ORIGINAL RESEARCH

The Radiological Study to Determine the MRCP's Accuracy over USG and CT in Diagnosing Obstructive Jaundice

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ABSTRACT
Aim: The goal of the radiological study is to determine the accuracy of MRCP over USG and CT in diagnosing cases with obstructive jaundice.
Methods: The Department of Radiology performed a cross-sectional prospective research. This research comprised 50 individuals with clinically confirmed obstructive jaundice and total bilirubin levels more than 5mg/dl. All patients in the research had a USG examination first, then an MRCP, and lastly a CT scan.
Results: Twenty of the 50 individuals had benign lesions, whereas 30 had malignant lesions. MRCP detects the location of blockage with 96% accuracy, followed by CT and USG. The sensitivity of MRCP and CT is the same, but USG has a sensitivity of 96%. Despite the high sensitivity of USG, the specificity is quite poor at 62% when compared to CT's 62% and MRCP's 96%. Thus, USG is an excellent screening technique for benign obstructive jaundice lesions, but CT and MRCP are the specific investigations. With an accuracy of up to 96%, the MRCP is once again the most accurate examination. MRCP has a high sensitivity and specificity, making it more accurate. While USG and CT have great sensitivity, their specificities are poor. The MRCP has the biggest area of the three studies, demonstrating that it is the most effective in detecting malignant lesions. Again, the p value is more than 0.05, indicating that it is significant. Thus, in the diagnosis of obstructive jaundice, MRCP is statistically more significant than CT and USG.
Conclusion: In the diagnosis of obstructive jaundice and to determine the aetiology, location, and size of the lesion, MRCP seems to be a better option than other radiological techniques such as USG, CT, or ERCP.
Keywords: MRCP's , USG , CT , Obstructive Jaundice

INTRODUCTION
Obstructive jaundice is a common clinical issue associated with an elevated risk of death and morbidity. In 90% of patients, intrahepatic and extrahepatic blockage may be determined using appropriate clinical data, but the reason and location of obstruction are primarily determined using imaging modalities. In obstructive jaundice, the primary goal of any imaging modality is to determine the existence of blockage, its location, extent, and likely origin. Because of the widening range of treatment choices for the jaundiced patient, the radiologist must do more than merely distinguish between obstructive and non-obstructive jaundice. Correct therapy options are typically based on a detailed evaluation of the genesis,

location, degree, and extent of illness.[1,2] Ultrasonography (USG), computed tomography (CT), endoscopic retrograde cholangiopancreatography (ERCP), and magnetic resonance cholangiopancreatography are the most often employed imaging modalities (MRCP). Drainage operations are performed using Percutaneous Transhepatic Cholangiography (PTC).[3] Radiological imaging is critical in establishing treatment decisions for individuals with Obstructive Jaundice. USG, computed tomography (CT), magnetic resonance imaging (MRI), MRCP, and ERCP are all imaging options for identifying acute pancreatitis. The option is determined by the cause for the research.[4] Magnetic Resonance Imaging Cholangiopancreatography is the imaging modality of choice in these patients because to its inherent high contrast resolution, speed, multiplanar capabilities, and essentially artifact-free depiction of anatomy and disease. The picture quality acquired is equivalent to that of direct cholangiography procedures such as ERCP, which is regarded the gold standard in ductal diseases. It has been shown to be useful in showing bile duct dilatation, stricture, and Choledocholithiasis. The first MR cholangiopancreatography findings were obtained utilising gradient echo sequences and steady-state free precession methods. Rapid Acquisition with Relaxation Enhancement (RARE) and Half-Fourier Acquisition Single-Shot TurboSpin-Echo are the most recent imaging methods for MRCP (HASTE). [5,6]Although ultrasonography and CT are non-invasive, they can have downsides. In most situations, USG is inefficient at determining the location of the blockage. CT has a higher risk of radiation exposure and is insufficiently sensitive for finding stones. ERCP and PTC are complex procedures that need technical competence as well as contrast media. Several problems from the operation may also occur. [7]

MATERIALS AND PROCEDURES

After receiving clearance from the protocol review committee and the institutional ethics committee, a cross-sectional prospective research was undertaken at the Department of Radiology. Following informed permission, a comprehensive history was obtained from the patient or family. All patients were informed about the procedure's approach, risks, advantages, outcomes, and related complications. This research comprised 50 individuals with clinically confirmed obstructive jaundice and total bilirubin levels more than 5mg/dl. This research excluded patients with claustrophobia, renal failure, pregnancy, and MR incompatibility.

