



## Role of Magnetic Resonance Cholangiopancreatography (Mrcp) In Diagnosis of Bile Duct Disorders in Correlation with Endoscopic Retrograde Cholangiopancreatography (Ercp).

**KEYWORDS**

Biliary strictures, choledocholithiasis, perampullary lesions.

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**ABSTRACT**

Title of the article: Role of MRCP in diagnosis of bile duct disorders in correlation with ERCP. Aim: To determine the specificity, sensitivity and accuracy of MRCP as compared to ERCP for evaluating bile duct disorders. Patients and methods: From October 2012 to May 2015, 100 patients with suspected biliary pathology were included in this observational study. MRCP was performed prior to ERCP in all the patients included in this study. Results: MRCP had 97 % sensitivity, 100%specificity, 100% positive predictive value (PPV), 88% negative predictive value (NPV). MRCP had a low positive predictive value for the diagnosis of biliary strictures. For diagnosis of perampullary lesions MRCP had a sensitivity of 86 %, specificity of 99%, PPV of 83%, NPV of 99%. Conclusion: MRCP should be preferred over diagnostic ERCP for the assessment of biliary pathologies.

**Introduction**

Biliary obstruction may be due to choledocholithiasis, benign or malignant strictures, tumor, trauma, external compression, among other causes. The most common cause is choledocholithiasis. Biliary duct pathologies are initially evaluated on ultrasound. Several studies suggest that when ultrasound is strongly suggestive of specific hepatobiliary pathology, patient should be further managed with a therapeutic ERCP without a prior MRCP. However, for symptomatic patient with indeterminate ultrasound findings, using MRCP as the next appropriate examinations avoids the morbidity and patient discomfort associated with diagnostic ERCP.

As compared to MRCP, which is noninvasive test, ERCP is an invasive test which requires sedation, cannulation of the common bile or pancreatic duct. Another disadvantage of ERCP over MRCP is the use of ionizing radiation in ERCP.

ERCP, while routinely performed by experienced gastroenterologists, is still associated with adverse effects like pancreatitis, bile leak, hemorrhage, gastro duodenal perforation and sepsis with a morbidity rate of 7% and a mortality rate of 1% (Bilbao MK).

A big disadvantage of MRCP is that it is a purely diagnostic test and has no therapeutic capability. However, MRCP does not have the adverse effect associated with ERCP.

In this retrospective and prospective study we predict the accuracy, sensitivity and specificity of MRCP as compared to ERCP, which is considered as a gold standard for evaluation of hepatobiliary pathology.

**AIM**

To evaluate diagnostic accuracy of MRCP in comparison to

ERCP in evaluations of biliary pathologies, using specificity, sensitivity, and positive and negative predictive values.

**Materials and methods**

During the period October 2012 to May 2015, 100 patients with suspected biliary pathology who underwent MRCP and ERCP, were included in this prospective and retrospective observational study.

Our study was run at the MRI and the ERCP units of KMC Ambedkar circle, Manipal University, Mangalore. In all the patients included in this study MRCP was performed prior to ERCP.

The study was approved by the institute's ethics committee.

**Inclusion criteria –**

Symptomatic patients with suspected biliary pathology who underwent MRCP prior to ERCP.

**Exclusion criteria –**

Absolute contraindications to the MRCP (e.g. cardiac pacemaker, claustrophobia).

**Poor image quality due to motion artifacts.****MRCP and MRI technique**

All the MRCP studies were done on a 1.5 T magnetic resonance (Siemens, Germany) using a 16 phased array coil. Single shot fast spin echo (SSFSE) with an adequate field of view was used to pal the axial images. Spin echo axial T2 images were acquired using a TE of 102, Field of view (FOV) of 28 to 38cm, slice thickness of 8mm, with a spacing of 2mm. Frequency encoding was done from right to left. Phase encoding FOV was 8cm. Long TE was used to perform thick slabs to image the biliary and pancreatic ducts. Patient was advised to fast for 4 to 6hours before

the MRCP study for better distension of gall bladder. Single breath hold was used for acquiring all images.

### ERCP technique

Fluoroscopy: A GE OEC 850 was used for screening and taking hard copy plain films. Duodenoscopy: An Evis Olympus JF type 180 side view duodenovideoscope was used. The procedure was performed with patients under conscious

sedation or short general anesthesia, depending on the individual evaluation of the patients by the anesthetist. Patients were positioned in the prone position and ERCP performed by an experienced surgical endoscopist. The endoscopist had no access to information from the prior MRCP.

