

Evaluation of Diagnostic Ability with Ultrasound and Colour Doppler in Hepatic Space Occupying Lesions Along with Histopathological Correlation

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Received: 01-11-2024/ Revised: 15-12-2024 / Accepted: 21-01-2025

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Conflict of interest: Nil

Abstract

Background: Ultrasonography (USG) is a cost-effective and widely available imaging modality used to evaluate hepatic lesions. This study aims to assess the diagnostic role of USG in characterizing liver space-occupying lesions (SOLs) as benign or malignant. Additionally, it investigates the utility of color Doppler imaging and the correlation between ultrasound findings and histopathology.

Methods: A prospective observational study included 50 patients who underwent USG evaluation using grey scale and color Doppler techniques. SOLs were assessed for various characteristics, including composition, echogenicity, shape, and margins. Blood flow patterns within the lesions were analyzed using color Doppler imaging. Pathological diagnosis through FNAC/biopsy served as the reference standard. Statistical analysis was performed to evaluate the correlation between USG diagnosis and histopathology. This study provides a concise analysis of the effectiveness of USG in evaluating and diagnosing liver SOLs, emphasizing the use of color Doppler imaging for improved diagnostic accuracy.

Results: In the present series 50 patients with focal hepatic SOL who were identified during sonological evaluation of abdomen with various clinical conditions, were included in my study. USG and colour Doppler flow imaging (CDFI) were studied meticulously. Then an attempt was made to correlate clinical, sonological (Both grey scale & colour Doppler) and histopathological diagnosis of these lesions. Therapeutic aspiration was also performed during the procedure whenever indicated. In the present series metastases was found to be the most common focal hepatic SOL and it is followed by amoebic liver abscess. Overall focal hepatic SOL are more common in the age group of 30-60 yrs. Male was found to be more affected irrespective of disease.

Most common echo pattern of liver metastases found in this series was heterogeneous and hyperechoic masses. Hypo echoic & bull's eye metastatic deposit were also found. On colour Doppler flow imaging most of the lesion showed no intra or peritumoral blood flow. Among the liver abscesses, amoebic liver abscess was found much more common than the pyogenic abscess, this may be due to improper hygienic condition in our country. USG was quite accurate in diagnosing all the cases & was also helpful in locating the abscess prior to therapeutic aspiration. Among the hepatic cysts hydatid cyst was most common. In this series also USG was competent enough in successfully diagnosing the condition. Colour Doppler flow imaging of inflammatory conditions of liver is not of any significant role. Among the hepatocellular carcinoma older age group was mainly affected. It was found that USG findings were not confirmatory but were sufficient enough in suggesting the condition. CDFI showed increased intra and peritumoral blood flow in majority of the cases thus enhancing the diagnostic specificity of the condition but confirmation was done by histopathological examination. Haemangioma of liver were encountered incidentally during scanning of hepatobiliary system with various clinician conditions. No significant blood flow was detected (intra or peritumoral) in this study.

Conclusion: USG is an accurate, safe, non-invasive, sensitive and cost effective imaging modality for diagnosis of focal hepatic SOL. The presence or absence of flow on colour Doppler flow imaging is not a reliable feature for differential diagnosis of focal hepatic lesions when it is used alone. The flow pattern as assessed on CDFI may point to the nature of the lesion and when used along with other morphological imaging features can assist in diagnosis or in narrowing the list of differential diagnosis in a particular clinical situation. The guided FNAC procedure is very useful in establishing a final histopathological diagnosis. Therefore widespread use of ultrasonography should be strongly recommended for diagnosing focal hepatic SOL and colour Doppler flow imaging (CDFI) should be used as an adjunct whenever indicated and histopathological correlation should be done by guided FNAC.

Keywords: ultrasonography, liver space-occupying lesions, benign, malignant, color Doppler imaging, histopathology, fine-needle aspiration cytology, diagnostic accuracy, grey scale imaging.

