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ORIGINAL RESEARCH

Diagnostic Value of Multi Detector Computed Tomography (MDCT) In Evaluation of Clinically Diagnosed Patients of Obstructive Jaundice

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ABSTRACT

Introduction: Accurate diagnosis of the cause is crucial in the management of obstructive jaundice. Multidetector computed tomography (MDCT) play the pivotal role in the diagnosis. Study was planned to evaluate the usefulness of multiphasic MDCT in detection and characterization of the cause of obstructive jaundice and to provide information on the cause and make diagnosis that help clinician to determine the choice of treatment. **Methods:** This hospital based observational study included 50 patients who were referred to the Department of Radiodiagnosis & Imaging with clinical features of obstructive jaundice. The USG and MDCT evaluation of cases with obstructive jaundice were performed and diagnostic efficacy of USG versus MDCT was analysed. **Results:** Diagnostic accuracy of USG was compared to MDCT and we found sensitivity was 44.5%, specificity was 52.2% and accuracy was 46.9%. According to MDCT diagnosis, maximum number of patients had CBD stricture (22%). **Conclusion:** Ultrasound as a initial screening modality is useful to diagnose or exclude biliary obstruction. The MDCT could serve as better, superior initial, cost-effective, widely available, and time efficient imaging modality for diagnosing various causes of obstructive jaundice.

Key words: Obstructive jaundice, MDCT, Sensitivity, Ultrasound, Stricture.

INTRODUCTION

Obstructive jaundice occurs when there is a blockage in the bile clearance pathways, leading to the retrograde accumulation of bilirubin in the blood. This condition can result in severe complications such as hepatorenal syndrome, malabsorption, and ascending cholangitis [1]. The most common causes of obstructive jaundice include malignant biliary strictures, ampulla of Vater neoplasms, pancreatic neoplasms, and biliary tract infections, while choledocholithiasis is less prevalent. Biliary obstruction can be intrahepatic or extrahepatic and is classified as either benign or malignant based on pathology [2,3,4].Accurate and timely diagnosis is crucial to preventing complications from obstructive jaundice. Various imaging modalities play a key role in diagnosis and subsequent therapeutic interventions. Ultrasound (US) is often the first imaging technique used due to its non-invasive nature, wide availability, and cost-effectiveness. However, it has limitations in sensitivity, specificity, and its ability to assess peripheral intrahepatic ductal lesions [5,6]. MRI offers better diagnostic accuracy but has drawbacks such as high costs, limited accessibility, and contraindications for certain patients [7,8,9].

Multidetector computed tomography (MDCT), particularly when combined with multiplanar reformatting (MPR) and minimum intensity projection (MinIP) techniques, provides superior visualization of the biliary and pancreatic ducts compared to axial CT. These advancements also allow for better identification of biliary obstruction causes and early staging of biliary cancer, which are crucial for surgical planning [10,11].ERCP and PTC remain gold standards for both diagnosis and therapeutic intervention but are invasive and carry risks such as bleeding and infection [12,13]. MDCT is particularly useful in patients with abnormal liver or renal

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function or elevated bilirubin levels, offering advantages in imaging intrahepatic ducts and vascular invasion using contrast-enhanced series [14,15].Given these factors, this study aims to assess the diagnostic utility of MDCT in patients clinically diagnosed with obstructive jaundice.

METHODOLOGY

Study Design: This was a hospital-based observational study conducted over a period of 18 months, with 12 months dedicated to data collection and 6 months to data analysis, following the approval from the Institutional Research and Ethical Committee.

Study Area: The study was carried out in the Department of Radiodiagnosis & Imaging at Muzaffarnagar Medical College, Muzaffarnagar, U.P.

Ethical Clearance and Confidentiality: The study was granted ethical clearance by the Institutional Review Board. All participants were thoroughly informed about the study's methodology and objectives. Written informed consent was obtained from each participant or their representative, in their preferred language. Confidentiality of patient information was strictly maintained throughout the study.

Study Population: The study population included all patients clinically diagnosed with obstructive jaundice who attended the Outpatient Department (OPD) and Inpatient Department (IPD) of the Department of Surgery and Department of Medicine at Muzaffarnagar Medical College.

Inclusion and Exclusion Criteria: The study included patients of all ages and genders who were clinically diagnosed with obstructive jaundice and attended the OPD or IPD of the Department of Surgery and Department of Medicine at Muzaffarnagar Medical College. Patients with a history of allergy to contrast media, those with nephropathy, and pregnant patients were excluded from the study. Additionally, patients who were unwilling to participate were also excluded from the study.

Sample Size: A total of 50 subjects were included in the study.

Study Procedure: The diagnosis of obstructive jaundice was based on a combination of clinical history, laboratory investigations, and radiological findings. Clinical history was obtained from the patient or their attendant. All patients underwent a triphasic liver scan using a Siemens SOMATOM 16 MDCT machine, involving both plain and contrast-enhanced studies.

