

Determinants for Predicting the Conversion of Laparoscopic Cholecystectomy to Open Cholecystectomy - A Prospective Study

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ABSTRACT

BACKGROUND

Laparoscopic surgery is a kind of minimal access surgery that obviates various complications which are encountered during open method, but the outcome of procedure varies according to condition of the patient. Knowledge of these factors may be used for the preoperative counselling of the patients regarding the successful outcome of the surgery as well as to herald the risk of conversion before undertaking patients. We wanted to evaluate the various preoperative factors for conversion of laparoscopic cholecystectomy to open cholecystectomy.

METHODS

A total of 100 patients of both sexes, from all age groups and socio-economic status was included in the study. All routine investigations and USG (Ultrasonography) were done. Risk factors assessed were age, sex, abdominal tenderness, gall bladder wall thickness, any history of para-umbilical surgery. Clinical evaluation was done for each included patient and score was given according to their signs and symptoms. Patients were categorised subsequently into mild (group 1 & 2), moderate (group 3 & 4) and severe (group 5) difficulty as per scoring method.

RESULTS

The mean age was 46.21 ± 13.36 , ranging between 20 years to 80 years (95 % CI 43.56 to 48.86) with 89 females and 11 males. Among the converted group, 3 (18.75 %) participants were > 60 years of age and 2 (2.38 %) participants were of age < 60 years. According to patient's expected level of difficulty in laparoscopic cholecystectomy and according to scoring system, patients were categorised as mild, moderate and severe. A total of 81 patients were categorised as mild, 17 as moderate and 2 as severe. Conversion rate is 0 % in mild difficulty group, 17.64 % in moderate difficulty group and 100 % in severe difficulty group.

CONCLUSIONS

Difficulty and conversion risk may be predicted accurately by using the scoring system. Surging scores indicated marked increase in difficulty levels intra-operatively and thus affects the conversion rates. Thus, it can be concluded that the scoring system accurately assessed the conversion rates of laparoscopic cholecystectomy preoperatively to open surgery. Higher scores indicated increase in difficulty level.

KEYWORDS

Laparoscopic Cholecystectomy, Open Cholecystectomy, Determinants

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BACKGROUND

Laparoscopic cholecystectomy is the treatment of choice for the cure of indicative cholelithiasis and is being done by most general surgeons globally.¹ It is a minimal access surgery that obviates the need for an open wound with decreased post-operative pain, less postoperative respiratory complications and wound infection.² It also results in briefing the hospital stay, better esthetics, prompting normal activity and greater patient satisfaction.³ In approximately 2 - 15 % of patient, there is non-fulfilment of proper indication for the conversion of it into open method. Various patient and procedure related factors have been implicated for this conversion like anatomical variations (difficult delineation), previous abdominal surgeries (adhesions), increased gall bladder wall thickness and previous attacks of acute cholecystitis etc.³ Knowledge of these factors may be used for the preoperative counseling of the patients regarding the successful outcome of the surgery as well as to forecast the risks during surgery preoperatively, to prepare the patient intellectually, to arrange other operating schedules accordingly and also affecting procedure economically which is a significant problem in countries like India so that needful arrangements can be made by the patients.⁴ So the focus of present study was to evaluate the various factors that assess preoperatively the switching of laparoscopic cholecystectomy to open cholecystectomy.

METHODS

This study included 100 patients of both sexes and included all age groups and socio-economic status admitted in the Department of General Surgery, Maharaja Agrasen Medical College, Agroha, Hisar, for laparoscopic cholecystectomy. Patients having carcinoma gall bladder, common bile duct stones, portal hypertension, with cardiovascular disease, end stage liver disease, coagulopathies and pregnant patients were excluded. All routine investigations were done. Ultra-sonography was done in all the patients to confirm the diagnosis. All cases of laparoscopic cholecystectomy were performed under general anaesthesia. Designed patient Performa was filled for each patient which includes all six variables and a constant and patients were divided into five groups.

Group 1	- 20 to - 11
Group 2	- 10 to - 1
Group 3	0 to 9
Group 4	10 to 19
Group 5	> 19

Grouping and Categorization According to Score

Mild Difficulty	Group 1 & 2
Moderate Difficulty	Group 3 & 4
Severe Difficulty	Group 5

Groups for Conversion Probability Categorization of Groups According to Level of Difficulty

Patients were taken for laparoscopic cholecystectomy; a detailed history and pre-operative findings were recorded.

