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UTILITY OF MAGNETIC RESONANCE CHOLANGIOPANCREATOGRAPHY IN THE EVALUATION OF BILIARY TRACT OBSTRUCTION

Hina Gul, Sameer Waheed, Rashid Orakzai, Muhammad Nawaz, Ummara Saddique, Inayat Shah Roghani

Department of Radiology, Khyber Teaching Hospital, Peshawar - Pakistan

ABSTRACT

Objectives: To evaluate the accuracy of Magnectic Resonance Cholangiopancreatography (MRCP) in the detection of bile duct calculi and strictures using Endoscopic Retrograde Cholangiopancreatography (ERCP) and operative findings as gold standard.

Materials and Methods: A total of 110 patients aged between 25 years and 75 years with clinical and laboratory suspicion of obstructive jaundice, were investigated using MRCP in the Radiology Department of Khyber Teaching Hospital, Peshawar, Pakistan. The study was conducted from January 2007 to March 2008. The findings of MRCP were confirmed using ERCP and open surgery.

Results: Final diagnoses were normal bile ducts (n=12), choledocholithiasis (n=38), benign and malignant stenosis (n=60). The overall sensitivity and specificity of MRCP for stenosis were found to be 98% and 92% respectively. The sensitivity and specificity for detection of biliary tract calculi were found to be 95% and 92% respectively.

Conclusion: The lower cost, absence of ionizing radiation, operator independence and greater safety for patients make MRCP an attractive alternative to diagnostic ERCP.

Key Words: Magnetic Resonance Cholangiopancreatography, Endoscopic Retrograde Cholangiopancreatography, Obstructive Jaundice.

INTRODUCTION

The evaluation of suspected biliary obstruction has traditionally involved a variety of imaging modalities like Ultrasound (U/S), Computed Tomography (CT), Endoscopic Retrograde Cholangiopancreatography (ERCP), percutaneous transhepatic Cholangiography (PTC) and peroperative cholangiography[1]. All these techniques have limitations because of poor visualization of intraductal stones (like U/S and CT Scan) and a subsequent need for invasive procedures like PTC, ERCP[1]. MRCP is non-invasive imaging technique for the visualization of biliary ducts with images similar to ERCP and PTC[2, 3,4]. As no contrast injection is needed, it is an ideal imaging method for patients with allergy to iodine – based contrast materials or those with a general history of atopy[1].

The interest in MRCP on the part of surgeons, gastroenterologists and radiologists is due to its accuracy, safety and availability in nearly all modern MR scanners, as well as fact that it is well tolerated by patients[2].

Address for Correspondence:
Dr. Hina Gul
Department of Radiology,
Khyber Teaching Hospital, Peshawar - Pakistan
Contact No. 0333-9156718

Currently the diagnostic accuracy of MRCP is considered to be equivalent to that of ERCP for the majority of benign and malignant diseases causing biliary obstruction[6,7].

MRCP is an excellent diagnostic modality with a high sensitivity and specificity in detecting the cause and level of biliary obstruction[5], however it has got few limitations e.g., therapeutic manouvers like extraction of calculi, direct visualization of ampulla and biopsy of lesions are not be possible with MRCP[23].

Further more, radiographic images obtained with ERCP have higher spatial resolution[2]. Other limitations are image deterioration by stents and metalic clips at the site of previous surgery[8]. Due to these facts ERCP is still the gold standard for the evaluation of the biliary tract[7,9], but this procedure carries higher complication rates like bleeding from sphincterotomy site, pancreatitis, duodenal perforation and even death[10,11], and failure of procedure. Use of contrast agents in ERCP are an additional risk especially in atopic patients and those with renal disease.

Additionally ERCP is very much operator dependent and the frail elderly patients are at a greater risk[19]. ERCP can not be done on patients who have undergone previous biliary or gastric surgery[11] and in cases of tight strictures[12].

MRCP approaches the ideal imaging modality when used with proper indications and offers a safer and more acceptable alternative to diagnostic ERCP[13,14]. MRCP is particularly useful where ERCP is difficult, hazardous, impossible or has failed[14].

