



ULTRASOUND EVALUATION OF PATIENTS WITH FOCAL HEPATIC MASS LESIONS

Dipti A Shah, *Vaishali Sanghrajka

Professor & Head of Department,
Department of Radiodiagnosis,
AMC MET Medical College, Sheth L.G. Hospital, Maninagar, Ahmedabad-380008

*3rd year Resident doctor,
Department of Radiodiagnosis,
AMC MET Medical College, Sheth L.G. Hospital, Maninagar, Ahmedabad-380008
vaishalisanghrajka@gmail.com

Abstract

The aim of this study was to evaluate the role of ultrasound in evaluation of patients with focal hepatic mass lesions, to study the imaging spectrum of focal hepatic lesions, to study the relative prevalence of different focal hepatic mass lesions, and to correlate the ultrasound findings with FNAC and/or CT scan. Methods: The study was prospective and was carried out between December 2018 and April 2019 at the Department of Radiology, AMC MET Medical College and Sheth L.G.Hospital, Ahmedabad. Total 100 patients having focal hepatic mass lesions diagnosed on ultrasound and findings confirmed either on CT scan or ultrasound guided aspiration cytology were included in the study. Confirmation of diagnosis either by CT scan or ultrasound guided FNAC done prior to data collection. (Only those patients are included whose ultrasound diagnosis was confirmed either by ultrasound guided FNAC or CT scan already done.) **Results:** Out of 100 patients diagnosed by ultrasound, the most common focal hepatic mass lesions seen in our study were- liver abscess, hemangiomas, hydatid cysts, metastasis, primary liver tumors and focal areas of contusions/hematoma. Correlating with FNAC and/or CT scan, ultrasound had an average specificity of 94%, with 100% specificity for common benign lesions like hemangiomas. **Conclusion:** Ultrasound is a safe and effective method of detecting focal liver lesion. Its low cost, easy availability and lack of ionizing radiation and iodinated contrast media makes it most ideal for imaging the liver. It aids in defining therapeutic decision quickly and allows ultrasound guided interventions. High degree of specificity of ultrasound diagnosis in the present study confirms the value of ultrasonographic evaluation of focal liver lesions and suggests that it can be effectively used in the routine diagnostic work.

Keywords: focal hepatic mass lesions, liver abscess, metastasis, ultrasound, Fine needle aspiration cytology (FNAC).

INTRODUCTION

- Liver diseases are amongst the common causes of morbidity and mortality in India, which are encountered frequently in day-to-day practice. To establish the correct diagnosis and treatment, a precise initial diagnostic imaging modality is needed.
- Following history and clinical examination, ultrasonography has become one of the first and most useful methods of investigation in patients with upper abdominal pain, jaundice and mass per abdomen.
- Ultrasound is widely accessible, inexpensive, non-invasive and portable with high spatial and temporal resolution.
- Ultrasound is the first choice of investigation for screening of patients with suspected liver diseases.
- A liver mass is defined as a focal solid or cystic lesion that can be differentiated from the surrounding liver parenchyma by imaging techniques.
- Focal liver lesions mainly comprise of liver abscess, hydatid cyst, hemangioma, primary malignant neoplasms, metastases and focal contusion or hematoma.
- The signs and symptoms of such lesions are non-specific and biochemical tests have limitations in the diagnosis of these lesions.
- Real-time ultrasonography has got considerable application in diagnosis of focal liver lesions. Ultrasonography has an important role in the detection and follow-up of focal liver lesions. It can be used as an imaging guide for FNAC and therapeutic drainage of abscesses.



AIMS AND OBJECTIVES OF THE STUDY

- To evaluate the ultrasound imaging spectrum of focal hepatic mass lesions.
- To study the relative prevalence of different focal hepatic mass lesions detected by ultrasound during the study period.
- To evaluate the role of ultrasound in evaluation of focal hepatic mass lesions.
- FNAC and/or CT scan correlation of ultrasound findings of focal hepatic mass lesions.

