

## DR. ASMA AFZAL KIANI

Department of Radiology  
Combined Military Hospital  
Rawalpindi

## DR. RANA HASSAN JAVAID

Department of Surgery  
Combined Military Hospital,  
Rawalpindi,

## DR. ABDUL GHAFAR

Department of Radiology  
Military Hospital,  
Rawalpindi

## Dr. Shamrez Khan

Department of Radiology  
Combined Military Hospital  
Rawalpindi

**ABSTRACT... Objective:** To evaluate the validity of ultrasonography in patients who have obstructive jaundice. **Design:** Descriptive study. **Place and duration of study:** The study was carried out from September 2006 to May 2008 in department of Radiology Combined Military Hospital Quetta. **Patients and Methods:** A total of 30 patients; 14 male and 16 female underwent operation for obstructive jaundice. All of them had preoperative ultrasonography. The site and nature of biliary obstruction were noted and the accuracy was determined with per-operative findings / histological diagnosis as gold standard. **Results:** The cause of obstructive jaundice identified by ultrasonography with reasonable sensitivity of 90% and specificity of 90% for choledocholithiasis and sensitivity of 55.5% and specificity of 95.2% for pancreatic head tumours. **Conclusions:** Ultrasonography should be the first and best initial imaging procedure in patients who have obstructive jaundice and shows reasonable sensitivity and specificity to identify causes of obstruction in obstructive jaundice.

**Key words:** Ultrasonography, Jaundice, Choledocolithiasis.

## INTRODUCTION

Jaundice is a generic term for the yellow pigmentation of the skin, mucus membranes or sclera that is caused by heterogeneous group of disorders amendable either to surgical or medical therapy. Jaundice is one of the commonest disorders encountered in clinical practice. It is helpful to divide the causes of jaundice into cholestasis from parenchymal liver disease or mechanical obstruction from the blockade of either the intra or extra-hepatic biliary tract. The causes of jaundice are numerous and obstructive jaundice is part of a larger spectrum.

Surgical Jaundice is more common in our hospital than previously thought so, especially in the elderly. The commonest causes being carcinoma of pancreatic head and biliary stones. Carcinoma has a high mortality rate while stones have high morbidity rates.

Surgical jaundice can be distinguished from medical jaundice by a thorough history, physical examination and simple laboratory tests in most cases<sup>1</sup>.

During the last two decades tremendous advances have occurred in the imaging of the biliary tract. Prior to that

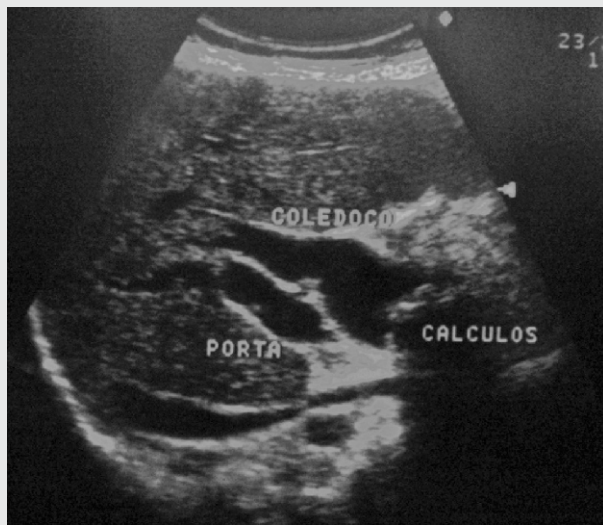
time, the diagnosis of obstructive jaundice often relied on the patient's symptoms, palpation of the right upper quadrant and the shades and hues of jaundice which the patient was exhibiting. There was little the radiologist could offer except the intravenous cholangiogram for the mildly jaundiced patient, or the "large needle" trans-hepatic cholangiogram; both of these procedures entailed significant complications. Nowadays the biliary tree can be evaluated radiologically through ultrasounds, CT, PTC, T-tube cholangiogram, ERCP, MRCP<sup>2</sup>.