### Image Analysis

Both MRCP and ERCP images were retrospectively interpreted by experienced radiologists and gastroenterologists respectively in a blinded fashion.

### Statistical analysis

The sensitivity, specificity, and positive and negative predictive values For MRCP were calculated as compared to the ERCP. All data were analyzed using SPSS Version 15.

### Results

All the patients included in the study were referred for evaluation of cause for obstructive jaundice. USG reports of the patients were either equivocal or negative. USG reports for 3 patients were not available.

Out of the 80 cases included in the study, 58 were male, 22 were female patients. Age group of included patients varied from 30 to 60 years.

MRCP detected 63 out of the 65 cases of choledocholithiasis confirmed on ERCP (~97 % sensitivity, specificity – 100%, PPV-100%, NPV-88%). In 8 patients MRCP detected benign strictures in mid or distal CBD, out of these on ERCP only one patient was proved to have a stricture in the distal CBD (sensitivity 100%, specificity of 91%, PPV-12%, NPV-100%), (Fig 2,3). Out of the 6 cases reported as periampullary lesion on MRCP, 5 patients had similar lesion on ERCP, 1 case reported as periampullary nodule turned out to be edematous ampulla secondary to passage of calculus on ERCP, 1 case reported as sludge ball/calculus at the ampulla causing proximal biliary dilation on MRCP had a small periampullary nodule on ERCP (sensitivity-86 %, specificity- 99%, PPV-83%, NPV-99%).

ERCP cannot evaluate biliary ducts proximal to the obstruction which can be done by MRCP (Fig. 1)

### Discussion

ERCP provides less patient satisfaction due to its invasiveness and the post procedural complications. MRCP on the other hand is a non invasive procedure without any adverse effects. In our study, we found that the accuracy of MRCP for detection of bile duct calculi was comparable to ERCP, MRCP also had a high sensitivity for detection of benign CBD strictures. Non contrast MRCP had a low sensitivity for detection of small periampullary lesions, but was highly specific. Our findings were in concordance with results of studies done by Naloh et al and D Hurter et al(1)

In a study done by D Hurter et al(1) on 52 patients they found a sensitivity, and specificity of MRCP 87 and 80 % for

the detection of choledocholithiasis. The paper concluded that MRCP due to its non invasive nature, less complications rates and comparable sensitivity to ERCP for detection of biliary duct pathologies, has the potential to replace ERCP as a diagnostic test. This study, however, had a small sample size.

In a systemic review done by E Kaltenthaler et al (2) for evaluation of diagnostic and economical effectiveness of MRCP in detection of biliary pathologies as compared to ERCP. Data was taken from 28 prospective studies. Sensitivities, specificities, likelihood ratios and confidence intervals were calculated for evaluation of clinical effectiveness of MRCP as compared to ERCP. To evaluate cost effectiveness probabilistic economic models were used. The review concluded that patients preferred MRCP over ERCP as a diagnostic modality due to lack of invasiveness and adverse effects with high accuracy rate for detection of biliary pathologies.

In another systematic review done by Romagnuolo J et al found that MRCP had a sensitivity of 95 % and a specificity of 97 % for the detection of biliary obstructions. The review concluded that sensitivity was lower for detection of malignant lesions and small biliary calculi.

Gregory et al(3) performed within 30 days. Three blinded readers used a scoring system to evaluate nine segments of the pancreatic and biliary ducts as depicted on the ERCP and MRCP images. MRCP image quality was also evaluated. RESULTS: Of 196 segments analyzed, 17 were not seen at MRCP (sensitivity, 91% compared findings of MRCP with ERCP in 39 patients with pancreatitis and found a high correlation between the findings of MRCP and ERCP. They concluded that MRCP has a potential to replace ERCP and can be especially helpful in patients in whom ERCP is contraindicated.

Out of the two false negatives in cases of choledocholithiasis, one was seen in a post op case of gall bladder carcinoma where CBD calculi and terminal CBD stricture were mistaken for compression of CBD by adjacent mass lesion. In other case of choledocholithiasis, terminal CBD calculus was mistaken for a stricture.

Artifacts due to Post op metal clips, duodenal air can lead to misinterpretation of the findings in MRCP. CBD calculi which are smaller than the slice thickness used in MRCP sequence can be easily missed. Motion artifacts due to physiological movements like respiration/ peristalsis/ pulsation artifacts also lead to degradation of the image quality, hence, non visualization of small CBD calculi(4).

