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COMPARISON OF ULTRASONOGRAPHY AND COMPUTED TOMOGRAPHY TO EVALUATE THE CAUSES OF BILIARY OBSTRUCTION

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ABSTRACT **Objective:** to watch how an ultrasonography (USG) examination and a computed tomographic (CT) scan are used to assess the reasons of biliary blockage. **Materials And Methods:** A total of 57 individuals who were clinically suspected of having obstructive jaundice participated in this cross-sectional investigation. **Results:** The age range of 40 to 49 years old had the highest incidence of biliary blockage and the mean (±SE) age of the patients was 48.4 ± 1.6 yearsAll patients had elevated levels of serum alkaline phosphatase and serum bilirubin. USG revealed 42 true negative instances, 2 false negative cases, and 13 true positive cases with no false positives for the assessment of pancreatic mass. According to this, a CT scan revealed a true positive in 15 instances and a false positive, false negative, or true negative in 42 others. Sensitivity and specificity of USG in detecting pancreatic mass were 80 and 97.6%. CT scan showed 93.3% sensitivity and 97.6% specificity. In case of gallbladder (GB) mass USG found true positive in 20 and 1 false positive. In 36 situations, there was neither a true negative nor a false negative. Moreover, a CT scan showed improved sensitivity. The USG was unable to find any periampulla cases. **Conclusion:** Both USG and CT scans are highly accurate in identifying biliary tree dilatation; however, CT scans are somewhat more accurate than USGs. With time, the cost differential between the two should narrow, making CT an even more appealing and practical imaging option for the hepatobiliary system.

KEYWORDS : Biliary obstruction, Ultrasonography, Computed tomography.

INTRODUCTION

In patients who have a suspected bile duct obstruction, imaging plays a crucial role in not only confirming the obstruction's existence but also identifying its etiology, degree, and stage of the illness process [1]. When diagnosing biliary blockage, a combination of ultrasonography (USG), computed tomography (CT), endoscopic retrograde cholangiopancreatography (ERCP), and percutaneous transhepatic cholangiopancreatography (PTC) is typically used to get detailed information. Cholangio computed tomography (CCT) and magnetic resonance cholangiopancreatography (MRCP) have been included. USG is 95% accurate to detect dilated and nondilated bile ducts, if the serum bilirubin exceeds 170 µmol/l (10 mg/dl).[2] When an obstruction is intermittent or of short duration, false negative results are observed. Ultrasonography is a painless, safe, accessible, reasonably priced, and radiation-free diagnostic technique. However, there are several limits when it comes to diagnosing certain causes of biliary blockage. The bigger primary right and left hepatic ducts are visible in USG as tubular structures that run anteriorly and parallelly to the portal vein's right and left branches. In the nondilated system, these structures can have a diameter of up to 2 mm.[3] The diameter of the normal common duct at the porta hepatis should be less than 5 mm,[4] increasing slightly (less than 6 mm) as the duct runs caudally in the free edge of the lesser omentum and within the head of the pancreas.[5]

An additional imaging modality for assessing obstructive jaundice is CT. According to reports, the overall accuracy of CT in identifying biliary blockage ranges from 85 to 97%,[6] sensitivity 96% and specificity 91%.[7] The common bile duct (CBD) and common hepatic duct (CHD) calibers are used to diagnose extrahepatic bile duct dilatation. A CBD on CT should be regarded as normal if its diameter is less than or equal to 7 mm, ambiguous if it is between 7 and 10 mm, and dilated if it is higher than 10 mm.[7] A thorough analysis of the transition zone's appearance is necessary to determine the cause of the obstruction.

Biliary blockage is a prevalent clinical condition in Bangladesh. Two crucial diagnostic methods for assessing the biliary tree that are available in our nation are USG and CT scans. The purpose of the study was to illustrate, from the perspective of our nation, the utility of CT and USG in the assessment of biliary obstruction and its etiology.

MATERIALS AND METHODS

Statistical Analysis

Statistical analysis was done by computer software devised as the statistical package for social science (SPSS ver 16.0). The results were presented in tables and diagrams. The sensitivity, accuracy, positive predictive values and negative predictive values of ultrasonogram and CT in diagnosis of cause of biliary obstruction were calculated out. A p-value <0.05 was considered as significant.

