choice⁴, but it increases operating time, postoperative morbidity and hospital costs, with significantly longer hospital stays, greater pain, and delays in returning to work.^{5,6} Identifying risk factors for conversion helps

surgeon to plan and counsel the patient and sometimes allows being ready to opt for the open technique even without first attempting the Laparoscopic cholecystectomy. In this way, predictors can be used so that laparoscopy may be avoided altogether, thereby avoiding the conversion and its negative consequences.¹ This identification of factors is not always possible and technical difficulties like bleeding, iatrogenic injuries to biliary tract or adjacent organs, intolerance to pneumoperitoneum may arise in the course of any laparoscopic procedure, even in apparently simplest case, where conversion is the only possible solution. However there are several potential risk factors for conversion which can be evaluated preoperatively, both with clinical and investigative results. Relative importance of one or the other as a predictive factor for conversion remains conflicting in a number of studies². An understanding of these issues will facilitate surgical planning, discussions regarding consent and the avoidance of unnecessary conversions.³ This study was designed to assess a number of factors that may contribute in conversion of laparoscopic to

open cholecystectomy perioperatively in patients subjected to laparoscopic cholecystectomy in order to identify factors in our population.

Materials and Methods

This descriptive study was conducted at District Headquarters Hospital, Rawalpindi and Holy Family Hospital, Rawalpindi, the two teaching hospitals of Rawalpindi Medical College, during the two year period starting from January 2011 to December 2012. Informed consent was obtained from all patients after the nature of the procedure and the possibility of the need for conversion from the laparoscopic approach to an open cholecystectomy was explained. A routine history was taken from all patients presenting for treatment of symptomatic gallbladder disease and all underwent a physical examination, laboratory testing, and ultrasonographic examination of the abdomen. All the patients diagnosed on clinical and investigative data as cholelithiasis were included in the study and patients with evidence of solid mass in the gall bladder or suspicion of gall bladder or hepatic malignancy, history of jaundice and choledocholithiasis or with acute presentation were excluded from the study. Total 240 patients were included in the study through non-probability convenience sampling. Record of laparoscopic cholecystectomies for symptomatic cholelithiasis was maintained on a Proforma indicating demographic, clinical and investigating data. The variables examined included age, sex, obesity, hypertension, diabetes, chronic hepatitis, previous attacks of pancreatitis, biliary colics, previous ERCP, previous upper or lower abdominal surgery, nature and time of onset of acute pain, fever, white cell count and ultrasound signs of cholecystitis. Per-operatively, the formation of phlegmon in RHC and the nature of adhesion, adhesiolysis and the duration to identify anatomy at the Calot triangle were included. The cause of conversion was noted and relevant factors like duration of surgery, attempts at adhesiolysis and the experience of operating surgeon was recorded. All the Surgeons were considered experienced after their 50 laparoscopic cholecystectomies. All patients had surgery performed under general anesthesia. Open cholecystectomy was performed through a transverse upper abdominal incision. Laparoscopic cholecystectomy was carried out using a four port technique and creation of pneumoperitoneum by Hassan's open technique or with the use Veress needle as the surgeon's preference. Adhesions of gall bladder were separated by blunt and sharp only. Distended gall bladder (especially mucocele and empyema) were decompressed by suction and aspiration, cystic duct and artery skeletonized, clipped and divided. Drains were kept selectively in difficult cases with the risk of postoperative bleeding or biliary leakage. Prophylactic

antibiotic, 1gm cefotaxime I/V was used for 24 hours (total 3 I/V doses).

Statistical analysis

The data had been analyzed using SPSS version 17. Descriptive statistics were used to describe the results. Study variables were compared between converted and non-converted patients using Chi square test. P-value < 0.05 was considered as significant.

