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Morbidity of Complicated Gallstone Disease with Surgical Management: Comparison between Laparoscopic and Open Cholecystectomy

Bushra Ghulam[1], Shabbir Ahmed[2], Muhammad Mumtaz Ather[3], Aamir Javid[4], Shoiab Anwar[5], Usama Ali[6]

[1]Senior Registrar of General Surgery Dept, Bakhtawar Amin Medical & Dental College, Multan
[2]Associate Professor of General Surgery Dept, Bakhtawar Amin Medical & Dental College, Multan
[3]Associate Professor of Gastroenterology Dept, Bakhtawar Amin Medical & Dental College, Multan
[4,5]Consultant of General Surgery Dept, DHQ Hospital, Multan
[6]Consultant of General Surgery Dept, Children Hospital and Institute of Child Health, Multan

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Address of Correspondent
Dr. Shabbir Ahmed
Associate Professor of General Surgery Dept.
Bakhtawar Amin Medical & Dental College, Multan.
shabbirahmad2011@hotmail.com

ABSTRACT

Objective: To compare the outcomes of laparoscopic cholecystectomy with open cholecystectomy in patients with complicated gallstone disease.

Methodology: This prospective, randomized controlled trial study conducted at the general surgery department, Bakhtawar Amin Medical and Dental College Multan from January 2021 to December 2022, focused on patients with complicated gallstone disease diagnosed on basis of ultrasonography the patients were divided into two groups, Group A for open cholecystectomy and Group B for laparoscopic cholecystectomy by simple randomization method. Main variables of study were post-operative infection, pain score, hospital stay and mobilization time. SPSS version 27 was used for data analysis.

Results: Severity of pain was mild in 16 (17.8%) and 29 (32.2%) patients of OC and LC groups respectively. Whereas, pain was severe in 28 (31.1%) and 25 (27.8%) patients of OC and LC groups respectively, (p=0.076). According to complications, chest infection was most common in 30 (33.3%) LC group, (p<0.001). The average mobilization time in OC and LC groups was 16.78±8.51 hours and 15.78±9.74 hours, respectively, (p=0.469). While, length of hospital stay in OC was higher than LC group, 5.91±2.45 days and 2.97±1.89 days, respectively. (p<0.001).

Conclusion: Laparoscopic cholecystectomy is a safe and effective treatment for complicated gallstone disease in many cases. It offers several advantages, including minimal invasiveness, shorter hospitalization, early mobilization, and faster recovery. However, the decision on the surgical approach should be individualized based on the patient's specific condition and the surgeon's judgment.

Keywords: Cholecystectomy, Laparoscopy, Open technique, Hospital stay, Pain score, Sepsis.

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Introduction

Gallstone disease, also known as cholelithiasis, involves the formation of solid particles or stones in the gallbladder or the bile ducts.[1] These stones are typically made up of cholesterol or bilirubin. Gallstones can vary in size from tiny grains of sand to large, golf ball-sized stones.[2] In certain cases, patients with gallstones do not experience symptoms 80% in western world and may never be aware of their presence.[3] However, when gallstones block the flow of bile or cause inflammation, they can lead to symptoms, including pain, nausea, vomiting and jaundice.[4] The exact cause of gallstone formation is not fully understood, but several risk factors and contributing

factors are obesity, intake of high saturated fats, female gender, increased age, rapid loss of weight either with diet control or surgical, family history and medical illness like diabetes and liver cirrhosis.[5]

Surgical treatment is often necessary for gallstone disease when the condition causes severe symptoms, complications, or when conservative treatments are not effective. The two primary surgical options for gallstone disease are open cholecystectomy and laparoscopic cholecystectomy when bile duct needs exploration.[6] Laparoscopic cholecystectomy is the most common and preferred method for gallbladder removal. It is a minimally invasive procedure that involves making several small incisions in the abdomen and using a laparoscope to remove the gallbladder. Recovery time is relatively short, and patients can often go home on the same day or the day after surgery.[7]

In some cases, when laparoscopic surgery is not feasible due to complications or other medical issues, an open cholecystectomy may be performed.[8] This procedure involves a larger incision in the abdomen and has a longer recovery time. Open cholecystectomy was first time performed in 1882 by Carl August Langerbach.[9] The choice of surgical treatment depends on the patient's specific condition, the extent of the disease, and the surgeon's expertise. The majority of patients undergoing cholecystectomy experience relief from their symptoms and can resume normal activities relatively quickly.[10]

Identifying any disparities in morbidity rates between laparoscopic and open cholecystectomy can highlight areas for further research and improvement in surgical techniques, perioperative care, and patient selection criteria. Overall, the significance of this study lies in its potential to enhance our understanding of the morbidity associated with complicated gallstone disease and to guide clinicians in selecting the most appropriate surgical approach to optimize patient outcomes.

