



ROLE OF MAGNETIC RESONANCE IMAGING AND MAGNETIC RESONANCE CHOLANGIOPANCREATOGRAPHY IN PATIENTS WITH SURGICAL JAUNDICE

Radiodiagnosis

Dr Hashim P I

MD, Dept of Radiodiagnosis & Imaging, INHS Asvini, Colaba, Mumbai-400005

Dr Vikas Chauhan*

MD, Dept of Radiodiagnosis & Imaging, INHS Asvini, Colaba, Mumbai-400005
*Corresponding Author

ABSTRACT

Aim: To evaluate the effectiveness of Magnetic Resonance Imaging and Magnetic Resonance Cholangio Pancreatography in imaging various pathological conditions causing surgical jaundice and assessing the level of obstruction.

Methods: Hundred consecutive patients who were admitted to the Surgical Gastroenterology ward at a tertiary care centre with clinical and biochemical evidence of obstructive jaundice were evaluated using MRI& MRCP. Liver function tests, routine blood, urine examinations, ultrasonography and in case necessary CT scan were done. The patients were then subjected to a detailed MRI& MRCP examination and then followed up with endoscopy in some selected cases. Based on the MRI findings, lesions were classified initially into benign or malignant variety. The malignant lesions were further characterized and categorized. After surgery, the post operative findings and findings at a histopathological examination were compared to the MRI&MRCP findings.

Results: In our study MRI&MRCP as a modality in the diagnosis of obstructive jaundice had a sensitivity of 98% and a specificity of 100%, with a diagnostic accuracy of 94%. MRI& MRCP was accurate in 96-97% of cases in detecting the level and cause of obstruction. Benign lesions were the most common cause of obstructive jaundice in this group at 60%. Of the benign lesions, the highest incidence was CBD calculus (28%) followed by benign CBD stricture (10%). For post operative stricture MRI had a sensitivity of 80% and a diagnostic accuracy of 100%.

Conclusions: MRCP in conjunction with MRI is a safe, non-invasive and accurate investigation in the evaluation of obstructive jaundice. It is non-invasive, non operator dependent and more accurate in depicting the level and cause of obstruction than other modalities like USG, ERCP, PTC or CT and hence should be the investigation of choice in case of surgical jaundice

KEYWORDS

Magnetic Resonance Imaging(MRI), Magnetic Resonance Cholangiopancreatography , Benign, Malignant, Surgical jaundice.

INTRODUCTION

Several imaging modalities have been suggested for radiological evaluation of patients with suspected bile duct obstruction. Most of these use USG as the initial modality to confirm or exclude biliary obstruction, which it does with 90% accuracy^[1]. CT is similarly accurate but involves radiation and hazards of iodinated contrast media to the patient. Other interventional procedures have its own side effects.

The accuracy of MRI&MRCP in diagnosing the presence of obstruction ranges between 91-100%, whereas the level of obstruction can be correctly evaluated in 85-100% cases and cause of obstruction could be identified in approximately 96% cases^[2]

MATERIALS AND METHODS:

Hundred consecutive patients who were admitted to the Surgical Gastroenterology ward at a tertiary care hospital with clinical and biochemical evidence of obstructive jaundice were evaluated using MRI& MRCP.

The cases were first evaluated by clinicians. Liver function tests, routine blood, urine examinations, ultrasonography and in case necessary CT scan were done. The patients were then subjected to a detailed MRI& MRCP examination and then followed up with endoscopy in some selected cases. The MRI&MRCP findings along with the relevant clinical data and laboratory findings were recorded in a special proforma. Based on the MRI findings, lesions were classified initially into benign or malignant variety. The malignant lesions were further characterized and categorized.

After surgery, the post operative findings and findings at a histopathological examination were compared to the MRI&MRCP findings.

Patients in whom MRI was contraindicated or could not be done due to other reasons were excluded from the study. Images which were highly degraded were also excluded.

