Original Article

Detection and characterization of focal liver masses- presentation of cases at a tertiary medical centre

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Received: 13 March, 2023 Accepted: 3 June, 2023

ABSTRACT

Introduction: Hepatic masses can be caused by a wide range of lesions, both cancerous and non- cancerous, and there are many possibilities for a differential diagnosis. The present study aims to detect and characterize focal liver masses that were presented to the department of radio-diagnosis at tertiary medical centre in Rajasthan, India. **Materials and Method**: The present prospective study was collected among 60 patients attending the department of Radio Diagnosis of Pacific Medical College and Hospital (PMCH), Udaipur with clinically suspected focal liver lesions, or previous images depicted focal hepatic lesions with non specific appearance. The patients were evaluated with Triple Phase CT (128 Slice Dual Source Siemens Somatom). **Results:** There was female preponderance in hepatocellular carcinoma (HCC) (75%), Intrahepatic CCA (Cholangio Carcinoma) (50%) and metastases (64.29%) when compared to males. All cases of Adenoma, FNH and Hemangiomas (100%) were seen in females. Of the total focal liver lesions seen in 60 patients there were 57 hypo vascular lesions accounting for 95% of the total (n=60) lesions and 3 hyper vascular lesions accounting for 5% of the total (n=60) lesions. There were 42 lesions showed arterial enhancement accounting for 70% of the total (n=60) patients and 18 lesions showed delayed enhancement accounting for 30% of the total (n=60) patients. **Conclusion**: The most common malignant lesion was metastases followed by HCC and Intrahepatic CCA. Hemangiomas (n=14) was the most common benign lesion, followed by and Adenoma (n=2), FNH. Hemangiomas was seen in almost all age groups; about 40% of cases of hemangioma were seen in age range of 51-60 years. Majority (42%) of the patients with metastases were in the age range of 51- 60 years. Majority (75%)of the patients with HCC were in the age range of 51-80 years. Intrahepatic Cholangiocarcinoma were in the age range of 71-90 years. Adenoma was seen in the age range of 41-50years. FNH were seen in patients < 50years.

Keywords: Hepatic masses; Hepatic malignancy; Metastasis; Triple Phase CT;

INTRODUCTION

Hepatic masses can be caused by a wide range of lesions, both cancerous and non- cancerous, and there are many possibilities for a differential diagnosis. Both primary hepatic lesions and metastases are included. The clinical history, age, gender, history of medication use, including hormone use, imaging features, and the presence of any underlying liver disorders must all be correlated to make a diagnosis. The type of underlying liver disorder offers a critical indicator of the most likely possibilities, and cirrhosis' presence or absence is crucial in creating the differential diagnosis.[1] 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.[2,3] Characterization of a hepatic lesion using triple phase CT is very crucial in distinguishing a benign lesion from malignant to avoid unnecessary invasive procedures especially in benign tumors like hemangioma.[4] Improved detection and characterization can help determine which hepatic tumors may be amenable to aggressive surgical techniques and which indicate palliative treatment. Few studies have elucidated its role and most of them have been on western population. The identification and classification of focal liver lesions remain difficult. Characterization of these lesions is crucial because benign focal liver lesions like cysts, hemangiomas, and focal nodular hyperplasia occur frequently. With the widespread use of diagnostic imaging modalities, these lesions, which are distinct abnormalities developing within the liver, are being found more frequently. It is thought that differentiating these liver lesions is essential for choosing the best course of treatment. Patients who present with a focal liver lesion have a wide range of possible diagnoses, including both malignant and non-malignant lesions.[1] The present study aims to detect and characterize focal liver masses that were presented to the department od radio-diagnosis at tertiary medical centre in Rajasthan, India

MATERIALS AND METHOD

The present prospective study was collected among 60 patients attending the department of Radio Diagnosis of Pacific Medical College and Hospital (PMCH), Udaipur with clinically suspected focal liver lesions, or previous images depicted focal hepatic lesions with non specific appearance. The patients were evaluated with Triple Phase CT (128 Slice Dual Source Siemens Somatom).