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Introduction

Ultrasonography (USG) plays a pivotal and irreplaceable role in the evaluation of hepatic lesions. Focal liver lesions (FLLs) are commonly encountered during ultrasound examinations, necessitating accurate characterization for optimal management. USG, with its wide availability, high sensitivity, and low cost, is the preferred first-line imaging modality for liver imaging. USG's versatility in detecting lesions, distinguishing between cystic and solid nature, and assessing their relationship to vital vascular structures makes it indispensable. [1] The integration of color Doppler imaging with USG provides crucial information on blood flow patterns within and around lesions, enhancing the precision of lesion characterization. This information enables the radiologist to determine the nature of the lesion with greater precision, aiding in the differentiation between benign and malignant lesions. Variations in vascularity and resistive index in Doppler imaging contribute to the accurate characterization of lesions. Hepatocellular carcinoma (HCC), the most prevalent primary malignant neoplasm of the liver worldwide [2], is optimally detected at early stages using USG. The liver is second only to regional lymph nodes for metastatic disease. Metastatic liver disease is 18-20 times more common than HCC. Liver is the second most common site for metastasis from gastrointestinal tract, pancreas, breast and lung. [3-7] USG also enables differentiation between primary liver lesions and hepatic secondaries without the need for surgical intervention, owing to the distinct vascularity exhibited by these lesions.

In comparison to computed tomography (CT) and magnetic resonance imaging (MRI), USG offers significant advantages. It can detect most lesions without the need for contrast agents and is especially suitable for elderly patients with compromised renal function. Furthermore, its long-term use in surveillance of liver lesions mitigates concerns regarding radiation exposure. USG allows for the detection and localization of hepatic lesions in various oblique planes, making it equal or superior to computed tomography (CT) and magnetic resonance imaging (MRI) in this regard. USG's role extends beyond detection and characterization. It serves as a valuable imaging guide for ultrasound-guided fine needle aspiration cytology (FNAC) of suspicious lesions, allowing for accurate cytological diagnosis and potentially obviating the need for curative hepatic resection. USG-guided fine needle aspiration cytology

(FNAC) is a safe, accurate, and cost-effective method for diagnosing various hepatic lesions, including diffuse, focal/nodular, and cystic lesions with good sensitivity and specificity. [4] USG guidance facilitates targeted sampling, obviating the need for extensive surgical interventions in selected cases. This study aimed to comprehensively evaluate the ultrasound imaging spectrum of liver space-occupying lesions (SOLs), determine their nature as benign or malignant and investigate the utility of color Doppler ultrasonography in the diagnosis of these lesions. The correlation between ultrasound imaging findings and histopathology was also explored. Overall, this study provides a concise and comprehensive analysis of ultrasound's effectiveness in evaluating and diagnosing liver SOLs, with a focus on characterizing their nature and utilizing color Doppler imaging for improved diagnostic accuracy.

Material and Methods

The present study was conducted between January 2019 to September 2020 in the department of Radio diagnosis in collaboration with different departments of Darbhanga Medical College & Hospital, Laheriasarai, and Bihar. Indoor and outdoor patients of different departments of Darbhanga Medical college and Hospital, referred to the department of radiodiagnosis for Sonological evaluation were screened Sonologically of these, 50 patients were found to have focal hepatic SOL. These patients were selected for present study.

Ultrasonic equipments – Our department is equipped with

(a) B-mode Commercially available Ultrasound machine of LOGIQ (GE Health Care) having Grey Scale display & real-time facilities with 3.5 MHz Convex sector and 5 & 7.5 MHz liner transducer.

b) LOGIQ (GE Health Care) ultrasound machine with 3.5 annular sector probe & 'Faillogic automatic multi spot imager' Camera.

c) Agilent image point – HX colour Doppler machine of Hewlett Packard (HP) having colour Doppler, angio, continuous wave & pulse wave facility with 1.8, 2.5, 3.5, 7.5 & 10 MHz. Curvilinear linear probes & 'Odonis automatic multiimager model AE:66' Camera, HP Deskjet 640c printer, One personal computer, Samtel computer monitor & HP Key board.

Technique of liver Ultrasonography

1. Patients preparation – Ideally, the patient should fast a minimum of 6 hours prior to examination so that bowel gas is limited and gallbladder is not contracted. Traditionally the following measures are taken in our department for proper preparation-

- Light diet in the previous night.
- N.P.M. from the morning in the day of examination till the examination is completed (Examination usually done at 9 A.M. to 2 P.M.).
- Tab. Festal 1 tab TDPC x 2 days previous to the day of examination

2. Patients Position – Both supine and right anterior oblique views should be obtained if patient can move or be moved.

3. Technique proper- Real-time imaging is the principal mode used in modern sonography. Real-time scanning not only allows assessment of structures in motion, but it also facilitates rapid delineation of pathology, quickly displaying the anatomical relationship and internal characteristics of any lesion. During colour Doppler study patient is asked to hold the breath to reduce movement colour artefacts.

Generally, a sector real-time device is best since it can scan between ribs to image problem areas.