CT Scanning Method and Technique: Patients were instructed to fast for 4 to 6 hours prior to the CT scan to avoid complications during contrast material administration. Before the contrast study, patients were informed about the associated risks, and consent was obtained. The scanning process included the acquisition of supine images of the abdomen during breath-hold, with axial sections of 5 mm thickness obtained from the lung bases to the iliac crest. A non-ionic contrast medium (100-120 ml) was administered intravenously at a rate of 3-5 ml/sec. Imaging phases included early arterial (10 seconds post-contrast), late arterial (15-30 seconds), portal venous (40 seconds), hepatic venous (60-75 seconds), and delayed (2-5 minutes, best at 10 minutes) phases. Imaging was conducted during repeated episodes of suspended inspiration.

Follow-up: Final diagnoses were established based on operational outcomes, histology, fine-needle aspiration cytology (FNAC)/biopsy (FNAB), surgery, and/or clinical follow-up.

Statistical Analysis: All statistical analyses were performed using SPSS version 22 (SPSS Inc., Chicago, Illinois, USA). Comparisons between groups were made using the Student's t-test and Chi-square test, with a significance level set at $p < 0.05$.

RESULT

A total of 50 clinically diagnosed patients with obstructive jaundice were included in this study. The gender distribution revealed that the majority of the patients were female (n=34, 68%), while males constituted 32% (n=16) of the study population. Age-wise distribution showed that the highest number of patients were above 60 years of age (n=14, 28%), followed by those aged 51-60 years (n=12, 24%) and 41-50 years (n=11, 22%).

Clinically, the most common feature among the study subjects was appetite loss, reported by 82% (n=41) of patients, followed by abdominal pain in 76% (n=38), and nausea and vomiting in 46% (n=23). General physical examination findings indicated that icterus was present in 98% (n=49) of the patients, while 68% (n=34) exhibited weight loss and 24% (n=12) had abdominal distension.

Regarding the clinical diagnosis, the most frequent conditions were cholecystitis (n=16, 32%), neoplastic lesions (n=14, 28%), and cholelithiasis (n=13, 26%). Pancreatitis was identified in 8% (n=4), and obstructive jaundice without a definitive underlying cause was noted in 6% (n=3).

Ultrasound (USG) findings revealed that 84% (n=42) of the patients had intrahepatic bile duct dilatation (IHBR), and 82% (n=41) had a dilated common bile duct (CBD). Additionally, gallbladder (GB) distension was observed in 62% (n=31) of the patients. The most common USG diagnoses included CBD obstruction/stricture (n=20, 40%), choledocholithiasis (n=8, 16%), and GB carcinoma (n=7, 14%).In contrast, multidetector computed tomography (MDCT) findings showed that 80% (n=40) had IHBR dilatation, with 48% (n=24) presenting with CBD dilation. The MDCT diagnosis highlighted that the most prevalent conditions were CBD stricture (n=11, 22%), choledocholithiasis (n=10, 20%), and GB carcinoma (n=10, 20%). Other notable diagnoses included cholangiocarcinoma, liver metastasis, and

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cholelithiasis, each identified in 12% (n=6) of patients.

Table 1: Distribution of study participant as per Gender, Age Distribution, Clinical Features, General Physical Examination, and Clinical Diagnosis

Variable	Number (N)	Percentage (%)
Gender		
Male	16	32
Female	34	68
Total	**50**	**100**
Age Group (in years)		
25-30	4	8
31-40	9	18
41-50	11	22
51-60	12	24
>60	14	28
Clinical Features		
Pain Abdomen	38	76
Fever	10	20
Nausea & Vomiting	23	46
Appetite Loss	41	82
Pruritus’	10	20
General Physical Examination (GPE)		
Icterus	49	98
Weight Loss	34	68
Abdominal Distension	12	24
Clinical Diagnosis		
Cholecystitis	16	32
Neoplastic	14	28
Cholelithiasis	13	26
Pancreatitis	4	8
Obstructive Jaundice (OJ)	3	6
Total	**50**	**100**

Table 2: USG findings among the study subjects

USG Findings	N	%
IHBR Dilated	42	84
CHD		
Not visualized separately	4	8
Dilated	8	16
CBD Calculus/debris	4	8
Dilated	41	82
Compressed	1	2
Stent in Lumen	2	4
Not visualized separately	2	4
Irregular wall thickening	1	2
PD		
Dilated	12	24
GB Distended	31	62
Calculus	13	26
Wall edema	11	22
Mass in Gb fossa	8	16
Overdistended	7	14
Mass in GB fossa with ext, into liver	6	12
Focal wall thickening	3	6
Contracted	1	2
Cystic duct calculus	1	2
Post cholecystectomy	1	2

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PV		
Thrombus	2	4
Prominent	3	6
Reduced caliber	1	2
Dilated & tortuous, collaterals	1	2

