

## Factors influencing Complications and Conversion rates following Laparoscopic Cholecystectomy in Acute Cholecystitis

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**Background:** Laparoscopic cholecystectomy in acute cholecystitis is associated with a relatively high rate of conversion as well as complications. The aim of this study was to analyze prospectively various pre-operative and per-operative factors influencing the complications and conversion rate.

**Methods:** A total of 60 patients (45 females and 15 males) undergoing laparoscopic cholecystectomy for acute cholecystitis were studied prospectively by analyzing the data accumulated in the process of investigation and treatment. Factors associated with conversion and complications were assessed to determine their significance.

**Results:** Out of 60 patients, 10 patients (16.67%) were converted. Age > 65 years ( $p=0.005$ ), body mass index >30 kg/m<sup>2</sup> ( $p=0.01$ ), previous attack of acute cholecystitis ( $p=0.02$ ), clinically palpable lump right hypochondrium ( $p=0.001$ ), time of surgery > 48 hours from admission ( $p=0.002$ ), time of surgery > 96 hours from symptom onset ( $p=0.005$ ), short inflamed cystic duct ( $p=0.01$ ) and empyema gallbladder ( $p=0.01$ ) were significantly associated with conversion. 9 patients had major intra-operative complications (cystic duct avulsion = 3 patients, liver bed bleed = 3 patients, cystic artery bleed = 2 patients and duodenal injury = 1 patients) and 3 patients had post-operative complications (bile leak = 3 patients). Body mass index > 30 kg/m<sup>2</sup> ( $p=0.01$ ), previous attack of acute cholecystitis ( $p=0.01$ ), clinically palpable lump right hypochondrium ( $p=0.01$ ), impacted stone at gallbladder neck ( $p=0.007$ ) and empyema gallbladder ( $p=0.04$ ) were associated with higher complication rates.

**Conclusion:** Laparoscopic cholecystectomy can be performed safely for acute cholecystitis, with acceptable low conversion and complication rates in selected cases. However, larger study groups will enable us to evaluate these predictors of conversions and complications more accurately.

### Introduction

In the early years of minimally invasive surgery acute cholecystitis was considered to be a relative contraindication to laparoscopic cholecystectomy because of the potential risks of severe complications owing to distorted anatomy caused by acute inflammation<sup>1</sup>.

Today, the considerable experience acquired in minimal invasive surgery has led to Laparoscopic cholecystectomy being the treatment of choice for acute cholecystitis. Similar mortality rates to those historically observed in open cholecystectomy, but significantly lower morbidity rates, are reported<sup>2</sup>. The timing of laparoscopic cholecystectomy for acute cholecystitis remains controversial. It has been suggested that laparoscopic cholecystectomy should be performed within 72 to 96 hours, after which there is an increased risk of complications and conversion to an open procedure.

Conversion from laparoscopic cholecystectomy to open cholecystectomy leads to abandonment of all the benefits associated with this minimally invasive operation and markedly increases the hospital length of stay and hospital expenses. The reported conversion rate and incidence of bile duct injury were higher when laparoscopic cholecystectomy was performed for acute cholecystitis. With significant progress in instrumentation and technical proficiency,

comparative and randomized studies have demonstrated laparoscopic cholecystectomy to be a safe and effective procedure for acute cholecystitis. Some studies identified certain risk factors that are associated with higher conversion rate and complications<sup>3</sup>. This prospective study in the Government Medical College Jammu evaluated:

- i. the factors influencing complications and conversion rates to open surgery following laparoscopic cholecystectomy in acute cholecystitis; and
- ii. its consequences on patient outcome and healthcare systems.

### Patients and Methods

The present study was carried out on patients of Acute cholecystitis admitted in the Department of Surgery, Government Medical College Jammu over a period of 1 year. All patients were subjected to standard laparoscopic cholecystectomy within 96 hours of admission. General anaesthesia was used in all cases. The duration of operation was taken from time of initial skin incision to time of skin closure. The hospital stay was taken as the number of days patient stayed in hospital since admission.

Various parameters of the laparoscopic cholecystectomy during and after the procedure were analyzed and recorded. The parameters included:

- i. Conditions of the gallbladder including Enlargement of gallbladder, Inflammation, Oedema of the wall, Pericholecystic oedema, Adhesions, Contents – mucus, mucopus and pus
- ii. Operating time and technical difficulty faced / any modifications in operating technique
- iii. Intraoperative complications
- iv. Incidence of conversion to open cholecystectomy and its reasons
- v. Post-operative recovery
- vi. Post-operative complications (if any)

**Statistical analysis** was made using Chi square test ( $\chi^2$ )/Fisher's Exact Test to evaluate statistical significance among proportions. Unpaired t-test was applied to evaluate differences in mean values. A p-value of  $<0.05$  was considered as statistically significant. Strength of association was assessed by use of Odd's ratio with corresponding 95% confidence intervals on univariate analysis.