REVIEW OF LITERATURE

Focal liver masses include a variety of malignant and benign neoplasms, as well as masses with developmental, inflammatory and traumatic causes. In cross sectional imaging, two basic issues relate to a focal liver lesion: characterization of known liver lesion (what is it?) and detection (is it there?). The answer to either question requires a focused examination, often adjusted according to the clinical situation.

LIVER ABSCESS: Amoebic Liver Abscess: 80% of abscesses occur in right lobe due to streaming of portal venous blood from the more frequently and more heavily infected right side of colon and much greater volume of right lobe. Sonographic features include a round or oval-shaped lesion, absence of prominent abscess wall, hypogeneity compared to normal liver, fine low level internal echoes, distal sonic enhancement and contiguity with the diaphragm. Diagnosis is made using a combination of the clinical features, ultrasound findings and serologic results[1].

Pyogenic Liver Abscess: Ultrasound will usually show spherical oval or slightly irregular echo poor lesions with distal enhancement.

HEMANGIOMAS: Cavemous hemangioma is the most common primary liver tumour, occurring in 0.4-20% of the general population in autopsy series.[4] Haemangiomas are most common in middle aged women (5:1), occur more frequently in the right lobe of the liver, are usually single and rarely greater than 5cm. At ultrasound, the most common appearance is of a well circumscribed, uniformly hyperechoic lesion. This is caused by multiple interfaces between walls of the cavernous spaces and blood within them. [5]

HYDATID DISEASE: Liver is the most frequently involved organ with more than 50% of cysts found in the liver. Cysts are multiple in 40% of cases and about in 25% of patients with liver disease also have lung cysts. Lesions may be purely cystic, solid or mixed. The cyst appears as a well-defined anechoic lesion with smooth borders and posterior acoustic enhancement. Separation of the membrane producing an ultrasound "Water Lilly" sign results from detachment of inner germinal layer from the exocyst. This gives characteristic appearance for the hydatid lesion. The collapsed germinal layer is seen as an undulating linear collection of echoes either floating in the cyst or lying in the most dependent portion. The development of daughter cysts from the lining germinal layer produces a characteristic appearance of cyst within a cyst. This appearance is extensively characteristic, producing "cart-wheel" or "honey comb" appearance. Capsule is well outlined but the inner architecture show circular array of cysts and a solid centre [6]. With heavy or continued infestation, multiple primary parent cysts may develop within the liver and will often produce hepatomegaly. Aspirated fluid from hydatid cyst is turbid and thick; fragments of the hyaline laminated cyst wall membrane are readily demonstrated. The diagnosis is confirmed by the demonstration of scolices or refractile hooklets [7].

HEPATOCELLULAR CARCINOMA: HCC is the most common primary liver cancer comprising of 80% of primary liver malignancies. It is typically a disease of middle aged and elderly individuals. The sonographic appearance of HCC is variable. The masses may be hypoechoic, complex or echogenic. Ultrasonography provides information on shape, echogenicity, growth pattern and vascular involvement of the neoplasm. Finally, ultrasound guidance allows puncture of intrahepatic nodules as small as 1cm. The sensitivity of this procedure in the diagnosis of focal liver lesions is very high, varying between 91% and 95% with a specificity of 92%-100% [7].

METASTASIS: The liver is one of the commonest sites for metastasis and terminal involvement is the rule in all but CNS malignancies. This can be attributed to its large size, high rate of blood flow and double perfusion by the portal vein and hepatic artery. The route of tumor spread to the liver is more likely to be hematogenous rather than lymphatic, because for the most part of the liver's lymphatics are hepatofugal. The most common primary tumors are those of the gut, breast, lung and melanoma. Highly reflective lesions may be surrounded by an echo-poor band which may be fine or a few millimeters thick. This is called Bull's eye pattern and is more often seen in larger lesions. Highly reflective and target lesions are typically of tumors originating in the gastrointestinal tract and urogenital tract.

