

# Role of Ultrasound as Compared with ERCP in Patient With Obstructive Jaundice

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## ABSTRACT

### Background

The diagnosis of obstructive jaundice relies on proper history taking, clinical examination, laboratory investigations and different non invasive imaging modalities like Ultrasonography (USG), Cholangio Computed Tomography (CCT), Magnetic resonance Imaging (MRI) with Magnetic Resonance Cholangio Pancreatography (MRCP) and invasive modalities like endoscopic retrograde cholangiography (ERCP) and percutaneous trans hepatic cholangiography (PTC).

### Objective

To compare the role of ultrasound with endoscopic retrograde cholangiography and to determine the major causes of obstructive jaundice in our prospect.

### Methods

This was a prospective, analytical study conducted on 88 patients presenting to Department of Radiodiagnosis and Imaging at Dhulikhel Hospital-Kathmandu University hospital from March 2011 to August 2012 with clinical diagnosis of obstructive jaundice. Sonographic evaluation was performed in Siemens acuson x-150 and x-300. The final diagnosis was made by endoscopic retrograde cholangiography and /or surgery and confirmed histopathologically.

### Results

The most common benign causes of obstructive jaundice were choledocholithiasis (63%), CBD stricture (12.3%), cholangitis (8%) and pancreatitis (6.85%) whereas cholangio carcinoma (6.85%) and carcinoma head of pancreas (4%) comprised of the malignant causes . Ultrasonography had sensitivity of 100% and specificity of 89% in detecting choledocholithiasis. It was found to be 98.78% sensitive and 83.33% specific in cholangiocarcinoma. Similarly in pancreatitis, the sensitivity of ultrasonography was 97.59% and sensitivity was 66.67%.

### Conclusion

Ultrasonography acts as a valuable diagnostic imaging modality in detecting the causes of obstructive jaundice. Due to its easy availability, non invasive nature and cost effectiveness, it can be considered as the first line imaging technique/ tool. ERCP is the invasive imaging tool and can be used for both diagnostic and therapeutic purpose.

## KEY WORDS

*ERCP, obstructive jaundice, ultrasonography*

## INTRODUCTION

Obstructive jaundice is a common surgical problem that occurs when there is an obstruction to the passage of bilirubin from liver to the intestine.<sup>1</sup> The importance of differentiating obstructive jaundice from non obstructive jaundice lies in the fact that there is a great difference in the existing treatment between the two. Recent years have witnessed a rapid and continuous evolution in the diagnosis of biliary obstructive disease.<sup>2</sup> Commonly used procedures include Ultrasonography(USG), Computed Tomography (CT), Endoscopic retrograde cholangiopancreatography (ERCP), Percutaneous transhepatic cholangiography (PTC) and Magnetic resonance cholangiopancreatography (MRCP).<sup>3</sup>

Invasive modalities such as PTC and ERCP are mainly dependent on personal skills of the operator and are associated with relatively high rate of complications. Even though many new imaging modalities are available, because of the cost effectiveness, easy availability and non invasive nature USG can be considered as first line imaging tool.

## METHOD

This was a prospective, analytical study conducted on 88 patients presented to Department of Radiodiagnosis and Imaging at Dhulikhel Hospital-Kathmandu University hospital from March 2011 to August 2012 with clinical diagnosis of obstructive jaundice.

Patients with clinical jaundice (symptomatic and asymptomatic), deranged liver function test (raised total, direct bilirubin and Alkaline phosphatase) were included in the study. Immediate post ERCP cases were excluded from the study. The study was approved by Institutional Review Committee of Kathmandu University School of Medical Sciences. A detailed history was taken and written informed consent was taken and proforma was filled up. The patients were evaluated clinically to detect the presence of jaundice and biochemical assessment for serum bilirubin, alkaline phosphatase and other relevant pathological tests were done. Sonographic evaluation was performed in Siemens acuson x-150 and x-300 USG machine using 3.5MHz convex transducer in supine and lateral decubitus position in all patients preferably on an overnight fasting state. Careful scanning of the entire course and caliber of the duct system whenever possible was done to trace the extent of the duct dilatation and to localize the level of obstruction. In several cases 5MHz linear transducer was used and water was given orally to provide better acoustic window to image distal common bile duct and pancreas. Gray scale B mode study was performed transabdominally using axial, subcostal and intercostal approach. The final diagnosis was made by ERCP and /or CT, surgery and confirmed histopathologically. Statistical analysis was done by using SPSS software version 16.0. Sensitivity, specificity, positive predictive value (PPV);

negative predictive values (NPV) were also calculated.

