

A study to assess the distribution of cystic and solid hepatic lesions on contrast enhanced helical computed tomography

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Abstract

Introduction: Focal liver lesions are defined as solid or liquid-containing masses foreign to the normal anatomy of the liver that may be told apart from the latter organ using imaging techniques. **Material and Methods:** This prospective study was done in the Department of Radiodiagnosis and imaging at Bhopal Medical Centre, Bhopal, Madhya Pradesh, India. A total of 100 patients who were referred to our department with strong clinical suspicion of focal liver lesion and those diagnosed by ultrasonography underwent multiphase contrast enhanced CT evaluation of abdomen using Single slice Spiral CT scanner from March 2010 to May 2012. **Results:** The majority of lesions appeared as solid lesions on CT comprising 63% of lesions. The remaining were cystic lesions comprising 37% of cases. Among the cystic lesions, the most common CT diagnosis was Simple Cyst Seen in 49% of cases. The other diagnosis was liver abscess in 30% and hydatid cyst in 21%. Among the solid lesions, the most common CT diagnosis was that of metastases seen in 49% of cases. The next common lesions seen were HCC seen in 22.5% of cases and hemangioma seen in 19.5% of cases. **Discussion:** Simple cysts are diagnosed by the presence of a well defined intra hepatic mass of fluid attenuation, no perceptible wall or internal septations and no enhancement. Among solid lesions, haemangiomas were diagnosed by the presence of a hypodense lesion with peripheral nodular enhancement of arterial attenuation with centripetal fill in. **Conclusion:** Most of the lesions evaluated were solid compared to cystic. Among cystic lesions, simple cyst was the most common abnormality seen in around half the cases followed by liver abscess and hydatid cyst. Among the solid lesions, the most common abnormality detected was metastases seen in around half the cases followed by HCC and hemangioma.

Keywords: Cystic lesion, solid hepatic lesion, Contrast enhanced helical computed tomography.

Introduction

Focal liver lesions are defined as solid or liquid-containing masses foreign to the normal anatomy of the liver that may be told apart from the latter organ using imaging techniques [1]. They may be benign, malignant or metastatic in origin. Commonly encountered benign lesions include pyogenic liver abscess, focal nodular hyperplasia, simple cyst, hydatid cyst and hemangiomas.

Malignant lesions include Hepatocellular carcinoma, Intrahepatic Cholangiocarcinoma. Metastatic lesions include secondaries from colon, lung, breast, stomach, pancreas, prostate, etc. [2]. The objectives of liver

imaging in oncology are the detection of the liver disease, the characterization of liver lesions, the staging of neoplasms, the evaluation of biliary ductal status, the evaluation of treatment response, and the assessment of vascular anatomy for surgical planning and chemotherapy pump placement [3].

CT offers the best spatial resolution and the ability to study the entire liver in a single breath-hold. Recent technological advances in CT technology, such as helical CT and multidetector row helical CT, have further improved the performance of CT scanners in terms of speed of acquisition, resolution, and the ability to image the liver during various phases of contrast enhancement more precisely than was possible previously [4].

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Recent advances in CT provide higher spatial and temporal resolution for the evaluation of liver tumor hemodynamics, while also providing three-dimensional or four-dimensional imaging for treatment planning. Perfusion CT provides quantitative information about arterial perfusion in HCC, allowing the evaluation of tumor angiogenesis and response to therapy [5,6].

There is insufficient diagnostic performance for both the early detection and the characterization of small liver lesions even with computed tomography (CT) and magnetic resonance (MR) imaging techniques. As such, there is a need to improve on morphology-based CT and MR imaging using contrast agents for the early detection and characterization of hepatic disease [7].

Material and Methods

This prospective study was done in the Department of Radiodiagnosis and imaging at Bhopal Medical Centre, Bhopal, Madhya Pradesh, India. A total of 100 patients who were referred to our department with strong clinical suspicion of focal liver lesion and those diagnosed by ultrasonography underwent multiphase contrast enhanced CT evaluation of abdomen using Single slice Spiral CT scanner from March 2010 to May 2012.