Factors found significant on univariate analysis with respect to the outcome of interest were further subjected to multivariate analysis. Stepwise logistic regression analysis was used for this purpose to evaluate independent effect of factors associated with the outcome of interest.

### Results

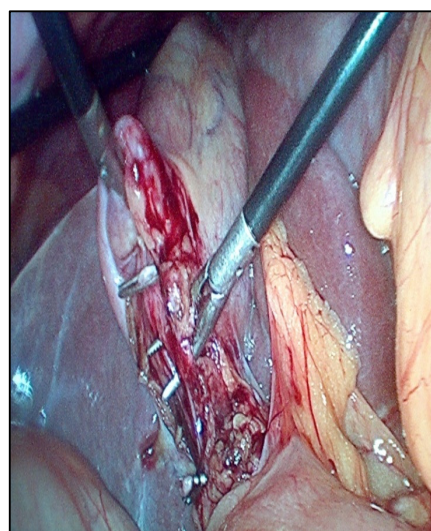
Out of 60 patients under study, 15(25%) were males & 45(75%) were females. Male to Female ratio was 1:3. Mean age was  $42.03 \pm 13.4$  years. The mean age of male patients was  $38.20 \pm 12.08$  years. The mean age of female patients was  $43.31 \pm 13.82$  years.

Logistic regression was applied to the data obtained. Past history of Acute Cholecystitis, Time of surgery from admission and Empyema gallbladder were found to be independent predictors of conversion

**Table 1.** Univariate analysis of the factors influencing Conversion

Pre- and Intra-operative Factors	Factor (+) n	Conversion (+) n (%)	Odd's ratio	95% C.I	p value	S/NS
Age >=65 yrs	6	4 (66.67%)	16	1.88-167.68	0.005	HS
Female Sex	45	9(20%)	3.50	0.38-80.56	0.42	NS
BMI >= 30 kg/m <sup>2</sup>	26	8(30.77%)	7.11	1.18-54.84	0.01	S
Duration of symptoms >48 hrs	23	7(30.43%)	4.96	0.96-28.41	0.03	S
Past history of acute cholecystitis	17	6(35.29%)	5.32	1.06-28.30	0.02	S
Comorbidity	18	4(22.22%)	1.71	0.34-8.46	0.46	NS
Palpable GB lump	5	4(80%)	32.67	2.60-919.83	0.001	HS
TLC >15000/mm <sup>3</sup>	21	5(23.81%)	2.13	0.45-10.23	0.29	NS
USG Mucocele	7	2(28.57%)	2.25	0.25-17.35	0.32	NS
USG Impacted Gallstone at neck	16	4(25%)	2.11	0.41-10.66	0.43	NS
Time of Surgery from admission <=48 hrs	44	3(6.82%)	0.09	0.02-0.52	0.002	HS
Time of surgery from symptom onset <= 96 hours	46	7(15.22%)	0.08	0.01-0.44	0.005	HS
Empyema GB	7	4(57.14%)	10.44	1.46-83.20	0.01	S
Short inflamed cystic duct	7	4(57.14%)	10.44	1.46-83.20	0.01	S
Intraoperative bleed >=100 ml	17	5(29.41%)	0.32	0.06-1.55	1.2	NS

Key: S= Significant; NS= Not significant; HS= Highly significant; GB= Gallbladder; USG= Ultrasonography


**Figure 1:** Inflamed Gallbladder with Gangrenous changes

**Figure 2:** Cystic Duct clipped and divided

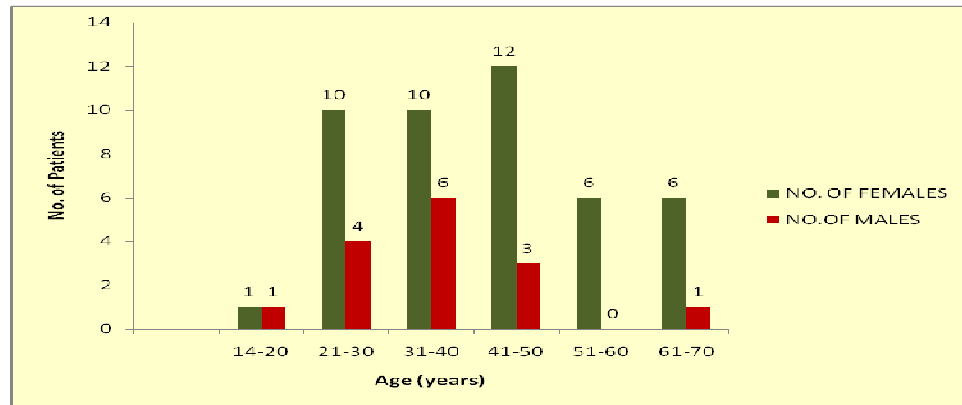


Figure 3. Age and Sex Distribution of Patients.

