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Original Research Article

MDCT Evaluation's Role in Identifying and Classifying Hepatic Mass Lesions

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Abstract

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.

Objective: To assess the imaging features of focal hepatic lesions on Multidetector Computed Tomography (MDCT) and its comparative assessment with histopathological results.

Materials and Methods: For 15 months, the Department of Radiodiagnosis of a tertiary care hospital hosted this cross-sectional study. The study included all patients presenting with abnormal liver function or known cases of liver mass lesions as well as adult individuals in the age range of 20–60 years with localized hepatic lesions on abdominal imaging (USG). Along with the histological and biochemical study report, all values for the arterial phase, venous phase, portal phase, and delayed phase were recorded and analyzed. For the analysis, SPSS (Version 22.0) was utilized.

Results: 90 focal liver lesions were discovered by MDCT, of which 70 (85%) were benign and 12 (14.3%) were malignant. The MDCT's diagnostic effectiveness (accuracy) was determined to be 95% with a predicted value (95% CI: 84.20- 96.75%). Highly significant agreement (p0.001) was discovered between MDCT and biopsy methods for the hepatocellular carcinoma cases. Malignant lesions were shown to have an overall sensitivity, specificity, PPV, NPV, and diagnostic accuracy of 83%, 97%, 83%, 97%, and 95%, respectively.

Conclusion: MDCT is highly sensitive in classifying the hepatic lesions into clinically relevant categories, making diagnosis and evaluation of lesion.

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

Introduction

Multiphasic CT is the best tool for evaluating and characterizing focal liver lesions. It is a useful tool for identifying the number, location, and nature of these lesions as well as tracking changes in their size over time. The accurate identification of metastatic illness in cancer patients at the time of diagnosis or during therapy is still essential to the management of the condition. An improvement in CT

technology is Multidetector Computed Tomography (MDCT), which uses a multiple-row detector array rather than the more conventional single-row detector array used in spiral CT. The scanning speed is four to eight times faster with this invention than with spiral CT. [1] The entire liver is imaged using a triphasic spiral CT approach during the arterial, portal, and equilibrium phases [2,3,4,5] Inclusion of arterial phase imaging along with portal venous imaging improves the lesion detection especially in hyper vascular neoplasms. [6] Most sensitive phase for lesion detection is portal phase whereas additional information on vascularity of the lesion is given by arterial and equilibrium phases. [7] A correct diagnosis is made using a variety of radiological imaging techniques, histopathological findings, and clinical evaluation. [7] There aren't many thorough studies about the role of multiphasic MDCT scans in classifying liver lesions as benign or malignant, and those that exist were carried out with very small sample sizes. With the aforementioned context in mind, it was believed that this study would be an endeavor to evaluate the role of MDCT in identification and characterization of focal liver lesions with a larger sample size and assist in determining the next step in care.

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 2021 to April 2022 and total of 90 patients were included in the study. Sample size was calculated based on specification and Positive Predictive Value of MDCT [8] using the formula:

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

Sample Size = 2 2 ×0.05×(1-0.05)/ (0.05) 2 = 4×0.05×0.95 0.0025 = 76

Where, Zα=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

All patients presenting with abnormal liver function or known cases of liver mass lesions, adult patients in the age range of 20 to 60 years, and participants who were willing to participate in the study and offered their written agreement for the same were included in the study. Patients with abnormal blood clotting profiles and those with traumatic liver lesions were eliminated. All of the patients provided written, informed consent before having a USG scan, a Quadri-phasic CECT scan, and a biopsy, all with the institutional ethical committee's approval. The samples that were obtained were sent for histopathological and biochemical examination.

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.

Results

Table 1: Demographic details of the study participant

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)

Out of 90 patients, 33% of those were between the ages of 30 and 39. 55% of the study participants were men. In terms of demographic information and lifestyle choices, 30% of patients used alcohol and cigarettes equally. The average age was 38.72 11.55. (20-60 year)

Table 2: Distribution of subjects according to complaints.