Inclusion Criteria consisted of patients with suspicion of hepatic masses on clinical and ultrasonography findings and cases of all age groups, irrespective of gender were included. Exclusion criteria comprised of patients with renal failure (raised serum creatinine), patients who were at risk for allergic reactions to contrast, pregnant patients, claustrophobic patients, focal liver lesions with infective etiology (hydatid cyst and liver abscess) and patients not willing to give consent for the study. The ethical permission was taken from the Institutional Ethical committee before commencement of the study. If the inclusion criteria are fulfilled, the patient were briefed about the procedure and relevant instruction was given to the patient and written informed consent was taken from each patient. Findings of general and physical and specific systemic examination was recorded as per the proforma attached. Patients were kept nil orally 4 hours prior to the CT scan to avoid complications while administrating contrast medium. Risks of contrast administration were explained to the patient and consent was obtained prior to the contrast study. Routine anteroposterior topogram of the abdomen was initially taken in all patients in the supine position withthe breath held. Axial sections of 5 mm thickness were taken from the level of lung bases to the level ischial tuberosities. In all cases plain scan was followed by intravenous contrast scan in suspended inspiration. For contrast enhancement, 18G Vasofix (indwelling catheter) was placed in antecubital vein and dynamic injection at a rate of about 80-100cc of non ionic contrast material (omnipaque: iohexol; 320mg iodine/ml) was given initially. Sections were taken in HAP (40s), PVP (60s) and delayed (3-5mins) phases in craniocaudal direction from the superior margin to the inferior border of the liver.

Post study reconstructions were done at 2.5 mm. Sagittal and coronal reconstructions were made wherever necessary. Newer techniques in Multislice CT like curved planar reformatting, volume rendering, Maximum and Minimum Intensity Projections were done as and when necessary. The magnification mode was commonly employed, and the scans were reviewed on a direct display console.

Image interpretation:

Dynamic viewing of all reconstructed images was done. First the unenhanced, HAP, and PVP images were reviewed for presence of focal liver lesions. Second the CT appearance of each lesion in each phases (unenhanced, HAP, PVP and delayed images) are characterized based on enhancement patterns and its attenuation compared with that of the liver parenchyma in that phase. Lesions were broadly grouped as hypervascular lesions relative to the surrounding parenchyma or, as hypovascular lesions compared with the surrounding parenchyma. Images of different phases were analyzed separately and later were reinterpreted together. Later the lesions were confirmed by biopsy/surgery/usg/ follow-up as and when required. In some patients with multiple lesions biopsy was performed on only two lesions rest with similar CT appearance were assumed to be the same lesion. If the lesion did not show any change in size after minimum of six months than the lesion was presumed to be benign. If the number of lesions were >10 than analysis of 10 most representative lesions was performed using the combination of all the phases. The size and conspicuity of lesions on each phase were noted. Lesion consipiquity was graded as, 0-Not Visualized, 1-Visualised, as 2-Good and 3- Excellent. The pattern of enhancement is a three-pattern name that includes appearance of lesionin each phase (e.g.; hypo/hyper/mix).

Additional patterns of subtype enhancement in arterial phase like peripheral puddles, variegated, continuous hyperattenuating rim, incomplete rim and cleft were also considered. All relevant details including history, general clinical examination findings, radiological findings and cytopathological interpretations were recorded in case reporting form. A database was constituted using SPSS version 22 and electronic Microsoft Excel spreadsheets to store and manage the collected data. Categorical data has been represented as frequency (number) and proportions (percentages). Continuous data has been presented as Mean+Standard deviation (SD). For the analysis of data, ANOVA and Chi-square tests were used. The confidence level of the study was kept at 95%, hence a p-value <0.05 was considered as statistically significant.

RESULTS

Focal liver lesions were detected in 60 patients, 20 lesions were benign and 40 lesions were malignant. The most common malignant lesion was Metastases (n=34) followed by hepatocellular carcinoma (HCC) (n=4) and Intrahepatic CCA (n=2). Hemangiomas (n=14) was the most common benign lesion (table 1).

