



# **Diagnostic Accuracy of Magnetic Resonance Cholangiopancreatography (MRCP) In-Patients Undergoing Endoscopic Retrograde Cholangiopancreatography (ERCP) for Pancreaticobiliary Disorders**

**M. Vignesh Kumar<sup>1\*</sup>**

<sup>1</sup>*Bharath Institute of Higher Education and Research, India.*

## **Author's contribution**

*The sole author designed, analysed, interpreted and prepared the manuscript.*

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## **ABSTRACT**

This is a prospective study done to compare the diagnostic accuracy of Magnetic Resonance Cholangiopancreatography (MRCP) in patients undergoing Endoscopic Retrograde Cholangiopancreatography (ERCP) for pancreaticobiliary disorders. Majority of the study participants were males (63.3%), while the rest 36.78% of them were females and periampullary carcinoma (11.7%) and common bile duct calculus (11.7%) are the common cause of obstruction found on MRCP followed by malignant stricture (10%). The extent of obstruction was determined in most of the study participants (91.7%) by MRCP while the rest 8.3% were not determined by MRCP. The Common bile duct calculus (11.7%) is the common cause of obstruction on ERCP followed by malignant stricture (10%) and Periampullary carcinoma (10%) and 20% of the patients were found to be normal in ERCP. Among them, 71.4 % did not show MRCP and the association was found to be significant. (p- Value < 0.00).

**Keywords:** MRCP; Common bile duct; periampullar carcinoma.

## 1. INTRODUCTION

Northern India has one of the highest reported incidences of gallbladder cancer (GBC) in the World [1]. Magnetic resonance cholangiopancreatography (MRCP) is an abdominal MR imaging method that allows non-invasive visualization of the pancreatobiliary tree and requires no contrast administration [2,3]. The specific reason behind this is MRCP results are more sensitive and specific than ERCP in the setting of common bile duct stones. Also MRCP is entirely non-invasive and avoids the risks of ERCP and thus MRCP has emerged as a diagnostic alternative to ERCP for the detection and exclusion of common bile duct stones [4]. Comparing the diagnostic accuracy of Magnetic Resonance Cholangiopancreatography (MRCP) in-patients undergoing Endoscopic Retrograde Cholangiopancreatography (ERCP) for pancreatic biliary disorders.

The major limitation of MRCP is that it is not a therapeutic procedure. In contrast, ERCP provides diagnostic information as well acts as a therapeutic tool in the same setting. Like ERCP, MRCP is operator dependent. This study aims to compare the diagnostic accuracy of Magnetic Resonance Cholangiopancreatography (MRCP) in-patients undergoing Endoscopic Retrograde Cholangiopancreatography (ERCP) for pancreatic biliary disorders.

## 2. METHODOLOGY

### 2.1 Study Setting

The study was conducted in the Department of Radio Diagnosis and Imaging and collaboration with Department of Gastroenterology, Sree Balaji Medical College and Hospital, Chennai. Study Population: This study was done among patients referred to Department of Radiodiagnosis from evaluation of pain abdomen/ Jaundice/ fever.

**Study Design:** This study was taken as a Prospective Study during two years period.

**Study Sample:** Patients with suspected Pancreaticobiliary disorders referred to the department of Radiodiagnosis was included in the study after a written informed consent using Non Probability Purposive Sampling Technique during Sep, 2018 – Aug, 2020.

### Inclusion Criteria:

- Participants from age groups and all genders subject to their consent to participate in the study
- Patients presenting with jaundice, abdominal pain, infections of the biliary tract, suspected malignancies of the pancreatobiliary system.
- Patients willing to undergo MRCP.
- Patients willing to undergo ERCP procedure.
- Exclusion Criteria:
  - Patients who did not give consent for the study were excluded from the study.
  - Patient with claustrophobia.
  - Patients with cardiac pace maker, cochlear implants or other ferromagnetic implants.
  - Patients with altered anatomy (Roux-en – Y, Billroth II and Pancreaticoduodenectomy) without necessary skills and tools available
  - Hemodynamically unstable patients.
  - Patients with pharyngeal or esophageal obstruction (unless these can be treated simultaneously)

Patients presenting with symptoms such as abdominal pain (right upper quadrant pain), fever, vomiting, cachexic patient, yellow coloured urine (dark urine), pale coloured stools, pruritus, abnormal liver profile who are suitable to undergo ERCP as a gold standard investigation, would be included in this study. Such patients would normally be required to undergo MRCP as a pre ERCP. Work up. The study is to compare the results of both procedures and to determine the diagnostic accuracy of MRCP. 60 patients presented with the above symptoms undergone MRCP (3 TESLA MRI) and the same patients were exposed to ERCP by Gastroenterologist and their results were compared. The results were compared based on Pearson Chi Square method.

