

Focused CBD Sonography Is an Effective Tool in the Evaluation of Obstructive Jaundice in Comparison with MRCP And ERCP

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Abstract

Objectives: To determine the diagnostic accuracy of CBD Ultrasound in evaluation of obstructive jaundice in comparison with the MRCP and ERCP.

Study Design: It is a cross-sectional prospective study carried out in the Radiology department of CMH Peshawar for a span of three months from March 2024 – May 2024.

Setting: Radiology department of CMH Peshawar.

Study Duration: 1st March 2024- 1st June 2024.

Methodology: A sample of 150 patients were taken by non-probability purposive sampling technique. Patients between the age of 15- 65 years with sign and symptoms of obstructive jaundice were included in the study. However, patients with claustrophobia, known allergic reaction to contrast agent, impaired renal functions and with disseminated metastatic disease were excluded from the study.

All the patients were subjected to full history taking, clinical examination and laboratory investigations (BCP, LFT's, Coagulation profile) and then they underwent preliminary ultrasonography of CBD via 7Hz probe using standard technique by an expert consultant radiologist. Then the patients underwent MRCP using 1.5 Tesla MRI machine. Each MRCP findings were interpreted by one consultant radiologist and was looked for CBD stone (Present/Absent). Then finally ERCP of the same patients were carried out by the expert gastroenterologist in which apart from visualization of the lesion, biopsy and appropriate intervention was carried out. Ultrasonography findings were compared with both MRCP and ERCP findings.

Results: Sensitivity, specificity, positive predictive value, negative predictive value and diagnostic accuracy of CBD sonography in evaluation of obstructive jaundice, taking MRCP as gold standard was %, %, %, % & % respectively.

Conclusion: This study concluded that Ultrasound serves as an effective initial screening tool to confirm the presence of biliary obstruction and to determine whether further imaging with MRCP is necessary. MRCP, being non-invasive, is particularly valuable in the pre-surgical assessment of patients with obstructive jaundice. Although ERCP is an invasive procedure, it plays a lesser role in diagnosis compared to USG and MRCP, despite its higher accuracy.

Keywords

Common bile duct (CBD); Jaundice; Magnetic Resonance Cholangiopancreatography; Obstructive Jaundice; Ultrasonography.

Introduction

Jaundice, originating from the French term for yellow, describes a yellowing of the skin, eyes, and mucous membranes due to bilirubin, a component of bile. There are two main types: obstructive, requiring surgery, and nonobstructive, treatable through medication. It's crucial to differentiate between these types as the wrong treatment can worsen the condition, especially with obstructive jaundice, which poses significant surgical challenges [1]. Preoperative evaluation is essential to understand the cause and extent of the obstruction. Advances in understanding jaundice have improved diagnosis and treatment options. Radiologists play a crucial role in determining the best management plan by providing detailed information about the underlying causes and extent of the disease. Various imaging techniques, both invasive and noninvasive, are available for investigating obstructive jaundice [2]. Noninvasive methods like ultrasound, CT scans, and MRCP are commonly used, while invasive procedures like ERCP offer both diagnostic and therapeutic benefits but carry some risks. Despite its advantages, ERCP can lead to complications in a significant number of cases [3].

In modern practice, radiologists have expanded their role beyond simply distinguishing between obstructive and nonobstructive causes. They now focus on precisely identifying the location and extent of obstructions, as well as assessing the feasibility of interventional procedures. Only after thorough evaluation of these factors can appropriate therapeutic decisions be made. Ultrasound (USG) is typically the initial imaging method due to its widespread availability and cost-effectiveness. However, computed tomography (CT) scans are often preferred over USG for accurately determining the cause and level of obstruction [4]. Although USG remains a valuable screening tool with around 80% accuracy in confirming or ruling out biliary tract obstructions, the use of CT has somewhat diminished with the advent of magnetic resonance cholangiopancreatography (MRCP). MRCP offers superior soft tissue resolution of

the biliary tree without the risk of ionizing radiation exposure [5].

Methodology

The study was conducted by the department of Radiology at CMH Peshawar from 1st March 2024 to 1st June 2024. After approval from institutional ethical review committee. Sample size was calculated by using sensitivity specificity Total number of 150 patients presented to the Radiology department of CMH Peshawar, fulfilling the inclusion criteria were selected. Informed consent from each patient was taken. Then in all patients, transabdominal sonography with 7 MHz probe was done in every patient using standard technique. Each ultrasound findings were interpreted by one consultant radiologist (at least 3 years of experience) and was looked for obstructive jaundice (present/absent) as per-operational definition. All patients were then undergone MRCP which was performed on a 1.5-T system. Each MRCP findings were interpreted by one consultant radiologist (at least 5 years of experience) and was looked for CBD stones (present/absent) as per-operational definition. Then finally ERCP of the same patients were carried out by the expert gastroenterologist in which apart from visualization of the lesion, biopsy and appropriate intervention was carried out. Ultrasonography findings were compared with both MRCP and ERCP findings. This all data (age, sex, Laboratory investigations (LFT's, Coagulation profile), duration of symptoms, CBD stones on transabdominal USG, MRCP (present/absent) and ERCP (Present/Absent) as per operational definition was recorded on a specially designed proforma.