Table 2. Univariate analysis of the factors influencing complications

S/No	Pre- and Intra-operative Factors	Factor n (%)	Complications n(%)	Odds ratio	95% C.I	Chi square value	p value	S/NS
1.	Age $\geq 65$ yrs	6	4	1.18	1.60-10.29	-	1.0	NS
2.	Male Sex	15	7	0.40	0.10-1.52	2.39	0.12	NS
3.	BMI $\geq 30$ kg/m <sup>2</sup>	26	17	3.95	1.18-13.59	6.46	0.01	S
4.	Past history of acute cholecystitis	17	15	6.52	1.18-47.08	6.33	0.01	S
5.	Palpable GB lump	5	5	UD	-	-	0.01	S
6.	USG Mucocele	7	6	8.45	0.89-200	-	0.04	S
7.	USG Impacted Gallstone at neck	16	12	5.25	1.26-23.51	7.41	0.007	HS
8.	Time of Surgery from admission $>48$ hrs	16	11	0.29	0.07-1.11	4.28	0.03	S
9.	Empyema GB	7	6	8.45	0.89-200	-	0.04	S

Key: S= Significant; NS= Not significant; HS= Highly significant; GB= Gallbladder; USG= Ultrasonography

Table 3. Logistic regression parameters.

S/No.	Variable	Regression coefficient ( $\beta$ )	Standard error	Significance (p)	Adjusted odds ratio	95% confidence interval
1.	Past history of acute cholecystitis	-4.092	1.813	.024	.017	.000-.584
2.	Comorbidity	-1.860	1.378	.177	.156	.010-2.320
3.	Time of surgery from admission	-3.772	1.658	.023	.023	.001-.594
4.	Empyema gallbladder	-4.93	2.32	.034	.007	.000-.682
5.	Short inflamed cystic duct	-3.57	1.928	.064	.028	.001-1.227
6.	Intra-operative bleed	-2.28	1.39	.100	.101	.007-1.54
	Intercept	11.833	4.774	-	-	-

## Discussion

In this study, 60 patients were evaluated. Majority of the patients were in the age group of 21-50 years. Male to female ratio was 1:3. The mean age of male patients was  $38.20 \pm 12.08$  years. The mean age of female patients was  $43.31 \pm 13.82$  years. Major intra-operative complications occurred in 9 patients. Major post-operative complication was bile leakage and subhepatic collection which occurred in 3 patients but both were managed conservatively with intravenous fluids and antibiotics. In this study, the factors influencing complications and conversion rates were grouped into two categories- statistically significant/higher association but not of statistical significance. Factors found to be significantly associated with complications on univariate analysis were Body mass index  $\geq 30 \text{ kg/m}^2$ , Previous history of acute cholecystitis, Clinically palpable lump right hypochondrium, Ultrasonographic finding of mucocele, Time of surgery from admission  $> 48$  hours, Empyema gallbladder and Impacted gallstone at neck.

Factors associated with higher risk of complications but not of statistical significance were Age  $\geq 65$  years and Female gender. Factors found to be significantly associated with conversion on univariate analysis were Age  $\geq 65$  years, Body mass index  $\geq 30 \text{ kg/m}^2$ , Duration of symptoms  $> 48$  hours, Previous history of acute cholecystitis, Clinically palpable lump right hypochondrium, Time of surgery from admission  $> 48$  hours, Empyema gallbladder and Short inflamed cystic duct. Factors associated with higher risk of conversion but not of statistical significance were Female gender, Comorbidity, Total leucocyte count  $> 15000/\text{mm}^3$ , Ultrasonographic finding of mucocele, Impacted gallstone at neck and Intra-operative bleed  $> 100 \text{ ml}$ .

