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UTILITY OF QUADRIPHASIC MULTIDETECTOR CONTRAST ENHANCED CT SCAN IN DETECTION AND CHARACTERIZATION OF LIVER LESION KEEPING HISTOPATHOLOGIC EXAMINATION AS GOLD STANDARD

Radio-Diagnosis

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ABSTRACT

Background: Focal liver lesions may be benign or malignant, and accurate diagnosis is important for proper management. Quadriphasic 128-slice MDCT helps characterize these lesions by assessing enhancement and washout patterns, with histopathology used as the gold standard for confirmation.**Aim:** To evaluate the diagnostic role of quadriphasic contrast-enhanced 128-slice MDCT in characterizing focal liver lesions, using histopathology as the reference standard.

Objectives:

1. To assess enhancement patterns of focal liver lesions on quadriphasic 128-slice MDCT.
2. To evaluate the diagnostic accuracy of MDCT by correlating its findings with histopathology.

Methods : A hospital-based cross-sectional study was conducted at MGMCH, Jaipur, on 81 patients with USG-detected focal hepatic lesions. MDCT findings were correlated with histopathology, and Chi-square test was applied with $p < 0.05$ considered significant. **Results:** Abscess was the most common lesion on MDCT. MDCT showed 90.91% sensitivity, 97.14% specificity, 98.55% NPV, and 96.30% overall accuracy in differentiating benign and malignant focal liver lesions. **Conclusion:** Quadriphasic 128-slice MDCT is a reliable and accurate tool for differentiating benign and malignant focal liver lesions..

KEYWORDS

Focal liver lesions; Quadriphasic MDCT; 128-slice CT.

INTRODUCTION

Liver is prone to a wide variety of focal lesions because of its rich blood supply from both the hepatic artery and portal vein and its important role in digestion, metabolism and detoxification[1]. Globally, more than 1.5 billion people are living with chronic liver disease, while chronic hepatitis B affects more than 350 million individuals and hepatitis C contributes around 58 million infections[2]. Non-alcoholic fatty liver disease affects nearly 30% of the global population, further increasing the risk of hepatic injury and focal liver lesions[2]. Focal liver lesions may be benign, infective, inflammatory or malignant, including cysts, hemangioma, abscess, hydatid cyst, focal nodular hyperplasia, hepatocellular carcinoma, cholangiocarcinoma and metastases[3]. Hepatocellular carcinoma is now one of the major liver malignancies and is reported as the sixth most common cancer and the third leading cause of cancer-related mortality, causing more than 8 lakh deaths annually[4]. In India, the burden is also high, with around 40–50 million chronic hepatitis B cases and 6–12 million chronic hepatitis C cases, making liver lesions an important clinical problem[5]. Ultrasonography is commonly used as the initial imaging modality for detecting focal hepatic lesions because it is safe, inexpensive and widely available[6]. However, ultrasound has limitations in accurately characterizing lesion type, especially in fatty liver, cirrhosis, obesity or lesions with overlapping appearances[7].Therefore, dynamic contrast-enhanced imaging is required to assess lesion vascularity, enhancement pattern and washout characteristics more accurately[8].Quadriphasic contrast-enhanced 128-slice MDCT provides phase-wise assessment of liver lesions through non-contrast, arterial, portal venous and delayed phases, helping in better benign–malignant differentiation[9]. As histopathology remains the gold standard, this study evaluated the diagnostic role of MDCT in focal liver lesions[10].

METHODOLOGY

This hospital-based cross-sectional observational study was conducted in the Department of Radiodiagnosis, Mahatma Gandhi Medical College and Hospital, Sitapura, Jaipur. The study population included outpatient and inpatient cases aged 20–60 years with focal hepatic lesions detected on abdominal ultrasonography. The sample size was estimated by considering the prevalence of focal hepatic lesions as 5% with an absolute error of 5%; after adding 10% attrition, the final sample size was calculated as 81 patients.

Patients fulfilling the inclusion criteria and giving written informed consent were included, while critically ill patients, pregnant females, patients with contrast allergy, patients without renal function test reports, claustrophobic patients and non-consenting patients were excluded. All selected patients underwent quadriphasic contrast-enhanced 128-slice MDCT, including non-contrast, arterial, early portal venous, late portal venous and delayed/equilibrium phases.

