VOLUME-7, ISSUE-11, NOVEMBER-2018 • PRINT ISSN No 2277 - 8160

Original Research Paper

Radiodiagnosis

COMPARISON OF ULTRASOUND AND CT SCAN IN BILIARY OBSTRUCTION.

Dr. Disha B. Patel 3rd year Resident, Department of Radiodiagnosis, V.S. General Hospital, Ahmedabad.

Dr. Dharita S. Shah Professor and H.O.D., Department of Radiodiagnosis, V.S. General Hospital, Ahmedabad.

Dr. Sahil Shah* Senior Resident, Department of Radiodiagnosis, V.S. General Hospital, Ahmedabad.
*Corresponding Author

ABSTRACT

Objective: To observe the role of computed tomographic (CT) scan and ultrasonography (USG) examination in diagnosis of biliary obstruction.

Methodology: This cross-sectional study was conducted in 70 patients clinically suspected of obstructive jaundice.

Results: The highest incidence of biliary obstruction was found in the age group between 51 and 60 years. 44 out of 70 patients had a benign cause for biliary obstruction, of which choledocholithiasis was the most common cause(25 cases). CT revealed better sensitivity than USG in diagnosing all causes of biliary obstruction except for choledocholithiasis where USG had better sensitivity than CT. No specific diagnosis was obtained in 15 cases evaluated by USG and 10 cases by CT scan.

Conclusion: Accuracy of USG and CT is high in detecting biliary tree dilatation, with CT scan slightly more accurate than USG. The difference in cost between the two is likely to decline with time and make CT even more attractive and accessible for imaging the hepatobiliary system.

KEYWORDS : Biliary obstruction, Ultrasonography, Computed tomography.

INTRODUCTION

Surgical jaundice (or Obstructive jaundice) can occur as a result of obstruction to the biliary tract at any level from the biliary radicles to the ampulla of Vater. The causes of biliary obstruction can be divided into intrahepatic and extrahepatic. The major signs and symptoms of biliary obstruction result directly from the accumulation of bilirubin and bile salts in the blood and the failure of bile to reach its proper destination{1}.

The role of imaging in patients with suspected bile duct obstruction is not only to confirm the presence, but also to determine the level and cause of obstruction and the extent or stage of the disease process{2,3}. Evaluation of suspected biliary obstruction involves a variety of imaging modalities including ultrasonography (USG), Computed tomography (CT)and invasive procedures like percutaneous transhepaticcholangiography(PTC) and endoscopic retrograde cholangiopancreatography (ERCP){4}.

Abdominal ultrasound is the initial examination of choice for imaging bile ducts in patients with jaundice as it helps to differentiate between obstructive and non-obstructive causes{5}. USG plays an important role in evaluation of hepatobiliary tract pathology by detecting lesions, giving clue about its internal structure & idea about exact extent of the lesion, especially in infants and children. It provides important information about liver size and texture, the size and clarity of bile ducts as well as evaluation of other abdominal organs{6}.

In current practice, ultrasonography is widely accepted as first line radiological investigation for biliary tract pathology as it is non-invasive, inexpensive, painless, free of ionizing radiation hazards and can be repeated as and when required. USG allows dynamic and real time evaluation of the biliary tree. It is harmless and comfortable for patients and very accurate in hands of skilled operator{7}. With colour Doppler it is possible to evaluate vascularity of any mass lesion. However, ultrasound has some limitations in the diagnosis of some of the causes of biliary obstruction.

CT is another imaging modality to evaluate obstructive jaundice. Spiral CT after intravenous injection of iodinated contrast medium allows the rapid acquisition of images during the arterial, portal, and delayed parenchymal phases. It also provides high-resolution, thin-slice, multiplanar and 3D reconstructions and can depict up to third-order intrahepatic branches. CT also provides anatomical details to optimize surgical interventions. These advances in technology have expanded the role of CT in evaluating the biliary tree{8}. CT scanning is also helpful in evaluating liver masses as well as for staging of tumors.

Overall, the purpose of this study will be to prospectively assess the accuracy of USG and Computed tomography in obstructive biliary pathologies.

AIMS AND OBJECTIVES

The main aim of this study is to compare the diagnostic accuracy of Ultrasound and CT scan in assessing the level and cause of biliary obstruction in patients with obstructive jaundice.

