

Accuracy of ultrasonography in evaluation of level and cause of biliary obstruction: a prospective study

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Abstract

Aim: To find out the accuracy of ultrasound in evaluation of level and cause of biliary obstruction. **Materials and methods:** Forty-five patients (26 to 86 years of age) with suspected biliary obstruction underwent Ultrasonography followed by Direct Cholangiograms (Percutaneous Transhepatic Cholangiography / Endoscopic Retrograde Cholangiography). The levels of biliary obstructions were grouped as hilar, suprapancreatic and intrapancreatic. Similarly the causes were grouped as malignant and benign. Diagnosis was confirmed either at surgery or histopathologically (USG-guided FNAC or ERC-biopsy). **Results:** Ultrasonography accurately identified the level of obstruction in 89 % (hilar), 91 % (suprapancreatic) and 87 % (intrapancreatic) cases. Malignancy was found in 33 patients and remaining 12 had benign diseases. USG accurately identified malignant and benign causes in 91% and 84% cases respectively. Findings were found to be statistically significant ($p\text{-value}=<0.05$ at 95% confidence interval). **Conclusion:** This study showed that USG has high accuracy in identifying the level and cause of biliary obstruction. Considering cost, availability and patient friendly nature, Ultrasound should be the first imaging modality of choice in evaluation of biliary obstruction.

Key words: Ultrasound, biliary obstruction, direct cholangiogram

Jaundice may be obstructive (surgical) or non-obstructive (medical). The basic distinction can usually be made on the basis of the history, physical examination and liver function tests (LFTS)¹.

The aim of radiological investigations in obstructive jaundice is to provide the diagnostic information including the level and cause of obstruction⁵. Improvement in resolution of USG and greater experience with this technique has yielded consistently better success rate of late^{12, 13}.

Since USG is widely available, cost effective and patient friendly, we present a prospective study to determine the level and cause of biliary obstruction by the transabdominal ultrasonography.

Materials and methods

It was a prospective non-randomized study conducted in the department of radiology Tribhuvan University Teaching Hospital Kathmandu, Nepal from August 2003 to July 2004. Patients with suspected obstructive jaundice were referred to the department for radiological evaluation. The relevant information was recorded in a pre-designed data collection sheet. Transabdominal ultrasonography was performed in

commercially available real time scanner (GAIAMT8800 medison with colour Doppler facility) at transducer frequency of 3.5 MHZ using the neutral matching gel over the examination parts. Direct cholangiography (PTC/ERC) was performed within two weeks of the ultrasonographic examination. Histopathological diagnosis was obtained either by FNAC, ERC-Biopsy or at surgery.

Statistical analysis was performed by using Epi Info 6.0 software programme.

Results

A total of 45 patients of biliary obstruction were evaluated. There were 17(38%) males and 28 (62%) females. The age group ranged from 20-90 years with largest group in 50-59 years (44%).

The levels were grouped as hilar (I), suprapancreatic (II) and intrapancreatic (III).

The validity of USG was compared with the DC and is summarized in table 1.

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Table: 1 Summary of Validity of USG in evaluation of level of biliary obstruction

VALIDITY		SENSITIVITY	SPECIFICITY	ACCURACY	PPV	NPV	P-VALUE
I	USG	88%(15/17)	89%	89%	83%	93%	0.000001
II	USG	87%(13/15)	93%	96%	87%	93%	0.000005
III	USG	77% 10/13)	94%	89%	83%	91%	0.00004

I = Hilar; II=Suprapancreatic; III=Intrapancreatic.

Figure 1. Assessment of level of biliary obstruction by Ultrasonography

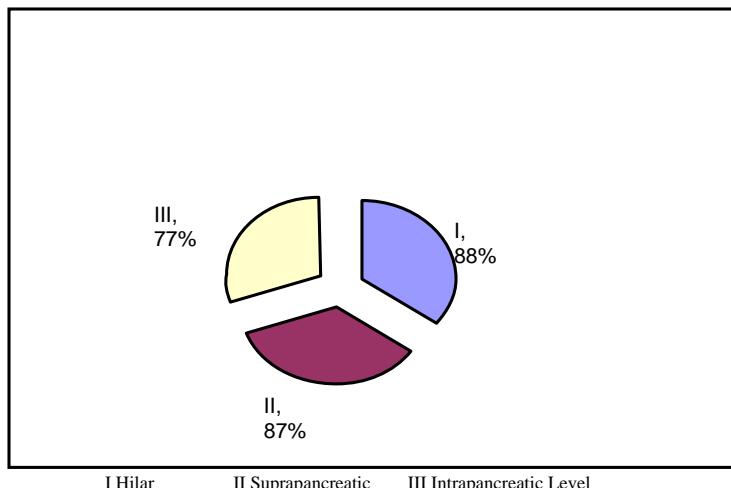


Table 1 shows the accuracy of transabdominal ultrasound in identification of level of biliary obstruction as 89% for hilar (I), 96% for the suprapancreatic (II) and 89% for the intrapancreatic (III) level ($p<0.05$ at 95% confidence interval).

Hence the ultrasound was found to be more sensitive in identification of hilar and suprapancreatic levels of

obstruction as compared to intrapancreatic level in this study.

Regarding the cause of obstruction, 33 patients (73.3%) had malignant aetiology and 12 (26.7%) had benign aetiology. Ultrasound had the sensitivity of 97% and accuracy of 91% for the identification of malignancy as a cause of biliary obstruction ($p <0.05$ at 95% confidence interval) (table-2).