RESULTS

Table 1: Distribution Of Patients According To Ultrasonographic, Computed Tomographic And Ultimate Diagnosis (n = 57)

Parameter	USG		CT		Ultimate diagnosis	
	N	%	N	%	N	%
No diagnosis	36	32.0	4	3.5	0	0
Periampullary carcinoma	0	0.0	20	18.0	20	18.0
Cholangiocarcinoma	0	0.0	4	3.5	4	3.5
Ca/mass in pancreas	26	23.0	30	26.0	30	26.0
GB mass	42	37.0	40	35.0	40	35.0
Choledocholithiasis	10	8.8	12	11.0	16	14.0
Benign stricture	0	0.0	2	1.8	2	1.8
Choledochal cyst	0	0.0	2	1.8	2	1.8
Total	114	100	114	100	114	100

Table 2: Distribution Of Patients According To The Ability Of USG And CT Scan To Diagnose Cause Of Biliary Obstruction (n = 57)

Parameter	USG		CT		p-value
	N	%	N	%	
No diagnosis	36	31.6	4	3.5	0.0018
Diagnosed	78	68.4	110	96.5	
Total	114	100	114	100	

In USG, 36 (32.0%) patients had No diagnosis USG, 26 (23.0%) patients had Ca/mass in pancreas USG, 42 (37.0%) patients had GB mass USG and 10 (8.8%) patients had Choledocholithiasis USG.

In CT, 4 (3.5%) patients had No diagnosis CT, 20 (18.0%) patients had Periampullary carcinoma CT, 4 (3.5%) patients had Cholangiocarcinoma CT, 30 (26.0%) patients had Ca/mass in pancreas CT, 40 (35.0%) patients had GB mass CT, 12 (11.0%) patients had Choledocholithiasis CT, 2 (1.8%) patients had Benign stricture CT and 2 (1.8%) patients had Choledochal cyst CT.

In Ultimate diagnosis, 20 (18.0%) patients had Periampullary carcinoma Ultimate diagnosis, 4 (3.5%) patients had Cholangiocarcinoma Ultimate diagnosis, 30 (26.0%) patients had

Ca/mass in pancreas Ultimate diagnosis, 40 (35.0%) patients had GB mass Ultimate diagnosis, 16 (14.0%) patients had Choledocholithiasis Ultimate diagnosis, 2 (1.8%) patients had Benign stricture Ultimate diagnosis and 2 (1.8%) patients had Choledochal cyst Ultimate diagnosis.

In USG, 36 (31.6%) patients had No diagnosis USG and 78 (68.4%) patients had Diagnosed USG.

In CT, 4 (3.5%) patients had No diagnosis USG and 110 (96.5%) patients had Diagnosed USG.

Types and Parameter Association was statistically significant (p=0.0018).

DISCUSSION

We have not yet assessed the imaging look of various causes of obstructive jaundice in USG and CT scans, nor compared the accuracy of these tests in identifying the causes of biliary obstruction.

In previous study, the mean age of presentation of biliary obstruction was 48.14 ± 12.55 years and ranged from 15 to 72 years. The majority of the patients, in line with the current study, were in their fifth decade of life.[8] The age range of 40 to 49 years old accounted for the largest number of cases, or 50 (43.9%).

Regarding the frequency of biliary obstruction by sex, there was no discernible variation in the prevalence of obstructive jaundice between the sexes.[8] Even though there were significantly more men in our survey, this could be explained by the fact that women in our nation have less access to treatment centers.

Common signs of biliary obstruction include biliary colic, jaundice, itching, abdominal lump, fever, vomiting, anorexia, and weight loss.[8]

In all cases, the participants' serum bilirubin and alkaline phosphatase levels were greater. In a previous study, the mean blood bilirubin level was 8 mg/dl and all patients had serum bilirubin levels greater than 3 mg/dl.[9] Serum alkaline phosphatase is typically greater than three times the upper limit of normal in obstructive jaundice (40-125 U/l).[10] The mean serum alkaline phosphate level in this series was more than three times higher than the reference value.

In assessing choledocholithiasis, the sensitivity, specificity, accuracy, positive predictive value (PPV), and negative predictive value (NPV) of USG were 60.7, 100, 92.9, 100 and 90.2% respectively, whereas the sensitivity, specificity, accuracy, PPV and NPV of CT scan in diagnosing choledocholithiasis were 74, 100, 93.5, 100 and 89.1% respectively. Because of intestinal gas and obesity, the USG was unable to see the whole amount of CBD, which is why some cases of CBD calculi were missed. In a research, 71% of patients with ductal stones had their cause of biliary blockage accurately identified by USG.[11]

In a different investigation, the sensitivity and accuracy of USG were found to be 18 and 19%, respectively, for the detection of choledocholithiasis, while the corresponding values for CT were 87 and 84%.[12] The capacity of sonography to image calculi in the distal CBD was restricted. Previous study[13] showed that just 22% of instances were regarded as positive, indicating a very low sensitivity of sonography in the detection of CBD stones. It's possible that a calculus needs a substantial amount of surrounding bile to contrast sonographically and be seen as distinct from the periductal soft tissue and duct wall.[13] the low sensitivity could possibly be caused by the duct's curved sides reflecting and refracting the sound beam. It's possible that the common duct is not in the higher frequency transducers' ideal focal zone, which is necessary to photograph small calculi.

