

Role of Ultrasonography in Evaluation of Focal Hepatic Lesions

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Abstract

Introduction: Liver is the site of maximum no. of biochemical reactions of the body. Focal liver lesions are common on pathologic or imaging evaluation of the liver. Ultrasonography is economic, widely available, noninvasive, and nonionizing investigation that allows imaging of liver in multiple planes with high sensitivity and specificity for correct diagnosis and characterization of focal liver lesions.

Aims and Objectives: The aim of the study was to evaluate the role of ultrasonography in different types of focal hepatic lesions and characterization of the lesions.

Materials and Methods: This was hospital-based prospective study done on May 2019 to April 2020 at the Department of Radiodiagnosis of Nil Ratan Sircar Medical College and Hospital, Kolkata. Patients referred for ultrasonography with clinically suspected of having focal hepatic lesions with complaints and incidentally found focal hepatic lesions on patient's ultrasonography done for other reasons from both inpatient and outpatient departments.

Results: Hence, most common lesion was liver abscess and least common lesion was hemangioma in my study. I found single lesion in 32 cases (64%) and multiple lesions in 18 cases (36%).

Conclusion: With ultrasonography as an initial imaging modality, time and cost to arrive at an diagnosis were significantly reduced.

Key words: Echogenicity, Focal hepatic lesion, Ultrasonography

INTRODUCTION

Liver is the largest and one of the most important organs of the body, often called as chemical laboratory of the body as it is the site of maximum no. of biochemical reactions of the body required for tissue respiration, metabolism, detoxification, storage, etc. Focal liver lesions are common on pathologic or imaging evaluation of the liver and include a variety of malignant and benign neoplasms, as well as congenital and acquired masses of inflammatory and traumatic nature. Evaluation of focal liver lesions is a complex tissue which is often the major focus of a

cross sectional imaging study.^[1] Next only to lymph nodes, liver is the most common site for metastases. At death, 40–50% of all primary carcinomas will have metastases within the liver.^[2] Ultrasonography is economic, widely available, noninvasive, no ionizing investigation that allows imaging of liver in multiple planes with high sensitivity and specificity for correct diagnosis and characterization of focal liver lesions. According to ALARA protocol (as low as reasonably achievable) in the low- and middle-economic background like West Bengal, it is needed to re-emphasize the role of the cheap and harmless investigation ultrasonography as the primary diagnostic tool for the various focal hepatic lesions. Sonography is widely accessible, relatively inexpensive, portable, noninvasive, nonionizing, allows imaging in multiple planes, and can be repeated frequently. It assists in real-time evaluation of organ under examination, especially the liver which is situated just below the ribcage without intervening gas, has a high sensitivity and reasonable specificity.^[3] Sonography has excellent spatial and contrast resolution, hence gray-

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scale morphology of a mass allows for differentiation of cystic and solid masses and in many instances, characteristic recognized appearances may suggest the correct diagnosis without further evaluation.^[1] Characterization of a liver mass on conventional sonography is based on the appearance of the mass on gray scale imaging.^[1] Sonography is widely available and inexpensive. Based on the patient's complaints such as vague upper abdominal pain, jaundice, fever, or unexpected abnormal liver function tests many clinicians request sonography as the initial imaging modality for clinically suspected liver pathology.^[4,5]

The presence of diffuse liver disease such as cirrhosis or steatosis may largely vary the gray-scale sonographic appearance of the hepatic tumors because the echogenicity of the background liver may be altered and make the characterization of the tumors difficult.^[6]

Aims and Objectives

General objective

The general objective of the study is as follows:

- To evaluate role of ultrasonography in different types of focal hepatic lesions and characterization of the lesions.

Specific objective

The specific objective of the study is as follows:

- To study ultrasonography as a prime diagnostic modality for patients with clinical features of focal liver diseases
- To evaluate the ultrasound imaging spectrum of focal hepatic lesions
- To study the relative prevalence of different focal hepatic lesions detected by ultrasound during the study period
- To make early diagnosis so that treatment can be started as early as possible.

MATERIALS AND METHODS

Study Design/Experimental Design

This was a hospital-based prospective study.

Study Period

The study period was from May 2019 to April 2020.

Place of study

This study was conducted at Nil Ratan Sircar Medical College and Hospital, Kolkata.

- Department of radiodiagnosis
- Department of pathology

Study population

Patients referred for ultrasonography at department of Radiodiagnosis Nil Ratan Sircar Medical College, Kolkata,

with clinically suspected of having focal hepatic lesions with complaints and incidentally found focal hepatic lesions on patient's ultrasonography done for other reasons from both inpatient and outpatient departments during May 2019–April 2020

Inclusion Criteria

- Patients with complaints such as vague upper abdominal pain, jaundice, fever, abdominal mass, or unexpected abnormal liver function tests with suspicion of focal liver disease
- Only adult patients (more than 18 years of age) will be included
- Focal liver lesions of diameter more than 10 mm.

