ORIGINAL ARTICLE

DIAGNOSTIC ACCURACY OF MRCP IN BILIARY AND PANCREATIC DUCT PATHOLOGIES WITH ERCP AS GOLD STANDARD

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ABSTRACT

BACKGROUND: Magnetic Resonance Cholangiopancreatography (MRCP) is a non-invasive imaging modality used for evaluating biliary and pancreatic ductal pathologies. Endoscopic Retrograde Cholangiopancreatography (ERCP), although considered the gold standard for these evaluations, is associated with significant risks, including pancreatitis and bleeding. **METHODS:** This retrospective observational study involved 246 patients with suspected biliary or pancreatic duct pathologies presented to Radiology department of Shifa International Hospital, Islamabad from January 2018 till September 2022. Frequencies and percentages were used for categorical data while continuous data was represented as mean and standard deviation. The following metrics of diagnostic accuracy were computed: sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) using Med Calc software. **RESULTS:** Mean age group was 52.37 years. The most common pathologies identified were benign biliary strictures and choledocholithiasis (45.5% and 27.6%). Less common pathologies were malignant biliary strictures, pancreatic duct strictures/stones, and congenital CBD abnormality like choledochal cyst. MRCP demonstrated sensitivity of 84% and specificity of 92% for Choledocholithiasis, sensitivity of 92% and specificity of 77% in detecting benign biliary strictures, sensitivity of 67% and specificity of 100% in detecting malignant biliary strictures, sensitivity of 100% and specificity of 99%in detecting pancreatic duct pathologies, sensitivity of 16% specificity of 99% in detecting congenital CBD anomalies. **CONCLUSION:** MRCP is a reliable and accurate non-invasive imaging modality for diagnosing biliary and pancreatic ductal pathologies, showing a high degree of concordance with ERCP.

Keywords: MRCP, ERCP, biliary pathologies, pancreatic duct pathologies, diagnostic accuracy, sensitivity, specificity.

Introduction

Diseases of the biliary and pancreatic ducts, including choledocholithiasis, strictures, and malignant obstructions, represent common and clinically significant conditions. Accurate diagnosis is essential to guide therapeutic decisions.

Endoscopic Retrograde Cholangiopancreatography (ERCP) has been used for diagnosing the biliary and pancreatic ductal pathologies since last quarter of 20th century. Its unique advantage is hidden in its therapeutic role like relieving biliary ductal obstruction regardless of the cause and taking tissue samples for histopathological diagnosis. However because of its invasive nature it carries its own risks among which pancreatitis, perforation and infection are the major concerns besides radiation exposure leading to significant morbidity and even rarely mortality.[1] To help avoid the complications of ERCP due to its invasive nature and radiations, use of advanced MRI imaging known as Magnetic Resonance Cholangiopancreatography (MRCP), being noninvasive and non-radiating to diagnose biliary and pancreatic ductal pathologies has become quite popular in clinical use especially when it is being used for diagnostic purposes alone.[2]

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A study performed by Hanif et al. stated that MRCP for biliary obstruction irrespective of the cause (biliary strictures or stones)depicted promising results with sensitivity and specificity of 94% and 95% respectively, making it specifically useful for the diagnosis of choledocholithiasis and biliary strictures.[3] Similarly another review established by Patel et al. has proven the use of MRCP in diagnosing of malignant biliary strictures with high confidence, however potentially lacking the sensitivity to identify tiny strictures and minute stones.[4] Another point to take into our conscious is need of expert radiologist to interpret the MRCP findings. Certain studies question the negative predictive value of MRCP in diagnosing biliary ductal abnormities like choledocholithiasis.[5] In this study we have compared the findings given on MRCP and confirmed on prospective ERCP while taking into account the liver function tests (LFTs) to establish the reproducibility of former modality.
In the literature, studies have been done on the sensitivity and specificity of MRCP however sample size and particularly the cases of biliary strictures were limited,[6] therefore this study aims to assess the diagnostic accuracy of MRCP in identifying biliary and pancreatic ductal pathologies compared to ERCP, with special focus on biliary strictures which is commonly seen in our study group.

