

Clinico-Etiologic Profile Assessment of Conversion Rate of Laparoscopic Cholecystectomy to Open Cholecystectomy: An Observational Study**Sajal Kumar**

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Conflict of interest: Nil

Abstract**Aim:** This study was conducted in an effort to determine the conversion rate and also identify the factors responsible for conversion of laparoscopic to open cholecystectomy.**Methods:** This was a prospective clinical study consisting of 100 patients undergoing laparoscopic cholecystectomy at department of General Surgery**Results:** In 100 cases, 32 were males and 68 were females. The mean age in this study was 43.7 years. The age group of the patients ranged from 18 years to 76 years. The maximum incidence was seen in the age group of 41-50 years followed by 31-40 years of age. Out of 100 patients, 74 patients (74%) had a chief complaint of pain in the right hypochondrium, 20 patients (20%) presented with epigastric pain and the remaining 6 patients (6%) were asymptomatic (incidental cholelithiasis). 32 patients presented with nausea along with pain abdomen and 11 patients presented with vomiting, whereas 15 patients presented with both. 10% of patients suffered from Diabetes mellitus whereas 16% of patients were Hypertensive. On ultrasound, single calculi were noted in 72 patients whereas remaining 28 patients presented with multiple calculi. Difficult anatomy at Calot's triangle accounted for near one half of conversions; we observed that individual anatomy was obscured primarily by dense adhesions (40%) and aberrant anatomy (10%) was also noted.**Conclusion:** It can be reliably concluded that LC is the preferred method even in the difficult cases. Our study emphasizes that although the rate of conversion to open surgery and complication rate are low (7.5%) in experienced hands the surgeon should keep a low threshold for conversion to open surgery and it should be taken as a step in the interest of the patient rather than be looked upon as an insult to the surgeon.**Keywords:** laparoscopic cholecystectomy, open cholecystectomy, conversionThis is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.**Introduction**

After the first laparoscopic cholecystectomy was performed by Mühe in Germany in 1986, the procedure became one of the most common surgical procedures performed worldwide. [1] Conversion from laparoscopic cholecystectomy (LC) to open cholecystectomy (OC) may be resorted to for various reasons with reported rates of 1% to 15%. [2,3] Open conversion increases the operative time, complication rates, perioperative costs and the length of hospital stay. [4-6]

Difficult cholecystectomies are usually associated with severe inflammation that distorts the anatomy and renders dissection more difficult (i.e. acute cholecystitis, empyema, gangrene, perforation and Mirizzi syndrome) or with liver cirrhosis increasing the risk of bleeding and a higher probability of conversion. As laparoscopic skills increase surgeons become more able to utilise different techniques to reduce their conversion rates. Some strategies were

already well established in OC such as fundus first dissection (FFD) and subtotal cholecystectomy. [7]

It is important therefore that there is standardization of documentation and communication, with risk-adjusted measures, to allow qualitative studies and outcome comparisons. Accurate and reproducible stratification of the severity of gallbladder (GB) disease requires a scoring/ grading system that is easily implemented, clinically and operatively relevant and simple. A number of publications have reported new scoring and grading systems. [8-12] Some of these scores are based on preoperative clinical findings, and imaging, but only concentrate on actual operative findings limiting their use. Recently, the AAST scoring system has been validated and it has been suggested that it is superior to the 2013 Tokyo classification in part due to the greater number of grades of cholecystitis with the AAST classification. [13] The Tokyo guidelines for classifying cholecystitis use three grades, without

robust inclusion of the operative findings. [14] More recently, the Tokyo updates have expanded the potential scoring-grading system, but this remains yet to be validated.

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This study was conducted in an effort to determine the conversion rate and also identify the factors responsible for conversion of laparoscopic to open cholecystectomy.

