ACCURACY of Ultrasound in the Diagnosis of Upper Abdominal Pain

Sabina Imran

Department of Radiology, Ayub Medical College, Abbottabad

Background: Upper abdominal pain is one of the commonest complaints in patients seeking medical advice, and in majority of the cases the aetiology is simple and treatable. Ultrasonography is hazard free and cost effective investigation. This study was designed to evaluate the accuracy of ultrasound in the diagnosis of upper abdominal pain. **Methods:** Ultrasonography using 3.5 MHz convex transducer was performed in patients presenting with upper abdominal pain. **Results:** Five hundred consecutive cases with upper abdominal pain underwent ultrasonic examination. Positive findings were there in 248 patients while 252 had normal studies. **Conclusion:** This study showed that ultrasound is an easy and quick investigation in the diagnosis of upper abdominal pain with slightly less than 50% accuracy.

Key Words: Ultrasonography, Upper abdominal pain, 3.5 MHz convex transducer.

INTRODUCTION

Patients presenting with upper abdominal pain comprise the largest group of people reporting to medical and surgical out-patient department/OPDs. Following the history and clinical examination, ultrasonography has become one of the first and most useful methods of investigation[1]. Upper abdominal pain whether acute or chronic, is caused by diseases of the liver, gall bladder, kidneys, pancreas, stomach, duodenum, spleen, pleura, pericardium and basal lung segments[1,2]. Rare causes include aortic aneurysm and acute myocardial infarction. All these conditions have useful sonographic features which help in their diagnosis except uncomplicated peptic ulcer disease, acute myocardial infarction and basal pneumonitis[1,2].

MATERIAL AND METHODS

The study included 500 consecutive patients who were sent to the radiology department, Ayub Teaching Hospital for ultrasonography with the complaints of upper abdominal pain. Ultrasonography, using high resolution 3.5 MHz convex transducer with depth adjustment facility, was performed in these patients. Few patients with increased gut gases or contracted gall bladder were advised to come 8 hours fasting next day. Similarly few patients were called for follow-up scans after 2-4 weeks.

RESULTS

In our study of 500 cases with upper abdominal pain, 248 patients had positive findings on ultrasound. This comes to slightly less than 50%. Bulk of the positive cases had liver, biliary tree and renal pathologies, all roughly with equal numbers.

The final outcome of negative cases justified the failure of ultrasound as 157 of them were later found to have gastrointestinal problems like gastritis, uncomplicated peptic ulcer disease, worm infestation and intestinal tuberculosis. Eighteen patients had problems above the diaphragm like basal pneumonitis and myocardial infarction. Fifteen patients had urinary tract infection. The cause of upper abdominal pain was not clear in 62 patients but they however, responded well to ordinary analgesics and smooth muscle relaxants.

Table-1 shows the ultrasound diagnosis in patients with upper abdominal pain and Table-2 shows the incidence of organ involvement in upper abdominal pain.

DISCUSSION

Abdominal pain is a common problem in all age groups and whether chronic or acute it is caused by a divers group of diseases. Differential diagnosis is sometimes difficult and often requires the use of many modalities including the history and physical examination, laboratory tests, ultrasonography, computerized tomography scan and nuclear medicine. Magnetic resonance imaging is at present of limited value in upper abdomen. Its major limitations are motion and prolonged scanning time[3].

Upper abdominal ultrasound examination takes about 20 minutes and costs thirty rupees per case (excluding the equipment investment, maintenance and staff salaries). When upper abdominal pain is acute, rapid and accurate diagnosis on an emergency basis may be crucial. Many of the internal disasters that precipitate an acute abdomen are readily detectable with ultrasound.

The role of ultrasonography in hepatitis is to evaluate parenchymal changes. Sonographic patterns have been reported to correlate with histologic changes[4]. In the acute phase the appearance range from normal to enlarged liver. While the fibrosis resulting from chronic hepatitis produce a hyperechoic texture.

Table-1: Ultrasound diagnosis in patients with upper abdominal pain.