Entire liver must be imaged during the examination. Each hepatic Sonogram should include an examination of biliary tree, both Kidneys, spleen, Pancreas and upper retro peritoneum. Fine needle aspiration was done where patient condition permits and there was no colour indication to FNA e.g. Raised prothrombin time or bleeding diathesis etc.

FNA was done by conventional methods usually followed in our institution. Samples were sent to the dept. of pathology for histopathological examination. Correlation of histopathological reports with Ultrasonography and colour Doppler were done.

Results and Analysis

A total number of 50 cases were included in this study. All these patients had mass lesion in hepatobiliary system as detected by ultrasonography and colour Doppler flow imaging (CDFI) and the diagnosis was confirmed by FNAC study. Six cases of hydrated cyst and two cases of haemangioma of liver were detected sonologically but FNAC was not performed because of risk of anaphylaxis and haemorrhage respectively.

The following table shows the distribution of different Cases according to aetiology.

Table1: Distribution of different cases according to an etiology

Diseases	No of Cases	Percentage (%)
Metastases	16	32%
Amoebic Liver abscess	11	22%
Pyogenic Liver abscess	9	18%
Hydatid Cyst	6	12%
Hepatocellular CA	3	6%
Congenital Cyst	2	4%
Haemangioma	2	4%
Haematoma	1	1%
Total	50	100%

The commonest SOL of liver encountered in this study was metastases (32%) and the next common lesion was amoebic liver abscess (22%). The overall age distribution of the patients in this study were within range of 8 yrs. to 70 yrs. The following table 2 shows the overall age distribution.

Table 2: Overall age distribution

Diseases	0-10	11-20 yrs.	21-30 yrs.	31-40 yrs.	41-50 yrs.	51-60 yrs.	>60 yrs.
Metastases	-	-	-	5	1	7	3
Amoebic liver abscess	-	2	1	5	2	1	-
Pyogenic liver abscess	1	1	-	1	5	1	-
Hydatid cyst	1	1	2	-	2	-	-
Hepatocellular CA	-	-	-	1	1	1	-
Congenital cyst	1	-	-	-	1	-	-
Haemangioma	-	-	1	-	-	-	1
Haematoma	1	-	-	-	-	-	-
Total	4	4	4	12	12	10	4

From the above table it was noted that commonest age group affected by metastatic. Overall sex incidence is shown in the following table -

Table 3: Sex incidence

Diseases	Male	Female
Metastases	9	7
Amoebic liver abscess	7	4
Pyogenic liver abscess	7	2
Hydatid cyst.	3	3
Hepatocellular CA	2	1
Congenital cyst	1	1
Haemangioma	2	0
Haematoma	1	0
Total	32	18

In this study males are more affected by metastatic disease than female at a ratio of 9:4. Amoebic & Pyogenic liver abscess also occur predominantly in male. Hydatid cyst occurred at a ratio of 1:1.

Overall liver SOL are more commonly encountered in male patients in this study.

Metastases

In this present study 16 cases of metastatic carcinoma of liver were identified.

The age & sex distribution of these cases are analysed in the following table.

Table 4A: Age & sex distribution of these cases

Age Group	Male	Female	Total
<10years	-	-	-
21-30 Yrs.	1	-	1
31-50 Yrs.	2	3	5
50-60Yrs.	3	3	6
>60 Yrs.	3	1	4
Total	9	7	16

It is clear from the above study that the commonest age group affected by hepatic metastases is older age group (>50 yrs.). In only one case a young male aged 26 yrs. had metastases in liver which was proved to be a case of seminoma by FNAC

study. In this study there was obvious male preponderance. No case was found in 1-20 yrs age group.

The following table shows the clinical presentation of different cases

Table 4B:

Symptom	No. of Cases	Percentage
Pain abdomen	8	50%
Lump abdomen in rt. upper quadrant	6	37.5%
Jaundice	4	25%
Abdominal Swelling	5	31.25%

Most common clinical presentation was pain abdomen followed by lump in upper abdomen. Almost all the patient complained of anorexia & loss of weight. The following table shows different clinical signs.

