

Role of Magnetic Resonance Cholangiopancreatography (MRCP) in the Evaluation of Patients with Obstructive Jaundice

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ABSTRACT

Introduction: Obstructive jaundice is a common clinical problem and most common presentation in patients with biliary ductal obstruction. The role of imaging is crucial for detection of site and cause of obstruction and also to differentiation of benign and malignant pathology. MRCP is used in patients with history of obstructive jaundice to identify and confirm the presence of obstruction, its location, extent, probable cause and also to obtain a map of the biliary tree that will help the surgeon or the interventionist to determine the best approach to each individual case. The main aim and objective of the study was to determine the accuracy of MRCP in the evaluation of patients with obstructive jaundice.

Method and Materials: In the evaluation of patients with obstructive jaundice, MRCP was conducted in the Department of Radio Diagnosis, Sree Balaji Medical college and Hospital. A total number of twenty five patients suffering from obstructive jaundice of all age groups and either sex were included in this study. Total of Twenty five patients with clinical diagnosis of obstructive jaundice were included in the study. MRCP was done in all the patients and results were compiled and compared with Operative/ ERCP findings and histopathological reports.

Results: A total of twenty five patients suffering from obstructive jaundice underwent MRCP. Out 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 accurate and better choice.

Keywords: Cholelithiasis, Choledocholithiasis, Carcinoma of Pancreas, MRCP, Obstructive Jaundice, Periapillary Carcinoma, Stricture of CBD, Klatskin Tumour

the best approach to each individual case. 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. MRCP is a standard MR imaging technique that has revolutionized the imaging of biliary and pancreatic ducts and has emerged as an accurate, noninvasive means of visualization of the biliary tree and pancreatic duct without radiation and injection of contrast material. Since its introduction by Wallner et al in 1991, MRCP has undergone a wide range of changes. It relies on heavily T2-Weighted image sequences that display stationary water as high signal. Multiplanar thin and thick section acquisitions are obtained using fast spin-echo techniques. The latest imaging techniques for MRCP are Rapid Acquisition with relaxation Enhancement (RARE) and Half-Fourier Acquisition Single-Shot Turbo-Spin-Echo (HASTE).¹ 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. 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. MRCP shows the entire biliary tract and pancreatic duct without any intervention and use of oral or IV contrast. The quality of images obtained is comparable with those of direct cholangiography procedure like ERCP. The diagnostic accuracy of MRCP suggests that, it has the potential to replace the more invasive procedures like diagnostic ERCP, which should be used only in cases where intervention is being contemplated. MRCP is very effective in diagnosing calculi within the CBD, level of stricture, Intra hepatic, extra

INTRODUCTION

Obstructive jaundice is a common clinical problem. It has been documented as one of the leading cause of increased mortality and morbidity. Though clinical data such as history, physical examination, and laboratory tests can differentiate between intrahepatic and extra hepatic obstruction in 90% of patients, the cause and site of obstruction is diagnosed by imaging modalities. Purpose of imaging procedure in obstructive jaundice are to identify the level of obstruction, location and length of obstruction, probable cause for obstruction. MR Imaging also obtain a map of the biliary tree that will help the surgeon or the interventionist to determine

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hepatic biliary ductal dilatation. In patients with malignant obstruction or stenosis of biliary-enteric anastomosis, this noninvasive imaging technique demonstrates the site and extent of the stenosis, the degree of proximal dilatation, the presence and size of biliary stones, and associated findings. 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. IV cholangiography has its own limitations as in 30-40 % of the cases there is incomplete opacification of the biliary passage and increased contrast reaction. ERCP and PTC are complicated procedures and require technical expertise and contrast media. Also several complications from the procedure may arise.

The main aim and objective of the study was to determine the accuracy of MRCP in the evaluation of patients with obstructive jaundice.

MATERIAL AND METHODS

This study 'Role Of Magnetic Resonance Cholangiopancreatography (MRCP) In The Evaluation Of Patients With Obstructive Jaundice' was conducted in the Department of Radio Diagnosis, Sree Balaji Medical college and Hospital. A total number of twenty five patients suffering from obstructive jaundice of all age groups and either sex were included in this study. The inclusion criteria was that the patient be clinically diagnosed as suffering from obstructive jaundice and patient referred to the Department of Radio Diagnosis for further investigation. Patients who are

not suitable for MRI study due to claustrophobia, pregnancy etc, were excluded from the study. The study protocol was approved by the ethical committee of this institute and all the patients gave written consent to participate. All the patients were instructed to fast over night prior to examination. All the metallic belongings removed prior to the examination and screened by using a metal detector. All the patients in the study underwent MRCP. MRCP was performed on Philips Healthcare Intera 1.5 Tesla MRI Scanner. All images were obtained with breath holding and parameters were individualized. Detailed parameters of each sequence are summarized below.