Usually after laboratory investigations ultrasonography of the abdomen is considered the first choice technique in the study of biliary obstructive disease, due to its accessibility, speed, ease of performance and low cost. This has been even more so in recent years, following the technological evolution of US equipment which, thanks to Tissue Harmonic Imaging (THI), gives better visualization of fluid filled structures (such as the biliary structures), reduced artifacts and enhanced contrast resolution. Diagnostic sonography has advanced at a breath taking pace<sup>3</sup>. Ultrasound has the advantage that the biliary tree is easily assessed, but the retro-pancreatic tissue are less well visualized, and bowel gas, periodically in the presence of an ileus accompanying

acute pancreatitis can partially or completely obscure the pancreas<sup>4</sup>. Ultrasound is non-invasive, painless, does not submit the patient to radiation and can be performed on the critically ill patients<sup>5</sup>.

No study to determine the accuracy of ultrasonography in establishing site and nature of biliary obstruction has been done at Combined Military Hospital Quetta. We conducted this study to see whether it shows reasonable sensitivity and specificity to identify causes of obstruction in obstructive jaundice.

**Fig-1. Ultrasound image showing large calculus in the CBD**

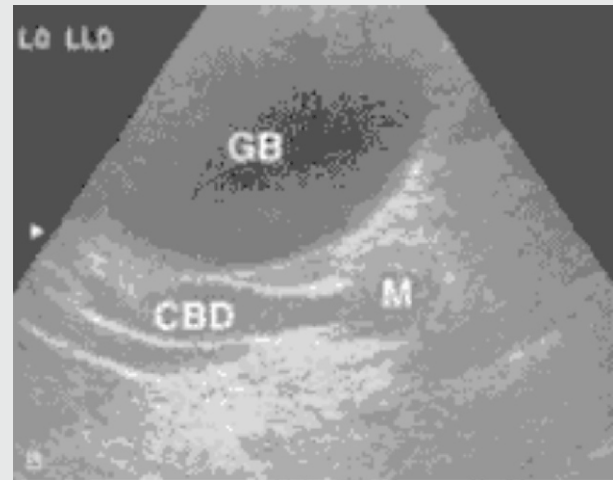


## PATIENTS AND METHODS

A descriptive prospective study was carried out in the radiology department of Combined Military Hospital Quetta from September 2006 to May 2008. The total number of patients in the study was 30. Convenience sampling technique was used. All patients above 18 years of age having obstructive jaundice were included in the study. All those patients who had a history of previous hepatobiliary surgery were not included in the study. Patients whose diagnosis had already been proven by biopsy were excluded from the study.

A detailed history and clinical examination was to be carried out on all patients who presented with jaundice to the radiology department for ultrasound. Their liver

**Fig-2. Longitudinal image reveals a distended gallbladder (GB) and common bile (CBD). The CBD can be traced to a mass (M) in the pancreatic head**



function tests were noted to aid in pre ultrasonography assessment regarding the diagnosis of obstructive or non-obstructive jaundice. Fasting for six hours was ensured before the ultrasound. A 3.5 and/or 5 MHz probe was used. The patients were scanned in the supine and left lateral position. In those patients in whom overlying gas was a hindrance, pressure was applied through the transducer to push the abdominal gas out of the way. In some patients it was necessary to have the patient drink water to displace gas out of the stomach and duodenum. In those patients in whom adequate visualization of the biliary tract proved problematic despite these manoeuvres, changing the patient's position from supine to upright also proved helpful. When the anterior epigastric approach failed to allow visualization of the distal common bile duct, a right lateral or anterolateral approach, with the patient placed in a left posterior oblique position frequently allowed the distal common bile duct to be evaluated in a semi coronal plane. In case of biliary stones, endoluminal hyperechogenic images with or without posterior shadow cone was noted. Irregular or eccentric wall thickenings or intraluminal vegetations or isoecogenic mass, associated with abrupt interruption and dilatation of the biliary tree, were considered malignant stenosis. The presence, level and cause of biliary obstruction along with the common bile duct diameter were noted.

Working with the treating surgeon in close collaboration the diagnosis was confirmed by taking per-operative findings as gold standard. A proforma including all the above information was filled out by us for every patient.

Data was analyzed on SPSS 10.

