

Role of Magnetic Resonance Cholangiopancreatography in Pancreatobiliary Diseases in Patients of Obstructive Jaundice

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Abstract

Introduction – Obstructive jaundice is not a very common disease. It is usually associated with cholelithiasis and biliary strictures. Magnetic resonance cholangiopancreatography (MRCP) is the most useful diagnostic tool for its diagnosis. **Material and methods** – 100 patients with obstructive jaundice underwent magnetic resonance imaging (MRI) on 3T Siemens Magnetom Vida machine to delineate the cause of obstruction and associated pathology. **Observation** – The disease is more common in females. It is common in middle to old age group and in rural population. The common causes are choledocholithiasis, calculus cholecystitis and pancreatitis. **Discussion** – In 100 patients who underwent MRCP, our diagnostic accuracy was 95-98% compared operatively. MRCP is the primary and most important investigation to diagnose causes of obstructive jaundice.

Keywords - Magnetic resonance cholangiopancreatography (MRCP), Choledocholithiasis, Calculus cholecystitis, Pancreatitis

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I. Introduction

Obstructive jaundice or biliary tract disorders is a common complaint. They are more common in females. Correct detection of pancreato-biliary disease is important for the treating surgeon to carry out appropriate treatment for the patient.

Suspected biliary obstruction has traditionally involved evaluation by a various modalities like Ultrasonography (US), Computed Tomography (CT), Endoscopic Retrograde Cholangiopancreatography (ERCP), Percutaneous Transhepatic Cholangiography (PTC) and Magnetic Resonance Cholangiopancreatography (MRCP).

A diagnostic modality which is safe, non-invasive and highly sensitive in diagnosing the cause of pancreato-biliary disorders is preferred since the approach of treatment varies depending on the cause of obstruction. The fact that MRCP is non-invasive, involves no radiation or need for sedation, operator-independent and is highly sensitive with the ability to delineate lesions at all levels makes it a preferred alternative over ERCP.

Aims and objectives

- To evaluate the level, cause and other details of obstruction in patients with pancreato-biliary disorders with MRCP.
- To compare MRCP findings with the histopathological diagnosis.

II. Materials And Methods

Our study consists of a hundred patients of different age groups in whom there was a clinical suspicion of biliary disease. This is a retrospective cross-sectional study carried out in the Department of Radiodiagnosis at Mahatma Gandhi Hospital (MGH) in Jaipur. All cases of biliary pathologies attending MGH, Jaipur for a period of 18 months from August 2019 to January 2021 were included in our study, excluding those with metallic implants (e.g., cardiac pacemakers, prosthetic heart valves, cochlear implant etc.). The MRCP was done on 3T Siemens Magnetom Vida machine.

III. Observation

In our study, out of hundred patients, sixty-seven cases were female and 3 cases were male. The maximum percentage of cases (26%) were from the 51-60 years age bracket, followed by 41-50 years (22%), and 61-70 years (20%). The majority of our cases were from the rural area (69%). In patients with choledocholithiasis and calculus cholecystitis with choledocholithiasis, the most common symptom was jaundice (100%), followed by pain (97%) and fever (24%). In patients with pancreatitis, the most common symptom was jaundice (100%), followed by pain in the right hypochondrium (49%), fever (35%), lump in the abdomen (27%), and weight loss, respectively. Overall, the most common symptom was jaundice, followed in chronological order by pain, lump in the abdomen, fever, and weight loss. In terms of the causes of obstruction, choledocholithiasis & calculus cholecystitis with choledocholithiasis predominated (37%), followed by pancreatitis (18%), and benign CBD stricture with choledocholithiasis/cholelithiasis (13%). Laboratory findings showed that all patients (37) with choledocholithiasis and calculus cholecystitis with choledocholithiasis had an elevated total bilirubin level, with 33 having elevated SGOT (>35 u/L), and 27 with elevated SGPT (>40 u/L). In cases with pancreatitis (18), all showed elevated total bilirubin level, with 17 of those with elevated SGOT and 13 with elevated SGPT. In cases of benign CBD stricture with choledocholithiasis/cholelithiasis (13), all had elevated total bilirubin levels. Female preponderance was noted in choledocholithiasis and calculus cholecystitis (27%).

