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ORIGINAL RESEARCH

Predictors and Outcomes of Conversion from Laparoscopic to Open Cholecystectomy

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ABSTRACT

Background: Laparoscopic cholecystectomy (LC) is the gold standard for the treatment of symptomatic gallstone disease. However, conversion to open cholecystectomy (OC) may be required in certain cases due to intraoperative complications. This study aimed to evaluate the conversion rate and identify factors influencing the need for conversion from LC to OC. **Methodology:** An observational study was conducted at Rajshree Medical Research Institute & Hospital Bareillyfrom December 2022 to July 2024, involving 196 patients undergoing elective LC for symptomatic cholelithiasis. Excluded were patients with acute cholecystitis, gallbladder cancer, or other contraindications. Preoperative evaluations included clinical and imaging assessments. Statistical analysis was performed using SPSS v21.0. **Results:** The overall conversion rate was 8%, with higher rates in males (15.4%) and older patients. Significant predictors of conversion included acute cholecystitis, pericholecystic fluid, and thickened gallbladder walls. The most common reason for conversion was adhesions at Calot's triangle (62.5%). Postoperative recovery was faster in LC patients, who had shorter hospital stays and fewer complications. **Conclusion:** Conversion to OC is influenced by factors such as age, male gender, acute cholecystitis, and gallbladder wall thickness. LC remains the preferred approach, with OC as a backup when necessary. Preoperative evaluation and informed consent are essential for managing potential conversions.

Keywords: Laparoscopy, cholecystectomy, Open cholecystectomy, Acute cholecystitis, Gallbladder.

INTRODUCTION

More than two decades have elapsed since McKernan conducted the inaugural laparoscopic cholecystectomy (LC) in North America (1), and 17 years since LC was recognised as equivalent to open cholecystectomy (OC) in a consensus statement by the National Institutes of Health (NIH) (2). Currently, laparoscopic cholecystectomy is the preferred method for symptomatic biliary illness (3,4). About 75% of cholecystectomies are conducted laparoscopically, with conversion to open surgery occurring in 5% to 10% of cases nationwide (5). The NIH posited that the results of LCs would be significantly affected by surgeon-specific characteristics, including training, experience, ability, and judgement. Furthermore, other patient and disease-related characteristics, including male gender, obesity, advanced age (>65), previous abdominal surgery, acute cholecystitis, choledocholithiasis, and aberrant architecture (5-8), have been identified as important risk factors for conversion to an open operation.

A conversion rate of 5% to 10% has been documented on a national scale (9). A conversion may be classified as either elective, wherein the surgeon opts for a laparotomy due to ambiguous anatomy or stagnation of the laparoscopic procedure, or enforced, occurring in response to an intraoperative emergency such as uncontrollable haemorrhage or bile duct injury (10).

The necessity to convert a laparoscopic cholecystectomy to an open operation is influenced by various circumstances, including the patient's condition, the surgeon's proficiency, and the availability of suitable surgical instruments. The

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inability to identify anatomical structures and challenging dissection are two predominant reasons for transitioning from laparoscopic to open cholecystectomy, with complications such as haemorrhage ranking closely behind (11). Hence, the objective of this study was to ascertain the conversion rate from laparoscopic cholecystectomy to open cholecystectomy and to evaluate the factors contributing to this conversion.

METHODOLOGY

This observational analytical study, carried out from December 2022 to July 2024 at the Department of General Surgery, Rajshree Medical Research Institute & Hospital Bareilly, had 196 patients slated for elective laparoscopic cholecystectomy. The research concentrated on patients exhibiting symptomatic cholelithiasis, omitting individuals with acute cholecystitis, gallbladder cancer, common bile duct calculi, acute cholangitis, pancreatitis, or those deemed unfit for general anaesthesia. Comprehensive preoperative evaluations were performed, encompassing medical history, physical examination, laboratory tests (CBC, kidney and liver function tests, viral profile), chest X-ray, and abdominal ultrasound to verify the diagnosis of cholelithiasis. A pre-anesthetic evaluation was conducted, and all patients granted informed permission, with standard prophylactic antibiotics administered prior to surgery.