## Conclusion

All these factors should be used not only for the diagnosis but also for predicting the risk of complications and conversion during laparoscopic cholecystectomy in acute cholecystitis. The pre-operative assessment and intra-operative evaluation shall also be helpful in better case selection and intra-operative decision making by resident surgeons and those in the early learning curve. The knowledge of these predictive factors can help in better psychological preparation of the patient. The surgeons in the periphery can also evaluate their patients pre-operatively by these cost-effective and readily available predictive factors and thus plan for their management accordingly. Conversion is most frequently needed for significant factors like empyema, impacted gallstone at neck and gangrenous cholecystitis and once such pathologies are identified, excessive time should not be spent in laparoscopic trial dissection before converting to open surgery.

We recommend these factors for the usage by the surgeon to achieve the successful goal of laparoscopic cholecystectomy in acute cholecystitis, thus minimizing the complications and conversion rates.

## References

1. Johansson M, Thune A, Blomqvist A, Nelvin L and Lundell L. Management of Acute Cholecystitis in the Laparoscopic era: results of a prospective , randomized clinical trial. Journal of Gastrointestinal Surgery 2003; 7(5): 642-5
2. Giger U, Michel JM, Vonlanthen R et al. Laparoscopic cholecystectomy in acute cholecystitis: indication, technique, risk and outcome. Langenbecks Archives of Surgery (2005) 390:373-380.
3. Chau CH, Siu WT, Tang CN et al. Laparoscopic cholecystectomy for acute cholecystitis: The evolving trend in an institution. Asian journal of surgery 2006; 29: 120-124.



4. Al-Mulhim Abdulmohsen Abdullah. Laparoscopic cholecystectomy is feasible and safe in acute cholecystitis. Saudi Journal of Gastroenterology 1999; 5:56-60.
5. Al-Salamah S.M. Outcome of Laparoscopic Cholecystectomy in Acute Cholecystitis. Journal of College of the Physicians and Surgeons –Pakistan 2005 Jul;15(7):400-403.
6. Avrutis O, Friedman SJ, Meshoum J et al. Safety and success of early laparoscopic cholecystectomy for acute cholecystitis. Surgical Laparoscopic Endoscopy and Percutaneous Tech. 2000; 10(4): 200-207.
7. Bhattacharya D, Senapati P.S, Hurle R and Ammori B.J. Urgent versus interval laparoscopic cholecystectomy for acute cholecystitis: a comparative study. Journal of Hepatobiliary and Pancreatic Surgery. 2002;9(5):538-542.
8. Bingener J, Stefanidis D, Richards M.L and Schwesinger W.H. Early Conversion for Gangrenous Cholecystitis: Impact on Outcome. Surgical Endoscopy 2005 Aug; 19(8):1139-1141.
9. Borzellino G, Sauerland S, Minicozzi AM et al. Laparoscopic cholecystectomy for severe acute cholecystitis. A meta-analysis of results. Surgical Endoscopy (2008) 22:8-15.
10. Brodsky A, Matter I, Sabo E et al. Laparoscopic cholecystectomy for acute cholecystitis: can the need for conversion and the probability of complications be predicted? A prospective study. Surgical Endoscopy 2000; 14: 755-760.
11. Cameron IC, Chadwick C and Phillips J. Management of acute cholecystitis in UK hospitals: time for a change. Postgraduate Medical Journal. 2004 May; 80(943):292-294.
12. Cheema S, Brannigan A.E, Johnson S. and Grace P. Timing of Laparoscopic Cholecystectomy in Acute Cholecystitis. Irish Journal of Medical Science 2003 Jul-Sept; 172(3):128-131.
13. Chi Ming Lam, Albert W. Yuen, Barbara Chik and Andy C. Variation in the use of Laparoscopic Cholecystectomy for Acute Cholecystitis. Archives of Surgery 2005; 140:1084-1088.
14. Cox MR, Wilson TG, Luck AJ et al. Laparoscopic cholecystectomy for acute inflammation of the gallbladder. Annals of Surgery 1993 ; 218: 630–634
15. David D, Manzanares C, Picho ML et al. Experience in the treatment (early vs. delayed) of acute cholecystitis via laparoscopy. Cirugia Espanola 1999;66( Suppl 1):233
16. David GG, Al-Sarira AA, Willmott S et al. Management of acute gallbladder disease in England. British Journal Of Surgery 2008; 95: 472-476.
17. David W. Rattner, Charles Ferguson, Andrew L. Warshaw et al. Factors associated with Successful Laparoscopic Cholecystectomy for Acute Cholecystitis. Annals of Surgery 1993; 217:233-236.
18. Eldar S, Sabo E, Nash E et al Laparoscopic cholecystectomy for acute cholecystitis: prospective trial. World Journal of Surgery 1997; 21: 540-545.