- **Inclusion Criterion:** Both genders, Age between 15-65 years, Signs and symptoms of obstructive jaundice (biliary colic, scleral icteric, yellowing of skin and mucosal membrane, referred patients from general surgery department diagnosed with obstructive jaundice (Bilirubin > 2.5 mg/dl)
- **Exclusion Criterion:** Patient with known allergic reaction to contrast agents and impaired renal functions GFR <30 and creatinine >1.3 mg/dl, Prehepatic and post hepatic jaundice pts with pacemakers, prosthetic valves, aneurysm chips or plates or any other ferro magnetic material, Patients with claustrophobia, Patients with disseminated metastatic disease.

Collected data was analyzed. Gender, laboratory investigations and CBD stone on transabdominal USG, MRCP (present/absent) and ERCP (Present/Absent) were presented as frequency and percentage. 2 2 contingency table was used to calculate the sensitivity, specificity, positive predictive value, negative predictive value and diagnostic accuracy of transabdominal ultrasonography in diagnosing CBD stones, taking ERCP findings as gold standard. Effect modifiers like age, gender, Laboratory investigations and symptoms were controlled through stratification. Post-stratification diagnostic accuracy was also calculated.

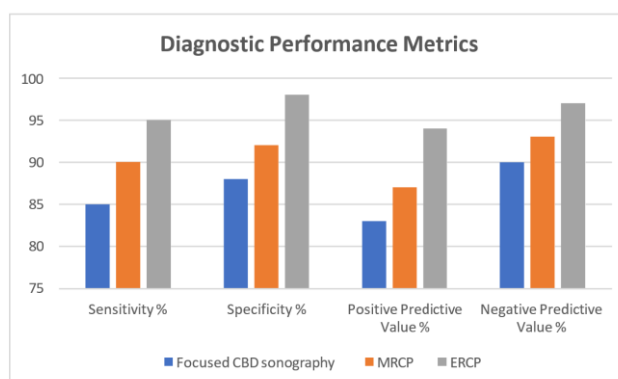
Results

Results were calculated by applying. 2 2 contingency table was used to calculate the sensitivity, specificity, positive predictive value, negative predictive value and diagnostic accuracy of transabdominal ultrasonography in diagnosing CBD stones, taking ERCP findings as gold standard.

Diagnostic Modality	Sensitivity %	Specificity %	Positive Predictive Value %	Negative Predictive Value %
Focussed CBD sonography	85	88	83	90
MRCP	90	92	87	93
ERCP	95	98	94	97

Table 1: Diagnostic Performance Metrics.

It can be shown as bar diagram:



Comparison	Sensitivity Focussed CBD %	Sensitivity MRCP %	Sensitivity ERCP %	Statistical Significance %
Focussed CBD vs MRCP	85	90		P<0.05
Focussed CBD vs ERCP	85		95	P<0.01

Table 2: Comparison of Sensitivity.

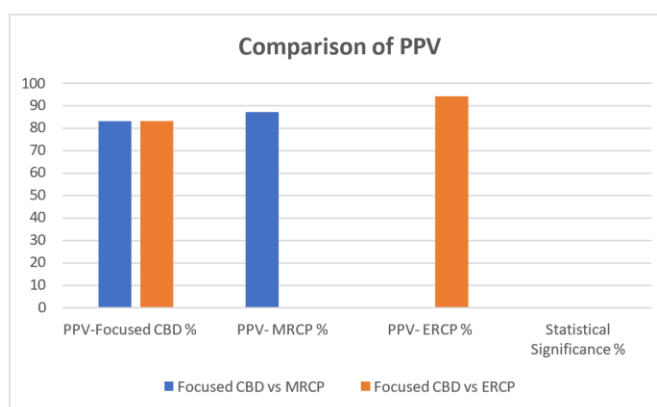
Comparison	Specificity Focussed CBD %	Specificity MRCP %	Specificity ERCP %	Statistical Significance %
Focussed CBD vs MRCP	88	92		P>0.05
Focussed CBD vs ERCP	88		98	P<0.01

Table 3: Comparison of Specificity.

