ABSTRACT

Background: The expanding spectrum of therapeutic options for patients with surgical jaundice makes it necessary for the radiologist to precisely assess the etiology, location, level and extent of disease.

Aim: To compare the diagnostic accuracy of Magnetic Resonance Cholangiopancreatography (MRCP) with Ultrasound and Computed Tomography (CT) in evaluation of patients with obstructive jaundice taking direct cholangiographies (ERCP and PTC), histologic tests and anatomo-pathological findings after surgical intervention as gold standard.

Settings and Design: This prospective study included 50 patients who were referred to the radiology department with clinical features of biliary obstructive disease.

Materials and Methods: Initial ultrasonography (USG) evaluation was followed by Computed tomography (CT) and Magnetic Resonance Cholangiopancreatography (MRCP), however in cases of benign pathologies where USG findings were unequivocal, Computed tomography (CT) was not done to avoid unnecessary radiation exposure. The results were read by radiologists blinded to other imaging findings. The characteristic Endoscopic Retrograde Cholangiopancreatography (ERCP) features/histopathological diagnosis/surgical findings (as applicable) were considered as final.

Results: Diagnostic accuracy of MRCP (98%) in the diagnosis of benign and malignant diseases was relatively high (98% and 98%) as compared to CT (82.86% and 91.43% in benign and malignant respectively) and USG (88% and 88%). In the diagnosis of benign diseases, MRCP was 100% sensitive compared to ultrasound (80.77%), which was more sensitive than CT scan (54.55%). In the diagnosis of malignant diseases, MRCP was more sensitive (95.83%) as compared to CT scan (91.67%), which was more sensitive than ultrasonography (79.17%).

Conclusion: Ultrasound as a screening modality is useful to confirm or exclude biliary dilatation and to choose patients for MRCP examination. MRCP is an important non invasive imaging investigation in the pre operative evaluation of patients with obstructive jaundice.

Keywords: MRCP, Obstructive jaundice, Choledocholithiasis, Stricture, CBD, Cholangiocarcinoma, Periampullary carcinoma

INTRODUCTION

Obstructive jaundice is one of the most frequent and grave form of hepatobiliary disease. It can pose problems in diagnosis and management, particularly intrahepatic cholestasis [1]. Despite the technical advances, the operative modes of management of obstructive jaundice were associated with very high morbidity and mortality. Yet, during the last decade significant advances have been made in our understanding with regard to the pathogenesis, diagnosis, staging and the efficacy of management of obstructive jaundice [2]. The expanding spectrum of therapeutic options for the jaundiced patient has made it necessary for the radiologist to do more than simply discriminating between obstructive and non-obstructive jaundice. Correct choices among therapeutic options usually rest upon a precise assessment of etiology, location, level and extent of disease [3].

So, it is mandatory to determine pre-operatively the existence, the nature and site of obstruction because an ill chosen therapeutic approach can be dangerous. US has been always considered the first choice technique in the study of biliary obstructive disease, due to its accessibility, speed, ease of performance and low cost [4]. Traditional Computed Tomography (CT) scan is usually considered more accurate than US for helping determine the specific cause and level of obstruction [5]. Both ultrasound and CT scan are regarded as safe and non-invasive procedures in evaluating the status of the biliary tract. Ultrasound is used as an initial modality to confirm or exclude duct obstruction, which it does with at least 90% accuracy [6]. The range of application of CT has been partially restricted by MRCP [7]. MRCP techniques have greatly evolved, providing high resolution images of the biliary tree with short exam duration, while remaining non invasive without contrast medium injection [8].

AIM

This prospective study aimed to compare the diagnostic accuracy of Magnetic Resonance Cholangiopancreatography (MRCP) with Ultrasound and Computed Tomography (CT) in evaluation of patients with obstructive jaundice taking direct cholangiographies (ERCP and PTC), histologic tests and anatomo-pathological findings after surgical intervention as gold standard.

MATERIALS AND METHODS

The ethics committee of our institute approved this prospective study. Informed consent was taken from all patients undergoing this study. We prospectively studied 50 patients (28 females and 22 males) in the age range 14-82 years over a period starting from January 2012 to December 2013 at SGRD medical college, Amritsar. Initial USG evaluation was followed by CECT and MRI/MRCP, however in patients with Obstructive Jaundice with CBD calculi as diagnosed on USG, CT was performed if required. Transabdominal ultrasonography was done with convex 1 to 5 Mhz probe on GE Voluson E8 followed by Contrast enhanced Computed Tomography (CECT) done on multislice CT (Siemens – Erlanger, Germany) with collimation of 2 mm. However in cases of benign pathologies where USG findings were unequivocal CECT was not done to avoid unnecessary radiation exposure. MRCP was done in all patients on Philips GyroscanAchieva 1.5 Tesla MRI using our
standard MRCP protocol [Table/Fig-1]. The USG, CECT and MRCP results were read by radiologists blinded to other imaging findings. As the gold standard we used direct cholangiographies (ERCP and PTC), histologic tests and anatomo-pathological findings after surgical intervention, in accordance with the appropriate diagnostic and therapeutic approach to the case considered. All patients with clinical features of biliary obstructive disease were included in the study. Following patients were excluded:
1. Patients less than 12 years of age.
2. With contraindications to MRI.
3. Patients with Prehepatic/Hepatic Jaundice.

