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Comparative assessment to establish the accuracy of MRCP over USG & CT in diagnosing the case of obstructive jaundice

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Abstract

Aim: To compare the diagnostic accuracy of Magnetic Resonance Cholangiopancreatography (MRCP) with Ultrasound and Computed Tomography (CT) in evaluation of patients with obstructive jaundice.

Methodology: This study was conducted in the Department of Radio Diagnosis, Maharishi Markandeshwar Medical College and Hospital, Kumarhatti, Solan for the period of 6 months. 60 patients clinically diagnosed as suffering from obstructive jaundice and having total Bilirubin greater than 5mg/dl were included in this study. Patients who were pregnant and claustrophobic were not included in this study. All the patients were instructed to fast overnight prior to examination. Renal functional status, clinical history of all the patients was noted before undergoing contrast CT. All the patients in the study underwent USG examination first followed by MRCP and finally CT. Both curvilinear and linear probes were used in the study. Images of the biliary tree were recorded for later review. Helical CT was performed on a Philips Healthcare 128 slice CT scanner. MRCP was performed on Philips Healthcare 1.5 Tesla MRI Scanner. All images were obtained with breath holding and parameters were individualized.

Results: Of 60 patients, 16 (26.7%) patients were ≤45 years and 44 (73.3%) were >45 years. 32 (53.3%) cases were males and 28 (46.7%) were females. There were 37 (61.7%) patients with ≤40 days of duration of symptoms and 23 (38.3%) patients with >40 days of duration of symptoms. In causes of obstruction, choledocholothiasis was responsible for19(31.7%),stricture16(26.7%),carcinoma ofheadofpancreas11(18.3%), gallbladdercarcinoma6 (10%), periampullary carcinoma5(8.3%) and cholangiocarcinoma in 3 (5%) of the cases. Taking MRCP as gold standard, 100% (60 cases) had obstructive jaundice. Whereas 56.7% (34 cases) were diagnosed correctly using USG and 86.7% (52 cases) were diagnosed correctly using CT. The sensitivity of MRCP is 94% and CT is 92%, while it is 100% for USG. Inspite of the high sensitivity for USG, the specificity for the same is very low at 70% when compared to that of CT's 72% and MRCP's 100%.

Conclusion: The only drawback of MRCP is the cost involved and the availability. From this study, It is recommended that helical CT can be used as a screening imaging technique to identify the presence or absence of intrahepatic biliary duct dilatation; thereby shortlisting the patients for MRCP examination.

Keywords: Magnetic Resonance Cholangiopancreatography (MRCP), Ultrasonography (USG), Computed Tomography (CT), choledocholithiasis

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Introduction

Obstructive jaundice is one of the most frequent and grave form of hepatobiliary disease. It can pose problems in diagnosis and management, particularly intrahepatic cholestasis [1]. Obstructive jaundice is a common surgical problem that occurs when there is an obstruction to the passage of conjugated bilirubin from liver cells to intestine [2]. Obstruction of pancreatobiliary system is responsible for development of obstructive jaundice. It is a common clinical problem and it is important to evaluate it quickly for prompt treatment and prevent complications. According to a study 17.1% of cases of jaundice are due to obstruction commonly with involvement of pancreatic and biliary system [3].

Despite the technical advances, the operative modes of management of obstructive jaundice were associated with very high morbidity and mortality. Yet, during the last decade significant advances have been made in our understanding with regard to the pathogenesis, diagnosis, staging and the efficacy of management of obstructive jaundice [4]. The expanding spectrum of therapeutic options for the jaundiced patient has made it necessary for the radiologist to do more than simply discriminating between obstructive and non-obstructive jaundice. Correct choices among therapeutic options usually rest upon a precise assessment of etiology, location, level and extent of disease [5].

Ultrasoundhas easyaccessibility,speed,ease of performance and low cost [6]. Magnetic Resonance Cholangiopancreatography (MRCP) is an important noninvasive imaging investigation in the preoperative evaluation of patients with obstructive jaundice [7-9], a primary role in the workup and therapeutic operative planning of obstructive jaundice [10].

So, it is mandatory to determine pre-operatively the existence, the nature and site of obstruction because an ill chosen therapeutic approach can be dangerous. Ultrasound is used as an initial modality to confirm or exclude duct obstruction, which it does with at least 90% accuracy [11]. The range of application of CT has been partially restricted by MRCP [12]. MRCP techniques have greatly evolved, providing high resolution images of the biliary tree with short exam duration, while remaining non-invasive without contrast medium injection [13].

Materials and Methods

This study was conducted in the Department of Radio Diagnosis, Maharishi Markandeshwar Medical College and Hospital, Kumarhatti, Solan for the period of 6 months. 60 patients clinically diagnosed as suffering from obstructive jaundice and having total Bilirubin greater than 5mg/dl were included in this study. Patients who were pregnant and claustrophobic were not included in this study.

Methodology

All the patients were instructed to fast overnight prior to examination. Renal functional status, clinical history of all the patients was noted before undergoing contrast CT. All the patients in the study underwent USG examination first followed by MRCP and finally CT. Both curvilinear and linear probes were used in the study. Images of the biliary tree were recorded for later review. Helical CT was performed on a Philips Healthcare 128 slice CT scanner. Unenhanced CT with 7 mm collimation of the upper abdomen was performed. Contrast (100 ml, 300mg I/ml) was then injected intravenously. The scans were taken from diaphragm to iliac crest on 5mm collimation, 2mm reconstruction interval, pitch of 1.5, and FOV of 30-40 cms. The images were reformatted up to smaller intervals. MRCP was performed on Philips Healthcare 1.5 Tesla MRI Scanner. All images were obtained with breath holding and parameters were individualized. Detailed parameters of each sequence are summarized and analyzed.