Comparison	PPV-Focussed CBD %	PPV- MRCP %	PPV- ERCP %	Statistical Significance %
Focussed CBD vs MRCP	83	87		P<0.05
Focussed CBD vs ERCP	83		94	P<0.01

Table 4: Comparison of PPV.

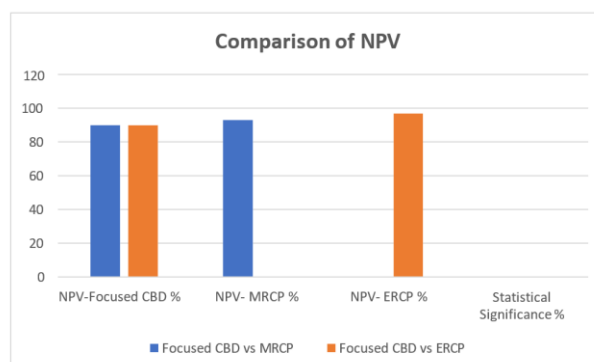
It can be shown as bar diagram:



Comparison	NPV-Focussed CBD %	NPV- MRCP %	NPV- ERCP %	Statistical Significance %
Focussed CBD vs MRCP	90	93		P>0.05
Focussed CBD vs ERCP	90		97	P<0.01

Table 5: Comparison of NPV.

It can be shown as bar diagram:



Focused CBD ultrasound demonstrated high sensitivity and specificity for detecting common bile duct

stones and ductal dilatation⁶. In comparison, MRCP also showed high accuracy but with limitations in identifying small stones. ERCP, while highly effective in direct stone retrieval, was less utilized for initial diagnosis due to its invasive nature [7].

Focused CBD ultrasound proved to be non-invasive and well-tolerated by patients. MRCP, although non-invasive, involves exposure to MRI technology which can be less accessible in some settings. ERCP, being invasive, carries risks such as pancreatitis and infections [8,9,10].

Focused CBD ultrasound was more cost-effective compared to MRCP and ERCP. The lower cost and reduced need for specialized equipment make it a viable first-line diagnostic tool ¹¹. MRCP, while effective, is more expensive and less available, and ERCP involves significant procedural costs and resource use [12].

Patients undergoing focused CBD ultrasound experienced fewer complications and shorter procedure times compared to those undergoing ERCP¹³. MRCP also had favourable outcomes but with longer imaging times and potential discomfort [14].

Focused CBD ultrasound is an effective and efficient tool for the initial assessment of biliary conditions [15]. It compares favourably with MRCP in terms of diagnostic accuracy and outperforms ERCP in terms of invasiveness and cost-effectiveness [16].

However, MRCP remains valuable for complex cases requiring detailed imaging, and ERCP continues to be indispensable for therapeutic interventions [17,18]. Thus, a combined approach utilizing focused CBD ultrasound as a preliminary diagnostic tool, followed by MRCP or ERCP as needed, may optimize patient care and resource utilization in biliary imaging [19].

Discussion

Focused CBD sonography provides a practical approach for initial assessment of obstructive jaundice, particularly in settings where MRCP or ERCP are not immediately available [20]. Its lower sensitivity and specificity compared to MRCP and ERCP highlight its role as a complementary rather than a replacement tool [21,22]. While MRCP and ERCP offer higher diagnostic accuracy, they come with higher costs and procedural risks [23]. Focused CBD sonography's non-invasive nature and availability make it suitable for preliminary evaluation, with follow-up MRCP or ERCP as needed for comprehensive diagnosis and treatment [24].

Conclusion

Focused CBD sonography is a valuable diagnostic tool for obstructive jaundice, providing significant benefits in terms of safety and cost-effectiveness. Although MRCP and ERCP demonstrate superior diagnostic accuracy, focused CBD sonography should be utilized as an initial screening method [25]. Further studies could explore optimizing its use in conjunction with other imaging modalities [26].

Focused CBD sonography is a viable initial diagnostic tool for obstructive jaundice, demonstrating superior convenience and cost-effectiveness compared to MRCP but inferior to ERCP in diagnostic accuracy [27].

It is recommended as a first-line screening tool with MRCP or ERCP for definitive diagnosis and management [28].

Each imaging modality—Focused CBD Sonography, MRCP, and ERCP—has distinct roles in the management of obstructive jaundice. Focused CBD Sonography serves as an accessible and cost-effective initial diagnostic tool, MRCP offers detailed and non-invasive imaging ideal for comprehensive assessments, and ERCP combines diagnostic and therapeutic capabilities but with higher risk and cost [29]. The choice of modality often depends on the clinical context, the severity of the condition, and the need for immediate intervention. Integrating these tools effectively can optimize patient outcomes in the management of obstructive jaundice [30].

Conflict of interest: None

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