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Research Article

**CONSERVATIVE VS LAPAROSCOPIC CHOLECYSTECTOMY
IN RELATION TO THE SIZE & NUMBER OF GALL BLADDER
STONES AND ASSOCIATED FACTORS AFFECTING
DECISION-MAKING**¹Alshakhs, Ahmed M, ¹Alashwan hassan A, ¹Albrahim Eman A, ¹Alali Sajidah M,
²Adel Gaafar Elbagir Osman¹Imam Abdulrahman Bin Faisal University²King Fahd Hospital of the University**Abstract:**

Approximately 10-15% of the adult population in Saudi Arabia complains of symptomatic gallbladder stones. Laparoscopic cholecystectomy is the gold standard to treat people who present with acute cholecystitis. However, there is evidence suggesting that the conservative management can be effective and safe in treating asymptomatic patients. The purpose of this study is to identify the factors that affect decision-making to treat patients with either the conservative or the operative approach. Those factors include different size of stones, number of stones, and symptomatic stones. The study was conducted at the Department of General Surgery at King Fahad University Hospital- IAU in al-Khobar city, Saudi Arabia. Data were collected from hospital archives using medical records with a biased sampling technique. Data from 113 patients who had gallstones disease for a period of one year were collected. 89.4% of patients who had gallstones were treated with laparoscopic cholecystectomy (LC), while 10.6% received a conservative therapy. Most of patients with a mean age between 20-49 years had surgery and most of them were females. Management type was not significantly associated with different sizes of stones, number, or presence of obstruction. Symptomatology and severity of symptoms were significantly associated with the LC group where severe symptomatic patients were treated surgically, while mild symptoms received conservative therapy. Complete recovery from symptoms was approximately the same in both groups.

Keywords: *cholecystectomy, surgical, conservative, symptomatic, laparoscopic.*

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INTRODUCTION:

Gallstones, or cholelithiasis, are deposits of the digestive bile fluid that can be hardened within the gallbladder. Although the burden of gallstone disease has been emphasized in the modern medical society, gallstones have been identified for many years. Gallbladders containing gallstones have been found in the Egyptian mummies as far back as 1000 BC (1). In general, gallstone formation may be caused by three main pathogenic pathways: excessive cholesterol production by the liver, excessive bilirubin production, or impaired gallbladder motility (2). According to the etiology, gallstones may be classified into cholesterol gallstones, brown pigment gallstones, or black pigment gallstones. Obesity, pregnancy, rapid weight loss, genetics, and female gender are considered the main risk factors of the most predominant type, cholesterol gallstones (3).

Cholelithiasis is a very common medical problem globally even though its prevalence varies with the geographical location (4-8); the developing countries reported less prevalence, where the people still consume traditional diets more frequently (9). The highest prevalence of gallstones has been reported among Native American individuals (10). In the United States and Europe, the prevalence ranges between 9% and 30% (11-13). Epidemiological studies have shown that increasing age has been associated with cholelithiasis; older people are 4-10 times more likely to develop gallstones than young people (14). The disease is found in approximately 9% of women and 6% of men. Considering both factors, about 25% of women aged 60 years or more may potentially develop gallstones (15).

Evidence from Africa and Asia shows low gallstone prevalence (16, 17). In Saudi Arabia, cross-sectional studies have revealed prevalence ratios of 8.6% in Riyadh (18), 11.7% in Abha (19), and 23.5% in Almadinah Almunawwarah (20). The most common modifiable risk factors of gallstone progression among Saudi population are diabetes, elevated levels of liver enzymes and abnormal lipid profile (18).

Despite such epidemiological figures, gallstones may cause no symptoms in more than 80% of individuals with an established disease. As such, these stones are called "silent stones". However, biliary pain will develop in 1-2% of asymptomatic people each year and in 20% of them over 15-year period (21). Symptoms include recurrent pain episodes in the upper quadrant or epigastric region of the abdomen, possibly due to the impaction of gallstones in the cystic duct (22). Additionally, some patients may encounter acute episodes of pain the upper right abdomen associated with nausea and vomiting, which

lasts usually for 30 minutes to several hours. Patients may present also with acute cholecystitis. In 0.1%-0.3% of symptomatic patients, major complications may take place, such as choledocholithiasis, cholangitis, or gallstone pancreatitis. Gallstones are diagnosed chiefly by ultrasonography. It has a sensitivity and specificity ranging between 90% and 95% and can efficiently detect small stones that may be as small as 2 mm in diameter (23). Other diagnostic approaches include oral cholecystography and cholescintigraphy.