The basic principle of MRCP is that stationary body fluids such as bile and pancreatic secretions have high signal intensity on heavy T2 WIs (i.e. they appear white), whereas back ground tissues generate little signals (i.e. they appear dark) Since most of the background signals in abdomen arise from fat, techniques that allow suppression of fat can substantially reduce the back ground signals[1,21,22].

MATERIAL AND METHODS

A body phased array coil was used for signal reception. The place of study was Khyber Teaching Hospital. A total of 129 patients were assessed with clinical signs, biochemical and sonographic evidence of biliary obstruction, from Jan 2007 to March 2008. Patients with medical jaundice were excluded from the study.

A final diagnosis was based on operative findings and invasive cholangiography. MRCP images were evaluated by two Radiologists. All MRCP were performed on a 1.5 Tesla whole body system, with patients on empty stomach.

RESULTS

A total of 110 patients were included in the study with clinical and laboratory suspicion of obstructive jaundice. The age ranged was 25-75 years with male to female ratio of 2:1.

On basis of final diagnosis based on operative and ERCP findings, 38 patients had choledocholithiasis, 60 patients had biliary stenosis/ stricture and 12 patients were normal. MRCP correctly diagnosed 36 of 38 patients with choledocholithiasis (Fig. 1 and 2).

False negative results occurred in 2 cases due to calculi less than 2mm in size in the distal common bile duct (CBD). False diagnosis of cholelithiasis occurred in only one case for whom the final diagnosis was CBD adeno carcinoma confirmed at subsequent open surgery. In case of biliary strictures, one wrongly diagnosed case by MRCP was subsequently proved to be papillary edema on endoscopy. Level of obstruction is shown in Table 1 and sensitivity/specificity/negative and positive predictive values are given in Table 2.

Table 1: Level of Obstruction on MRCP

Level	No. of cases
Intrahepatic	02 (3 %)
Portahepatis	25 (42%)
Suprapancreatic CBD	18 (30%)
Intrapancreatic CBD	9 (15%)
Ampullary	6 (10%)

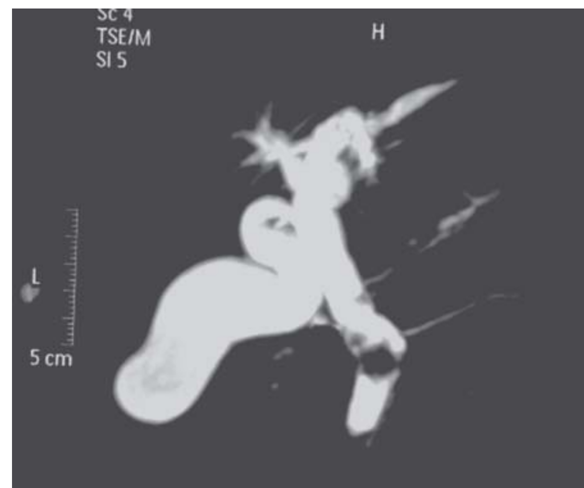

Fig. 1: Filling defect in Common Bile Duct due to calculus with resultant cholestasis and a smooth stricture in the lower end.

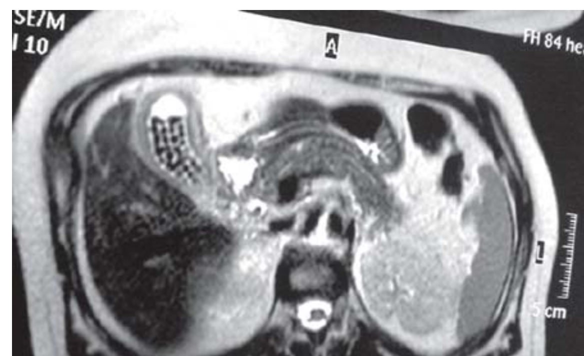

Fig. 2: Multiple small calculi in the gallbladder and common bile duct (evident on complimentary T2 weighted axial image).

