

STUDY OF MAGNETIC RESONANCE CHOLANGIO PANCREATOGRAPHY (MRCP) IN HEPATOBILIARY PATHOLOGIES AT A TERTIARY HOSPITAL

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Abstract

Background: MRCP (Magnetic Resonance Cholangio pancreatography) is an excellent, non-invasive, safe and highly sensitive diagnostic procedure for patients with suspected bile duct or pancreatic duct abnormalities. Present study was aimed to study magnetic resonance cholangio pancreatography (MRCP) in hepatobiliary pathologies at a tertiary hospital. **Material and Methods:** Present study was single-center, hospital based prospective cross sectional observational study, conducted in patients of either gender, presented with symptoms suggestive of involvement of pancreaticobiliary system like pain in abdomen, jaundice, fever, vomiting etc who were referred to department of radiology, examined on a 1.5 T MR scanner for MRCP. **Results:** In present study, 50 patients were included, age ranging from 10-70 years. Majority were from > 50 years age (40 %) followed by 41-50 years age group (32 %). Of these, the number of males were 54 % and the number of females were 46 %. Pain in abdomen (88 %), jaundice (48 %), nausea (46 %) and vomiting (38 %) were the most frequent presenting complaints while fever, loss of appetite, steatorrhea, constipation and distension of abdomen were less common. Most of patients presented with combination of symptoms. In this study common pathologies identified were acute pancreatitis with/without pseudocyst (16 %), cholelithiasis (14 %), choledocholithiasis (12 %), benign stricture (10 %) & cholecystitis (10 %). **Conclusion:** MRCP is non-invasive, non-ionizing imaging modality for evaluation of the pancreaticobiliary anatomy and pathology. It is much superior in the diagnosis and evaluation of various pathologies as compared to the ultrasound and Computed Tomography.

INTRODUCTION

MRCP (Magnetic Resonance Cholangio pancreatography) was described for the first time by Walner in clinical practice in 1991.^[1] Although endoscopic cholangio pancreatography (ERCP) has been the mainstay for diagnosing and treating pancreatico-biliary disease, complications such as pancreatitis, cholangitis, haemorrhage and duodenal perforation have limited its use as a routine diagnostic test. In fact, MRCP is the examination of choice in a setting where ERCP is difficult or impossible.^[2]

It incorporated the use of heavily T2 weighted sequences with long TE, causing only fluid filled compartments to be visible. There is near complete suppression of the background. MRCP is useful in diagnosis of commonly occurring disorders of pancreaticobiliary systems such as cholelithiasis,

choledocholithiasis, acute cholecystitis, acute and chronic pancreatitis.^[3,4] Other pathologies such as gall bladder carcinoma, cholangiocarcinoma, cholangitis, carcinoma pancreas are also well evaluated preoperatively and non-invasively with the help of MRCP.^[4,5]

Congenital anomalies and variants of the ductal system which guide the surgical planning is also well demonstrated preoperatively through imaging with MRCP. MRCP is an excellent, non-invasive, safe and highly sensitive diagnostic procedure for patients with suspected bile duct or pancreatic duct abnormalities.^[3,5] Currently the diagnostic accuracy of MRCP is nearly equivalent to ERCP for a broad spectrum of benign and malignant pancreatic and biliary diseases. Present study was aimed to study magnetic resonance cholangio pancreatography (MRCP) in hepatobiliary pathologies at a tertiary hospital.

MATERIAL AND METHODS

Present study was single-center, hospital based prospective cross sectional observational study, conducted in department of Radio-diagnosis, at KJ Somaiya medical college, Mumbai, India. Study duration was of 5 months (February 2023 to June 2023). Study approval was obtained from institutional ethical committee.

Inclusion Criteria

- Patients of either gender, presented with symptoms suggestive of involvement of pancreatico-biliary system like pain in abdomen, jaundice, fever, vomiting etc who were referred to department of radiology, willing to participate in present study

Exclusion Criteria

Contraindications for MRI: Patients having

- Brain Aneurysm Clip
- Implanted neural stimulator
- Implanted cardiac pacemaker or defibrillator
- Cochlear implant
- Ferromagnetic Ocular foreign body
- Other implanted medical devices: (e.g., Swan Ganz catheter)
- Insulin pump

- Metal shrapnel or bullet

Study was explained to patients in local language & written consent was taken for participation & study. The study group consisted of 50 patients being referred for MRCP i/v/o pancreaticobiliary complaints and following blood investigations and ultrasound. Post MRCP, based on the findings, patients were subjected to endoscopic/surgical procedure or medical treatment and histopathological examination was done.