Methodology

This prospective, randomized controlled trial study focused on patients with complicated gallstone disease was carried out at the general surgery department of Bakhtawar Amin Medical and Dental College Multan from January 2021 to December 2022. 180 patients were randomly divided into two equal group, 90 patients operated with open cholecystectomy (OC) and 90 patients operated with laparoscopic cholecystectomy (LC). Detailed medical histories were obtained from all patients regarding abdominal pain, right hypochondrium pain, nausea, vomiting, fever and lump in right hypochondrium. Special examination was done for hypochondrium to evaluate visceromegaly any palpable mass and Murphy's sign.

All patients in the study underwent specific investigations including ultrasound abdomen for evaluation of complicated gall stone. Patients were only included in the study if they met the criteria of having a history of gallstone disease, clinical symptoms, and positive findings in the ultrasound of the abdomen. cases of gallstone disease that are associated with complications, which can include conditions such as acute cholecystitis with phlegm, chronic cholecystitis with mucocele, empyema, and perforation with pericholecystic abscess, unfit patient for anesthesia, obstructive jaundice, acute pancreatitis, pregnant women and carcinoma gall bladder were excluded from the study.

Follow-up assessments were conducted on patients at 6 months and one year. The data collected during these assessments was then analyzed using SPSS software. Numerical values were represented as mean ± SD and categorical values were represented as frequency and percentages.

Results

One hundred and eighty patients were included, in our study. The mean age of OC and LC groups was 41.05±5.51 years and 43.84±5.81 years. Most of patients were male as 63 (70.0%) and 65 (72.2%) in OC and LC groups, respectively. Most of the patients had multiple stones as 55 (61.1%) and 66 (73.3%), in OC and LC groups, respectively, according to ultrasonic findings. The mean operative time in OC and LC groups was 16.78±8.82 minutes and 15.78±9.74 minutes, respectively. The differences were statistically insignificant, ($p>0.050$). (Table I)

Severity of pain was mild in 16 (17.8%) and 29 (32.2%) patients of OC and LC groups respectively. Whereas, pain was severe in 28 (31.1%) and 25 (27.8%) patients of OC and LC groups respectively, ($p=0.076$). According to complications, chest infection was most common in 30 (33.3%) LC group, ($p<0.001$). The average mobilization time in OC and LC groups was 16.78±8.51 hours and 15.78±9.74 hours, respectively, ($p=0.469$). While, length of hospital stay in OC was higher than LC group, 5.91±2.45 days and 2.97±1.89 days, respectively. ($p<0.001$). (Table II).

Table I: Demographic and baseline characteristics of the study groups.

Characteristic	Open Cholecystectomy N=90	Laparoscopic Cholecystectomy N=90	p-value
Age (years)	41.05±5.51	43.84±5.81	0.057
Sex			
Male	63 (70.0)	65 (72.2)	0.742
Female	27 (30.0)	25 (27.8)	
Ultrasound findings			
Single stone	35 (38.9)	24 (26.7)	0.081
Multiple stone	55 (61.1)	66 (73.3)	
Operative time (minutes)	16.78±8.82	15.78±9.74	0.375
Laparoscopic to open conversion rate		3 (3.3%)	

Table II: Post-operative characteristics of the study groups.

Characteristic	Open Cholecystectomy 90 (50.0%)	Laparoscopic Cholecystectomy 90 (50.0%)	p-value
Severity of pain			
Mild	16 (17.8)	29 (32.2)	0.076
Moderate	46 (51.1)	36 (40.0)	
Severe	28 (31.1)	25 (27.8)	
Complications			
Nausea & Vomiting	19 (21.2)	10 (11.1)	<0.001
Chest infection	14 (15.6)	30 (33.3)	
Bleeding	7 (7.8)	19 (21.1)	
Biliary leak	8 (8.9)	17 (18.9)	
Wound sepsis	20 (22.2)	11 (12.2)	
Mobilization time (hours)	16.78±8.51	15.78±9.74	0.469
LOS (days)	5.91±2.45	2.97±1.89	<0.001

Discussion

In this study conducted, we evaluated postoperative complications among patients who underwent laparoscopic and open cholecystectomy, and systematically graded these complications based on the requisite degree of non-surgical or surgical interventions needed for management.