Table 2: Sensitivity and Specificity of MRCP

Parameter	Sensitivity	Specificity	Positive Predictive Value	Negative Predictive Value
Calculi	95%	92%	97%	86%
Strictures	98%	92%	98%	92%

DISCUSSION

Biliary diseases and conditions associated with biliary obstruction are quite common. The accurate diagnosis of the presence, cause and level of biliary obstruction is the key to the cost effective work-up of patients with suspected biliary disease.

No established non-invasive imaging method is sufficiently reliable to diagnose every case of obstructive jaundice because each imaging method has inherent limitations.

ERCP is regarded as the diagnostic modality of choice; however, it is technically unsuccessful in approximately 4% of patients and is associated with a .8-25% risk of non fatal complications[17] and 0.2-0.5% risk of fatal complications[15]. MRCP is a non invasive method to visualize the bile ducts without use of contrast material. It is therefore, appropriate to use MRCP for diagnostic purposes and to restrict ERCP to those cases in whome endoscopic interventions is needed.

The overall sensitivity and specificity of MRCP for biliary strictures was found to be 98% and 92% respectively. These findings are in accordance with those of Tekin et al in Turkey[17] which showed sensitivity and specificity of 97% and 94% respectively. The study conducted by Alcaraz et al[5] in Spain also revealed comparable sensitivity of 92% but slightly lower specificity of 88%. This contradiction may be due to newer and faster MR machines having excellent spatial resolution compared to the older ones.

The sensitivity of MRCP in detecting CBD calculi was quite high in our study, i.e 95%. This finding coincides with studies conducted by Kim et al in Korea[16] (98%), Magnuson et al in USA[1] (92%), Shanmugam et al[10] in UK (97%), Tekin et al in Turkey[17] (96%) and Lomanto et al in Italy[3] (91%) while the specificity of detecting biliary calculi in our study was 92% which coincides with the study of Alcaraz et al (90%)[5], however it is lower than those of Lomanto et al in Italy (100%)[3], Zidi et al in France (100%)[18], and Magnuson et al in USA (99%)[1]. This might be due to high professional expertise and more meticulous review of the source / raw images from which MIP images are developed.

CONCLUSION

The lower cost, absence of ionizing radiation, operator independence and greater safety for patients, make MRCP an attractive alternative to diagnostic ERCP.

REFERENCES

1. Magnuson TH, Bender JS, Dancan MD, Ahrendt SA, Harmon JW, Regan F. Utility of Magnetic Resonance Cholangiography in evaluation of biliary obstruction. J Am Coll Surg. 1999 Jul; 189(1): 63-71.
2. Barish MA, Yucel EK and Ferrucci JT. Magnetic Resonance Cholangio Pancreatography New Eng J Medicine.1999; 341: 258-64.
3. Lomanto D, Pavone P, Laghi A, Panebianco V, Mazzochi P, Fiocca F et al. Magnetic Resonance Cholangiopancreatography in diagnosis of biliopancreatic diseases. Am J Surg. 1997; 174(1): 33-38.
4. Pavone P, Laghi A, Catalano C, Broglia L, Scipioni A, Di Girolamo M, et al. (Magnetic Resonance Cholangiopancreatography). A new method of non-invasive biliopancreatic diagnosis. Radiol Med. 1995; 90(4): 438-43.
5. Alcaraz MJ, De la Morena EJ, Polo A, Ramos A, De la Cal MA, Gonzalez Mandly A. A comparative study of Magnetic Resonance Cholangiography and direct cholangiography. Rev Esp Enferm Dig. 2000; 92(7): 423-26.
6. Fulcher AS, Turner MA, Capps GW, Zfass AM, Baker KM. Rare MR cholangio-pancreatography: experience in 300 subjects, Radiology 1998; 207: 21-32.
7. Kaltenthaler E, Vergel YB, Chilcott J, Thomas S, Blakeborough T, Walters SJ et al. A systematic review and economic evaluation of magnetic resonance cholangiopancreatography compared with diagnostic endoscopic retrograde cholangio-pancreatography. Health Technol Assess. 2004 Mar; 8(10): iii, 1-89.
8. Romagnuolo J, Bardou M, Rahme E, Joseph L, Reinhold C, Barkun AN. Magnetic resonance cholangiopancreatography: a meta-analysis of test performance in suspected biliary disease. Ann Intern Med. 2003; 139(7): 547-57.
9. Watkins JL, Etzkorn KP, Wiley TE, De-Guzman L, Harig JM. Assessment of technical competence during ERCP training. Gastrointest Endosc. 1996; 44: 411-15.
10. Shanmugam V, Beattie GC, Yule SR, Reid W and Loudon MA. Is magnetic resonance cholangio-pancreatography the new gold standard in biliary imaging? Br Rad. 2005; 78: 888-93.
11. Topal B, van de Moortel M, Fieuws S, Van-beckevoort D. The value of magnetic cholangio-pancreatography in predicting common bile duct stones in patients with gall stone disease. Br J Surg. 2003; 90: 42-47.
12. Kaltenthaler EC, Walters SJ, Chilcott J, Blakeborough A, Vergel YB and Thomas S. MRCP compared to diagnostic ERCP for diagnosis when biliary obstruction is suspected: a systemic review. BMC med Imag. 2006.
13. Takehara Y. MR Pancreatography: technique and applications. Top Magn Reson Imaging 1996; 8: 290-301.
14. Barish MA, Soto JA, Yucel EK. MRCP of biliary ducts: techniques, clinical applications and limitations. Top Magn Reson Imaging 1996; 8: 302-11.