The study was done on 1.5T. All patients were examined on a 1.5 T MR scanner. Sequences of scanning was

1. Coronal T2 TSE
2. Axial T2 TSE
3. Axial T1 TSE in phase
4. Axial T1 TSE out phase
5. Axial BTFE
6. MRCP thin
7. MRCP thick
8. T2 SPIR axial

Data was collected and compiled using Microsoft Excel, analysed using SPSS 23.0 version. Statistical analysis was done using descriptive statistics.

RESULTS

In present study, 50 patients were included, age ranging from 10-70 years. Majority were from > 50 years age (40 %) followed by 41-50 years age group (32 %). Of these, the number of males were 54 % and the number of females were 46 %.

Table 1: General characteristics

Characteristics	No. of patients	Percentage
Age groups (in years)		
11-20	1	2
21-30	3	6
31-40	10	20
41-50	16	32
51+	20	40
Mean age (mean ± SD)		
Gender		
FEMALE	23	46
MALE	27	64

Pain in abdomen (88 %), jaundice (48 %), nausea (46 %) and vomiting (38 %) were the most frequent presenting complaints while fever, loss of appetite, steatorrhea, constipation and distension of abdomen were less common. Most of patients presented with combination of symptoms.

Table 2: Symptoms

Symptoms	No of cases	percentage
Abdominal pain	46	88%
Jaundice	24	48%
Nausea	23	46%
Vomiting	19	38%
Steatorrhea	15	30%
Constipation	14	14%
Weight loss	8	16%

In this study common pathologies identified were acute pancreatitis with/ without pseudocyst (16 %), cholelithiasis (14 %), choledocholithiasis (12 %), benign stricture (10 %) & cholecystitis (10 %).

Table 3: Benign and malignant pathologies

PATHOLOGIES	No. of patients	Percentage
Acute pancreatitis with/ without pseudocyst	8	16%
Cholelithiasis	7	14%
choledocholithiasis	6	12%
Benign stricture	5	10%
Cholecystitis	5	10%
Malignant stricture	4	8%
Chronic pancreatitis	4	8%
Choledochal cysts/pancreatic divisum	3	6%
Periampullary carcinoma	2	4%
Klatskintumor	2	4%
Bile leak post-surgery	2	4%
Pancreatic carcinoma	1	2%
Gall bladder carcinoma	1	2%
Primary sclerosing cholangitis	1	2%

DISCUSSION

MRCP provides all preoperative information required by surgeon about GB calculi and cholecystitis, Size of the calculus, Gall bladder mass lesion, GB wall thickness, GB wall surface, Diameter and presence of the calculus in CBD, MR cholangiopancreatography combined with hepatobiliary contrast-enhanced MR imaging is a useful approach that provides comprehensive information about the biliary system and can detect biliary leak and differentiate it from other post-operative complications.

In our study, out of the total cases, a total of 7 cases (14%) were of cholelithiasis as diagnosed on MRCP. MRCP helped in identifying the location, sizes. Moreover, the anatomical details obtained through MRCP were useful during surgical planning.

A total of 6 cases of choledocholithiasis were identified on MRCP, (12%) causing features of obstructive jaundice and raised liver enzymes. A study by Chang JH *et al.*,^[6] showed that MRCP had a high negative predictive value and thus could be used as an alternative to a more invasive modality like ERCP. Our findings of MRCP were confirmed on ERCP, thus further reaffirming the diagnostic utility of MRCP. The stones were identified as filling defect in the common bile duct surrounded by high signal intensity fluid. The meniscus sign is used to identify the calculus. Pitfall to identification of calculus would be air bubble in the biliary tract.

