

Preoperative and Operative Risk Factors for Conversion of Laparoscopic Cholecystectomy to Open Cholecystectomy

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Abstract

Background: According to the world's statistics, there are approximately 20 million people who are diagnosed with gallstones in the United States of America. Moreover, the occurrence of gallstones is 0.63/100 persons per year. According to research from Pakistan, the surgical occurrence of gallstones in females was 14.2 percent, and it was 4.2 percent in males. To treat gallstones, the gold standard treatment, which is used worldwide, is laparoscopic cholecystectomy (LC). It is important to have an understanding of and knowledge related to the preoperative and intraoperative factors that lead to conversion from LC to open cholecystectomy (OC). Objective: To study the risk factors (operative as well as pre-operative) that are associated with the conversion of laparoscopic cholecystectomy to open cholecystectomy. Study design: A cross-sectional study Place and Duration This study was conducted in Liaquat University Hospital Hyderabad from February 2022 to February 2023. Methodology: All of the participants of this study were diagnosed with symptomatic gallstones. Every patient was planned for laparoscopic cholecystectomy. There were a few operative factors, such as empyema, perforation, scleroatrophic (gross appearance of the gallbladder), and gallbladder adhesions. Furthermore, there were a number of pre-operative factors such as morbid obesity, age, previous endoscopic retrograde cholangiopancreatography (ERCP), liver function tests, previous upper abdominal surgery, alkaline phosphatase, total leukocyte count, alanine transaminase, severe sepsis, and total bilirubin. Results: There were a total of 1200 patients who were a part of this research. Among these 1200 patients, 92% successfully underwent laparoscopic cholecystectomy, while 8% had to undergo conversion to open cholecystectomy. The conversion rate in our study was 7.78 percent. The average age of the participants was 41.6 years. Morbid obesity was the most significant risk factor associated with the conversion. The most common reason for the conversion was finding difficulty in defining anatomy. Conclusion: Although laparoscopic cholecystectomy is the gold standard for treating gallstones, open cholecystectomy is a safer approach for people who are diagnosed with complicated gallbladders.

Keywords: laparoscopic cholecystectomy, gallstones, open cholecystectomy

1. Introduction

According to world statistics, there are approximately 20 million people diagnosed with gallstones in the United States of America [1]. This

proportion represents almost 15 percent of the USA's population [2]. If we talk about Europe, gallstones have a prevalence of up to 21% [3]. Moreover, the occurrence of gallstones is 0.63/100 persons per year [4]. According to research from Pakistan, the surgical occurrence of gallstones in females was 14.2

percent, and it was 4.2 percent in males [5]. To treat gallstones, the gold standard treatment, which is used worldwide, is laparoscopic cholecystectomy (LC) [6]. A study by Hu et al. states that 1 to 15% can be the conversion rate from LC to OC (open cholecystectomy) [7]. Another study from Pakistan, which was conducted by Tayeb et al., reported that the conversion rate was 7.2% [8]. It is important to have an understanding of and knowledge of the preoperative and intraoperative factors that lead to conversion from LC to OC. Currently, there are only a few studies from Pakistan that focus on the risk factors (operative as well as pre-operative) that are associated with the conversion of laparoscopic cholecystectomy to open cholecystectomy. It is also important to have knowledge of the outcomes that are related to advanced healthcare. In order to have a safe surgical process, it is necessary to have conversion to open cholecystectomy [9]. There are a number of reasons for the conversion. Some of them include ambiguous anatomy, bile duct injury, dense fibrosis and inflammation of the Calot's triangle, and excessive bleeding that could be life-threatening. Moreover, the consequences due to the conversion include a rise in cost, increased morbidity, and a prolonged hospital stay [10]. Thus, this research aims to study the risk factors (operative as well as pre-operative) that are associated with the conversion of laparoscopic cholecystectomy to open cholecystectomy.

2. Methodology

All of the participants in this study were diagnosed with symptomatic gallstones. All of the patients were admitted to the outpatient or emergency department. Each individual was briefed about the research, and their written consent was obtained.

Exclusion criteria: Individuals with any proven malignancy, known concomitant infectious aetiology, or immunocompromised state were not a part of this study. Every patient was planned for laparoscopic cholecystectomy. A standard proforma was used to obtain the information related to the operative and preoperative factors. There were a few operative factors, such as empyema, perforation, scleroatrophic (gross appearance of the gallbladder), and gallbladder adhesions. Furthermore, there were a number of pre-operative factors such as morbid obesity, age, previous

endoscopic retrograde cholangiopancreatography (ERCP), liver function tests, previous upper abdominal surgery, alkaline phosphatase, total leukocyte count, alanine transaminase, severe sepsis, and total bilirubin. Some ultrasonographic findings were also recorded. These findings include wall thickness, number of stones, and common bile duct diameter. Conversion to open cholecystectomy was the dependent variable. All the participants were divided into two groups. One group had patients under 65 years old, and the other had patients over 65 years old. Moreover, morbid obesity was also categorised into 2 categories based on the absence or presence of morbid obesity, which was defined as a BMI of >39.9 kg/m². SPSS version 26 was used for statistical analysis. To compare both groups, a chi-square test was used. A significant p-value was considered to be less than 0.05.