The CBD was dilated in all the patients with choledocholithiasis (37 patients), out of which, calculus was noted within the proximal CBD in 25% of patients and distal CBD in 31% patients, with stricture being noted in 2 patients. In case of calculus cholecystitis, calculus in gall bladder was noted in 27 patients and inflammation with thick biliary sludge was seen in 9 patients. In pancreatitis, main pancreatic duct (MPD) was dilated in 12 patients, out of which, 5 patients showed a calculus. Pancreatic pseudocyst was noted in 8 patients. In one patient, there was fistulous communication between the duodenum and the pancreas. Benign CBD strictures were noted in 13 patients versus malignant strictures were seen in 8 patients. In our study, 2 patients of choledochal cyst were noted. In case of malignancy, infiltration to the liver was seen in 9 patients, to the common bile duct (CBD) in 5 patients and to the colon in 1 patient. In 9 patients, we noted metastases to the liver. The major causes of obstructive jaundice in our study were choledocholithiasis and calculus cholecystitis (37%), followed by pancreatitis (18%) and benign stricture (13%). Other causes were cholangiocarcinoma, gall bladder malignancy, pancreatic malignancy and Mirizzi syndrome. 1 patient each of biliary ascariasis and Lemmel syndrome were seen. The sensitivity of our study was 90% and positive predictive value (PPV) was 100%.

Table 1: MRCP findings in patients of choledocholithiasis, calculus cholecystitis with choledocholithiasis

		No. of Patients (N=37)	Percentage	
Choledocholithiasis (N= 37)	Dilated	37	100.00	
	Stone	Proximal/mid / Distal	25	67.56
		Distal	31	83.78
	Stricture	2	5.40	
Calculus cholecystitis with choledocholithiasis	IHBR Dilated	35	94.59	
	GB- calculi	Yes	27	72.97
		No	11	29.72
GB- Inflammation (Acute / Chronic)	9	24.32		

		No. of Patients	Percentage
Pancreatitis	Inflammatory	Acute	10 55.55
		Chronic & Pancreatic Pseudocyst	8 44.44
	MPD	Dilated	12 66.66
		Stone	5 27.77
Pancreatitis Associated complications	Cholelithiasis		8 44.44
	Cholecystitis		9 50.00
	Choledocholithiasis		8 44.44
	CBD Stricture		3 16.66
	Fistulation with duodenum in pancreatitis		1 5.55

Table 2: MRCP findings in pancreatitis patient and pancreatitis associated complications (N = 18)

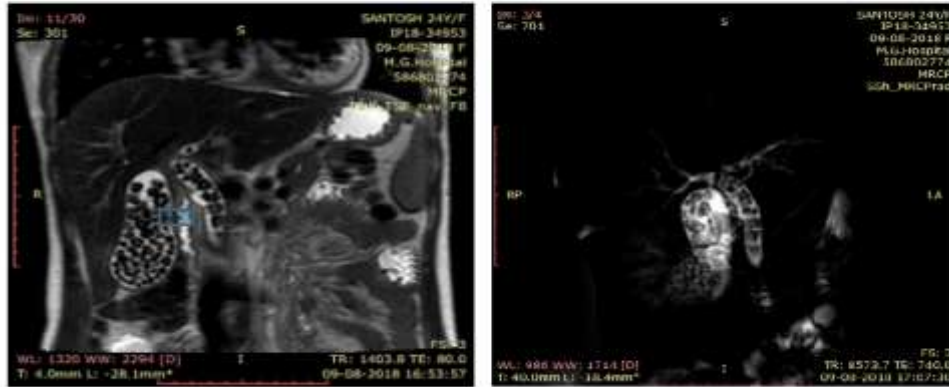
Table 3: Distribution of cases according to diagnosis

