

# Role of MDCT Evaluation in Detection and Characterisation of Hepatic Mass Lesions

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## A B S T R A C T

**Introduction:** Multiphasic Computed Tomography (CT) has become the chief imaging modality for recognition and characterisation of focal liver lesions. CT has assumed primary role in evaluating hepatic masses. Study aimed to assess the imaging features of focal hepatic lesions on Multidetector Computed Tomography (MDCT) and its comparative assessment with histopathological results.

**Material and Methods:** This cross-sectional study was conducted in the Department of Radiodiagnosis in a tertiary care hospital for a period of 15 months. Adult patients of age group 20-60 years with focal hepatic lesions on abdominal imaging (USG), all patients presenting with deranged liver function or known cases of liver mass lesions were included in the study. All the values for the arterial phase, venous phase, portal phase and delayed phase were recorded and analysed along with the histopathological and biochemical analysis report. SPSS (Version 22.0) was used for analysis.

**Results:** As detected by MDCT, out of 90 focal liver lesions, benign focal liver lesions were 70(85%) and malignant lesions were 12 (14.3%). The diagnostic accuracy (efficiency) of MDCT was found to be 95% with predicted value (95% CI: 84.20-96.75%). For the hepatocellular carcinoma cases, highly significant agreement ( $p < 0.001$ ) was found between MDCT and biopsy techniques. The overall sensitivity, specificity, PPV, NPV and diagnostic accuracy for malignant lesions was found to be 83%, 97%, 83%, 97% and 95% respectively.

**Conclusion:** The study indicates MDCT to be highly sensitive in classifying the hepatic lesions into clinically relevant categories, making diagnosis and evaluation of lesion.

**Keywords:** Benign, Malignant, Hepatic Lesion, Contrast Enhanced Computed Tomography, Hepatic Cancer

## INTRODUCTION

Focal liver lesions are best assessed and characterised by multiphasic CT. It is an effective aid in determining the number, location, and nature of such lesions and monitoring their size over period. In patients with cancer, the precise detection of metastatic disease at the time of diagnosis or during treatment remains crucial to organisation of the disease. Multidetector Computed Tomography (MDCT) represents an advance in CT technology that involves the use of a multiple-row detector array instead of the traditional single-row detector array used in spiral CT. This innovation allows scanning four to eight times faster than scanning with spiral CT.<sup>1</sup> A triphasic spiral CT technique images the entire liver in arterial, portal, and equilibrium phases.<sup>2,3</sup> Rapid availability and short scanning time made CT an ideal imaging modality.<sup>4,5</sup> Inclusion of arterial phase imaging along with portal venous imaging improves the lesion detection especially in hyper vascular neoplasms.<sup>6</sup> Most sensitive phase for lesion detection is portal phase whereas additional information on vascularity of the lesion is given by arterial and equilibrium phases.<sup>7</sup> Multiple modalities in radiological

imaging along with histopathological characteristics and clinical assessment are used to achieve a correct diagnosis.<sup>7</sup> In the available literature there are fewer comprehensive studies about the character of multiphasic MDCT scan in characterising liver lesions under benign or malignant category and were conducted with a very small sample size. With the above background, this study was assumed as an effort to assess the role of MDCT in detection and characterisation of focal liver lesions with a larger sample size and help in deciding further course of management.

## MATERIAL AND METHODS

This cross-sectional study was conducted in the Department of Radiodiagnosis in Tertiary care institute for a period of 15 months from January 2018 to April 2019 and total of 90 patients were included in the study. Sample size was calculated based on specification and Positive Predictive Value of MDCT<sup>8</sup> using the formula:

$$n = Z\alpha \times P(1-P)/L^2$$

$$\text{Sample Size} = 2 \times 2 \times 0.05 \times (1-0.05) / (0.05)^2 = 4 \times 0.05 \times 0.95 / 0.0025 = 76$$

Where,  $Z_{\alpha}=1.96$  (95% CI),  $P=Prevalence=5\%$  (based on Tertiary Care Hospital) and  $L=Margin\ of\ error=5\%$   $Loss=10\%=8$  Then sample size came out to be  $=84-90$  Adult patients of age group 20-60 years with focal hepatic lesions on abdominal imaging (USG), all patients presenting with deranged liver function or known cases of liver mass lesions and the subjects who were willing to participate in the study and gave their written consent for the same were included in the study. Patients with traumatic liver lesions and patients with deranged blood clotting profile were excluded. After obtaining approval from the institutional ethical committee and written and informed consent from all the patients, they were subjected to a USG scan followed with Quadri-phasic CECT scan and biopsy. Obtained samples were sent for histopathology and biochemical analysis. All the values for the arterial phase, venous phase, portal phase and delayed phase were recorded, and all the patients were followed up till histopathological and biochemical report confirmation was done.

