Comparison of Magnetic Resonance Cholangiopancreatography (MRCP) with Ultrasonography (USG) and Computed Tomography (CT) in the Evaluation of Patients with Obstructive Jaundice

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ABSTRACT

Introduction: Obstructive jaundice is a widespread clinical problem. It has been documented as one of the primary cause of increased mortality and morbidity. Although clinical data such as history, physical examination, and laboratory tests can differentiate between intra hepatic and extra hepatic obstruction in 90% of patients, the cause and site of obstruction is diagnosed by imaging modalities. The frequently used imaging modalities include Ultrasonography (USG), Computed Tomography (CT), Endoscopic Retrograde Cholangiopancreatography (ERCP) and Magnetic Resonance Cholangiopancreatography (MRCP). Percutaneous Transhepatic Cholangiography (PTC) is used for drainage procedures. Study aim to appraise the diagnostic accuracy of MRCP in detecting the cause and level of obstruction in patients suffering from with Obstructive Jaundice.

Material and methods: A total no. of 25 patients suffering from obstructive jaundice of all age groups and either sex who were referred to Department of Radio-Diagnosis, Chettinad Hospitals and Research Institute were included in this study.

Results: Of the twenty five patients, ten patients had benign causes of obstructive jaundice while fifteen patients had malignant causes of obstructive jaundice. MRCP had an accuracy of 97% in detecting the cause of obstructive jaundice. In diagnosing the site of obstruction MRCP had an accuracy of 100%.

Conclusion: In the diagnosis of obstructive jaundice and to know the cause, site and extent of the lesion MRCP being a non invasive, non ionizing procedure seems to be a better choice. The only drawback of MRCP is the cost involved and the availability. The limitation of the study is the small sample size and that ERCP correlation for these patients was not done.

Keywords: MRCP, Obstructive Jaundice, Cholangiocarcinoma

INTRODUCTION

Obstructive jaundice is one of the widespread clinical problems which has increased incidence of mortality and morbidity. Intra hepatic and extra hepatic obstruction in 90% of patients, can be made out through suitable clinical data but the cause and site of obstruction is diagnosed mostly by imaging modalities. The main aim of any imaging modality in obstructive jaundice is to identify the presence of obstruction, its location, extent, possible etiology.

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.[1,2]

The commonly used imaging modalities include Ultrasonography (USG), Computed Tomography (CT), Endoscopic Retrograde Cholangiopancreatography (ERCP) and Magnetic Resonance Cholangiopancreatography (MRCP). Percutaneous Transhepatic Cholangiography (PTC) is used for drainage procedures.[3]

Radiological imaging is vital in making a decision in management of patients with Obstructive Jaundice. Imaging choices available in diagnosing acute pancreatitis include USG, computed tomography (CT), Magnetic Resonance imaging (MRI), MRCP and ERCP. The choice depends

upon the reason for investigation.[4]

Magnetic Resonance Cholangiopancreatography with its inherent high contrast resolution, rapidity, multiplanar capability and virtually artifact free display of anatomy and pathology, is proving to be imaging of choice in these patients. The quality of images obtained is comparable with those of direct cholangiography procedure like ERCP, which is considered as standard of reference in ductal pathologies. It has proved effective in demonstrating bile duct dilatation, stricture and Choledocholithiasis (Fig-1). The initial results with MR cholangiopancreatography studies were achieved with gradient echo sequences by using a steady-state free precession techniques. The latest imaging techniques for MRCP are Rapid Acquisition with relaxation Enhancement (RARE) and Half-Fourier Acquisition Single-Shot Turbo-Spin-Echo (HASTE).[5,6]

Though Ultrasonography and CT are non invasive, they have their drawbacks as well. USG is ineffective in accurately diagnosing the site of obstruction in most cases. CT has an increased risk of radiation and is also not sufficiently sensitive for detecting stones. ERCP and PTC are complicated procedures and require technical expertise and contrast media. Also several complications from the procedure may arise.[7]

Study aimed to appraise the diagnostic accuracy of MRCP in detecting the cause and level of obstruction in patients suffering from with Obstructive Jaundice.

MATERIAL AND METHODS

A total of 25 patients with clinical history and symptoms of obstructive jaundice irrespective of age and sex who were referred to Department of Radio-Diagnosis, Chettinad Hospitals and Research Institute were included in our study. The inclusion criteria being the patients who were clinically diagnosed with obstructive jaundice.

Sex	No of cases	Percentage (%)
Male	11	44
Female	14	56
Total	25	100

Table-1: Demonstrating Sex incidence in the studied population

Type of lesion	No of cases	Percentage (%)
Benign	10	40
Malignant	15	60
Total	25	100

Table-2: Benign versus Malignant causes of obstructive jaundice in the studied population

Patients who were not suitable for MRI study due to claustrophobia, pregnancy or MR incompatibility were excluded from the study.