Materials and Methods

This was a prospective clinical study consisting of 100 patients undergoing laparoscopic cholecystectomy at department of General Surgery, Narayan Medical College and Hospital, Sasaram, Bihar, India for one year

Inclusion Criteria:

- All patients of cholelithiasis undergoing laparoscopic cholecystectomy
- Patient's age >18 years

Exclusion Criteria:

- Patients unfit for general anesthesia
- Age <18 years.

A written informed consent obtained from patients included in the study and data collected on printed Performa included age, gender, history of pain in right hypochondriac region, jaundice, previous abdominal surgery, obesity and concomitant diseases (DM, HTN), white blood cell (WBC) count, preoperative liver function tests, ultrasound findings of the gallbladder and suspicion of common bile duct stones.

Standard Laparoscopic cholecystectomy procedure performed. Adhesions of GB separated by blunt, sharp dissection and by use of suction cannula and gauze piece. Distended GBs decompressed by suction and aspiration. Cystic Duct and Cystic Artery identified, ligated and divided with endoclips. Wide Cystic Ducts suture ligated and divided. Fundus first method and sub total cholecystectomies performed for unclear anatomy of Calot's triangle. GBs dissected from GB fossa by use of hook/spatula/scissors. Hemostasis achieved by using monopolar/bipolar cautery. GBs extracted through port site. GB fossas re-examined and suction dried. Port closure used for port site bleeding. Skin closure was done with skin suture.

The common reported etiologies of such a conversion are uncontrollable bleeding, adhesions, inflammation, anatomical variations, common bile duct (CBD) injury, vascular injuries, trauma of bile duct and other hollow viscera, presence of malignant pathologies, and technical failures. Surgeons' experience, no progression for 30 minutes are the indications for conversion.

Statistical analyses were performed using SPSS (Statistical Packages for Social Sciences) 11.5 software. The chi-squared test was used for comparisons of categorical variables. A value of p,0.05 was accepted as statistically significant.

Results

Table 1: Characteristics of the patients

Gender	N%
Male	32 (32)
Female	68 (68)
Age in years	
11-20	6 (6)
21-30	7 (7)
31-40	31 (31)
41-50	39 (39)
51-60	12 (12)
61-70	3 (3)
71-80	2 (2)

In 100 cases, 32 were males and 68 were females. The mean age in this study was 43.7 years. The age group of the patients ranged from 18 years to 76 years. The maximum incidence was seen in the age group of 41-50 years followed by 31-40 years of age.

Table 2: Chief complaint, Symptoms, Co-morbidities and ultrasound findings

Chief complaint	N%
Right hypochondrium	74 (74)
Epigastric pain	20 (20)
Asymptomatic	6 (6)
Symptoms	
Nausea with pain abdomen	32 (32)
Vomiting	11 (11)
Both	15 (15)
Co-morbidities	
Diabetes Mellitus	10 (10)
Hypertension	16 (16)
Ultrasound findings	
Single calculi	72 (72)
Multiple calculi	28 (28)

Out of 100 patients, 74 patients (74%) had a chief complaint of pain in the right hypochondrium, 20 patients (20%) presented with epigastric pain and the remaining 6 patients (6%) were asymptomatic (incidental cholelithiasis). 32 patients presented with nausea along with pain abdomen and 11 patients

presented with vomiting, whereas 15 patients presented with both. 10% of patients suffered from Diabetes mellitus whereas 16% of patients were Hypertensive. On ultrasound, single calculi were noted in 72 patients whereas remaining 28 patients presented with multiple calculi.

Table 3: Reason for Conversion

Reason for conversion	No. of cases	Percentage (%)
Difficult anatomy due to:		
- Dense adhesions of Calot's triangle	4	40
- Anatomical variation	1	10
Bleeding from:		
- Calot's triangle (Cystic artery)	2	20
Common bile duct injury	1	10
Duodenal injury	1	10
Instrument failure	1	10

Difficult anatomy at Calot's triangle accounted for near one half of conversions; we observed that individual anatomy was obscured primarily by dense adhesions (40%) and aberrant anatomy (10%) was also noted.