MATERIALS AND METHODS

- Place of study- AMC MET MEDICAL COLLEGE & Sheth L.G. HOSPITAL, AHMEDABAD
- Duration of Study- Dec '18 to April'19
- Type of Study- Prospective Study



- Ultrasound Machine - GE LOGIQ P5 Ultrasound machine using a 4 MHz curvilinear and 11 MHz linear transducer.
 - Inclusion criteria- Cases of focal hepatic mass lesions detected by ultrasound during the study period and confirmed by ultrasound guided FNAC or CT scan already done.
 - Exclusion criteria- Diffuse fatty infiltration, Storage disorders, Cirrhosis of liver and Diffuse infiltrative malignancies e.g. lymphoma and leukemia.
- Well defined, anechoic cystic lesion in liver showing posterior enhancement leading to definitive diagnosis of simple cyst were excluded from the study.

Ultrasound diagnosis	No. of Cases	No. of male patients	No. of female patients	Percentage	FNAC /CT scan	Specificity
Liver abscess	46	36	10	46%	44	95.6%
Hemangioma	19	8	11	19%	19	100%
Metastases	17	12	5	17%	14	82.3%
Hydatid cyst	7	5	2	7%	7	100%
Primary malignant liver tumors	4	2	2	4%	3	75%
ocal areas of contusion/hematoma	7	5	2	7%	7	100%
TOTAL	100	68	32	100%	94	94%

METHODOLOGY

Liver was scanned in various planes- sagittal, parasagittal, transverse, oblique, subcostal, intercostal and coronal planes. Comprehensive scanning of other upper abdominal organs was done.

Various ultrasonographic features of focal liver lesions were observed, which include: Number of lesions – single or multiple, size of the lesion, Location of the lesion within liver – Lobar distribution (right lobe, left lobe, both lobes), segmental distribution, Echogenicity (by comparing with that of normal liver Parenchyma), hyperechoic, hypoechoic, anechoic or mixed echogenic.

FNAC and/or CT scan correlation was done in all the patients.

RESULTS AND ANALYSIS

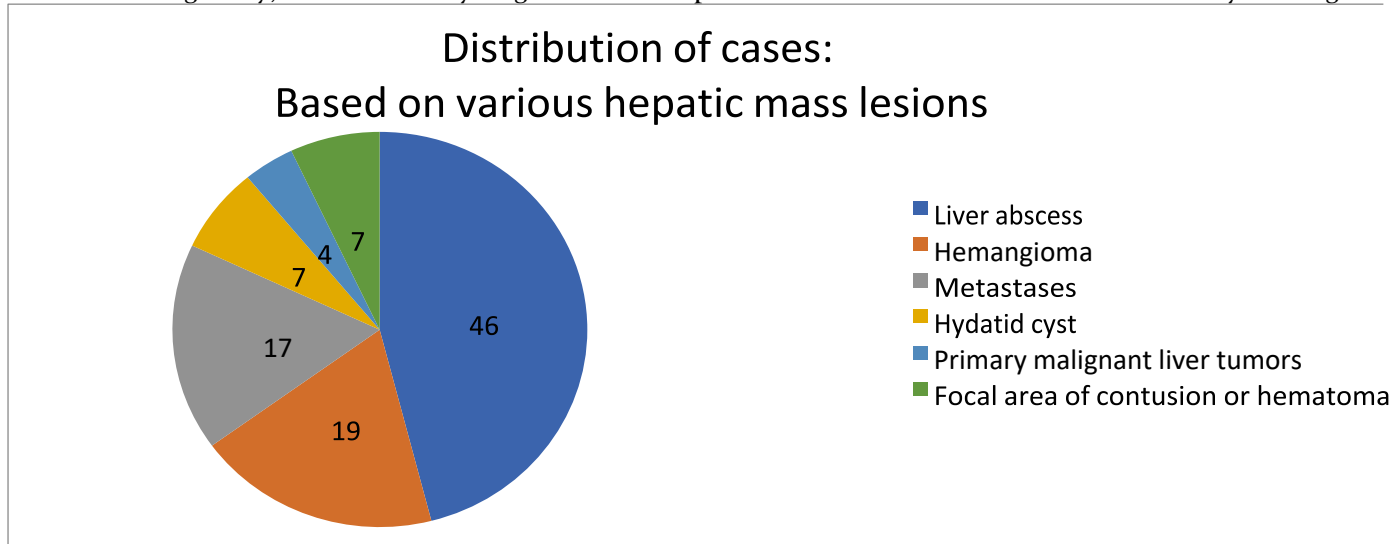
The study comprises of 100 cases of focal hepatic mass lesions detected by ultrasound.