**Results:** Higher proportion of male (34.2%) and females (27.3%) were found in the age group above 60 years. The association was not found to be significant. (p- value- 0.908). Among the study participants, pain abdomen is the common complaint among male (44.7%) and female (45.5%). The association was not found to be significant. (pvalue- 0.744). Peri ampullary carcinoma (13.2%) in males and GBC+ CC and

primary sclerosing cholangitis (13.6%) in females were the common ERCP findings. The association was not found to be significant. (p-value- 0.867) Among the study participants, the extent of obstruction was determined in 95.5% of females and 89.5% of males. The association was not found to be significant (pvalue- 0.419).

There is 88.3% agreement between MRCP findings and per- operative findings i.e. 88% of the findings in MRCP is same as in per-

operative findings and there is 11.7% disagreement between MRCP and per-operative findings. There is 78% agreement between ERCP findings and per- operative findings i.e. 78% of the findings in ERCP is same as in per-operative findings and there is 21.7% disagreement between ERCP and per-operative findings. Among the study participants, 96% findings of females and 85% of findings of males agree with that of per operative findings. The association was not found to be significant (p-value- 0.191).

**Table 1. Distribution of gender based on MRCP extent of obstruction (n=60)**

Obstruction	Gender		Total n (%)	p value*
	Male n (%)	Female n (%)		
Determined	34 (89.5)	21 (95.5)	55 (91.7)	0.419
Not determined	4 (10.5)	1 (4.5)	5 (8.3)	
Total	38 (100)	22 (100)	60 (100)	

**Table 2. Distribution of gender based on ERCP extent of obstruction (n=60)**

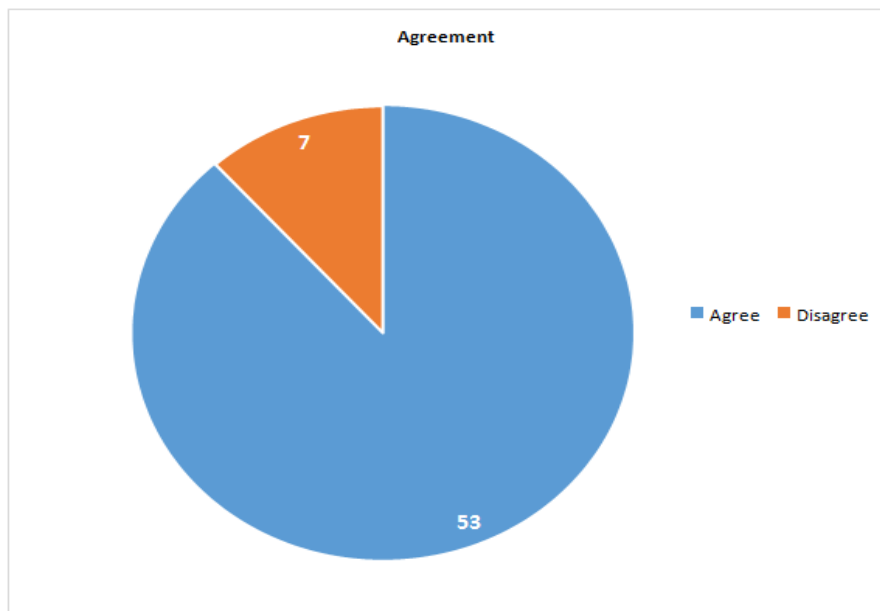
Obstruction	Gender		Total n (%)	p value*
	Male n (%)	Female n (%)		
Determined	21 (55.3)	13 (59.1)	34 (56.7)	0.773
Not determined	17 (44.7)	9 (40.9)	26 (43.3)	
Total	38 (100)	22 (100)	60 (100)	

**Table 3. Distribution of study participants based on MRCP extent of obstruction (n=60)**

Causes	Obstruction		Total n (%)	p value*
	Determined n (%)	Not-determined n (%)		
Chronic pancreatitis (CH.PAN)	4 (7.3)	0 (0)	4 (6.7)	0.00
Periampullary carcinoma (PAM)	7 (12.7)	0 (0)	7 (11.7)	
Primary sclerosing cholangitis (PSC)	5 (9.1)	0 (0)	5 (8.4)	
Cholangio carcinoma (CH-CA)	2 (3.6)	0 (0)	2 (3.3)	
Common bile duct calculus (CBD-CAL)	7 (12.7)	0 (0)	7 (11.7)	
Choledochal cyst (CC)	4 (7.3)	0 (0)	4 (6.7)	
Malignant stricture (MS)	6 (10.9)	0 (0)	6 (6.7)	
Benign stricture (BS)	5 (9.1)	0 (0)	5 (8.3)	
Pancreatic carcinoma (PAN-CA)	4 (7.3)	0 (0)	4 (6.7)	
Mirrizi syndrome (MIR-SY)	3 (5.5)	0 (0)	3 (5)	
Gall bladder carcinoma (GB-CA)	3 (5.5)	0 (0)	3 (5)	
Gall bladder calculus +CBD calculus (GBC + CC)	5 (9.1)	0 (0)	5 (8.3)	
Normal (N)	0 (0)	5 (100)	5 (8.3)	
Total	55 (100)	5 (100)	60 (100)	