The following Parameters like level of obstruction, Presence of bile duct calculi, Status of CBD, Degree of dilatation of intra hepatic biliary radicles, Gall bladder pathology including size, wall, stones, Dilatation of pancreatic duct, Pancreatic atrophy, calcifications, and pseudocysts, Presence of masses, Invasion of viscera, fascial planes and metastasis, in case of malignant lesions were studied.

Then classification of imaging findings as benign or malignant cause of obstructive jaundice is based on following scale of confidence.

Definitely Benign: Biliary duct dilatation with a visible stone in the duct with no associated mass or stricture.

Probably Benign: Cystic dilatation of bile duct. Pancreaticobiliary duct dilatation considered benign (i.e. Sign of chronic pancreatitis).

Inconclusive: Not confidently diagnosed as benign or malignant.

Probably Malignant: Iso - Hypo mass with indirect signs of tumor such as duct dilatation with ductal cut-off adjacent to the mass or atrophic distal parenchyma or pancreatobiliary dilatation considered malignant without sign of a mass or lesion in pancreatic head without duct dilatation.

Definitely Malignant: Mass in the pancreatic head with consistent duct dilatation. Isolated CBD dilatation with an abrupt narrowing located cranial to the level of mass lesion. MRCP was analyzed separately and final diagnosis was established with per operative / ERCP or histopathological correlation. Among these twenty patients underwent surgery, five patients underwent cytology and remaining with other modalities of investigation. Probably benign lesions were considered as benign and similarly probably malignant lesions were considered as malignant.

RESULTS

This study was conducted to establish the Role of MRCP in the evaluation of obstructive jaundice. A total of twenty five patients with clinical diagnosis of obstructive jaundice were included in the study. The age group of the patients varied from 21 to 86. The average age of the patients in the study

Age group	No of cases	Percentage (%)
Children (0-12yrs)	0	0
Adolescent & young adults (13-30yrs)	3	12
Adults (31-60yrs)	15	60
Geriatric patient (>60yrs)	7	28
Total	25	100

Table-1: Age group of various pathologies in studied population

Pathology	No of cases	Percentage (%)
Anatomic variants	1	4
GB and CBD calculi	6	24
Benign Stricture	3	12
Ca Head of Pancreas	4	16
Periampullary Ca	3	12
Cholangiocarcinoma	2	8
Ca GB	2	8
Klatskins tumor	3	12
Metastatic compression	1	4
Total	25	100

Table-2: Various causes of obstructive jaundice studied in the population

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

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

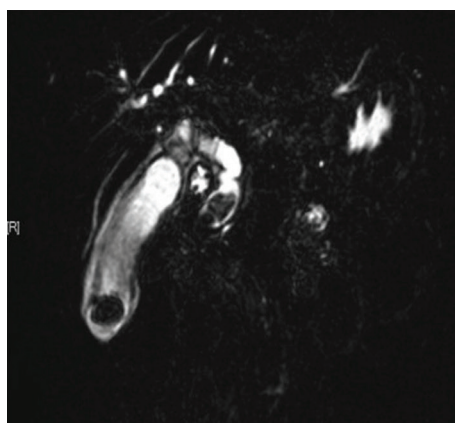


Figure-1: Cholelithiasis and choledocholithiasis



MRCP



T2W MR

Figure-2: Case of ca head of pancreas

was 52 (Table-1).

Most of the patients affected with obstructive jaundice are over the age of 30 yrs. More than 60% of the patients affected were over the age of 50 yrs. The average age of patients with benign lesions was 53yrs while that of malignant lesions was 52.8 yrs (Table-1). There was no obvious sex predilection in the patients affected with obstructive jaundice. In diagnosis the site of obstruction, MRCP was accurate in all twenty five patients.

Out of twenty five patients with history of obstructive jaundice, 60 percent (15 patients) were diagnosed to be having malignant pathology, among these Carcinoma of head of pancreas constituted the most common malignant pathology in our study population, comprising 16% of



MRCP



T2W MRI

Figure-3: Case of klatskin's tumour

study population. Next common malignant pathology are Periaumbullary carcinoma and klaskins tumour comprising 12 % of study population each. (Table No:2)

Total of 40 % study population had benign pathology as a cause of obstructive jaundice, Out of these benign lesions, Calculus in the common bile duct constituted the most common cause of obstruction in our study, comprising 24% of study population. Even though the malignant cases were out numbering the benign causes, most common single lesion causing obstructive jaundice in our study is Calculus in the common bile duct, comprising 24% of our study population (Table No:2)

