Research Article

Magnetic resonance cholangiopancreatography (MRCP) based diagnosis of pancreaticobiliary disorders: Three years study at a tertiary care Hospital

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Abstract

Magnetic Resonance Cholangiopancreatography (MRCP) is a non-invasive imaging modality that has high accuracy for evaluation of the biliary and pancreatic ducts. The current study aims to assess the role of MRCP in finding various pancreaticobiliary pathologies. It was a retrospective study, data was collected from 659 patients who underwent MRCP at MRI unit Holy Family Hospital, Rawalpindi. Chi-Square was applied to find the difference in the prevalence of various disorders. The presenting indication in our data shows 72% of patients with pain (abdominal, epigastric and right hypochondrium) followed by jaundice in 11.3% participants. Our results indicate that the most common pancreaticobiliary disorders were obstructive including cholelithiasis along with choledocholithiasis (8.3%), cholelithiasis (17.8%) CBD stricture (16.4%) and acute pancreatitis (10.9%). Moreover, our data also showed that the obstructive disorders particularly cholelithiasis (20.9%vs 13.7%) was more common in females as compared to males. We also showed that neoplastic disorders were more prevalent in the age group 53-65, whereas strictures were more common in the 39-52 age group, and we have observed higher prevalence of inflammatory disorders in age group 27-39. MRCP allows the evaluation of pancreaticobiliary disorders with high accuracy. Being non-invasive, MRCP can be used in early diagnosis and preventive treatment of pancreaticobiliary disease thereby facilitating accurate diagnosis and subsequent clinical management.

Keywords: Pancreaticobiliary disorders, MRCP, Biliary tract, Pancreas.

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Introduction

Pancreaticobiliary disorders comprise a broad spectrum of diseases that impact the pancreas, liver, gallbladder, and bile ducts. They cause disturbances in the complex equilibrium of this system, leading to health problems that need close monitoring and treatment. In Pakistan, one of the major causes for patients visiting

emergency departments is pancreatico-biliary disorders that present as acute abdominal pain. Magnetic Resonance Cholangiopancreatography (MRCP) is an imaging method that allows for quick and non-invasive evaluation of the biliary tree and pathology localization [1]. It offers a thorough assessment of the pancreaticobiliary ductal system and helps to determine the fluid components of lesions or collections [2]. MRCP acts as a problem-solving technique in cases where CT or sonography provide limited options. In this regard, Hepatic MRI can be used to confirm the diagnosis without the need for biopsy, surgery, or multiple follow-up examinations [3].

Previous studies have shown that MRCP acts as an important method for the identification of pregnant patients with acute biliary disorders. When an ultrasound identifies biliary dilatation, MRCP can evaluate the etiology and save the patient from unnecessary endoscopic retrograde cholangiopancreatography (ERCP) by excluding biliary pathology [4]. Another study has shown that Endoscopic ultrasound scan (EUS) and MRCP are important in identifying or excluding malignancy and choledocholithiasis [5].

The current study was designed to report the MRCP-based detection of pancreaticobiliary disorders at a tertiary care hospital. Our purpose was to investigate the role of MRCP in the clinical evaluation of patients with pancreaticobiliary diseases and to determine its additional importance.

Material and Method

The study was conducted in the MRI section of the Department of Radiology at Holy Family Hospital, Rawalpindi, Pakistan over a period of 3 year, between January 2021 and September 2023. It was a retrospective study in which 659 patients with common bile duct or pancreatic duct pathologies were evaluated using MRCP.

Those patients who developed signs of biliary or pancreatic disorders after initial clinical evaluation and are further referred for the identification of pancreato-biliary disorders were included in the current study. Also, patients who observed contraindicated or unsuccessful ERCP and who have suspected neoplastic etiology for biliary or pancreatic obstruction were included.

Exclusion criteria encompassed patients who refused additional evaluation procedures following MRCP. Patients who had allergy to contrast agents, pregnancy, severe renal impairment, and unstable medical conditions were also excluded.

Patient preparation

To enhance the gastric emptying and gall bladder filling, patients were asked to fast for 4 hours [6, 7].

Technique

All the 659 patients were directed to MRCP with the SIEMENS MAGNETOM ESSENZAA 1.5 TESLA machine.

Results

Data was collected from 659 patients who underwent MRCP between January 2021 to September 2023 at the MRI unit of Holy Family Hospital, Rawalpindi.