Materials and Methods

It was a retrospective observational study conducted in the radiology and gastroenterology department of Shifa International Hospital, Islamabad. All those patients with clinically suspected biliary and pancreatic duct pathologies (having yellowish discolouration of skin and sclera or total bilirubin more than 1.2 mg/dl) who further proceeded with MRCP followed by ERCP were included in the study. Patients who were claustrophobic, had spine disorders, unable to hold breath were excluded as MRCP could not be performed in them. Similarly those having deranged coagulation profile or had contrast allergies were also excluded as they could not proceed with ERCP. Sample size was calculated using sensitivity and specificity calculator as follows:
Sensitivity of choledocholithiasis on MRCP= 96.2%[6]
Specificity of choledocholithiasis on MRCP = 91.8%[6]
Prevalence = 54%[6]
Confidence Interval = 95%,
Sample size n= 246

Data was collected from January 2018 till September 2022 using radiology information system (RIS). Each patient underwent MRCP followed by ERCP within a two-week interval. At the time of reporting MRCP, the radiologist was unaware of the ERCP findings. The MRCP reports were compared to the findings of ERCP, which served as the reference standard. Frequencies and percentages were used for categorical data (Gender, choledocholithiasis, benign distal common bile duct (CBD) strictures, malignant CBD strictures, pancreatic duct strictures and congenital CBD anomalies) while continuous data (age, total bilirubin in mg/dl, aspartate aminotransferase (AST) in U/L, alanine aminotransferase (ALT) in U/L, gamma- glutamyl transferase (GGT) in U/L and alkaline phosphastase (ALP) in U/L) was represented as mean and standard deviation. Positive predictive value (PPV), negative predictive value (NPV), sensitivity, and specificity were among the diagnostic accuracy metrics that were computed using Med Calc software. Fisher Exact 2x2 test was used to compare the concordant and discordant results of MRCP and ERCP using SPSS version 23.

MRCP Technique

High-field MRI (1.5T or 3T) with phased-array body coil was used. Heavily T2-weighted sequences (single-shot fast spin-echo, respiratory-triggered sequences) were acquired. Thin-slice 3D MRCP reconstructions for detailed ductal mapping were prepared. Additional Dixon in and out phase sequences were also obtained.

ERCP Technique

Performed under sedation or anesthesia using a side-viewing duodenoscope. Selective intubation of the common bile duct and/or pancreatic duct was done. Iodinated contrast media was injected under fluoroscopic guidance to delineate ductal anatomy. Fluoroscopic images obtained in multiple projections to evaluate for stones, strictures, leaks, or anomalies. If pathology confirmed, therapeutic interventions such as sphincterotomy, stone extraction, or stent placement performed.

Results

Mean age of the patients was 52.37 years. Mean AST, ALT, GGT, total bilirubin and ALP levels of these patients

were 91.57 U/L, 115.62U/L, 389 U/L, 4.00 mg/dl and 334 U/L respectively as shown in (Tab.1). The most common pathologies identified were benign biliary strictures and choledocholithiasis (45.5% and 27.6%). Benign strictures were mostly seen in post living donor liver transplant patients. Less common pathologies were malignant biliary strictures, pancreatic duct strictures/stones, and congenital CBD abnormality like choledochal cyst and seen in 3.7%, 2.8% and 3.3% of the cases respectively (Tab.2).

Variable	N	Minimum	Maximum	Mean	Std. Deviation
Age	245	9	86	52.37	15.093
AST U/L	221	13	735	91.57	88.621
ALT U/L	221	9	1229	115.62	144.923
GGT U/L	212	0	5116	389.01	566.470
Total bilirubin mg /dl	179	.000	99.000	4.00311	8.791638
ALP U/L	178	17	2020	334.03	289.856
Valid N (listwise)	169				

Table 1: Showing descriptive statistics.

