

Accuracy of MRCP in Comparison with ERCP for Diagnosing Hepato-Pancreatico-Biliary Pathologies.

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Abstract

Background: To determine the accuracy of magnetic-resonance-cholangio-pancreatography (MRCP) in comparison with the endoscopic-retrograde-cholangio-pancreatography (ERCP) in the diagnosis of bile duct pathologies.

Methods: Patients with suspected pancreatico-biliary pathologies having a clear indication for ERCP were included in this prospective study. MRCP was performed, using a torso phased-array coil. ERCP was performed by duodeno-videoscope and general electric fluoroscopy. MRCP were reviewed by radiologist who was blinded to the ERCP results. The ERCP was interpreted by an experienced consultant gastroenterologist also blinded to the MRCP results. Results of hepato-pancreatico biliary system from both techniques were compared, according to the pathology found, e.g. choledocholithiasis, pancreatico-biliary strictures and dilatation. The sensitivity, specificity, and positive and negative predictive values were calculated. Statistical significance was set at $p < 0.05$, with 95% confidence intervals.

Results. MRCP had sensitivity, specificity, positive and negative predictive values of 87%, 80%, 83.3% and 84.2% respectively for choledocholithiasis, which correlates well with results obtained in other parts of the world.

Conclusion. MRCP has high diagnostic accuracy for bile duct calculi and is a useful non-invasive technique to diagnose biliary pathologies and avoids unnecessary ERCPs and its complications.

Key Words: MRCP, ERCP, Hepato-Pancreatico-Biliary Pathologies

Introduction

It is very important to detect accurately bile duct and pancreatic duct abnormalities in patients with obstructive jaundice as it helps both surgeons and endoscopists to take care of such patients and plan further line of management.¹ Biliary obstruction may be the result of choledocholithiasis, tumours or trauma

but the most common cause is choledocholithiasis.² Although ERCP is still considered the gold standard for exploration and management of the hepatobiliary diseases, it requires direct invasive procedure like cannulation of the common bile or pancreatic duct, sedation, the use of ionizing radiation along with an expert team of trained and experienced gastroenterologists and nursing staff. ERCP is also associated with significant complications like hemorrhage, sepsis, pancreatitis and bile leak, as well as a documented mortality of upto 1%.³

MRCP is a non-invasive and considered a safe alternative as compared to ERCP for investigating the biliary tree and detection of any kind of biliary obstruction.⁴ MRCP is basically selective fluid-sensitive magnetic resonance imaging (MRI) of hepato-biliary and pancreatic drainage ducts. It was developed first time in 1991 and since then this technique is increasingly utilized in diagnosis of pancreatico-biliary disorders. One of the major disadvantages of MRCP is that it is only a diagnostic procedure, whereas ERCP is used for both diagnosis and treatment.⁵ But on the other hand in most of such pathologies, if no therapeutic intervention is needed MRCP avoids the potential complications like sepsis and pancreatitis which are associated with ERCP.⁶ MRCP is also particularly of benefit where ERCP is anticipated technically difficult, hazardous or impossible. It is also considered a useful alternative option for patients with failed attempt for ERCP.⁷

Patients and Methods

The study was carried out at Fauji Foundation Hospital, from January 2016 to February 2018. Forty two patients with suspected pancreatico-biliary pathologies having a clear indication for ERCP were included in this prospective study. Patients with absolute contraindications to the MRCP technique (e.g. cardiac pacemaker, claustrophobia, large patient size, degenerative or ankylosing spine conditions) were excluded from the study. MRCP was performed, using a torso phased-array coil. Three plane gradient-echo localizing images were obtained and used to plan

MRCP sequence. Axial slices were performed using single-shot fast spin-echo (SSFSE) sequences; parameters: 2.1 TE, Field of view 28 - 38 cm, Slice thickness: 7 mm with spacing: 1-2 mm and frequency: 256 kHz. Radial slice acquisitions with high resolution, thick slab using long TE were performed in the region of the biliary and pancreatic ducts. Twelve reconstructed slices with 10-degree spacing were used. All the sequences were acquired during a single breath-hold after a 12-hour period of fasting to promote gallbladder filling. ERCP was performed by Olympus JF type 230 duodeno-videoscope and general electric fluoroscopy with patients under conscious sedation or general anesthesia. Patients were positioned in the prone position and ERCP performed by an experienced gastroenterologist who had no access to information from the prior MRCP. Results of MRCP were reviewed by an experienced radiologist blinded to the ERCP results but having only clinical information related to the symptoms of patients. The ERCP was interpreted by an consultant gastroenterologist also blinded to the MRCP results. Results of hepato-pancreatico biliary system from both techniques were compared and analyzed according to the pathology found, e.g. choledocholithiasis, pancreatico-biliary strictures and dilatation. The sensitivity, specificity, and positive and negative predictive values were used to compare the two imaging techniques. Fisher's 2x2 exact tests were used to compare groups. Statistical significance was set at $p < 0.05$, with 95% confidence intervals.

