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Radiological Evaluation of Focal Hepatic Lesions

Dr. Pawan Kumar Morwani[1], Dr. Deepika Meena[2], Dr.G.L.Meena[3*]

[1, 3*]Department of Radiodiagnosis, S.P. Medical College, Bikaner, Rajasthan.

[2]Department of Dentistry, S.P. Medical College, Bikaner, Rajasthan.

Correspondence Author: Dr. Deepika Meena, Senior Resident, Department of Dentistry, Sardar Patel Medical College, Bikaner, Rajasthan-334003-India

Conflicts of Interest: Nil.

Abstract

Aims & Objectives

We aim to elucidate the following objectives in our study, viz.

1) MDCT characterization of different focal hepatic lesions presenting to our hospital.
2) Assessment of Sensitivity & Specificity of MDCT as an imaging modality in diagnosis of focal hepatic lesions.
3) Assessment of Sensitivity & Specificity of USG as an initial investigation in screening & diagnosing of focal hepatic lesions.
4) To study the spectrum of focal hepatic lesions seen in our vicinity.

Materials and Methods

This hospital based study was conducted in Department of Radio-diagnosis and Modern imaging of PBM Hospital, Bikaner, Rajasthan. Data for the study was collected from patients attending/ referred to the department of Radio-Diagnosis. A preliminary ultrasound scanning was done in all cases using GE LOGIQ P5 sonography machine with transducers of appropriate frequency. Color Doppler imaging was done as and when required based on gray scale characteristics. Non-contrast and contrast enhanced CT examination of the patients was carried out, using PHILLIPS BRILLIANCE MDCT 64 SLICE CT SCAN. Scanning protocols were tailored according to the age, weight of the patient and the clinical situation. Imaging findings were correlated with the clinical course of disease and/or surgical/cytological findings as far as possible. The results were subjected to statistical analysis wherever applicable and expressed as percentages.

Results

We studied 80 cases of focal liver lesions in various age groups. Quite a large spectrum of lesions was found. Out of 80 cases, 16(20%) were metastases from various primary sites, 15 cases (18.75%) were abscesses, 11 cases (13.75%) were hemangiomas, 9 cases (11.25) were HCC, 7 cases (8.75) were hydatid cysts, 6 cases (7.5%) were liver cysts and 16 cases (20%) were other lesions. MDCT has more accuracy in predicting nature of lesion, its localization, extent and exact diagnosis than USG in case of mets, hemangioma and HCC and has comparable accuracy in case of abscess, hydatid cyst and simple cyst.

Conclusion

The recent advances have expanded the usefulness of CT in the evaluation of focal liver lesions. The advantage of single breath hold acquisition, improved vascular contrast enhancement, increased detection of parenchymal lesions, and multiplanar and three dimentional reconstruction may make it one of the modalities of choice in evaluation of focal liver lesions and should be employed for evaluation of complicated cases, to know exact extent of the lesion and for confirmation of the surgically planned cases.

Keywords: liver, focal, imaging, CT, USG, sensitivity, specificity.

Introduction

Liver is the largest organ in the abdomen, having a number of important functions. Owing to its many and varied functions there is no single, test by which the liver can be stated that functioning normally. Indeed, many tests detect liver damage rather than liver function. Therefore several tests are usually undertaken in each patient. No less than 80% of the liver can be out of action without affecting individual tests. Even in cirrhosis all the liver function tests could be normal. Besides each test as got its own limitations and pitfalls. Hence in addition to these tests imaging of the liver is invariably required in a patient of suspected liver disease.

Imaging of the liver can be accomplished by a number of modalities like plain radiographs, ultrasound, CT, radio-isotope studies, MR and invasive procedures like angiography, percutaneous trans-hepatic cholangiography and endoscopic retrograde cholangiography. Plain radiograph of the abdomen is only of limited value and may show enlargement of liver, calcification of hydatid cyst, other calcified granulomas or air-fluid level in pyogenic abscess. US is safe, simple, non–invasive, cheap, yet effective method which is able to pick up a number of abnormalities of the liver, bile ducts, gall bladder and other organs. CT has been widely used for evaluating liver problems for more than 15 years and now it has become established as an imaging method of choice for routine screening of the liver.

