

Diagnostic Accuracy of Ultrasound in The Detection of Obstructive Jaundice

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SUMMARY

The purpose of this study was to evaluate the accuracy of ultrasonography in predicting the level and cause of obstruction in obstructive jaundice. Sonographic studies were done on GE (RTX200 model) ultrasound unit using 3.5MHz convex transducer. Sixty four patients with clinical diagnosis of obstructive jaundice were examined. All the diagnoses were subsequently established by another investigation like ERCP or PTC and/or operation. The positive predictive values of the site and nature of obstruction were 96.9% and 85.9% respectively. The precision of ultrasonography in this study can be attributed to specific selection of patients with knowledge of biochemical information and advanced stage of disease. The high degree of accuracy achieved in this series makes ultrasound the primary technique for definite diagnosis in patients with obstructive jaundice without help of other more expensive investigations as routine procedures.

INTRODUCTION

Ultrasound has been recognized as a primary procedure in evaluating the status of the biliary tree and to distinguish between obstructive (surgical) and non obstructive (medical) jaundice. But a simple non-invasive technique like ultrasound should be used for more than mere confirmation of obstructive jaundice (OJ). Coupled with clinical and biochemical findings it is possible to delineate and ascertain the site and cause of obstruction with high degree of precision in most of the cases without recourse to other investigations¹⁻⁴. The present report evaluates the diagnostic accuracy of ultrasonography in predicting the site and cause of obstruction.

PATIENTS AND METHODS

The study is based on 64 patients with the clinical diagnosis of obstructive jaundice treated at the Shaikh Zayed Postgraduate Medical Institute, Lahore from April, 1994 to September, 1995. Ultrasound was performed in all patients using a real time GE scanner RTX 200 model equipped with

3.5 MHz convex transducer. Liver, gallbladder, intrahepatic ducts, common duct and pancreas were evaluated. The criteria used for the diagnosis of biliary obstruction by ultrasonography were dilated intrahepatic bile ducts or common bile duct diameter of >8mm. A diameter of 10mm was considered the upper limit of normal in post-cholecystectomy patients⁵. All patients fulfilled these criteria. The diagnosis was classified as follows:

- a) Site of obstruction ---- proximal or distal.
- b) Cause of obstruction --- neoplastic or non-neoplastic [calculi/stricture (benign and postoperative)].

The ultrasound diagnosis was recorded before the establishment of the final diagnosis by another investigation and/or operation. ERCP, PTC, FNA/Operative Biopsy were used for the establishment of the final diagnosis. ERCP was performed in 36 patients. PTC in 14 patients and FNAC in 3 patients. A total number of 38 patients underwent surgery.

The ultrasound diagnoses were compared with the final diagnoses and the results were calculated to determine the accuracy of ultrasonography.

RESULTS

Table 1 summarizes the sonographic evaluation of the site of obstruction. Ultrasonogram provided a correct diagnosis of proximal obstruction in 27 of 29 cases and of distal obstruction in all 35 cases. The overall positive predictive value for the site of obstruction was 96.9%. Ultrasonogram reports went wrong in locating the site of obstruction in two patients (3.1%). These included patients with a nodal mass and periampullary carcinoma causing lower end obstruction.

Table 1: Accuracy of determination of site of obstruction by ultrasound.

Site	Determination by ultrasound			
	Correct		Incorrect	
	No.	%	No.	%
Proximal end (n=29)	27	93.1	2	6.9
Distal end (n=35)	35	100	0	0.0
Total (n=64)	62	96.9	2	3.1

The etiological diagnoses of these 64 patients as confirmed by additional investigations (including Laparotomy) are given in Table 2. Table 3 summarizes the sonographic evaluation of the cause of obstruction. The positive predictive value of the calculus disease was 100%⁶ and for non-calculus disease 83%. Overall positive predictive value for the cause of obstruction was 85.9%. Fifty three patients had a non-calculus lesion that included tumors and strictures (benign and postop). The etiology was correctly determined by ultrasound in 44 patients.

