



Short-term Outcomes of Surgical Treatment of Benign Obstructive Jaundice, Sana'a, Yemen.

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ABSTRACT

Background: Obstructive jaundice is among the most challenging conditions managed by general surgeons and significantly contributes to high morbidity and mortality.

Objectives: This study evaluated the short-term outcomes of surgical treatment for benign obstructive jaundice.

Methods: A cross-sectional descriptive study was conducted prospectively at Al-Thawra Modern General Hospital between January 2019 and December 2021, including all patients with benign obstructive jaundice who underwent open surgical treatment.

Results: The study included 36 patients with a median age of 55 years, and female predominance (63.9%) compared with male predominance (36.1%). The most common preoperative diagnosis was common bile duct stones (66.7%), followed by postcholecystectomy biliary strictures (25%). Abdominal pain (91.7%) and jaundice (83.3%) were the most frequent symptoms. Twenty-four patients with CBD stones underwent cholecystectomy with CBD exploration with either T-tube drainage (17 patients) or choledochoduodenostomy drainage (5 patients), and only two patients underwent cholecystostomy tube drainage. However, all 9 patients with postcholecystectomy biliary strictures underwent hepaticoenterostomy drainage procedures. Postoperatively, the median length of hospital stay was 6.33 (2-15) days, and direct bilirubin levels decreased in most patients by the 7th day (88.9%). Wound infection (27.8%), mild pulmonary complications (19.4%), and moderate pulmonary complications requiring ICU admission (13.9%) were the most common complications. No mortality was recorded. **Conclusions:** Open surgical treatment of benign obstructive jaundice is safe and effective because improved abdominal pain, subsidence of obstructive jaundice features, and postoperative bilirubin level drop were observed in almost all patients. Wound infection and pulmonary complications were the most common complications. Common bile duct stones were the leading cause of this condition, and female preponderance was observed. Future studies should focus on optimizing the management of these patients, including minimizing postoperative complications such as wound infections.

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1. Introduction:

Benign obstructive jaundice is a common clinical problem that requires prompt evaluation and management [1]. It results from obstruction of bile flow within or outside the liver, leading to precipitation of bile components in tissues and symptoms of jaundice [2,3].

The causes of obstruction can be divided into intrahepatic or extrahepatic etiologies. Common intrahepatic causes include choledocholithiasis and strictures at the bile duct confluence due to chronic pancreatitis [4]. Extrahepatic obstruction commonly occurs from gallstone impaction in the common bile duct (CBD), which accounts for up to 80% of cases [5]. Other extrahepatic causes are pancreatic masses, choledochoceles, or CBD anomalies [6].

The manifestations of benign obstructive jaundice include generalized pruritus, anorexia, and dark urine [7]. Physical examination often reveals jaundiced sclera and skin, with possible right upper quadrant abdominal pain or tenderness. Laboratory findings show elevated serum bilirubin and alkaline phosphatase levels, accompanied by normal liver enzyme levels [8]. Surgery plays a key role in treating benign obstructive jaundice in selected patients. An individualized approach factoring in the severity of the disease and the patient's clinical status is recommended when selecting between different treatment alternatives. For extrahepatic obstruction, the most direct approach is open or laparoscopic cholecystectomy for gallstone-related bile duct obstruction [9]. Choledocholithotomy via transverse choledochotomy is performed to remove stones from the common bile duct (CBD) under direct vision or with endoscopic guidance. Malignant or benign CBD strictures can be managed by open or laparoscopic choledochoplasty/CBD exploration and biliary stenting [10]. Endoscopic retrograde cholangiopancreatography (ERCP) with endoscopic sphincterotomy and biliary stenting is now the first-line treatment for attempted bile duct stone removal because of its minimal invasiveness [11]. Percutaneous

transhepatic biliary drainage can also provide decompression for patients who have failed ERCP or when surgical risks are prohibitive [12]. Surgical intervention for obstructive jaundice promptly relieves bile obstruction and restore bile flow. Studies have consistently reported over 90% success for cholecystectomy and biliary bypass in relieving jaundice. High stone extraction rates, averaging 80-85%, have also been reported for ERCP [13,14,15]. Laparoscopic techniques significantly reduce the operation duration compared with open surgery across all procedures. The average duration ranged from 60 to 120 min depending on the complexity. [16,17]. With the use of minimally invasive options, the average postoperative stay has substantially decreased. The average length of stay after laparoscopic cholecystectomy and ERCP was 4-6 days, whereas the average length of stay was 1-2 weeks for open drainage procedures [18,19]. Morbidity rates remain low, at 5-10%, with minimal procedures such as ERCP and laparoscopy. On average, mortality is negligible (<1%) when procedures are appropriately selected for patient disease status [20,21].

