

# Diagnostic Accuracy of Magnetic Resonance Cholangiopancreatography in Comparison to Endoscopic Retrograde Cholangiopancreatography in Obstructive Biliopathy

MUHAMMAD AYUB NAICH<sup>1</sup>, SAGHEER HUSSAIN<sup>2</sup>, HINA ZAMIR<sup>3</sup>, ADEEL QAMAR<sup>4</sup>, FATIMA CHEEMA<sup>5</sup>, ZIA UL MUSTAFA<sup>6</sup>

<sup>1</sup>Assistant Professor Gastroenterology, Sir Ganga Ram Hospital Lahore

<sup>2</sup>Consultant Gastroenterologist DHQ Hospital Sheikhpura

<sup>3</sup>Assistant Professor Medicine, Sir Ganga Ram Hospital Lahore

<sup>4</sup>Assistant Professor Gastroenterology, Sahara Medical College Narowal

<sup>5</sup>Registrar Gastroenterology Sir Ganga Ram Hospital, Lahore

<sup>6</sup>Associate Professor of Medicine, Sahara Medical College Narowal

Correspondence to: Muhammad Ayub Naich, Email: [mnaich@hotmail.com](mailto:mnaich@hotmail.com), Cell: 03324662546

## ABSTRACT

**Objective:** To determine the diagnostic accuracy of magnetic-resonance-cholangio-pancreatography (MRCP) in diagnosis of obstructive biliopathy in comparison to endoscopic retrograde cholangio-pancreatography (ERCP) taking as gold standard.

**Study design:** It is a cross sectional study.

**Place and duration of study:** Study was conducted on the patients admitted in the gastroenterology department of Sir Ganga Ram Hospital Lahore. Study was completed in six months duration from January 2022 to June 2022.

**Methodology:** Patients with the suspicion of obstructive biliopathies requiring ERCP were included in this study. Study sample was divided into two groups, in one group ERCP was done while other group underwent MRCP. Result of both techniques were reviewed by radiologist and gastroenterologist and compared with each other considering ERCP as gold standard. P-value <0.05 was considered statistically significance. Confidence interval was 95%.

**Results:** Total 130 cases were divided into two groups with equal number of 65 patients in each. There were 75(57.6%) female and 55(42.3%) male cases. Mean age of the patients was 43.7± 3.5 years. Sensitivity of MRCP for obstructive biliopathies was 92.4%, specificity 90.7%, positive predictive value 88.3% and negative predictive value 89.2%.

**Conclusion:** MRCP is a non-invasive investigation of choice in obstructive biliopathies having high diagnostic accuracy avoiding unnecessary complications of ERCPs.

**Keywords:** MRCP, ERCP, Obstructive Biliopathy, CBD Stone, Stricture

## INTRODUCTION

Patients with obstructive biliopathy commonly present to gastroenterologists and it is crucial for the doctor to diagnose them and give proper management.<sup>1</sup> Causes of biliary obstruction include calculi, tumor and bile duct trauma especially during cholecystectomy.<sup>2</sup> According to a report incidence of gall stones in European countries is 182 per 10,000 people annually.<sup>3</sup> Most common cause of obstructive biliopathy is bile duct calculi. Such patients need x-rays or direct visualization of pancreatic duct and common bile duct under sedation by expert gastroenterologists and staff.<sup>4</sup> Currently ERCP is the gold standard investigation for biliary obstruction. ERCP complications include pancreatitis, bile leakage, sepsis and bleeding.<sup>5</sup> Its mortality rate is 1%. MRCP is an efficient non-invasive alternative procedure for diagnosing pancreato-biliary outflow obstruction.<sup>6</sup> It is actually a fluid sensitive magnetic resonance imaging of pancreatic and hepato-biliary ducts. MRCP was first used in 1991 and since then it is being used in high number of patients with hepatobiliary and pancreatic duct pathologies.<sup>7</sup> ERCP is superior to MRCP as it can be used as therapeutic as well as diagnostic procedure.<sup>8</sup> MRCP is suitable for the Patients with no therapeutic indications and require just diagnostic procedure. In this way ERCP associated complications can be avoided.<sup>9</sup> MRCP can also be used in the patients non-compliant to ERCP or those patients who had failed ERCP previously.<sup>10</sup> Purpose of this study is to highlight the uses of MRCP as a non-invasive technique to diagnose hepatobiliary and pancreatic pathologies avoiding complications related to ERCP.