Pathology	Frequency (%)
Choledocholithiasis	68 (27.6)
Benign distal CBD strictures	112 (45.5)
Malignant distal CBD strictures	9 (3.7)
Pancreatic duct strictures/stones	7 (2.8)
Congenital CBD anomalies	8 (3.3)

Table 2: Frequencies and percentages of different pathologies.

The concordance rate between MRCP and ERCP findings was 73.2% with significant P values for choledocholithiasis and biliary strictures (0.024 and 0.000). MRCP demonstrated sensitivity of 84%, specificity of 92%, PPV of 80.28%, and NPV of 93.71% in detecting choledocholithiasis, sensitivity of 92%, specificity of 77%, PPV of 76%, and NPV of 92% in detecting benign biliary strictures, sensitivity of 67%, specificity of 100%, PPV of 100%, and NPV of 99% in detecting malignant biliary strictures, sensitivity of 100%, specificity of 99%, PPV of 81%, and NPV of 100% in detecting pancreatic duct pathologies, sensitivity of 16%, specificity of 99%, PPV of 50%, and NPV of 97% in detecting congenital CBD anomalies (Tab.3).

Pathology	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)
Choledocholithiasis	84	92	80.28	93.71
Benign distal CBD strictures	92	77	76	92
Malignant distal CBD strictures	67	100	100	99
Pancreatic duct strictures/stones	100	99	81	100
Congenital CBD anomalies	16	99	50	97

Table 3: MRCP sensitivity, specificity and predictive values.

Discussion

MRCP has become a rapidly developing tool forevaluating biliary obstruction in recent years. ERCP, though gold standard in detecting biliary pathologies is invasive technique and associated with complications. Procedure related mortality ranges from 0.26% to 1% while overall complication rates vary from 9.4% to 15.9%.[7] The most frequent complication is post ERCP pancreatitis, which is followed by infection related problems such as cholangitis and blood stream infections.

Our study shows that MRCP has higher sensitivities and specificities for choledocholithiasis, benign and malignant biliary stricturesas well as pancreatic duct pathologies however it has lower sensitivity yet higher specificity in detecting congenital CBD anomalies.

A Study conducted by Isram et al. showed that MRCP had sensitivity of 96.2% while specificity of 91.8% in detecting choledocholithiasis which is even more than our study.[6] While sensitivity and specificity of 88.1% and 94.4% respectively was seen in another study.[8] Griffin et al.[9] reported that when MRCP is used to diagnose choledocholithiasis, its sensitivity, specificity, PPV, and NPV are 86%, 93%, 87%, and 82%, respectively, when compared to ERCP. Vitellas et al.[10] stated that MRCP and ERCP are similar in their ability to diagnose choledocholithiasis, with sensitivity and specificity ranging from 81% to 100% and 85% to 100%, respectively. In a different study, MRCP and ERCP had 80% and 90% sensitivity, respectively, in detecting choledocholithiasis. Overall, there was 90.6% agreement between MRCP and ERCP.[11]

The most sensitive noninvasive technique for observing the biliary tree and bile duct calculi is MRCP.[12] But it has a number of drawbacks. Its sensitivity in diagnosing tiny stones (≤ 3 mm), for instance, is just 64%, according

to earlier research.[13] 29% of patients with tiny stones (3-5 mm) had calculi that Koshinaga et al.[14] failed to detect. Furthermore, when there is aberrant biliary disease, MRCP is unable to see the biliary tree. Furthermore, sludge can mimic a stenosis, and blood, proteinaceous debris, or air in the bile duct can mimic a stone.[15]

The sensitivity and specificity for CBD strictures were 83.33% and 97.92% respectively in the study conducted by kumar et al.[8] Very low sensitivities for for benign and malignant strictures in the study conducted by Isram et al. were seen, i.e. 4.3% and 15.4% respectively. However higher specificities were seen, i.e. 97.5% and 100% respectively.[6] Another study found that MRCP had a 94.44% sensitivity, 81.81% specificity, 89.47% positive predictive value, and 90% negative predictive value for detecting malignant strictures.[16] Research conducted by Singh A et al. revealed that MRCP had superior sensitivity (100%), specificity (98.5%), and accuracy (98.7%) for cases involving benign strictures.[17]