Results

Of 60 patients, 16 (26.7%) patients were ≤45 yearsand44(73.3%)were>45 years. 32 (53.3%) cases were males and 28 (46.7%) were females. There were 37 (61.7%) patients with ≤40

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days of duration of symptoms and 23 (38.3%) patients with >40 days of duration of symptoms. In causes of obstruction, choledocholothiasis was responsible for19(31.7%),stricture16(26.7%),carcinoma ofheadofpancreas11(18.3%), gallbladdercarcinoma6 (10%), periampullary carcinoma5(8.3%), and cholangiocarcinoma in 3 (5%) of the cases.

Table 1: Demographic details and causes of obstruction

Variables		Number (n=60)	%
Age	≤45	16	26.7
	>45	44	73.3
Gender	Male	32	53.3
	Female	28	46.7
Duration of symptoms (in days)	≤40	37	61.7
	>40	23	38.3
Causes of obstruction	Choledocholithiasis	19	31.7
	Stricture	16	26.7
	Carcinoma of head of pancreas	11	18.3
	Gall bladder carcinoma	6	10
	Periampullary carcinoma	5	8.3
	Cholangiocarcinoma	3	5

Taking MRCP as gold standard, 100% (60 cases) had obstructive jaundice. Whereas 56.7% (34 cases) were diagnosed correctly using USG and 86.7% (52 cases) were diagnosed correctly using CT.

Table 2: Number of cases diagnosed with obstructive jaundice through different modalities

Modality	Number of cases diagnosed correctly	%
Ultrasonography	34	56.7
CT	52	86.7
MRCP	60	100
Total	60	100

MRCP has the highest accuracy for detecting benign lesions followed by CT and USG. The sensitivity of MRCP is 94% and CT is 92%, while it is 100% for USG. Inspite of the high sensitivity for USG, the specificity for the same is very low at 70% when compared to that of CT's 72% and MRCP's 100%.

Table 3: Comparison of diagnostic values of USG, CT and MRCP in cases of obstructive jaundice

Modality	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)	Accuracy (%)
USG	100	70	60	98	68
CT	92	72	78	94	80
MRCP	94	100	100	96	100

Discussion

MRCP is a relatively new MR imaging technique that has revolutionized the imaging of biliary and pancreatic ducts and has emerged as an accurate, noninvasive means of visualization of the biliary tree and pancreatic duct without radiation & injection of contrast material [14, 15]. Wallner*et al*. in 1991 introduced this technique. It relies on heavily T2-Weighted image sequences that display stationary water as high signal. Magnetic Resonance Cholangiopancreatography with its inherent high contrast resolution, rapidity, multiplanar capability and virtually artifact free display of anatomy and pathology, is proving to be imaging of choice in these patients [16, 17]. MRCP shows the entire biliary tract and pancreatic duct without any intervention and use of oral or IV contrast. The quality of images obtained is

comparable with those of direct cholangiography procedure like ERCP, which is considered as standard of reference in ductal pathologies. The diagnostic accuracy of MRCP suggests that, it has the potential to replace the more invasive procedures like diagnostic ERCP, which should be used only in cases where intervention is being contemplated [18-20].

Improved high resolution radiological equipment and improved imaging techniques performed by an experienced radiologist provide effective means for diagnosis the etiology of obstructive jaundice. Imaging modalities such as ultrasound, CT, MRI, direct cholangiography and invasive methods such as ERCP can help diagnose the cause of obstructive jaundice as well as identify the level of obstruction [21, 22]. Ultrasound has always been used as initial screening method. Many advantages of this technique are present. It is a cost effective and non-invasive modality that is available easily. Most important advantage is its lack of ionizing radiation [23, 24].

In our study, the sensitivity of MRCP is 94% and CT is 92%, while it is 100% for USG. Inspite of the high sensitivity for USG, the specificity for the same is very low at 70% when compared to that of CT's 72% and MRCP's 100%. Toduа*et al.*, [25], has mentioned that for choledocholithiasis, CT is similar to ultrasound, with a sensitivity range of 23% to 85% and specificity of 97%. Present study showed similar results. MRCP diagnostic accuracy, sensitivity and specificity are comparable to those reported in the literature (Huassein*et al.*, [26], Varghese *et al.*, [27]) where sensitivity, specificity and diagnostic accuracy respectively range between 81-100%, 84-100% and 90-96%. Study conducted by Al-Obaidi*et al.*, [28] showed higher sensitivity (100%), specificity (98.5%), and accuracy (98.7%) of MRI/MRCP for cases with benign stricture as compared to sensitivity of USG (44.4%) which is consistent with present study.

Andersson M *et al.*, [29] concluded in their study that MRI with MRCP was more accurate than CT in differentiating between malignant and benign lesions in patients with suspected periampullary tumors. This is consistent with present study where MRI/MRCP showed 100 % accuracy in diagnosing cases with periampullary carcinoma. Verma *et al.*, [30] demonstrated the sensitivity and specificity of 85.3% and 88.4% on ultrasound, 84.6% and 94.2% on CT, 92.3% and 86% on MRCP for detecting the benign etiology of obstruction. Ferrari FS *et al.*, [31] demonstrated similar findings for benign lesions in their study. The diagnostic accuracy, sensitivity and specificity of USG was 78.62%, 16.67% 97.29%, of CT it was 92.59%, 92.3%, 92.85% and of MRCP was 93.13%, 90%, 94% respectively.

Conclusion

The only drawback of MRCP is the cost involved and the availability. From this study, It is recommended that helical CT can be used as a screening imaging technique to identify the presence or absence of intrahepatic biliary duct dilatation; thereby shortlisting the patients for MRCP examination.

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