Investigating the short-term outcomes of open surgical treatment for benign obstructive jaundice is of utmost importance for improving patient care and surgical management. The primary objective of this study was to evaluate the short-term outcomes of open surgical treatment in patients with benign obstructive jaundice. Specifically, we assessed postoperative complications, length of hospital stay, time to jaundice resolution, and overall mortality. The secondary objectives were to determine the common causes, clinical presentations, and surgical procedures used.

2. Patients and Methods

This was a cross-sectional descriptive study conducted prospectively at Al-Thawra Modern General Hospital between January 2019 and December 2021; all female and male patients diagnosed with benign obstructive jaundice who underwent open surgical treatment were

included. Patients with severe comorbid diseases, such as congestive heart failure or ischemic heart disease, were excluded.

After applying the inclusion and exclusion criteria, the study included 36 patients who underwent surgical treatment for benign obstructive jaundice.

2.1. Data collection

Data were collected throughout the pre- and postoperative hospital stay periods from 36 patients who met the inclusion criteria using a structured questionnaire based on prior studies [22, 23].

The relevant demographic characteristics, including age, sex, comorbidities, preoperative laboratory values, such as bilirubin levels, and imaging findings, such as the presence of gallstones or strictures, were collected. Detailed information regarding the surgical procedure was recorded, including the type of surgical intervention performed, such as biliary drainage or bile duct reconstruction. Postoperative data, including complications such as wound infections, bile leaks, and postoperative bleeding, were documented using standardized definitions. The duration of hospitalization from the time of surgery until discharge was recorded, and the time taken for bilirubin levels to return to normal or near-normal values was noted.

2.2. Outcome measures

The primary objective of this study was to evaluate the short-term outcomes of surgical treatment in patients with benign obstructive jaundice. Specifically, we assessed postoperative complications, length of hospital stay, time to jaundice resolution, and overall mortality. Secondary outcome measures included common causes, clinical presentations, and surgical procedures used.

2.3. Operative procedure

The elective surgical procedures were performed following the preoperative diagnosis based on clinical features, elevated direct bilirubin levels, and imaging studies such as ultrasound and/or CT scans. Because of the lack of facilities for

advanced laparoscopic surgery, an open surgical approach was chosen for surgery. Preoperative preparation included admitting patients to the surgical ward, providing informed consent, reviewing preoperative investigations (liver function tests, kidney function tests, coagulation profile, and blood group), and preparing blood and plasma.

Before surgery, patients were given intravenous fluids and antibiotics and kept at nil per mouth. The open surgical approach was performed under general anesthesia. A right subcostal incision was made, which provided good exposure to the peritoneal cavity. If still present, the gallbladder was identified, and the Calot triangle was dissected using a combination of sharp and blunt dissection techniques.

Once adequate exposure was achieved, the cystic artery and duct were identified, ligated, and divided. The gallbladder was then dissected free from its bed, with care taken to avoid injury to adjacent structures such as the common bile duct (CBD) and hepatic artery. Hemostasis was achieved using electrocautery or ligatures as necessary.

Following complete removal of the gallbladder, attention was turned to CBD exploration. CBD was palpated to detect the presence and location of any stones. Confirmation of CBD was achieved by aspirating bile using a fine-tip syringe, and two stay sutures were placed. A small longitudinal incision (choledochotomy) was made between the stay sutures using a number 11 knife, which was then extended with Potts scissors.

CBD stones were extracted using Randle stone forceps, both proximally and distally. A small silicone tube was passed superiorly and inferiorly to irrigate the CBD with saline. A Fogarty balloon catheter was inserted superiorly and inferiorly, and the catheter was inflated and gently pulled to remove any remaining stones. Choledochotomy was either closed over a T-tube or anastomosed to the duodenum using absorbable sutures, depending on the diameter of CBD.

In cases of postcholecystectomy biliary stricture, the procedure involved meticulous dissection of the portal triad near the porta hepatis. The stump of the common hepatic duct was identified by its color and anatomical structure and confirmed by bile aspiration using a fine-tip syringe. Care was taken not to injure the hepatic artery or portal vein. The stump of the common hepatic duct was incised, and the anatomy was confirmed by passing a small tube through both the right and left hepatic ducts. Hepaticojejunostomy was performed starting with the posterior wall using interrupted absorbable stitches.