## MATERIALS AND METHODS

This is a cross sectional study conducted in gastroenterology department of Sir Ganga Ram Hospital Lahore. Study was commenced in January 2022 and completed after six months duration in July 2022. Suspected cases of obstructive biliopathy admitted in the department of gastroenterology requiring ERCP were included in this study. WHO sample size calculator was used to determine sample size of the study. Sample size was calculated using online WHO sample size calculator. Total 130 cases were studied. Cases were divided into two groups using lottery method

with the same number of 65 cases each, on the basis of procedure undergoing ERCP and MRCP. Written consent was taken from all the study cases. Ethical approval was also taken from the institutional review committee. Patients with cardiac pacemaker, claustrophobia, ankylosing spondylitis and very obese patients were excluded from the study. MRCP sequence was planned using three plane gradient-echo localizing images. Single –shot fast spine echo (SSFSE) was used to obtain axial slices having parameters of 2.1 TE, slice spacing 1-2mm and thickness 7mm, field of view 28-38cm and frequency 26 kHz. 12 reconstructed slices were used with 10 degree spacing. To obtain gall bladder filling 12 hours fasting was acquired and all slices were taken in a single breath hold method.

ERCP was done under local and general anesthesia using Olympus JF type 230 flexible duodeno-ideoscope and general electric fluoroscopy. A skilled gastroenterologist performed ERCP with patient in prone position. MRCP images examined by skilled radiologists were blinded with ERCP conclusions. Results of MRCP and ERCP were compared to each other on the basis of pathology like pancreatobiliary strictures, dilataions and choledocholithiasis. Data analysis was done using SPSS software (version 24). Our outcome variables included positive and negative predictive values, sensitivity and specificity. Fisher's 2x2 exact tests were used to compare results of both groups. Confidence interval was 95% and p-value <0.05 was significant

## RESULTS

Total 130 patients were studied. Sample size was calculated using WHO sample size formula. They were divided into two groups each containing 65 cases. Age range of the cases was 30-70 years with mean age of 43.7± 3.5 years. There were 75(57.6%) females and 55(42.3%) males. 110(84.6%) cases had deranged liver function tests and 85(65%) cases were jaundiced.

Out of 25 cases with choledocholithiasis, 24 were detected on MRCP and out of cases with terminal CBD stone, 3 cases were detected on MRCP. Out of 17 cases with CBD stricture all 17 were detected on MRCP. In 30 cases with choledocholithiasis 27 were detected on MRCP hence sensitivity of MRCP was 90% and

specificity was 96% for choledocholithiasis. For CBD strictures sensitivity and specificity of MRCP was 80% and 94% respectively. Overall 88.3%, 89.2%, 92.4% and 90.7% were positive predictive value, negative predictive value, sensitivity and specificity of MRCP.

Table-I: Findings on MRCP and ERCP

Pathology		ERCP (n=65)	MRCP (n=65)	p-value
Choledocholithiasis	CBD	25(19.2%)	24(18.4%)	<0.05
	Terminal CBD/Ampulla	05(3.8%)	03(2.3%)	<0.05
	Total	30(23%)	27(20.7%)	
Strictures	CBD	17(13%)	17(13%)	<0.05
	Pancreatic	05(3.8%)	03(2.3%)	<0.05
	Papilla	02(1.5%)	09(6.9%)	<0.15
	Total	24(18.5%)	29(22.3%)	
Dilated CBD		54(41.5%)	56(43%)	<0.05
Failed procedure		06(4.6%)	03(2.3%)	<0.05
Normal cases		05(3.8%)	06(4.6%)	<0.05

