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Laparoscopic cholecystectomy versus percutaneous catheter drainage for acute cholecystitis in high risk patients

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Abstract---Aim: To assess which treatment modality, Patients with AC who are at a high risk should have a cholecystectomy performed using or percutaneous catheter drainage. Methodology: Sixty people were included in this study because they got diagnosed with acute calculous cholecystitis. Both the procedure of laparoscopic cholecystectomy and percutaneous catheter drainage were offered to them at random. Results: In terms of the need for further surgery, there was a statistically significant difference between the groups as there were 2 (6.7%) who needed re-intervention in laparoscopic cholecystectomy group and 14 (46.7%) in percutaneous catheter drainage group ($p=0.001^*$), recurrent biliary disease as there were 2 (6.7%) in laparoscopic cholecystectomy group and 17 (56.7%) in percutaneous catheter drainage group ($p<0.001^*$) and total length of hospital stay as the mean of laparoscopic cholecystectomy group was 4.9 (± 2.77 SD) while in percutaneous catheter drainage group was 10.67 (± 6.62 SD). Conclusion: Cholecystectomy with laparoscopic is favored over percutaneous drainage for high-risk individuals with acute cholecystitis. When compared to percutaneous catheter drainage, laparoscopic cholecystectomy decreased significant complications but did not affect fatality rates.

Keywords---acute cholecystitis, laparoscopic cholecystectomy, high risk patients, percutaneous cholecystostomy.

Introduction

One of the most prevalent reasons for acute abdomen in emergency rooms is acute cholecystitis (AC), which is caused by gallstones (cholelithiasis) blocking the duct that contains cysts. (1) Each year, biliary colic affects 4%-15% of individuals with diagnosed cholelithiasis. While the vast majority of people with gallstones never have any symptoms, as many as 25% may develop cholangitis, cholecystitis, or biliary pancreatitis. (2) In the presence of co-morbid

conditions the diagnosis and treatment of acute cholecystitis may be challenging, increasing the risk of morbidity and death. Empyema, gangrene, and perforation of the gallbladder are all potentially fatal consequences of acute cholecystitis. (3)

Early or delayed removal by surgery of the gallbladder is necessary due to an elevated incidence of gallstone problems after a first hospitalisation for acute cholecystitis attack. (4) Laparoscopic cholecystectomy (LC) is the procedure of choice for young patients who are otherwise in good health. The most effective treatment for gallstones is laparoscopic cholecystectomy. Every year, more than a million of these operations are carried out. It has a low complications rate and often results in a shorter hospital stay, making it both safe and economical. (5). Since acute LC in these patients might result in substantial morbidity (up to forty-one percent) and death (up to 4.5 percent), percutaneous cholecystostomy (PC) seems preferred, particularly in older patients with major comorbidities and very unwell patients, particularly those who are already confined to an intensive care unit. (6)

However, there is still a third category of individuals who, due to the severity of their sickness or the presence of co-occurring conditions, are classified as "high risk patients" but do not fall into either of the two previously described groups. Although LC and PC are often used in this population of patients, there are no well-established selection criteria for either therapy, and many concerns remain about PC's safety and effectiveness. (7). The primary purpose of this investigation was to compare the efficacy of laparoscopy for cholecystectomy with percutaneous catheter drainage in high-risk individuals with AC.

Research Hypothesis

This research adopted null hypothesis, laparoscopic cholecystectomy is better treatment than percutaneous catheter drainage in high-risk individuals with AC.