**RESULTS**

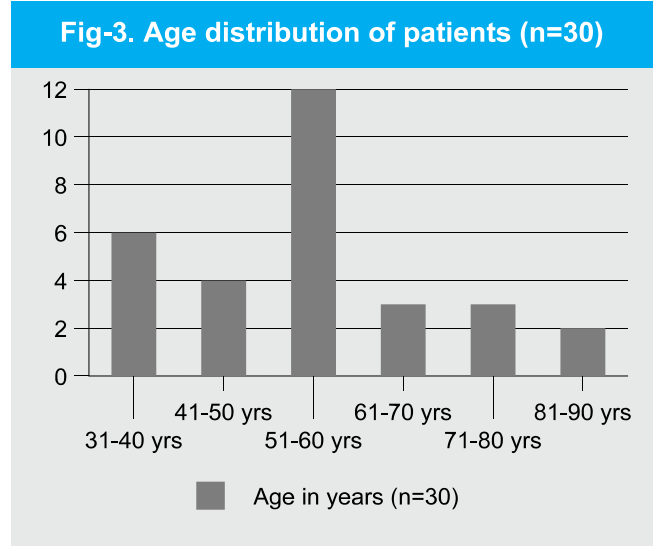
Out of the thirty patients the youngest patient was 33 years old and the oldest was 82 years old. The demographic data is given in Fig.3. The mean age was 55.6 years (SD12.86).

Majority of the patients were civilian non entitled patients (73.3%). The major presenting complaints were jaundice (100%), abdominal pain (73.3%) and weight loss (40%).

Choledocholithiasis was the commonest cause (twenty patients i.e., 66.6%) followed by various malignancies. Nine patients (30%) had carcinoma head of pancreas. The mean age of patients with choledocholithiasis was 54.3 years (SD 10.39). The mean age of patients with carcinoma head of pancreas was 63.3 years (SD 14.87). The youngest patient with choledocholithiasis was 33 years old and with malignant obstructive jaundice was 40 years old; while the oldest patient was 71 years old and 82 years old respectively. 14 (46.7%) patients were males out of which eight had Ca head of pancreas. Out of the 16(53.3%) female patients only one had Ca head of pancreas.

The ultrasonographic diagnosis were compared with the final diagnosis. On ultrasonography 19 patients table I were thought to have common bile duct stones as a cause of jaundice pre- operatively. 18 were confirmed intraoperatively as true positives. Two patients out of 11 who were free of stones by ultrasound examination were found to have choledocholithiasis at operation. This gives sensitivity of 90%, specificity of 90%, positive predictive value of 94.7% and negative predictive value Of 81.8% (Table-II).

Out of 6 patients who were thought to have pancreatic head carcinoma as a cause for obstruction on USG five of them were found to be true while one of them had no tumour. While four patients in whom carcinoma could not



Ultrasound results	Peroperatively stones found	Peroperatively stones not found	Total
Positive for stones	18	01	19
Negative for stones	02	09	11
Total	20	10	30

be demonstrated by ultrasonography were found to have pancreatic head carcinoma as a cause of jaundice. This gives a sensitivity of 55.5% and specificity of 95.2%, a positive predictive value of 83.3% and negative predictive value of 83.3%.

Sensitivity	=	90%
Specificity	=	90%
Positive predictive value	=	94.7%
Negative predictive value	=	81.8%
Accuracy	=	90%

Sensitivity	=	55.5%
Specificity	=	95.2%
Positive predictive value	=	83.3%
Negative predictive value	=	83.3%
Accuracy	=	83.3%

**Table-II. Ultrasonographic diagnosis versus intraoperative and pathological diagnosis for pancreatic head carcinoma (n = 30)**

Ultrasound results	Peroperative / histological diagnosis positive for Ca head of pancreas	Peroperative / histological diagnosis negative for Ca head of pancreas	Total
Positive for Ca head of pancreas	05	01	06
Negative for Ca head of pancreas	04	20	24
Total	09	21	30

## DISCUSSION

We found that common bile duct stones and pancreatic head tumours are the most common cause of obstructive jaundice in my hospital and this finding is comparable with results from other parts of the world. The most common aetiologies of obstructive jaundices were neoplasia and then common bile duct stone in the two genders in a study carried out by Moghimi et al at Taleghani Hospital, Shahid Beheshti University of Medical Sciences, Tehran, Iran<sup>6</sup>.

Several studies have shown high sensitivity (upto 97%) of ultrasonography to differentiating obstructive jaundice from jaundice secondary to hepatocellular pathology. The success rate in diagnosing specific cause has continued to improve with advancing high resolution equipment, scanning technique and interpretive skills. With the availability of US, CT, MRI, including MRCP, ERCP and PTC, diagnostic approach in a patient with biliary tract pathology has been completely revolutionised with accuracy of radiological diagnosis approaching 98 percent when combined with clinical data<sup>7</sup>. Even with all these high tech new imaging modalities the opinion is broadly shared that US is the first choice option in the diagnosis of choledocholithiasis. The main advantage of US as the initial investigation for obstructive jaundice over ERCP is that US is non invasive. ERCP is associated with a morbidity of 1%-

7%<sup>8,9</sup>.