Discussion

Gallstones are among the most common gastrointestinal illness requiring hospitalization with a prevalence of 11% to 36% in autopsy reports. The optimal treatment for patients with symptomatic cholelithiasis is cholecystectomy. [17] It is important therefore that there is standardization of documentation and communication, with risk-adjusted measures, to allow qualitative studies and outcome comparisons. Accurate and reproducible stratification of the severity of gallbladder (GB) disease requires a scoring/ grading system that is easily implemented, clinically and operatively relevant and simple. A number of publications have reported new scoring and grading systems. [18-21]

In 100 cases, 32 were males and 68 were females which were similar to those observed by Frazee et al [22] and U. Berggren et al. [23] The reason for the

high incidence among females could be that pregnancy and child birth have a definitive influence on biliary tract disease, acting by casual stasis as well as weight gain and consequent hypercholesteremia. The mean age in this study was 43.7 years. The age group of the patients ranged from 18 years to 76 years. The maximum incidence was seen in the age group of 41-50 years followed by 31-40 years of age. Out of 100 patients, 74 patients (74%) had a chief complaint of pain in the right hypochondrium, 20 patients (20%) presented with epigastric pain and the remaining 6 patients (6%) were asymptomatic (incidental cholelithiasis). 32 patients presented with nausea along with pain abdomen and 11 patients presented with vomiting, whereas 15 patients presented with both. 10% of patients suffered from Diabetes mellitus whereas 16% of patients were Hypertensive.

Today ultrasonography is the best non-invasive, economical and an easily available investigation. On ultrasound, single calculi were noted in 72 patients whereas remaining 28 patients presented with multiple calculi. In a study by Pawan lal et al [24], they found a good correlation between gall bladder

thickness and conversion to the open procedure (sensitivity of 41.18%) and a positive predictive value of 70. In another study by Tayeb M et al [25], 58% of the patients with gallbladder wall thickness more than 3mm were converted to open cholecystectomy, suggesting gall bladder thickness as a good predictive factor for conversion. In a retrospective analysis by Chahin F. [26] over a 3 year period of 557 patients who underwent laparoscopic cholecystectomy; 88 patients had acute cholecystitis. He concluded that conversion rates were 22% in patients with acute cholecystitis as compared to 5.5% in case of patients with chronic cholecystitis. Difficult anatomy at Calot's triangle accounted for near one half of conversions; we observed that individual anatomy was obscured primarily by dense adhesions (40%) and aberrant anatomy (10%) was also noted. Vecchio et al [27] and Magee et al [28] also found it as the most common reason for conversion observed in 41.5% and 48.5% of patients respectively.

With the passage of time the experience has grown, the laparoscopic technique has been understood and thus the conversion rate has reached a remarkably low level of 1-6%. [29] In our series, the conversion to open cholecystectomy was required in 15 patients with conversion rate of 7.5%. This rate is comparable to the results of most international studies published in early years of laparoscopic cholecystectomy (2- 15%), but remains higher than those results reported recently in last five years (1-6%). [30] This may be due to differences in institutional and individual practice including experience of operating team.

Conclusion

Laparoscopic Cholecystectomy is a safe and minimal invasive technique with 7.5% conversion rate. The main intra-operative causes of conversion from laparoscopic cholecystectomy to open were difficulty in identifying the anatomy as a result of dense adhesions and anatomical variations followed by bleeding in the Calot's triangle, injury to the CBD, Duodenal Injury and Instrument Failure. It is therefore, mandatory to explain to the patients about the possibility of conversion to open technique at the time of taking consent for Laparoscopic Cholecystectomy. Conversion from laparoscopic to open procedure should not be considered a complication but rather a reflection of sound surgical judgement in difficult case.

References

1. Coelho JC, Dalledone GO, Schiel W, Berardin JD, Claus CM, Matias JE, de FREITAS AC. Does male gender increase the risk of laparoscopic cholecystectomy?. ABCD. Arquivos Brasileiros de Cirurgia Digestiva (São Paulo). 2019 Aug 26;32.