Table 4C:

Signs	No. of Cases	Percentage
Hepatomegaly	16	100%
Jaundice	4	25%
Ascites	5	31.25%

Most Common clinical sign was hepatomegaly, which was present in all the Cases. The following table shows the number & distribution of lesion as seen sonologically –

Table 4D:

Description		No. of cases	Percentage (%)
Number of lesion –	Single-	4,	25%
	Multiple-	12	75%
Site of lesions-	Lt. lobe of liver	2	12.5%
	Rt. lobe of liver	6	37.50%
	Entire liver	8	50%

The above table shows that multiple deposits (75%) are more common than solitary deposit & the right lobe is more involved than left lobe. The sonographic feature of the metastatic lesions are shown in the following table-

Table4E:

USG Appearance	No. of Case	Percentage (%)
Homogeneous ,hypoechoic	4	25%
Bull's eye or target pattern	3	18.7%
Heterogeneous predominantly hyperechoic	7	43.7%
Mixed echogenicity	2	12.5%

From the above study is it obvious that the commonest sonographic pattern is heterogeneous predominantly hyperechoic (43.7%). Typical bull's eye or target pattern is not uncommon and found is 18.7% of cases. The colour Doppler flow imaging (CDFI) features of metastatic liver disease are shown in the following table

Table4F:

Pattern of blood flow	No. of Cases	Percentage (%)
No Intra tumoral flow	11	68.75%
Tumoral flow present -	5	31.25%
a) Intra tumoral flow present	3	18.75%
b) Peritumoral flow present	4	25%

From the above study it is obvious that commonest colour Doppler flow imaging pattern of metastatic hepatic lesions are absence of both intra & peritumoral blood flow (68.75%). Tumoral flow was present in (31.25%) of cases among them

intratumoral flow was in 18.75% & peritumoral flow was present is 25% of cases.

Amoebic Liver Abscess: A total number of 11 cases of amoebic liver abscess were studied. The table 5 shows the age & sex distribution.

Table5:

Age Group	Male	Female	Total number of cases
11-20	1	1	2
21-30	-	1	1
31-40	4	1	5
41-50	1	1	2
51-60	1	-	1
	7	4	11

In this study maximum case were found between 31-40yrs. Age group and males are more commonly affected than females. Predominant clinical sign & Symptoms are shown in table – 6

Table6:

Symptom & Sign	No. of patients	Percentage (%)
Pain in upper abdomen	11	100%
Fever	10	90.9%
Hepatomegaly	7	63.6%
Inter costal tenderness	9	81.8%
Rt.pleural effusion	4	36.3%

Commonest presenting symptom was pain right upper quadrant & commonest sign was inter costal tenderness followed by hepatomegaly. Rt. Sided pleural effusion was detected is 4 Cases. Sonographic evaluation of the cases are analysed in the following tables (6 & 7)

Table7:

USG finding	Amoebic abscess	Percentage
No of lesions		
Single	9	81.7%,
Multiple	2	18.3%
Site of lesion –		
Rt-Lobe	8	72.7%
Lt.Lobe,	2	18.1%
Both Lobes	1	9%

Size of lesions		
2-5cm	3	27.2%
5-10cm	6	54.5%
>10cm	2	18.3%

It is noted that most of the amoebic liver abscess are single. Most common site of affection is right lobe of liver. More than half of the cases (54.5%) was considerably larger (5-10cm) is size. The following table shows sonological features of the lesions-

Table8:

USG appearance	No. of Cases	Percentage (%)
Homogeneously hypoechoic, oval with irregular margin.	4	36.3%
Sonolucent with multiple fine internal echoes, oval	5	45.4%
Heterogeneous, Predominantly hypoechoic, irregular margins	2	18.1%
Distal sonic enhancement	5	
Associated pleural effusion	2	

In this study 11 cases of amoebic liver abscesses were found by ultrasonological examination. Among these cases 7 cases were diagnosed clinically as amoebic liver abscess and other 4 cases were diagnosed otherwise. The commonest USG appearance encountered in this study was oval sonolucent lesions with multiple fine internal echoes. All these lesions were hypoechoic and without any wall echo. These USG findings in conjunction with clinical features suggested amoebic liver abscess and the diagnosis was confirmed by FNA findings and clinical response

so metronidazole. Aspiration of typical anchovy sauce 'pus' was obtained in 10 cases. Therapeutic aspiration was performed in 8 cases. 9 patients could be followed up sonologically and gradual reduction of size of the abscess cavity was noted. No detectable intra or perilesional flow was seen on colour doppler flow imaging (CDFI).