Patients with clinically suspected focal liver disease were referred to the Department of Radiology and incidental focal liver lesions were picked up in patients on whom ultrasound was being done for other reasons.

Findings were confirmed by FNAC or CT scan. The following observations were made.

Table 1- Distribution of cases diagnosed by ultrasound with FNAC/CT scan correlation

In the following study, most commonly diagnosed focal hepatic mass lesion was liver abscess followed by hemangioma.



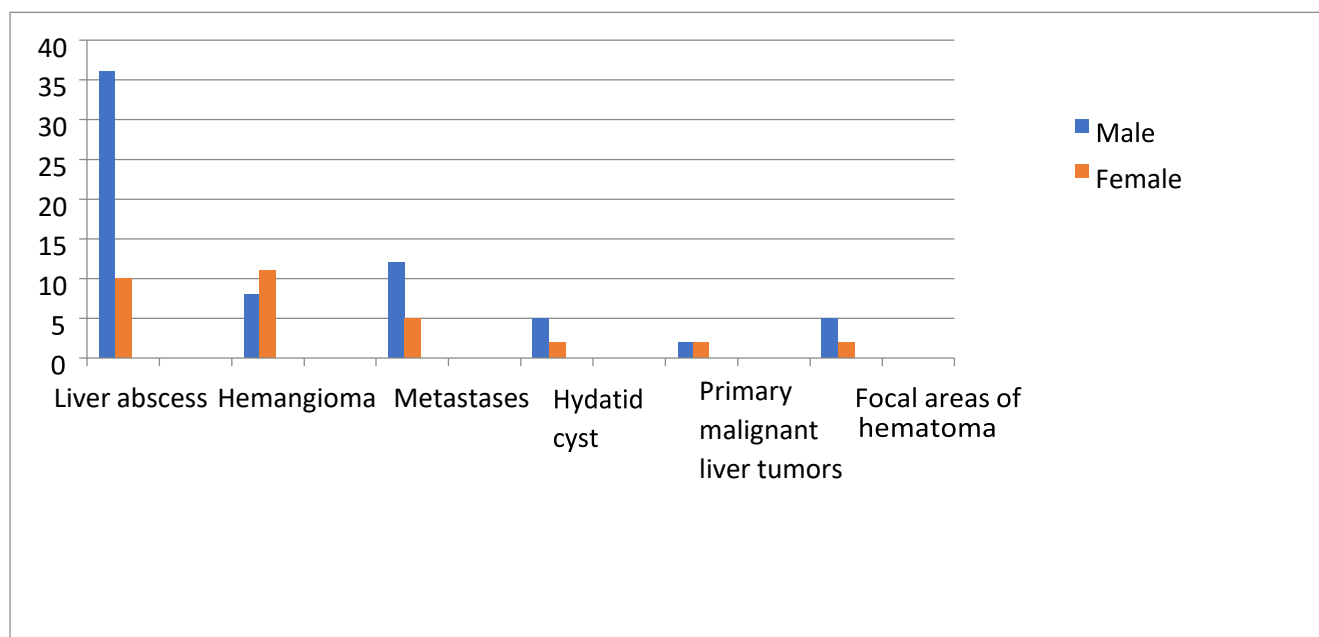
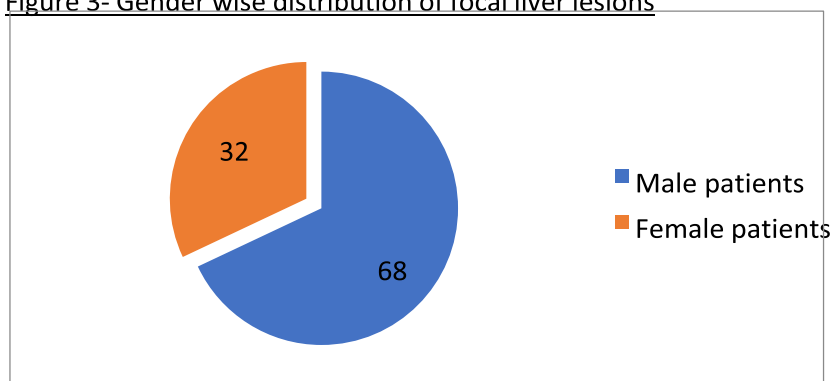