Presenting symptoms in both genders

Among patients who underwent MRCP, 57% were female and 43% were male. The clinical manifestations varied among patients, but abdominal pain (right hypochondrium, epigastrium) was present in ¾th of the patients. Jaundice (11%)

Table 1: Presenting symptoms in both genders

Gender	Abdominal Pain (epigastrium or RHC)	Jaundice	Pain /jaundice	Pain & Jaundice, post-surgery	χ^2, p-value
Female	270(73.4%)	32(8.7%)	30(8.2%)	36(9.80%)	6.896, 0.075
Male	207(71.1%)	43(14.8%)	18(6.2%)	23(7.90%)	
Total	477(72.3)	75(11.4%)	48(7.3%)	59(9.00%)	

and post-cholecystectomy complications (7.3%) were also among the leading indications. Our results did not show any significant difference in presenting symptoms among males and females' patients (Table 1).

Different kinds of biliary pathologies identified by MRCP

Our results showed the highest percentage of the patients 323 (49%) were in the age group of (25-50) years while 256 (38.8%) were (51-75) years old. Most of the cases had bile-duct and gall bladder stones 310 (47%) followed by inflammatory (22.5%) and neoplastic (7.1%) etiologies. Our data shows that Isolated cholelithiasis was significantly higher in females as compared to males: 77(20.9%) and 40(13.7%). Similarly, isolated Choledocholithiasis and Cholelithiasis with Choledocholithiasis as listed in Table 2 were more prevalent in females as compared to males. Whereas, Neoplastic disorders were more common in male as, out of 14 cases of klatskin tumor 11(3.8%) were male and three (0.8%) were females in our data set. Among congenital pathologies, only one case of biliary atresia and four cases of choledochal cyst were identified. Overall (16.4%) of the patients had CBD strictures, and (10.9%) were diagnosed with acute pancreatitis. Details of MRCP identified pancreaticobiliary disorders in both genders are given in Table 2.

Table 2: Final diagnosis of 659 patients undergoing magnetic resonance cholangio-pancreatography**.**

MRCP Findings	Female (368)	Male (291)	Total (659)
	n (%)	N (%)	N (%)
Congenital			
Biliary atresia	0(0.0)	1(0.3)	1(0.2)
Choledochal cyst	1(0.3)	3(1.0)	4(0.6)
Sub-total	**1(0.3)**	**4 (1.4)**	**5(0.8)**
Stones (Bile Duct & Gall Bladder)			
Cholelithiasis	77(20.9)	40(13.7)	117(17.8)
Choledocholithiasis	23(6.3)	32(11)	55(8.3)
Cholestasis	11(3.0)	4(1.4)	15(2.3)
Cholelithiasis, Choledocholithiasis	9(2.4)	7(2.4)	(16(2.4)
Cholecystolithiasis, Choledocholithiasis	5(1.4)	2(0.7)	7(1.1)

MRCP Findings	Female (368)	Male (291)	Total (659)
	n (%)	N (%)	N (%)
Cholelithiasis, Choledocholithiasis, EH, and IH cholestasis	38(10.3)	30(10.3)	68(10.3)
Cholelithiasis, Hepatomegaly	2(0.5)	2(0.7)	4(0.6)
Cholelithiasis, Cystic duct stone	2(0.5)	0(0.0)	2(0.3)
Cholelithiasis, Splenomegaly	2(0.5)	2(0.7)	4(0.6)
Hepatic involvement	14(3.8)	9(3.1)	23(3.5)
Sub-total	181(49.2)	129(44.3)	310(47)
Strictures			
Distal CBD stricture	67(18.2)	43(14.8)	110(16.7)
Sub-total	**67(18.2)**	**43(14.8)**	**110(16.7)**
Inflammatory			
Pancreatitis	10(2.7)	8(2.7)	18(2.7)
Chronic Pancreatitis	3(0.8)	3(1.0)	6(0.9)
Acute Pancreatitis	29(7.9)	43(14.8)	72(10.9)
Cholecystitis	9(2.4)	2(0.7)	11(1.7)
Acute calculus cholecystitis	12(3.3)	5(1.7)	17(2.6)
Cholelithiasis, cholecystitis	16(4.3)	10(3.4)	26(3.9)
Sub-total	**79(21.5)**	**71(24.4)**	**150(22.8)**
Neoplastic			
Klatskin tumor	3(0.8)	11(3.8)	14(2.1)
Ampullary mass with double duct sign	7(1.9)	7(2.4)	14(2.1)
Intrahepatic cholangiocarcinoma	5(1.4)	4(1.4)	9(1.4)
CA Gall bladder	4(1.1)	4(1.4)	8(1.2)
CA head of pancreas	1(0.3)	0(0.0)	1(0.2)
Liver metastasis	0(0.0)	1(0.3)	1(0.2)
Miscellaneous			
Mirizzi syndrome	3(0.8)	2(0.7)	5(0.8)
Biloma	4(1.1)	3(1.0)	7(1.0)
GB sludge	9(2.4)	10(3.4)	19(2.9)
duodenal diverticula, IH& EH cholestasis (Lemmel syndrome)	0(0.0	1(0.3)	1(0.2)
leakage at anastomotic site	1(0.3)	0(0.0)	1(0.2)
mass along second part of duodenum	1(0.3)	0(0.0)	1(0.2)
Cyst in rt hemiabdomen D/D duplication enteric/mesenteric cyst, hepatic cyst, pancreatic pseudocyst, choledochal cyst.	0(0.0)	1(0.3)	1(0.2)
Thick wall gallbladder	0(0.0)	1(0.3)	1(0.2)