Pyogenic Liver Abscess

Nine cases of pyogenic liver abscess were seen in this study. Predominant symptoms, age and sex distribution are shown in table – 9

Table9:

Sub. No	Age	Sex	Sign & Symptom	Routine investigation
3	16	M	Fever, hepatomegaly, pain right upper abdomen	Leucocytosis
11.	8	M	Fever, Hepatomegaly pain abdomen	Leucocytosis Abnormal LFT
19.	60	F	Fever, Vomiting, Pain abdomen	Leucocytosis
20.	35	M	Fever, Pain abdomen Hepatomegaly	Leucocytosis Abnormal LFT
34.	48	F	Fever, Hepatomegaly, Pain abdomen	Leucocytosis
35.	45	M	Fever, Hepatomegaly Pain abdomen	Leucocytosis
39.	49	M	Fever, Pain abdomen	Leucocytosis
44.	49	M	Fever, Pain abdomen	Leucocytosis
48.	50	M	Fever, Hepatomegaly Pain abdomen	Leucocytosis

All the patients were suffering from fever and pain abdomen and 6 of them had hepatomegaly. Leucocytosis was found in all the cases and in 3 of them abnormal liver function was detected. Sonological appearance and FNAC Study of these cases are given in table No – 10

Table10:

USG appearance	No. of Cases	FNAC study
Solitary hypoechoic lesion smooth margin & fine level internal echoes, centrally located in right lobe	1	Inflammatory cells
Multiple hypoechoic lesions involving both lobes of liver with smooth wall & wall echo sign	4	Inflammatory Cells
Multiple hypoechoic lesions predominantly in right lobe with ragged margin & very few internal echoes	3	Inflammatory Cells
Multiple lesions with ill-defined margin and heterogeneous echotexture without wall echo sign	1	Inflammatory cells & necrotic hepatocytes.

Most of the patients had multiple abscesses more commonly affecting right lobe. Most of the lesions were hypoechoic with echofree central part

of the lesions. All the patients were confirmed to have abscess by fine needle aspiration cytology. No

detectable intra or peri lesional flow was seen on colour Doppler flow imaging (CDFI).

Hydatid Disease: In this series 6 cases were found to have hydatid disease. Clinical suggestion of hydatid cyst of liver was given in two cases, 2

cases were diagnosed as hepatomegaly due to hepatic SOL and two other were diagnosed as pneumonia complaining of vague abdominal pain.

Following table with show age & Sex distribution of hydatid cyst of liver as found in this series.

Table 11:

Age Group	Male	Female	Total
<10 yrs.	1	0	1
11-20 yrs.	1	0	1
21-30 yrs.	0	2	2
31-40 yrs.	0	0	0
41-50 yrs.	0	2	2
Total	2	4	6

One case was in the age group below 10 yrs. 4 cases were female & 2 cases were male in this study. Casoni's test were performed in 4 out of 6 cases and was positive in 3 cases. Abnormal X-ray abdomen was found in 2 cases & hydatid disease of lung was found in chest X-ray in 2 cases.

Among these 6 cases diagnosed as hydatid disease by USG, 2 cases were diagnosed clinically. Two cases were presented with non-specific hepatomegaly. Of these 6 cases 2 cases were operated and diagnosis was confirmed, 4 cases did not turn up.

While doing USG five cases presented with typical daughter cyst within the cyst and one case with a single daughter cyst within the cyst.

No detectable intra or perilesional flow was detected in any of the lesions on colour Doppler flow imaging.

Hepatocellular Carcinoma

In this series 3 cases of hepatocellular carcinoma were found.

In all the 3 cases, duration of illness was short (less than 3 months) and 2 of them presented with hepatomegaly. One patient had the past history suggestive of cirrhosis & one of the patient had past history of jaundice.

The following table shows their relevant clinical history, clinical features & positive laboratory investigations.

Table 12:

Sub. No.	Relevant past history	Presenting symptom	Clinical finding	Investigations
7.35 yrs.	Jaundice	Pain abdomen, abdominal Swelling	Hepatomegaly Ascites	Blood. Count -normal, LFT-↑ Alk. Phos., ↑ Bilirubin
32- 55 yrs.	Alcoholic	Weight loss, Pain abdomen. Abdominal swelling	Tender Hepatomegaly Ascites	Blood. Count -normal, ↑enzymes.
45. 45 yrs.	Cirrhosis	Pain abdomen. Abdominal swelling	Ascites	Blood. Count – normal,. LFT-normal, ↓serum protein.

In this series colour Doppler flow imaging showed intra tumour flow in all the three cases (100%), peritumoral flow was seen in two cases (66%) one of the three cases (33%) showed few spots of colour (mild variety) and other two (66%) showed

few well defined vessels (moderate variety) within the tumour. Mixed type of flow (multiple or dilated vessels) was not found in any of the cases. The following table shows the clinical diagnosis, USG features & FNAC findings.