The MDCT images were analyzed for lesion number, site, enhancement pattern and benign or malignant characterization. CT findings were correlated with histopathological diagnosis, which was considered the reference standard, and diagnostic efficacy was assessed in terms of sensitivity, specificity, positive predictive value, negative predictive value and overall accuracy. A p-value <0.05 was considered statistically significant.

RESULT

A total of 81 patients were included. Abscess was the most common lesion on MDCT 46.91%. MDCT showed significant correlation with histopathology $p < 0.001$, with 90.91% sensitivity, 97.14% specificity and 96.30% diagnostic accuracy for benign–malignant differentiation.

Table1:Distribution of study participants according to age and sex (n = 81)

Variable	Category	Frequency (%)
Age group	20–29 years	21 (25.93%)
	30–39 years	13 (16.05%)
	40–49 years	22 (27.16%)
	≥50 years	25 (30.86%)
Sex	Male	45 (55.56%)
	Female	36 (44.44%)

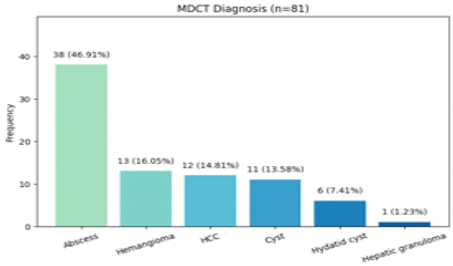


Figure 1: Distribution of focal liver lesions according to MDCT diagnosis(n = 81)

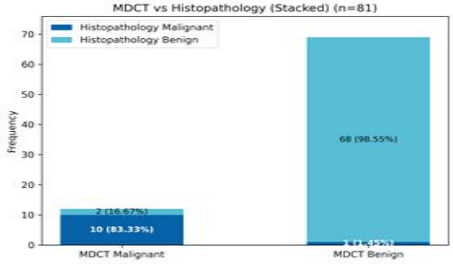
It is evident from the above table that most patients were aged ≥50 years (30.86%), while the least were aged 30–39 years (16.05%). Males (55.56%) were slightly more common than females (44.44%). above Figure shows that abscess was the most common lesion on MDCT 46.91%, followed by hemangioma 16.05% and hepatocellular carcinoma 14.81%, while granuloma was the least common lesion 1.23%.

Table 2: Distribution of focal liver lesions according to histopathological diagnosis (n = 81)

Histopathological diagnosis	Frequency (%)
Abscess	40 (49.38%)
Hemangioma	13 (16.05%)
HCC	11 (13.58%)
Cyst	9 (11.11%)
Hydatid cyst	5 (6.17%)
Hepatic metastasis	1 (1.23%)
Hepatic granuloma	1 (1.23%)
Biliary hamartoma	1 (1.23%)
Focal nodular hyperplasia	1 (1.23%)
Hepatic adenoma	1 (1.23%)
Total	81 (100%)

The above table shows that abscess was the most common histopathological diagnosis 49.38%, followed by hemangioma 16.05% and HCC 13.58%.

Figure 2. Correlation of MDCT diagnosis with histopathological diagnosis(n = 81)



The above table shows significant correlation between MDCT and histopathology, with MDCT correctly identifying 10 malignant and 68 benign lesions; the association was statistically significant, $p < 0.001$.

Table 3: Diagnostic efficacy of MDCT in differentiating benign and malignant focal liver lesions(n=81)

Diagnostic parameter	Value
Sensitivity	90.91%
Specificity	97.14%
Positive predictive value	83.33%
Negative predictive value	98.55%
Diagnostic accuracy	96.30%

The above table shows that MDCT had high diagnostic accuracy 96.30%, with sensitivity 90.91% and specificity 97.14% for benign–malignant differentiation.

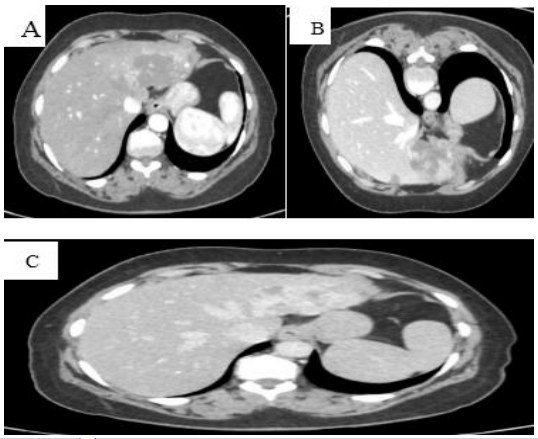


Figure-3 A,B,C (A) case hepatic haemangioma of left lobe of liver shows minimal peripheral enhancement with centrally hypoattenuating area on arterial phase. (B) marked increment in peripheral enhancement in a centripetal pattern on portal venous phase. (C) show central filling with persistent enhancement on delayed phase

