Ultrasonic Evaluation of Hepatobiliary System

M Akhtar, Arun Kumar, Surjit Singh

Ultrasonography of hepatobiliary system allows with great accuracy to separate hepatocellular and obstructive causes of liver disease and to differentiate between intra and extra hepatobiliary obstruction. In a study of 83 patients, gall stones (20.5%), liver abscess (13.3%) and liver cysts(12.3%) were the predominant lesions. 46.9% of patients had normal hepatobiliary system. Cirrhotic changes and malignancy, both primary as well as secondaries, were also seen in a small number of patients. Main clinical indications for referral for ultrasound evaluation were suspected liver abscess (33.73%), gall stone (31.34%) and malignancy (34.93%). Ultrasound is considered superior to isotopic and radiological techniques for diagnosis of pathology in hepatobiliary system. It is also of value in establishing normality in patients with equivocal isotopic liver scan. Ultrasonic characteristics of pathologies observed are briefly discussed.

Keywords: Gall stones, hepatic malignancy, hepatic cysts, hepatomegaly, liver abscess

Ultrasound has the capacity of distinguishing interfaces among soft tissue structures of different accoustic densities. Ultrasonography of hepatobiliary system has proved to be of great benefit since it allows the physician to separate with great accuracy the hepatocellular and obstructive cause of liver disease and to differentiate between intra and extra hepatobiliary obstruction. Imaging of intrahepatic structures by gray scale scan means display of fibrous structures of the organ. Space occupying lesions are seen as defects in the normal structure while diffuse abnormalities are apparent in the changed pattern of the returned echoes.

Materials and Methods

Patients admitted to Command Hospital, Air Force, Bangalore with clinical diagnosis of hepatobiliary diseases are included in this study.

Ultrasonography was carried out at Institute of Aviation Medicine, IAF Bangalore. Equipment used was the Toshiba Sonolayer V Model, Japan. The standard visceral scanner was placed over the liver and gall bladder area and series of exposures in different positions were applied to study the echo patterns. Repeated evaluations were done to confirm the diagnosis. Review after therapy or surgery was also done to assess improvement or cure. Patients were usually followed up till cure and discharge from hospital.

Observation

Eighty three cases were included in this study, 48 men and 35 women. Provisional diagnosis prior to ultrasonography was based on clinical features and investigations including haematology, biochemistry and radiology (Table I). 26 cases (31.34%) were suspected to have gall stones and 28 cases (33.73%) liver abscess. 29 cases (34.93%) with varied presentations were suspected of intra abdominal malignancy and were referred to Ultrasonography to exclude involvement of hepatobiliary system. Out of these 29, 13 had features of upper abdominal malignancy, 4 had lump epigastrium, 7 had unexplained hepatomegaly and 5 cases had complaint of progressive weight loss.

Table -I ***Clinical Indication for Ultrasonography***

Condition Suspected	Number Of Patients Male	Female	Total (%)	Age (yrs) Average	Range
Gall stones	15	11	26 (31.34)	35.5	28-48
Liver abscess	16	12	28 (33.73)	39.2	26-52
Malignancy	17	12	29 (34.93)	53.4	43-66
Total	48	35	83(100.00)	46.6	26-66

Out of the 83 cases, 44 (53%) were found to have evidence of hepatobiliary disease, whereas the rest 39 (47%)did not show involvement of liver, gall bladder or biliary tract by ultrasonography.

Predominant ultrasonographic diagnosis were gall stones in 17 out of 26 cases (65.38%) and liver abscess in 11 out of 28 cases (39.28%). Cystic disease of liver was diagnosed in 10 cases. Interestingly, none of the 83 cases reported with provisional diagnosis of cyst of liver.

Twenty out of the 26 suspected gall stone patients were evaluated by radiology including oral cholecystography. 9 cases (45%) showed positive evidence of gall stones by this investigation. When evaluated with ultrasonography, however, 17 cases(65.38%) out of the 26 showed evidence of gall stones. All these 17 cases were later subjected to surgery when the ultrasonographic diagnosis was confirmed and gall stones of varying size and number were removed (Table II).

Table - II Gall Stone : Correlative Observations

Method	No. of Patients	Gall Stone		Remarks
		Seen	Not seen	
Clinical	26	—	—	Suspected to have gall stones in all
Radiological (Oral Cholecystography)	20	9	11	6 not subjected to radiology
Ultrasonography	26	17	9	

Twenty two of the 28 suspected cases of liver abscess were evaluated by isotopic liver scan. 18 cases showed evidence of "space occupying lesion" in the liver by the isotope study. When evaluated by Ultrasonography, echogenic features of liver abscess was demonstrated in 11 cases (39.28%), cystic disease of liver in 4 cases and 'normal' liver scan in the rest of 13 cases (Table III). Three cases who had shown isotopic evidence of space occupying lesion, did not show any abnormality in the ultrasonographic study. Needle aspiration of the site of lesion in the isotope study also was unsuccessful in these cases. On the other hand one case with large liver abscess clinically and ultrasonographically had normal isotope liver scan. The ultrasonographic diagnosis in this case was confirmed by needle aspiration and antiamoebic therapy whereas purulent fluid was removed. Ten out of the 11 cases of liver abscess were treated with needle aspiration and antiamoebic therapy whereas one case was treated with antiamoebic therapy alone. Repeat ultrasonography in all these cases before discharge from hospital was normal without any evidence of residual liver abscess.

Table - III Liver Abscess : Correlative Observations

Method	No. of Patients	Liver abscess		Remarks
		Seen	Not seen	
Clinical	28	—	—	Liver abscess suspected in all
Radio isotope	22	18	4	Seen as space occupying lesions.
Ultrasonography	28	11	17	4 were cysts
Therapeutic aspiration	10	10		1 was treated with DHE alone.