The procedures were categorised as easy, where no anatomical variations and no adhesions present; difficult, where there is difficult delineation, dense adhesion in Calot's triangle, and adhesions after previous surgery. The specific patient Performa was filled up after taking informed consent in their own language. All the personal details of the patient, his / her history and examination was kept confidential.

Risk Factors	Variables	Coefficient
Sex	Male	11
	female	0
Abdominal tenderness	Present	9
	Absent	0
Gall bladder wall thickness	≥ 4 mm	13
	< 4 mm	0
Age	≥ 60 years	5
	< 60 years	0
Acute cholecystitis	Present	15
	Absent	0
Previous supra-umbilical surgery	Present	8
	Absent	0
Constant		- 20

Risk Factor Scoring System

Statistical Analysis

Statistical analysis was done by using student t-test and chi-square test. A p value of < 0.05 was considered as significant.

RESULTS

In the present study of total 100 patients mean age was 46.21 ± 13.36, age ranging between 20 years to 80 years (95 % CI 43.56 to 48.86) with 89 females and 11 males. Among the converted group, 3 (18.75 %) participant were > 60 years of age and 2 (2.38 %) participants were of age < 60 years. Among the intro-op findings, in difficulty present group, 1 (6.25 %) participant was > 60 years of age and 11 (13.09 %) participants were < 60 years of age. Among the intraoperative findings, in difficulty absent group, 12 (75.00 %) participants were > 60 years of age and 71 (84.52 %) participants were < 60 years of age. The difference in the proportion of age (> 60 years) group across intraoperative findings was statistically significant.

GB Wall Thickness (> 4 mm)	Total Patients	Converted (N = 5)	Difficulty Present (N = 14)	Difficulty Absent (N = 81)	Chi Square	P - Value
Yes	8	1 (12.5 %)	5 (62.5 %)	2 (25 %)	18.95	0.00
No	92	4 (4.34 %)	9 (9.78 %)	79 (85.86 %)		

Table 1. Comparison of GB Wall Thickness (> 4 mm) across Intra-Op Findings (N = 100)

Among the converted group, 1 (12.5 %) participant had GB (Gall Bladder) wall thickness > 4 mm. Among the intro-op findings in difficulty present group, 5 (62.5 %) participants had GB wall thickness > 4 mm. Among the intro-op findings in difficulty absent group, 2 (25 %) participants had GB wall thickness > 4 mm. The difference in the

proportion of GB wall thickness of > 4 mm across intra-op findings was statistically significant (p value < 0.001).

Abdominal Tenderness	Total Patients	Intra-Op Findings		
		Converted (N = 5)	Difficulty Present (N = 14)	Difficulty Absent (N = 81)
Present	35	5 (14.28 %)	12 (34.28 %)	18 (51.42 %)
Absent	65	0 (0 %)	2 (3.07 %)	63 (96.92 %)

Table 2. Comparison of Abdominal Tenderness across Intra-Op Findings (N = 100)

Among the converted group, 5 (14.28 %) participants had abdominal tenderness. Among the intro-op findings in difficulty present group, 12 (34.28 %) participants had abdominal tenderness. Among the intro-op findings in difficulty absent group, 18 (51.42 %) participant had abdominal tenderness. Among the present converted groups, 1 (20 %) participant had previous supra-umbilical surgery.

Previous Supraumbilical Surgery (PSUS)	Total Patients	Intra-Op Findings		
		Converted (N = 5)	Difficulty Present (N = 14)	Difficulty Absent (N = 81)
Present	5	0 (0 %)	1 (20 %)	4 (80 %)
Absent	95	5 (5.26)	13 (13.68 %)	77 (81.05 %)

Table 3. Comparison of Previous Supra Umbilical Surgery (PSUS) across Intra-Op Findings (N = 100)

Among the intro-operative group findings, in difficulty absent group, 4 (80 %) participants had previous supra umbilical surgery. Among the converted group, 5 (41.6 %) participants had acute cholecystitis. Among the intra-op findings, in difficulty present group, 6 (50 %) participants had acute cholecystitis. Among the intra-op findings, in difficulty absent group, 1 (8.33 %) participant had acute cholecystitis.