More recently however MR has proved to be at least as effective as contrast enhanced CT for detecting and characterizing hepatic abnormalities. Radio-isotope scanning using technetium 99^{m} ($99^{m}Tc$) is another imaging modality.

Thus we see that a number of imaging modalities and biochemical investigations are available to us for evaluation of a patients with a suspected hepatic problem. Each imaging modality has its strength and limitations. At the same time the technique of conducting the examination is crucial to its performances. Because of the multiplicity of available imaging modalities and complex biochemical investigations and the cost constraints, the treating physician has a dilemma in deciding the best imaging modality for the patients.

A focal liver lesion is by definition a discrete abnormalities arising within the liver. Clearly, to some degree this distinction between focal and diffuse abnormalities is artificial and often the two merge together.Difficulty in separating an infra from extra hepatic mass is sometimes a problem. Ultrasonic features suggesting an intrahepatic origin include movement of the lesion within the liver with respiration, bulging of the liver capsule, displacement and distortion of PV and IVC.

CT is appropriate as a complimentary investigation to US when difficulties arise. CT is ideally suited for examination of a small, superiorly situated lesion, in which cases US are difficult.

Materials & Methods

This hospital based prospective study will be conducted in Department of Radio-diagnosis and Modern imaging of PBM Hospital, Bikaner, Rajasthan.

Source of Data

Data for the study will be collected from patients attending/referred to the department of Radio-Diagnosis, PBM Hospital, Bikaner for CT evaluation of focal liver lesions.

INCLUSION CRITERIA of study group

- Clinical history or physical examination suggestive of a focal liver lesion.
- Patients with focal liver lesions identified on USG.

- Abnormal liver function tests.

Patients selected on the basis of the above mentioned criteria were first subjected to a detailed USG examinatoion of the liver. The liver was examined with real time USG equipment after a 6 hours fast so that bowel gas was minimal and gall bladder and pancreas could be optimally evaluated in the same setting.

The second step in the study was to perform CT examination in these patients by using Helical CT machine in the department. Plain (non-contrast CT) and contrast CT was done. For confirmation subsequent repeat scans was done and rest of the CT and US findings were correlated with surgical and histopathological findings wherever necessary or by clinical outcome, size of the lesions, attenuation values. US guided aspiration/ FNAC was done wherever necessary.

EXCLUSION CRITERIA OF STUDY GROUP

- Diffuse liver diseases
- Pregnant or nursing mothers
- Bleeding diathesis
- Previous case of anaphylactic reaction to iodinated contrast

Machine Details

- **CT**
- All CT scans at our institution will be performed using Phillips brilliance 64 slice MDCT scanner with Phillips windows workstation and software. Informed consent obtained from the patient if I.V. contrast was administered.
- **USG**
- GE LOGIQ P5 using curvilinear 3.5 - 5 MHz and 11 MHz transducers.

Results

Present study "MDCT evaluation of focal liver lesions" was carried out in 80 patients who were first subjected to an ultrasound examination followed by a spiral CT examination later. Out of 80 diagnosed and then confirmed by histo-pathology cases, 56 patients were male and 24 patients were female. Age varies from 18 to 70 yrs. The Focal liver lesions with histo pathology confirmation encountered in our study were

S.No.	Disease	No.of cases	Percentage	Male	Female
1.	Metastasis	16	20%	10	6
2.	Abscess	15	18.75%	12	3
3.	Hemangioma	11	13.75%	5	6
4.	HCC	9	11.25%	7	2
5.	Hydatid cyst	7	8.75%	5	2
6.	Liver cyst	6	7.5%	4	2
7.	Others	16	20%		
a	Liver Hematoma	4	5%	3	1
b	Granulomas	4	5%	4	0
c	Peri biliary cyst	4	5%	3	0
D	Focal fatty Change	4	5%	3	1

The commonest lesions occurring in our set up were Metastasis, followed by Abscess, Hemangioma, HCC and Hydatid cysts. Simple liver cyst were also frequently seen. The smallest lesion detected in our study was 5 mm which was a simple biliary cyst.