## RESULT

Out of total 88 patients 29(33%) were male and 59(67%) were female. The age of patients ranged from 5 to 82 years (mean age 50.27 years). Table 1 shows the frequency and percentage of the symptoms.

**Table 1. Frequency and percentage of presenting symptoms.**

Chief complaint	Frequency	Percent
Nausea	76	86.4
Vomiting	17	19.3
Pain	75	85.2
Weight loss	6	6.8
Loss of appetite	14	15.9
Itching	9	10.2
Jaundice	34	38.6
Fever	10	11.4

The sonological findings encountered in patient with obstructive jaundice was dilatation of intrahepatic biliary radicals.USG was found to be 94.8% sensitive and 100% specific.

The most common benign causes of obstructive jaundice were choledocholithiasis(63%), CBD stricture(12.3%), pancreatitis(6.85%) and cholangitis(8%), whereas cholangiocarcinoma(6.85%) and carcinoma head of pancreas(4%) accounted for the malignant causes.

Some rare causes of jaundice like Choledochal cyst (2.74%), gall bladder malignancy with hilar nodes (1.37%), groove pancreatitis (1.37%), Caroli's disease (1.37%), intrahepatic biliary radical parasite (Ascaris lumbricoides) (1.37%), duodenitis (1.37%), periampullary carcinoma (1.37%) were also encountered during our study.

USG has sensitivity of 100% and specificity of 89% in detecting choledocholithiasis. Similarly, USG was found to be 98.78% sensitive and 83.33% specific in cases of cholangiocarcinoma and 97.59% sensitive and 66.67% specific in pancreatitis. Ultrasound was found to have very high accuracy in detecting biliary tract dilatation with sensitivity of 94.8% and specificity of 100%. However the detection of CBD stricture by USG was not statically significant as compared to ERCP.

**Table 2. Comparison between the findings of Ultrasound and ERCP.**

USG	Frequency	Percent	ERCP	Frequency	Percent
IHBRD	55	62.5	IHBRD	58	65.9
EDC	44	60.3	EDC	46	63
EDS	5	6.8	EDS	9	12.3
EDG	3	4.1	EDG	0	0

Note IHBRD- intrahepatic biliary radical dilatation,ED-extrahepatic duct, C-calculus, S-stricture, G-growth, GB-gallbladder.

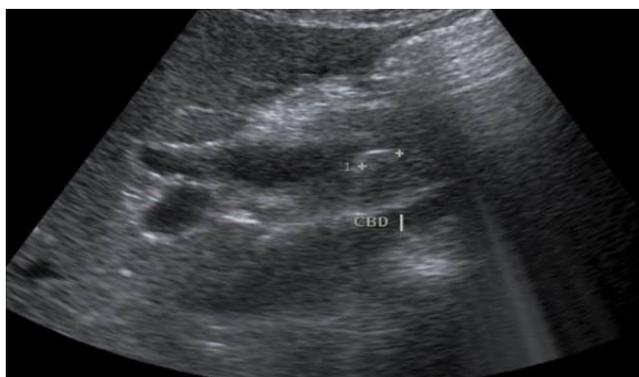
patients with clinical diagnosis of obstructive jaundice are shown in Table 2.

## DISCUSSION

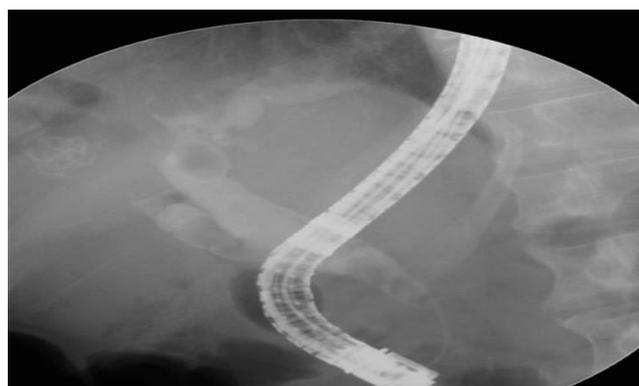
When evaluating a case of obstructive jaundice, the aim of the radiologist is to confirm the presence of obstruction and to identify its location, extent and probable cause. The success rate in diagnosing specific cause has continued to improve with advancing high resolution equipment, scanning technique and interpretive skills. With the availability of USG, CCT, MRI, including MRCP, ERCP and PTC, diagnostic approach in a patient with biliary tract pathology has been completely revolutionized with accuracy of radiological diagnosis approaching 98% when combined with clinical data.<sup>4</sup>