In cases of hydatid cysts with cystobiliary communication, the procedure included endocystectomy and closure of the biliary communications using nonabsorbable stitches via a figure-of-eight technique. Then we did common bile duct exploration as described above.

In all patients, a subhepatic drain was inserted. The abdominal layers were closed in a standard fashion, and a sterile dressing was applied to the incision site. The patients were extubated and transferred to the recovery area in stable condition.

Postoperatively, the patients received intravenous fluids and antibiotics. Venous thromboembolism prevention measures were implemented according to established guidelines. Patients in the T-tube group initiated oral feeding on the second postoperative day, whereas those with enterostomy started oral feeding on the fifth postoperative day. Abdominal drains were removed once minimal serous fluid output was observed.

T-tube patients underwent a cholangiogram on postoperative day 10 to confirm CBD patency before T-tube removal.

2.4. Statistical analysis

Descriptive statistics will be used to summarize the collected data. Continuous variables are presented as means with standard deviations or medians with interquartile ranges, depending on their distribution. Categorical variables were presented as frequencies and percentages. IBM

SPSS Statistics, version 26.0, was used to conduct the statistical analyses.

2.5. Ethical aspects

Approval from the Al-Thawra Modern General Hospital administration was obtained for this investigation. Before surgery, each patient signed a consent document. In addition, we adhered to the principles of the Helsinki Declaration when conducting this study.

3. Results

3.1. Demographic characteristics

Gender

The study included 36 patients; females (n=23, 63.9%) made up most patients compared with males (n=13, 36.1%) (**Figure 1**).

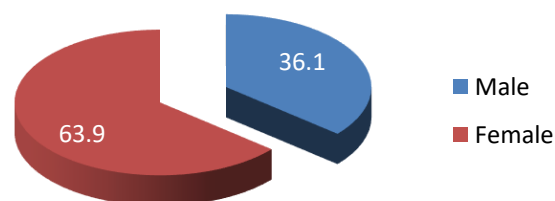


Figure 1: Sample distribution by gender

Age

The median age of the patients was 55 (15-80) years. The age group 51–71 years was the most common age group, followed by the other age groups (36-50 years), as shown in **Figure 2**.

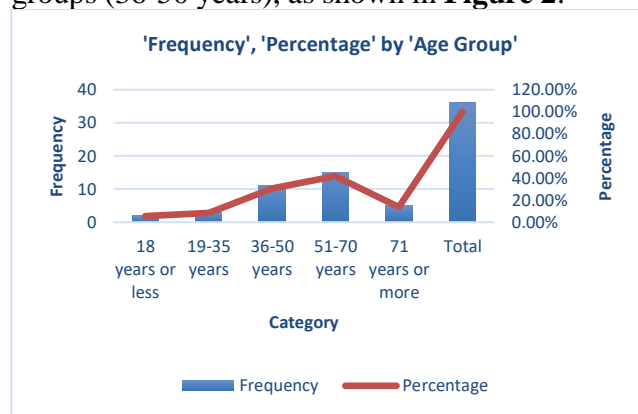


Figure 2: Sample distribution by age

Comorbidities

Concerning concomitant comorbidities, a total of eight individuals (22.2%) had diabetes mellitus, approximately 19.4% of the patient cohort had hypertension, two subjects (5.6%) reported a history of smoking, and only two patients (5.6%) were diagnosed with viral hepatitis (**Figure 3**).

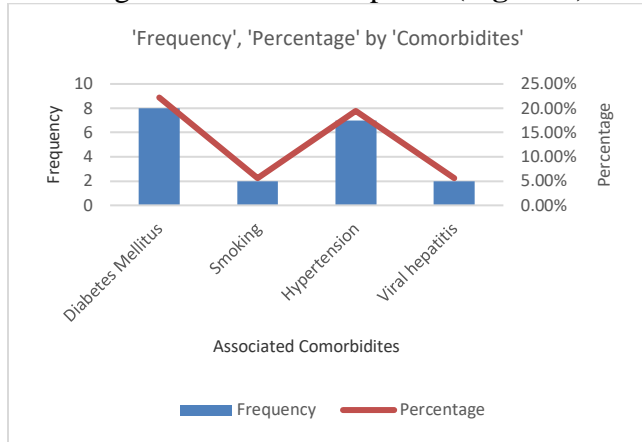


Figure 3: Sample distribution by comorbidities

3.2. Short-term Outcomes

The mean duration of hospitalization for the study participants was 6.33 days, ranging from 2 to 15 days. In terms of clinical postoperative outcomes, notable improvements were observed in abdominal pain and the resolution of obstructive jaundice symptoms, including jaundice, pruritus, and changes in urine and stool color.