Inclusion criteria

- Patients referred to the Radio diagnosis Department of Bhopal Medical Centre, Bhopal with strong clinical suspicion of focal lesion of liver including those with primary malignancy elsewhere.
- Patients already diagnosed with focal liver lesion by ultrasonography

Exclusion criteria

- Patients with diffuse liver diseases
- Patients with mass lesions infiltrating the liver from outside the liver
- Patients with traumatic injury to liver

Results

The present study was carried out in the Department of Radiodiagnosis Bhopal Medical Centre, Bhopal, Madhya Pradesh.

A total of 100 patients were included which were referred to our department with history of focal liver lesions. Contrast Enhanced Multiphase Computed Tomography was performed and evaluated for the underlying focal liver lesion.

In our study, majority of patients belonged to the age group 30-39 Years (29%) and males constituting 55% of cases. The most common clinical presentation was that of pain in abdomen seen in 57% of cases. The second most common presentation was that of history of malignancy elsewhere seen in 36%.

Procedure- After obtaining the written consent from all the participants under the study, detailed history of the patient including signs and symptoms, detailed physical examination, biochemical investigations and radiological investigations which included chest x-ray and ultrasonography of the abdomen were recorded.

The liver was viewed in non-contrast enhanced phase, arterial phase, portal venous phase and delayed phase in axial, sagittal and coronal sections and any abnormality was identified. When multiple lesions are noted the most representative lesion or the largest of the lesions was taken into consideration.

When different types of lesions were identified in the same person representative lesions of each type was considered. The following characteristics of the lesions were noted.

- The number of lesions
- The segmental location of the lesion
- The size and shape of the lesion
- The presence of calcification/ septa/ internal nodules
- The wall/ thickness of wall/sharpness of contour
- Homogenous/heterogenous
- Presence/absence of enhancement
- Pattern of enhancement in arterial, portal venous and delayed phases
- Potency of vessels
- Surrounding hepatic parenchyma
- Other specific features.

Follow up of all patients were done either with biopsy, aspiration, surgical correlation, follow-up ultrasonography to look for the stability of the lesion or additional investigations like MRI/nuclear scintigraphy.

The final diagnosis was made. Then results obtained were compared with the multiphase contrast enhanced helical CT imaging findings and tabulated.

Table No.-1: Frequency of cystic lesions and solid lesions.

Appearance	No. Of cases	% of cases
Cystic	37	37%
Solid	63	63%
Total	100	100

The majority of lesions appeared as solid lesions on CT comprising 63% of lesions. The remaining were cystic lesions comprising 37% of cases.

Table No.-2: Cystic lesions distribution.

Lesion	Criteria	No. of cases	% of cases
Simple cyst	homogenous, imperceptible wall, no enhancement	18	49%
Hydatid cyst	Perceptible wall, enhancement, daughter cysts or membrane	8	21%
Liver abscess	thick, irregular wall ring enhancement, surrounding edema	11	30%
Total		37	100%

Among the cystic lesions, the most common CT diagnosis was Simple Cyst Seen in 49% of cases. The other diagnosis was liver abscess in 30% and hydatid cyst in 21%.

Table No.-3: Solid lesions distribution.