Exclusion Criteria

Patients with diffuse liver disease such as steatosis, cirrhosis, hepatitis, storage diseases, diffuse malignancies, and also post-traumatic and post-operative cases.

Sample size

The sample size was 50 patients.

Sample design

The sample design was randomized.

1. Clinical history
 - Patient demographics
 - Main presenting complaint
2. General examination
3. Systemic examination: Local abdominal examination and palpation of liver.
4. Investigations:
 - Blood – Hb%, total count, differential count, erythrocyte sedimentation rate, Fasting blood sugar. Liver function test
 - Ultrasonography: Discussed in details below
 - Pathological investigation:
 - o FNAC from the lesion
 - o Biopsy (if needed).
 - Other relevant investigation(s):
 - o Computed tomography (CT) scan of Abdomen (non-contrast and contrast)
5. Study tools
 - Ultrasonography machine: Philips HD7 and Samsung SonoAce R7 machine with 3.5–5 MHz curvilinear probe and 3–12 MHz linear probe and sector probe whenever needed
 - A pro forma designed for recording age of presentation, sex, clinical, radiological, and other investigations findings.
6. Radiological procedure
 - Consent forms duly signed
 - Grey scale real-time ultrasonography to be performed using 3.5–5 MHz curvilinear probe and

3–12 MHz linear probe and sector probe whenever needed

Patient preparation and scanning technique

- Once the patient agrees to participate in the study, informed consent was taken before ultrasound examination, followed by detailed history and brief clinical examination
- Patients were kept nil by mouth ideally for 6 h so that bowel gas is limited before ultrasound examination
- Patients were examined in the supine position to begin with and then in decubitus (right or left) and sitting position if needed
- Suspended inspiration enables examination of the dome of the liver, frequently an ultrasound blind spot
- Liver was scanned in various planes such as sagittal, parasagittal, transverse, oblique, subcostal, intercostal, and coronal planes. Comprehensive scanning of other upper abdominal organs was done
- In some cases clinical condition of patient demanded an ultrasound examination without prior preparation
- The real time scan has many advantages and is easier to perform and it can be easily maneuvered and most of the liver can be evaluated. It provides easy visualization of vascular landmarks. The liver is best examined with real-time sonography, The normal liver is homogeneous, contains fine-level echoes, and is either minimally hyperechoic or isoechoic compared to the normal renal cortex. The liver is hypoechoic compared to the spleen. The portal vein is encased in collagenous sheaths running in common with the hepatic artery and bile duct and their margins tend to be echodense. The apex of the angle of the portal vein has a horizontal orientation. The caliber increases toward the porta hepatis. Hepatic veins can be traced to inferior vena cava and since the collagen content in their walls is less the walls are imperceptible. The apex of the hepatic vein bifurcation is longitudinal toward inferior vena cava and their caliber increases as they course toward the inferior vena cava
- The liver is examined using 3–3.5 MHz. In children and superficial lesions 5 MHz transducers is necessary.

RESULTS

We found that the most common presenting age group in the study was 51–60 year (24%). Among all cases 58% were males and 42% were females. Most common complain of patients were abdominal pain and least common complain were itching (urticaria) [Table 1]. The lesions were distributed as liver abscess (34%), primary malignant liver tumors (10%), metastases (20%), hemangioma (8%), simple hepatic cysts (16%), and hydatid lesion (12%)

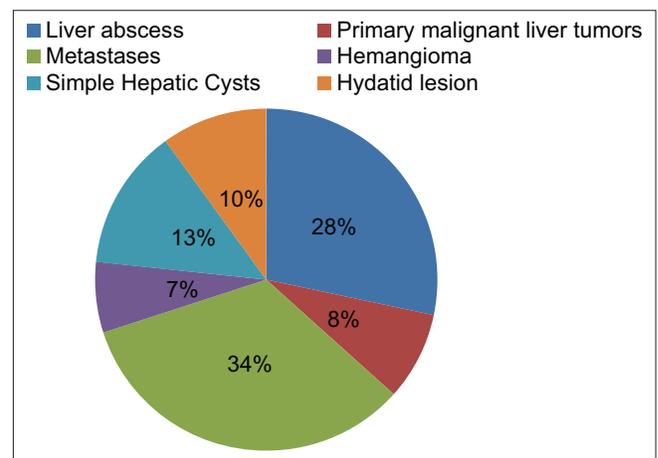
[Graph 1]. Hence, most common lesion was liver abscess and least common lesion was hemangioma in my study. I found single lesion in 32 cases (64%) and multiple lesions in 18 cases (36%). Our study showed that most of the lesions were distributed in right lobe (64%). Rest 3% in left lobe and 15% cases involved both lobes. Most of the lesions had round and regular margin (76%) and few had irregular margin (24%). Considering echogenicity of the lesions they are mostly mixed echogenic (36%), hypoechoic (28%), hyperechoic (10%), and anechoic (26%). Hepatomegaly was present in 52% cases and absent in 48% cases. We found complications (Necrosis, Calcification) in 48% cases [Table 2].