**Table 4. Distribution of study participants based on type of cause and MRCP extent of obstruction (n=60)**

MRCP causes	Obstruction		Total n (%)	p value*
	Determined n (%)	Not-determined n (%)		
Calculus	12 (21.8)	0 (0)	12 (20)	0.000
Stricture	16 (29.1)	0 (0)	16 (26.7)	
Tumors	16 (29.1)	0 (0)	16 (26.7)	
Cyst	4 (7.3)	0 (0)	4 (6.7)	
Extrinsic causes	7 (12.7)	0 (0)	7 (11.7)	
Normal	0 (0)	5 (100)	5 (8.3)	
Total	55 (100)	5 (100)	60 (100)	



**Fig. 1. Distribution of study participants based on MRCP agreement with Per-operative findings (n=60)**

**Table 5. Distribution of study participants based on ERCP agreement with per operative findings (n=60)**

Causes	Agreement		Total n (%)	p value*
	Agree n (%)	Disagree n (%)		
Chronic pancreatitis (CH. PAN)	3 (6.4)	0 (0)	3 (5)	0.00
Periampullary carcinoma (PAM)	6 (12.8)	0 (0)	6 (10)	
Primary sclerosing Cholangitis. (PSC)	5 (10.6)	0 (0)	5 (8.3)	
Cholangio carcinoma (CH-CA)	2 (4.3)	0 (0)	2 (3.3)	
Common bile duct calculus (CBD-CC)	7 (14.9)	0 (0)	7 (11.7)	
Choledochal cyst (CC)	2 (4.3)	0 (0)	2 (3.3)	
Malignant stricture (MS)	6 (12.8)	0 (0)	6 (10)	
Benign stricture (BS)	3 (6.4)	0 (0)	3 (5)	
Pancreatic carcinoma (PAN-CA)	4 (8.5)	0 (0)	4 (6.7)	
Mirrizi syndrome (MIR-SY)	3 (6.4)	0 (0)	3 (5)	
Gall bladder carcinoma (GB-CA)	2 (4.3)	0 (0)	2 (3.3)	
Gall bladder calculus + CBD Calculus (GBC+CC)	4 (8.5)	1 (7.7)	5 (8.3)	
Normal (N)	0 (0)	12 (92.3)	12 (20)	
Total	47 (100)	13 (100)	60 (100)	

### 3. DISCUSSION

Majority of the study participants were males (63.3%), while the rest 36.78% of them were females. Similar results were seen in a study done by A Mahaboobkhan et al. where among the study participants majority [5] were male and rest were female [6]. In contrast to these studies in a study done by J. Kats et al majority were female patients (127 out of 200). Dwerryhouse et al regarded the clinical findings of jaundice, cholangitis, and acute gallstone pancreatitis as high-risk factors, and patients with these symptoms underwent ERCP without undergoing MRCP likewise in our study pain abdomen (45%) was the common complaint among the study participants followed by jaundice (36.7%) and Fever with pain abdomen (18.3%). In their study J. Kats et al. [7] described that the indications for MRCP are bile duct lesions, primary sclerosing cholangitis, common bile duct cysts, congenital bile duct atresia and pancreatic duct evaluation in chronic pancreatitis. In the present study periampullary carcinoma (11.7%) and common bile duct calculus (11.7%) are the common cause of obstruction found on MRCP. In their study, H E Adamek et al observed that majority (38%) [8] of the patients undergoing MRCP were having malignant stricture followed by benign stricture and normal pancreatobiliary system. Cholangiocarcinoma and Choledochal cyst were rare findings.

In our study, we observed that the extent of obstruction was determined in most of the study participants (91.7%) by MRCP while the rest 8.3% were not determined. In the present study, Common bile duct calculus (11.7%) is the common cause of obstruction on ERCP followed by malignant stricture (10%) and Periampullary carcinoma (10%) and 20 % of the patients were found to be normal in ERCP. Common ERCP findings are tumors (25%) and stricture (23.3%) and followed by calculus (20%). The extent of obstruction was determined among maximum study participants (56.7%) by ERCP while the rest 43.3% were not determined by ERCP. Whereas in a study by A Mahaboobkhan et al. [9-11] 16% were having malignant stricture due to Klatskin Tumour, 12% are having Benign Stricture due to Post Cholecystectomy squal, 12% are having CBD calculus.

### 4. CONCLUSION

In summary, since the first clinical application of MRCP, it has emerged as a viable alternative to

diagnostic ERCP, in patients in whom an interventional endoscopic procedure is unlikely, MRCP can replace ERCP as a diagnostic tool, as it is non-invasive and well tolerated by patients. MRCP is a non-invasive important tool in the diagnosis of biliary-pancreatic diseases and has a comparable accuracy to ERCP. Despite relatively low spatial resolution when compared with ERCP the early assessments of diagnostic performance suggest that MRCP can reliably demonstrate normal and abnormal pancreatic and biliary ducts, accurately diagnose the cause and site of obstruction, be of diagnostic value when ERCP is unsuccessful.

### CONSENT AND ETHICAL APPROVAL

As per international standard or university standard guideline Patient's consent and ethical approval has been collected and preserved by the authors.

### COMPETING INTERESTS

Author has declared that no competing interests exist.

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