Results

Patients' ages ranged from 35 to 76 years, with a mean of 55.5 years. Majority (69%) were female. Majority (65.3%) were clinically and 31 patients (83.7%) were biochemically jaundiced. On ERCP examination choledocholithiasis was the commonest finding. Dilated bile ducts were found in 31 patients in conjunction with either stones or strictures. The ERCP was found normal in 4 patients. ERCP failed in 6 patients due to various factors like excessive papillary edema, impacted stone just above the ampulla of Vater, duodenal ulcer or tumor, difficulty in patient compliance with the procedure. On MRCP examination choledocholithiasis was seen in 18 patients, affecting the ampulla of Vater/terminal part of CBD in 3 patients and the bile ducts in 15 patients.

Table 1: Comparison of ERCP Vs MRCP as diagnostic modality in hepato-biliary pathologies

Pathology		ERCP (n 42)	MRCP (n 42)	Significance
Choledocho lithiasis	Total	16	18	
	CBD	14	15	P-value<0.05
	Ampulla/ Terminal CBD	2	3	P-value<0.05
Strictures	Total	9	9	
	CBD	6	5	P-value<0.05
	Pancreatic	2	1	P-value<0.05
	Papilla	1	3	P-value<0.16
Dilated CBD		31	28	P-value<0.05
Normal		4	2	
Failed Procedure		6	3	

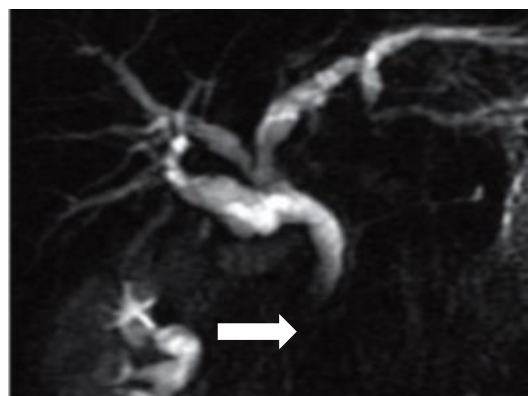


Figure 1.MRCP of a patient showing distal common bile duct stricture with proximal dilatation.

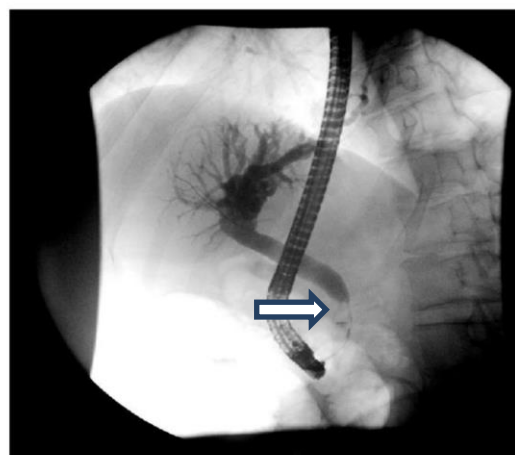


Figure 2.ERCP of same patient showing distal CBD stricture and proximal dilatation

Strictures were diagnosed in 9 patients out whom 5 were found in main bile duct, 3 were due to suspected tumour in the main papilla and 1 was found in the pancreatic duct. Dilated bile ducts were found in 28 patients in conjunction with either stones or strictures. The MRCP was normal in 2 patients. MRCP failed in 3 patients: one due to poor co-operation of patient for the procedure and 2 patients had gross ascites, leading to poor visibility of the ducts. (Table 1) .While comparing results of both techniques MRCP correctly diagnosed 15 of the 16 patients with ERCP-proven bile duct calculi, and 24 of the 26 patients without calculi. Stones in the ampulla of Vater were correctly diagnosed in 2 of the 2 affected patients, and excluded in rest of patients correctly with MRCP. The sensitivity, specificity for bile duct calculi were 92%, 88% respectively. Strictures were correctly diagnosed by MRCP in 7 out of 9 affected patients, and excluded in 31 of the 33 unaffected patients. There were 2 false-positive and 2 false-negative results for MRCP. The sensitivity, specificity of MRCP for diagnosing strictures was 77.7%, 93.9% respectively. Bile duct dilatation was found by MRCP in 28 of the 31 affected patients and excluded by MRCP in 8 of the 11 unaffected patients. There were 3 false-positive and 2 false-negative results for MRCP. The sensitivity, specificity was 90.3%, 81.8%, respectively. Ampullary tumours were correctly diagnosed in the only affected patient, but 2 false-positive results were found. MRCP failed to diagnose all patients with bile duct leaks. The overall sensitivity, specificity, and positive and negative predictive values of MRCP for bile duct pathology were 87%, 80%, 83.3% and 84.2% respectively. The sensitivity and positive predictive values for pancreatic duct filling defects were 100%. In all of the 3 patients with failed MRCP, ERCP was 100% successful but ERCP failed in 1 patient where MRCP was successful in diagnosing choledocholithiasis and secondary bile duct dilatation. In addition, ERCP allowed therapeutic intervention with sphincterotomy, stone extraction and/or stent placement and relevant histology was also obtained in some suspected patients of ampullary growth.