MRI techniques:

The scanning system used was 1.5 Tesla (Symphony, Siemens Medical Solutions System) using a phased array body coil. MRI was done in patients after an overnight fast. This not only distends the gall

bladder with bile to allow investigation of its lumen but also helps to reduce the contents of stomach and duodenum which can create artifacts. The patient was explained about the procedure before the investigation. Thereafter, T1 weighted fast low angle shot sequence was performed to localize the pancreatic and biliary tree. Subsequently MRCP was obtained using a non-breath hold T2 HASTE (Half Fourier Acquisition Single Shot Turbo spin echo) Axial sequence, followed by a breath-hold T2 HASTE THICK SLAB sequence in the coronal plane.

Lesion analysis:

All examinations were prospectively evaluated for the presence or absence of biliary obstruction. In instances of dilatation of biliary tree, an attempt was made to establish the level of obstruction as intra-hepatic, obstruction at the level of porta hepatis, supra-pancreatic, intra-pancreatic and at the level of ampulla. A definitive diagnosis of the cause of obstruction was made when the clinical and radiographic evidence overwhelmingly favoured a particular conclusion. Associated findings like hepatic metastases, ascites, lymphadenopathy, gall bladder calculi etc were also recorded.

Data Analysis

RESULTS

The data was analysed using Microsoft Excel 2010®.

Of the hundred patients which comprised the study group, majority were males (M: F – 56:44). The mean age of the patients studied was 54.82±13.33 years. The age distribution is given in table 1 and sex distribution in table 2. The youngest patient was 2 year old and the oldest was 90 yrs. The most common age group of the patients studied in the series was between 41 and 50 years (34%).

Table 1

Age	No	Percentage
0-20	10	10
21-30	6	6
31-40	20	20
41-50	34	34
51-60	20	20
61-70	5	5
71-80	4	4
>80	1	1

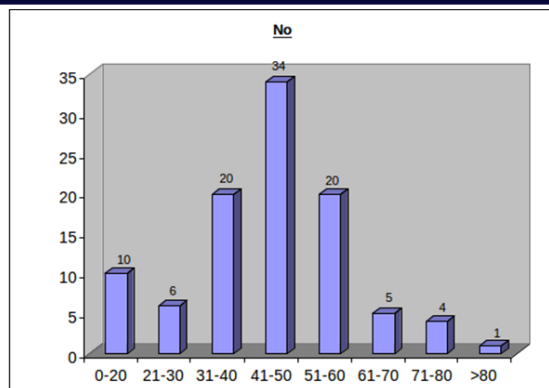
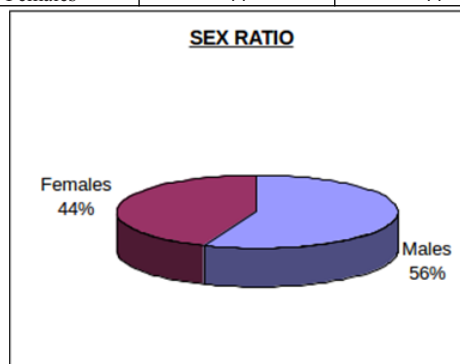


Table 2

Sex	Number	Percentage
Males	56	56
Females	44	44

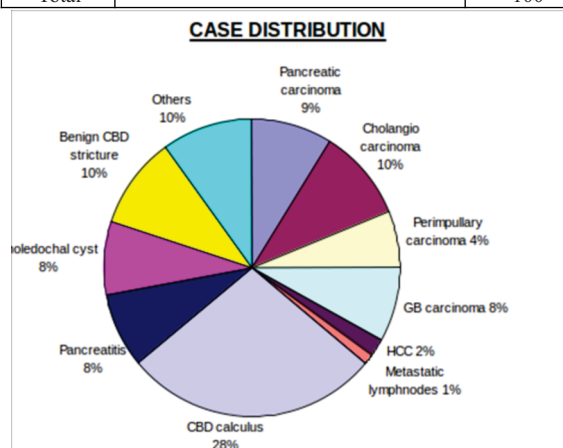


Both intra-hepatic and extra-hepatic biliary radicle dilatation was seen in 73 patients, 8 patients had only intra-hepatic biliary radicle dilatation while in 20 patients only extra-hepatic biliary radicle dilatation was seen.