The statistical analysis was conducted with SPSS version 21.0. Quantitative data were reported as means with standard deviations, and categorical data were conveyed as frequencies and percentages. The student's t-test was employed to compare means, while the chi-square test was utilised to evaluate differences in categorical variables, with a p-value of less than 0.05 being statistically significant.

RESULT

The study comprised 200 individuals slated for elective laparoscopic cholecystectomy, with a mean age of 39.02±7.75 years, spanning from 26 to 56 years. The predominant demographic of patients was female (61%), with the age range of 41-50 years exhibiting the highest prevalence (42%). Conversion to open cholecystectomy occurred in 8% of cases, with a markedly elevated incidence in older age groups (41-50 years and 51-60 years) and in males (15.4% of males versus 3.3% of females) ($p < 0.001$).

Patients with acute cholecystitis exhibited a markedly elevated conversion rate to open surgery (12.8%) in contrast to those with cholelithiasis (4.9%) ($p < 0.001$). The presence of pericholecystic fluid and a thicker gallbladder wall correlated with increased conversion rates, with 15% of patients exhibiting pericholecystic fluid necessitating conversion ($p = 0.001$), and 13.3% of patients with a thickened gallbladder wall requiring conversion ($p = 0.001$).

Post-operative complications comprised jaundice (10%), vomiting (13%), and abdominal distension (3%), with a notably extended hospital stay in patients who underwent conversion to open cholecystectomy (mean 8.28±3.09 days versus 4.09±1.85 days for laparoscopic procedures) ($p = 0.011$). The length of hospital stay was less than 5 days for 120 patients (60.0%), 5 to 7 days for 25 patients (25.0%), and more than 7 days for 15 patients (15.0%). The conversion to open surgery was markedly higher in participants with a hospital stay exceeding 7 days. The conversion was mostly attributed to adhesions surrounding Calot's triangle (62.5%), followed by a thickened gallbladder (25%) and instances of haemorrhage or anatomical anomalies (12.5%). The conversion to open treatment was markedly higher in participants with a thickened gallbladder wall and those with pericholecystic fluid.

Table 1 showing the age group wise Conversion to open procedure

Age groups	Frequency	Percent	Conversion to open procedure	
21-30 years	30	100.0%	0	0.0%
31-40 years	52	26.0%	4	7.7%
41-50 years	84	42.0%	8	9.5%
51-60 years	34	17.0%	4	11.8%
p-value	< 0.001*			

Table 2 showing the occurrence ofPericholecystic fluid and Conversion to open procedure

Pericholicystic fluid	Conversion to open procedure			
	No		Yes	
	Frequency	Percent	Frequency	Percent
No	150	93.7%	10	6.3%
Yes	34	85.0%	6	15.0%
Total	200	100.0%	16	100.0%
p-value = 0.001*				

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Table 3 showing the occurrence of Thickened GB wall and Conversion to open procedure

	Conversion to open procedure			
	No		Yes	
Thickened GB wall	Frequency	Percent	Frequency	Percent
No	158	92.9%	12	7.1%
Yes	26	86.7%	4	13.3%
p-value = 0.001*				

Table 4 showing the occurrence of Duration of hospital stay and Conversion to open procedure

Duration of hospital stay	Over-all		Conversion to open procedure	
	Frequency	Percent	Frequency	Percent
< 5 days	120	60.0%	4	3.3%
5-7 days	50	25.0%	4	8.0%
> 7 days	30	15.0%	8	26.7%
p-value	0.001*			

Table 5 showing the mean Duration of hospital stay among subjects undergoing conversion

Conversion to open procedure	Duration of stay in hospital			
	Mean	Std. Deviation	t-test value	p-value
No	4.09	1.85	-4.462	0.011*
Yes	8.28	3.09		

DISCUSSION

Open cholecystectomy, the benchmark for gallbladder disease since Carel Johann Langenbuch's inaugural operation in 1882, was predominantly supplanted by laparoscopic cholecystectomy (LC) following Dr. Philip Mouret's successful technique in 1987 (12). Laparoscopic cholecystectomy is now regarded as the "new gold standard" for the treatment of gallstone disease. Laparoscopic cholecystectomy was first conducted in India in 1990 (13). The change from open cholecystectomy (OC) to laparoscopic cholecystectomy (LC) represented a pivotal advancement in the management of gallbladder disease, with LC establishing itself as the "new gold standard" following its inaugural successful procedure in 1987 (12). Nonetheless, conversion to open surgery may be required owing to several intraoperative problems, including biliary damage, haemorrhage, or procedural stagnation. This choice is founded on clinical judgement, emphasising patient safety.