Management of gallstones depends partially on the symptomatology. For asymptomatic cases, clinicians should take into account the natural history and risks of surgical interventions prior to making a decision. Interventions may include expectant management, prophylactic cholecystectomy (surgical removal of the gallbladder) or selective cholecystectomy. While laparoscopic cholecystectomy (LC) is the treatment of choice in symptomatic patients as recommended by the National Institute of Health in 1992 (24), only 30% of patients with asymptomatic gallstone disease will require LC during their lifetime (25). Furthermore, LC is the most acceptable intervention in the patients who experience cholecystitis. However, specific factors may contribute to the development of a more deleterious course that may warrant a prophylactic LC in asymptomatic patients. Knowledge about such factors should be further highlighted to assist in making the correct intervention-related decisions. Therefore, we aimed in the present study to investigate the potential factors that might affect the decision-making process, whether to select conservative or LC interventions in patients with gallstones.

MATERIALS AND METHODS:**Design and setting**

A cross-sectional study was conducted in the Department of General Surgery at King Fahad University Hospital- IAU, al-Khobar city, Saudi Arabia. Patients' records were retrospectively investigated for the period between May 1st, 2016 to April 30th, 2017.

Population

All patients with a gallstone disease, with or without cholecystitis, who were managed at the hospital were included. However, those with definitive treatment decisions, such as those with a calcified gall bladder, dyskinesia, etc., were excluded.

Data collection

The collected data were classified into: A) demographic variables, including patients' age, gender and nationality. B) type of treatment received,

either conservative or surgical using a minimally-invasive LC, C) gallstone data, including stone size, number of stones, sites of stones, the resultant obstruction, D) symptomatology (the patient has experienced symptoms or not) and severity of symptoms, E) Postoperative data, including postoperative length of hospital stay and the recovery period.

Definitions

The conservative treatment of gallstones was defined as either an expectant management (wait and see) or medical management using an oral dissolution therapy (ursodeoxycholic acid and/or chenodeoxycholic acid). Laparoscopic cholecystectomy is the surgical excision of gallbladder via several small incisions.

For grading of symptoms, mild symptomatic patients are those with biliary pain but did not require hospitalization. Patients with moderate symptoms required hospital admission for few days without having complications, while severely-affected patients were hospitalized for prolonged periods as a result of their complications, including sepsis, dehydration, cholangitis or biliary pancreatitis.

Statistical Analysis

Data coding and statistical analysis was performed using Statistical Package for Social Sciences version

20.0 for Windows (SPSS Inc., Chicago, IL, USA). Frequency and percentages were used to present the categorical variables. Group differences were analyzed using a Chi-square test for categorical variables and t-test for continuous variables. The statistical difference was considered to be significant at a p value of < 0.05 .

Ethical Approval

The study protocol was approved by King Fahad University Hospital- IAU institutional review board under the registration number IRB-2018-01-161

RESULTS:

A total of 113 patients with symptomatic and asymptomatic gallbladder stones as well as patients who developed acute cholecystitis were included in the study. LC was performed in 101 (89.4%) patients while conservative therapy was administered in 12 (10.6%) patients. Demographic characteristics are presented in Table 1. There were 21 (20.8%) males and 80 (79.2%) females in the laparoscopic group and 2 (16.7%) males and 10 (83.3%) females in the conservative group.

In both groups, those with mean age 20 – 49 years were; 75 (74.3%) in laparoscopic, and 11 (91.7%) in conservative group. Majority of cases were Saudi nationals, numbering 85 (84.2%) and 10 (83.3%) in laparoscopic and conservative groups respectively.

Table 1: Demographic characteristics of cases

	Interventions		P-value
	Laparoscopic (n=101)	Conservative (n=12)	
Gender			
Male	21 (20.8%)	2 (16.7%)	0.74
Female	80 (79.2%)	10 (83.3%)	
Nationality			
Saudi	85 (84.2%)	10 (83.3%)	0.94
Non-Saudi	16 (15.8%)	2 (16.7%)	
Age (years)			
15-19	6 (5.9%)	0	0.08
20-49	75 (74.3%)	11 (91.7%)	
50-69	19 (18.8%)	0	
≥70	1 (1%)	1 (8.3%)	

As shown in Table 2, the association between the size and number of stones has been statistically similar in both groups ($p = 0.87$ and 0.3 , respectively) and had no significant effect on decision making. It worthy to note that a stone size greater than 3 cm in diameter has not been reported in our study.