Metastases

This was the most common lesion in our study (n=16). Of these 10 were male and 6 were female (M:F = 1.6:1).

The primary sites were as follows:

Sr. No.	Primary Site	No. of Cases	Percentage
1	Prostate	3	18.75
2	Breast	2	12.5
3	Colorectal	2	12.5
4	RCC	2	12.5
5	Cervix	2	12.5
6	Stomach	1	6.25
7	Adrenal	1	6.25
8	Bladder	1	6.25
9	Testis	1	6.25
10	Pancreas	1	6.25

The commonest age group affected was 6^{th} and 7^{th} decade. Youngest patient presented with metastasis in our study was 23 yrs male, who was a known case of seminoma of right testis. 68.75% lesion was ranging in size from 1 cm to 3 cm. All the lesion was well defined.

Hepatomegaly was present in 31% cases. Abdominal lymph nodes were enlarged in 3 cases.

Sensitivity and Specificity of USG for metastasis in our study were 88.88% and 93.38% respectively and of CT is 94.11% and 98.41%.

15 abscess cases were encountered in our study. This was the second most lesion in our study, of these 11 were amoebic abscesses and 4 were pyogenic abscesses. Sensitivity and Specificity of USG for abscess in our study were 93.75% and 98.43% respectively and of CT is 93.75% and 98.43%.

Hemangioma was third most lesions encountered in this study. 11 hemangiomas were detected in our study.Sensitivity and Specificity of USG for hemangioma in our study were 91.66% and 97.05% respectively and of CT is 100% both.

Hydatid cysts constituted 8.75% of our cases (n=7). The most common cause of hydatid disease in humans is infestation by the parasite E. granulosus.Both Sensitivity and Specificity of USG and CT were 100% in our study for Hydatid cyst. Alltree et al found that US and CT scan define equally well the daughter cysts and calcification.

Our study revealed 6 cases with hepatic cysts (7.5%) of these 4 (66.6) were simple hepatic cysts and 2 (33.3%) were complicated hepatic cysts.Both Sensitivity and Specificity of USG and CT were 100% in our study for cysts. Spiegel et al[15] summarised the established ultrasonic criteria of a simple hepatic cyst must be anechoic, must have smooth borders and strong posterior wall echoes, must be spherical or oval in shape. Our observation was also the same.

Amongest other lesions we encountered 4 cases (5%) of liver hematoma, 4 cases of granulomas, 4 cases of simple peribiliary cysts and 4 cases of focal fatty changes. Out of 4 cases, in one case of abdominal trauma, liver hematoma was missed on US which was seen on CT.

sensitivity and specificity of ct in 80 diagnosed focal liver lesions

Final diagnosis	True positive	True negative	False positive	False negative
Metastasis	16	62	1	1
Abscess	15	63	1	1
Hemangioma	11	69	0	0
HCC	9	70	0	1
Hydatid Cyst	7	73	0	0
Liver Cyst	6	74	0	0

Liver disease	No. of cases	Sensitivity	Specificity
Metastasis	16	94.11%	98.41%
Abscess	15	93.75%	98.43%
Hemangioma	11	100%	100%
HCC	9	90%	100%
Hydatid Cyst	7	100%	100%
Liver Cyst	6	100%	100%