χ^2, 8.592 p-value = 0.126

Trends of pancreaticobiliary disorders in both genders

Our results indicates that the bile-duct and gall bladder stones particularly cholelithiasis (20.9% vs 13.7%) were more common in females as compared to males. Similarly, the prevalence of strictures (18.2% vs. 14.8%) was higher in females compared to males. Whereas Neoplastic and inflammatory disorders were more prevalent in males (9.5 vs 5.4) & (24.4%VS 21.5%) compared to females, respectively (Figure 1).

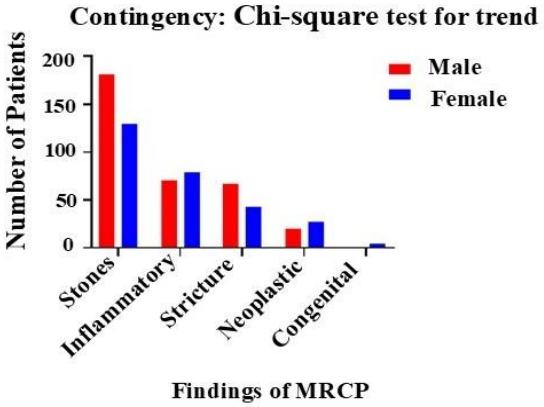

Figure 1: Findings of MRCP in both gender

Trends of pancreaticobiliary disorders in different age groups

We showed that the bile duct and gall bladder stones were more common in all age groups compared to other pancreaticobiliary disorders. Among our data set, the most affected age group by these disorders was (27-39) years (27.1%). Neoplastic disorders were more prevalent in (53-65) years (48.9%), whereas strictures were more common in the 39-52 age group (29.1%). A higher prevalence of inflammatory disorders was found in 27-39 years old subjects (32%) (Figure 2).

Discussion

The MRCP technique evolved during the 1990s as a non-invasive imaging tool used for the identification of pancreato-biliary

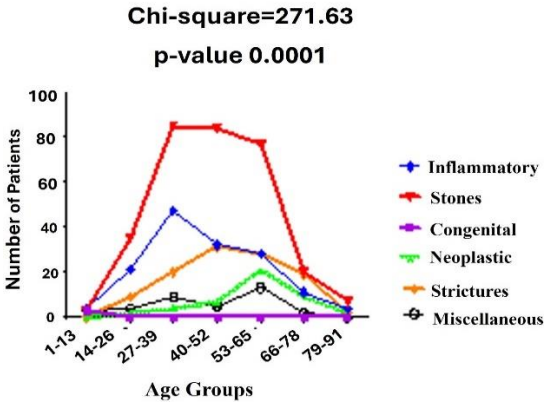

Figure 2: MRCP results in different age groups.

diseases [8]. Different refinements were made in this imaging method and the generation of 3-D MRCP sequences further enhanced the MRCP quality, which further allowed the construction of overlapping slices that were of less than 1mm in size [9]. MRCP has an accuracy of 100% in evaluating the presence and degree of pancreato-biliary obstruction.

Biliary stones are one of the most common diseases of the biliary family and can lead to acute pancreatitis [10]. MRCP exhibited an excellent overall detection rate for bile duct and gall bladder stones. When gallstones migrate to the common bile duct, they can cause acute biliary pancreatitis. Gallstones affecting the cystic duct or gallbladder neck can be detected more accurately with MR imaging.

Based on our finding's prevalence of cholelithiasis was higher in females compared to females which is line with many local as well as international studies [11]. Numerous epidemiological studies indicate that there is a significant difference in the overall prevalence of Cholelithiasis between different populations.

Acute pancreatitis is frequently manifested as acute abdominal pain, and over the past few decades, the incidence has increased. MRCP evaluates pancreatitis by identifying dilatation, stones, stricture or

irregularity of biliary duct [12]. In our study, we have recorded 18 (2.7%) patients with pancreatitis, 6 (0.9%) with chronic pancreatitis and 72 (10.9%) patients with acute pancreatitis.