Results

Laparoscopic cholecystectomy was performed on 240 patients over the 2 years period, 82 (34.2%) males and 158 (65.8%) females with male to female ratio of 1:1.93, and a mean of 46 years (SD = 7.21). During the study period, 32 (13.3%) conversion were made. Conversion was significantly higher in males as compared to females ($p < 0.001$). Pain in right hypochondrium in last 3 months, multiple calculi, thick walled gall bladder and raised white cell count were also significantly associated with conversion. (Table-II)

Table I: Demographic details of both the groups

Variables	Not Converted (n = 208)	Converted (n=32)	p-value
Gender			
Male	61 (29.3%)	21(65.6%)	< 0.001**
Female	147 (70.7%)	11(34.4%)	
Age			
16-30	15 (7.2%)	0 (0%)	0.145 ^{NS}
31-40	58 (27.9%)	5 (15.6%)	
41-50	45 (21.6%)	11 (34.4%)	
51-60	55 (26.4%)	12 (37.5%)	
61-82	34 (16.3%)	5 (15.6%)	

** = Highly significant

* = Significant

NS = Insignificant

Major reason for conversion was adhesions (41%) followed by fibrosed gall bladder (22%) and surgeon experience (19%). (Figure-1)

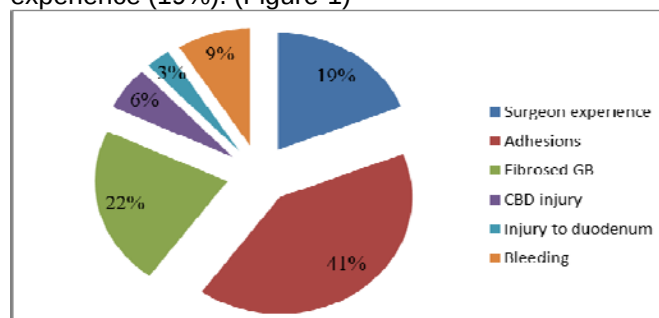


Figure-1: Description of reasons for conversion

The reasons for conversion is shown in table.3, include lack of visualization of Calot's triangle due to adhesions, iatrogenic injury to duodenum and common bile duct (CBD), phlegmon of the gall bladder and uncontrollable

bleeding. Bile leak in two patients was treated expectantly, CBD injury was recognized during surgery in 1 patient and was converted to open procedure and managed by T-tube placement and in one patient injury to duodenum was repaired with primary closure.

Table II: Clinical variables, laboratory and ultrasound findings

Variables	Not Converted (n = 208)	Converted (n=32)	p-value
BMI 25-30kg/m ²	62 (29.8%)	10 (31.2%)	0.868 ^{NS}
Pain in last 3 months	20 (9.6%)	7 (21.9%)	0.041*
H/O pancreatitis	19 (9.1%)	4 (12.5%)	0.547 ^{NS}
H/O Lower abdomen surgery	18 (8.6%)	0 (0%)	0.084 ^{NS}
Multiple calculi	154 (74%)	16 (50%)	0.005*
GB wall (>3mm)	3 (1.4%)	26 (81.2%)	< 0.001**
WBC >11000cmm	15 (7.2%)	22 (68.8%)	< 0.001**

** = Highly significant

* = Significant

NS = Insignificant

Table III: Operative reasons for conversion

Variable	Total n=240	Male	Female
Surgeon experience	6(2.5%)	4(1.66%)	2(0.83%)
Adhesions	13(5.4%)	7(2.92%)	6(2.5%)
Fibrosed GB	7(2.92%)	7(2.92%)	0
CBD injury	2(0.83%)	1(0.415%)	1(0.415%)
Injury to duodenum	1(0.415%)	0	1(0.415%)
Bleeding	3(1.25%)	2(0.83%)	1(0.415%)
Total conversion	32(13.33%)	21(8.75%)	11(4.58%)

