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Comparative Evaluation of the Role of Ultrasonography & Magnetic Resonance Cholangiopancreatography in Obstructive Jaundice

Vibha Verma	Department of Radiodiagnosis and Imaging, M.M. Institute of Medical Sciences and Research, Mullana (Distt -Ambala), India
Harneet Narula	Department of Radiodiagnosis and Imaging, M.M. Institute of Medical Sciences and Research, Mullana (Distt -Ambala), India
Kartar Singh	Dept of gastroenterology, M.M. Institute of Medical Sciences and Research, Mullana (Distt -Ambala), India
Amit Mittal	Department of Radiodiagnosis and Imaging, M.M. Institute of Medical Sciences and Research, Mullana (Distt -Ambala), India
Samita singal	Department of Radiodiagnosis and Imaging, M.M. Institute of Medical Sciences and Research, Mullana (Distt -Ambala), India
Rikki Singal	Department of Surgery , M.M. Institute of Medical Sciences and Research, Mullana (Distt -Ambala), India

ABSTRACT

Aims and Objective: To evaluation the role of ultrasonography (USG) & magnetic resonance cholangiopancreatography (MRCP) in obstructive jaundice patients. This study assessed the USG & MRCP as useful diagnostic tool and then correlate the findings with operative / fine needle aspiration cytology (FNAC) / histopathological / therapeutic follow up whosever performed.

Material and Methods: This is a prospective study performed on 35 patients (22 females and 13 males) with an average age of 45 years presented with obstructive jaundice for whom USG and magnetic resonance imaging (MRI) and MRCP performed in the department of radiology in Maharishi Markandeshwar University, Mullana, Ambala. The final diagnosis was found by operative / FNAC / histopathological / ERCP findings.

Results: The most common cause of obstructive jaundice in our study was choledocholithiasis (45.7%), followed by carcinoma pancreas and periampullary growth (17%), then benign strictures and mass at port (8.5% each), cholangiocarcinoma, carcinoma gall bladder and choledochal cyst (5.7% each) & finally pancreatitis (2.8%). In this study, USG correctly defined the level and cause of obstruction only in 69% of total cases with a sensitivity of 69% and specificity of 100% in pancreaticobiliary diseases. MRI-MRCP correctly defined the level and cause of obstruction in all cases (100%), with the sensitivity and specificity of 100%.

Conclusion: USG is a very useful screening modality to identify the dilated pancreaticobiliary ductal system & level and cause of obstruction. It is safe, simple, inexpensive, free from hazards of radiation exposure. However, MRCP along with conventional MR imaging is highly accurate in determining presence, level and cause of obstruction. After the ultrasonographic demonstration of a biliary tract dilatation, MRCP can be used as the first diagnostic modality to assess the diagnosis and to establish the indication for a surgical.

KEYWORDS USG; MRCP; obstruction; bilary duct; jaundice; pancreatic duct

Introduction-

Choledocholithiasis and malignant bile duct obstruction are the most common diseases that involve the biliary system, and pancreatitis and pancreatic carcinoma are the most common disorders of the pancreas.[1]Accurate methods of detecting common bile duct and pancreatic disease in patients with obstructive jaundice are important to both surgeons and endoscopists for planning an effective interventional strategy and therefore a need for less invasive, safe and highly sensitive diagnostic procedure.[2] Before the advent of radiology, clinicians had to use their bed side skills and a few laboratory tests to predict the type of jaundice. In those days exploratory laparotomy was the only way to confirm the diagnosis. Beck (1889) was the first to report a radiopaque calculus in gallbladder on pelvic X-ray abdomen.[3] The incidence of opaque biliary calculi is about 20%. Thus, a preliminary plain film was of paramount importance in cholecystography, since these calculi were later obscured by the contrast filled gallbladder.[4]

Material and methods –

This study was conducted in the Department of Radiodiagnosis in Maharishi Markandeshwar Institute of Medical Sciences and Research, Mullana. 30 patients suffering from various diseases of biliary tract and pancreas with obstructive jaundice of all age group and either sex were included in this study. All the patients with obstructive jaundice were included. The patients excluded from the study were – if metallic implants in situ, uncooperative patients, CBD stents, biliary bypass procedure done earlier.

Thorough clinical history of the patients was taken. A general physical examination of all the patients was carried out along with detailed per abdomen examination. Then USG was done in all patients on HD-6 (Philips Medical Systems) ultrasound machine. Liver, gall bladder, biliary tract, pancreas & abdomen were scanned & the findings were recorded as per proforma attached.

METHOD:

Magnetic Resonance Imaging (MRI) examination was performed on a 1.5 T Achieva (Philips Medical System) using SENSE body array coil. MRCP was performed using 2D and 3D Fast spin echo sequences. In thin slab 3D (HR) technique images were taken in axial, coronal and oblique coronal planes and in thick slab (Ssh MRCP) technique images were taken radially so as to include the entire portahepatis, intrahepatic biliary radicals and pancreatic duct. Breath hold techniques were added to eliminate breathing related artifacts. Fat saturation technique was also done to obtain a homogenous complete suppression of background signal. After obtaining the data, source images were reconstructed using maximum intensity projection (MIP) algorithm. Three dimentional display and rotation of images were used. Additional T_1w and T_2 weighted& other relevant sequences were obtained through the liver and pancreas and contrast MRI was done wherever required.