Table 2: Association between different stone sizes, number, and intervention.

	Interventions		P-value
	Laparoscopic (n=101)	Conservative (n=12)	
Size of stones			
<1 cm	48 (47.5%)	6 (50%)	0.87
1-3 cm	53 (52.5%)	6 (50%)	
Number of stones			
Solitary	21 (20.8%)	1 (8.3%)	0.3
Multiple	80 (79.2%)	11 (91.7%)	

Sites of stones were significantly different between both groups (p-value = 0.006). Stones within gallbladder lumen were significantly higher in the laparoscopic group=99 (98%) as compared to the conservative group. However, the statistical difference was not reported in the resultant stone-related obstruction (in both groups (laparoscopic & conservative); p-value = 0.3 (Table 3).

Table 3: Association between sites of stone, obstruction, and intervention

	Interventions		P-value
	Laparoscopic (n=101)	Conservative (n=12)	
Site of stones			
Within gallbladder lumen	99 (98%)	10 (83.3%)	0.006*
Cystic duct	0	1 (8.3%)	
Multiple sites	2 (2%)	1 (8.3%)	
Obstruction			
Obstructive	2 (1.98%)	1 (8.3%)	0.3
Non-obstructive	99 (98.02%)	11 (91.7%)	

* Significant correlatio

Both symptomatology (asymptomatic vs symptomatic) and severity of symptoms (mild, moderate & severe) were significantly different in both groups (p = 0.004 and 0.047, respectively). Symptomatic cases were significantly higher in the laparoscopic group=97 (96.04%) while mild symptoms were significantly higher in conservative group=10 (83.4%) when compared to their counterparts in other groups (Table 4).

Table 4: Association between symptomatology, severity and intervention

	Interventions		P-value
	Laparoscopic (n=101)	Conservative (n=12)	
Severity			
Mild	50 (49.5%)	10 (83.4%)	0.047*
Moderate	46 (45.5%)	1 (8.3%)	
Severe	5 (5%)	1 (8.3%)	
Symptomatology			
Asymptomatic	4 (3.96%)	3 (25%)	0.004*
Symptomatic	97 (96.04%)	9 (75%)	

* Significant correlation

As shown in Table 5, there was no statistical difference between the conservative group and LC group in the length of hospital stay (p = 0.83) or the rates of postoperative complete recovery (p = 0.9, Table 5).

Table 5: Association between hospital stay outcome and intervention

	Interventions		P-value
	Laparoscopic (n=101)	Conservative (n=12)	
Hospital Stay (Days)			
<5	66 (65.3%)	8 (66.6%)	0.83
5-6	23 (22.8%)	2 (16.7%)	
>6	12 (11.9%)	2 (16.7%)	
Outcome			
complete recovery from symptoms	96 (95%)	12 (100%)	0.9
Incidence of complications	5 (5%)	0	

DISCUSSION:

During the last three decades, the essential principles of gallstone treatment have not evidenced fundamental changes. Early studies indicated that open cholecystectomy was exclusively performed for symptomatic patients (25). For those with no apparent symptoms, the clinicians preferably established expectant management approaches by observation solely (26). Nonetheless, treatment approaches have undergone substantial evolutions with the advent of laparoscopy. This was supported by the increasing learning curve that has been associated with the globally-conducted retraining and re-education programs of surgeons. As such, LC has been considered the gold standard for cholelithiasis treatment in symptomatic patients (27). The clinical therapeutic decision for asymptomatic patients and selected symptomatic patients whom surgical treatment could not be performed is still debated. We investigated the most important factors that would direct the physicians to either conservative treatment or LC.

In the post-laparoscopic era, the decisions of gallstone management have been relying on the clinical stage; whether being symptomatic, asymptomatic, or complicated. In asymptomatic patients, given the low possibility of conversion to symptoms and the rare development of complications if there is no evidence for biliary pain episodes, it has been recommended that gallbladder removal should not be expanded to include such patients (28). Furthermore, the natural history of 279 cholelithiasis patients with no symptoms revealed that only 20% of patients developed colicky pain over a period of 24 years (29). Additionally, although the existence of small gallstones, or microlithiasis, or biliary sludge in the lumen of the gallbladder represents a risk for the development of pain episodes or acute pancreatitis (30, 31), there is a low risk for development of complications (0.3%) and cancer of the gallbladder

(0.02%) (32).

