Original Article

Role of Magnetic Resonance Cholangiography (MRC) in Patients with suspected Choledocholithiasis

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ABSTRACT

Objective: To evaluate the diagnostic accuracy of magnetic resonance cholangiography (MRC) in patients with suspected choledocholithiasis.

Study Design: Cross sectional / comparative diagnostic procedural study

Place and Duration of Study: This study was conducted at the Department of Radiology & Gastroenterology Nishtar Medical College & Hospital, Multan from March 2011 to March 2012

Materials and Methods: 50 patients (25 men and 25 women) having mean age of 50 years with suspected choledocholithiasis on sonography were included in the study.MR cholangiogram with two dimensional turbo spin echo sequences were acquired.ER cholangiogram was performed as a reference imaging technique.

Results: 48 out of 50 patients had bile duct stone on reference imaging technique. Two patients were truly negative for choledocholithiasis.MR cholangiogram was positive in 45 patients.MR cholangiogram missed CBD calculi in three patients that were positive on ER cholangiogram having size of calculi <6mm.33.3% patients had single calculus, while 66.7% have multiple CBD calculi. Stone size was 6mm in 25(55.5%) patients,6-10mm in 15(33.3%) patients and >10mm in 5(11.2%) patients

Sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV),and accuracy of MR cholangiogram were 93.7%,100%,100%,40% and 94% respectively

Conclusion: MR Cholangiogram provides results comparable with the ER cholangiogram in patients with suspected bile duct obstruction due to choledocholithiasis. In patients in whom an interventional endoscopic procedure is unlikely, MR Cholangiogram can replace ER Cholangiogram as a diagnostic tool, as it is non invasive and well tolerated by patients

Key Words: Magnetic Resonance Cholangiography, Endoscopic retrograde cholangiography,Choledocholithiasis.

INTRODUCTION

Accurate methods detecting bile duct abnormalities in patients with obstructive jaundice are important to both surgeons and endoscopists. Biliary obstruction may be the result of choledocholithiasis, tumors, trauma or infection. The most common cause is choledocholithiasis[1,2]. The prevalence of common bile duct (CBD) stones in patients who undergo cholecystectomy has been reported to be in the range of 10-20%, and the frequency of undetected CBD stones is approximately0%-4.2%.[3]. Accurate identification of CBD stones is important to avoid the surgical morbidity associated with residual stones.[4]

Endoscopic reterograde cholagiography (ERC), percutaneous transhepatic cholagiography(PTC), and intraoperative cholagiography(IOC) are considered to be the best diagnostic methods for common bile duct (CBD) stones; however, these procedures are invasive. Transcutaneous ultrasonography is generally used for the initial evaluation of patients presenting with symptoms consistent with choledocholithiasis but its diagnostic yield is low.[5] The diagnostic accuracy of endoscopic ultrasonography for biliary tract stone disease is greater than 95% and compares favorably with ERC. However; the accuracy of both techniques is highly operator dependent.[6, 7]

Magnetic Resonance Cholagiography (MRC) is a non invasive method of imaging the biliary tract. No contrast medium, sedation, or analgesics are needed. Several reports have shown the ability of MRC to display the biliary tree by combing the advantages of projectional and cross sectional views. The major challenge for MRC is whether it will reach the diagnostic accuracy of ERC and endoscopic ultrasonography for CBD stones and assume a diagnostic role.[8]

Many authors have compared the accuracy of MR cholangiography (MRC) with that of endoscopic reterograde cholangiography (ERC). In one study, the sensitivity, specificity, and accuracy of magnetic resonance cholangiography (MRC) in identifying CBD stones with reference to direct cholangiography (ERC or IOC) were 96%,97% and 97% respectively.[9]

In Pakistan, where health care facilities are limited and limited data is available nationally regarding the diagnostic accuracy of MR cholangiography in detecting choledocholithiasis in patients with symptomatic gall stones. A study of this kind is deemed necessary to generate local database that will be helpful

to determine the diagnostic value of MR cholangiography that is a non-invasive technique in comparison with endoscopic reterograde cholangiography. If the diagnostic accuracy of this method is found to be high then it can be utilized in such cases.