Case distribution of patients is given in Table 3

Table 3

No	Aetiology	Proven
1	Pancreatic carcinoma	9
2	Cholangiocarcinoma	10
3	Periampullary carcinoma	6
4	GB carcinoma	8
5	HCC	2
6	Metastatic lymphnodes	1
7	Duodenal carcinoma	0
8	CBD calculus	28
9	Pancreatitis	8
10	Choledochal cyst	8
11	Benign CBD stricture	10
12	Others	10
Total		100



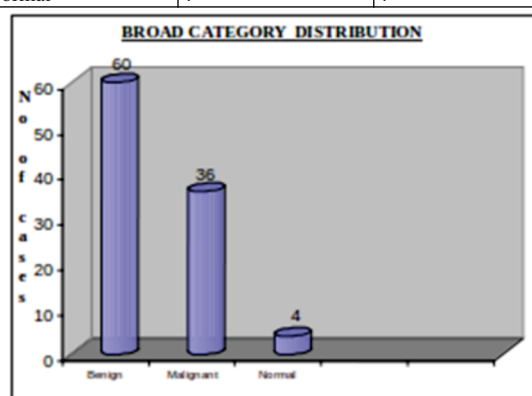
Thirty four patients underwent CT. Endoscopy and ERCP was done in 22 patients. Laparotomy was done in 92 patients included in this study while FNAC was done to achieve the histopathological diagnosis in 10 cases. Endoscopy was done in all cases of suspected periampullary carcinoma.

In our study MRI&MRCP as a modality in the diagnosis of obstructive jaundice had a sensitivity of 98% and a specificity of 100%, with a diagnostic accuracy of 94%.

In the given setup, there were 60 benign cases, where as 36 cases were diagnosed as malignant and 4 cases were normal.

Table 4 and the pie diagram depict the broad category distribution.

Broad category	No of cases	%
Benign	60	60
Malignant	36	36
Normal	4	4



Of the 60 benign cases, maximum belonged to the category of acquired biliary diseases, e.g. cholelithiasis, choledocholithiasis and Mirizzi's syndrome i.e. 10 cases followed by 8 cases of post operative complications. Congenital causes of 7 cases, whereas post infective and inflammatory causes for 5 cases.

In the diagnosis of benign conditions, our study had a sensitivity of 97% and a specificity of 100%, with a diagnostic accuracy of 97%.

Out of the 36 malignant cases, 10 cases were Cholangio carcinomas i.e. 28%, which included 2 cases of Klatskin tumor. There were 6 cases of periampullary carcinoma, 8 cases of carcinoma gall bladder, 9 cases of carcinoma head of pancreas, 2 cases of HCC and one case of metastatic lymphadenopathy accounting 17%, 22%, 25%, 6% and 3% respectively.

Two patients were referred for MRI with a clinical and sonographical suspicion of carcinoma gall bladder, however on evaluation at MRI&MRCP there were multiple small to large calculi within the gall bladder: the gall bladder was contracted and the biliary radicals were unaffected- diagnosed as chronic calculus cholecystitis, which was subsequently proved at surgery, accounting for true negative cases.

In two other patients referred with clinical suspicion of Cholangio carcinomas, post cholecystectomy stricture and chronic cholecystitis were diagnosed as there was no evidence of malignant stricture. Subsequently they turned out to be Cholangio carcinoma and carcinoma gallbladder at surgery accounting for false negative cases.

In the diagnosis of malignancy, the sensitivity was 95% and specificity was 100% with a diagnostic accuracy of 94% in our study.

18 cases were referred for post operative evaluation of jaundice which included 4 cases of post cholecystectomy retained CBD calculi, 4 cases of post cholecystectomy stricture, 4 cases of post-biliary-enteric anastomosis with anastomotic stricture, 2 cases of post-cholecystectomy biliary leak, 2 cases of post cholecystectomy cholangitis and 2 cases were reported as normal post operative status.