Discussion

The main aim of our study was to compare the accuracy and results of relatively non-invasive MRCP vs. much invasive ERCP as a diagnostic tool for bile duct abnormalities. MRCP is considered a relatively non-invasive and safe alternative to ERCP for imaging biliary tree and investigating biliary obstruction.⁸ Even though for gastroenterologists if indications for diagnostic or therapeutic ERCP are not yet clear, the

usefulness of MRCP stands beyond debate.⁹ As a diagnostic tool ERCP is used very less as the expertise of this technique and management of its complications is restricted to some expert centers only all around the world.¹⁰

For diagnostic purpose only MRCP has got sufficient advantages over ERCP to be considered as the initial modality for diagnosing hepatobiliary disorders.¹¹ There is no risk of complications which are associated with ERCP like cannulation of the pancreatic duct and leading to pancreatitis, sepsis and intestinal bleeding or perforation but diagnostic yield is similar to ERCP in most pathologies.¹² MRCP can also give added advantage over ERCP in providing additional anatomical information of pancreaticobiliary tree by cross sectional MRI and MR angiography.¹³ There is no danger of exposure to ionizing radiation or iodinated contrast medium and sedation is also rarely needed.¹⁴ If patient is fasting the MRCP procedure takes only a few minutes. The main disadvantage with MRCP is image artifacts and difficulty in patient compliance because of claustrophobia. Image artifacts can be seen as bright signals arising from stationary fluid within the adjacent duodenum, duodenal diverticula and ascitic fluid. In addition, local areas of signal dropout can be caused by metallic clips following cholecystectomy.¹⁵ On the other hand MRCP can miss small stones (<4 mm) in common bile duct, small ampullary lesions, small strictures of the ducts especially in pancreatic duct.¹⁶ Obstructing stones are generally easier to identify than non-obstructing stones (especially if smaller than the thickness of the acquired image slices). In addition small stones may not be distinguishable from sludge, mucin or even blood. Stones >4 mm are although readily seen but easily confused with filling defects such as blood clots, tumour, sludge or parasites¹⁷. Other mimickers of choledocholithiasis include flow artifacts, biliary air and a pseudo-calculus at the ampulla.¹⁸

In the light of above advantages and disadvantages of MRCP over ERCP, MRCP has the potential to replace diagnostic ERCP and thereby avoid possible complications related to ERCP. The accuracy of MRCP has been evaluated in several international studies, with overall sensitivity of 85 - 97%, specificity of 75 - 98%, positive predictive values of 83 - 89%, and negative predictive values of 82 - 98%.^{19,20} Although there is evidence that MRCP is an accurate investigation compared with diagnostic ERCP, the values for malignancy compared with choledocholithiasis is somewhat lower.²⁰ A systematic

review found that the overall sensitivity and specificity of MRCP was were 95% and 97% for the diagnosis of biliary obstruction respectively but sensitivity was a bit lower for stones (92%) and for malignant conditions (88%).²¹ In a recent prospective study complete depiction of the biliary tract was achieved in 94% and 82% with ERCP and MRCP respectively ($p>0.05$).²² A study done by Park *et al.* to differentiate extra-hepatic bile duct cholangio-carcinoma from benign causes of stricture with MRCP in comparison with ERCP concluded that accuracy of MRCP is comparable with that of ERCP²³. In another study done by Moon *et al.* In patients with suspected biliary-pancreatitis sensitivities of MRCP and ERCP for identifying choledocholithiasis were 80.0% and 90.0%, respectively.²⁴ The sensitivity of MRCP in detecting choledocholithiasis decreased with dilated bile ducts.²⁵

Conclusion

1. MRCP has got the potential to replace diagnostic ERCP in a wide range of bile duct abnormalities (tumor, stricture and occlusion), thereby avoiding possible unnecessary ERCP procedure and its complications.

2. Although ERCP is still employed in the diagnosis of biliary abnormalities present data shows that MRCP is an accurate investigation compared with diagnostic ERCP but on the other hand ERCP is still needed for therapeutic purpose.

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