MATERIALS AND METHODS

Study was conducted from March 2011 to March 2012 to determine the diagnostic value of magnetic resonance cholangiography (MRC) in patients with suspected choledocholithiasis comparing with the reference imaging that is endoscopic reterograde cholangiography (ERC).

Fifty consecutive in-patients with suspected CBD stones were prospectively included in the study over a period of 12 months. There were 25 men and 25 women with mean age of 50 years. The patients were referred for magnetic resonance cholangiography (MRC) with suspicion of choledocholithiasis on ultrasonography.

Magnetic resonance cholangiography (MRC) examination was performed on 1.5 T unit (Philips) with a body coil.MR cholangiogram were acquired using non breath holding fat suppressed respiratory triggered turbo spin echo (TSE) sequences. Two dimensional TSE imaging was performed in the axial and coronal planes. The source images obtained were reformatted into targeted small volume maximum intensity images.

The presence of stone within biliary system, its location and size were determined by consultant radiologist with five year experience. Associated findings i.e. biliary, pancreatic duct dilatation and any associated mass were noted.

Endoscopic reterograde cholangiogram (ERC) was performed with TJF 100 or TJF 130 duodenoscopes in 50 patients. The presence of stone within biliary system, its location and size were determined along with associated findings.

Data collection was twofold, i.e. part- I includes demographics of patients like age, sex and presenting symptoms and part-II looked at the magnetic resonance cholangiography (MRC) and endoscopic reterograde cholangiography (ERC) findings. Statistically analysis was performed using SPSS. Sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV) and accuracy indices of magnetic resonance cholangiography (MRC) were calculated taking endoscopic retrograde cholangiography (ERC) findings as gold standard.

Regarding ethical considerations, this study uses ionizing radiation during fluoroscopy in endoscopic reterograde cholangiography (ERC), which could cause harmful effects on population, so we included only those patients, having clinical, sonographic and magnetic resonance cholangiography suspicion of choledocholithiasis.

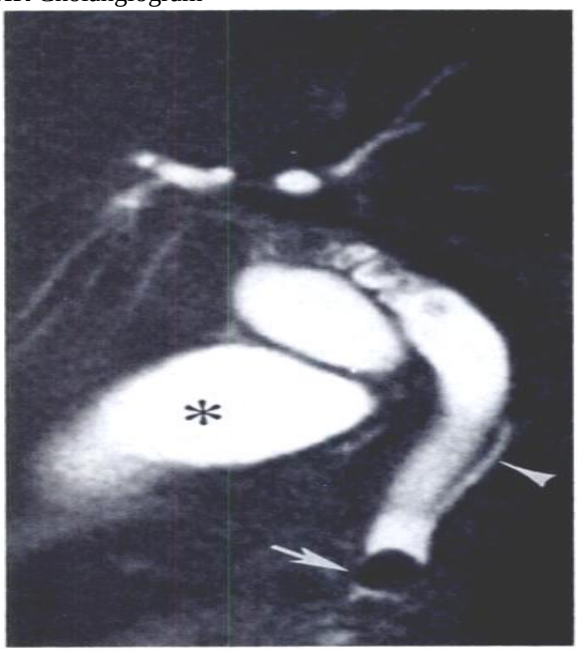
RESULTS

From total 50 patients, 25(50%) were male and 25(50%) were female. The mean age was 50 years.

MR Cholangiogram giving complete delineation of the CBD were obtained in all cases and were technically adequate for interpretation. Cholangiogram of diagnostic quality were obtained in all the patients who underwent endoscopic reterograde cholangiography

Results of MR Cholangiogram: MR Cholangiogram detected calculi in 45(90%) patients out of total fifty patients with clinical suspicion of choledocholithiasis. A single stone was found in 15 patients (33.3%), and 30 patients had two or more calculi. Stone size was 6mm in 25(55.5%) patients, 6-10mm in 15(33.3%) patients and >10mm in 5(11.2%) patients. 40 (88.8%) patients has calculi in CBD, In 4(8.8%) patients calculi were found in CHD and in one (2.2%) patient in cystic duct.