Regarding laboratory postoperative outcomes, a decrease in postoperative bilirubin levels was observed in 32 patients (88.9%), whereas the remaining four patients had normal preoperative bilirubin levels because of prior stent insertion through endoscopic retrograde cholangiopancreatography (ERCP).

With regard to postoperative complications, one patient experienced a bile leak that resolved spontaneously. Wound infection occurred in ten patients (27.8%). Mild pulmonary complications were observed in seven patients (19.4%), whereas five patients (13.9%) required admission to the intensive care unit (ICU) and supplemental oxygen because of more severe pulmonary complications. None of the patients developed severe pulmonary complications necessitating tracheal intubation or mechanical ventilation.

Moreover, no instances of postoperative bleeding, small bowel fistula, intra-abdominal abscess, myocardial infarction, renal failure, or mortality were reported among the study participants (**Table 1**).

Table 1. Short-term postoperative outcomes and complications

Short-term postoperative outcomes and complications	Frequency	Percentage
Mild pulmonary complications	7	19.4%
Pulmonary complications requiring ICU admission without intubation	5	13.9%
Wound infection	10	27.8%
Bile leak	1	2.8%

3.3. Preoperative clinical presentation

In terms of clinical features, most patients (83.3%) were presented with jaundice, whereas approximately 91.7% experienced abdominal pain. Nausea or vomiting was reported by fourteen patients (38.9%), and approximately 19.4% had fever. Changes in urine and stool color were observed in fourteen patients, and itching was reported by approximately 47.2% of the patients. Five individuals reported appetite loss (13.9%), and only two patients reported weight loss (**Table 2**).

Table 2. Preoperative clinical symptoms

Clinical symptoms	Frequency	Percentage
Abdominal pain	33	91.70%
Jaundice	30	83.30%
Itching	17	47.20%
Nausea or vomiting	14	38.90%
Urine and stool color changes	14	38.90%
Fever	7	19.40%
Loss of appetite	5	13.90%
Loss of weight	2	5.60%

The duration of illness before presentation varied, with most patients (52.8%) experiencing symptoms for one week to 1 month (**Figure 4**).

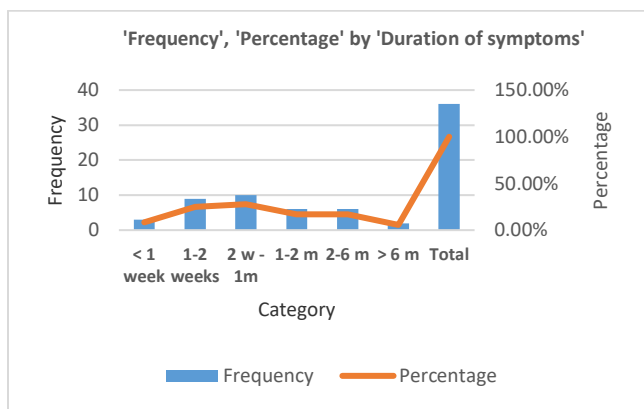


Figure 4: Sample distribution by the duration of symptoms

Preoperative laboratory investigations, including liver function tests, revealed elevated total and direct bilirubin levels in most patients and increased alkaline phosphatase levels in 26 patients (72.2%). Elevated serum ALT and AST levels were observed in 23 patients (63.9%) (Table 3).

Table 3. Statistical analysis of the preoperative laboratory results

Variables	Hb	WBC	Albumin	INR	Creatinine
Mean	12	12	32	1.3	0.9
Median	12	11.5	32	1.2	0.9
Standard Deviation	1.9	4.98	5.634	0.36	0.43
Range	6	22	27	2.07	2.4
Minimum	9	2	19	0.83	0.1
Maximum	15	24	46	2.9	2.5

Preoperative imaging, which was conducted through ultrasound and/or CT scans, was performed for all patients. In patients with choledocholithiasis, the mean diameter of the common bile duct was 16 mm.