Figure 2: Gender wise distribution of various focal hepatic mass lesions

In following study, males are more commonly affected by focal hepatic mass lesions as compared to females.

Figure 3- Gender wise distribution of focal liver lesions



Sex	No. of Patients	percentage
Male	68	68%
Female	32	32%
Total	100	100%

Males are more commonly affected by hepatic mass lesions in the following study.

Table 2- Age distribution of focal hepatic mass lesion

Age group (years)	No. of Cases	Percentage
Below 10	4	4%
11-20	3	3%
21-30	13	13%
31-40	17	17%
41-50	27	27%
51-60	20	20%
61-70	11	11%
71-80	5	5%
Total	100	100%



In the following study, most common affected age group is 41-50 years followed by 51-60 years.

Table 3- Distribution of cases based on number of focal lesions

Lesions	No. of Patients	percentage
Solitary	62	62%
Multiple	38	38%
Total	100	100%

There are total 62 solitary type and 38 multiple type of focal liver lesions were observed.

Table 4- Distribution of cases based on lobar involvement

Lobar	No. of Patients	Percentage
Right lobe	67	67%
Left lobe	12	12%
Both lobes	21	21%
Total	100	100%

In the following study, right lobe of liver is more commonly affected by focal hepatic mass lesions. According to distribution of lobe, there are 67 cases of right, 12 cases of left and 21 cases of both lobes were reported.

DISCUSSION

In the following study, the various focal hepatic mass lesions encountered were liver abscess, metastasis, primary malignant liver tumors, haemangiomas, hydatid cysts, focal areas of contusion or hematoma.

Ultrasound features of focal hepatic mass lesions were studied and diagnosis was confirmed by fine needle aspiration cytology or CT scan.

Ultrasonography when adopted as an initial imaging modality is seen as a method which reduced the cost and time to arrive at diagnosis. By this method, even small lesions with subtle difference in reflectivity can be detected.

Ultrasound has been used as an accepted method for the diagnosis of focal hepatic mass lesions due to its rapidity of diagnosis and high sensitivity. The widespread use of imaging techniques has led to an increased diagnosis of incidental liver tumors. The differential diagnosis is extremely broad since it may range from benign asymptomatic lesion to malignant neoplasms. The correct characterization of a focal liver mass has become a diagnostic challenge for most clinicians. According to Marin D, et al, in their study of imaging approach for evaluation of focal liver lesions found that, imaging plays a pivotal role for diagnosis, staging, treatment planning and follow up of focal liver lesions. Decision of an imaging modality cannot be based on the diagnostic accuracy of an imaging test solely but must also consider patient safety and cost effectiveness.

In the following study, total 100 cases of focal hepatic mass lesions diagnosed by ultrasound were included.