Discussion

Laparoscopic cholecystectomy may not be completed and it may be necessary to convert to open technique due to a number of factors which may range from age, gender, history of pain in right hypochondrium (RHC), fever, jaundice, pancreatitis, endoscopic retrograde cholangiopancreatography (ERCP), previous upper or lower abdominal surgery, co morbidities like diabetes, hypertension, pulmonary or renal disease, preoperative investigative findings like elevated total leukocyte count (TLC), deranged liver functions, ultrasonographic (U/S) findings such as thickened gall bladder wall, empyema, or the presence of peri-cholecystic fluid, choledocholithiasis and finally the operative findings and iatrogenic injuries to various organs. These various factors are essentially the same as those that increase the complexity of conventional open cholecystectomy.⁷

Conversion during laparoscopic cholecystectomy has adverse effects on operative time, postoperative morbidity and hospital costs. Identifying risk factors for conversion helps surgeons to plan and counsel the patient and arranging operating schedules accordingly⁸. It is now beyond dispute that laparoscopic cholecystectomy can be safely performed in the majority of acute cholecystitis cases, and when uneventfully completed, the advantages over open cholecystectomy are maintained. However, in about 20% to 30% of the cases, because of the inflammatory process, the procedure may be complicated and unsafe, demanding conversion¹. Under these circumstances, this inefficient, uneconomic, and sometimes time-consuming mishap proves to be inferior to the traditional open approach¹. Different scoring factors are devised in an attempt to predict the possibility of conversion preoperatively with varying success, however there is no accepted scoring system available to predict difficulty and the degree of difficulty⁹ but the factors like BMI > 27.5, previous hospitalization, palpable gall bladder and thick-walled gall bladder on ultrasound are found of statistical significance in predicting difficult laparoscopic cholecystectomy.⁹

Laparoscopic cholecystectomy was performed on 240 patients over the 2 year period, 82 (34.2%) males and 158 (65.8%) females with male to female ratio of 1:1.93, and mean age 46years, and 32(13.3%) conversion, with a significant male preponderance (65.6% compared with females 34.4%) was performed. M:F ratio of 1.4 is reported by Rafique M et al¹⁰ and Gabriel R². M Shamim¹¹ reported mean age of 41.25 years, 12.76% male patients and a conversion of 72(6.3%) cases with a conversion required significantly higher in male patients (16.45% compared with 5.09% in females), whereas conversion rate of only 0.65% is described in the study by Rafique et al which is probably due to highly experienced surgeons (> 300 laparoscopic surgeries performed by each surgeon in the study) or to some selection criteria or the large number of patients(n.1224), while Gabriel R² gives a rate of 26.1% (61conversions) in a series of 234 patients, with no significant male dominance, the reason for higher conversion rate being quoted to be learning phase of the surgeons. In this study a significantly higher rate of conversion was noted in male patients (p<0.001) as well as thick walled gall bladder (>3mm on U/S), TLC of > 11000/mm², multiple calculi, and pain in RHC in last three months. The male predominance for conversion was reported by Shamim et al¹¹ and Ghulam Shabbir¹², and others^{7,13,14}, and not by some others^{1,5,9,15,16}, where sex did not prove significant for conversion in these studies, however the male gender(p=0.02) was the only independent predictor of prolonged postoperative stay.¹⁶ In many studies, male sex had a significant association with conversion, the