Organ	Disease	No. of Cases
Liver	Hepatitis	15
	Abscess	12
	Cirrhosis	10
	Metastasis	8
	Hemangioma	8
	Hepatoma	4
	Hydatid cyst	3
	Simple cyst	3
	Hematoma	1
Biliary Tree	Gall Stones	26
	Ac. Cholecystitis	13
	C.B.D. Stone	8
	G.B. Growth	4
	Worms in Biliary Tree	4
	Ampullary Carcinoma	3
Kidneys	Nephrolithiasis	21
	Hydronephrosis	19
	Ac. Pyelonephritis	7
	Perinephric Abscess	5
	Renal Abscess	2
Pancreas	Ac. Pancreatitis	8
	Pseudocyst	5
	Ca head of Pancreas	5

	Pancreatic Tail Mass	3
Aortic & Para Aortic	Para Aortic Lymphadenopathy	16
	Aortic Aneurysm	2
	Retroperitoneal Sarcoma	2
Thorax	Pleural Effusion	8
	Lung Abscess	4
	Pericardial Effusion	4
GIT	Colonic Carcinoma	4
	Perforated Duodenal Ulcer	3
	Transverse Colitis (Fig.6)	2
Spleen	Simple Cyst	2
	Infarct	1
	Metastasis	1
	Abscess	1
	Hematoma	1

Ultrasound is a useful imaging modality in the diagnosis of focal hepatic lesions. The cause of a hepatic abscess is usually bacterial infection or amoebiasis. The ultrasonographic appearance of a pyogenic liver abscess varies with the stage at which it is seen. Initially it is less echogenic and has irregular margins. As necrosis progress the abscess becomes more spherical, well defined and cystic. The differential diagnosis include haematoma, necrotic tumour and metastatic cyst adenocarcinoma[5,6]. An amoebic abscess is characteristically round, subcapsular and contains fine echoes which may layer dependently[8]. The mortality rate can be 100% in untreated cases[9]. Sonographic examination can non-invasively locate, measure and characterize such masses. Ultrasound guided aspiration is carried out in large abscesses.

Table-2: Organ distribution of diseases in patients with upper abdominal pain

Organ		**No of Cases**	**%**
Liver		64	25.8
Biliary Tree		58	23.4
Renal		54	21.8
Pancreatic		21	8.5
Aortic and para-aortic		20	8.0
Thoracic	Lung = 4 Pleural = 8 Pericardial=4	16	6.5
GIT	Colon = 6 PUD = 3	9	3.6
Splenic		6	2.4
Total		248	100%

Cirrhosis is diagnosed with 99% confidence if the ratio of caudate lobe width to right lobe width on a transverse section is greater than 0.73 and if the ratio is less than 0.60, cirrhosis is less likely[10]. Sonographically,

the cirrhotic liver appears atrophic, echogenic and with irregular contour secondary to nodular regeneration[11]. Ultrasound is an excellent imaging modality for liver tumours[12]. Cavernous haemangioma is the most common benign hepatic tumour. The classic sonographic appearance is a homogeneous hyperechoic mass with well defined margins in sub-capsular position or closely related to the hepatic veins[13] (Fig-1).

Fig-1: Haemangioma liver

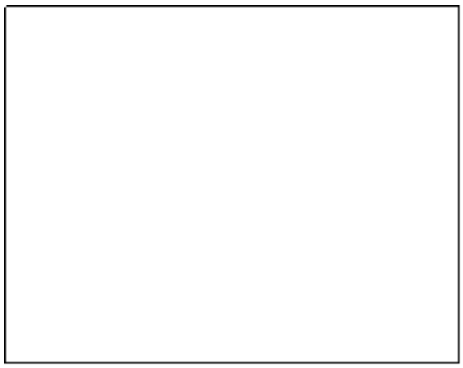
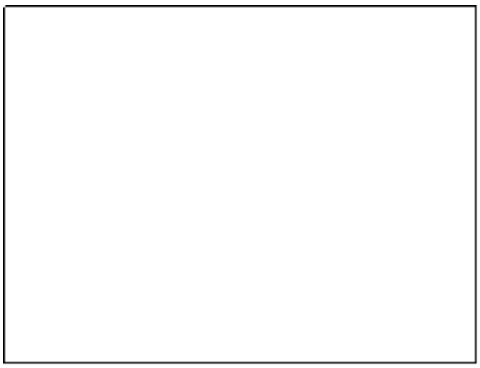


Fig.2: Portal vein thrombosis



In obese or gaseous patients, where ultrasonography cannot resolve the pathology, computerized tomography is the preferred imaging modality. The major disadvantage of C.T. is the higher cost of examination, the exposure to ionizing radiation and the possibility of contrast reaction.