DISCUSSION

- In our study 50 patients, who were clinically suspected of having focal hepatic lesions and incidentally detected focal hepatic lesions were included in the study. The age group of the subjects ranged from 18 years to 75 years. Study group contained 58% males and 42% females with the male to female ratio being 1.4:1. Most lesions were found in the age group of 51–60 with 12 patients, followed by 41–50 years age group compromising ten patients

Table 1: Distribution of symptoms in focal liver lesions

Clinical features	Number of cases	% Total (Out of 50 cases)
Abdominal pain	30	60
Loss of weight	12	24
Loss of appetite	12	24
Abdominal distension	8	16
Fever	24	48
Mass Per abdomen	5	10
Jaundice	11	22
Urticaria	2	4



Graph 1: Ultrasound diagnosis

Table 2: Sonographic features of the focal liver lesions

Sonographic	Hepatic	PMLT	Metastasis	Hemangioma	Simple hepatic	Hydatid
Features	Abscess				Cyst	Lesion
Hepatomegaly	13	4	7	0	1	1
Number - Single	13	4	0	4	6	5
Number - Multiple	4	1	10	0	2	1
Lobar involvement :	13	4	0	4	7	4
Right lobe						
Lobar involvement: Left lobe	2	0	0	0	0	1
Lobar involvement: Both lobes	2	1	10	0	1	1
Shape round and borders regular	15	0	5	4	8	6
Irregular shape borders	2	5	5	0	0	0
Lesion hyperechoic -	0	1	0	4	0	0
Lesion-hypoechoic	13	0	2	0	0	0
Lesion - Mixed	4	4	8	0	0	1
Lesion - Anechoic	0	0	0	0	8	5
Necrosis	16	3	4	0	0	1
Calcification	0	2	0	0	0	1

7. Hepatic abscess was the most common focal hepatic lesion in the study with an incidence of 34% (17 patients) which is in close correlation to the study of Hapani *et al.*^[7] and study of Vishwanath.^[8] It was most commonly seen in the age group of 21–30 years. Majority of the patients presented with non-specific abdominal pain and fever. Ultrasonography is unable to differentiate pyogenic from amebic abscess.

- Hepatic metastases compromised the second most common focal hepatic liver lesion in the study group with an incidence of 20% (ten patients). It was most commonly seen in the age group of 51–60 years. Females constituted majority (60%) and males the remainder. Most (80%) of them presented with loss of weight and loss of appetite. Constitutional symptoms such as abdominal pain, abdominal distension, mass per abdomen, and jaundice were noted in rest of the patients. On examination majority, seven patients (70%) had hepatomegaly. About 50% of the lesions were round and irregular margins. All lesions involved both lobes. Mixed echogenic pattern was noted in eight patients (80%). All the patients had multiple lesions (100%) [Figure 1]. The sonographic features were in close correlation with study conducted by Yoshida *et al.*^[9]
- There were 8 (16%) cases of simple primary liver cysts in the age group of 51–60 years. Cases were distributed more in males with male female ratio 1.3:1. Right lobe preference was noted in 7 (83.3%) and 1 (16.7%) in the left lobe. The most common complaint was non-specific abdominal pain seen in two cases. Sonographically the lesions were anechoic with absence of internal structure, sharp smooth borders, and strong posterior sonic transmission, which was consistent with Spiegel *et al.*^[10] study [Figure 2]
- Five cases (10%) cases of primary malignant liver tumor with age range of 41–50 years. Majority of the



Figure 1: Ultrasonography: Multiple echogenic metastatic deposits in both lobes of liver

