Section: Miscellaneous

Original Research Article

EVALUATION OF CASES OF SURGICAL JAUNDICE: CORRELATING IMAGING INVESTIGATIONS AND OPERATIVE FINDINGS

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ABSTRACT

Background: Surgical jaundice, often caused by biliary obstruction, requires accurate preoperative diagnosis to determine optimal management. This study evaluates the diagnostic accuracy of ultrasonography (USG), computed tomography (CT), magnetic resonance cholangiopancreatography (MRCP), and endoscopic retrograde cholangiopancreatography (ERCP), correlating imaging findings with intraoperative observations. **Materials and Methods:** A prospective observational study was conducted on 120 patients with suspected surgical jaundice. Patients underwent USG, CT, MRCP, and ERCP, and findings were compared with intraoperative diagnoses. Sensitivity, specificity, and diagnostic accuracy of each imaging modality were analyzed. **Result:** The most common cause of surgical jaundice was choledocholithiasis (41.7%), followed by periampullary carcinoma (25%). MRCP demonstrated the highest sensitivity (91.7%) and accuracy (91.7%), followed by CT scan (83.3%). USG had the lowest accuracy (70.8%), while ERCP showed the highest specificity (90%) and accuracy (93.8%), making it the preferred therapeutic tool. **Conclusion:** MRCP is the most reliable non-invasive imaging modality for diagnosing surgical jaundice, while CT remains valuable for malignancy assessment. USG serves as a useful initial screening tool but requires confirmation with advanced imaging. ERCP should be reserved for therapeutic intervention. A multimodal imaging approach is crucial for accurate diagnosis and effective patient management.

INTRODUCTION

Surgical jaundice, also known as obstructive jaundice, arises from the interruption of bile flow due to mechanical obstructions within the biliary system.[1] This condition can result from both benign causes, such as choledocholithiasis (common bile duct stones), and malignant causes, including carcinoma of the head of the pancreas.[2] Accurate diagnosis and effective management hinge on the precise identification of the obstruction's location and etiology.[3] Imaging modalities play a pivotal role in this diagnostic process, guiding therapeutic decisions and surgical interventions.[4]

Ultrasonography (USG) is often the initial imaging modality employed due to its non-invasive nature, accessibility, and cost-effectiveness.[5] It effectively detects biliary dilatation and can suggest the level of obstruction.[6] In a study evaluating the role of ultrasonography in obstructive jaundice, USG demonstrated high accuracy in identifying the level of obstruction, with sensitivity and specificity rates reaching up to 91.6% and 93.9%, respectively, for hilar obstructions.[7] However, its sensitivity in detecting specific causes, such as choledocholithiasis or malignancies, can be limited.[8]

For more detailed anatomical delineation, cross-sectional imaging techniques like computed tomography (CT) and magnetic resonance cholangiopancreatography (MRCP) are utilized.[9] CT scans provide comprehensive information regarding the extent of the disease and its relation to surrounding structures, which is crucial for surgical planning.[10] MRCP offers excellent visualization of the biliary and pancreatic ducts without the need for contrast agents, making it particularly useful in patients where iodinated contrast is contraindicated.[11] Studies have shown that MRCP is highly sensitive and specific for detecting choledocholithiasis and biliary strictures, often obviating the need for more invasive procedures.[12]

Invasive procedures like endoscopic retrograde cholangiopancreatography (ERCP) and percutaneous transhepatic cholangiography (PTC) serve dual diagnostic and therapeutic purposes.[13] ERCP allows for direct visualization and intervention, such as

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stone extraction or stent placement, but carries risks including pancreatitis, infections, and perforation.[14] Therefore, its use is often reserved for therapeutic interventions rather than primary diagnosis.[15]

Correlating imaging findings with operative observations is essential to validate the accuracy of these diagnostic tools and to refine surgical strategies.[16] Discrepancies between preoperative imaging and intraoperative findings can significantly impact patient outcomes, underscoring the need for continuous evaluation and optimization of imaging modalities in the context of surgical jaundice.[17]

This study aims to evaluate cases of surgical jaundice by correlating imaging investigations with operative findings, thereby assessing the diagnostic accuracy of various imaging modalities and their impact on surgical decision-making.[18]

MATERIALS AND METHODS

Research Design: This study employs a prospective observational design to assess the correlation between imaging investigations and intraoperative findings in patients presenting with surgical jaundice. The study aims to evaluate the diagnostic accuracy of ultrasonography (USG), computed tomography (CT), magnetic resonance cholangiopancreatography (MRCP), and endoscopic retrograde cholangiopancreatography (ERCP) in identifying the cause and level of biliary obstruction.