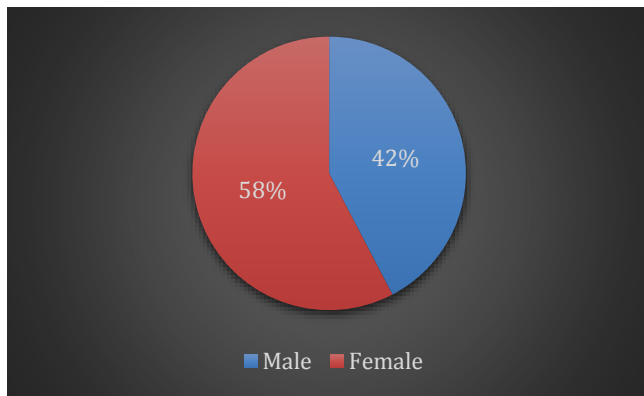


Figure-I: Gender-based distribution of cases in the study group (n=130)

There were 24(18.5%) cases between 30-40 years age, 48(36.9%) between 41-50 years, 42(32.3%) between 51-60 years and 16(12.3%) with age >60 years.

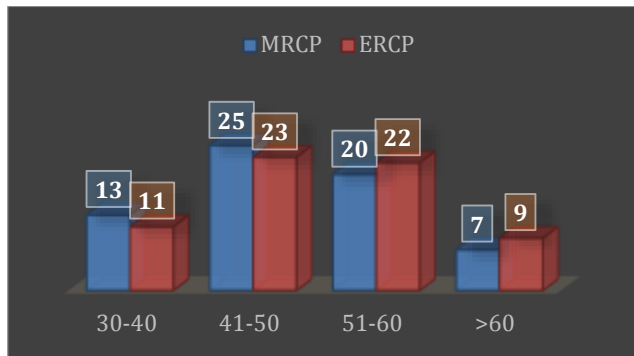


Figure-II: Age based distribution of cases in MRCP-group and ERCP-group (n=130)

**DISCUSSION**

This study was conducted to compare diagnostic accuracy of non-invasive MRCP to invasive ERCP technique.<sup>11</sup> Though ERCP is a study of choice for hepatobiliary and pancreatic pathologies however MRCP is considered substitutional study for diagnostic purpose only.<sup>12</sup> MRCP is a compliant, non-invasive and non-interventional study which gives accurate results. ERCP is performed in very few health institutions due to limited skilled persons who can perform this study as well as manage associated complications.<sup>13</sup> For the diagnosis of hepatobiliary pathologies MRCP is considered first line investigation of choice as it is non-invasive and avoids ERCP related complications. Complications

associated with ERCP include hemorrhage, bowel perforation, sepsis, pancreatitis and cannulation of pancreatic duct.<sup>14</sup> Rahayu et al stated that MRCP gives excellent information about pancreato-biliary tract anatomy and pathology by MRI and MR angiography.<sup>15</sup> Unlike ERCP, in MRCP contrast medium, radiation exposure and sedation are not used.<sup>16</sup> Patients having claustrophobia are not suitable for this technique and that is one of the limitations of MRCP. Fluid in the duodenum and ascetic fluid give artifacts with bright signals.<sup>16</sup> Metallic surgical clips used in cholecystectomy also give bright signals and artifacts.<sup>17</sup> On MRCP small filling defects like in parasitic infestation, tumors and blood clots are usually misdiagnosed with calculi of <4mm size.<sup>18</sup> Flow imaging artifacts, intrabiliary bubbles and false ampullary stones are misdiagnosed as bile duct stones.<sup>19</sup> In our study for CBD strictures sensitivity and specificity of MRCP was 80% and 94% respectively. Overall 88.3%, 89.2%, 92.4% and 90.7% were positive predictive value, negative predictive value, sensitivity and specificity of MRCP. Many previous national and international studies have determined sensitivity of 85%-98%, specificity of 75%-96%, positive predictive value of 75%-90% and negative predictive value of 80%-97%.<sup>19-21</sup> According to Ali et al sensitivity and specificity of MRCP for pancreatobiliary outflow obstruction is 97% and 95% respectively but for diagnosing malignant lesions sensitivity is 92% that is higher than biliary obstruction.<sup>22</sup> According to a prospective cohort study conducted by Hanif et al sensitivity of ERCP and MRCP for hepatopancreato biliary tract pathology is 82% and 91% respectively (p>0.05).<sup>23</sup> Nitin et al stated that sensitivity of ERCP and MRCP is 90% and 80% respectively in the detection of choledocholithiasis.<sup>24</sup> Recently a study conducted in USA by David et al reported that in the cases of choledocholithiasis abnormally dilatation of CBD causes reduced sensitivity of MRCP, so ERCP is suitable in such cases.<sup>25</sup> However previous literature states usefulness of MRCP with minimum complications and higher diagnostic accuracy in biliary obstruction.