For pancreatic duct strictures, sensitivity of 80% and specificity of 98% was observed in the study conducted by Kunati et al.[8] Sensitivity and specificity of 100% in detecting pancreatic duct strictures were seen in the study conducted by Isram et al.[6] Hurter et al. reported that MRCP had a sensitivity of 100%, a positive predictive value of 94.1%, and a negative predictive value of 100% in the diagnosis of pancreatic duct stricture.[18]

Very few cases of congenital CBD anomalies like choledochal cyst were seen in our study. In a study conducted by Philpott C et al. on pediatric MRCP, when both MRCP and direct cholangiography (DC) were conducted, there was complete concordance of 100%.[19] In another study, MRCP had sensitivities of 75.7% for biliary findings and 73.5% for pancreatic findings in pediatric population.[20] However in our study lower sensitivity (16%) was seen for congenital CBD anomalies.

This review reinforces MRCP as a highly accurate and non-invasive diagnostic modality for evaluating the biliary and pancreatic ducts. MRCP has several advantages: 1) Non-invasive, radiation-free, and contrast-free 2) Provides three-dimensional reconstruction of the biliary tree 3) Useful for preoperative planning and for patients unfit for ERCP. MRCP also has limitations: 1) Lower sensitivity for microlithiasis and small stones, 2) Inability to obtain tissue samples or deliver therapy, 3) Longer acquisition time and dependence on patient cooperation, 4) Difficulty in differentiating benign and malignant strictures.

ERCP, despite being invasive, remains indispensable due to its therapeutic capabilities, including sphincterotomy, stone extraction, stenting, and tissue sampling. Thus, MRCP is best positioned as a first-line diagnostic tool, while ERCP should be reserved for therapeutic intervention or when MRCP findings are inconclusive. Limitations of our study are: retrospective nature of the study, limited cases of congenital CBD anomalies and limited number of malignant CBD structures.

Conclusion

MRCP is a highly accurate, non-invasive imaging modality for biliary and pancreatic duct pathologies, with diagnostic performance comparable to ERCP in most scenarios. While ERCP remains the gold standard and is essential for therapeutic interventions, MRCP effectively reduces the need for diagnostic ERCP, minimizing procedure-related risks.

References

1. JohnsonKD, Perisetti A, Tharian B, ThandasseryR, Jamidar P, Goyal H, Inamdar S. Endoscopic retrograde cholangiopancreatography-related complications and their management strategies: a “scoping” literature review. Digestive diseases and sciences. Feb 2020; **65(2):** 361-75.

2. Papaefthymiou A, Landi R, Arvanitakis M, TringaliA, Gkolfakis P. Endoscopic retrograde cholangiopancreatography: A comprehensive review as a single diagnostic tool. Best Practice & Research Clinical Gastroenterology. Jan 2025; 101976.

3. Hanif H, Khan SA, Muneer S, Adil SO. Diagnostic accuracy of ultrasound in evaluation of obstructive jaundice with MRCP as gold standard. Pakistan journal of medical sciences. May 2020; **36(4):** 652.

4. Patel VB, Musa RK, Patel N, Patel SD. Role of MRCP to determine the etiological spectrum, level and degree of biliary obstruction in obstructive jaundice. Journal of family medicine and primary care. Jul 2022; **11(7):** 3436-41.

5. Goldfinger MH, Ridgway GR, Ferreira C, Langford CR, Cheng L, Kazimianec A, Borghetto A, Wright TG, Woodward G, Hassanali N, Nicholls RC. Quantitative MRCP imaging: accuracy, repeatability, reproducibility, and cohort-derived normative ranges. Journal of Magnetic Resonance Imaging. Sep 2020; **52(3):** 807-20.