Percentage distribution of focal liver lesions according to age in years as given in table 2 as follows:

1. Hemangiomas was seen in almost all age groups; about 40% of cases of

hemangioma seen in age range of 51-60 years.
2. Majority (42%) of the patients with metastases were in the age range of 51- 60 years.
3. Majority (75%) of the patients with HCC were in the age range of 51-80 years.
4. Intrahepatic Cholangiocarcinoma were in the age range of 71-90 years.
5. Adenoma was seen in the age range of 41-50years. 6) FNH were seen in patients < 50years.

There was female preponderance in HCC (75%), Intrahepatic CCA (50%) and metastases (64.29%) when compared to males (table 3). All cases of Adenoma, Focal nodular hyperplasia (FNH) and Hemangiomas (100%) were seen in females. Of the total focal liver lesions seen in 60 patients there were 57 hypo vascular lesions accounting for 95% of the total (n=60) lesions and 3 hyper vascular lesions accounting for 5% of the total (n=60) lesions (table 5).

Among the total focal liver lesions, there were 42 arterial enhancement accounting for 70% of the total (n=60) patients and 18 delayed enhancement accounting for 30% of the total (n=60) patients (table 6).

Of the 57 hypovascular lesions, malignant hypovascular lesions included metastases (n=4) accounting for 21.04% of the total hypovascular lesions, Hemangioma in 12(63.16%) & adenoma 2(10.53%) (table 8).

Of the 42 Arterial Enhancement lesions, Malignant Arterial Enhancement lesions were metastasis in 29 (69.05%) followed by hemangioma and HCC 4 (9.52%) respectively, focal nodular hyperplasia and intrahepatic cholangiocarcinoma in 2 (4.76%) each and hemangioma 1 (2.38%) (table 8).

Table 1: Distribution of Patients According to Diagnosis

Diagnosis	Number	Percent
Intrahepatic Cholangio Carcinoma (Intrahepatic CCA)	2	3.33%
Hepatocellular carcinoma (HCC)	4	6.67%
Hemangioma	14	23.33%
Metastasis (METS)	34	56.67%
Adenoma	2	3.33%
Giant Hepatic Hemangioma	1	1.67%
Atypical Hemangioma	1	1.67%
Focal nodular hyperplasia (FNH)	2	3.33%
Total	60	100.00%

Table 2: Distribution of Diagnosis According to Age

		Age Group (yrs)							
		<21 (n-1)	21-30 (n-2)	31-40 (n-6)	41-50 (n-9)	51-60 (n-20)	61-70 (n-14)	71-80 (n-6)	81-90 (n-2)
Intrahepatic Cholangio Carcinoma	No.	0	0	0	0	0	0	1	1
	%	0.00%	0.00%	0.00%	0.00%	0.00%	0.0%	16.67%	50.00%
HCC	No.	0	0	1	0	1	1	1	0
	%	0.00%	0.00%	14.29%	0.00%	5.00%	7.69%	16.67%	0.00%
Hemangioma	No.	1	1	2	1	5	1	3	0
	%	100.00%	50.00%	28.57%	11.11%	25.00%	7.69%	50.00%	0.00%
METS	No.	0	0	2	5	14	11	1	1
	%	0.00%	0.00%	\28.57%	55.56%	70.00%	84.62%	16.67%	50.00%
Adenoma	No.	0	1	0	1	0	0	0	0
	%	0.00%	50.00%	0.00%	11.11%	0.00%	0.00%	0.00%	0.00%
Giant Hepatic Hemangioma	No.	0	0	0	1	0	0	0	0
	%	0.00%	0.00%	0.00%	11.11%	0.00%	0.00%	0.00%	0.00%
Atypical Hemangioma	No.	0	0	1	0	0	0	0	0
	%	0.00%	0.00%	14.29%	0.00%	0.00%	0.00%	0.00%	0.00%
FNH	No.	0	0	1	1	0	0	0	0
	%	0.00%	0.00%	14.29%	11.11%	0.00%	0.00%	0.00%	0.00%