**CONCLUSION**

Many pancreatohepato-biliary pathologies like stricture, stone and tumor can be detected using MRCP, a non-invasive and non-interventional study with very good diagnostic accuracy, good compliance and avoiding many complications related to ERCP. Though there are few limitations of this study yet it is study of first choice.

**Conflict of interest:** No

**Source of funding:** No

**REFERENCES**

- Nayab S, Jesrani A, Awan RH, Magsi K. Diagnostic accuracy of MRCP in obstructive biliary taking ERCP as gold standard. Experience at tertiary care hospital of developing country. Prof Med J. 2022 Feb 28;29(03):285-90.
- Salam F, Islam NF, Parveen F, Afrin T, Nazmul Hakim HA, Saha TK. Comparison among the Role of Different Imaging Techniques in Diagnosis of Malignant Lesions Causing Obstructive Jaundice. Journal of Bangladesh Col Phys Surg. 2021 Sep 30;39(4):233-40.
- Jain R, Gupta A, Kandasamy D, Jana M. Imaging in Pediatric Obstructive Jaundice. Ind J Pediatr. 2022 Jun 2:1-9.
- 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. J Fam Med Prim Care. 2022 Jul 1;11(7):3436-41.
- Abdulwahid HM, Al-Mosawe AM, Jabbar JA, Nayyef QT. The Diagnostic Accuracy of MRCP and Transabdominal Ultrasound in Patients with Obstructive Jaundice in Correlation with ERCP. Iraqi Postgrad Med J. 2022;21(1).
- Sherpa NT, Manandhar S, Karki A, Karki P. Accuracy of magnetic resonance cholangiopancreatography in the diagnosis of benign and malignant cause of obstructive jaundice: Accuracy of MRCP in obstructive jaundice. J Patan Acad Health Sci. 2022 Mar 28;9(1):65-71.
- Alsaigh S, Aldhubayb MA, Alobaid AS, Alhajjaj AH, Alharbi BA, Alsudais DM et al. Diagnostic Reliability of Ultrasound Compared to Magnetic Resonance Cholangiopancreatography and Endoscopic Retrograde Cholangiopancreatography in the Detection of