3.4. Diagnosis

Regarding the etiology of benign obstructive jaundice, common bile duct stones were identified in approximately two-thirds (66.7%) of the patients, whereas postcholecystectomy biliary stricture was present in approximately 25% of the patients. Hydatid cysts accounted for approximately 8.3% of the patients (Figure 5).

Of the patients included in the study, twelve individuals (33.3%) underwent preoperative endoscopic retrograde cholangiopancreatography (ERCP) as part of their diagnostic and therapeutic management. Unfortunately, ERCP was unsuccessful at extracting stones in these patients. However, among those who underwent ERCP, four patients received a stent as an intervention to alleviate the obstruction caused by the stones.

3.5. Surgical procedures

Concerning the types of open surgical interventions, common bile duct exploration and T-tube placement were performed in twenty patients (55.6%). Five patients (13.8%) underwent common bile duct exploration and choledochoduodenostomy, whereas cholecystostomy was performed in only two patients. In addition, all nine patients with common hepatic duct strictures underwent hepaticoenterostomy (Figure 5).

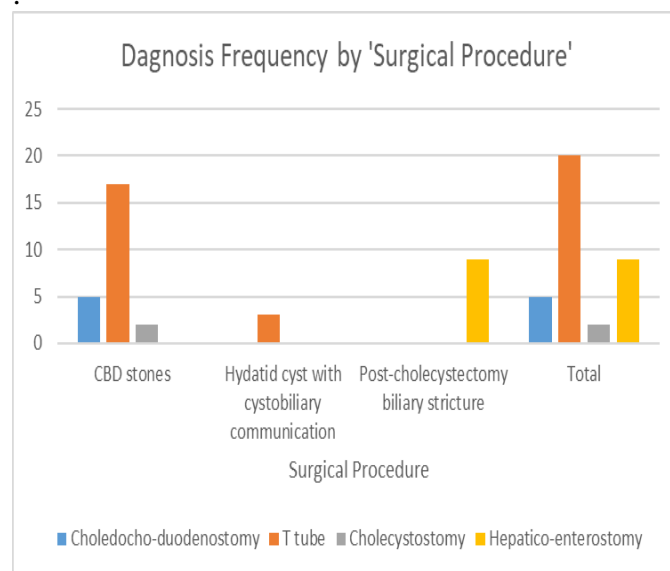


Figure 5: Diagnosis distribution using surgical procedure

4. Discussion

The present study aimed to evaluate the short-term outcomes of surgical treatment for patients with benign obstructive jaundice, specifically focusing on common bile duct stones, hydatid cysts with biliary communication, and postcholecystectomy biliary strictures. Our findings provide valuable insights into the clinical features, etiology,

preoperative investigations, surgical interventions, and postoperative outcomes of these patients.

Consistent with the findings of previous studies conducted worldwide, common bile duct stones were the most common cause of benign obstructive jaundice in our patients [24,25]. This emphasizes the importance of recognizing and promptly addressing this condition. Additionally, the observed higher prevalence of female patients aligns with the literature, sex-related susceptibility to certain biliary disorders [24,25,26].

Abdominal pain and jaundice were the most common clinical features identified in our study, consistent with previous findings [27,28]. These symptoms serve as important indicators of the presence of obstructive jaundice and can guide further diagnostic and therapeutic interventions.

The duration of illness varied among our patients, with the majority experiencing symptoms for one week to 1 month. This timeframe aligns with those of previous studies and highlights the need for early detection and intervention to prevent disease progression and associated complications [22].

Our preoperative laboratory investigations revealed elevated levels of total and direct bilirubin in most patients, as well as increase alkaline phosphatase levels. These findings are consistent with those of other studies and further support the diagnostic significance of these markers in the assessment of biliary obstructions [22].

Preoperative imaging via ultrasound and/or CT provided valuable information regarding the common bile duct diameter in patients with choledocholithiasis, for whom the mean diameter was 16 mm. This measurement serves as a useful reference for clinicians in assessing the severity of obstruction and determining the appropriate surgical approach [23].

Although endoscopic retrograde cholangiopancreatography (ERCP) is generally considered the gold standard for imaging and therapeutic interventions in biliary diseases, our study revealed that preoperative ERCP was less effective than the standard approach [27]. However, it is worth noting that the success rate of stone extraction was relatively low in our study, as only four out of twelve patients who underwent

ERCP received a stent. This highlights the need for further research and improvement in the management of patients with obstructive jaundice.