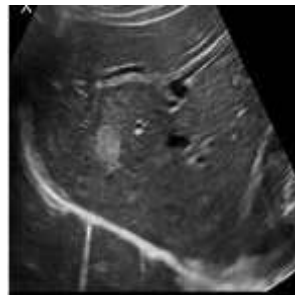
Out of 100 cases, 46 cases of liver abscess (46%), 19 cases of hemangioma (19%), 17 cases of metastasis (17%), 7 cases of hydatid cyst (7%), 4 cases of primary malignant liver tumors (4%) and 7 cases of focal hepatic contusion or hematoma (7%) are included. The results of our study are comparable with study of "Evaluation of focal hepatic lesions by using ultrasound done by Dr. Rajeev Ranjan", found that out of 25 cases, 10 cases were of liver abscess (40%), 4 cases of metastasis (16%), 4 cases of hemangioma (16%), 3 cases of hydatid cyst (12%), 2 cases of primary malignant liver tumor (8%) and 3 cases of contusion (12%). The minor variation in both study results may be explained by demographic variation as well as different sample size of both studies.

Liver abscess: Of total 46 cases of liver abscess, 18 patients had pyogenic liver abscess and 28 patients had amoebic liver abscess, proved on aspiration cytology. Out of 46 patients, 36 were male and 10 were female. Ultrasound features of liver abscess varied from cystic, with fluid ranging from echofree to highly echogenic, mixed echogenic to predominantly hypoechoic. The abscess wall can vary from well defined to irregular and thick. 25 lesions had well defined wall (54%) and 21 had ill defined wall (45%). 23 lesions were mixed echogenic (50%), 13 were hypo echoic (28%) and 10 were cystic lesion with echogenic fluid (22%).



Liver abscess- Ill defined predominantly hypoechoic lesion in right lobe of liver

Hemangiomas: Total 19 cases of hemangioma are included in the following study. 11 cases were female and 8 males. Aytakin Oto et al.; described that hemangioma are more common in females [9]. Majority of lesions (89%) were of size less than 5 cm, only 2 lesions (11%) were more than 5 cm and maximum number of cases had single lesion. Mayo Foundation for Medical Education and Research, has described that most of the hepatic hemangioma are small, single and do not produce symptoms. 16 lesions were hyper echoic (84%), 3 had central cystic/ anechoic area (16%). 15 lesions had well defined margins (78%) and 4 had ill defined margins (22%). All cases were correctly diagnosed on ultrasound as they were confirmed on CT scan, so specificity was considered 100%.



Hemangioma- well defined hyperechoic lesion

Hydatid Disease: In the following study, total 7 cases of hydatid cyst are diagnosed on ultrasound, and the findings were confirmed on CT scan, so specificity of USG to diagnose hydatid cyst is 100%. 5 were male and 2 were female. 4 cases showed classic appearance showing a cyst containing multiple daughter cysts (57%), 2 cases showed unilocular cyst, fairly uncommon morphology for hydatid cyst, however confirmed on aspiration cytology (28%), 1 case showed complex heterogenous mass with finger like projections within suggestive of hydatid cyst (15%).



Hydatid cyst- Multiple anechoic areas with multiple septations appearing as rounded mass in right lobe of liver.

Hepatocellular Carcinoma: In the following study, total 4 cases of primary malignant tumors are included, with similar incidence in both male and female. Out of 4 cases, 3 cases were turned out to be hepatocellular carcinoma on FNAC, while in one case was diagnosed as metastasis but it turned out primary hepatocellular carcinoma on histopathology, so specificity of diagnosis of HCC by ultrasound was considered 75%. 3 cases had lesions with well defined margins (75%) and 1 was with ill defined margins (25%). 2 cases had portal vein thrombosis (50%). Saini et al.; has described that the tumor thrombus is another one of the characteristic feature of HCC.[10].



Hepatocellular carcinoma- large lobulated mixed echogenic lesion

Metastasis : Total 17 cases of liver metastasis were taken in the study. Out of 17 cases, 14 cases were given metastasis on FNAC, while in remaining 3 cases, primary malignancy was not known and FNAC report was indeterminate, so specificity of ultrasound for diagnosis of metastasis was considered 82.3%. Most of the cases (13 cases) had lesions showing well defined margins (76%). In 5 cases, lesions were hypoechoic (29%), lesions were hyperechoic in 3 cases (17%), target appearance of lesion was seen in 4 cases (23%), lesions were cystic in 4 cases (23%). According to Fazelle et al.; sonographically, it may either be multiple or solitary, heterogenous or nearly hypo echoic mass.[11].