The current study indicates that Gallbladder disease was most common among individuals aged 31-50 years, with the highest incidence observed in the 41-50 year age group (42%). Advanced age was markedly correlated with an increased conversion rate, consistent with research by Awan et al. (14) and others, indicating that older patients frequently present with more complex anatomical conditions (e.g., thickened or fibrosed gallbladders, dense adhesions), thereby complicating laparoscopic surgery. Our investigation indicated that conversion rates were elevated in patients over 60 years of age.

The current study observed a larger conversion rate in male patients (15.4%) compared to female patients (3.3%), consistent with the findings of Awan et al. (14) and previous research. Male sex was identified as a significant preoperative risk for problems resulting in conversion, likely attributable to factors such as a higher frequency of acute cholecystitis, increased gallbladder wall thickness, and anatomical obstacles. The conversion rate to open surgery in this study was 8%, aligning with the 10% reported by Thyagarajan et al. (15) and other literature. Conversion is frequently necessitated by factors such as extensive adhesions, ambiguous anatomy, or haemorrhaging. In our investigation, prior acute cholecystitis (AC) was a major predictor of conversion, corroborating the findings of Fried GM et al., (16) who indicated that AC induces fibrosis and scarring, complicating laparoscopic dissection and elevating the risk of complications.

A gallbladder wall thickness above 4mm was substantially correlated with conversion, as demonstrated in our work and by Awan et al. (14) and others. This discovery endorses the utilisation of ultrasound as a predictive instrument for assessing conversion risk, especially when integrated with additional signs such as a constricted gallbladder or stone impaction at the neck.

Transitioning to open surgery may mitigate complications such as bile duct injury or gallbladder perforation. In our study, bile leakage was the predominant complication following laparoscopic cholecystectomy (4%), whereas it was nonexistent in open cholecystectomy patients. This discovery corresponds with research conducted by Chauhan et al., (17) which similarly indicated elevated bile leak rates in laparoscopic cholecystectomy compared to open cholecystectomy. Moreover, wound infections occurred more frequently in OC (20%) than in LC (4%), aligning with the results of Mishra and Soni (18).

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Patients who transitioned to open surgery experienced a markedly extended hospital stay (mean 8.28±3.09 days) in contrast to those who received a successful laparoscopic treatment (mean 4.09±1.85 days). This outcome aligns with research conducted by Mishra and Soni (18), as well as Huang SM et al., (19) which identified reduced postoperative durations in laparoscopic cholecystectomy patients relative to open cholecystectomy patients. This indicates the typically swifter recovery and less complications linked to the laparoscopic method.

In conclusion, age, gender, previous acute cholecystitis, thicker gallbladder wall, and ultrasound abnormalities were all critical criteria in forecasting the necessity for conversion to open surgery. The conversion rate was elevated among males, older patients, and individuals with a history of acute cholecystitis. Postoperative recovery was expedited in LC patients, characterised by a notably reduced hospital stay and fewer problems in comparison to OC patients.

CONCLUSION

Laparoscopic cholecystectomy is considered the definitive treatment for symptomatic gallstone disease. Nonetheless, there are several situations in which conversion to an open approach is imperative. In the process of securing informed permission for laparoscopic surgery, it is essential to advise the patient about the potential necessity to convert the procedure to an open approach. The study identified thick adhesions as the predominant reason for conversion, succeeded by ambiguous anatomy at Calot's triangle. Establishing a dependable backup plan helps mitigate the likelihood of preventable consequences, such as equipment malfunction, and safeguard patient safety.

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