RESULTS
Of the 50 patients included in this study, benign and malignant lesions constituted 26 (52%) and 24 (48%) cases respectively. Age distribution of benign vs milgnant lesions is shown in [Table/Fig-2,3].

Benign Pathologies
The diagnostic accuracy, sensitivity and specificity of USG, CT and MRCP for different benign pathologies were as shown in [Table/Fig-4-6]

**Choledocholithiasis [Table/Fig-5]**
Fourteen cases confirmed to be choledocholithiasis on final diagnosis were accurately diagnosed on ultrasound. One case was falsely diagnosed as choledocholithiasis on ultrasound that later on ERCP biopsy was diagnosed as cholangiocarcinoma. Ultrasound was unable to diagnose a specific cause for one case where ERCP confirmed the diagnosis to be choledocholithiasis.
Three out of four cases of choledocholithiasis in which CT scan was performed were accurately diagnosed. One case was falsely diagnosed as choledocholithiasis that later on ERCP biopsy was diagnosed as cholangiocarcinoma. CT scan was unable to diagnose a specific cause for one case where ERCP confirmed the diagnosis to be choledocholithiasis.
All fifteen cases were accurately diagnosed on MRI/MRCP. One

<table>
<thead>
<tr>
<th>Mode</th>
<th>Total</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Choledocholithiasis</td>
<td>15</td>
<td>57.7</td>
</tr>
<tr>
<td>Benign stricture</td>
<td>05</td>
<td>19.2</td>
</tr>
<tr>
<td>Cholangitis</td>
<td>04</td>
<td>15.4</td>
</tr>
<tr>
<td>Other benign conditions*</td>
<td>02</td>
<td>7.7</td>
</tr>
<tr>
<td>Total</td>
<td>26</td>
<td>100</td>
</tr>
</tbody>
</table>

*one case was diagnosed as choledochal cyst while the other showed isatrogenic stenosis as a result of laproscopic cholecystectomy.

**Table/Fig-4**: Benign pathologies

<table>
<thead>
<tr>
<th>Mode</th>
<th>USG</th>
<th>CT</th>
<th>MRCP</th>
</tr>
</thead>
<tbody>
<tr>
<td>DA%</td>
<td>SE%</td>
<td>SP%</td>
<td>DA%</td>
</tr>
<tr>
<td>Choledocholithiasis</td>
<td>96</td>
<td>93.3</td>
<td>97.14</td>
</tr>
<tr>
<td>Benign Stricture</td>
<td>100</td>
<td>40</td>
<td>100</td>
</tr>
</tbody>
</table>

**Table/Fig-5**: Diagnostic accuracy, sensitivity and specificity - benign pathologies

![MRCP image demonstrates cystic dilatation of CHD and Proximal CBD - Choledochal cyst](image-url)
All five cases of benign stricture in which MRI/MRCP was performed were accurately diagnosed and findings accurately correlated with the final diagnosis.

**Malignant Pathologies** [Table/Fig 7-9]

The diagnostic accuracy, sensitivity and specificity of USG, CT and MRCP for different malignant pathologies were as shown in [Table/Fig-8].

Four out of seven cases of Periampullary carcinoma in which ultrasound was performed were accurately diagnosed. Ultrasound was unable to diagnose a specific cause for three cases where final diagnosis confirmed the diagnosis to be periampullary carcinoma.

Six out of seven cases of Periampullary carcinoma in which CT scan was performed were accurately diagnosed. It was unable to diagnose a specific cause for one case where final diagnosis confirmed the diagnosis to be periampullary carcinoma.

The overall accuracy, sensitivity and specificity of USG, CT and MRCP in benign and malignant lesions observed in this study are as shown in [Table/Fig-10].

**DISCUSSION**

The opinion is broadly shared that US is the first choice option in the diagnosis of choledocholithiasis. Our results for US diagnostic accuracy, sensitivity and specificity are in accordance with those reported in literature. Boraschi et al., reported a specificity of over 90% [9]. In the literature, a sensitivity range of 20 to 80% is often documented [10]; 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 and patients with abdominal meteorism, as well as to the variability of the US technique applied.

The high sensitivity in our study presumably derives from the use of compressed technique, and to THI, which allowed for better study of the distal tract of the CBD. As described by Ortega et al., [11], harmonic imaging, by improving contrast resolution, stresses the difference between the anechoicity of the duct lumen and the surrounding soft tissues.
patients preferably should be in a fasting state four hours prior to the ultrasound and MRCP investigation. Ultrasound and Spiral CT have high diagnostic accuracy and specificity and along with MRCP have largely confined the role of invasive cholangiography (ERC) to therapeutic/palliative procedures, rather than primary diagnostic tests in modern setup.

CONCLUSION

MRI-MRCP was superior to ultrasound and CT scan in studying both the benign and malignant lesions. Periampullary carcinoma was the commonest malignant etiology, while choledocho lithiasis was the commonest benign cause. MRCP is the modality of choice for optimal characterization of the causative lesions in most of the cases of obstructive jaundice. MRI-MRCP was superior to ultrasound and CT scan in studying both the benign and malignant lesions.

REFERENCES