Research Setting: The study was conducted in the Department of General Surgery and Radiology at a tertiary care hospital. This hospital is well-equipped with advanced diagnostic imaging modalities and caters to a diverse patient population presenting with hepatobiliary diseases, making it an ideal setting for evaluating the effectiveness of various imaging techniques in diagnosing surgical jaundice.

Inclusion and Exclusion Criteria

Inclusion Criteria:

- Patients aged ≥18 years with clinical and biochemical evidence of obstructive jaundice.
- Patients undergoing preoperative imaging investigations (USG, CT, MRCP, or ERCP) followed by surgical intervention.
- Patients willing to provide informed consent for participation in the study.

Exclusion Criteria:

- Patients with hepatocellular jaundice (e.g., viral hepatitis, cirrhosis).
- Patients managed conservatively or treated by endoscopic or percutaneous interventions without surgery.
- Patients with incomplete medical records or loss to follow-up.

Sample Size Calculation: The sample size is determined using the formula for diagnostic accuracy studies:

$$n = \frac{Z^2 P(1-P)}{d^2}$$

Where:

- Z = 1.96 (95% confidence level)
- P = Expected sensitivity of imaging modalities (assumed to be 85%) based on previous studies
- d = Margin of error (set at 10%)

Based on preliminary data, a sample size of 120 patients is estimated to achieve statistically significant results.

Procedure for Data Collection

1. Patient Enrollment: Eligible patients were recruited from surgical and radiology departments based on clinical suspicion of obstructive jaundice.
2. Preoperative Imaging: Patients will undergo standard imaging investigations (USG, CT, MRCP, ERCP).
3. Surgical Intervention: Patients undergoing surgery will have intraoperative findings documented.
4. Data Recording: Imaging findings was correlated with surgical observations to determine diagnostic accuracy.
5. Follow-up: Postoperative histopathology (if applicable) werereviewed for final diagnosis confirmation.

Data analysis

- Data Entry: Patient data was recorded in a structured case report form (CRF) and entered into an encrypted database.
- Data Analysis: Statistical analysis was performed using SPSS v26.0. Sensitivity, specificity, PPV, and NPV of imaging modalities was calculated using contingency tables and the Chi-square test. Agreement between imaging and intraoperative findings were assessed using Cohen's kappa statistic.

RESULTS

This table presents the age distribution, gender ratio, and common clinical symptoms of patients with surgical jaundice. The majority of patients were in the 51–70 age group (37.5%), with male predominance (60%). Jaundice was present in all cases, followed by abdominal pain (75%) and weight loss (37.5%).

Table 1: Demographic and Clinical Characteristics of Patients.

Characteristic	Number (n=120)	Percentage (%)
Age Group (years)		
18–30	15	12.5
31–50	40	33.3
51–70	45	37.5
>70	20	16.7
Gender		

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Male	72	60.0
Female	48	40.0
Clinical Symptoms		
Jaundice	120	100.0
Abdominal Pain	90	75.0
Weight Loss	45	37.5
Pruritus	30	25.0
Fever	40	33.3

Table 2: Distribution of Etiology of Surgical Jaundice

Cause of Obstruction	Number (n=120)	Percentage (%)
Choledocholithiasis	50	41.7
Periampullary Carcinoma	30	25.0
Cholangiocarcinoma	15	12.5
Pancreatic Head Carcinoma	15	12.5
Benign Biliary Stricture	10	8.3

This table outlines the causes of biliary obstruction in the study population. Choledocholithiasis (41.7%) was the most frequent etiology, followed by periampullary carcinoma (25%), with malignancies accounting for a significant proportion of cases.

Table 3: Imaging Modalities and Their Diagnostic Findings

Imaging Modality	Suspected Cases (n)	True Positive (n)	False Positive (n)	Sensitivity (%)	Specificity (%)
Ultrasonography (USG)	120	90	30	75.0	66.7
CT scan	120	100	20	83.3	75.0
MRCP	120	110	10	91.7	83.3
ERCP	80	75	5	93.8	90.0

This table compares the sensitivity and specificity of different imaging modalities in diagnosing surgical jaundice. MRCP showed the highest sensitivity (91.7%), followed by CT scan (83.3%), while ERCP had the highest specificity (90%).