Ultrasonography plays a key role in the diagnosis of gall bladder and biliary diseases. In acute cholecystitis the gall bladder is distended, thick walled and tender, may show calculi and pericholecystic fluid collection[14]. While in chronic cholecystitis the gall bladder is small, contracted with stones and has thick fibrous echogenic wall.

Ultrasonography is an important tool for diagnosing obstructive jaundice and locating the level and cause of obstruction (Fig-3,4).

Fig-3: Choledocholithiasis

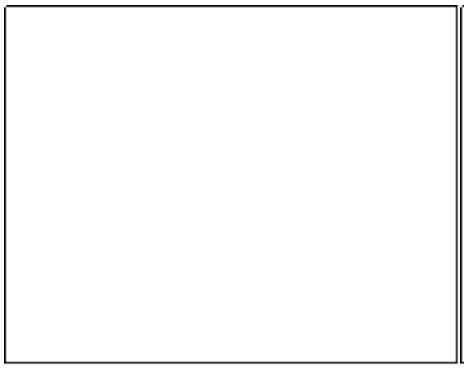
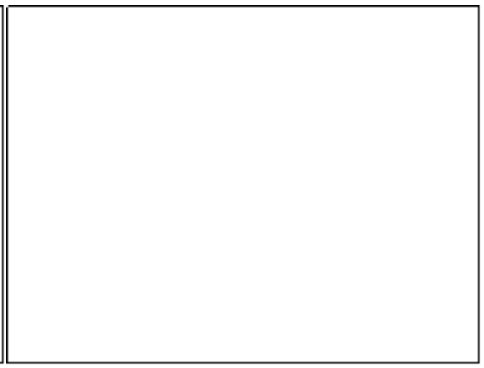


Fig-4: Worm/Ascaris infestation of the biliary tree



The sonographic criteria for intrahepatic cholestasis is double barrelled shot gun sign representing the dilated duct accompanying the portal vein and for extra hepatic duct internal diameter greater than 6 mm and common bile duct diameter greater than 8 mm[15].

Ultrasonography is extremely sensitive to the presence of hydronephrotic changes[16] (Fig-5). The sonographic hallmark of hydronephrosis is splaying, spreading or ballooning of the pelvicalyceal system[17]. Within the resolving capabilities of the equipment and regardless of their chemical composition, ultrasonography images

calculi as echogenic structures. These highly reflective calculi situated within the highly reflective central sinus echoes are difficult to discern unless they are large and cast acoustic shadow or associated with hydronephrosis.

Fig-5: Pyonephrosis right kidney

Fig-6: Transverse colitis

Sonographically, an inflamed pancreas appears enlarged and hypoechoic, although in some cases it may appear normal[18]. The pancreatic duct may be dilated beyond the normal 2 mm A.P. diameter. Pseudocyst is a common complication of pancreatitis. Ultrasound is used to diagnose and follow pseudocyst maturation as well as when necessary to guide drainage. Solid pancreatic tumours usually appear hypoechoic areas within the parenchyma of the organ. 70% occur in the head and cause obstructive jaundice (Fig-6).

Computerized tomography is the imaging method of choice for evaluating the retroperitioneum. Sonography is indicated as a follow-up modality in cases where retroperitoneal disease has been diagnosed. However, it may be the modatlity of choice in children, very ill patients who cannot be transported for C.T. and thin patients. Moreover condition like para-aortic lymphadenopathy (Fig-7), aortic aneurysm (Fig-8) and large solid tumours can be easily diagnosed with ultrasound.

Fig-7: Para-aortic lymphadenopathy

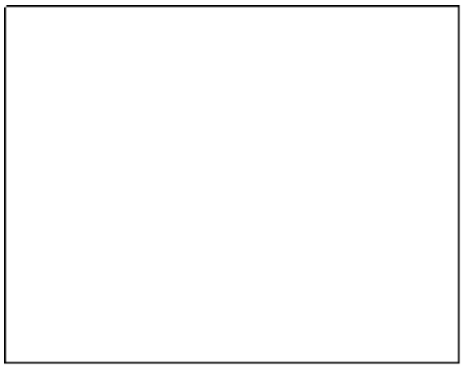
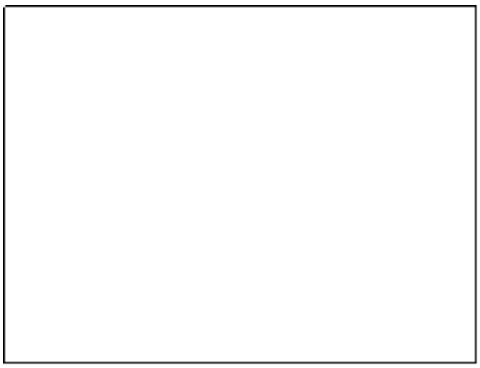