Participants and Methods

This was a clinical experiment with randomized participants. Both a laparoscopy cholecystectomy and a drainage through the abdomen trial were offered to patients randomly. Each participant provided written informed permission before their participation in the research. Sixty patients with ages more than or equal to 18 who had been diagnosed with AC and whose APACHE-II scores were between 7 and 14 were included in our research. According to the Tokyo Guidelines, the following are the diagnostic criteria for acute calculous cholecystitis: (8)

- Murphy's sign and a mass, discomfort, or soreness in the right upper quadrant are local indicators of inflammation.
- Systemic indicators of inflammation include: fever, increased CRP, and increased WBC count.
- Imaging results: imaging results indicative of acute cholecystitis

Definitive diagnosis: (1) One of the items in A and one of the items in B is positive; (2) when acute cholecystitis is clinically believed C confirms the diagnosis. Patients having an APACHE II score of six or higher were disqualified from the

trial, as were those whose symptoms persisted for more than seven days at the time of their first presentation. Pregnancy, decompensated liver cirrhosis, admission to the critical care unit at the time of cholecystitis diagnosis, and mental illness precluding informed consent were additional exclusion factors. Two categories of treatment with laparoscopic cholecystectomy or percutaneous drainage were used to treat the patients. Each patient's information included the following: patient characteristics such as gender, age, BMI, comorbidities, history of abdominal surgery, APACHE-II score, and length of symptoms. All patients had an arterial blood gas analysis in addition to the usual laboratory tests, including a complete blood count, liver function tests, kidney function tests, serum electrolytes, and viral indicators. The diagnosis was confirmed by an abdominal ultrasound. A contrast enhanced CT-scan of the abdomen was done on a few chosen individuals if the results of the ultrasound examination were inconclusive.

Interventions

Group A: cholecystectomy done laparoscopically

The four-trocar method was used to do LC, and after the critical view was attained, the cystic duct and artery were transected. Supine positions were used for patients. Both the surgeon and his or her helper were standing off to the patient's left. Under laparoscopic guidance, a 10 mm trocar was inserted periumbilically by open approach, and three 5 mm ports were inserted into the patient's upper right abdomen. Prior to occluding the cystic duct and the aorta, a thorough assessment of risk was performed. In accordance with standard practice at the medical facility, patients were given a single dosage of antibiotic prophylaxis before surgery.

Group B: Percutaneous drainage

Under local anesthesia and sterile conditions, a catheter was inserted into the patient's vascular system to drain excess fluid. Qualified radiologists either carried out the treatments themselves or oversaw them closely. Any radiologist in the Netherlands is capable of doing percutaneous catheter drainage, hence specialized training wasn't necessary to conduct this treatment. Depending on the radiologist's choice and the gallbladder's location, they may have chosen either the transhepatic or transperitoneal method to puncture it. The pigtail catheter was inserted into the gallbladder using either the trocar method (a single-step procedure) or the Seldinger technique (a series of steps). For PC to be effective, the patient's symptoms and fever must go away, and their C-reactive protein and white blood cell count must return to normal. LC will occur if the patient fails to improve clinically, has a fever for more than 48 hours, or shows worsening infection parameters despite proper drain placement and function. The percutaneous drain was left in place when the patients were sent home. After three weeks, the drain was removed. Before the drain was taken out, antegrade cholangiography was done to make sure there was no duodenal leakage and that the cystic duct was patent. Antibiotics were not given to PC patients unless they were septic and hemodynamically unstable.

Antibiotic treatment may be initiated for individuals in either group if they develop an infectious complication. Anything that happens will be documented. Immediately after the surgery, the operating surgeon or radiologist recorded data on the procedure's difficulties, time, and complications. Patients' vital signs, test results, and any difficulties that arose during their stay in the hospital were recorded daily. Patients were contacted by phone once a month for a year after they were discharged from the hospital, and then again three weeks after they were released. Data was collected by local practitioners utilizing case record forms.

Outcomes

The main goal is a combination of all major illness, death, and re-intervention. We will compare complications that happen in the first 30 days after randomization, the need for reintervention, and deaths during the one-year follow-up time. The secondary endpoints include all of the parts of the primary endpoint, as well as all minor complications, such as wound infection, bleeding that doesn't need to be stopped or treated, and infections of the urinary tract. They also include the difficulty of cholecystectomy, the overall duration of stay in the hospital, visits to an ER for issues related to the surgery, re-admissions, the length of healthcare and intensive care unit stay, and the total (direct and indirect) costs.

