OBJECTIVE: To determine the diagnostic accuracy of multidetector computed tomography cholangiography in diagnosis of biliary tract obstruction keeping Endoscopic Retrograde Cholangiopancreatogram (ERCP) as gold standard.

STUDY DESIGN: A Cross Sectional Validation Study

PLACE AND DURATION: The study was done in the Department of Radiology, KRL Hospital Islamabad, from 1st May 2013 to 31st October 2013.

METHODOLOGY: All patients included in the study underwent contrast enhanced CT scan using Toshiba Aquilion 64 slice CT scanner. Reformatted cholangiographic images were produced using a workstation (Vitrea, version 3.9)Final multidetector computed tomography diagnosis was later on compared with ERCP done and reported by an endoscopy specialist. Both qualitative and quantitative variables were calculated.

RESULTS: In our study two age groups i.e 20-40 years and 41-60 years were included, mean age was calculated as 36.81+/− 9.72 years, with 57.27% were male and 42.73% were females. The frequency of biliary tract obstruction diagnosed on Endoscopic Retrograde Cholangio-Pancreatography (ERCP) was recorded in 60.91%. Diagnostic accuracy of MDCT cholangiography in diagnosis of biliary tract obstruction shows 55.45% true positive, 2.73% false positive, 37.27% true negative and 5.45% false negative values.

CONCLUSION: From study it can be concluded that MDCT cholangiography can be reliably used as tool in diagnosis of biliary tract obstruction in comparison with ERCP.

KEYWORDS: Biliary tract obstruction, minimum intensity projection, multidetector computed tomography (MDCT), Endoscopic retrograde cholangiopancreatography (ERCP).

INTRODUCTION

Biliary tract obstruction leading to obstructive jaundice can be secondary to a number of causes. Pancreatic head tumor is the commonest malignancy while commonest benign cause includes choledocholithiasis is 1. Gallstone disease is prevalent worldwide; in Asians the prevalence ranges from approximately 3% to 15% 2. In the UK around 8,000 people are diagnosed with adenocarcinoma of the pancreas each year 3. High morbidity and mortality is associated with obstructive jaundice, so in malignant cases timely diagnosis of the cause of obstruction is very important, as resection is only possible at that stage 4. The wide availability, portability, low cost and safety makes ultrasound the first imaging modality in gallbladder and biliary duct disease 5. However, considerable drawbacks inherent to ultrasonography are operator dependence and its limited diagnostic efficacy 6. Direct visualization of biliary tree and have therapeutic potentials made Endoscopic Retrograde Cholangio Pancreatographic (ERCP) gold standard for biliary imaging 7. ERCP is considered as a gold standard because it has sensitivity of 95% and specificity of 100% 8. Invasive nature and time consumption are negative factors for ERCP and PTC compared to CT scan 9. Minor to life threatening risks are always associated with these invasive techniques 10. For Magnetic resonance cholangiopancreatography being noninvasive technique but failure to depict the normal intrahepatic bile ducts counts as a negative point 11. Its high cost and several contraindications such as heart pacemakers devices, aneurysmal metallic clips and patient with claustrophobia limits its use. When comparing non contrast enhanced Computed Tomography scan in the detection of choledocholithiasis with Endoscopic Retrograde, the authors found that using bile window settings (i.e., adjusting the window width setting to 150 H and window level to attenuation of the common bile duct) improved the detection of the stones because of better contrast between the bile and the soft tissue. Use of multi-Detector row CT (MDCT) has taken the imaging field to advanced levels due to its short time of image acquisition; generate thin slices which permit data collection by using appropriate analysis workstation. 3D assessment of vascular structures and biliary tree can be achieved by volumetric data collection technique of MDCT, and this is completely non contrast enhancing technique. Cholangiopancreatographic images can be produced using a workstation with advanced post processing techniques such as Multiplanar Reformations (MPR). The use of MPR technique significantly improves the certain images as compare to axial CT such as anatomy of pancreatic and bile ducts and their

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confluence\textsuperscript{9}. The following numerical data 96.9\%, 96.2\% and 85.7\%, 100\% respectively has been reported to represent the sensitivity and specificity for bile duct calculi and stricture diagnosis\textsuperscript{12}.

The rationale of this study is that MDCT cholangiography with CT workstation based image postprocessing techniques is a noninvasive, quick technique and which without using an additional biliary contrast agent significantly improves the images of biliary ducts. Our study may help in recommending whether this technique can be relied upon in future.

**METHODOLOGY**

This Cross Sectional Validational Study was done to determine the diagnostic accuracy of MDCT cholangiography in diagnosis of biliary tract obstruction keeping ERCP as gold standard. The study was conducted in the Department of Radiology, KRL Hospital Islamabad, from 1\textsuperscript{st} May 2013 to 31\textsuperscript{st} October 2013. Sample size calculation done on the basis of sensitivity and specificity calculator based on sensitivity of 85.7\%\textsuperscript{8} and specificity of 96.2\%\textsuperscript{8}, sample size was 220.

Diagnostic Accuracy to be judged statistically in terms of sensitivity, specificity, true positives, positive predictive value and negative predictive value.