Diagnosis	No. of Patients	Percentage
Choledocholithiasis, calculus cholecystitis with Choledocholithiasis	37	37.00
Cholangiocarcinoma	8	8.00
Gall bladder malignancy	8	8.00
Mirizzi syndrome	3	3.00
Ampullary / periampullary, head of pancreas malignancy	4	4.00
Choledochal cyst	3	3.00
Primary sclerosing cholangitis	2	2.00
Ligation / injury to biliary duct in post cholecystectomy patient	2	2.00
Lemmel syndrome	1	1.00
Pancreatitis with associated complication	18	18.00
Benign Stricture of CBD with choledocholithiasis, cholelithiasis	13	13.00
Biliary ascariasis lumbricoides	1	1.00
Total	100	100.00

Illustrations

CHOLEDOCHOLITHIASIS WITH CHOLELITHIASIS

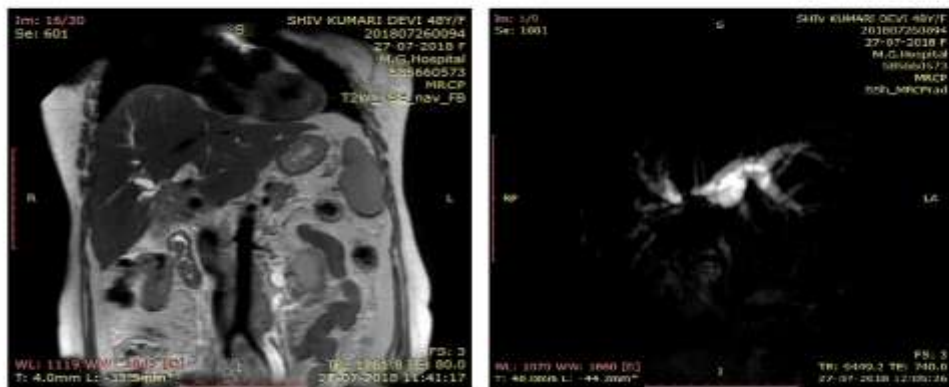
Case No. 19



Hypointense filling defects seen in Gall bladder and CBD

HILAR CHOLANGIOCARCINOMA

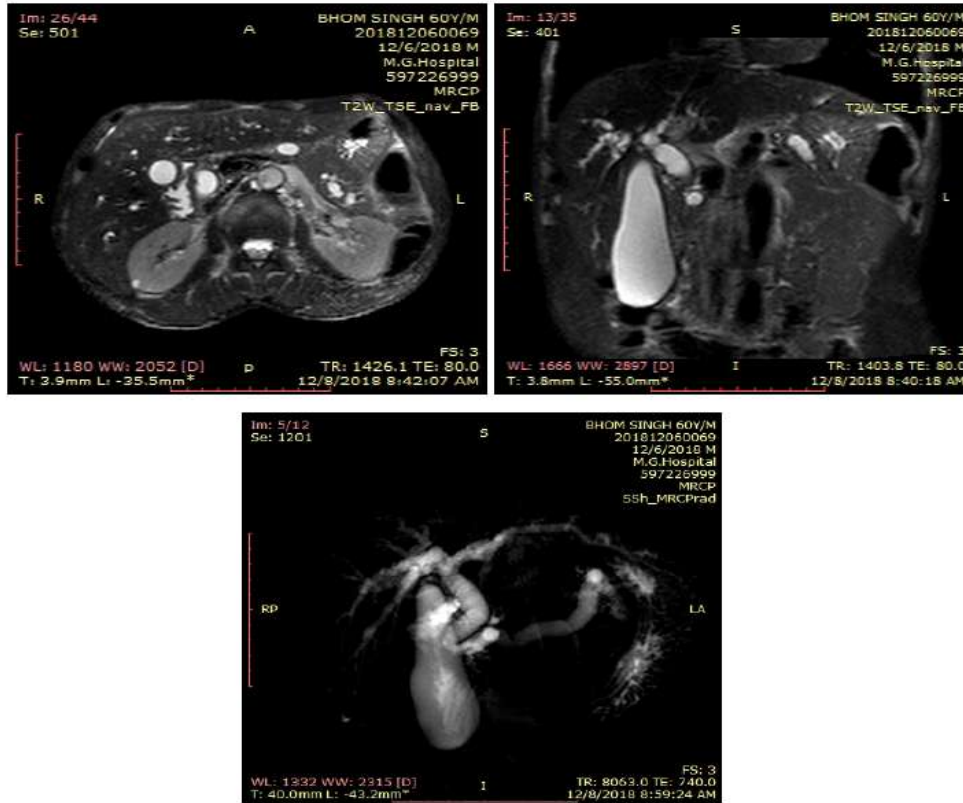
Case No. 1



Mass seen at confluence of RHD and LHD on MRCP

PERIAMPULLARY CARCINOMA

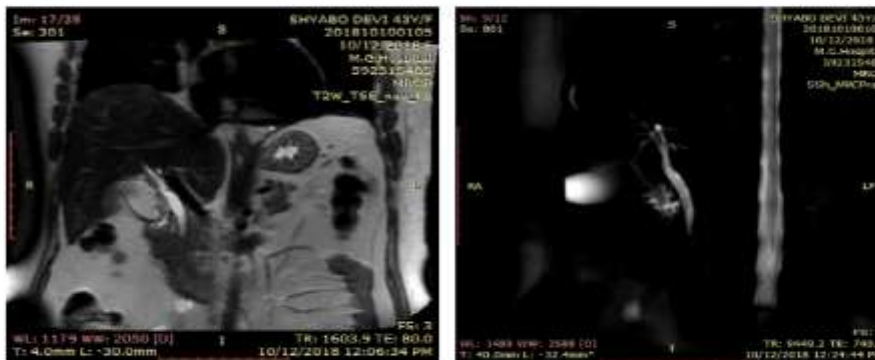
Case No. 44



Dilated CBD and MPD showing Double Duct sign with distended gall bladder on MRCP. (Periampullary Carcinoma)