2. Kaafarani HM, Smith TS, Neumayer L, Berger DH, DePalma RG, Itani KM. Trends, outcomes, and predictors of open and conversion to open cholecystectomy in Veterans Health Administration hospitals. *The American Journal of Surgery*. 2010 Jul 1;200 (1):32-40.
3. Gholipour C, Fakhree MB, Shalchi RA, Abbasi M. Prediction of conversion of laparoscopic cholecystectomy to open surgery with artificial neural networks. *BMC surgery*. 2009 Dec;9(1):1-6.
4. Tang B, Cuschieri A. Conversions during laparoscopic cholecystectomy: risk factors and effects on patient outcome. *Journal of gastrointestinal surgery*. 2006 Jul;10:1081-91.
5. Peters JH, Krailadsiri W, Incarbone R, Bremner CG, Froes E, Ireland AP, Crookes P, Ortega AE, Anthone GA, Stain SA. Reasons for conversion from laparoscopic to open cholecystectomy in an urban teaching hospital. *The American journal of surgery*. 1994 Jan 1; 168(6):555-9.
6. Lengyel BI, Panizales MT, Steinberg J, Ashley SW, Tavakkoli A. Laparoscopic cholecystectomy: what is the price of conversion?. *Surgery*. 2012 Aug 1;152(2):173-8.
7. Sormaz İC, Soytaş Y, Gök AF, Özgür İ, Avtan L. Fundus-first technique and partial cholecystectomy for difficult laparoscopic cholecystectomies. *Turkish Journal of Trauma & Emergency Surgery/Ulusal Travma ve Acil Cerrahi Dergisi*. 2018 Jan 1;24(1).
8. Vera K, Pei KY, Schuster KM, Davis KA. Validation of a new American Association for the Surgery of Trauma (AAST) anatomic severity grading system for acute cholecystitis. *Journal of Trauma and Acute Care Surgery*. 2018 Apr 1;84(4):650-4.
9. Sugrue M, Sahebally SM, Ansaloni L, Zielinski MD. Grading operative findings at laparoscopic cholecystectomy-a new scoring system. *World Journal of Emergency Surgery*. 2015 Dec;10(1):1-8.
10. Bharamgoudar R, Sonsale A, Hodson J, Griffiths E. The development and validation of a scoring tool to predict the operative duration of elective laparoscopic cholecystectomy. *Surgical endoscopy*. 2018 Jul;32:3149-57.
11. Sutcliffe RP, Hollyman M, Hodson J, Bonney G, Vohra RS, Griffiths EA, Fenwick S, Elmasry M, Nunes Q, Kennedy D, Khan RB. Preoperative risk factors for conversion from laparoscopic to open cholecystectomy: a validated risk score derived from a prospective UK database of 8820 patients. *Hpb*. 2016 Nov 1;18(11):922-8.
12. Madni TD, Leshikar DE, Minshall CT, Nakonezny PA, Cornelius CC, Imran JB, Clark AT, Williams BH, Eastman AL, Minei JP, Phelan HA. The Parkland grading scale for