In a comparative study done by Francesco A Polistina(5) on 202 patients to predict the accuracy of MRCP in detection of biliary calculi as compared to EUS and ERCP. They found that MRCP had a sensitivity of 77.4% and specificity of 100% in detection of biliary calculi and concluded that biliary calculi are under diagnosed on MRCP as compared to EUS and ERCP. They also stated that calculi less than 5mm were hard to be detected on MRCP.

Most false positive cases in our study were due to detection of benign strictures when they were not present. Arterial pulsation artifacts and defects caused by the crossing of hepatic artery over CBD can result in false interpretation of MRCP images and over diagnosis of biliary duct strictures. Contracted choledochal sphincter can mimic terminal CBD stricture or small impacted calculus at the ampulla, es-

pecially in elderly people with prominent CBD(4).

In a study done by Rosch T et al(6)CT, and EUS. Methods: Fifty patients (21 men, 29 women, mean age 65.7 years, on 50 patients with suspected biliary stricture and with painless jaundice, evaluated the accuracy of magnetic resonance cholangiopancreatography (MRCP) as compared to other established diagnostic procedures including CT, EUS, ERCP or percutaneous transhepatic cholangiography (PTC), they found that the sensitivity / specificity for diagnosis of biliary strictures was 85% / 75% for ERCP/PTC, 85% / 71% for MRCP. However they also concluded that MRCP has only a limited role in the differential diagnosis of the biliary strictures and other diagnostic procedures are still a necessity.

In another study done by Stuart et al(7), they found that sensitivity for detection of biliary stricture, biliary dilatation and corrected localization of level of stricture was 100%, 100%, and 94% for MRCP as compared to ERCP.

In all the 80 patients included in our study there was no morbidity or mortality in any patient. Non contrast MRCP uses thin TSE images to provides good anatomic delineation of the biliary tree without administration of contrast. Few recent studies have shown that contrast MRCP can improve the diagnostic efficacy of MRCP in detection of biliary pathologies. However, a study done by Choi et al showed that there is no significant difference between the diagnostic efficacy of contrast versus non contrast MRCP.

Edematous bile duct secondary to passage of calculi can also be misinterpreted as a stricture on MRCP images.

Periampullary lesions were also misdiagnosed in our study, edematous ampulla or sludge ball was mistaken for CBD stricture.

Terminal segment of the bile duct at the ampulla of Vater contains less fluid within its lumen, therefore it becomes difficult to identify a small impacted calculi or a small periampullary nodule, and moreover sometimes the bulging duodenal papilla can mimic a papillary tumor. High signal in duodenum can sometimes obscure small lesions of the ampulla. Sludge ball with similar signal intensity to a soft tissue lesion can also be misinterpreted as a periampullary nodular lesion.

Di Cesare et al(8) compared MRCP and ERCP in the evaluation of malignant distal CBD lesions in 21 patients they concluded that MRCP is a preferable diagnostic modality for detection of distal CBD strictures due to its non invasive nature and ability to visualize entire biliary system even in the presence of critical terminal CBD stricture where CBD proximal to the stenosis cannot be visualized by ERCP .

Sensitivity for detection of periampullary lesions can be increased by doing a conventional post contrast MRI abdomen imaging in addition to MRCP, in which enhancing small periampullary lesions are can be easily picked up and will not be confused with non enhancing lesions like sludge ball or edematous ampulla due to passage of calculi.

#### Conclusion:-

In this study, we found that MRCP results for detection of biliary pathologies are comparable with those of ERCP. Due to better patient satisfaction and high sensitivity and specificity for diagnosis of biliary pathologies MRCP should be preferred over diagnostic ERCP for the assessment of bil-

iliary pathologies

Images :

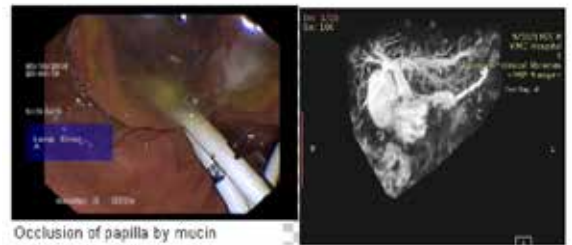


Fig. 1- case of IPMN, right -ERCP image shows occlusion of papilla by mucin. MRCP image shows dilated proximal biliary and pancreatic ducts



Fig. 2- MRCP image reported as mid CBD stricture. No stricture was present in ERCP.



Fig.3- Left - MRCP reported as stricture at CBD -CHD junction, ERCP images showed calculi in CBD with no stricture at CBD - CHD confluence.

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