The age group of the patients varied from 21 to 86. There was no obvious sex in relation to obstructive jaundice in our study. Out of twenty five patients, ten patients were diagnosed to have benign lesions while fifteen were diagnosed with malignant lesions. Among these fifteen patients with malignant lesions, MRCP had diagnosed all the fifteen. In diagnosis of the site of obstruction, MRCP was accurate in all twenty five patients.

The ethics committee of our institute approved this prospective study. Informed consent was taken from all patients undergoing this study. We prospectively studied 25 patients (14 females and 11 males) over a period of one year at Chettinad Hospitals and Research Institute. 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 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 3 Tesla MRI using our standard MRCP protocol.

Inclusion Criteria
Patients age between 21 to 86
Patients who have given Consent form

Exclusion Criteria
Patients less than 12 years of age.
With contraindications to MRI.
Patients with Prehepatic/Hepatic Jaundice.
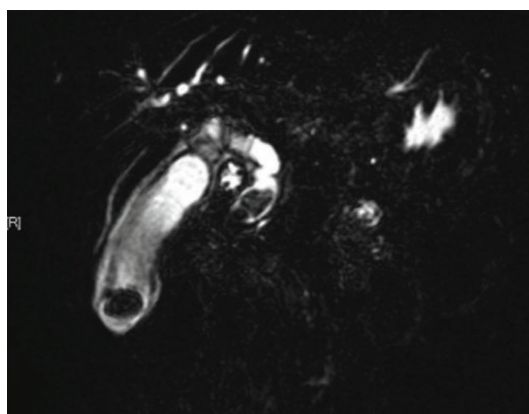
STATISTICAL ANALYSIS

The Results obtained was expressed as percentages and variables as required. Microsoft office 2007 was used for the data analysis.

RESULTS

The table-1 demonstrates that there was no obvious sex predilection among the patients affected with obstructive jaundice.

Table 2 shows that there was almost equal predilection for both benign and malignant causes of obstructive jaundice.

The illustration gives us a graphic representation of the common causes of obstructive jaundice. CBD calculi were the most common cause of obstructive jaundice followed by

Modality	Sensitivity (%)	Specificity (%)	Positive Predictive Value (%)	Negative Predictive Value (%)	Accuracy (%)
MRCP	94	100	100	94	97

Table-3: Diagnostic values of MRCP in benign causes of Obstructive Jaundice

Modality	Sensitivity (%)	Specificity (%)	Positive Predictive Value (%)	Negative Predictive Value (%)	Accuracy (%)
MRCP	100	94	94	100	97

Table-4: Diagnostic values of MRCP in malignant causes of Obstructive Jaundice

Figure-1: Case of Cholelithiasis with Choledocholithiasis

Figure-2: MRCP showing dilatation of the intramural portion of the distal common bile duct suggestive of Choledochocele

Figure-3a: Case of CA head of pancreas; **Figure-3b:** MRCP and T2W MRI showing dilatation of intra, extra hepatic and pancreatic duct with abrupt tapering at the Peri Ampullary region and hetero intense lesion in the head of pancreas.

Figure-4a: Case of klatskin's tumour; **Figure-4b:** MRCP and T2W MRI showing dilatation of intra hepatic ducts with an ill defined tumor confined to confluence of the ducts

periampullary and Ca Head of Pancreas

From the table -3 it is inferred that MRCP has the highest accuracy for detecting benign lesions. The sensitivity of MRCP was 94% but the specificity was high as 100%.

The specificity of MRCP was 100%. Thus MRCP was a specific investigation for benign lesions of obstructive jaundice.

MRCP was again the most accurate investigation with an accuracy upto 97%. The sensitivity and specificity of MRCP was high making it more accurate (table-4).

DISCUSSION

With the introduction of MRCP for diagnosing the biliary and pancreatic ductal pathologies, invasive procedure such as ERCP can be avoided. MRCP is used as a second line investigation following USG in patients with obstructive jaundice.[8] MRI combined with MRCP is the safe and cost effective investigation in evaluating the patients with significant biliary duct dilatation or congenital biliary tree abnormalities.[9] Single shot MRCP was highly sensitive (70 to 80%) and specific in detecting lesions in bile duct and pancreatic duct.[10]

Most presenting complaints were jaundice, abdominal pain, passing pale colored stools and itching. In our study 25 patients with clinical history of obstructive jaundice were studied. On clinical examination Icterus was the most common sign elicited. The youngest patient in our study was 27 years old female who was suffering from Carcinoma of pancreatic head with PD dilatation. The oldest patient was seventy five years old and was suffering from periampullary carcinoma. The average age of patients with benign lesions

and malignant lesions was in the fifth decade.