In the evaluation of the post-operative patient, our study had a sensitivity of 100% with a diagnostic accuracy of 89%.

DISCUSSION:

Jaundice refers to the yellowish discoloration of the skin and mucous membrane with elevated serum bilirubin level. It can be detected when the serum bilirubin exceeds 2.5 mg/dl^[1]. Jaundice can be classified into surgical jaundice because of mechanical obstruction or medical jaundice because of impaired functional hepatic excretion of bilirubin. The evaluation of patients with surgical jaundice involves stepwise performance of several imaging techniques to provide not only the level and cause of obstruction but also to find out tumor resectability in case of malignancy.

In this study, the maximum number of cases of obstructive jaundice were detected in the age group 41-50 yrs (34%) and males were more commonly effected than females (56%).

Of the 100 patients studied, MRI& MRCP accurately predicted the level of obstruction in 96% of cases. In our study the most frequent site of obstruction was at the supra-pancreatic level (65%).

Of the malignancies detected in this study, the most common lesion was cholangiocarcinoma (28%), followed by pancreatic carcinoma (25%). Both were seen predominantly in males. The majority of the cases of cholangiocarcinoma (50%) were seen in age group 51-60 yrs.

The sensitivity for detection of biliary calculi by MRCP therefore is 100% in our study which correlate well with the studies conducted by Pavone et al^[2] who achieved a sensitivity of 100%, Regan et al^[4] with a sensitivity of 93%, and Becker et al^[5] who achieved a sensitivity of 92%.

In our study, 10 cases were referred for evaluation of the post operative strictures- 4 cases for post cholecystectomy strictures and 6 cases for post biliary-enteric anastomotic strictures. 8 cases were true positive whereas 2 were diagnosed as true negative cases; thereby producing a sensitivity of 80% and a diagnostic accuracy 100% which correlates well with the studies conducted by Fulcher et al^[6] achieving a sensitivity of 98%, Pavone et al^[7] achieving a diagnostic accuracy of 100% and Lomes et al^[8] achieved a sensitivity of 100%.

In our study of malignant lesions, we achieved a sensitivity of 95%, specificity of 100% with a diagnostic accuracy of 94%, which corroborates with the studies conducted by Pavone et al^[9] with a sensitivity of 98% and Guibaud et al^[10] with a sensitivity of 86%, specificity of 98% and a diagnostic accuracy of 97%.

In our study although the number of cases referred for suspected pancreas divisum was small i.e. 4 cases, however MRCP diagnosed the presence of pancreas divisum with 100% accuracy which correlates with the study conducted by Bret et al^[11] on a large study group.

In our study for the evaluation of pancreatitis, we achieved a sensitivity of 80% in the diagnosis of pancreatitis, and approximately 100% in the diagnosis of MPD calculi which correlates with that of the study conducted by Takehara et al^[12] having a sensitivity of 92% for the diagnosis of pancreatitis and 100% for detection of filling defects.

CONCLUSION:

In this study out of 100 patients who underwent this study 96 were positive and 4 were normal. MRI& MRCP was accurate in 96-97% of cases in detecting the level and cause of obstruction. Benign lesions were the most common cause of obstructive jaundice in this group at 60%. Of the benign lesions, the highest incidence was CBD calculus (28%) followed by benign CBD stricture (10%). For post operative stricture MRI had a sensitivity of 80% and a diagnostic accuracy of 100%. MRI& MRCP is highly sensitive in detecting malignant lesions (95%). The specificity for the detection of the malignancies was 100% with a diagnostic accuracy of 94%. Of the malignant lesions, cholangiocarcinoma was the most frequent followed by carcinoma of pancreas.

Thus, MRCP in conjunction with MRI is a safe, non-invasive and accurate investigation in the evaluation of obstructive jaundice. It is non-ionising, non operator dependent and more accurate in depicting the level and cause of obstruction than other modalities like USG, ERCP, PTC or CT and hence should be the investigation of choice in case of obstructive jaundice.

Conflict of Interest: None

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