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DIAGNOSTIC ACCURACY OF MRCP AS COMPARED TO ULTRASONOGRAPHY IN PATIENTS WITH PANCREATICO-BILIARY DISEASES

Radiodiagnosis

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ABSTRACT

Evaluation of suspected biliary obstruction has traditionally involved a variety of imaging modalities including ultrasonography (US), computed tomography (CT) and invasive cholangiography. Magnetic Resonance Cholangio-Pancreatography (MRCP) has rapidly gained ground and has now firmly established in the evaluation of the biliary and pancreatic ducts in view of limitation of USG and CT and invasiveness of PTC, IVC and ERCP.

Overall the purpose of this prospective study carried out in the Department of Radiodiagnosis, MGIMS, Sewagram over a period of 2 years comprising of fifty unselected patients was MRCP evaluation of pancreatico-biliary diseaes and correlation of its accuracy with ultrasonography. Our results demonstrate that preoperative MRCP had a safe guarding effect on laparoscopic cholecystectomy and deserves further promotion.

KEYWORDS

Pancreatico-biliary Diseases, Cholelithiasis-choledocholithiasis, Mrcp.

INTRODUCTION

Evaluation of suspected biliary obstruction has tradition¬ally involved a variety of imaging modalities including ultra¬sonography (US), computed tomography (CT) and invasive cholangiography. These techniques have limitations because of poor visualization of intra-ductal stones on US and CT and the need for invasive procedures like endoscopic retrograde cholangiopancreatography (ERCP) and percutaneous tran¬shepatic cholangiography (PTC). Magnetic resonance chol¬angio-pancreatography (MRCP) is a non-invasive imaging modality that provides good visualization of the hepato-biliary system [1].

Ultrasound is the initial screening tool that is used in evaluating patients presenting with pancreatic biliary diseases and was being mainly supplemented with CT [2]. Ultrasonography has limitations especially in the evaluation of the distal CBD where bowel gas, debris, fluid in the duodenum and obesity can degrade the image quality.

CT scan has its share of limitations, especially in demonstrating two important pathologies, biliary stones and biliary strictures. CT has a sensitivity of only 90% for detecting biliary stones [2,3]. Stones which have high cholesterol content may be missed as their attenuation resembles fluid; as a result, they are difficult to separate from bile. Mixed stones also may be difficult to detect on CT as they present as soft tissue density; this soft tissue density may merge with the pancreatic parenchyma thereby decreasing the sensitivity of CT. Biliary strictures are not directly visualized on CT. As CT is a cross-sectional imaging modality, limited to an axial plane, strictures are not demonstrated in a coronal or projectional plane. CT, therefore, detects strictures only by a process of exclusion, an abrupt cut off of dilated bile ducts without mass lesion. The length and extent of the stricture are difficult to determine on CT. It is very important from a management point of view to be able to visualize the length and extent of strictures.

For these reasons cholangiographic modalities like intravenous cholangiography (IVC), percutaneous transhepatic cholangiography (PTC) and Endoscopic Retrograde Cholangiopancreatography (ERCP) are required. IV cholangiography has limitations, in 30-40% of cases, there is incomplete opacification of the biliary system [4,5].

PTC and ERCP have the same diagnostic and therapeutic role but PTC is more invasive and risky with the incidence of sepsis as high as 4% [6]. ERCP is operator dependent and invasive procedure and it is associated with 1–7% morbidity and 0.2%–1% mortality [7].

In view of the limitation of US and CT and invasiveness of PTC, IVC and ERCP there is a need for an imaging modality which is noninvasive and provides high-resolution projection images of the biliary and pancreatic duct [6,8].