Table 13:

Sub. No.	Clinical diagnosis	USG appearance	FNAC finding
7	Liver SOL	Heterogeneous liver SOL	Hepatocellular Carcinoma
32.	Liver SOL	Heterogeneous hepatic SOL, well defined margin	Hepatocellular carcinoma
45.	Cirrhosis of liver	Shrunken liver, a heterogeneous SOL in right lobe of liver	Hepatocellular carcinoma

On doing sonography in all these three patients had heterogeneous liver SOL. Possibility of hepatocellular carcinoma were suggested in all the three patients and confirmation was done by FNAC.

Cystic Disease of Liver

2 cases were found in this study. One case presented with pain in right hypochondrium.

Clinically it was diagnosed as cholecystitis. Other case presented with pain in right hypochondrium, fever & hepatomegaly.

Clinical diagnosis of this case was hydatid cyst of liver.

The following table shows symptom, Sign, USG feature & FNAC findings of these two cases.

Table 14:

Sub. No.	Symptom	Sign	USG feature	FNAC finding
18	Pain right hypochondrium	Tenderness over it hypochondrium	Solitary cystic SOL in right lobe of liver with distal sonic enhancement, calculus in GB	Clear fluid
27.	Pain. Fever	Hepatomegaly	Well defined multiple cystic SOL in both lobes of liver with distal 'sonic enhancement.	Clear fluid

Case No 18 was diagnosed as acute calculus cholecystitis. Cholecystectomy was done, the patient was symptomatic thereafter. On follow up scan the cyst showed no significant change. Case no 27 did not turned up for follow up scan. No detectable intra or peritumoral flow were seen in any of the lesions on colour Doppler flow imaging.

Haemangioma

Two cases of haemangioma of liver was found in this series. Case no. 25 presented with right. Hypochondrial pain. On USG he was found to have a hyperechoic well defined SOL in right lobe in sub diaphragmatic location. Multiple Calculi was found in GB lumen case No 46 presented with burning sensation, frequency of micturition. On USG she was found to have a well-defined hyper echoic SOL in left. Lobe of liver.

On both the case colour Doppler flow imaging showed no intratumoral blood flow. There was no change of blood flow in peritumoral region also.

Haematoma

One case of haematoma was found. Case No. 21, a 8 year old male patient presented with right hypochondrial pain following fall from height. Ultrasonography showed a hypoechoic cystic area in right lobe, fine strands were seen within it. On follow up scan the size of the lesion was gradually decreased in size. No change of colour flow in perilesional region. Intralesional flow was absent in colour Doppler flow imaging.

Discussion

In this present series metastatic lesions were found to be the most frequent which comprised of about 32% of total cases followed by amoebic liver abscess which was found in 22% of cases. Frequency of pyogenic liver abscess was 18%,

other lesions encountered in this study were hydatid cyst (12%). Hepatocellular carcinoma (6%), congenital cyst (4%), haemangioma (4%) and haematoma (2%).

G Montali et al [8] has studied 126 focal lesions of liver & found similar incidence of hepatic metastases (39%).

Ruth Rosenblatt (1982) from New York reported study of 59 of focal lesions in liver & found maximum cases were diagnosed as metastatic carcinoma.

In 1960 Sharmon et al found that pyogenic liver abscess accounted for 80% cases of liver abscess. Yama-da et al in 1971 reported similar result (69%). The above two results were in sharp contrast to the result obtained in present series which had established amoebic liver abscess as most frequent among the abscesses. This may be due to the suboptimal sanitary surrounding (Rallis et al 1981). Amoebiasis affects 15% of Indian population (Park-2000) whereas overall prevalence in western countries are 3-4%. Lack of hygiene is the reason behind it (Cavin 1987).

Carlson [9] is indicated that majority of metastases are primarily transsonic. Viscomol et al [10] noted sonolucent metastases in 37.5% mixed 5% & pure echogenic in 27% of cases. Green B Bree [11] described the bull's eye lesion of hepatic metastases. In this study 18.7% cases presented as bull's eye lesion in USG study. 25% cases of solitary metastatic deposit was found in this study though Dubbins et al in 1981 observed that it is very difficult to differentiate solitary metastatic deposit from primary neoplasm in USG.

In this series the site of origin of primary cancer was most commonly found in the GI system. Pichren et al in 1982 found that GI tract was the

most common site of primary tumour followed by breast & lung. No definite association between echopattern of the metastases & site of origin of primary cancer was identified in this present study.