Table 3: Distribution of Diagnosis According to Gender

		Gender	
Diagnosis		Female	Male
Intrahepatic Cholangio Carcinoma	No.	1	1
	%	3.13%	3.57%
HCC	No.	3	1
	%	9.38%	3.57%
Hemangioma	No.	6	8
	%	18.75%	28.57%
METS	No.	16	18
	%	50.00%	64.29%
Adenoma	No.	2	
	%	6.25%	0.00%
Giant Hepatic Hemangioma	No.	1	
	%	3.13%	0.00%
Atypical Hemangioma	No.	1	
	%	3.13%	0.00%
FNH	No.	2	
	%	6.25%	0.00%

Table 4: Distribution of Lesions According to Gender

Lesions	Female		Male		Total	
	No.	Percentage	No.	Percentage	No.	Percentage
Few	0	0.00%	1	3.57%	1	1.67%
Mass, Multiple lesions	1	3.13%	0	0.00%	1	1.67%
Multiple	20	62.50%	18	64.29%	38	63.33%
Single	10	31.25%	5	17.86%	15	25.00%
Single mass, Multiplelesions	0	0.00%	1	3.57%	1	1.67%
Two	1	3.13%	3	10.71%	4	6.67%
Total	32	100.00%	28	100.00%	60	100.00%

Table 5: Distribution of Density in Focal liver lesions According to Gender

Lesions	Female		Male		Total	
	No.	Percentage	No.	Percentage	No.	Percentage
Hypodense lesion	28	87.50%	25	89.29%	53	88.33%
Isodense lesion	1	3.13%	1	3.57%	2	3.33%
Nodular soft tissuedensity	0	0.00%	1	3.57%	1	1.67%
Hypodense lesion	1	3.13%	0	0.00%	1	1.67%
Isodense lesion, Hypodense lesion	2	6.25%	1	3.57%	3	5.00%
Grand Total	32	100.00%	28	100.00%	60	100.00%

Table 6: Distribution of Arterial and Delayed Enhancement in Focal Liver Lesions of the Total Lesions (n= 60)

Group	Number	Percentage
Arterial Enhancement	42	70%
Delayed Enhancement	18	30%
Total	60	100%

Table 7: Distribution of Benign/Malignant Delayed Enhancement Lesions (n = 18)

Delayed Enhancement	Number	Percentage
Hemangioma	12	63.16%
Adenoma	2	10.53%
Metastases	4	21.06%
Total	18	100.00%

Table 9: Distribution of Benign/Malignant Arterial Enhancement lesions (n = 42)

Arterial Enhancement lesions	Number	Percentage
Giant Hemangioma	1	2.38%
Intrahepatic Cholangiocarcinoma	2	4.76%
Focal Nodular Hyperplasia (FNH)	2	4.76%
Hepatocellular carcinoma (HCC)	4	9.52%
Hemangioma	4	9.52%
Metastasis (METS)	29	69.05%
Grand Total	42	100.00%