MRCP findings were recorded as per proforma attached. Patients were followed up and the final diagnosis (made on the basis of operative findings/ histopathology reports/ ERCP – wherever performed) was compared with USG &MRCP diagnosis.

USG: USG examination of abdomen was done in all cases paying particular attention to pancreaticobiliary tract to evaluate the presence, type and extent of the disease and other associated findings, if any.

MRI: All the cases were subjected to routine MRI of the upper abdomen for pancreaticobiliary disease followed by MRCP to evaluate the presence, type and extent of the disease and other associated findings, if any. Other relevant investigations like chest x-ray PA view, x-ray abdomen, barium meal follow through and postoperative T-tube cholangiogram were done wherever indicated. Diagnosis was finally confirmed by surgery and/or histopathological examination, or clinical follow-up. MRI and USG findings were compared and evaluated with operative / histopathological findings or clinical follow up.

Results-Age of the youngest patient was 7 years while that of oldest was 77 years. The mean age was 50 years. Majority of the patients were more than 30 years of age (94%). There were 13 males and 22 females with a sex ratio being 0.59 (13/22). Age range of patients in malignant group was 33-70 years with a mean of 53.8 years while in benign group, the range was 47- 65 years with a mean of 56 years. There were 4 males and 8 females in malignant group and 1 male and 1 female in benign group. Many young patients were seen in malignant group, youngest being 33 years of age, a case of confluent lymph nodal mass.

Maximum number of patients presented with duration of jaundice above 6 months (37%). Only 2 patients presented with duration less than 1 month and 7 patients with duration of jaundice from 3-6 months.13 patients did not give any history of jaundice. Serum bilirubin was raised in 33 cases with bilirubin level ranging from 1.7 to 22.2 mg%. The range in malignant group was 11.8 to 22.2 mg% with a mean of 16.2 mg%. The range in benign group was 1.7 to 20.6 mg% with a mean of 5.1 mg%. Table 9 shows the S.bilirubin distribution in 35 cases. SGOT was raised in 27 cases with values ranging from 58 to 531 IU. SGPT was raised in 25 cases with values ranging from 5 to 585 IU. Serum alkaline phosphatase was raised in 28 patients with values ranging from 16 to 1473 KAU. Serum amylase was raised in 3 patients, 2 patients were of carcinoma pancreas (360 units/l) and 1 of pancreatitis (260 units/l).

On USG, Ist order IHBR were dilated in 29 cases, 2nd order in 12 and 3rd order in 3 cases. IHBR were normal in 3 cases. Gall bladder was visualized 26 cases on USG and MRCP. 9 patients had a past history of cholecystectomy (cases no. 1, 7, 9, 10, 15, 16, 18, 23, 29). The following points were observed. Out of 7 malignant causes, 4 cases were carcinoma pancreas, 2 cases were cholangiocarcinoma and 1case was carcinoma GB. Benign group included 3 cases of choledocholithiasis and 2 cases of benign stricture .Carcinoma pancreas was the commonest cause (4 cases). Findings were same in USG and MRCP. On USG, gallstones were identified in 13 cases (cases no. 4, 5, 8, 9, 11, 13, 14, 17, 25, 26, 27, 31, 35), gallstones were associated with choledocholithiasis in 11 cases, with portal mass (case no. 35) and carcinoma GB (case no. 25), in 1 case each. MRCP detected GB calculi in 10 cases. There were 3 false negative cases (2 cases of choledocholithiasis and 1 case of carcinoma GB), in which MRCP could not detect multiple small (2-3mm) gall stones proven on surgery.

Extra hepatic bile duct: Common hepatic duct (CHD) was dilated in 18 cases. It was not visualized on USG in 2 cases one in benign stricture and 1 in choledocholithiasis. CHD caliber was normal in 5 cases. Findings were same on MRCP which included 7 cases of choledocholithiasis, 3 cases of carcinoma pancreas, 2 cases each of stricture, cholangiocarcinoma and carcinoma GB, 1 case each of choledochal cyst and portal mass. Proximal common bile duct (CBD) was dilated in 31 cases where as distal CBD was dilated in 27 cases. In 2 cases, one each of carcinoma GB and portal mass, proximal CBD was dilated whereas distal part was normal. In 1 case of benign stricture (case no 1), involving distal CBD, proximal CBD was dilated and distal part was narrowed on MRCP which was not visualized on USG. On USG, filling defect (FD) was seen in 13 cases, all due to CBD calculi. On MRCP, filling defect (FD) was seen in 16 cases, which was due to choledocholithiasis in all cases. Mean maximum diameter of dilated CBD for 27 cases was 14.37mm. The mean CBD diameter in malignant group was 17.25mm and in benign group was 13.14mm(table-1).