reason being not clear, may be male patients tend to seek medical care only after repeated painful episodes compared with women⁸. The factors significantly associated with conversion included age over 55 years, diabetes mellitus, ultrasound signs of cholecystitis, a white cell count of over 9000/mm³, and intraoperative adhesions by Changiz Gholipour et al¹⁵, Gurkan Y et al¹⁷ and including in addition preoperative ERCP by Raffael Costantini et al⁸. Though all these factors are not contraindication to the laparoscopic cholecystectomy approach, their systematic evaluation preoperatively in patients may help predict the difficulty of the procedure, allow patient to be better informed about possible conversion, and optimize the planning of interventions, especially regarding the selection of the most experienced surgeon for cases at risk.^{18,19} In our study, major reason for conversion was lack of visualization of Calot's triangle due to adhesions (41%) followed by fibrosed gall bladder (22%) and surgeon experience (19%). Bile leak in two patients was treated expectantly, Common bile duct injury was recognized during surgery in 1 patient and was converted to open procedure and managed by T-tube placement and in one patient injury to duodenum was repaired with primary closure. Similar reasons and other rare reasons reported for conversion include wide cystic duct, bilioenteric fistula, dense adhesions between gall bladder and bowel, Mirizzi's syndrome, spillage of stones and equipment failure.^{10,11,12,16} Surgeon experience has been categorized as a reason for conversion and it is variously calibrated as an experience of number of laparoscopic cholecystectomies ranging from 20², 50^{10,15}, 200^{1,20} to more than 300¹⁰ or series of cases operated by a single surgeon^{16,21}, so obviously the results regarding conversion are variable in all these studies as laparoscopic cholecystectomy at most hospitals is generally a collective experience of a team of surgeons²⁰. Surgeon's experience does influence the rate of conversion to open cholecystectomy¹⁶ but paradoxically experienced surgeons may have increased conversion rates as they operate on complex cases²². Actually all such predicting factors are related to acute presentation of gall bladder disease.³

We excluded altogether the cases of previous operation in the supramesocolic space, however the literature reveals higher incidence of conversion in such case. Numerous studies show that the presence of adhesions in supramesocolic areas is associated with conversion.²³

The clinical factors like pain and fever at admission were not significant regarding conversion, which is due to a number of factors such reporting of symptoms by the patients, their threshold for pain and other pathologies mimicking the symptoms. Likewise the timing of laparoscopic cholecystectomy as before or after 72 hours of admission is not significant. Instead, Peng et

al²⁴ reported higher conversion rate if operated 48 hours after the start of the symptomatology, while the Pezzolla et al²⁵ recommend intervention within 72-96 hours to reduce the risk of conversion. Fever per se is reported to be associated with conversion significantly.^{26,27} All the cases admitted through emergency or with acute presentation and fever were excluded from our study, so that we may have a reasonable control of preoperative study factors, while the peroperative factors have various other influencing imperatives already discussed.

Obesity seems to be an important factor associated with conversion in some studies^{18,28} but paradoxically, the obesity is one important indication for laparoscopy.⁸ However, with increase in experience and improvement in surgical apparatus conversion is reduced in obese patients. In present study, obesity (BMI >25) did not prove significant for conversion. In study by Raffaele Costantini et al⁸ obesity was not a risk factor for conversion. The age was not deciding factor for conversion in our study as well, though it is thought that elderly patients often tend to seek medical advice long after the start of the disease, when complications have already occurred. Many studies have shown that age is not a risk factor for conversion.⁸ Many researchers in laparoscopic cholecystectomy have elaborated a system of scoring grades⁹ and a way of analysis using advanced statistics and artificial neural network (ANNs)^{1,15}, and have included a huge number of variables based on clinical, investigative and operative parameters. An artificial neural networks based model provides a practical tool for the prediction of successful laparoscopic cholecystectomies and their conversion. The ANNs are computer programs that can be used to discover complex relations within data sets. They permit the recognition of patterns in complex biological data sets that cannot be detected by other means. The ANNs perform, in addition, multiple nonlinear transformations, using their many parallel components; they constitute a model of computation that is stronger than the conventional statistical computation models. The high degree of certainty of prediction with such tools reveals its potential, and justifies, under appropriate conditions, the complete avoidance of laparoscopy and turning directly to open cholecystectomy¹. But because of logistics and technical supports, such data collection and processing may not be possible in our teaching set ups and most of the studies in subcontinent are descriptive in nature, relying on evident characteristics of the study material. It is hoped that better tools of statistics and computer skills may be used in future attempts to understand and better define the problem and its predictive outcome.

Conclusion

This study identifies predictive factors, such as male patient, high WBC count, and recurrent attacks of cholecystitis, for open conversion in patients due for laparoscopic cholecystectomy which can help surgeons select in time management of their operation lists, with a choice to perform open cholecystectomy electively rather than forced conversion after laparoscopic attempt and avoid complications and risk of iatrogenic injuries in our set up.

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