Table 3: CT findings among the study subjects

CT Image findings	N=50	%
IHBRD		
Dilated	40	80
Thickened/enhancing	1	2
Pneumobilia	1	2
CHD		
Dilated	16	24
Intraluminal growth	1	2
Stent	1	2
Non visualization	7	14
CBD		
Dilated	24	48
Calculus	10	20
Narrowing/stricture	17	34
Stent	2	4
Choledochal cyst	1	2
Non visualization	2	4
Main Pancreatic duct		
Dilated	12	24
Ampulla		
Growth	4	8
Non visualization	1	2
Portal vein		
Thrombus	1	2
Prominent	3	6
Compressed	2	4
Cavernous transformation	1	2
GB		
Calculus	10	20
Growth in GB fossa	9	18
Gb fossa growth ext into liver	5	10
Distended	31	62
Overdistended	7	14
Wall edema	11	22
Cystic duct calculus	1	2
Contracted	1	2
Focal wall thickening	3	6
Post cholecystectomy	2	4

Table 4: USG Diagnosis and MDCT Diagnosis Among the Study Subjects

Variable	Number (N)	Percentage (%)
USG Diagnosis		
CBD Obstruction/Stricture	20	40
GB Carcinoma	7	14
Choledocholithiasis	8	16
Cholecystitis	7	14

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Cholelithiasis	6	12
Cholangiocarcinoma	4	8
Periampullary Carcinoma	2	4
Liver Metastasis	2	4
Carcinoma Head of the Pancreas	3	6
Cystic Duct Calculus	1	2
Pseudocyst	1	2
Choledochal Cyst	1	2
MDCT Diagnosis		
CBD Stricture	11	22
Choledocholithiasis	10	20
GB Carcinoma	10	20
Cholecystitis	7	14
Cholangiocarcinoma	6	12
Liver Metastasis	6	12
Cholelithiasis	6	12
Periampullary Carcinoma	4	8
Pseudocyst	2	4
Carcinoma Head of Pancreas	1	2
Choledochal Cyst	1	2
Cholangitis	1	2
Cystic Duct Calculus	1	2

Table 5: Diagnostic efficacy of USG versus MDCT

Variables	Value
Sensitivity	44.5%
Specificity	52.2%
Accuracy	46.9%

DISCUSSION

This study focused on the evaluation of obstructive jaundice, a condition that can result from various benign and malignant etiologies, leading to bile duct obstruction. The study revealed that a significant proportion of the participants were female (68%), aligning with previous studies, such as those by Khadka S et al. (2023) [16] and Singh SS et al. (2017) [17], which also reported a higher incidence of obstructive jaundice among women. Age distribution indicated that more than half of the subjects were over 50 years old, which is consistent with findings from Singh SS et al. (2017) [17] and Mathew RP et al. (2016) [18], who identified the fourth to sixth decades as peak periods for the onset of obstructive jaundice.

The clinical presentation of the patients was dominated by symptoms such as appetite loss (82%), abdominal pain (76%), and jaundice, with the majority of the patients showing signs of icterus (98%) and weight loss (68%) during physical examinations. These findings are comparable to those reported by Yadav N et al. (2018) [19], who found hyperbilirubinemia and loss of appetite as common features in cases of obstructive jaundice.

In terms of diagnostic imaging, ultrasound (USG) was found to be a useful initial diagnostic tool, identifying CBD obstruction or stricture in 40% of cases, choledocholithiasis in 16%, and GB carcinoma or cholecystitis in 14%. However, MDCT was shown to be more effective, identifying CBD stricture in 22% of patients and both choledocholithiasis and GB carcinoma in 20% each. These findings highlight the superior diagnostic capability of MDCT over USG, particularly in complex cases of biliary obstruction. Studies by Rishi M et al. (2015) and Mathew RP et al. (2016) [18] similarly underscored the higher accuracy of MDCT in diagnosing conditions like choledocholithiasis and cholangiocarcinoma.

The comparison between USG and MDCT in terms of diagnostic efficacy further established MDCT as the more reliable modality. With sensitivity and specificity percentages significantly higher than those of USG, MDCT proved to be a critical tool in determining the cause and site of obstruction, supporting its use as a preferred imaging technique for patients presenting with obstructive jaundice. The study's findings resonate with those of Taheri A et al. (2016) [21] and Todua et al. (2017) [22], who also advocated for the use of MDCT in complex biliary conditions due to its superior diagnostic performance.

CONCLUSION

In addition to axial pictures, volume rendering or three-dimensional reconstruction of plain and post contrast images provide a more anatomically meaningful depiction of lesions and obstruction in biliary pathway and their relation adjoining anatomical structures. In addition, the craniocaudal extent and relation to adjacent anatomic structures of the obstruction/lesion is reliably determined by

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MDCT. The pancreas, duodenum, and liver are just a few of the key nearby organs that can be seen in detail using this technique. When detecting obstructive jaundice, MDCT shows better accuracy in diagnosing cause of obstructive jaundice than ultrasonography (USG). Therefore, MDCT is the recommended imaging modality for assessing biliary blockage since it is reliable, non-invasive, cost effective and widely available. .

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