3. Results

There were a total of 1200 patients who were part of this research. Among these 1200 patients, 92% of individuals (n=1104) successfully underwent laparoscopic cholecystectomy. However, 8% of individuals (n=96) had to undergo conversion to open cholecystectomy. The conversion rate in our study was 7.78 percent. The average age of the participants was 41.6 years. The average BMI in our study was 28.3 kg/m². Table 1: shows the characteristics of our population.

Characteristics	N	%
• Age (years)		
• Less than 65	864	72
• More than 65	336	28
• Gender		
• Female	936	78
• Male	264	22
• Biliary Colic		
• Yes	624	52
• No	576	48
• Chronic dyspepsia		
• Yes	456	38
• No	744	62
• Gallbladder polyp		
• Yes	12	1
• No	1188	99
• Obesity		
• Yes	540	45
• No	660	55

Table number 2 shows the risk factors that were associated with the conversion from laparoscopic cholecystectomy to open cholecystectomy.

Risk factors	LC group	Conversion to OC group	Risk Estimate
Age >65 years	14.47%	56.1%	7.26
Raised Alanine transaminase	27.9%	27.38%	0.96
High total leukocyte count	34.1%	51.21%	2.05
Morbid obesity	21.1%	59.8%	5.71
Previous abdominal surgery	15.2%	47.3%	4.82
Wall thickness	37.8%	52.7%	1.98
Raised Alkaline phosphatase	22.43%	61.1%	5.36
Pre-ERCP	42.2%	48.0%	1.24
High Total bilirubin	25.2%	55.1%	3.89
Diabetes mellitus	42.5%	61.9%	2.19

Table number 3 shows the reasons for conversion to

open cholecystectomy.

Reasons	%
Cystic duct injury	3.8
Difficult to define anatomy	75.0
Cystic artery bleeding	8.9
Suspicion of CBD injury	7.1
Suspicion of gallbladder cancer	3.5
Duodenal injury	1.7

4. Discussion

As we are aware that the gold standard treatment to treat gallstones is laparoscopic cholecystectomy because of its various advantages, such as its cost-effectiveness and safety [11]. When the risk factors are identified, they benefit the patient's outcome after surgery as well as their education. There were a total of 1200 participants in this research. The conversion rate in our research was found to be 7.78 percent. There was research conducted by Rosen et al. that reported a conversion rate of 5.3 percent [12]. In their research, the risk factor that was linked with a high conversion rate was age above 65 years. Another study by Sippey et al. stated the same: increased age was mostly associated with a high conversion rate [13]. The reason behind this can be the difficulty in dissection secondary to a repeated number of attacks of inflammation. Our research reported morbid obesity as one of the most significant risk factors which was associated with the conversion. Research performed by Goonawardena et al. also had similar results, which showed BMI above 30 was the most significant risk factor linked with the conversion [14]. Certain reasons were behind facing difficulty in defining anatomy, which include port displacement, short trocar length, or increased fat deposition.

A history of previous upper abdominal surgery was also another risk factor. The research of Akyurek et al. reported that the history of previous upper abdominal surgery was the most significant factor for conversion in their study [15]. The reason behind this increased rate was that Calot's triangle was not accessible due to adhesions. Diabetes mellitus was also one of the associated risk factors for conversion [16, 17]. However, the exact reason behind this has not been found. Wall thickness is an ultrasonographic sign of inflammation, which was also found to be a risk factor. It was linked with conversion because thick walls indicate repeated attacks of cholecystitis and chronic inflammation, which leads to conversion. There are a number of research studies that support this result [18, 19]. Our research also reported a high total leukocyte count as a significant risk factor linked to the conversion. Moreover, raised total bilirubin and alkaline phosphatase were also reported to be important risk factors in our research. There is prior research in which the conversion rate was 20.2 percent because patients had risk factors such as a raised leukocyte count and alkaline phosphatase. [20]

5. Conclusion

In our research, the conversion rate was reported to be 7.78 percent, which is a very low rate. Although laparoscopic cholecystectomy is the gold standard for treating gallstones, open cholecystectomy is a safer approach for people who are diagnosed with a complicated gallbladder.

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Interest confliction

There was no conflict of interest in the present study.

Permission

Permission was acquired and received from the ethical committee before the conduct of the study.

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