Six patients out of 25 were diagnosed with CBD and GB calculi which were accurately diagnosed by MRCP. Our study is in concordance with Soto et al 2000 study, they studied that detecting biliary calculi through MRCP is 94% sensitive and 100% specific.[11] Stephan et al did a study and found that diagnosing CBD calculus was 87% sensitive.

Three patients were diagnosed with Stricture disease. MRCP was 100% accurate in diagnosing the benign nature of the stricture in all 3 cases. The length of the stricture segment was well appreciated and helps in differentiating it from malignant stricture. MRCP to be extremely accurate in showing pancreatic dilatation, strictures, stones, cystic dilatation with sensitivity approaching 100%.[12] Our study is in concordance with Bhatt et al study they evaluated that MRCP is 100% accurate in diagnosing benign CBD stricture.[14]

One case of anatomical variant, a case of Choledochocele cyst was present in our study (fig-2). It was diagnosed accurately by MRCP. Our study is in concordance with Bhatt et al study who found 100% accuracy in diagnosing anatomical variants through MRCP.

Among the malignant lesions there were 2 cases of Head of Pancreas (Fig 3a) tumor and 4 cases of Periampullary Ca. MRCP accurately diagnosed all the six cases. Though MRCP alone could not clinch the diagnosis a few sequences of MRI was required to diagnose accurately the malignant lesions. Our study is in accordance with Anderrson et al 2005 study, they found MRCP is 90% accurate for diagnosing periampullary growth.[14] MRCP and T2W MRI showed dilatation of intra, extra hepatic and pancreatic duct with abrupt tapering at the Peri Ampullary region and hetero intense lesion in the head of pancreas (fig: 3b).

In 2 patients with extra hepatic Cholangiocarcinoma, MRCP with the help of conventional MRI is best at diagnosing all the cases with 100% accuracy. MRCP using breath-hold SSFSE sequence is exact in identifying the level of obstruction and the underlying tumor.[15]

Klatskin's tumor was found in three patients (Figure-4a), and MRCP showed 100% accuracy as studied by Bhatt et al 2005 in diagnosing klatskin's tumor which is 100% accurate by MRCP.[13] 3 patients with Ca of Gallbladder were diagnosed accurately by MRCP.

In patients with obstructive jaundice, ERCP is considered as the standard of reference in imaging, since it provides high resolution of biliary tree and pancreatic duct. The main advantage of ERCP is that it can perform therapeutic interventional procedures such as removal of stone, stricture dilatation, and stent placement. Highly skilled and experienced endoscopist is essential to perform this procedure. Visualization of biliary tree proximal to severe obstruction may not be possible almost always. Post procedural morbidity and mortality is significant. Procedure may not be performed in critically ill patients.[7] MRCP can clearly provide valuable information when ERCP is unsuccessful or inaccurate.[16]

Study conducted by Al-Obaidi et al.,[17] showed higher sensitivity (100%), specificity (98.5%), accuracy (98.7%) of MRI/MRCP for cases with benign stricture as compared to

sensitivity of USG (44.4%) which is consistent with present study.

Andersson M et al.,[14] concluded in their study that MRI with MRCP was more accurate than CT in differentiating between malignant and benign lesions in patients with suspected periampullary tumors. This is consistent with present study where MRI/MRCP showed 100 % accuracy in diagnosing cases with periampullary carcinoma.

MRCP is the only choice of investigation in imaging patients suffering from obstructive jaundice, as Helical CT and USG has few limitations invasiveness and complications. With addition of conventional MRI, MRCP becomes still more superior. Dynamic MR imaging is superior to helical CT in the preoperative detection and evaluation of local extension of tumor.[18]

Though MRCP is evolving as the gold standard in biliary imaging there are several pitfalls in MRCP imaging. Familiarity with the findings and imaging techniques which lead to misdiagnosis may help prevent misinterpretation of MRCP images. Also ERCP correlation, if available would have given a complete analysis of all the diagnostic modalities of obstructive jaundice.[19-23]

CONCLUSION

MRCP is the non invasive, non ionizing procedure in diagnosing the cause for obstructive jaundice and detect the cause, site and extent of the lesion. Cost and the availability are the only drawbacks of MRCP. The limitation of the study is the small sample size and that ERCP correlation for these patients was not done. With the introduction of MRI guided interventions MRCP can become both diagnostic and therapeutic application in detecting and treating obstructing jaundice and biliary tract in the near future.

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