Statistical analysis

Data were put into the computer, and the IBM SPSS software package version 20.0 was used to examine the data. (IBM Corp., Armonk, NY) Numbers and percentages were used to describe qualitative facts. The Kolmogorov-Smirnov test was used to see if the data were spread out in a normal way. The range (minimum and maximum), mean, standard deviation, median, and interquartile range (IQR) were used to describe the quantitative data. The 5% figure was used to judge how important the results were. The used tests were:

- Chi-square test
To compare between different groups for categorical variables
- Student t-test
For numeric factors that are usually spread, to compare between two groups

Table 1
Comparison between the studied groups as regard baseline data

	Group A (n=30)		Group B (n=30)		Test	p
Age	56.13 ± 15.57		56.2 ± 16.77		t=0.016	0.987
Sex	No.	%	No.	%	x ² = 0.0	1.0
Female	11	36.7	11	36.7		
Male	19	63.3	19	63.3		
BMI	29.35 ± 5.04		28.13 ± 5.79		t=0.868	0.389
Comorbidities	No.	%	No.	%	x ²	p
Cardiovascular	20	66.7	23	76.7		

disease						
Pulmonary disease	4	13.3	4	13.3	0.0	1.0
Chronic renal insufficiency	2	6.7	3	10.0	0.218	0.640
Diabetes	6	20.0	4	13.3	0.480	0.488
Previous abdominal surgery	5	16.7	8	26.7	0.884	0.347
ERCP before randomization	1	3.3	0	0.0	1.017	0.313

SD: Standard deviation

χ^2 : Chi square test t: Student t-test

p: p value for comparing between different categories

*: Statistically significant at $p \leq 0.05$

This table shows that there was no statistically significant difference between the studied groups as regard baseline data.

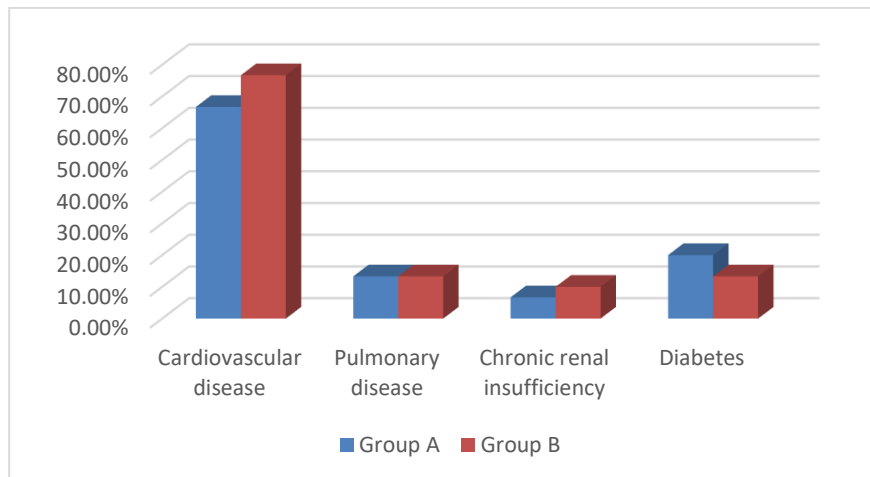


Fig 1. Comparison between the studied groups as regard comorbidities

Table 2

Comparison between the studied groups as regard disease severity data

	Group A (n=30)		Group B (n=30)		Test	p
ASA classification on admission	No.	%	No.	%		
I	6	20.0	2	6.7	$\chi^2=4.009$	0.135
II	12	40.0	19	63.3		
III	12	40.0	9	30.0		
APACHE II	9.77 $\pm$ 1.68		9.07 $\pm$ 1.84		t=1.542	0.128
CRP (mg/L)	132.4 $\pm$ 49.13		127.47 $\pm$ 57.49		t=0.357	0.722
WBCs ($\times 10^9/L$)	17.06 $\pm$ 5.2		18.92 $\pm$ 4.49		t=1.484	0.143
Temp	37.87 $\pm$ 0.71		37.7 $\pm$ 0.82		t=0.859	0.394
Time since onset of symptoms (days)	3.6 $\pm$ 1.79		3.23 $\pm$ 1.79		t=0.792	0.432

This table shows that there was statistically insignificant difference between the studied groups as regard disease severity data.