All patients who had any two or more of the following signs and symptoms of biliary tract obstruction e.g. yellowish discoloration of skin, itching, dark colored urine, clay colored stools, total bilirubin levels of >1.2 mg/dl, direct bilirubin level 0.5 mg/dl, alkaline phosphatase level >100 IU/L, along with the patients who have intrahepatic or extrahepatic biliary dilatation on ultrasound were included The patients who have history of contrast allergies and those without medical records were not included in the study.

Patients were included in the study according to inclusion and exclusion criteria. An informed consent was taken from all patients included in the study. Demographic data was entered in the proforma. Patients were then underwent intravenous contrast enhanced CT scan using Toshiba Aquilion 64 slice CT scanner. Reformatedcholangiographic images were produced using a workstation (Vitrea, version 3.9) with advanced post processing techniques such as multiplanar reformations (MPR). Without losing any detail of adjacent structure pancreatobiliary ducts can be visualized in different plans by using MPR images with MDCT. The images were reviewed and reported by a radiologist. Final MDCT diagnosis was later on compared with ERCP done and reported by an endoscopy specialist. All the findings were recorded in the proforma by the researcher.

SPSS version 10 was used to analyze the data. Descriptive statistics were calculated for both qualitative and quantitative variables. For quantitative variables like age, mean and standard variation was calculated.

**RESULTS**

A total of 220 cases fulfilling the inclusion/exclusion criteria were enrolled. Age distribution of the patients was done which shows that 64.55 \%(n=142) were between 20-40 years and 35.45\%(n=78) were between 41-60 years of age, mean+sd was calculated as 36.81+9.72 years. (Table No. I)

Frequency of biliary tract obstruction on ERCP i.e. gold standard was recorded in 60.91\%(n=134) while 39.09\%(n=86) had no findings of the morbidity. (Table No. II)

Diagnostic accuracy of MDCT cholangiography in diagnosis of biliary tract obstruction keeping ERCP as gold standard was recorded in Table No. IV, where 55.45\%(n=122) were true positive, 2.73\%(n=6) were false positive, 36.36\%(n=80) were true negative and 5.45\%(n=12) were false negative, sensitivity, specificity, positive predictive value, negative predictive value and diagnostic accuracy was calculated as 91.04\%, 93.02\%, 95.31\%, 86.96\% and 91.82\% respectively. (Table No.III)

**DISCUSSION**

For appropriate management of patients with suspected biliary obstruction, early diagnosis as this is crucial. Endoscopic Retrograde Cholangio-Pancreatography ERCP and percutaneous transhepatic cholangiography (PTC) unable the access for therapeutic intervention and enable direct visualization of biliary tree for which both techniques are considered gold standard in diagnosis of biliary obstruction\textsuperscript{13}. Inspite of these advantages ERCP and PTC, the fact cant be ignored that these are invasive techniques and carry associated minor to sever life threatening risks.\textsuperscript{14} Overlying bowel gas reflection is a major limitation of sonography in detecting bile duct stone, due to these reflection only 20-80\% stones can be visualized.\textsuperscript{15}
Recently, MDCT use is frequently seen in clinical practice. It allows short imaging time, which reduces the rate of movement related artifacts and thinner collimated sections can be achieved through this technique. This study was conducted with the view that MDCT cholangiography with implementation of image post processing techniques by using CT workstation. This is a noninvasive, quick technique and which without using an additional biliary contrast agent significantly improves the images of biliary ducts. Our findings with regards to diagnostic accuracy of MDCT cholangiography is in agreement with Kim HJ and co-workers. They assessed the role of MDCT cholangiography along with multiplanar reformation (MPR) technique in biliary obstruction patients. Sensitivity and specificity values for bile duct stricture diagnosis calculated in their study are 85.7% and 100%, respectively.

Another study by Tongdee T et al evaluated the accuracy of multidetector computed tomography (MDCT) cholangiography in evaluation of etiology of biliary tract obstruction. Tongdee Tet al also determine part MDCT cholangiography play for identification of calculus, benign stricture, and malignancy by recording the sensitivity, specificity, positive predictive value, and negative predictive value which were 91.7-100%.

Zandrino et al in his study make use of MIP projections for creating MDCT cholangiographic images. MIP stands for minimum intensity projection. It is reported in his study that MDCT cholangiography is quiet useful in determining level of obstruction and cause of obstruction. There study also revealed that sensitivity of stone detection reduced if bile duct is not dilated or stone is iso-attenuating.

Another study by Johnson et al, volume rendering technique was used to produced that MDCT cholangiographic in four patients with a pancreatic tumor. It was also reported by these researchers that embodiment of volume rendering technique with MDCT modify the display parameters and allow us to determine the site and cause of biliary obstruction and also give information about vascular invasion of tumor as a part of preoperative evaluation.

Multi Detector Computed Tomography scan of abdomen with and without for acute pancreatitis will not only give severity index of pancreatitis but also determine the causative factor i.e. gall stone in CBD.

Image acquisition time of MDCT is short and it has high sensitivity as well as specificity for diagnosis of biliary obstruction causes. Our study is helpful in recommending that this technique can be relied upon in future for the diagnosis of biliary tract obstruction.

CONCLUSION

From study it can be concluded that MDCT cholangiography can be reliably used as tool in diagnosis of biliary tract obstruction in comparison with ERCP.

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Dr. Muhammad Wasim Awan: Conception, Design of work, Acquisition, Research and Data analysis

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