### STATISTICAL ANALYSIS

Data so obtained were subjected to statistical analysis. Results were evaluated for the best modality through which benign and malignant lesions can be differentiated. Data analysis was done by SPSS software® version 22.0. Descriptive statistical analysis, which included frequency and percentages, was used to characterise the data. chi-square test was used for association between factors and  $p < 0.05$  was considered statistically significant.

### RESULT

Out of 90 patients, maximum number of patients was from age group 30-39 years (33%). The study was male

Age (years)	N (%)
20-29	24 (26)
30-39	30 (33)
40-49	16 (17)
>50	20 (22)
Gender	
Male	50 (55)
Female	40 (45)
Addictions	
Smoking	27 (30)
Alcohol	27 (30)
Tobacco	16 (17)

**Table-1:** Demographic details of the study participant

Complaints	N (%)
Acute abdomen	61 (68)
Abdominal discomfort	84 (93)
Palpable mass	72 (80)
Abdominal mass	42 (47)
Anorexia	64 (69)
Fever	68 (71)
Weight loss	57 (66)

**Table-2:** Distribution of subjects according to complaints.

Lesions	Lesion category	N (%)
Abscess	Benign	37 (53)
Cyst	Benign	13 (15)
Haemangioma	Benign	11 (13)
Hydatid cyst	Benign	4 (2)
Hepatic granuloma	Benign	5 (4)
Hepatocellular carcinoma	Malignant	12 (14)

**Table-3:** Distribution of hepatic lesion based on MDCT

Results	N (%)	Accuracy
Matched	90 (95%)	95%
Unmatched	10 (5%)	

**Table-4:** Diagnostic Accuracy of MDCT with Hepatic lesions

MDCT	Biopsy		Total
	Benign	Malignant	
	N	N	
Benign	68 (97%)	2 (3%)	70
Malignant	2 (16%)	10 (84%)	12
Total	70 (87%)	12 (14%)	82

**Table-5:** Validity and Reliability of MDCT with respect to Biopsy

preponderance (55%). Another demographic details and lifestyle habits in which smoking, and alcohol consumption was done equally by 30% of patients. Mean age was found to be  $38.72 \pm 11.55$  (20-60 year) (table-1).

As per table 2 the most common complaint was found to be abdominal discomfort (93%) followed by palpable mass (80%). Anorexia and fever also seen while the least common complaint was found to be abdominal mass (47%) (table-2). As per table 3 Out of 90, benign focal liver lesions were 70 (87%) and malignant lesions were 12 (14%). Among the benign lesions, maximum cases were of abscess (53%) Others were Cyst (15%), Haemangioma (13%), Hydatid cyst (2%) and Hepatic Granuloma (4%). Among the malignant lesions MDCT finding was of Hepatocellular carcinoma (14%) (table-3).

as per table 4 For detecting various types of lesions, the results of MDCT matched with biopsy in 90% cases while in 10% cases the results didn't match. So, the diagnostic accuracy (efficiency) of MDCT was found to be 90.5% with predicted value (95% CI: 84.20-96.75%)

To determine the validity and reliability MDCT with respect to biopsy shows benign cases by biopsy and among the malignant cases detected by MDCT only 84% cases confirmed as malignant by biopsy. Highly significant association ( $\chi^2=44.51, p<0.001$ ) was found between MDCT and biopsy techniques. The overall sensitivity, specificity, PPV, NPV and diagnostic accuracy for malignant lesions were found to be 83%, 97%, 83%, 97% and 95% respectively.