METHODOLOGY

All patients in the research had a USG examination first, then an MRCP, and lastly a CT scan. All patients in the research had a USG examination first, then an MRCP, and lastly a CT scan. A GE Healthcare Voluson 730 pro was used to do the USG. The investigation included both curved and linear probes. Images of the biliary tree were captured for further analysis. A GE Healthcare HiSpeedCTe Dual CT Scanner was used to conduct helical CT. Upper abdomen unenhanced CT with 7mm collimation was conducted. The contrast solution (100 ml, 300 mg I/ml) was then administered intravenously. The scans were performed using a 5mm collimation, a 2mm reconstruction interval, a pitch of 1.5, and a FOV of 30-40 cms. The photos were resized to fit smaller intervals. The Philips Healthcare Intera 1.5 Tesla MRI Scanner was used for the MRCP. For MRCP, the following parameters were investigated: level of blockage (four anatomical segments), hepatic, suprapancreatic, pancreatic, ampullary, presence of bile duct calculi, and bile duct calculi. Without a doubt, imagined.

The MRCP, CT, and USG images were evaluated individually in a blinded method, with no knowledge of the results of other tests or clinical findings. The final diagnosis was made based on surgical or histological correlation. Among these twenty-six patients, five had surgery, five had cytology, and the others had different forms of inquiry. Lesions that were

most likely benign were classified as benign, whereas lesions that were most likely malignant were classified as malignant.

RESULTS
The purpose of this research was to determine the superiority of MRCP over CT and USG in the assessment of obstructive jaundice. The research comprised a total of 50 patients. Twenty of the 50 individuals had benign lesions, whereas 30 had malignant lesions. While MRCP and CT had identified 48 of the seventeen lesions, USG identified all of the benign lesions. However, USG had shown that some of the malignant tumours were benign.

Table 1: Site of Obstruction in the studied population.

Modality	No of Cases Detected Correctly=50	Percentage
Ultrasonography	52	52
Helical CT	84	84
MRCP	96	96

MRCP has 96% accuracy in detecting the site of obstruction followed by CT and USG [Table 1].

Table 2: Comparison of diagnostic values of USG, Helical CT and MRCP in benign causes of Obstructive Jaundice.

Modality	Sensitivity (%)	Specificity (%)	Positive Predictive Value (%)	Negative Predictive Value(%)	Accuracy (%)
USG	100	68	62	100	68
CT	90	68	78	92	84
MRCP	90	96	96	94	94

From the above [Table 2] it is inferred that MRCP has the highest accuracy for detecting benign lesions followed by CT and USG. The sensitivity of MRCP and CT is the same for both modalities while it is 96% for USG.
Inspite of the high sensitivity for USG, the specificity for the same is very low at 62% when compared to that of CT's 62% and MRCP's 96%. Thus USG is a very good screening tool for benign lesions for obstructive jaundice while CT and MRCP are the specific investigations.
From the above ROC curve we infer that MRCP has the largest area proving that MRCP is the most sensitive and specific investigation. The p value is also <0.05 making MRCP statistically better investigation than CT and USG in detecting benign lesions.

Table 3: Comparison of diagnostic values of USG, Helical CT and MRCP in malignant causes of Obstructive Jaundice.

Modality	Sensitivity (%)	Specificity (%)	Positive Predictive Value (%)	Negative Predictive Value (%)	Accuracy (%)
USG	70	96	96	62	68
CT	70	90	88	72	82
MRCP	96	94	94	96	96

The above [Table 3] suggests that MRCP is again the most accurate investigation with an accuracy upto 96%. The sensitivity and specificity of MRCP is high making it more accurate while USG and CT have high sensitivity their specificities are low. The MRCP has the largest area among the three investigations, proving it to be the most efficient investigation in the detection of malignant lesions. The p value again is >0.05 making it significant. Thus MRCP is statistically more significant CT and USG in the diagnosis of obstructive jaundice.