Conclusion

- Cysts (hydatid and simple liver cyst) have typical appearances on both US as well as CT, having same specificity and sensitivity (almost 100% in our study) so if diagnosed in one modality no further investigation is needed.
- The sensitivity of USG in detecting liver metastasis is comparable to CECT.
- CT is superior to US in showing exact extent of a focal lesion and in delineating adjacent organs; so it is useful to clarify the extent of the liver tumors or hydatid cysts prior to planned surgical resection.
- Using spiral CT technique, there is a high degree of sensitivity and specificity (up to100%) in showing lesions such as hemangioma, which have specific enhancing pattern. US however is non-specific in diagnosis of hemangioma.
- Appearances of amoebic as well as pyogenic abscesses are non-specific on either imaging modality and require needle aspiration cytology for confirmation. However follow up study after a course of treatment (metronidazole/antibiotics) is easier with ultrasound.
- US is more easy and specific in distinguishing solid from cystic lesions.

- On CT, the normal liver density is 65+5 HU. Marked deviations allow specific diagnosis to be made immediately, such as focal fatty change.
- So in essence US and CT are the modalities having comparable specificity and sensitivity, CT is being slightly more accurate than US in the detection of focal hepatic lesions.

In spite of the various advantages of CT over US, in developing country like ours, due to various factors like availability and cost constraints it would suffice, to use US alone, and CT should be employed for evaluation of complicated cases and not as a primary imaging modality but should be reserved for confirmation and to know exact extent of the lesions in surgically planned cases.

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Images

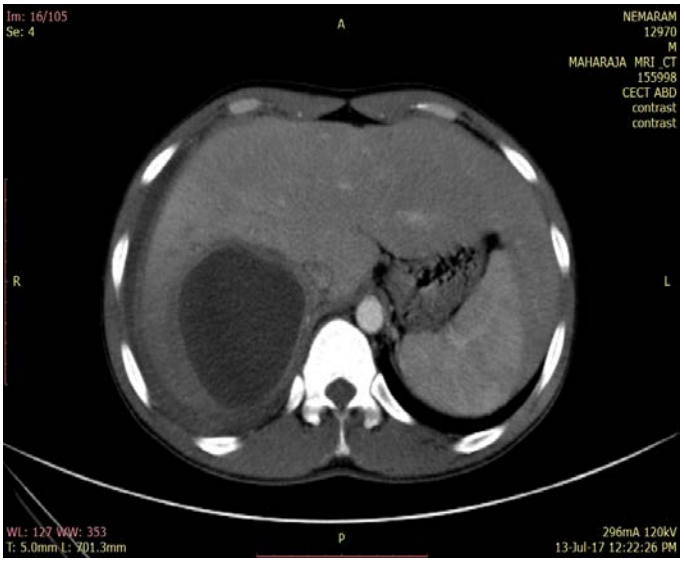

Figure 1: shows a hypodense area with thick enhancing wall and diagnosed as liver abscess. USG guided aspiration done and HPR report confirmed pyogenic abscess.

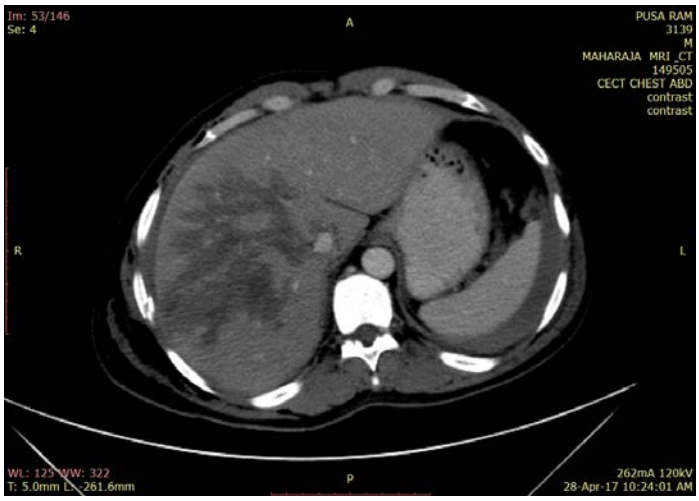

Figure 2: CECT shows multiple contusion and lacerations in Rt lobe of Liver.