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)

Abdominal discomfort (93%) and palpable mass (80%) were reported to be the two most frequent complaints, according to table 2. Fever and anorexia were also reported, however abdominal bulk was the least frequent issue (47%).

Table 3: Distribution of hepatic lesion based on MDCT

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)

According to table 3, out of 90 focal liver lesions, 70 (87%) were benign and 12 (14%) were malignant. The majority of benign lesions (53%) were abscesses. Cyst (15%), Haemangioma (13%), Hydatid cyst (2%), and Hepatic Granuloma (4%), among others, were also found. Hepatocellular carcinoma was one of the malignant lesions that MDCT discovered (14%).

Table 4: Diagnostic Accuracy of MDCT with Hepatic lesions

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

According to table 4, for detecting different types of lesions, the results of MDCT corresponded with biopsy in 90% of cases, whereas they didn't match in 10% of cases. Therefore, it was determined that MDCT had a diagnostic accuracy (efficiency) of 90.5% with the anticipated value (95% CI: 84.20-96.75%)

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

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

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-sq=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

There are only a few extensive Indian studies about the use of Multiphasic MDCT scans in enhancing the identification of malignant liver lesions in the literature that is currently available. Risk elements and grievances of the study participants: The majority of the participants in our study had habits including smoking, drinking alcohol, and chewing tobacco, which are thought to be risk factors for malignant liver lesions. Additionally, Simonetti RG et al. demonstrated that these behaviors are risk factors for malignant liver lesions. [8] Validity and reliability for identifying malignant liver lesions: In the current investigation, the overall sensitivity and specificity of MDCT with respect to biopsy were determined to be 83% and 97%, respectively, for determining their validity and reliability for identifying malignancy in liver lesions.

Additionally, based on 25 articles and 1747 patients, Kinkel K et al. showed a mean sensitivity of 72% with CT in a meta-analysis of hepatic metastases from gastrointestinal malignancies. [9] According to a study by Khalid M. et al., MRI had a diagnosis accuracy of 55% for metastatic localized hepatic lesions compared to CT's 17%. [10] Recent comparisons of non-invasive imaging modalities, notably MDCT and USG, have revealed that MDCT is just as accurate as, if not more so than, USG in this study. However, the abscess patients in this study demonstrate a relatively substantial level of agreement between MDCT and biopsy methods. MDCT was found to have an overall sensitivity and specificity of 99.3% and 97.1%, respectively. 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. [11] Overall sensitivity and specificity for the instances of hydatid cyst and hepatocellular carcinoma were 97.4%, 96.1%, and 96.9%, 90.4%, respectively. In contrast, Hassan and his colleagues found that the sensitivity and specificity of MRI for haemangiomas were 85.2% and 91.2%, while for hepatocellular carcinoma, CT had sensitivity and specificity of 62% and 83.3% and MRI had sensitivity and specificity of 90.3% and 87.5%. For metastases, sensitivity and specificity of CT were 60% and 84% and MRI had 76.2% and 87.8%. [12] Arterio-portal shunt was principally responsible for 83% of false-positive MRI results and 67% of false-positive CT results. Furthermore, in contrast-enhanced portal or delayed phase CT images [13], cirrhosis-related benign nodules may show predominate hypo-

attenuation and may not be distinguished from hypo-vascular HCC. Another study found that conspicuous nodules associated with cirrhosis were responsible with 33% of false-positive MDCT results. 92% of the 100 lesions in a research by Matilde NM et al. show vascular enlargement. [14] The likelihood of metastasis was predicted with 86.8% specificity for malignancy when all lesions with circumferential ring enhancement were taken into account. As discovered in this study and others, benign and malignant tumors may resemble one another visually. For instance, HCC, haemangiomas, and FNH can all display a homogenous pattern. [14] 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. [15] 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. [16,17]

Conclusion

The findings of this study show that MDCT is very sensitive in classifying hepatic lesions into clinically relevant categories, aiding in accurate lesion identification and evaluation. With early diagnosis and subsequent care of hepatic abnormalities, this study creates new opportunities for the prevention of liver disease.

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