DISCUSSION

In our study focal liver lesions were detected in 60 patients, 20 lesions were benign and 40 lesions were malignant. The most common malignant lesion was Metastases (n=34) followed by HCC (n=4) and Intrahepatic CCA (n=2). Hemangiomas (n=14) was the most common benign lesion, followed by and Adenoma (n=2), Focal nodular hyperplasia (FNH). Similar to present study Kaushal L et al[5] observed HCC in 13 (13.0%), Hemangioma in 23 (23.0%), Metastasis in 36 (36.0%), Adenoma in 7 (7.0%) & FNH in 3 (3.0%). Ibrahim AK et al[6] observed Hepato Cellular Carcinoma affected 9(23.1%) and Metastases constituting 15(38.5%) out of the 39 patients. Dakshit D et al[7] reported Metastasis in 35,Hemangioma in 24, HCC in 13, Adenoma in 6 & FNH in 3. In present study hemangiomas was seen in almost all age groups; about 40% of cases of hemangioma were seen in age range of 51-60 years. Majority (42%) of the patients with metastases were in the age range of 51- 60 years. Majority (75%) of the patients with HCC were in the age range of 51-80 years. Intrahepatic Cholangiocarcinoma were in the age range of 71-90 years. Adenoma was seen in the age range of 41-50years. FNH were seen in patients < 50years. Regarding gender distribution among individual abnormality in our study. There was female preponderance in HCC (75%), Intrahepatic CCA (50%) and metastases (64.29%) when compared to males. All cases of Adenoma, FNH and Hemangiomas (100%) were seen in females. Our Findings were similar to those of Kushal L et al[5] who observed HCC 3 (10), hemangioma 16 (7), metastasis 15 (21), adenoma 7 (0), FNH 3 (0) in their study. As detected by MDCT in study by Jain S et al,[7] out of 84 focal liver lesions, benign focal liver lesions were 72(85.7%) and malignant lesions were 12 (14.3%). In males majority had multiple lesions (64.29%), followed by single and double lesions. Similarly in females multiple lesions were observed in 62.50% followed by single in 31.25% and two in 3.13%. Young and middle-aged females are most commonly affected by the benign hepatic neoplasm known as hepatocellular adenoma[8]Adenomas are made up of cords of healthy hepatocytes that are arranged in layers without acinar distribution, portal spaces, and ductular structures. These cords vary in their lipid and glycogen content. Oestrogen and androgen-containing steroids increase the frequency, frequency, and number of hepatocellular adenomas.[9]

In our study of the total focal liver lesions observed in 60 patients, there were 57 hypovascular lesions accounting for 95% of the total (n=60) lesions and 3 hyper vascular lesions accounting for 5% of the total (n=60) lesions.

In our study there were 42 cases showed arterial enhancement accounting for 70% of the total (n=60) patients and 18 cases showed delayed enhancement accounting for 30% of the total (n=60) patients. In our study of the 57 hypovascular lesions, malignant hypovascular lesions included metastases (n=4) accounting for 21.04% of the total hypovascular lesions. Hemangioma in 12 (63.16%) and adenoma in 2 (10.53%). Kaushal L et al[5] observed Hemangioma 23 (23.0%), Metastasis 36 (36.0%), Adenoma 7 (7.0%). Manchikanti V et al[10] observed metastases 10(25%), hemangioma 7(17.5%) similar to present study. Of the 42 Arterial Enhancement lesions, Malignant Arterial Enhancement lesions were metastasis in 29 (69.05%) followed by hemangioma and HCC 4 (9.52%) respectively,focal nodular hyperplasia and intrahepatic cholangiocarcinoma in 2 (4.76%) each and hemangioma 1 (2.38%). Kaushal L et al[5] observed most common primary benign and malignant hepatic masses were hemangioma (23%) and HCC (13%) respectively. Hemangioma was commonly seen in females (69.5 %) while HCC (76.9 %) and secondary liver metastases (58.3 %) in males. In a study by Tomar S et al,[11] 55 patients, 4 (7.27%) were benign and 51 (92.73%) were malignant cases detected with the help of USG and same was verified on the basis of triphasic CT assessment.

CONCLUSION

The most common malignant lesion was Metastases (n=34) followed by HCC (n=4) and Intrahepatic CCA (n=2). Hemangiomas (n=14) was the most common benign lesion, followed by and Adenoma (n=2),FNH. Hemangiomas was seen in almost all age groups; about 40% of cases of hemangioma were seen in age range of 51-60 years. Majority (42%) of the patients with metastases were in the age range of 51- 60 years. Majority (75%) of the patients with HCC were in the age range of 51-80 years. Intrahepatic Cholangiocarcinoma were in the age range of 71-90 years. Adenoma was seen in the age range of 41-50years. FNH were seen in patients < 50years.

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