MATERIALS AND METHODS

This cross-sectional study included 70 patients with clinical and laboratorial findings suggestive of obstructive jaundice. This study was carried out from January 2018 to July 2018. All age group patients were included. Patients who had undergone USG examination for suspected abdominal pathology and found to be having biliary pathology were subjected to CT scan examination. The cause and level of obstruction were evaluated by both the modalities (USG and CT scan). The level of obstruction was classified into the following types: intra-hepatic, at porta, supra-pancreatic CBD and intra-pancreatic CBD. During scanning, the size of intrahepatic biliary ducts, extrahepatic biliary tree & main pancreatic duct, lumen of the gallbladder and common bile duct, pancreas, all were searched for presence of any mass lesion, calculus or any other pathology. Periampullary region was tried to be assessed.

- Pregnant patients, patients having allergy to iodinated contrast material and patients with high creatinine levels unfit for contrast CT study were excluded from this study.
- The radiologic procedure and logistics of the study were explained to the patients, and written informed consent was obtained from each patient or from parents in cases of paediatric patients.

SCANNING PROTOCOL:

USG TECHNIQUE

- USG of all patients was done on TOSHIBA ISTYLE NEMIO XG machine transabdominally in supine position and left lateral decubitus positions after a period of overnight fasting.

- An initial survey of gall bladder, biliary tree, liver, pancreas and duodenum was done. Organs were visualized in longitudinal and transverse planes in midline, parasagittal, midclavicular, mid-axillary and intercostal views.
- Additional findings like lymphadenopathy, ascites, ascaris, etc were also tried to be evaluated.

CTTECHNIQUE

- CT scan of the patients was done on either Philips 16 slice multidetector CT scanner or SIEMENS somatom definition CT scanner.
- Plain CT scan of abdomen was taken from diaphragm upto pubic symphysis.
- Then patients were given 1ml/kg intravenous bolus of non-ionic iodinated contrast media via power injector.
- Arterial phase, portal venous and delayed phases were taken at 10 seconds, 30 seconds and 5 minutes from time of contrast injection respectively.

RESULTS

TABLE 1: AGE WISE DISTRIBUTION OF OBSTRUCTIVE JAUNDICE PATIENTS

Age of Patient	No of patients	Percentage %
<30 years	3	4
31 to 40 years	5	7
41 to 50 years	16	23
51 to 60 years	23	33
61 to 70 years	18	26
71 to 90 years	5	7
Total	70	100

TABLE 2: GENDER WISE DISTRIBUTION OF OBSTRUCTIVE JAUNDICE PATIENTS

Gender	No. of cases	Percentage %
Male	30	43
Female	40	57
Total	70	100

TABLE 3: INCIDENCE OF BENIGN AND MALIGNANT LESIONS

Benign lesions (44 patients, 63 %)			Malignant lesions (26 patients, 37%)		
Lesions	No. of patients	%	Lesions	No. of patients	%
Choledocholithiasis	25	36	Peri-ampullary carcinoma	16	23
Benign biliary strictures	12	17	Cholangiocarcinoma	9	13
Biliary stricture with stone	3	4	GB carcinoma	1	1
Choledochal cyst	1	1			
Cystic pancreatic mass	1	1			
Mirizzi syndrome	2	3			

TABLE 4: LEVEL OF OBSTRUCTION

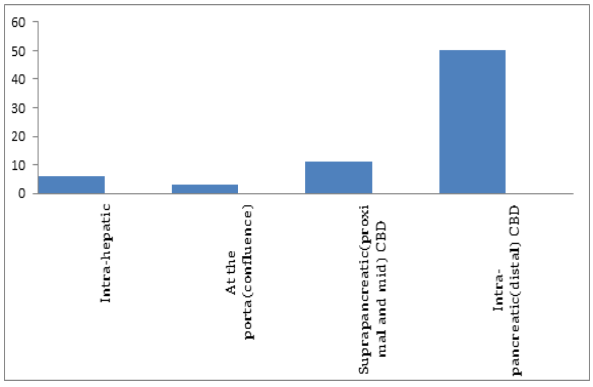

TABLE 5: PERCENTAGE OF PATIENTS SHOWING VARIOUS PATHOLOGIES AS DETERMINED BY HISTOPATHOLOGY

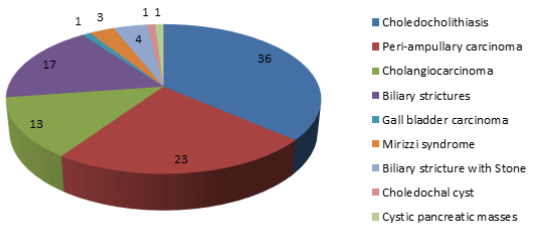

TABLE 6: NUMBER OF PATIENTS SHOWING VARIOUS PATHOLOGIES AS DETERMINED BY USG AND CT SCAN (AS COMPARED TO HISTOPATHOLOGY)