- cholecystitis. *The American Journal of Surgery*. 2018 Apr 1;215(4):625-30.
13. Hernandez M, Murphy B, Aho JM, Haddad NN, Saleem H, Zeb M, Morris DS, Jenkins DH, Zielinski M. Validation of the AAST EGS acute cholecystitis grade and comparison with the Tokyo guidelines. *Surgery*. 2018 Apr 1;163(4):739-46.
 14. Yokoe M, Takada T, Strasberg SM, Solomkin JS, Mayumi T, Gomi H, Pitt HA, Gouma DJ, Garden OJ, Büchler MW, Kiriya S. New diagnostic criteria and severity assessment of acute cholecystitis in revised Tokyo Guidelines. *Journal of Hepato-Biliary-Pancreatic Sciences*. 2012 Sep;19(5):578-85.
 15. Sormaz IC, Soytaş Y, Gök AF, Özgür İ, Avtan L. Fundus-first technique and partial cholecystectomy for difficult laparoscopic cholecystectomies. *Turkish Journal of Trauma & Emergency Surgery/Ulusal Travma ve Acil Cerrahi Dergisi*. 2018 Jan 1;24(1).
 16. Flowers JL, Bailey RW, Scovill WA, Zucker KA. The Baltimore experience with laparoscopic management of acute cholecystitis. *The American journal of surgery*. 1991 Mar 1;161(3):388-92.
 17. Ravi S.Chari and Shimul A.Shah. Biliary system. In, Townsend (ed). *Sabiston Textbook of Surgery Volume 2*, 18th edition, South Asia edition. Philadelphia, Saunders Publishers, 2009;1558-62.
 18. Vera K, Pei K, Schuster K, Davis K. Validation of a new American Association for the Surgery of Trauma (AAST) anatomic severity grading system for acute cholecystitis. *J Trauma Acute Care Surg*. 2018;84(4):650-4.
 19. Sugrue M, Sahebally S, Ansaloni L, Zielinski M. Grading operative findings at laparoscopic cholecystectomy- a new scoring system. *World J Emerg Surg*. 2015;10:14.
 20. Bharamgoudar R, Sonsale A, Hodson J, Griffiths E, CholeS Study Group, West Midlands Research Collaborative. The development and validation of a scoring tool to predict the operative duration of elective laparoscopic cholecystectomy. *Surg Endosc* 2018; 32(7):3149-3157.
 21. Sutcliffe R, Hollyman M, Hodson J, Bonney G, Vohra R, Griffiths E, Fenwick S, Elmasry M, Nunes Q, Kennedy D, Khan R. Preoperative risk factors for conversion from laparoscopic to open cholecystectomy: a validated risk score derived from a prospective UK database of 8820 patients. *J Hepatobiliary Pancreat Sci*. 2016;18(11):922-8.
 22. Frazee RC, Roberts JW, Symmonds R, Snyder SK, Hendricks J, Smith R, Custer MD. What are the contraindications for laparoscopic cholecystectomy?. *The American journal of surgery*. 1992 Nov 1;164(5):491-5.
 23. Berggren U, Gordh T, Grama D, Haglund U, Rastad J, Arvidsson D. Laparoscopic versus open cholecystectomy: hospitalization, sick leave, analgesia and trauma responses. *Journal of British Surgery*. 1994 Sep;81(9):1362-5.
 24. Lal P, Agarwal PN, Malik VK, Chakravarti AL. A difficult laparoscopic cholecystectomy that requires conversion to open procedure can be predicted by preoperative ultrasonography. *JSLs: Journal of the Society of Laparoendoscopic Surgeons*. 2002 Jan;6(1):59.
 25. Tayeb M, Raza SA, Khan MR, Azami R. Conversion from laparoscopic to open cholecystectomy: multivariate analysis of preoperative risk factors. *Journal of postgraduate medicine*. 2005;51(1):17.
 26. Chahin F, Elias N, Paramesh A, Saba A, Godziachvili V, Silva YJ. The efficacy of laparoscopy in acute cholecystitis. *JSLs: Journal of the Society of Laparoendoscopic Surgeons*. 1999 Apr;3(2):121.
 27. Vecchio R, MacFadyen BV, Latteri S. Laparoscopic cholecystectomy: an analysis on 114,005 cases of United States series. *International surgery*. 1998 Jul 1;83(3):215-9.
 28. Magee TR, Galland RB, Dehn TC, Reece-Smith H, Faber RG, Goodwin DP, Ross HB, Weston A. A prospective audit of cholecystectomy in a single health district. *Journal of the Royal College of Surgeons of Edinburgh*. 1996 Dec 1;41(6):388-90.
 29. AU B. Conversion of laparoscopic to open cholecystectomy-six years experience at Shalamar Hospital, Lahore.
 30. Kuldip Singh, Ashish Ohri. *Journal of minimal access. Surgery* 2005 June; 1:59-61.