Several studies have shown high sensitivity (97%) of ultrasonography to differentiating obstructive jaundice from jaundice secondary to hepatocellular pathology. The success rate in diagnosing specific cause has continued to improve with advancing high resolution equipment, scanning technique and interpretive skills<sup>10</sup>.

In literature, a sensitivity range of 20 to 80% is documented<sup>11</sup> when ultrasonography is used to detect CBD stones; these considerable differences in sensitivity among various case series are partially attributable to the impossibility of approaching the distal CBD and ampullary region in obese patients, as well as to the variability of the US technique applied.

Our results for US diagnostic accuracy, sensitivity and specificity for CBD stones are comparable with those reported, for example, in the paper by Boraschi et al<sup>12</sup>, who reported a specificity of over 90% and in a study conducted by Varghese JC et al at Beaumont Hospital in Ireland, Dublin ultrasound showed a specificity and diagnostic accuracy of 100% and 89%, respectively, in the diagnosis of choledocholithiasis<sup>13</sup>. Our overall diagnostic rate for choledocholithiasis is comparable to that of some series 97% of 150 patients (Taylor and Rosenfield), 95% of 40 patients (Isikoff and Diaconis), 86% of 35 patients (Malini and Sabel) and 88% of 26 patients (Vicary et al)<sup>14,15</sup>. Similarly a study by Upadhyaya et al where USG was able to identify the level in 83.50% and cause in 77% cases of obstructive jaundice<sup>16</sup>.

According to another prospective study which was done by Pasannel et al<sup>17</sup> the sensitivity of ultrasound in the diagnosis of choledocholithiasis was 53% and it is the most common cause of hepatic obstruction<sup>18</sup>. In other two studies the sensitivity of ultrasound was raised to 75%<sup>19,20</sup>.

The studies showing poorer results are mostly older studies when the ultrasonography machines did not have such a good resolution and it was a new technique still being learnt.

Variable results are also seen in the setting of



pancreaticobiliary malignancies, with sensitivities ranging from 5% for ampullary to 67–81% for pancreaticobiliary malignancies<sup>21,22</sup>. Similarly the sensitivity and specificity of ultrasonography in the diagnosis of pancreatic tumour by experienced hand is reported to be around 80%.

The sensitivity and specificity of Ultrasound for diagnosis of malignancy in our study is slightly lower and in some instances even comparable to other more invasive and expensive procedures. A study conducted at Department of Internal Medicine II, Technical University of Munich, Germany the sensitivity and specificity for diagnosis of malignancy in the 50 patients were as follows: 85% / 75% for ERCP/PTC, 85% / 71% for MRCP, 77% / 63% for CT, and 79% / 62% for EUS<sup>23</sup>.

Another study conducted at the Division of Gastroenterology, McMaster University Medical Centre, McMaster University Hamilton Ontario Canada also confirms that the initial assessment of a patient with suspected biliary tract obstruction should be done with a transabdominal ultrasound<sup>24</sup>.

Recently hepatobiliscintigraphy (HBSG) is also being used in cholelithiasis as a screening technique in evaluating the patency of the common bile duct, which allows cholecystectomy to be performed if there are normal values, without resorting to additional studies. Even in a study by Kudriashova et al it was recommended that invasive diagnostic techniques, such as ERCP and other direct X-ray contrasting methods, should be used after having a positive result of two techniques: ultrasonography and HBSG (in the above order).

## CONCLUSIONS

Cholelithiasis is the most common cause of obstructive jaundice at CMH Quetta. We found high sensitivity and specificity using ultrasonography to differentiate cases of obstruction in obstructive jaundice.

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Article received on: 20/10/2011

Accepted for Publication: 07/05/2012

Received after proof reading: 00/00/0000

**Correspondence Address:**

Maj. Asma Afzal Kiani  
Department of Radiology  
Combined Military Hospital,  
Rawalpindi  
aak1819@yahoo.com

**Article Citation:**

Kianai AA, Javaid RH, Ghaffar A, Khan S.  
Ultrasonography in obstructive jaundice. Professional  
Med J Aug 2012;19(4):436-441.

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