Table 2. Summary of validity of USG in evaluation of cause of biliary obstruction:

CAUSE	SENSITIVITY	SPECIFICITY	ACCURACY	PPV	NPV	P-VALUE
MALIGNANT	97%	75%	91%	91%	90%	.000002
BENIGN	67%	91%	71%	73%	88%	0.003

Fig 2. Appearance of Hilar cholangiocarcinoma (A) Ultrasonography (B) Percutaneous Transhepatic Cholangiography (PTC)

Final diagnosis of biliary obstruction is shown below:

Table 3. Final diagnosis of biliary obstruction		
CAUSES	NO OF PATIENTS	% OF TOTAL CASES
Cholangiocarcinoma	12	26.66%
Carcinoma of gallbladder	6	13.33%
Carcinoma of pancreatic head	4	8.86%
Ampullary carcinoma	11	24.5%
Choledocholithiasis	8	17.77%
Postoperative stricture	2	4.44%
Choledochal cyst	2	4.44%
TOTAL	45	100%

Among the malignant causes cholangiocarcinoma (26.6%) was the most common cause followed by ampullary carcinoma in 24.5%. Similarly

choledocholithiasis was the most common benign cause (17.7%).

Discussion

Evaluation of patients with bile duct obstruction frequently involves the stepwise performance of several imaging techniques. The aim of these investigations is to provide sufficient diagnostic and anatomic information to allow appropriate treatment. Such information includes the level and cause of biliary obstruction in addition to assessment of tumour resectability in malignant cases.²

The purpose of this study was to evaluate the level and causes of biliary obstruction in patients with obstructive jaundice by Ultrasound. Several pathways have been suggested for these patients.⁹

Our study involved Ultrasonographic evaluation of 45 patients with suspected biliary obstruction. Out of them 17(38%) were males and 28(62%) were females.

We divided the level of biliary obstruction into hilar (I), suprapancreatic (II) and intrapancreatic (III). Hilar level of obstruction was obstruction at or above the porta hepatis including the proximal part of common hepatic duct. Suprapancreatic level was defined as the level of obstruction from lower limit of hilar level to upper border of head of pancreas, similarly intrapancreatic level was the distal most level of obstruction involving the pancreatic and ampullary region of common bile duct. The most common level of obstruction in our study was hilar seen in 17(38%) patients followed by suprapancreatic in 15(33.3%) and intrapancreatic level in 13(28.7%) patients. Majority of the patients (73%) had malignant cause. Only 12 patients (27%) had benign aetiology.

Most of the studies comparing USG and DC have been retrospective, however, only a few prospective studies have been reported^{2,4}. In one of these studies² USG correctly indicated the level of obstruction in 60% and the cause in 38%.

USG and CT are also correct in the diagnosis of choledochal cyst with similar sensitivity and accuracy³. Most of these use USG as the initial modality to confirm or exclude biliary obstruction, which it does with at least 90% accuracy^{10, 11}.

The sensitivity of ultrasound for identification of hilar, suprapancreatic and intrapancreatic levels of obstruction was found to be 88%, 87% and 75% respectively and the accuracy was 91%.

The sensitivity and accuracy of ultrasound in identification of malignant biliary obstruction was 97%, and 91% respectively.

Most common cause of malignant obstruction was found to be cholangiocarcinoma in 12 patients (26.6%) followed by ampullary carcinoma in 11 patients (24.5%), carcinoma of gallbladder in 6 patients (13.3%), and carcinoma of head of pancreas in 4 patients (8.8%).

Among the benign aetiologies choledocholithiasis was found in 8 patients (17.7%), postoperative stricture in 2 (4.4%) and choledochal cysts in 2(4.4%) patients.

Our findings are similar to that of Gibson RN et al¹³. In their series. They had found that USG correctly identified the level of obstruction in 95% of cases. The cause was correctly identified by USG in 88%.

The retrospective study of Laing FC et al¹² had shown the correct identification of the level and cause of biliary obstruction by USG in 91.8% and 70.9% of patients respectively.

Ricardo Robledo et al⁷ divided the causes of biliary obstruction into malignant and benign. Malignancy was one of the most common causes of biliary obstruction. USG demonstrated the cause in 90% and level of obstruction in 96% of patients, comparable to our study. Likewise the effectiveness of USG has been shown in various studies^{13, 8}.

The better results of USG examination in our study could be due to improved resolution of USG machine as well as predominance of hilar obstruction in the study population. Hilar obstruction is better visualized in ultrasound as liver provides a good acoustic window and the fact that decreased amount of subcutaneous fat in the Nepalese population could have played positive role in proper visualization of hepatobiliary system.

Our findings were statistically significant (P-Value<0.05 at 95% confidence interval) for both level as well as cause of obstruction.

Conclusion

On the basis of our study result, we conclude that invasive procedures like PTC or ERC may be avoided for the evaluation of level and cause of biliary obstruction in patients with obstructive jaundice. Considering the risks of invasive procedures and the cost and availability of USG, it should be the first choice of investigation in suspected biliary obstruction followed by other imaging modalities as and when required. Invasive modalities should be reserved for those patients where therapeutic interventions are planned as they

carry a reported rate of complications ranging from 2-4%.^{5,6}

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