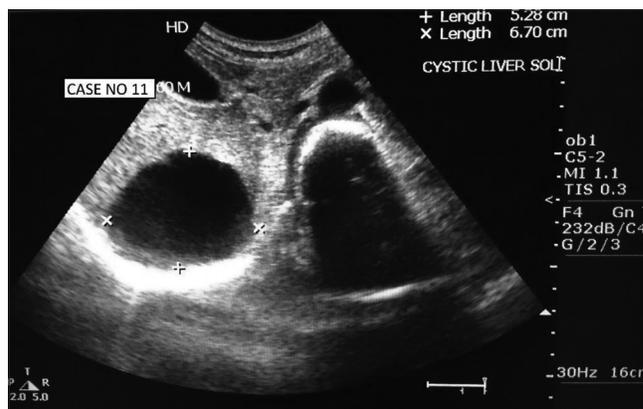


Figure 2: Ultrasonography: Simple hepatic cyst in the right lobe

patients were males 3 (60%) and 2 (40%) females. It was more common in the right lobe 4 (80%) and 1 (20%) in both lobes with most of them being solitary

4 (80%) and 1 with multiple lesions. Majority 4 (80%) of them presented with pain abdomen, loss of weight and appetite, followed by abdominal distension in two and jaundice in three patients. Sonographically they were mixed echogenic with irregular border [Figure 3]. The findings were in close correlation with the previous studies.^[11]

- Six cases (12%) of hydatid cystic lesion were noted in the study, in the age group of 18–30 years of age. Females were the predominant group comprising 5 (82%) and 1 (18%) male patient. Right lobe was affected in four patients, left in one patient and both lobes affected in one patient. Majority of patients presented with pain abdomen, fever, and mass per abdomen. Five patients had solitary lesion and one patient had multiple lesions. On ultrasound they were complex cystic lesion with well-defined walls with multiple septa daughter cysts and internal echogenic matrix [Figure 4].

Four cases were diagnosed as hemangioma of liver occurring in mid age to old age, male, and females had equal sharing of two cases each. They were single lesion occurring in right lobe having round and regular border



Figure 3: Ultrasonography: Mixed echogenic lesion with irregular border in the right lobe of liver : Primary malignant liver tumor

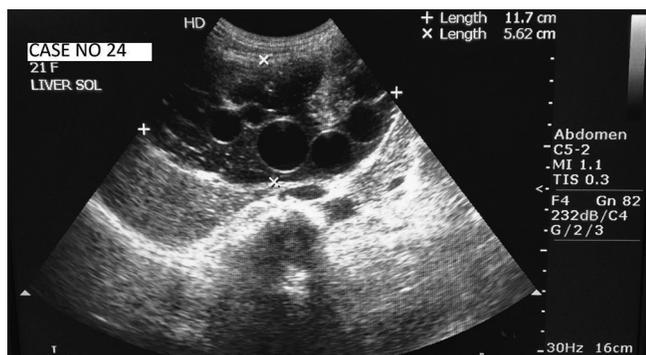


Figure 4: Ultrasonography: Hepatic hydatid lesion with daughter cyst

and hyperechoic echotexture. All patients complained of vague pain abdomen.

SUMMARY AND CONCLUSION

A total of 50 patients, clinically suspected of having focal space occupying lesions in the liver who underwent sonography were chosen for the study during a period of 18 month.

- The mean age of the patients in the sample study was 55 years with an age range of 18–75 years
- Majority of the patients were males
- The most common complaints were abdominal pain and fever
- The most common lesions were hepatic abscess followed by hepatic metastases
- In this study, out of 50 cases, hepatic abscess was present in 17 patients, metastases in ten patients, simple hepatic cyst in eight patients, primary malignant liver tumor in five patients and hemangioma in four patients, hydatid lesion six patients
- Ultrasonography serves as an important diagnostic tool in imaging and characterization of focal liver lesions
- Ultrasonography is a safe and effective method of detecting focal liver lesions. It is easy availability, portability, flexibility, lack of dependence on organ function, and lack of ionizing radiation makes it ideal for imaging the liver
- Ultrasonography also serves a key role in guided FNAC, which avoid unnecessary repeated trauma to the patient and also help to yield productive specimen for histopathological evaluation. It also helps the operating surgeon in planning a in the pre-operative approach to the lesions
- Its multiplanar imaging ability and portability has a significant advantage in sick patients to detect lesions, to locate lesion, and to identify solid from the cystic nature of lesion, thereby aid in characterization of lesions
- Information regarding the secondary features of liver disease such as ascites, primary source of malignancy, secondaries in the abdomen, splenomegaly, and pleural effusion can be evaluated
- As ultrasonography is safe, repeatable, and low cost as compared to newer modalities CT and MRI, it is still one of the most effective imaging modality for characterization and for overall assessment of abdomen

Limitation

In my study, 50 patients were studied for the period of 12 months. The study would be more productive and efficacious if we could run the study for longer period. The samples were taken randomly. Hence, we did not include

all patients. The study would be better if we were able to include all patients in our study.

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