In our study 8 cases (16%) of the total cases comprised of acute pancreatitis and its associated complications. MRCP study helped to identify the cases of acute pancreatitis, its causes including biliary sludge/calculi, associated complications like peripancreatic collections, necrosis, pancreatic duct disruption, possible fistula with pseudocyst formation. Our findings of the utility of MRCP in acute pancreatitis were like the Brizi MG *et al.*,^[2] Chronic pancreatitis comprised a total of 5 cases. Our findings were irregularity of the main pancreatic duct with areas of dilatation, narrowing

and strictures. Other findings included ductal filling defects due to stones, debris or mucinous plugs. In cases of severe pancreatitis, the dilatation of the side branches cause a chain of lake appearance. Findings of MRCP were confirmed on ERCP. These findings are like the findings of the study by Sugiyama M *et al.*,^[8]

In this study, we had a case of pancreatic divisum. The patient presented with nonspecific pain in abdomen. MRCP evaluation revealed A separate opening for the dorsal and the ventral pancreatic duct. Pancreas divisum is the most common congenital anomaly of pancreatic anatomy, which is associated with acute or chronic pancreatitis.^[1,2] The anomaly is the result of the absence of fusion between the ventral and dorsal pancreatic ducts.

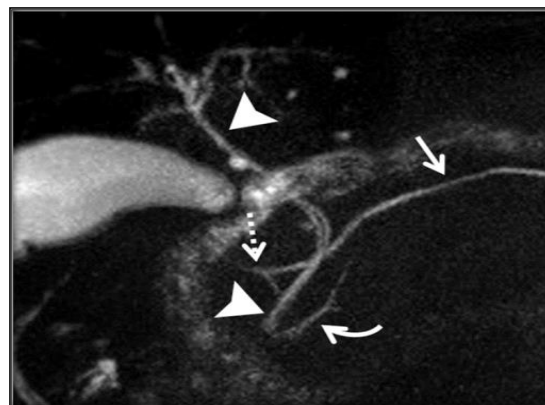


Figure 1: MR image shows the main pancreatic duct (dorsal Santorini duct, straight solid arrow) draining separately into the minor papilla (dashed arrow). The common bile duct (arrowheads) joins the smaller ventral pancreatic duct (curved arrow) at a more inferior level and drains into the duodenum through the major papilla.

In this study we had 2 cases of post operative bile leak. One of the cases was a patient with extensive peritoneal hydatidosis who after surgery developed post operative bile leak. The patient had a variant biliary anatomy with the right posterior sectoral duct draining into the Common hepatic duct. Post-surgery since the patient had a bilious drain, MRCP

was performed, which showed the possible site of leak and this was confirmed on ERCP.

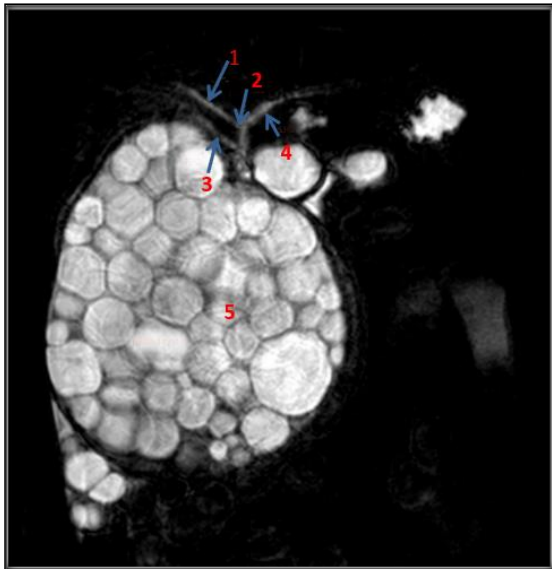


Figure 2: MRCP image of the patient with large hydatid cyst noted abutting the right lobe of liver adjacent to the gall bladder fossa. Also noted is the variant anatomy of the biliary tract with the right posterior sectoral duct draining into the right hepatic duct.

1. Right anterior sectoral duct
2. Biliary confluence
3. Right posterior sectoral duct
4. Left biliary duct
5. hydatid cyst

Variant biliary anatomy where the right posterior sectoral duct is draining into the common bile duct (Huang *et al.* Type IIIb)



Figure 2: T2 weighted coronal images demonstrates the site of bile leak with presence of T2 hyperintense collection noted in the subhepatic space adjacent to the course of the right posterior sectoral duct, indicated possible site of bile leak.

1. Bile collection
2. Possible site of leak with possible accidental injury to the right posterior sectoral duct

MRCP images of the patient shows layered appearance of the gall bladder wall, with irregular mucosa and presence of T2 hypointense calculi in the fundus of the gall bladder suggestive of acute calculus cholecystitis. Operative findings suggested gangrenous changes of the gall bladder wall. Image also depicts abnormal low curved course of the right posterior sectoral duct, which during surgery was injured and the patient had a post operative bile leak.