Table 3
Comparison between the studied groups as regard outcome

	Group A (n=30)		Group B (n=30)		Test	p
	No.	%	No.	%	χ^2	p
Death	1	3.3	3	10.0	1.071	0.301
Infectious and cardiopulmonary complication	3	10.0	2	6.7	1.220	0.543
Need to re-intervention	2	6.7	14	46.7	14.900	0.001*
Surgical	3	10.0	5	16.7	1.833	0.400
Endoscopic	2	6.7	7	23.3	4.820	0.090
Radiological	2	6.7	17	56.7	20.653	<0.001*
Recurrent biliary disease	0	0.0	1	3.3	2.614	0.339
Minor complications	0	0.0	0	0.0	0.0	1.0
Wound infection	0	0.0	1	3.3	2.614	0.339
Bleeding	0	0.0	1	3.3	2.614	0.339
UTI	0	0.0	1	3.3	2.614	0.339
Total length of hospital stay	4.9 ± 2.77		10.67 ± 6.62		t=4.311	<0.001*

Statistically significant differences in surgical re-intervention rates, rates of recurrent biliary illness, and median lengths of hospital stays across study groups are shown in the table below.

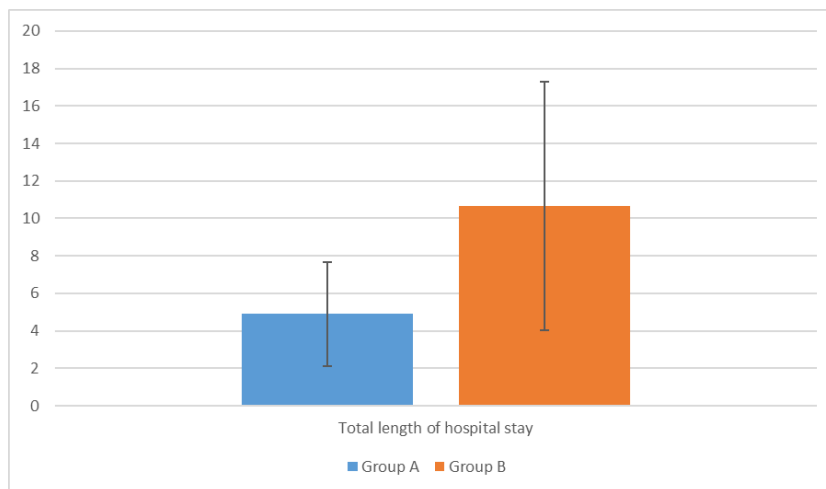


Fig 2. Comparison between the studied groups as regard total length of hospital stay

Discussion

Acute cholecystitis is the most common clinical manifestation of gallstones, which are thought to affect 10–15% of the population. Acute calculous cholecystitis is often treated by laparoscopic cholecystectomy (LC). Perioperative mortality risk in persons over the age of 80 is expected to be increased by a factor of 10 (9), and severe complications of LC and postoperative morbidity and death rates rise with age. It's also common practice to rule out nonagenarian patients as candidates for general anesthesia, which is required for LC, owing to their poor functional reserve. Consequently, it is crucial to investigate alternate treatment options, such as percutaneous catheter drainage (PCD) of the gallbladder, for this group (10).