PATHOLOGIES	USG	CT
Choledocholithiasis	20 (25)	18 (25)
Peri-ampullary carcinoma	10 (16)	14 (16)
Cholangiocarcinoma	6 (9)	8 (9)
Biliary strictures	14 (12)	14 (12)
Gall bladder carcinoma	1 (1)	1 (1)
Biliary stricture with Stone	1 (3)	1 (3)
Mirizzi syndrome	1 (2)	2 (2)
Choledochal cyst	1 (1)	1 (1)
Cystic pancreatic masses	1 (1)	1 (1)
No specific diagnosis	15 (0)	10 (0)

TABLE 7: COMPARATIVE RADIOLOGICAL SENSITIVITY AND SPECIFICITY OF USG AND CT IN DIAGNOSIS OF OBSTRUCTIVE JAUNDICE

PATHOLOGIES (AS DETECTED ON HISTOPATHOLOGY)	True +ve on USG	False +ve on USG	True +ve on CT	False +ve on CT
Choledocholithiasis	20	0	18	0
Peri-ampullary carcinoma	10	0	14	0
Cholangiocarcinoma	6	0	8	0
Benign biliary stricture	12	2	12	2
Biliary stricture with stone	1	0	1	0
Gall bladder carcinoma	1	0	1	0
Mirizzi syndrome	1	0	2	0
Choledochal cyst	1	0	1	0
Cystic pancreatic masses	1	0	1	0

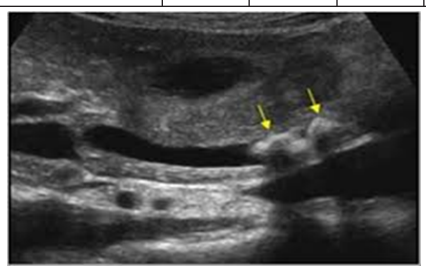

FIGURE 1: Multiple calculi in mid and distal CBD on USG

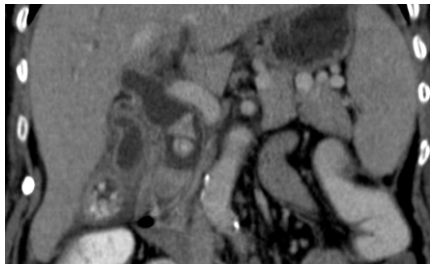

FIGURE 2: Multiple calculi in mid and distal CBD with proximally dilated CBD

FIGURE 3: Hilar cholangiocarcinoma with dilated IHBR

DISCUSSION

The mean age of presentation in the present study was 55.5 years(5-85 years).

In this study females(57%) were more commonly affected by obstructive biliary diseases than male(43%) with both the benign and malignant pathologies being more common in females.

In the present study, benign pathologies (63%) outnumbered the malignant pathologies(37%). This is in accordance with the studies done by Amandeepsingh et al{9}.

Amongst the benign causes, choledocholithiasis and amongst the malignant causes, periampullary carcinoma was the most common pathology in this study.

Obstruction was seen most often at distal CBD (71% patients). USG could not correctly diagnose choledocholithiasis in 5 out of 25 patients who had calculus in mid or distal common bile duct, which was difficult to evaluate due to gaseous prominence and obesity.

Despite this, the sensitivity of USG is moderately higher than CT for choledocholithiasis in this study.

In the study conducted by Amandeep singh et al. the sensitivity of USG for choledocholithiasis was much higher than CT{9}.

In contradiction to this, another study showed the sensitivity and accuracy of USG to detect choledocholithiasis 18 and 19% respectively, whereas sensitivity and accuracy of CT ware 87 and 84% respectively{10}.

Sensitivity of CT and USG for benign biliary stricture is similar is this study.

In this study CT scan has much higher sensitivity for detection of periampullary carcinoma and moderately higher sensitivity for cholangiocarcinoma. This is in accordance with the study by Amandeep singh et al{9}.