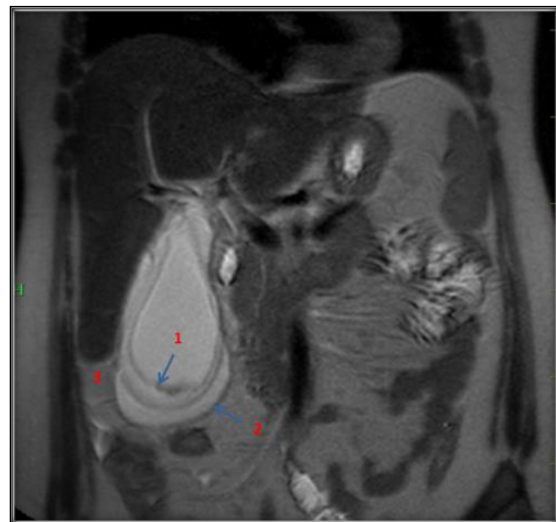


Figure 3: T2 weighted coronal images show the layered appearance and thickening of the gall bladder wall, which inflamed surrounding fat and multiple tiny hypointense calculi in the fundus of gall bladder suggestive of calculous cholecystitis.

1. T2 Hypointense tiny calculi in the fundus
2. Layered gall bladder wall.
3. Diffuse T2 hyperintensity and stranding in pericholecystic fat

MRCP images of the patient shows layered appearance of the gall bladder wall, with irregular mucosa and presence of T2 hypointense calculi in the fundus of the gall bladder suggestive of acute calculus cholecystitis. Operative findings suggested gangrenous changes of the gall bladder wall

Advantages of MRCP are no use of ionizing radiation. Main role of MRCP in modern era is to reduce or eliminate need for diagnostic ERCP which is an invasive procedure. MRCP can produce highly accurate cholangiographic images similar to that of direct cholangiography^[9,10,11]

Limitations of the study were common respiratory motion artifacts, requires breath hold for breath hold sequences, susceptibility artifacts were common in sequences with steady state free precession techniques. MIP 3D images may completely obscure a very small filling defect due to the partial volume effect; therefore, evaluation should be based on the multiple source images.

Limited spatial resolutions compared to ERCP in which there is direct opacification of ducts with contrast.

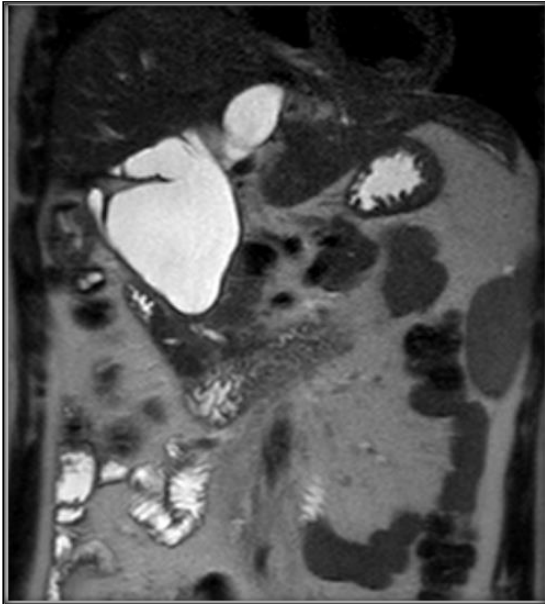


Figure 4:

Coronal T2 weighted images show a fusiform dilatations involving both the intra and extrahepatic bile ducts consistent with Type 4 A choledochal cyst.

The study was performed in a 36-year-old male patient complaining of pain in right upper quadrant of the abdomen.

CONCLUSION

MRCP is non-invasive, non-ionizing imaging modality for evaluation of the pancreaticobiliary anatomy and pathology. It is much superior in the diagnosis and evaluation of various pathologies as compared to the ultrasound and Computed Tomography. After preliminary ultrasound evaluation of abdomen in suspected cases of pancreaticobiliary pathologies, the next modality of choice should be MRCP. If the patient is not able to hold the breath or debilitated or there is contraindication for MR then one can go for quicker CT abdomen imaging.

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