Few studies have looked at the efficacy of LC in high-risk patients, despite the fact that this age group is growing at an exponential rate. A greater prevalence of problems has also been seen in research evaluating PCD therapy in high-risk individuals. Current literature reviews indicate that death rates 30 days following the surgery might be as high as 15.4%. Patients like the super old, a unique group with a significant perioperative risk owing to their frailty and many comorbidities (11), make it more important to evaluate the outcomes of both therapeutic strategies (LC versus PCD). There was no significant difference between the groups in this research with respect to any of the baseline characteristics or illness severity measures.

The research by Han et al. (12) concurs with our results, concluding that no significant differences were found between groups I and II with respect to age, gender, BMI, ASA class, duration of symptoms, criteria for severity, or mixed morbidities. The WBC and total bilirubin levels, as well as other laboratory data, had also been similar amongst the groups. When comparing PCD and LC patients, Ebrahim et al. (13) observed no significant differences in age, gender, BMI, ASA class, duration of symptoms, criteria for severity, or co-morbidities. By comparing the rates of surgical readmission, recurrence of biliary illness, and duration of hospital stay, we found statistically significant differences between the groups.

Although Loozen et al. (14) also discovered that reinterventions for cholecystitis were less common after cholecystectomy than drainage (12% v 66%, $P=0.001$), these numbers are not statistically significant. Cholecystectomy patients also had a lower incidence of recurrent biliary illness (5% vs. 53%, $P<0.001$). Total hospital stays (including readmissions) were shorter in the cholecystectomy group (5 days; interquartile range 4–8 days) than in the percutaneous drainage group (9 days; 6–19 days; $P<0.001$). In addition, laparoscopic cholecystectomy decreased severe complications but not mortality compared to percutaneous catheter drainage in patients with acute calculous cholecystitis and high surgical risk, as reported by Rappold et al. (15). The researchers also discovered that the median duration of hospital stay was significantly lower for the cholecystectomy group compared to the drainage group (5 vs 9 d, $P < 0.001$).

Re-intervention for cholecystitis, however, was performed less often after LC than following PCD, as reported by Ebrahim et al. (13) (10% vs. 71.4%, $P=0.001$).

In addition, patients assigned to LC had a lower incidence of recurrent biliary problem (5.7% vs 48.6%, $P < 0.001$). Overall hospital stays (including readmissions) in their research ranged from 5.010.120 days in the LC-group to 9.001.351 days in the percutaneous PCD group ($P < 0.001$). Similar results were obtained in a different research by Asai et al. (16), which also demonstrated substantial differences in surgical time, blood loss, postoperative problems, length of postoperative stay, and overall hospitalization time between the groups. Complications after surgery were more common in the PCD group (20.7%; 6/29) than the LC group (3.1%; 6/196) ($P=0.0005$). Furthermore, in the PCD group, patients stayed in the hospital for 11 days after surgery, but in the LC group, they stayed for just 6 days ($P < 0.0001$).

Patients who got PC had higher mortality rates, longer hospital stays, and a lower complication rate than patients who underwent cholecystectomy, as indicated by a retrospective analysis of the US Nationwide Inpatient Sample database by Anderson et al. (17). Accordingly, the research cohort of Dimou et al. (18) indicated that PC was linked with greater 30- and 90-day mortality, longer duration of hospital stay, and higher complication and readmission rates in 8818 senior patients hospitalized with grade III cholecystitis. Abi-Hadar et al. (19) found that compared to those who had cholecystectomy, PC patients spent much more time in the critical care unit, experienced significantly more problems, and were readmitted at a greater rate. There are various caveats to this study, including a very large sample size and the lack of a control group for comparison. In many instances, it was determined that the patients would not survive an emergency cholecystectomy, therefore PC was chosen instead.

Conclusion

Laparoscopy for cholecystectomy is favored over percutaneous drainage for high-risk individuals with acute cholecystitis. When compared to percutaneous catheter drainage, laparoscopic cholecystectomy decreased significant complications but did not affect fatality rates.

Conflict of interest

There were no potential biases that should be mentioned.

Authorship Statement

All authors named here have met the requirements for authorship and have approved the final version of the work.

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