USG has always been used as the initial screening procedure because of the various advantages like easy availability, cost effectiveness, no requirement of contrast material and lack of ionizing radiation. However, although it is well suited to visualize the Common Hepatic Duct (CHD) and proximal CBD, one of its major limitations is assessment of the distal CBD and pancreas, which are often obscured by overlying bowel gas in about 30-50% of the patients.<sup>5,6</sup>

In our study, the major causes of obstructive jaundice were choledocholithiasis (fig 1, 2) followed by CBD stricture (fig 3), cholangitis, cholangio carcinoma, and carcinoma head of pancreas which is comparable with previous study.<sup>7</sup>



**Figure 1.** USG showing dilated CBD due to calculus at mid segment of CBD.



**Figure 2.** ERCP showing dilated and irregular CBD, CHD and IHBR dilatation with multiple CBD calculi.



**Figure 3.** Fig 3 Dilated IHBR, hepatic ducts and entire CBD due to distal CBD stricture.

Several studies have shown that ultrasonography has very high sensitivity of upto 97% in diagnosing the cause of obstructive jaundice. The success rate in diagnosing specific cause has continued to improve with advancing high resolution equipment, scanning technique and interpretive skills.<sup>8</sup>

In a study conducted by Varghese et al, ultrasound was found to have specificity of 100% and diagnostic accuracy of 89% respectively, in diagnosing choledocholithiasis.<sup>9</sup>

In the present study, we found that sensitivity and specificity of USG in diagnosing choledocholithiasis was 100% and 89% respectively which were comparable to that of some series 97% of 150 patients, 95% of 40 patients and 86% of 35 patients.<sup>6,10,11</sup>

Similarly in a study performed by Upadhyaya et al, USG was able to identify the level in 83.50% and cause in 77% cases of obstructive jaundice.<sup>3</sup>

In literature, a sensitivity range of 20 to 80% is documented when ultrasonography is used to detect CBD stones.<sup>12</sup> These considerable differences in sensitivity among various case series are partially attributable to the impossibility of approaching the distal CBD and ampullary region in obese patients, as well as to the variability of the ultrasonography technique applied. The studies with poor results are mostly older studies when the resolution of ultrasound machine was not good and it was a new technique still being learnt.

The advent of ERCP dramatically changed the diagnosis and treatment of biliary and pancreatic diseases. It currently remains the standard of reference for imaging the bile duct and the pancreatic duct.

In our study, ERCP was found to be the much sensitive in detecting CBD stricture as compared to USG which was similar to the study performed by Upadhyaya et.al.<sup>3</sup>

PTC is particularly useful when proximal pathology is suspected based on previous screening procedures. A major drawback of these procedures is their invasive nature which may result in complications. Several authors have reported that ERCP is associated with a high rate of morbidity (1-7%).<sup>13-17</sup>

The recent studies have demonstrated that ERCP is not an innocuous procedure. Its morbidity rate ranges between 5% and 19% while diagnostic ERCP has a mortality rate ranging from 0.5% to 2%.<sup>18,19</sup>

This mortality rate is doubled in therapeutic ERCP, which obliges physicians not to use it diagnostically, but rather to use it therapeutically only when there is already a certain diagnosis.<sup>20</sup>

MRI with MRCP, CCT is the newer non invasive imaging modalities with very high accuracy in detecting the cause and level of obstruction. However due to cost effectiveness, easy availability USG is considered as first choice option in diagnosing biliary tract disease. If the suspicion posed by clinical and laboratory findings is not confirmed at US, the diagnosis must be achieved with the aid of higher imaging modalities like MRCP/CCT, so as to select candidates for therapeutic ERCP, PTC or surgery.<sup>2</sup>

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## CONCLUSION

With development of high resolution ultrasound machine, better preparation and positioning of patients and improved techniques, ultrasound has proven to be highly accurate in diagnosing the cause of obstructive jaundice and can be considered as the first line investigation. Considering the risks of invasive modalities including ERCP and PTC, these modalities could be indicated where therapeutic interventions are planned.

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