Table 1. Comparative evaluation of USG and MRCP findings in pancreaticobiliary tree

		IHBR						GALL BLADDER						DILATATION OF FOLLOWING								MAIN PANCREATIC DUCT DILATATION									
		1ST		2ND		3RD		DILATATION		STONE		GB WALL		CYSTIC DUCT		CHD		PRX CBD		DST CBD		HEAD		BODY		TAIL		PD SIDE BRANCHES	
		USG	MRCP	USG	MRCP	USG	MRCP	USG	MRCP	USG	MRCP	USG	MRCP	USG	MRCP	USG	MRCP	USG	MRCP	USG	MRCP	USG	MRCP	USG	MRCP	USG	MRCP	USG	MRCP	USG	MRCP
Choledocho lithiasis		12	12	3	6	-	-	3	4	10	8	3	4	9	10	7	7	16	16	16	16	2	2	2	2	-	-	-	-	-	-
Ca pancreas		6	6	3	3	2	2	4	4	1	1	-	-	4	4	3	3	6	6	6	6	5	5	5	5	2	3	-	-	2	2
Benign stricture		2	2	1	2	-	-	2	2	-	-	-	-	3	3	2	2	1	1	1	1	-	-	-	-	-	-	-	-	-	-
Cholangio carcinoma		2	2	2	2	-	2	2	2	-	-	-	-	1	1	2	2	2	2	2	2	1	1	1	1	-	-	-	-	1	1
Choledochal cyst		1	1	-	1	-	-	-	-	-	-	-	-	1	1	-	-	1	2	1	1	-	-	-	-	-	-	-	-	-	-
Pancreatitis		1	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	1	1	1	1	1	1	1	1	-	1	-	-	-	-
Ca GB		2	2	2	1	1	1	1	1	1	-	2	1	-	-	2	2	2	2	-	-	-	-	-	-	-	-	-	-	-	-
Mass at porta		3	3	1	1	-	1	-	-	1	1	-	2	-	-	1	1	1	1	-	-	2	2	2	2	2	2	-	-	-	-
Total no.		29	29	12	19	3	7	12	12	13	10	5	7	18	19	18	18	31	31	27	27	11	11	11	11	4	6	0	3		
Total %age		82	82	34	54	8.5	20	34	34	37	28	14	20	51	54	51	51	89	89	77	77	31	31	31	31	11	17	0	9		

Stricture length varied from 3.6 to 24 mm with a mean length of 12.97mm. The mean length of stricture in malignant group was 13.8mm and in benign group was 11.58mm on MRCP. Sensitivity and specificity of USG and MRCP in detecting GB and IHBR dilatation was 100%.

In cholelithiasis, sensitivity and specificity of USG and specificity of MRCP was 100%. However, the sensitivity of MRCP in diagnosing cholelithiasis was 77%. Sensitivity of MRCP and specificity of USG and MRCP in detecting GB wall thickness was 100%. However, sensitivity of USG in cases of GB wall diseases was 71%.

Sensitivity and specificity of USG and MRCP in detecting CHD, CBD and pancreatic duct (head and body) dilatation was 100%. Sensitivity of MRCP and specificity of USG and MRCP in detecting pancreatic duct (tail) dilatation was 67%. Sensitivity of MRCP and specificity of USG and MRCP in detecting pancreatic duct side branching was 100%. However, USG sensitivity in PD side branching detection was nil (0%).

Discussion-

Endoscopic retrograde cholangiopancreatography(ERCP) is the standard of reference for imaging the biliary tract and the pancreatic duct.. However, it is an invasive procedure and associated with a complication rate of 5 % of all ERCP attempts including pancreatitis, haemorrhage and GIT perforation. It exposes the patient to ionizing radiation and iodinated contrast material.[5] In the diagnosis of bile duct stones, CT and USG are effective and readily available screening techniques and may aid in the selection of patients who require MRCP or treatment with ERCP. Avoiding ERCP and the associated expense and morbidity is a goal that is becoming attainable with optimized CT, USG and MRCP techniques and an awareness of subtle findings.[6]

Barish et al[7] found the sensitivity and specificity of MRCP in the diagnosis of the diseases of PD to be 100% and 83% respectively in present study sensitivity and specificity was 100% each. Motohara et al [8] found the specificity and sensitivity of MRCP for the detection of pancreatic cancer to be 84% and 97% respectively. In present study, sensitivity and specificity was 100% each. It can be explained by evolving better techniques and greater experience with MRCP which helps to minimize the number of false negative cases.

Conclusion-

USG is a very useful screening modality to identify the dilated pancreaticobiliary ductal system & level and cause of obstruction as it is safe, simple, inexpensive, free from hazards of radiation exposure and contrast administration. Moreover, MRCP is non invasive, performed rapidly, free from hazards of radiation exposure and can demonstrate the ductal upstream of obstruction. After the ultrasonographic demonstration of a biliary tract dilatation, MRCP can be used as the first diagnostic modality to assess the diagnosis and to establish the indication for a surgical, endoscopic or percutaneous procedure.

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