Total cases evaluated for malignancy were 29 (Table IV). Out of the 13 cases with suspected upper abdominal malignancy, 3 cases were found to have evidence for secondaries in the liver, 3 had hepatic cysts and 7 cases did not show any abnormality in the hepatobiliary system. Four cases had lump epigastrium; out of them 2 had secondaries in the liver, one had cystic disease of the liver and the last one showed a normal liver echogram. Out of the 7 cases with hepatomegaly, 2 had cysts of the liver and one showed features of cirrhosis, while the rest 4 had no abnormality seen by the ultrasonographic evaluation. Out of the 5 cases who had progressive weight loss, only one case showed features of a primary tumor of liver and the rest 4 did not show any abnormality in the hepatobiliary system by ultrasonography. Sixteen cases who did not show involvement of hepatobiliary system were further investigated with relevant investigations to rule out malignancy of other intra-abdominal structures excluding the hepatobiliary system.

Table - IV Suspected Malignancies : Correlative Observations

Presenting feature	No. of Cases	Diagnosis by ultrasonography				
		Primary	Secondary	Cyst	Cirrhosis	Normal
Upper abd. malignancy	13	—	3	3	—	7
Lump epigastrium	4	—	2	1	—	1
Hepatomegaly	7	—	—	2	1	4
Unexplained weight loss	5	1	—	—	—	4
Total	29	1	5	6	1	16

Discussion

Ultrasonic scan of the hepatobiliary system including structure and abnormality of gall bladder and biliary tract,[1,2] Liver parenchymal study for detection and identification of cysts[3], abscess[4] chronic liver disease[5], hepatic mitotic lesions[6,7] and differential diagnosis of hepatomegaly[8] have been very informative both for therapeutic and prognostic purposes.

The dilated gall bladder is essentially a superficial cyst and therefore easily seen. Failure to image the gall bladder successfully in a fasting patient correlates well with the presence of underlying gall bladder disease[1]. Gall stone are well visualised even when they are not radio-opaque. An important diagnostic feature is the marked shadowing effect beyond the stone due to high attenuation of the beam by the stone. This accoustic shadow may be more obvious than the stone.

Sonographically cysts appear sonolucent with well defined borders and posterior enhancement[3]. Sonogrphic findings of liver abscess are variable[4]. Usually the collection will be a round intrahepatic lesion with scattered internal echoes due to septa and debris. Through transmission is usually good, though it depends on the amount of debris. The walls are shaggy and thick.

Ultrasonically the cirrhotic liver shows increased number and brightness of echoes, decreased number of vascular structures, and inhomegeneity due to local areas of regenerative nodules[5].

Hepatomas are usually more or less echogenic than normal liver. The borders are poorly defined. The tumor may be solitary or may occur simultaneously in several portions of the liver in three patterns[6,7,8] : i) Well defined hypoechoic mass (contains fewer echoes than the surrounding parenchyma), ii) Well defined echogenic mass (contains higher amplitude echoes than the surrounding parenchyma) and iii) Diffuse distortion of normal homogenous parenchymal pattern without focal masses (multiple echogenic and hypoechoic areas without dominant lesions.)

Ultrasonography has been found by us to be simple, cheap, repetitive non-invasive investigative procedure for evaluation of hepatobiliary system. This technique led us to arrive at positive diagnosis in 44 cases out of 83 patients with complaints and clinical signs referable to the hepatobiliary system. Thus as many as 39 cases (47%) were found to have normal liver and gall bladder, apparently suffering from gastrointestinal disorders other than hepatobiliary disease. Gall stones were detected in 17 out of 26 suspicions, confirmed subsequently by surgical removal. In contrast, only nine cases out of the possible twenty evaluations were found to show evidence of gall stone by radiological studies. Liver abscsesses and cysts were well visualised and differentiated by ultrasonography, whereas isotope liver scan studies done in these cases had suggested evidences of space occupying lesion only. All liver abscess cases were treated succesfully by combined needle aspiration and anti amoebic therapy (10 cases) and anti amoebic therapy alone in (1 case). A large number of cases from among from the group of suspected malignancies were cleared of suspicion of hepatobiliary involvement, only 6 cases out of the total of 29 showing unequivocal evidence of a hepatic mitotic lesion, and one case outlining features of cirrhosis.

REFERENCES

1. Kane RA : Ultrasonographic anatomy of the liver and biliary tree. Semin Ultrasound 1980; 1

2. Gonzalez, Land Macintyre WJ : Accoustic shadow formation by gall stones. Radiology 1980; 135 : 217-220

3. Spiegal RM, Kind DL, and Green WM : Ultrasonography of primary cysts of liver. Am J Radiol 1978; 131: 235-238

4. Sukow RJ, Gohen LJ and Sample WF : Sonography of hepatic amoebic abscesses, Am J Radiol 1980; 134: 911-915

5. Joseph AEA, Dewbury, KC, and Mc Guire PG : Ultrasound in the detection of chronic liver disease. Br J Radiol 1979; 52: 184-188

6. Broderick TW, Gosink BB, Menuck L, et al : Echographic and radionuclieс detection of hepatoma. Radiology 1980; 135: 149- 152

7. Kamin PD, Bernadino, ME and Green, B : Ultrasound manifestations of hepatocellular carcinoma. Radiology 1979; 134 : 459- 463

8. Gosink, BB and Leymaster, CE : Ultrasonic determination of hepatomegaly. J Clin Ultrasound 1981; 9: 37-40