BILIARY ASCARIASIS

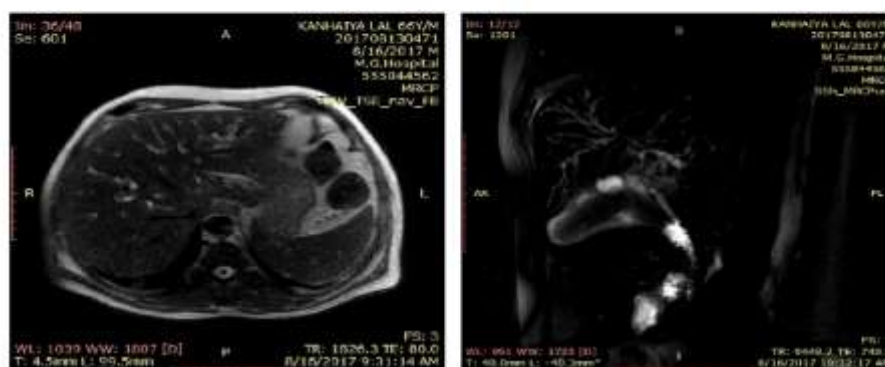
Case No. 37



A linear hypointense filling defect seen in CBD on MRCP. (Biliary ascariasis)

PRIMARY SCLEROSING CHOLANGITIS

Case No. 68



**Multiple short segment strictures with intervening intrahepatic biliary segments are of normal caliber or slightly dilated (beading appearance) on MRCP.—
Primary sclerosing cholangitis**

IV. Discussion

During our study of 18 months, 100 patients with symptoms, signs and biochemical features suggestive of obstructive jaundice were included and MRCP was performed in our department for the evaluation of the cause of obstruction. 67% of the patients were females as compared to 33% male patients. The maximum percentage of patients (26%) were from the 51-60 years age group followed by 22% patients from the 41-50 years age group and 20% patients from the 61-70 Yrs age group. Regan et al [1] have reported a similar symptomatology with the maximum number of cases presenting in the 4th and 5th decades of life. The F: M ratio in his study was 15: 8, while in ours, it was 3: 2.