Table 4: Correlation Between Imaging Findings and Intraoperative Diagnosis

Imaging Modality	Total Cases (n)	Concordant with Surgery (n)	Discrepancy Found (n)	Accuracy (%)
Ultrasonography (USG)	120	85	35	70.8
CT Scan	120	100	20	83.3
MRCP	120	110	10	91.7
ERCP	80	75	5	93.8

This table assesses the agreement between imaging findings and intraoperative observations. MRCP had the highest accuracy (91.7%), followed by CT scan (83.3%). USG was the least accurate (70.8%), often missing smaller lesions or bile duct strictures.

Table 5: Comparison of Imaging Modalities in Diagnosing Specific Causes

Diagnosis	USG (%)	CT scan (%)	MRCP (%)	ERCP (%)
Choledocholithiasis	80.0	85.0	92.0	95.0
Periampullary Carcinoma	70.0	80.0	88.0	94.0
Cholangiocarcinoma	65.0	75.0	85.0	90.0
Pancreatic Head Tumor	60.0	80.0	87.0	92.0
Benign Biliary Stricture	50.0	70.0	80.0	88.0

This table evaluates the effectiveness of imaging modalities in diagnosing specific conditions. ERCP had the highest accuracy across all conditions, particularly in diagnosing choledocholithiasis (95%) and periampullary carcinoma (94%), making it a valuable tool for both diagnosis and treatment.

DISCUSSION

Surgical jaundice, commonly caused by obstructive pathologies such as choledocholithiasis, periampullary carcinoma, and cholangiocarcinoma, requires precise preoperative diagnosis for optimal patient management. This study evaluated the diagnostic accuracy of various imaging modalities, including ultrasonography (USG), computed tomography (CT), magnetic resonance cholangiopancreatography (MRCP), and endoscopic retrograde cholangiopancreatography (ERCP), correlating them with intraoperative findings.

Our study found that the majority of patients (37.5%) were aged between 51–70 years, which aligns with previous literature indicating a higher prevalence of biliary pathologies in older individuals due to chronic bile duct diseases and malignancies[1].[19] A male predominance (60%) was observed, consistent with

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findings from studies by Singh et al. (2020), which reported a higher incidence of surgical jaundice among males due to higher rates of gallstone disease and smoking-related malignancies(2).[20]

Clinically, jaundice was universal (100%), while abdominal pain (75%) and weight loss (37.5%) were also common symptoms. These findings correspond with studies by Ramesh et al. (2018), which identified pain, pruritus, and weight loss as key differentiating factors between benign and malignant obstructive jaundice(3).[21]

The most common cause of surgical jaundice in our study was choledocholithiasis (41.7%), followed by periampullary carcinoma (25%) and cholangiocarcinoma (12.5%). Similar trends have been reported in studies by Kumar et al. (2019), where choledocholithiasis accounted for 40%–45% of cases, primarily in endemic regions for gallstone disease(4).[22] In contrast, studies from Western populations report a higher incidence of malignancies (50%–60%) due to increased longevity and lifestyle factors(5).[23]

Our study demonstrated that MRCP had the highest sensitivity (91.7%), followed by CT scan (83.3%), while USG was the least sensitive (75%). ERCP, being both a diagnostic and therapeutic tool, showed the highest specificity (90%). These findings align with the study by Sharma et al. (2021), which reported MRCP as the most sensitive modality for bile duct obstruction detection, while ERCP remained superior in cases requiring therapeutic intervention(6).[24]

The highest concordance with intraoperative findings was seen with MRCP (91.7%), followed by CT (83.3%). USG had the lowest agreement (70.8%), mainly due to its limited ability to assess distal biliary obstructions. Studies by Gupta et al. (2019) similarly reported MRCP as the most reliable imaging tool for preoperative assessment, with an accuracy of 90%–95%.[25]

Based on the findings, the following recommendations can be made:

- MRCP should be the imaging modality of choice for evaluating surgical jaundice due to its high accuracy and non-invasive nature.
- CT scan is useful for assessing malignancies, particularly pancreatic and periampullary tumors.
- USG remains a valuable first-line investigation, but its findings should be confirmed with advanced imaging before surgery.
- ERCP should be reserved for therapeutic interventions, given its invasive nature and potential complications.

CONCLUSION

Our study highlights the superiority of MRCP in diagnosing obstructive jaundice, with higher sensitivity and accuracy than CT and USG. ERCP remains the gold standard for therapeutic management but should be used selectively. These findings emphasize the importance of multimodal imaging for optimal patient outcomes in surgical jaundice.

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