15. Freeman ML, Nelson DB, Sherman S, Haber GB, Herman ME, Dorsher PJ, et al, Complication of endoscopic biliary sphincterotomy N Engl J Med. 1996; 335: 909-18 (PMID: 878247).

16. Kim JH, Kim MJ, Park SII, Chung JJ, Song SY, Kim KS, et al .MRCP In symptomatic gallstones: Diagnostic Accuracy according to clinical risk group Radiology 2002; 224: 410.

17. Tekin A, Saygili M, Hafta A, Oztan S. Biliary stones and stenoses: diagnostic value of magnetic resonance cholangiography. Turk J Gastroenterol. 2002; 13(3): 139-45.

18. Zidi SH, Prat F, Le Guen L, Rondena Y, Pelletier G. Performance characteristics of MRCP in staging of malignant hilar strictures, Gut 2000; 46: 103-6.

19. Hekimoglu K, Ustundag Y, Dusak A, Erdem Z, Karademir B, Aydemir S et al. MRCP vs. ERCP in the evaluation of biliary pathologies: review of current literature. J Dig Dis. 2008; 9(3): 162-69.

20. Howard K, Lord SJ, Speer A, Gibson RN, Padbury R, Kearney B. Value of magnetic resonance cholangiopancreatography in the diagnosis of biliary abnormalities in postcholecystectomy patients: a probabilistic cost-effectiveness analysis of diagnostic strategies. Int J Technol Assess Health Care 2006; 22(1): 109-18.

21. Meagher S, Yusoff I, Kennedy W, Martel M, Adam V, Barkun A. The roles of magnetic resonance and endoscopic retrograde cholangiopancreatography in the diagnosis of patients with suspected sclerosing cholangitis: a cost-effectiveness analysis. Endoscopy 2007; 39(3): 222-28.

22. Siddique K, Ali Q, Mirza S, Jamil A, Ehsan A, Latif S et al. Evaluation of the aetiological spectrum of obstructive jaundice. J Ayub Med Coll Abbottabad. 2008 Oct-Dec; 20(4): 62-66.

23. Alhayaf N, Lalor E, Bain V, McKaigney J, Sandha GS. The clinical impact and cost implication of endoscopic ultrasound on use of endoscopic retrograde cholangiopancreatography in a Canadian University Hospital. Can J Gastroenterol. 2008; 22(2): 138-42.

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