The most common symptom in choledocholithiasis and calculus cholecystitis with choledocholithiasis (37 cases) was jaundice (all), followed by pain (36 cases) and fever (9 cases). In pancreatitis with associated complications (N = 18), all cases presented with jaundice and pain in right hypochondrium, 13 cases with fever, 10 cases with lump in abdomen. Over all, jaundice was the most common symptom followed by pain, lump in the abdomen, fever and weight loss. In pancreatitis with associated complications [N= 18], all had elevated bilirubin level, 17 cases had elevated SGOT level, and 13 cases had elevated SGPT level, in 1 case the serum amylase and serum lipase were in normal limits, it was likely because of acute on chronic attack and patients came to hospital after 15 to 20 days after attack. In cases of benign stricture of CBD with choledocholithiasis/cholelithiasis [N = 13], all showed elevated bilirubin level, 12 showed elevated SGOT level and 11 showed elevated SGPT level, respectively.

Our study had 37 cases of choledocholithiasis and calculus cholecystitis with choledocholithiasis, majority of which were female and in the 40-to-60-year age group. CBD appeared to be dilated in all the cases. Calculi were noted in 83.7% cases of choledocholithiasis, out of which, in 80.6% cases, the calculi were seen in proximal, mid and distal parts of the CBD. Intrahepatic bile ducts were dilated in 94.5% cases and in 5% cases, a CBD stricture was present. In this sub-group, 11 patients had cholelithiasis, out of which, 9 were associated with the complication of cholecystitis.

Karwa S, Patil VV et al [2] reported that choledocholithiasis accounts for the maximum number of cases of biliary obstruction. They found that 70-80% of the gall stones in the western countries are of the cholesterol type, with the remainder being pigment stones. On MRCP, calculi appear as low signal intensity foci, irrespective of their composition. A combination of thin section multislice images and thick slab MRCP technique increases the sensitivity of detection of large as well as small (1-4 mm) calculi. Our study showed similar results with choledocholithiasis being the most common cause of biliary obstruction, part of which could be due to the fact that there is a higher incidence of gallstones in this part of the country. We found that they were more likely to occur in females in the age group of 41-to-50-years, similar to the findings of Regan et al [1]. Most of the calculi were located in the mid and distal part of the CBD, a finding similar to various studies conducted on the topic. Ahmet Mesrur Halefoglu et al [3] found that biliary calculi, independent of their calcium content, almost always present with a low signal intensity on MRI images, since both calcium and

cholesterol have a very low signal intensity. Hence, a calculus appears as a round or oval-shaped filling defect within the CBD, surrounded by high signal intensity bile.

Our study had 18 cases of pancreatitis, out of which 10 were acute and 8 were chronic. The MPD was dilated in 66.66% of the cases, with a calculus being seen within the MPD in 27.777% of the cases. Suraj Sonawane et al [4] conducted a magnetic resonance study on 40 patients, out of which 13 were found to have pancreatitis. 17.5% of these patients had acute pancreatitis whereas 15% had chronic pancreatitis.

Ahmet Mesrur Halefoglu et al [3] stated the MRCP diagnostic criteria for chronic pancreatitis which include MPD dilatation, narrowing, stricture, irregularity, pseudo-pancreatic cysts and ductal filling defects due to calculi, debris or mucinous plug.