Etiological diagnosis of carcinoma of gall bladder was confirmed by surgical exploration with biopsy and/or ERCP/PTC in six cases. Ultrasound provided correct diagnosis in 5 cases with a positive predictive value of 83.3% and wrong diagnosis of carcinoma of gall bladder causing proximal obstruction in a patient who had cholangiocarcinoma.

The diagnosis of carcinoma of head of pancreas was confirmed in 7 patients which included

operative biopsy and/or ERCP. Ultrasound diagnosis was correct in five patients with positive predictive value of 71.4% and wrong in remaining two cases who had periampullary carcinoma and cholangiocarcinoma.

Table 2: Etiological diagnoses of patients with obstructive jaundice.

Etiology	No. of cases
CBD stones	11
Carcinoma of gallbladder	6
Carcinoma of head of pancreas	7
Periampullary carcinoma	8
Cholangiocarcinoma	19
Stricture (including post.op.)	7
Others eg. obstruction due to extrinsic pressure (nodal)/invasion due to HCC/Ca duodenum	6
Total	64

Table 3: Accuracy of determination of cause of obstruction by ultrasound.

Causes	Determination by ultrasound			
	Correct		Incorrect	
	No.	%	No.	%
Calculus lesions (n=11)	11	100	0	0
Noncalculus lesions (n=53)	44	83.0	9	17.0
Total (n=64)	55	85.9	9	14.1

Periampullary carcinoma was confirmed in 8 patients by operation and/or ERCP/biopsy. The ultrasound diagnosis was correct in five of them with positive predictive value of 62.5%.

Nineteen patients had a confirmed diagnosis of cholangiocarcinoma by operation and/or ERCP. The ultrasound provided correct diagnosis in 16 with a positive predictive value of 84.2%.

The diagnosis of benign strictures which

included postoperative (iatrogenic) was made in 7 cases with a positive predictive value of 100% as confirmed by ERCP/PTC and laparotomy. In six cases the cause of obstruction was due to extrinsic pressure by a nodal mass⁷ and inflamed, distended gall bladder (2 cases); invasion of CBD by hepatocellular carcinoma⁸ and carcinoma of the duodenum (2 cases each). The ultrasound provided correct diagnosis in five cases with positive predictive value of 83.3%.

DISCUSSION

All 64 cases of proven obstructive jaundice reported here showed varying degree of dilatation of intrahepatic biliary ducts or common bile duct diameter of >8mm. Surgeons want to know the level and nature of obstruction in the biliary system. The overall positive predictive value of ultrasound for the level of obstruction in our series was 96.9% and for the cause of obstruction 85.9%. Tandon et al.⁹ demonstrated positive predictive values for the site and nature of the obstruction as 94.3% and 89.9% respectively. Dwivedi-N et al.¹⁰ demonstrated positive predictive values for the site and cause of obstruction as 90.9% and 95.2% respectively. Khandelwal-N et al.¹¹ diagnosed precisely the level and site of obstruction in 72% and 41% of cases respectively. Rigauts-H et al.¹² correctly defined the cause of obstruction in 71% of duct stones and in 90% of tumoral bile duct obstruction.

The comparable and relatively better results in our series may be attributed to the following factors:

- a) An advanced stage of the disease is observed in Pakistan. The patients reach the referral hospital late owing to the unfavourable socioeconomic factors, ignorance of symptoms and poor referral facilities.
- b) Specific selection of the patients with knowledge of clinical and biochemical information.

In the present series the positive predictive value of ultrasonography for calculus disease was 100% and for the various non-calculus diseases (mostly neoplastic) 83%. However, the positive predictive value of the test varied from

62.5% to 100%, depending upon the specific disease with overall positive predictive value of 85.9%.

The following points emerging from the present study need special mention:

- a) Visualization of the biliary tree by ERCP or PTC is not routinely required in patients of obstructive jaundice.
- b) Ultrasound deserves a status of greater confidence as a procedure for final diagnosis than is presently recognized.
- c) Ultrasound can be repeated as desired in order to reach the correct diagnosis.
- d) Ultrasound is a safe investigation with no complications.

We conclude that sonography is the preferred technique because of its availability, low cost and lack of radiation hazard and is sufficient to adequately evaluate the patients of obstructive jaundice in majority of cases.

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