Lesions	Criteria	No. of cases	% of cases
Hemangioma	hypodense with peripheral nodular enhancement with centripetal fill in	12	19.5%
FNH	hypodense with homogenous arterial enhancement with hypodense central cleft	1	1.5%
Focal fat	hypodense, no enhancement, adjacent to falciform ligament, no mass effect	2	3%
Hcc	heterogenous hypodense with enhancement in arterial phase, washout in delayed phase	14	22.5%
Cholangio carcinoma	hypodense ill defined margins with delayed prolonged enhancement	1	1.5%
IHE	hypodense ill defined lesion with arterial enhancement and isodense in delayed phase	1	1.5%
Hepatoblastoma	hypodense lesion with calcification and mixed enhancement	1	1.5%
Metastases	hypo-iso-or hyper, homo-or heterogenous lesions with variable enhancement	31	49%
Total		63	100

Among the solid lesions, the most common CT diagnosis was that of metastases seen in 49% of cases. The next common lesions seen were HCC seen in 22.5% of cases and hemangioma seen in 19.5% of cases.

Discussion

A cystic lesion is defined as one having an average attenuation coefficient between 0 and 20 HU [8]. Among the liver lesions solid lesions constituted the majority with 63% of cases and cystic lesions constituting a minority of 37% of cases.

Simple cysts are diagnosed by the presence of a well defined intra hepatic mass of fluid attenuation, no perceptible wall or internal septations and no enhancement [8]. Among the patients with simple cysts, one case of multiple liver cysts (more than 10)

associated with polycystic kidney Disease having multiple cortical cysts in the kidney was observed. Hydatid cysts are diagnosed by the presence of a well defined lesion of fluid attenuation with a perceptible wall which may undergo enhancement. Calcifications or daughter cysts or membranes may be present [8]. Among these, calcification was seen in 6/8 (75%) of cases and daughter cysts were seen in 4/8 (50%) of cases.

Liver abscesses are diagnosed by the presence of a well defined lesion with thick, irregular wall, ring enhancement and surrounding edema [9]. But one case of cystic metastases from Gall Bladder mass was wrongly diagnosed as liver abscess (false positive).

Among solid lesions, haemangiomas were diagnosed by the presence of a hypodense lesion with peripheral nodular enhancement of arterial attenuation with centripetal fill in [10,11].

FNH was diagnosed as a hypo/ iso dense lesion with homogenous arterial enhancement and a hypodense central cleft corresponding to the scar [12]. One case was wrongly diagnosed as metastases (false negative) and it had Hyper-A-A pattern.

Focal fat was diagnosed by the presence of a hypo-hypo lesion showing no enhancement, located adjacent to the falciform ligament and without any mass effect.

HCC was diagnosed by the presence of a heterogenous hypodense mass with hyper enhancement in the arterial phase with or without abnormal internal vessels and washout in venous phase [13]. One case of regenerative nodule in cirrhotic liver and a case of hemangioma were wrongly diagnosed as HCC (false positive).

Cholangiocarcinoma was diagnosed by the presence of a hypodense ill defined lesion with delayed and prolonged enhancement [14].

IHE was identified by the presence of solitary/ multiple hypodense lesions with arterial enhancement becoming isodense in the delayed phase. One case was seen and diagnosed correctly using these criteria. Multiple lesions were seen distributed throughout the liver. Associated cutaneous hemangiomas were also seen. Hepatoblastoma was diagnosed by the presence of a large hypodense lesion with calcification and mixed pattern of enhancement. This was similar to the study conducted by Dachman et al [15].

Thus the differentiation of cystic and solid lesions using Contrast Enhanced Multiphasic Computed Tomography in our study shows high accuracy and also helps in further characterization of the lesions based on the morphological and enhancement characteristics.

Conclusion

Most of the lesions evaluated were solid compared to cystic. Among cystic lesions, simple cyst was the most common abnormality seen in around half the cases followed by liver abscess and hydatid cyst. Among the solid lesions, the most common abnormality detected was metastases seen in around half the cases followed by HCC and hemangioma.

The accuracy of Contrast Enhanced Multiphasic Computed Tomography in detecting and characterizing focal liver lesions is high and it should be considered in the imaging work up of any patient with focal liver lesions.

This helps in guiding further management of these patients avoiding unnecessary investigations and work up for the diagnosis as there is a high incidence of benign pathologies in the liver.

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