MRI plays a vital role in diagnosing many conditions of the pancreatico-biliary tract. MRI can diagnose various pancreatico-biliary diseases like primary sclerosing cholangitis, acute and chronic pancreatitis, pancreatic and gall bladder carcinoma. It is a non-invasive, non-ionizing imaging modality and is unaffected by bowel gas shadow [9]. Since its introduction by Wallner et al in 1991 MRCP has undergone tremendous technical changes essentially in the search for an optional imaging sequence. However, with the development of higher magnetic field strength and newer pulse sequences, MRCP with its inherent high contrast resolution, rapidity, multiplanar capability, and virtually artifact free display of anatomy and pathology in this region is proving to be an examination of choice in patients with pancreatico-biliary diseases [8]. This imaging technique is able to create projection type images similar in detail and appearance to direct cholangiography. It avoids the use of intravenous (IV) contrast and ionizing radiation and is relatively operator independent. Several recent studies have demonstrated that MRCP is able to accurately identify common bile duct stones with a sensitivity of 81–100% [10]. Biliary strictures can also be visualized with sufficient anatomic detail to determine the level of obstruction and in some instances, differentiate benign from malignant causes. MRCP has potentially two major advantages in neoplastic pancreatico-biliary obstruction. Firstly, MRCP can directly reveal extraductal tumor whereas ERCP depicts only the duct lumen. Second, MRCP lacks the major complication rate of approximately 3% associated with ERCP such as sepsis, bleeding, bile leak, and death [6]. Its disadvantages include lack of visualization of the peripheral intrahepatic ducts and inability to provide endobiliary therapy [6,8].

MATERIAL AND METHODS

This was a prospective study conducted at the Department of Radiodiagnosis, M.G.I.M.S., Sewagram, over a period of 2 years from April 2015 to March 2017. This study included 50 unselected patients of different age groups who had undergone MRCP in whom there was clinical suspicion of the pancreatico–biliary diseases or on ultrasonography patient having pancreatico–biliary disease. There were 22 males and 28 female patients, ranging in age from 11 to 78 years.

Each patient was separately studied by using Ultrasonography, MRCP and both studies were compared with other modalities and some cases were followed up & compared with postoperative findings.

Exclusion criteria:

- Patients who did not give consent to participate in the study.
- Patients having cardiac pacemakers, prosthetic heart valves, cochlear implants or any metallic orthopedic implants.

Once the patient agrees to participate in the study, information is obtained as per the performa.

Patient preparation:
Patients were instructed to be on a fat-free diet for 24 hrs and the study was performed after an overnight fast.

Technique:
Sonography was performed on either Voluson S6 WIPRO GE Healthcare Sonography Machine or Philips HD 11XE and Philips Affinity 70 Sonography machine. Original sonographic reports regarding the presence of stones in the gall bladder and/ CBD were used to calculate the accuracy of the sonographic examination.

MRCP was performed with a 1.5T Magnetom Avanto MRI unit (Siemens Medical Systems) using a phased-array multicoil.

Follow-up:
Few cases were followed up clinically and radiologically as indicated. The radiological diagnosis was correlated with ERCP, surgical findings and histopathology correlation was done whenever possible.

RESULT
Following observations were made in the study of 50 patients, who were clinically diagnosed as having pancreatico-biliary diseases on USG and undergone MRCP for further evaluation.

- The peak incidence of pancreatico-biliary diseases was seen in the age group of 41-50 years with 14 (28%) participants falling in this age group **(Table 1)**.
- The age ranges from 11 to 78 years.
- Gender wise distribution shows preponderance towards the female with male:female ratio of 1:1.2.
- Cases of cholelithiasis-choledocholithiasis predominated and were seen in 28 (56%) patients **(Figure 2)**.
- Benign diseases were more common 88% as compared to malignant diseases 12%. **(Figure 1)**.

TABLE 1: Age-wise distribution in the pancreatico-biliary diseases.