DISCUSSION

USG was done prior to MRCP and CT for all patients. While USG all lesions with cholelithiasis, it had difficulty in diagnosing distal CBD calculi in about 3 patients which was easily picked up by MRCP.[8,9] Our study is in concordance with Hiroyuki Irie et al[9] in their study they found an accuracy of 100% in detecting CBD calculi on MRCP in cases with equivocal sonographic and CT results. Of the eight patients diagnosed with CBD and GB calculi both MRCP and CT had accurately diagnosed all the eight cases. MRCP showed calculus region as an area of signal void and CT showed it as hyperdense lesion. Our study is in concordance with Soto et al,[10] In their study they found, sensitivity of 94% and specificity of 100% for detecting bilary calculi in MRCP. Regan et al[11] In their study they found the sensitivity of diagnosing CBD calculus was 87% and our study showed that CT is more superior to their study. Van Hoe et al,[12] in prospective study of 15 patients with bile duct obstruction with various radiologic modalities, were compared for their capability to demonstrate the level and cause of obstruction, and found that USG appears to be the single most useful modality in evaluation of bile duct obstruction, compared to CT & Direct cholangiography. Robert N. et al,[13] in her study of 35 patients with obstructive jaundice using ISG concluded that USG had a sensitivity of 85% in finding the site of obstruction. USG being a simple, safe and non invasive tool, it can be used in the first line of investigation in patients with obstructive jaundice. Threasa H.[14] have analyzed the role of USG in the detection, characterization and staging of cholangiocarcinoma and have concluded that in well trained hands, with high resolution equipments it is possible to detect and characterize this rare tumor using USG as sensitively as with other radiological modalities. Cesar S et al,[15] have analyzed 14 patients with obstructive jaundice using 3D USG. The level of obstruction was correctly depicted in all patients, and a dilated common bile duct, common hepatic duct, gallbladder, and main intrahepatic ducts were well visualized on minimum transparent mode images. The findings on minimum transparent mode images were well correlated with those on cholangiography; however, the perspective of the whole biliary tree on minimum transparent mode images was inferior to that on cholangiography in all cases. Though USG is a very effective modality in the screening of obstructive jaundice its specificity seems to be low in many studies. CT as a modality of choice for obstructive jaundice was investigated by several researchers. In a study conducted by Cesar et al,[15] in evaluating the site of obstruction with CT the results were accurate and comparable to that of direct cholangiography. Another study was conducted to analyze biliary obstruction proximal to the pancreatic segment with CT. They concluded that CT is the most valuable as a non-invasive means of narrating surgical or radiologic drainage procedure in patients with biliary obstruction.[16] As CT was becoming popular MR Cholangiography was introduced by Matthew A.[17] Some authors used the rapid sequence gradient echo acquisition with three-dimensional post processing technique to evaluate the biliary system in five healthy volunteers and 13 patients of obstructive jaundice. The results were compared with other imaging modalities (US, CT scan and conventional radiographs obtained during PTC or ERCP). Authors concluded that MRCP has the capability for non invasive imaging of the biliary tree in patients with obstructive jaundice but improvement in technique is needed to overcome limited spatial resolution and low signal to noise ratio. 3D MR cholangiography using contrast enhanced Fourier acquired steady state technique (CE-FAST) was evaluated in 12 patients with malignancy related obstructive jaundice and the results were correlated with percutaenoustranshepatic biliary drainage performed 0-21 days later. Authors found dilatation and obstruction of the bile ducts were clearly demonstrated in all patients on MRCP and there was 100% correlation with PTBD gram. Authors concluded that though spatial resolution of 3D MR cholangiography is slightly inferior to the direct cholangiogrpahy the information obtained is similar to PTC and the non invasive MR Cholangiography procedure is less traumatic for the patient.[10] The

initial results with MR cholangiopancreatography studies were achieved with gradient echo sequences by using a steady-state free precession techniques.[18] Subsequently, MR Cholangiopancreatography studies were performed with fast or turbo spin echo pulse sequence (FSE). These sequences were not only slow and required longer scan time for adequate spatial resolution but were also prone to motion induced artifacts and signal loss. The latest imaging techniques for MRCP are Rapid Acquisition with relaxation Enhancement (RARE) and Half-Fourier Acquisition Single-Shot Turbo-Spin-Echo (HASTE).[19] Using RARE and HASTE sequences, image acquisition is possible within a few seconds, allowing MRCP to be performed comfortably during a single breath hold thus markedly reducing the motion artifacts and improving the quality of images. After the introduction of MRCP several studies were performed to compare the efficacy of MRCP with various other radiological modalities. The results and the conclusions of these studies are enumerated below. Considering few limitations of Helical CT and USG and invasiveness and complications of ERCP,MRCP alone can become the imaging modality of choice in imaging patients with obstructive jaundice, and it becomes still more superior on adding conventional MRI sections to it because, it is Non-Invasive imaging modality. No-Ionising radiation needed. No need of contrast media. Multiplanar imaging capability. Non-operator dependant. No post procedure complications. Can be performed in critically ill patients. It can show biliary tract proximal as well as distal to obstruction. Like all investigations MRCP also has a few limitations. It cannot be used for patients with metallic implants or pacemakers or patients having claustrophobia. It cannot provide therapeutic options like ERCP.

CONCLUSION
In the diagnosis of obstructive jaundice and to determine the aetiology, location, and size of the lesion, MRCP seems to be a better option than other radiological techniques such as USG, CT, or ERCP.

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