Group (for Conversion Probability)	Frequency	Patients with Difficulty Present	Converted	% of Converted Patients
1	69	2	0	0 %
2	12	1	0	0 %
3	10	7	1	10 %
4	7	4	2	28.5 %
5	2	0	2	100 %

Table 4. Descriptive Analysis of Groups (for Conversion Probability) in the Study Population (N = 100)

Among the various groups as per scoring system, group 1 and 2 have no conversion. In group 3 conversion occurred in 10 % patients, in group 4 conversion occurred in 28.5 % patients and in group 5 conversion rate was 100 %.

Category (According to Level of Difficulty)	Frequency	Percentages
Mild	81	81.00 %
Moderate	17	17.00 %
Severe	2	2.00 %

Table 5. Descriptive Analysis of Category (According to Level of Difficulty) in the Study Population (N = 100)

Among the study population, 81 % participants had mild, 17 % participants had moderate and 2 % participants had severe difficulty.

Scoring Difficulty	Intra-Operative Finding	No. of Patients	Difficulty Absent	Difficulty Present	Converted	Total
			Mild Difficulty	78	3	
Moderate Difficulty		No. of Patients	3	11	3	17
Severe Difficulty (Converted to Open)		No. of Patients	0	0	2	2

Table 6. Distribution of Patients in Various Groups of Difficulty and Its Correlation with Intra Operative Findings

According to patient's expected level of difficulty in laparoscopic cholecystectomy and according to scoring system, patients were categorised as mild, moderate and severe. A total of 81 patients were categorised as mild, 17 as moderate and 2 as severe. Conversion rate is 0 % in mild difficulty group, 17.64 % in moderate difficulty group and 100 % in severe difficulty group.

Parameter	Mean ± SD	Median	Minimum	Maximum	95 % C.I	
					Lower	Upper
Score of Patient	- 11.38 ± 11.61	- 17.50	- 20.00	28.00	- 13.68	- 9.08

Table 7. Descriptive Analysis of Score of Patient in the Study Population (N = 100)

The mean score of patients was - 11.38 ± 11.61 in the study population, ranging between - 20 to 28 (95 % CI - 13.68 to - 9.08).

DISCUSSION

While planning the laparoscopic surgery, it is difficult to forecast the risk of its conversion to open surgery. Our study was a prospective study that assessed the various determinants for risk of conversion of elective laparoscopic surgery. All patients admitted in the Department of General Surgery, Maharaja Agrasen Medical College, Agroha, Hisar, for laparoscopic cholecystectomy were included in present study. Kanaan et al.⁵ and Russel et al.⁶ described that the older males as one of the important determinants for switching of laparoscopic to open cholecystectomy. In our study the difference in the proportion of age (> 60 years) group and in male group across intra-operative findings was statistically significant so the results were comparable to the previous study.

Gall bladder with thick wall is related to the repeated inflammation and fibrosis that follows previous attacks of cholecystitis and thus, may reflect difficulty in delineation of the anatomy during surgery. Gabriel and Kumar⁷ showed 60 % conversion to open cholecystectomy in patients with thick

gall bladder. In our study, on multiple factor data analysis, it was found that gall bladder thickness was statistically significant determinant in prediction of difficulty in laparoscopic cholecystectomy.

Alponat et al.⁸ described previous abdominal surgery as an insignificant variable for its conversion. Abdominal surgery increases the chance of pneumo-peritoneum and during adhesiolysis, it was difficult to gain accurate access to the field of interest during operator; these problems depend largely on the site of previous surgery. In our study correlation of Previous Supra Umbilical Surgery (PSUS) with final outcome was done and we noticed that PSUS was not significant. Kama et al.³ prospectively analysed 1000 laparoscopic cholecystectomies. Higher scores resulted in significant increase in difficulty levels encountered during operation thus, increases conversion rate probabilities.

CONCLUSIONS

In the present study, various risk factors were assessed to check the difficulty levels during laparoscopic cholecystectomy: GB wall thickness > 4 mm, history of para-umbilical surgery, acute cholecystectomy were found be significantly associated with conversion to open cholecystectomy. Hence, it can be concluded that the scoring system accurately assessed the conversion rates of laparoscopic cholecystectomy preoperatively to open surgery. Higher scores indicated increase in difficulty level and also indicates the surgery to be carried out by open method.

Data sharing statement provided by the authors is available with the full text of this article at jebmh.com.

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