The incidence of gallstone disease varies significantly around the world. In the past few decades, advancements in medical science and surgery have led to a significant reduction in the morbidity (sickness or complications) and mortality (death) associated with gallbladder surgery, known as cholecystectomy.[11]

In both groups at our center, the affected patients were typically in their fifth decade as mean age of OC and LC groups was 41.05±5.51 years and 43.84±5.81 years, and male predominance observed in each group70.0% and 72.2% male in OC and LC groups, respectively. A contrast observation was reported by Channa et al[12] with 1:6 male-to-female ratio, and Murshid et al[13] reported a 5:5.1 male-to-female ratio. These ratios appear different from the male-to-female ratio found in present study. Varying male-to-female ratios in different studies can occur due to differences in sample sizes, study populations, methodologies, and other factors. When interpreting such findings, it's essential to consider the context, study design, and the potential limitations of each study.

Regarding age factor Laghari et al[14] conducted a study includes data on the age range of the participants, which is from 13 to 90 years, with a mean age of 48.4 years. Association of age with clinical outcomes was also reported as older patients have prolong hospital stay and other compromised outcomes.

On comparison of both groups regarding mobilization time, average mobilization time in OC and LC groups was 16.78±8.51 hours and 15.78±9.74 hours, respectively. A study was conducted by Shaikh et al[15] in 2011 and reported mean mobilization time in the OC group was 16.60 hours, with a standard deviation of 47 hours, the mean mobilization time in the LC group was 13.80 hours, with a smaller standard deviation of 5.01 hours.

Literature shows that length of hospital stay is main postoperative outcomes and plays an important role in patient outcomes, in a study by Rosenmüller et al[16] compared the duration of hospital stay for patients who underwent open cholecystectomy and laparoscopic cholecystectomy. In open cholecystectomy group mean hospital stay was 7.9 days and standard deviation (SD) was

8.9 days and in laparoscopic group mean hospital stay was 2.6 days standard deviation (SD) was 3.3 days. In our study length of hospital stay in OC was higher than LC group, 5.91±2.45 days and 2.97±1.89 days, respectively, that favors laparoscopic technique as best choice for gall stone management.

Another contributing factor in postoperative recovery is operative time as prolong operative time may affect patient's outcomes and recovery time. In our study no significant difference was observed in operative time between the groups. Contrast observations were reported by Khan et al[17] that the mean operative time for laparoscopic cholecystectomy (LC) was 62±15 minutes, while the mean operative time for open cholecystectomy (OC) was 60.5±17.5 minutes. This implies that, on average, the LC group had a slightly longer operative time, but the difference is not very large. In contrast to our study and study by Khan et al, Mayer et al[18] reported findings showing longer operative times in laparoscopic cholecystectomy (LC) group patients compared to other studies.

In this study conversion to open was 3.3% and chest infection was most common in 33.3% LC group ($p<0.001$). These conversion rates indicate the proportion of cases where a laparoscopic cholecystectomy (a minimally invasive procedure) had to be converted to an open cholecystectomy. Gabriel et al[19] reported a conversion rate ranging from 3.9% 12% in their study. Tang et al[20] also reported a conversion rate12%. The exact rate may vary depending on the patient population, the surgeon's skill, and the specific criteria used in each study.

Number of stones is also important factor that affect duration of surgery and postoperative outcomes, in this study most of the patients had multiple stones as 61.1% and 73.3%, in OC and LC groups, respectively, according to ultrasonic findings. The ultrasound findings presented by Ji et al[21] in their study indicate that multiple stones were observed in 69.71% of cases. Thickened gallbladder wall was present in 41.67% of cases. This finding suggests that a substantial proportion of the cases exhibited a thickened wall of the gallbladder as observed on ultrasound.

In this study severity of pain was mild in 17.8% and 32.2% patients of OC and LC groups respectively. Whereas, pain was severe in 31.1% and 27.8% patients of OC and LC groups respectively. Similar findings were observed by other authors in their studies that patients who undergo laparoscopic cholecystectomy typically experience less postoperative pain compared to open surgery.[22,23] The smaller incisions and reduced tissue manipulation contribute to this advantage

Conclusion

Laparoscopic cholecystectomy is a safe and effective treatment for complicated gallstone disease in many cases. It offers several advantages, including minimal invasiveness, shorter hospitalization, early mobilization, and faster recovery. However, the decision on the surgical approach should be individualized based on the patient's specific condition and the surgeon's judgment.

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