MRCP has the highest accuracy for detecting cause of obstruction in both and malignant lesions. The sensitivity of MRCP is 94% but the specificity is high as 100%. Inspite of the high sensitivity for USG, the specificity for the same is very low at 69% when compared to that of CT's 69% and MRCP's 100%. Thus MRCP is a specific investigation for level and cause of obstruction in patients with obstructive jaundice. (Table No:3)

DISCUSSION

Diagnosing patients with suspected biliary or pancreatic pathologies in their early stage is almost importance in patient care and management. Imaging technique are needed to determine the required and appropriate work up of patients with obstructive jaundice. With the introduction of MR

Cholangiopancreatography for the diagnosis of biliary and pancreatic ductal pathologies, invasive procedure like ERCP can be avoided solely for the purpose of diagnosis.

In our study twenty five patients with clinical diagnosis of obstructive jaundice were studied. Most of the patients presented with jaundice and abdominal pain. Icterus was the most common sign followed by passing of white stools and itching. The youngest patient in the study was twenty seven years old female who was suffering from Carcinoma of pancreatic head with pancreatic duct 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 (Table No-2). MRCP was done for all patients. Out Of the six patients diagnosed with CBD and GB calculi MRCP had accurately diagnosed all the six cases.(Figure No:1). MRCP showed calculus region as an area of signal void. Our study is in concordance with Soto et al 2000; In their study they found, sensitivity of 94% and specificity of 100% for detecting biliary calculi in MRCP.¹ Stephan et al 2006: In their study they found the sensitivity of diagnosing CBD calculus was 87%. 2. Stricture disease was diagnosed in three patients. MRCP clearly showed benign nature of stricture in all three cases approaching 100% accuracy. MRCP with MRI images differentiated the benign and malignant lesions and MRCP also assessed the length of stricture. Histopathology examination of the resected specimen revealed benign nature of obstruction. Our study is in concordance with Bhatt et al; In their study they found 100% accuracy for MRCP in diagnosing benign CBD stricture.³

One case of anatomical variant, a case of choledochal cyst was present in our study. It was diagnosed correctly by MRCP. Our study is in concordance with Bhatt et al; in their study they found 100% accuracy for MRCP in diagnosing anatomical variants.³

Among the malignant lesions there were 4 cases of Head of Pancreas tumour and 3 cases of Periampullary Ca. MRCP accurately diagnosed all the 7 cases. Though MRCP alone could not clinch the diagnosis a few sequences of MRI was required to diagnose accurately the malignant lesions. On MR it is invariably hypo intense on T1 weighted images and variable on T2 weighted images due to the desmoplastic reaction.^{4,5} (Figure No:2)

Our study is in concordance with Anderrson et al 2005; in their study they found 90% accuracy for MR in diagnosing periampullary growth and carcinoma pancreas.⁶ In 2 patients with extra hepatic Cholangiocarcinoma MRCP diagnosed all cases with a 100% accuracy with the help of conventional MRI, thus approaching 100% accuracy for MR with MRCP. Three patients were diagnosed to have klatskins tumour, (Figure No:3) and the accuracy of MRCP remains 100%. Our study is in concordance with Bhatt et al 2005; in their study they found accuracy of 100% for MRCP alone in diagnosing klatskins tumour.³ Two patients with Ca of Gallbladder were diagnosed accurately by MRCP and confirmed by histopathological examination after surgery. ERCP is the standard imaging study for patients with obstructive

jaundice, who needed intervention. and its great advantage is, in its ability to perform therapeutic interventional procedures, like stone removal, stricture dilatation, and stent placement which will relieve obstruction. It requires a highly skilled and experienced endoscopist. Technical limitations can lead to unsuccessful examination. It may fail to show biliary tree proximal to severe obstruction. It is associated with significant post procedure morbidity and mortality. It cannot be performed in critically ill patients.^{7,8} In the absence of limitations of CT and USG and invasiveness and complications of ERCP, MRCP can be used as the imaging modality of choice in patients with obstructive jaundice, and it becomes still more superior on adding conventional MRI sections to it because of its non invasive nature, non ionization, No use of contrast media in most of cases, multiplanar capability, Non operator dependance, No post procedure complication. MRCP and MRI can be done in critically ill patients. However, MRCP and MRI abdomen cannot provide therapeutic options like ERCP. The study also has a few limitations. The accuracy of the study would have improved had the sample size been larger. Also ERCP correlation, if available would have given a complete analysis of all the diagnostic modalities of obstructive jaundice.

With the introduction of MRI guided interventions it may soon be possible in the near future to use MRCP for diagnostic and therapeutic applications in biliary tract and pancreatic pathology

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 drawback of MRCP is, its limited availability and its high cost. The limitation of the study is the small sample size and that ERCP correlation for these patients was not done.

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