Cholecystitis, another biliary disorder, can be because of obstruction of the cystic duct or gall bladder neck. MRCP has a greater sensitivity than ultrasound for the diagnosis of acute cholecystitis [13]. In current study, we have recorded 11 (1.7%) with cholecystitis, 17 (2.6%) of patients with acute acalculous cholecystitis and 26 (3.9%) patients with cholelithiasis and Cholecystitis.

Biliary strictures, another important disorder of pancreatic biliary tree, can be because of surgical injuries, including cholecystectomy, post liver transplantation etc. [14,15]. Another disease from biliary tree is Pancreas divisum. It is one of the common variants of the pancreas [16]. Previous studies have shown that MRCP is accurately detecting biliary disorders including pancreas divisum [17]. Most of the cases of biliary obstruction were because of biliary stones or strictures (benign or malignant). MRCP can readily identify the reason for biliary obstruction. Pancreatic adenocarcinoma could be one of the causes of these strictures i.e., CBD common bile duct. It may present with identifiable mass lesion that cannot be identified using CT scan or MRI [18] but can be seen using MRCP. In the current study, we have identified CBD strictures in 110 (16.4%) patients.

Congenital biliary pathologies include biliary atresia and choledochal cyst. Biliary atresia is a rare disease that affects 1 in 20000 neonates. It is the reason for the infant jaundice and accounts for more than 30% of all newborns having cholestasis and other diseases affecting liver [19]. On the other hand, choledochal cysts are linked with cystic dilatations of the extrahepatic duct. The widely used classification system for choledochal cysts is based on location and number of intrahepatic and extrahepatic bile duct cysts and on cholangiographic morphology. Type I cysts are usually confined to the extrahepatic bile duct and can be further subdivided into IA, 1B and 1C [20]. In the current studies, we have observed 1 case of biliary atresia, we also recorded 1 patient for choledochal cyst, 1 patient for choledochal cyst type 1 and 1 patient for choledochal cyst type 1B as mentioned in Table 2. Previous work also illustrates the importance of MRCP in evaluating the pediatric biliary tree, especially for the diagnosis of congenital biliary pathologies [21].

Another important biliary disorder is Mirizzi syndrome. It is a rare disorder that is due to obstruction in CBD because of compression from biliary stones. This disorder was named after Pablo Luis Mirizzi, the Argentinian surgeon who first explained it. In the current study, we have identified Mirizzi syndrome in 5 (0.8%) of patients. GB sludge was also observed in 19 (2.9%) of patients using MRCP. Other findings are reported in Table 2. Figure 2 also represents MRCP findings in different age groups.

The results of the present study highlight the role of MRCP in assessing the pancreaticobiliary tree. Patients in our study who have indications of obstructive jaundice could have a choledochal cyst or biliary atresia, but there could be a possibility of ductal obstruction. Our MRCP results demonstrate stones in patients. These patients will need ERCP in the next step, that will remove these biliary stones. Our experience thus highlights the recommendation that ERCP should be avoided unless needed for further interventions. Studies have shown that MRCP, EU, and ERCP all have comparable sensitivity and specificity in identifying choledocholithiasis. ERCP should be avoided if the likelihood of a

biliary stone or stricture is low [22]. Another study indicates that Endoscopic ultrasound and MRCP provide important diagnostic in patients with dilated and nondilated biliary tree [23]. MRCP can eliminate the need for diagnostic ERCP in most settings. However, there are fewer reports of MRCP in children, for which further studies are required [21]. MRCP was also helpful for the detection of different neoplastic etiology. MRCP images can display periductal anatomy, a critical element in surgical decision-making. Cholangiocarcinoma is a cancer that can arise from the bile duct epithelium, In the case of Klatskin tumor, a form of cholangiocarcinoma, data about the interplay of only right or left biliary tree or both can be easily acquired using MRCP, leading to important consequences on therapeutic approach.

MRCP has the ability to exclude common forms of biliary disorders among patients who have biliary dilatation of unknown etiology on ultrasound. These patients improved with supportive medicine and later discharged without surgery or endoscopy. MRCP can also evaluate patients who need immediate treatment. MRCP has the ability to complement ultrasound and can provide ease in the management of patients who have suspected biliary disorders.

Conclusion

The current study concludes that at the tertiary hospital MRCP being non-invasive procedure has a great diagnostic accuracy in evaluating pancreaticobiliary disorders. Our studies proposed that MRCP can be used as a standard investigation procedure over ERCP in patients with biliary disorders for further diagnosis and to plan surgeries.

Ethical approval

The studies involving human participants were reviewed and approved by Benazir Bhutto Hospital, Rawalpindi. Written informed consent was obtained from the patients for the publication of any data included in this article.

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