In terms of surgical interventions, our study demonstrated that cholecystectomy with common bile duct exploration, along with T-tube drainage or choledochoduodenostomy, was the primary approach for patients with common bile duct stones. This differs from the findings of S. Kassa et al. [23] suggested possible regional or institutional variations in treatment preferences. In addition, hepaticoenterostomy was the chosen procedure for patients with postcholecystectomy biliary stricture, which is consistent with the literature [22,28].

The average hospital stay of 6.33 days, with a range of 2 to 15 days, most patients were likely able to return to their normal lives in a relatively short post-surgery period. This indicates a favorable short-term outcome for surgical treatment in terms of recovery time. However, the variability in hospitalization duration may indicate individual differences in recovery, which could be attributable to factors such as age, overall health, complexity of the surgery, or the presence of comorbidities.

Substantial improvements in clinical symptoms after surgery are encouraging, demonstrating the effectiveness of the surgical approach in alleviating the physical manifestations of obstructive jaundice. The resolution of symptoms such as abdominal pain, jaundice, pruritus, and changes in urine and stool color signifies a return to physiological normalcy for most patients. In addition, the decrease in bilirubin levels in 88.9% of patients is a clear biochemical marker of success in relieving biliary obstruction. However, it is worth noting that the remaining patients did not show a decrease in postoperative bilirubin levels, likely due to prior stent insertion through ERCP, which had already addressed the obstruction before surgery. This emphasizes the need for individualized treatment approaches [22,28].

Our study appears to be consistent with other reported outcomes. For example, a study from South-Western Uganda also observed notable clinical improvements following surgical treatment

for extrahepatic obstructive jaundice, with a higher number of surgical treatments performed in the benign group [29].

The reported postoperative complications highlight the risks associated with surgical treatment. The occurrence of a bile leak in one patient, although it resolved spontaneously, is a reminder of the potential for surgical complications. Wound infections in 27.8% of patients and pulmonary complications in a significant minority indicate areas where postoperative care could be enhanced. It is acknowledged in the literature that surgery in jaundiced patients is associated with a higher risk of postoperative complications compared with non-jaundiced patients, including septic complications and renal failure [30]. However, in our study, the incidence was greater than that in other reports [31]. This highlights the importance of implementing effective perioperative infection prevention measures and further investigating the contributing factors in our patient population.

The fact that none of the patients experienced severe pulmonary complications requiring invasive interventions is reassuring; however, the necessity of ICU admission for 13.9% of patients raises questions about the factors that may predispose certain individuals to more severe complications. This could be an important area for further investigation because understanding these factors could lead to better preoperative risk assessment and management.

Several limitations of the cross-sectional descriptive design of this study should be acknowledged. First, the lack of a temporal relationship inherent in this design hinders the ability to establish cause-and-effect relationships or assess changes over time. Additionally, the inability to establish causal relationships and the potential for selection bias limit the generalizability of the findings. Furthermore, the study design does not allow for assessing prevalence trends or the control of confounding variables. These limitations highlight the need for caution when interpreting the findings and call for future research using more robust study designs to address them and provide a more comprehensive understanding of the topic.

5. Conclusions

Our study results showed that surgical treatment for benign obstructive jaundice is generally effective and associated with acceptable short-term outcomes. The majority of patients experienced significant clinical improvement with a relatively short hospital stay and manageable complications. Moving forward, efforts should focus on reducing the incidence of complications such as wound infections and mild pulmonary issues, as well as understanding the patient-specific factors that contribute to the variability in outcomes. This could ultimately lead to optimized patient care and even better surgical outcomes for future patients with benign obstructive jaundice.

Recommendation

Based on our findings regarding short-term outcomes of surgical treatment for benign obstructive jaundice, we recommend the following: 1) continued monitoring and optimization of hospital stay durations, potentially through the use of minimally invasive surgical techniques where applicable; 2) further investigation into pre-operative and postoperative care protocols to reduce the variability in patient recovery times and to minimize the incidence of complications such as wound infections and pulmonary issues; 3) more rigorous preoperative risk assessments to identify patients at higher risk of postoperative complications, particularly for those requiring ICU care; and 4) implementation of standardized reporting for outcomes and complications across studies to facilitate more effective comparisons and evidence-based improvements in surgical care for patients with benign obstructive jaundice.

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Conflicts of interest/and competing interests

The authors declare no conflicts of interest.

Financial Disclosure

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