Fig-8: Abdominal aortic aneurysm with thrombus



A few chest conditions which can present as upper abdominal pain and are diagnosed with ultrasound include basal pneumonia, pleural and pericardial effusion. Similarly splenic pathologies are also diagnosed with ultrasound.

CONCLUSION

The accuracy of ultrasound examination in upper abdominal pain is slightly less than 50% because of its limitations in the diagnosis of gastrointestinal problems, mild urinary tract infections and few pathologies above the diaphragm. Despite of this fact, following the history and clinical examination ultrasound has become one of the investigations of choice in patients with upper abdominal pain. The only reason is that ultrasound imaging is a

cost effective, quick, painless and non-invasive investigation with no radiation hazards or parentral contrast reaction.

REFERENCES

1. Jeffrey B, Ralls P. Sonography of the abdomen . New York: Raven, 1995.

2. Roger CS, Nacy SM. Clinical sonography. New York: Lippincott, 1998.

3. Janes JO, Nelson JA. Jaundice. In Eisenberg RL (ed): Diagnostic imaging: An algorithmic approach, Philadelphia, JB Lippincott, 1988.

4. Kurtz AB, Rubin CS, Cooper HS. Ultrasound findings in hepatitis. Radiology 1980, 136: 717-723.

5. Gosink B. Intrahepatic gas: Differential diagnosis. Am. J Radiology 1981, 137: 763-767.

6. Kuligowska E, Noble J: Sonography of hepatic abscesses. Semin Ultrasound, 1983, 4: 102-116.

7. Ralls PW, Barnes PF, Radin DR. Sonographic appearances of amoebic and pyogenic liver abscesses. A blind comparison Am. J. Radiology 1987, 149: 499.

8. Mittlestaedt CA. Abdominal ultrasound. New York, Churchill Livingstone; 1987.

9. Robins SL, Cotran RS. Pathologic basis of disease, 2nd ed. Philadelphia WB Saunders, 1979.

10. Hess CF, Schmiedl U, Koelbel G. Diagnosis of liver cirrhosis with US: Receiver-operating characteristic analysis of multidimensional caudate lobe indexes. Radiology 1989, 171: 349-351.

11. Bissett RAL, Khan AN: Differential diagnosis in abdominal ultrasound. London, Bailliere – Tindal, 1990.

12. Nisenbaum HL, Rowling SE. Ultrasound of focal hepatic lesions. Semin Roentgenol, 1995; 30: 324-346.

13. Bree RL, Schuab RE, Neiman HL: Solitary echogenic spot in the liver: is it diagnostic of a hemangioma? Am. J. Radiology; 1983, 140: 41-45.

14. Bree RL. Further observations on the usefulness of the sonographic Murphy sign in the evaluation of suspected acute cholecystitis. J Clin Ultrasound, 1995; 23: 169-172.

15. Gilbert F, Calder JF, Bayliss AP: Biliary tract dilatation without jaundice demonstrated by ultrasound. Clin Radiol; 1985, 36: 199-203.

16. Ferris EJ, Seibert JJ. Urinary tract and adrenal glands: Imaging and diagnosis. New York, Grune and Stratton, 1980.

17. Ralls PW, Halls J. Hydronephrosis, renal cystic disease and renal parenchymal disease. Semin Ultrasound 1981, 2: 49-60.

18. Hill MC: Pancreatic sonography: An update in Sanders RC (ed). Ultrasound Annual 1982. New York, Raven Press, 1982.

Address for Correspondence:

Dr. Sabina Imran, Assistant Professor, Department of Radiology, Ayub Medical College, Abbottabad-22040, Pakistan.

Email: sabina@ayubmed.edu.pk