### DISCUSSION

In the available literature there are few Indian comprehensive studies about the role of Multiphasic MDCT scan in improving the diagnostic accuracy of characterising the malignant liver lesions. Risk factors and complaints of the study subjects: Habits like smoking, alcohol consumption

and tobacco chewing that are considered as risk factors for malignant liver lesions were present in majority of subjects in our study. Such habits were also proven by Simonetti RG et al., to be risk factors for malignant liver lesions.<sup>8</sup> Validity and reliability for detecting malignant liver lesions: In present study, the overall sensitivity and specificity of MDCT with respect to biopsy, for establishing their validity and reliability in detecting malignancy in liver lesions, was found to be 83% and 97%, respectively. In addition, in a meta-analysis of hepatic metastases from cancers of the gastrointestinal tract, Kinkel K et al., reported a mean sensitivity of 72% for CT, based on 25 publications that included 1747 patients.<sup>9</sup> In a study by Khalid M et al., the diagnostic accuracy of metastatic focal hepatic lesions by MRI was 55% as compared with 17% for CT.<sup>10</sup> In this study, more recent comparisons of non-invasive imaging modalities, primarily MDCT and USG, have shown equally accurate if not better lesion detection by MDCT. However, in the present study, cases of abscess show highly significant agreement between MDCT and biopsy techniques. The overall sensitivity and specificity of MDCT was found to be 99.3% and 97.1% respectively. For the cases of cyst, highly significant agreement was found between MDCT and biopsy techniques. The overall sensitivity, specificity, PPV, NPV and diagnostic accuracy of MDCT was found to be 97.9%, 96.6%, 87.9%, 97.9% and 96.7% respectively. Ahirwar CP et al., added that with sensitivity of 91.3%, specificity 97.8%, PPV 91.3% and NPV 97.8% (p-value<0.001, kappa value 0.847), Triple phase CT is excellent diagnostic modality for characterisation and better evaluation of hepatic masses.<sup>11</sup> The hydatid cyst and hepatocellular carcinoma cases showed overall sensitivity and specificity of 97.4%, 96.1%, and 96.9%, 90.4%, respectively. In contrast Hassan and their colleagues had sensitivity and specificity of haemangiomas to be 76.9%, 88.4% and for MRI 85.2% and 91.2%, whereas, in hepatocellular carcinoma, the sensitivity and specificity of CT were 62% and 83.3% and for MRI were 90.3% and 87.5% in metastases, sensitivity and specificity of CT were 60% and 84% and for MRI were 76.2% and 87.8%.<sup>12</sup> Eighty percent of the false-positive MRI results and 67% of the false-positive CT results were primarily attributed to arterio-portal shunt. Furthermore, cirrhosis-related benign nodules may exhibit predominant hypo-attenuation on contrast-enhanced portal or delayed phase CT image<sup>13</sup> and might not be differentiated from hypo-vascular HCC. In another study 33%, of false-positive findings on MDCT were attributed to prominent cirrhosis-related nodules. In a study by Matilde NM et al., 92% of the 100 lesions demonstrate arterial enhancement.<sup>14</sup> When all lesions with circumferential ring enhancement were considered, malignancy was predicted with 86.8% specificity for metastasis. As found in this study and others, benign and malignant lesions may overlap in appearances, for example, homogeneous pattern can be exhibited by HCC, haemangiomas and FNH.<sup>14</sup> In addition, according to Pattanayak SK et al., the conspicuity of a liver lesion depends on the attenuation difference between the lesion and the normal liver.<sup>15</sup> Due to low contrast in non-enhanced CT scans between tumor tissue and surrounding liver parenchyma, tumors become invisible. Usually, a combination

of different features like enhancement pattern, pathological features like presence of fat, blood, calcifications, cystic or fibrotic component in the liver lesions along with clinical history is used to frame the differentials. Gupta K et al., also added a significant finding about the role of CT in evaluation of parenchymal focal lesions of liver and concluded that MDCT is a highly sensitive non-invasive tool for detection and characterisation of focal hepatic lesions.<sup>16</sup>

## CONCLUSION

The results of this study demonstrate MDCT to be highly sensitive in categorisation the hepatic lesions into clinically applicable categories which helps in achieving correct diagnosis and evaluation of lesion. This study opens new likelihoods of prevention of liver disease with early detection and resulting management of hepatic lesions.

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