Results of ER Cholangiogram: Forty eight out of total fifty patients were positive for CBD stone on ER cholangiogram that is gold standard. Three additional patients were positive for CBD stone on ER cholangiogram that were falsely negative on MR Cholangiogram. Other radiological findings like size, location and number of calculi were comparable with MR Cholangiogram



MR Cholangiogram showing CBD Stone

Table No.1: Sensitivity, Specificity, PPV, NPV& Accuracy of MR Cholangiogram

MR Cholangiogram	ER-Cholangiogram	
	Stone +ve	Stone -ve
Stone +ve	45	00
Stone –ve	03	02

Sensitivity =93.7% Specificity =100%, PPV =100%, NPV=40%, Diagnostic Accuracy =94%

Correlation of Results from MR Cholangiogram with gold standard (ER Cholangiogram): Of the Forty eight patients with CBD stone disease, only forty five were detected on MR Cholangiogram. Three patients that were negative on MR Cholangiogram, found positive on ER cholangiography with stone size of <6mm.Calculated Sensitivity, Specificity, PPV, NPV and diagnostic accuracy were 93.7%,100%,100%,40% and 94% respectively (Table-I).

DISCUSSION

Transcutaneous sonography and CT scan are currently advocated for the initial evaluation of patients with symptoms consistent with choledocholithiasis with a few exceptions, the reported sensitivity for CBD stone diagnosis does not exceed 50% whereas specificity is higher than 90%(10,11,12).Direct cholangiography is generally still considered to be the ideal method for CBD stone diagnosis, although ERC may miss small stones :endoscopic sphincterotomy involving instrumental exploration is usually required to rule them out, especially in a dilated CBD (13,14).

Preliminary early reports indicate that MRC could be used to delineate the anatomy of the biliary tract and depict dilated bile duct and biliary obstruction(15,16).MRC images is based on the use of heavily T2 weighted sequences to highlight static or slowly flowing fluid which provide high signal intensity whereas the background appears hypointense(17).Diagnostic accuracy for choledocholithiasis and stenosis ranges from 71 to 100% (18) .To expand the clinical use of this less invasive diagnostic imaging modality technical refinements such as the use of fast spin echo variants allowing rapid acquisition within a few seconds.

Few reports have specifically addressed the use of MRC for diagnosis of gall stone disease(19).To our knowledge, only five reports has focused on choledocholithiasis(20) and only two were prospective: one include 126 patients with clinically suspected bile duct obstruction, of which thirty two were shown to have CBD stones; in the six cases not diagnosed by MRC,the stones were small (2-7mm):The other prospective study of 47 patients with suspected CBD stones confirmed 19 cases: MRC picked up 18 (95%),and one 6mm stone was missed. However the median stone size in this series was well above that of the present series, often exceeding 10mm (21, 22).

In our study of patients with high suspicion of CBD stone, 48(96%) actually had biliary stone disease, and 45 of these were diagnosed by MR Cholangiogram. Three patients having calculi were missed on MR Cholangiogram. The present study showed 93.7% sensitivity, 100% specificity and 94% diagnostic accuracy that is much higher than most of the studies mentioned in literature, however comparable with one study that is showing sensitivity, specificity and diagnostic accuracy of 96%,97% and 97% respectively[9].

Optimal patient management needs timely coupling of diagnosis and therapy; MRC is a purely diagnostic .Nevertheless, it may give valuable information on patients in whom ERC is not available.

CONCLUSION

In conclusion, MR Cholangiogram provides comparable results to ER cholangiogram in patients with suspected bile duct obstruction due to choledocholithiasis. In patients in whom an interventional endoscopic procedure is unlikely, MR Cholangiogram can replace ER Cholangiogram as a diagnostic tool, as it is non-invasive and well tolerated by patients.

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