In this study, sensitivity, specificity, accuracy, PPV and NPV of USG were 80.0, 95.4, 93, 90.1 and 93.2%respectively in evaluation of Ca pancreas, which were 93.3, 97.6, 96.5, 93.3 and 97.6% respectively in CT scan. In earlier study, USG was 97% sensitive with 100% PPV,[14] accuracy of USG was 75.0% and that of CT scan was 93%[15] in diagnosing pancreatic carcinoma. Their results are near similar to the present study.

In the end, more than one-third (35.1%) of the patients in the current study group had a gallbladder mass diagnosis. A gallbladder mass was found in 21 (36.6%) and 20 (35.1%) of the patients on USG. In terms of USG's validity as a diagnostic tool for assessing gallbladder mass, the current study's sensitivity was 95%. This value is near to the finding of Khalili and Wilson (2005)[16] where sensitivity of USG was 94%. Yeh (1979)[17] observed that 84.6% of gallbladder cancer cases were correctly diagnosed with USG. The accuracy in this trial was higher, at 93%. Specificity, PPV, and NPV of USG in the diagnosis of gallbladder mass were 94.6, 90.5, and 97.2%, respectively, in the current study.

In the current investigation, the sensitivity, specificity, accuracy, positive predictive value, and negative predictive value of CT as a diagnostic method for evaluating gallbladder mass were all 100%. Ghafoor (2006)[18] reported a sensitivity of 93.3%, Kumran et al. (2002)[19] Yoshimitsu et al. (2002) discovered that the accuracy of CT in the diagnosis of GB mass was 93.3%.[20] discovered that the detection of gallbladder mass has an 86% accuracy and 80% sensitivity. The dual slice sub-second scan CT scan scanners utilized in this investigation most likely boosted the detection rate of gallbladder masses.

The CT scan demonstrated 100% sensitivity, specificity, accuracy, PPV, and NPV in the diagnosis of periampullery cancer. Upadhyaya et al (2006)[8] additionally noted that, in their investigation, CT scans were used to identify every case of periampullary cancer. Lindsell (1990)[21] likewise noted in his investigation that none of the three periampullary cancer patients could be found by USG. The mass could only be noticed on USG if it were really large because it is frequently hidden by gas inside the duodenum.

In this study, a CT scan identified 93.5% of the causes of biliary blockage, compared to 65.0% with USG. ($p < 0.001$). When determining the source of obstructive jaundice, the USG had a 62.5% accuracy rate and the CT scan had a 95.5% accuracy rate. An earlier study found that the USG had a 77% accuracy rate and the CT scan an 83.50% accuracy rate for determining the source of biliary blockage. They claimed that MRCP had the best accuracy (87.5%).[8]

Prior research has demonstrated that USG and CT scan are far less accurate at identifying the underlying cause of biliary blockage. Previous study showed that accuracy of the CT scan was 70% and that of USG was only 38%.[1] However in 1981, a study[2] showed 94% accuracy of CT in detecting the cause of biliary obstruction. In 1979, a study[21] revealed that in 58% of patients, the reason of their jaundice was fully diagnosed. In another study,[22] In 23% of cases, the reason of biliary blockage was found to be accurately anticipated. A study[23] discovered that 88% of cases had a USG diagnosis of biliary blockage, and 63% had a CT scan. These results run counter to those of other research that are available.It's possible that technological advancements have increased the accuracy of CT scans.

In a study in 1993,3[24] the USG's accuracy in identifying the reason for biliary blockage was only found to be 55%. The current investigation indicated that the sensitivity and positive predictive value (PPV) of USG and CT scan, respectively, were 65.4 and 100% in identifying the source of biliary obstruction, and 93.5 and 100%, respectively, in the same study. Both exams have a 0% net present value.

Based on the current research findings and those of several other researchers, it is possible that both CT and USG are reliable diagnostic imaging modalities for identifying biliary tree dilatation. Nonetheless, a CT scan is more useful for determining the reason for biliary obstruction and assessing the degree to which neighboring structures are affected, allowing for the planning of the patient's further care.

When assessing individuals who have biliary tree obstruction, USG and CT are very helpful. In order to identify the source of biliary blockage, CT scan is more effective than USG. The CT scan is quickly becoming the method of choice for hepatobiliary imaging. One major explanation is that, whereas a USG is a focused examination, a CT scan provides a more thorough evaluation of the liver, extrahepatic abdomen, and pelvis, revealing precise information regarding the size of a lesion.

The fact that CT scanning depends far less on the operator's expertise is another benefit. While it is difficult to shorten the time needed for an ultrasound examination, the time needed for a CT examination is getting shorter due to technological advancements.

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