6. Isram J, Haider E, Khan RS, Hafeez M, e Hinna R, Baig I, Shahid A, Chaudhry M. Diagnostic accuracy of magnetic resonance cholangiopancreatography in comparison with endoscopic retrograde cholangiopancreatography for detection of the etiology of obstructive jaundice. Cureus. Feb 2023; **15(2)**.

7. Al-Kabban A, Al-Kabban FM, Obaid O, ALKABBAN Sr AN, AL-KABBAN FM, OBAID O. Post-endoscopic Retrograde Cholangiopancreatography (ERCP) Complications: A Systematic Review of Microbial Patterns, Incidence, Risk Factors, and Management Strategies in Contemporary Practice. Cureus. Jul 2025; **17(7)**.

8. Kumar A, Mohanty NR, Mohanty M, Dash S. Comparison of MRCP and ERCP in the evaluation of common bile duct and pancreatic duct pathologies. Frontiers in Medical Technology. 2023; **5:** 946555.

9. Griffin N, Charles-Edwards G, Grant LA. Magnetic resonance cholangiopancreatography: the ABC of MRCP. Insights Imaging. 2012; **3(1):** 11-21.

10. Vitellas KM, Keogan MT, Spritzer CE, Nelson RC. MR Cholangiopancreatography of bile and pancreatic duct abnormalities with emphasis on the single-shot fast spin-echo technique. Radiographics. 2000; **20(4):** 939-57.

11. Moon JH, Cho YD, Cha SW, Cheon YK, Ahn HC, Kim YS, et al. The detection of bile duct stones in suspected biliary pancreatitis: comparison of MRCP, ERCP, and intraductal US. Am J Gastroenterol. 2005; **100(5):** 1051-7.

12. Ali F, Aamir N, Hassan MK, Fakhar-E-Alam Khan HU, Khan D. Comparison of MRCP and ERCP findings: a retrospective secondary data analysis. J Pak Med Assoc. 2022; **72(2):** 284-6.

13. Ma S, Hu S, Gao F, Liang R. Endoscopy Lithotomy for Intrahepatic Gallstones: A Meta-Analysis. Surg Laparosc Endosc Percutan Tech. 2015; **25:** 269-74.

14. Koshinaga T, Inoue M, Ohashi K, Sugito K, Ikeda T, Hagiwara N, Tomita R. Persistent biliary dilatation and stenosis in postoperative congenital choledochal cyst. J Hepatobiliary Pancreat Sci. 2011; **18:** 47-52.

15. Erden A, Haliloglu N, Genç Y, Erden I. Diagnostic value of T1-weighted gradient-echo in-phase images added to MRCP in differentiation of hepatolithiasis and intrahepatic pneumobilia. AJR Am J Roentgenol. 2014; **202:** 74-82.

16. Magnetic resonance cholangiopancreatography in obstructive jaundice. Vaishali MD, Agarwal AK, Upadhyaya DN, Chauhan VS, Sharma OP, Shukla VK. J Clin Gastroenterol. 2004; **38:** 887-90.

17. Singh A, Mann HS, Thukral CL, Singh NR. Diagnostic accuracy of MRCP as compared to ultrasound/CT in patients with obstructive jaundice. Journal of clinical and diagnostic research: JCDR. Mar 2014; **8(3):** 103.

18. Hurter D, De Vries C, Potgieter P, Barry R, Botha F, Joubert G. Accuracy of MRCP compared to ERCP in the diagnosis of bile duct disorders. SA J Radiol. 2008; **12(1):** 14-22.

19. Philpott C, Rosenbaum J, Moon A, Bekhit E, Kumbla S. Paediatric MRCP: 10 year experience with 195 patients. European journal of radiology. Apr 2013; **82(4):** 699-706.

20. Dillman JR, Patel RM, Lin TK, Towbin AJ, Trout AT. Diagnostic performance of magnetic resonance cholangiopancreatography (MRCP) versus endoscopic retrograde cholangiopancreatography (ERCP) in the pediatric population: a clinical effectiveness study. Abdominal Radiology. Jul 2019; **44(7):** 2377-83.