As was noted by Hillman et al [12], hepatic metastases lacked specificity in defining the organ of origin. Tanaka et al [13] described a 'detour pattern' in some cases of hepatic metastases. The portal vein within the liver was dilated and meandered around the tumour nodule. Nino Murcia et al [14] however found that specific pattern could not be discerned although intra tumoural flow was found in 23% metastases. Srivastava et al [15] described 56% of the metastases showed internal vascularity whether they were intra tumoral or peritumoral while no vascularity was detected in 44% of metastases.

Longmire et al (1966) in their study of cases of hepatoma found that jaundice was present in 24% cases. Hepatomegaly was the most common sign in their study. In this present study Jaundice was found in 1 out of 3 cases (33%) & hepatomegaly was noted in that case. Longman et al in their study found that 67% of cases were provisionally diagnosed as liver cancer. In this study only one out of three cases was clinically diagnosed as liver SOL.

USG primarily suggested the diagnosis of hepatocellular carcinoma in all the three cases and all these three cases were diagnosed as hepatocellular carcinoma by FNAC study. So in this study the detection rate of USG was found to have 100%. But as because only a small number of cases were studied in this series no comment should be given regarding the diagnostic efficacy of USG in cases of hepatocellular carcinoma. Takashi et al (1984) obtained a higher detection rate of hepatoma (92%) by USG. Tanaka et al [13] described 4 patterns of vascularity in focal liver lesions on colour Doppler flow imaging (CDFI). A 'basket pattern' of peritumoral flow and a 'vessel in tumour' pattern was regarded as being very specific for hepatocellular carcinoma as seen in 75% and 65% of HCC respectively.

Nino Murcia et al [14] however found that specific patterns could not be discerned although intratumoral flow was found in 76% of HCC.

Srivastava et al [15] concluded that no definite pattern of flow such as 'basket pattern' or 'vessel in tumour' pattern could be described in particular lesion. Peritumoral flow was seen in 9 patients (56%) while intratumoral flow was seen in 94% of cases & degree of flow could be graded as a) mild – if a few spots of colour could be seen but no well-defined vessels were identified, b) Moderate – if a few well-defined vessels were seen and c) Marked

– if large, multiple or dilated vessels were seen within the lesion.

In this series the common presentation were upper abdominal pain (100%), fever (90.9%), intercostal tenderness (81.8%), and hepatomegaly (63.6%). These presenting features correlates well with the classical signs & symptoms of amoebic liver abscess as described by Lamont and Poller [16]. Pain at right lower chest & inter costal tenderness are valuable signs but not always present (Adams and McLeod 1977).

USG finding seen in majority of cases are similar to those described by Ralls et al (1982). In this study most cases are solitary (81.7%) & size vary greatly between 2cm to greater than 10cm. More than half of the cases (54.5%) were in between 5-10 cm in size. Newlin et al (1981) found that the size of the amoebic liver abscess varies greatly between 2-8 cm which is in accordance to our study. The commonest USG appearance encountered in this study was sonolucent lesions with multiple fine internal echoes & oval shaped (45.4%). Most lesions were located peripherally contiguous to the liver capsule. Phillips P W Ralls [17] studied 42 cases of amoebic liver abscess and noted that majority lesions were peripherally situated, well defined, round or oval without any capsule & with fine homogeneous low level echoes within the lesions. These findings are similar with our present study. Similar results were obtained by Newlin et al, (1981), who found that typical amoebic abscess were round or oval with discrete irregular echopoor margin.

In this study 72.5% of abscesses were situated in the right lobe of the liver. Similar results were obtained by Mahamoud H A [18]. It is due to the streamline flow of blood from large gut through portal vein. Distal acoustic enhancement helped to differentiate an abscess from neoplasm or haematoma (Ralls et al 1979). In this study distal sonic enhancement was found in 45% of cases. These USG findings in conjunction with clinical features suggested amoebic liver abscess and the diagnosis was confirmed by FNA findings & clinical response to metronidazole. Aspiration of typical anchovy sauce pus was obtained in 10 cases. Therapeutic aspiration was performed in 8 cases. Nine patients could be followed up sonologically & gradual reduction of size of the abscess cavity was noted.

C Rammohan et al (1989) evaluated 20 cases of liver abscess sonologically & performed FNAC in all cases. He opined that US can unravel the mystery of abscess through FNA & helps in early diagnosis & treatment.