Figure 3: CECT shows multiple hypodense lesions with peripheral enhancement seen in both lobes of liver with primary of Ca Prostate in 50 yrs old patient.

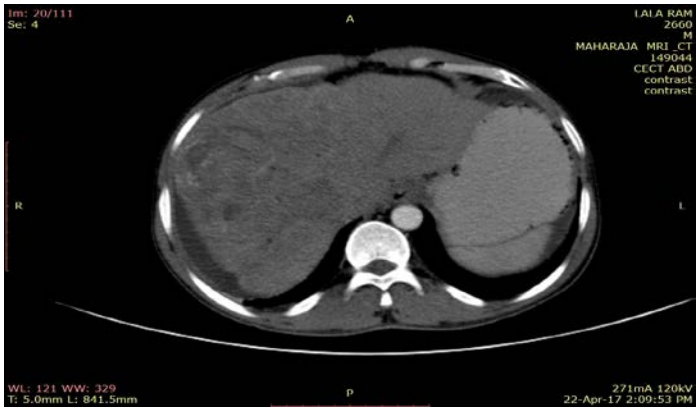

Figure 4: CT was showing heterogenous density and enhancement. Later biopsy revealed it is a HCC.

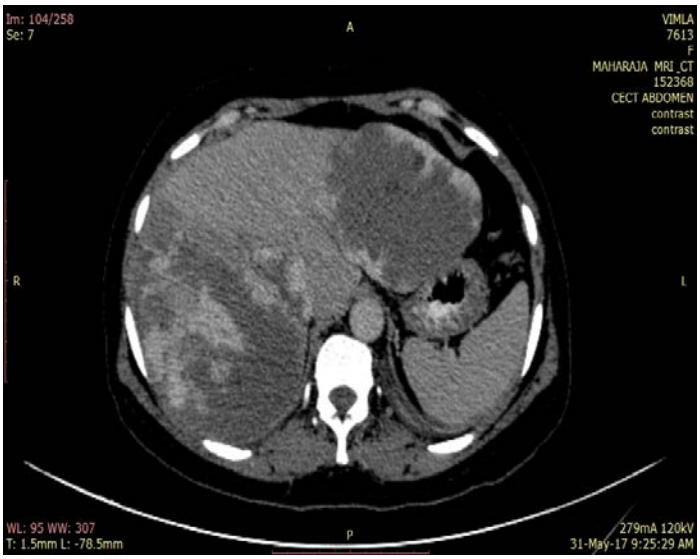

Figure 5: CECT image of the lesion was heterogenous, located in right and left lobe with irregular margins and areas of discontinuous nodular enhancement as well areas of internal enhancement. On delayed image the lesion became completely isointence, diagnosed as Hemangioma.

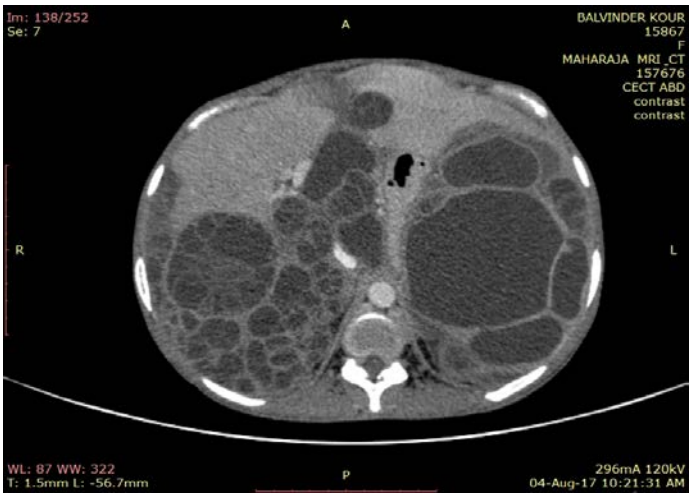

Figure 6: CECT shows multiple peripheral enhancing cystic lesions with internal daughter cysts and typical Cart-wheel appearance.