In our study there were 22 cases of benign CBD stricture, majority of which were females and between 50-70 years old. Out of these, three were associated with Mirrizzi syndrome (all of whom presented with a calculus impacted in the cystic duct); three with pancreatitis; two with primary sclerosing cholangitis and one was associated with biliary ascaris lumbricoides. A similar incidence was reported by Sundeep S et al [5],

The present study included twenty cases of biopsy-proved malignant CBD stricture. Of these twenty cases, eight were of carcinoma gall bladder; four were of ampullary or periampullary carcinoma and eight were of cholangiocarcinoma. Majority (fourteen) of these cases were females and between forty to sixty years old. The most common presenting symptom was jaundice, followed by pain in the abdomen, lump and weight loss. MRCP was able to correctly diagnose eighteen of the twenty cases as malignant. One case was misdiagnosed as a benign CBD stricture and other was designated as having an inflammatory etiology.

In cases of carcinoma of the gall bladder, MRCP was able to depict better the mass and its infiltration of the liver and CBD, as well as show peri-portal and peri-pancreatic lymph node metastases, as compared to ERCP which only showed stricture at the upper end of CBD and hence only provided intraductal information.

Our study had four cases of ampullary and periampullary carcinoma. IHBR, CBD and MPD were dilated in the four cases. MRCP was able to demonstrate the “double duct sign” in all of the four cases. ERCP could not demonstrate the extent of the tumor. Also, an assessment of resectability of the tumor can be made by MRCP, which is an important consideration. Reiman et al [6] had reported the significance of MRCP in differentiating an inflammatory mass lesion from a neoplasm. In their study, 85% of the patients with carcinoma showed a smooth dilatation of the MPD with the remainder showing an irregular dilatation of the CBD; and 27% of the patients with chronic pancreatitis showed a smooth dilatation of the CBD with the rest showing an irregular dilatation of the CBD. Masses demonstrated smooth dilatation of the CBD with abrupt termination. Our study results were much similar to his study, with three cases of the carcinoma of the head of pancreas showing smooth dilatation of the MPD and CBD with abrupt termination.

The present study had eight cases of cholangiocarcinoma. Four of these cases presented with a mass involving the confluence of RHD and LHD. Three cases involved the proximal CBD and one involved the distal CBD based on MRCP findings. Five of the cases of cholangiocarcinoma were associated with cholelithiasis. In two cases of cholangiocarcinoma, the mass was seen to be infiltrating into the gall bladder and in four cases, the mass was seen to be involving the liver,

Kim et al conducted an analysis in 2000 on 62 patients with biliary obstruction [2002]. They noted that MRCP images significantly improve the diagnostic accuracy in differentiation benign from malignant obstruction. Reiman et al [6] had reported the significance of MRCP in differentiating an inflammatory pancreatic mass from a neoplasm.

MRCP has a sensitivity of 87.5% in predicting the nature of the stricture. It has a specificity of 85.3%, positive predictive value of 80.8%, negative predictive value of 90.6% and an accuracy of 82.7%. MRCP diagnosed the presence of malignant duct obstruction with a sensitivity and specificity of 98%. In our study, on the basis of MRCP alone, the possibility of malignant duct obstruction was given in 18 cases, which were confirmed as malignant based on biopsy from tissue taken from the mass on surgery/ERCP. Two cases were misdiagnosed as benign on MRCP findings. Hence, in our study, MRCP as a modality had a sensitivity of 90% and positive predictive value of 100%.

MRCP has several advantages which includes the facts that the modality is non-invasive, allows for a detailed evaluation of the pancreatobiliary tract with a large field of view (FOV) and excellent patient tolerance, and provides three-dimensional (3D) projection images like endoscopic retrograde pancreatography (ERCP). Thus, MRCP has virtually replaced ERCP as the primary investigative modality in all cases of obstructive jaundice who do not require an early endoscopy.

V. Conclusion

Based on the results of our study we can conclude that MRCP is a revolutionary technique of non-invasive evaluation of the anatomy and pathologies of the biliary tree in patients with suspected pancreatobiliary pathologies. It is safe, non-invasive, non-ionizing, non-operator dependent with a diagnostic accuracy comparable to ERCP in evaluation of the biliary system.

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None.

Conflict of interest

Author declares that there is no conflict of interest.

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