In this series 9 cases of pyogenic liver abscesses were studied. Mainly older and younger age groups

are affected. Commonest presentation are fever, pain abdomen and hepatomegaly, leucocytosis was found in all cases on routine examination of blood.

8 Cases were correctly diagnosed as pyogenic liver abscess (88.8%) and one was diagnosed as amoebic liver abscess which was proved to be pyogenic abscess on FNAC study. Newton et al (1981). Studied 29 patients with Pyogenic liver abscesses and found that Preoperative USG assessment was correct in 95% of cases. Similar results was obtained by Nancy Newlin [19]. He obtained correct diagnosis in 90% of cases of pyogenic abscess by USG aided by clinical information.

Sonographically most of the lesions were situated at central portion of liver and majority have irregular ragged margins. Nancy-Newlin et al [19] noted similar observations that majority of Pyogenic abscess appeared to have more ragged wall than the amoebic abscess. The intensity of internal echoes and transmission were variable in this study in our study most of the cases were found to have hypoechoic and one case had heterogeneous echo pattern.

Therapeutic aspiration of pus was performed in 7 cases and 2 were treated conservatively. This was done in addition with proper antibiotic therapy. There was dramatic improvement of symptoms within few days. Sonological re-evaluation was done in all these cases after antibiotic therapy and definite improvement was noted. Results were similar to the study of Berger LA OS Bonne DR[20]. He treated 15 cases successfully by percutaneous aspiration under USG guidance. So in pyogenic liver abscess USG not only serves as a diagnostic method, but also serves as a guidance method for therapeutic aspiration as well as assessment of Prognosis. In this series two cases of simple hepatic cysts were encountered. One patients had pain, in right hypochondrium and was clinically diagnosed as cholecystitis. Other case presented with pain in right hypochondrium, fever and hepatomegaly. Clinical diagnosis of this case was hydatid cysts of liver. Age of the patients were 48 yrs and 8 yrs. respectively. In first case hepatic cyst was discovered incidentally during the evaluation of his gallbladder disease. Peter M Sanfillippo [21] studied few cases of simple cysts of liver. They found congenital cysts were most common in right lobe of liver with some female preponderance and presented in later life.

Both cases were diagnosed sonologically. Spigel et al [22] opined that USG remains the initial study of choice in evaluating hepatic cysts. In their series predictive value of USG was 100%.

Sonologically one case had a solitary and other case had multiple round smooth walled cyst with distal sonic enhancement without any internal echoes.

The differential diagnosis of an anechoic hepatic cysts other than simple cysts are necrotic metastases, Hydatid cysts, healing abscess etc. Romer et al [23] proposed fine needle aspiration for confirming diagnosis after exclusion of hydatid disease due to theoretical risk of anaphylaxis.

He done USG guided aspiration in 7 patient and found that it is a rapid save and inexpensive method for diagnosis of problem cases. In this present study FNA was performed in both cases and clear fluid was aspirated. No cells were found microscopically and diagnosis was confirmed.

In this present study 6 cases were found to have hydatid disease of liver on USG examination. Most of the cases were between the age group of 21 to 50 yrs with a ratio of 1:2 between male and female.

Main presenting symptoms were hepatomegaly abdominal pain and fever. These symptoms are similar the study done by Harris, Morris et al [24] they studied 26 patients of hydatid disease.

Casoni's test was previously considered as one of the most important diagnostic aid in case of hydatid disease. In this series Casoni's test was positive in 75% of cases. This result is similar to those obtained by Papadimtrion, Mandrekas et al (1970). They studied 10 cases of hydatid disease and concluded that negative serology does not exclude hydatid disease, Harris, Morris et al [24] found in their series that 23% of cases of hydatid disease present as featureless simple cysts.

Conclusion

USG is an accurate, safe, non-invasive, sensitive and cost effective imaging modality for diagnosis of focal hepatic SOL. The presence or absence of flow on colour Doppler flow imaging is not a reliable feature for differential diagnosis of focal hepatic lesions when it is used alone. The flow pattern as assessed on CDFI may point to the nature of the lesion and when used along with other morphological imaging features can assist in diagnosis or in narrowing the list of differential diagnosis in a particular clinical situation.

The guided FNAC procedure is very useful in establishing a final histopathological diagnosis.

Therefore widespread use of ultrasonography should be strongly recommended for diagnosing focal hepatic SOL and colour Doppler flow imaging (CDFI) should be used as an adjunct whenever indicated and histopathological correlation should be done by guided FNAC.

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