The first line in conservative management is watchful waiting, or expectant management, which has the advantage of avoiding unneeded surgical procedures as well as keeping the patients away from the exposure to general anesthesia. However, clinicians cannot ensure that the patient would have no severe or even lethal complications at an old age (26). The medical management of gallstones comprises of oral dissolution therapy, including ursodeoxycholic acid (UDCA) and chenodeoxycholic acid (CDCA). Since the latter has several side effects, such as the elevation of liver enzymes and diarrhea (33), UDCA is more widely used at a dose of 8-12 mg/kg/day. UDCA has the ability to specifically dissolve cholesterol stones and also has an anti-inflammatory effect for acute cholecystitis (34). As such, there is an approximate consensus that the conservative therapy is the most acceptable treatment for the majority of asymptomatic population. Moreover, as shown in our results, patients with mild symptoms were preferably managed by the conservative approach. Similarly, Tomida et al. (35) have found that UDCA treatment has been associated with a significant reduction in the risk of developing biliary pain ($P < 0.001$) in asymptomatic (6% vs. 12% in untreated patients) and symptomatic (62% vs. 92% in untreated patients) when the patients received treatment for 10 years. Additionally, the risk of conversion to cholecystectomy was reduced by 26% in the symptomatic patients when compared to 88% in untreated patients at 10 years (35). However, UDCA oral litholysis was only efficient in patients with selected criteria, including having a significant risk for complications following a surgical procedure, small gallstone size (less than 10mm in diameter), radiolucent stones on plain X-ray, and clear visualization of the gallbladder when performing cholecystography. Likewise, a randomized clinical trial by Petroni et al. (36) showed that the UDCA

therapy should be restricted to symptomatic patients if they have a patent cystic duct, radiolucency, gallstones smaller than 15 mm in diameter and a functioning gallbladder with previous pain episodes for no more than 30 minutes. Nonetheless, stone size was not an essential factor to make a definitive therapeutic decision in our study for a conservative management. This is probably due to using a higher threshold for stone size (less than 1 cm) in the present study rather than other studies, which might mask the established significant difference.

However, LC remains the most reasonable treatment in selected gallstone patients presenting without symptoms and those with moderate to severe symptoms. The asymptomatic candidates are those with a risk of malignancy, co-morbid with choledocholithiasis, transplant recipients, diabetes mellitus, and chronic hemolytic conditions (37). LC can be performed also as a concomitant surgical procedure, such as with colon cancer (26).

In the instance of symptomatic patients, the number of cases was significantly higher in the LC group when compared to those who received conservative therapies in our study. LC is quite safe, with a mortality rate ranging between 0.1% and 0.7%, providing a cost-effective approach when compared with open cholecystectomy (38). The increased knowledge and practice about LC facilitated its application over the conventional open procedures. Following LC procedures, patients will be hospitalized for shorter periods with a decreased need for postoperative analgesia, faster recovery rates, less cosmetic issues, and avoidance of the open surgery-related complications (39, 40).

To further support the clinical decision regarding gallstone management, whether conservative or laparoscopic management, Parmar *et al.* (41) have conducted a decision model in elderly patients (>65 years) with initial episodes of biliary pain. In patients who did not require emergent surgeries or immediate hospitalization, the elective LC procedures were more effective therapeutically only when the likelihood of biliary symptoms exceeded 45.3%, while the cost-effectiveness was more pronounced for the surgery side at a percentage of 82.7% of continued symptomatology. When considering gender preponderance, females have a 6-fold greater liability to undergo surgery for biliary pain than males up to 40 years old, while men are more likely to undergo LC in the elderly population (42).

Despite the consistency of our results with other studies in the literature, the present study has some limitations. We employed a biased sampling

technique, where the patients' records were not randomized, and thus the statistical significance should be interpreted cautiously. Furthermore, no control group was added to reduce the effects of potential confounding factors. Our retrospective analysis extended over a short period of time (one year) and involved a single medical institution.

CONCLUSION:

Consistent with our results, there is a sufficient evidence to conclude that asymptomatic gallstone patients as well as those presenting with mild symptoms should be managed conservatively. However, laparoscopic cholecystectomy remains to be the mainstay treatment for moderate to severe gallstone diseases and a selected group of asymptomatic patients. Clinicians are required to balance the data of each patient regarding the history of pain episodes, symptoms, radiographic findings, stone site, and gallbladder functionality to conclude the best suitable approach. For decision making, this might have a dual benefit to minimize undergoing unnecessary surgeries and decreasing the risk of developing distressing symptoms and subsequent cholelithiasis-related complications.

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