Age (Years)	No. of patients	Percentage (%)
<20	3	6
21-30	7	14
31-40	10	20
41-50	14	28
51-60	7	14
61-70	8	16
>70	1	2
TOTAL	50	100

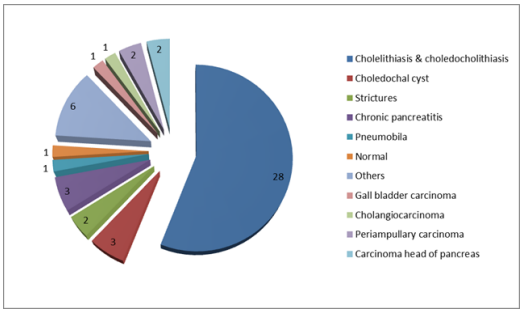

FIGURE 1: No of patients showing various pancreatico-biliary diseases

TABLE 2: Comparison of MRCP diagnosis accuracy with USG diagnosis accuracy.

Diagnosis	No. of cases	USG diagnosis accuracy	MRCP diagnosis accuracy
Choledochal cyst	3	100 %	100 %
Strictures	2	50 %	100 %
• Calculus	12	75 %	100 %
• Cholelithiasis & choledocholithiasis	9	88 %	100 %
• Cholelithiasis	7	57 %	100 %
• Choledocholithiasis			
• Neoplasm	1	100 %	100 %
• Gall bladder carcinoma	1	100 %	100 %
• Cholangiocarcinoma	2	100 %	100 %
• Periampullary carcinoma	2	50 %	100 %
• Carcinoma head of pancreas			

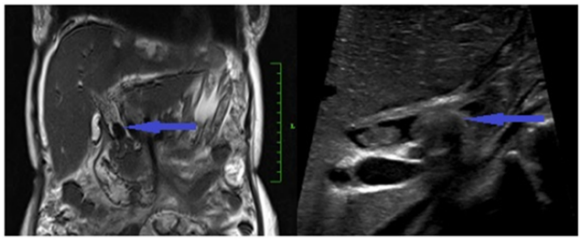

FIGURE 2: VIBE coronal and USG showing a mass in distal CBD causing obstructive biliopathy.

DISCUSSION
Two non-invasive and non-ionizing modalities for evaluation of pancreatico-biliary diseases are USG & MRCP. Currently, the diagnostic accuracy of MRCP is considered to be equivalent to ERCP for a broad spectrum of pancreatico-biliary diseases.

USG v/s MRCP
USG correctly diagnosed 21 of the 28 patients with MRCP-proven cholelithiasis or choledocholithiasis. There were 7 false-negative results for USG for cholelithiasis and/or choledocholithiasis. Ampulla of Vater stones was correctly diagnosed in 1 of the 3 affected patients. Strictures were correctly diagnosed by USG in one of the two affected patients. USG correctly diagnosed all 3 patients with MRCP-proven choledochal cyst.

Tumors were correctly diagnosed in 5 out of 6 affected patients by USG. USG failed to diagnose 1 case of carcinoma head of the pancreas.

The respective sensitivity of USG for cholelithiasis/ choledoch olithiasis, choledochal cyst, strictures and neoplasm were 75%, 100%, 50% and 83.3% respectively (Table 2). Guibaud et al [11], Barish M A and Soto [12] and Pavone et al [13] who concluded their studies with sensitivities ranging from 80-86% and specificities of 96-98% and diagnostic accuracies of 91-100% for level of obstruction. Sugita et al in his study of 25 cases of periampullary tumors reported a sensitivity 88%, specificity 100% and diagnostic accuracy of 96% [14].

Results of studies show clearly that USG can be used as a primary investigative tool but its diagnostic accuracy for stricture, mass lesion and calculi in the lower end of CBD was low.

CONCLUSION
Our results present this study as a potential investigation of using MRCP in a tertiary hospital with standard equipment. MRCP serves as a sensitive, specific, accurate and noninvasive, nonionizing imaging method for evaluation of pancreatico-biliary anatomy and pathology. MRCP has better diagnostic accuracy in detecting biliary calculi. We strongly recommend that MRCP should be incorporated as a standard investigation in-patient with pancreaticobiliary gallstones for intervention and surgical planning. It is a cost-effective tool and preoperative planning reduces the length of hospital stay.

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