- Obstructive Jaundice: Retrospective Medical Records Review. *Cureus*. 2020 Oct 16;12(10).
8. Abou Bakr S, Eleessawy H, Ghaly S, Elezz MA, Farahat A, Zaghloul MS. Diagnostic accuracy of endoscopic ultrasound in evaluation of patients with obstructive jaundice: single-center experience. *Egypt Liver J*. 2022 Dec;12(1):1-6.
  9. She YM, Ge N. The value of endoscopic ultrasonography for differential diagnosis in obstructive jaundice of the distal common bile duct. *Exp Rev Gastro Hepatol*. 2022 Jul 3(just-accepted).
  10. Gupta P, Gupta J, Kumar-M P. Imaging in obstructive jaundice: what a radiologist needs to know before doing a percutaneous transhepatic biliary drainage. *J Clin Interv Radiol ISVIR*. 2020 Apr;4(01):31-7.
  11. Rațiu I, Lupușoru R, Lungeanu D, Popescu A, Sporea I, Goldiș A et al. Diagnosis of malignant biliary obstruction: pondering over the ERCP, MRCP and histology. *J Int Med Res*. 2022 Feb;50(2):03000605221076924.
  12. Karki S, Phuyal A, Paudel RC, Bhandari A, Dahal MR. Role of Magnetic Resonance Cholangiopancreatography in the Evaluation of Obstructive Jaundice. *Kathmandu Univ Med J*. 2021 Jan 1;73(1):35-40.
  13. Nepalia S, Upadhyay S, Rajender A, Bhargava R, Nepalia S. Comparative Study of MRCP and ERCP in Extra Hepatic Biliary Obstruction.
  14. Makhlof M, Soltan H, Ammar M, Hagag M. Value of magnetic resonance cholangiopancreatography prior to endoscopic retrograde cholangiopancreatography in ultrasonographically and laboratory diagnosed obstructive jaundice. *Egypt J Surg*. 2021 Jan 1;40(1):153-9.
  15. Rahayu RF, Maharina L, Yueniwati Y. Ultrasonography (USG) diagnostic test compared to magnetic resonance cholangio pancreatografy (MRCP) in patients with obstructive jaundice in Dr. Moewardi Public Hospital. *GSC Advanc Res Rev*. 2020;5(2):167-71.
  16. Gondal M, Ch SM, Ahmad I, Hussain T, Awan S, Fatima K. Accuracy of MRCP in Comparison with ERCP for Diagnosing Hepato-Pancreatico-Biliary Pathologies. *J Rawal Med Col*. 2018 Jun 30;22:88-91.
  17. Ali F, Aamir N, Hassan MK, Khan HU, Khan D. Comparison of MRCP and ERCP findings: A retrospective secondary data analysis. *J Pak Med Assoc*. 2022 Apr 1;72(2):284-6.
  18. Renaldi K, Kurniawan R, Makmun D. Endoscopic Ultrasonography (EUS) Compared with Magnetic Resonance Cholangiopancreatography (MRCP) in Diagnosing Patients with Malignancy Causing Obstructive Jaundice. *Indones J Gastro Hepatol Diges Endo*. 2021 May 12;22(1):29-36.
  19. Patil V, Das SK, Devkant RH, Shetty S, Raj V. Role of Ultrasonography in the Era of 3 Tesla MRCP: A Comparative Study in Obstructive Jaundice. *Asia J Med Radiol Res Volume*. 2019 Jan;7(1).
  20. Salem MM, Hassan YH, Zeyada AI. Management of Postcholecystectomy Obstructive Jaundice. *Egypt J Hosp Med*. 2019 Jan 1;74(7):1566-76.
  21. Goud S, Devi BV, Kale PK, Lakshmi AY, Reddy VV. To study diagnostic efficacy of ultrasound and magnetic resonance cholangiopancreatography in obstructive jaundice. *Journal of Dr. NTR Uni Health Sci*. 2020 Oct 1;9(4):217.
  22. Ali F, Aamir N, Hassan MK, Khan HU, Khan D. Comparison of MRCP and ERCP findings: A retrospective secondary data analysis. *J Pak Med Assoc*. 2022 Apr 1;72(2):284-6.
  23. Hanif H, Khan SA, Muneer S, Adil SO. Diagnostic accuracy of ultrasound in evaluation of obstructive jaundice with MRCP as gold standard. *Pak J Med Sci*. 2020 May;36(4):652.
  24. Jagtap N, Kumar JK, Chavan R, Basha J, Tandan M, Lakhtakia S, Kalapala R et al. EUS versus MRCP to perform ERCP in patients with intermediate likelihood of choledocholithiasis: a randomised controlled trial. *Gut*. 2022 Feb 9.
  25. Tso DK, Almeida RR, Prabhakar AM, Singh AK, Raja AS, Flores EJ. Accuracy and timeliness of an abbreviated emergency department MRCP protocol for choledocholithiasis. *Emerg Radiol*. 2019 Aug;26(4):427-32.