Liver Metastasis – well defined mixed echogenic lesion with central hyperechoic area with hypoechoic rim lesion giving target appearance.

CONCLUSION

Ultrasound is a safe and effective method of detecting focal hepatic mass lesions. Its flexibility, easy availability and lack of dependence on organ function makes it most ideal for imaging the liver and also serves as an object of defining therapeutic decision quickly.

The liver can be scanned in multiple planes enabling us to know the exact location of lesions and study their echo pattern. Apart from detecting lesion, other valuable information like ascites, vascular involvement, primary source of malignancy in abdomen and pelvis can be easily obtained.

Ultrasonography is highly sensitive in diagnosing focal liver lesions such as Liver abscess, metastases and primary malignant liver tumors and hydatid lesions which constituted majority of focal liver lesions for which ultrasound was indicated in the present study, with a specificity of 95.6% for liver abscess, 82.3% for liver metastasis, 75% for primary malignant liver tumours and 100% for hemangioma, hydatid cyst and focal areas of contusion or hematoma respectively. So overall specificity of ultrasound to diagnose focal hepatic mass lesions is 94%.

The great majority of asymptomatic, single lesions are benign.

Hydatid cysts and haemangiomas with a classic appearance can be safely diagnosed with ultrasound alone.

It is evident from this study that ultrasound has a wide applicability in the diagnosis of focal hepatic mass lesions. Being a safe, simple, repeatable and without radiation exposure to the patient, it is worth being included in routine diagnostic work up.

ACKNOWLEDGEMENTS: None

CONFLICTS OF INTEREST: None

FUNDING: Nil

REFERENCES

- [1] Kuligowska E, Noble J. Sonographic features of hepatic abscess. Semin Ultrasound. 1983;4: 102-116.
- [2] Gossin KB. Intrahepatic focal liver lesions –Differential diagnosis. Am J Roentgenol.1981; 137: 763-767. [3]. Edmonston HA, Peters RL . Tumors of the liver – Pathological features. Seminars in Roentgenology. 1983; 18(2): 75-83.



- [3] Gaines P A, Sampson M A. The prevalence and characterisation of simple hepatic cysts by ultrasound examination. Br.J.Radiol. 1989; 62:335-7.
- [4] Liang P, Cao B, Wang Y, Yu X, Yu D, Dong B. Differential diagnosis of hepatic cystic lesions with grey-scale and colour Doppler sonography. J Clin Ultrasound. 2005;33(3):100-5.
- [5] TareqSinan, Mehraj Sheik, Abdulla Behbdoni, Fayaz A Chisti, Zafar Sheik, PR Hira et al. Diagnosis of abdominal hydatid cyst: The role of ultrasound and ultrasound guided fine needle aspiration cytology.
- [6] International Journal of Medical Principles and Practice. 2002; 11(04).
- [7] Bolandi L, Gaiani S, Benzi G, Zironi G, Rigamonti A, Fuscorni F et al. Ultrasonography and guided biopsy in the diagnosis of hepatocellular carcinoma. Italian J of Gastroenterology. Jan. 1992; 24(1): 46-49.
- [8] Scheible W, Gosink BB, Leopold GR. Gray scale echographic patterns of hepatic metastatic disease. Am J Roentgenol. 1977; 129: 983-987
- [9] Aytakin Oto, Kirti Kulkarni, Robert Nishikawa, Richard L. Baron; Contrast enhancement of hepatic hemangiomas on multiphase MDCT: Can We Diagnose hepatic hemangiomas by comparing enhancement with blood pool? AJR 2010; 195:381-6.
- [10] Gazelle SG, Saini S, Mueller P; Hepatobiliary and pancreatic Radiology imaging and intervention. Thieme 1998.
- [11] Fazelle GS, Lee MJ, Hahn PF; US, CT & MRI of Primary and secondary liver lymphoma. J Comp Ass Tom 1994; 18:412-15.