Upadhyaya et al (2006) also observed that all cases of periampullary carcinoma were detected by CT scan in their study{11}.

The sensitivity of CT and USG in diagnosis of gall bladder malignancy, choledochal cyst, and cystic pancreatic masses is similar in the present study.

In this study, USG could detect overall causes of biliary obstruction in 75% whereas CT scan could detect the cause in 83% cases ($p < 0001$). In comparison to this, the study by Upadhyaya et al showed that CT scan had 85.71% accuracy and USG 77% accuracy for assessing the cause of biliary obstruction.

CONCLUSION

Both USG and CT scan are ideal and accurate diagnostic imaging modalities to detect biliary tree pathologies. However, CT scan is of greater value in detecting the cause of biliary obstruction and in evaluating the extent and involvement of surrounding structures, thus enabling staging and planning of further management of the patients. CT scan is rapidly emerging as the preferred technique of choice for hepatobiliary imaging. An important reason is that, whereas USG is a targeted examination, CT scan offers a more comprehensive analysis of the liver and extrahepatic abdomen and pelvis, thus providing detailed information about the extent of a lesion. Another advantage of CT scanning is that it is much less dependent on the operator's skill. Overall, computed tomography has a high sensitivity, specificity and accuracy in detecting the causes of biliary obstruction, although it has a decreased sensitivity for detection of choledocholithiasis as CT is limited by inability to detect stones with lower attenuation than bile.

However, CT imaging is associated with the risks of I.V. contrast and ionizing radiation. Furthermore, due to financial affordability and easy accessibility in the current setup, USG is the preferred first-line investigation for evaluation of biliary tree. USG is non-invasive, cheap, easily available and does not involve ionizing radiation.

However, one of the major limitations of USG is assessment of the distal CBD and pancreas, which are often obscured by overlying bowel gas. Obesity is also an important limiting factor.

Considering these attributes, computed tomography can be used as an effective diagnostic modality in cases of obstructive jaundice. Accuracy and specificity for ultrasonography is high in detecting the causes of biliary obstruction with a slightly low sensitivity. Hence, ultrasonography can be used as an effective screening modality in cases of obstructive jaundice.

REFERENCES

(1) Bonheur Jennifer Lynn, Ells Peter F. Biliary obstruction: Pathophysiology. Medscape. 2017. 187001
(2) Baron RL, Stanley RJ, Lee JKT, et al. A prospective comparison of the evaluation of biliary obstruction using computed tomography and ultrasonography. Radiology 1982;145;91-98.
(3) Pedrosa CS, Casanova R, Rodriguez R. Computed tomography in obstructive jaundice. Radiology 1981;139:627-34.
(4) Magnuson T H, Bender JS, Duncan MD. Utility of Magnetic Resonance Cholangiography in evaluation of biliary obstruction. J Am CollSurg 1999:189:63-72.
(5) Yi Tang, Yamashita Y,Yasuko A. Et al. Pancreaticobiliary Ductal System : Value of Half Fourier RARE MRCP for post-operative evaluation. Radiology 2000 ;215: 81-88.
(6) Tissue Harmonic Imaging: Is it a benefit for Bile Duct Sonography. AJR 2001; 176:653-659. Ortega, Peter N Burns, David Simpson, Wilson R.
(7) Naffisaadedin et al, comparison of ultrasonography and computed tomography to evaluate causes of biliary obstruction; Euroasian journal of hepatogastroenterology, 2012July-December;2(2):98-103.
(8) Murcia MN, Jeffrey Jr RB, Beaulieu CF, Li KCP and Rubin GD. Multidetector CT of the Pancreas and Bile duct system : Value of Curved Planar Reformations.AJR. 2001March; 176:689-693.
(9) Singh A, Mann HS, Thukral CL, Singh NR. Diagnostic Accuracy of MRCP as compared to Ultrasound/CT in Patients with Obstructive Jaundice. Journal of Clinical and Diagnostic Research: JCDR. 2014;8(3):103-107.doi:10.7860/JCDR/2014/8149.4120.
(10) Mitchell SE, Clark RA. A comparison of computed tomography and sonography in choledocholithiasis. AJR 1984;142(4)729- 73.
(11) Upadhyaya V, Upadhyaya DN, Ansari MA, Shukla VK. Comparative assessment of imaging modalities in biliary obstruction. Ind J Radiol Imag 2006;1(4)577-82.