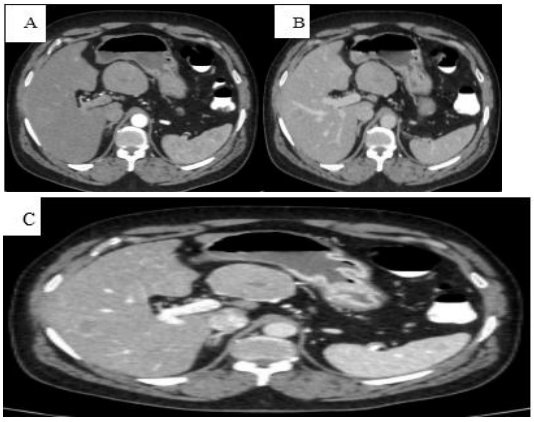


Figure-4 A,B,C (A) case of hepatic metastasis shows minimal peripheral enhancement on arterial axial image. (B) on portal venous axial image. (C) shows a peripheral enhancing with central non enhancing area lesion in right lobe of liver, show persistent mild peripheral enhancement on delayed phase.

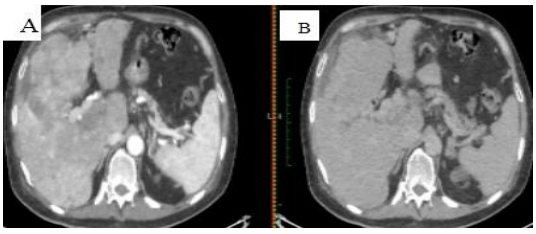


Figure-5 A,B (A) case of hepatocellular carcinoma of right lobe of liver shows, an irregular exophytic lesion on non contrast phase. (B) rapid enhancement on arterial phase axial image. portal venous axial image

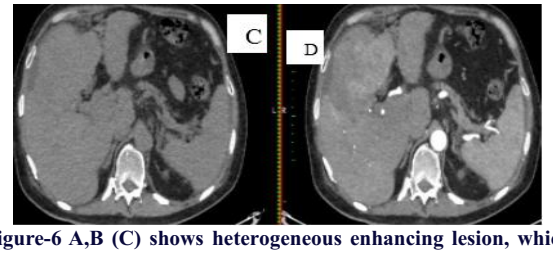


Figure-6 A,B (C) shows heterogeneous enhancing lesion, which shows rapid washout on delayed phase image. (D) A characteristic feature of HCC.

DISCUSSION

In the present study of 81 patients, most participants were aged ≥50 years (30.86%), followed by 40–49 years (27.16%), with slight male predominance 55.56%. Similar findings were reported by Jain et al.[1], who observed male predominance in their MDCT study of 84 patients. Nowicki et al.[6] also noted that malignant lesions were associated with higher age, with mean age 56 years in malignant lesions compared to 36 years in benign lesions.

On MDCT, abscess was the most common lesion (46.91%), followed by hemangioma (16.05%) and HCC (14.81%), showing predominance of benign and infective lesions. This was comparable to Jain et al.[1], who also reported benign predominance, with 85.7% benign and 14.3% malignant lesions. In contrast, Donati et al.[4] reported 65% malignant lesions, mainly metastases, due to their oncology-based study population.

Histopathology also showed abscess as the most common diagnosis (49.38%), followed by hemangioma (16.05%) and HCC (13.58%). Overall, histopathology classified 86.42% lesions as benign and 13.58% as malignant, closely matching MDCT findings of 85.19%

benign and 14.81% malignant lesions. This similarity supports the usefulness of MDCT in focal liver lesion characterization, as also shown by Jain et al.[1], who reported almost identical benign–malignant distribution.

MDCT showed significant correlation with histopathology, correctly identifying 10 of 11 malignant lesions and 68 of 70 benign lesions, with $p < 0.001$. Jain et al.[1] similarly reported high agreement between MDCT and histopathology, especially for common lesions. Ladd et al.[3] reported lower overall MDCT sensitivity for HCC detection 49.8%, increasing to 66.9% for lesions ≥2 cm, indicating that lesion size affects CT detection.

The diagnostic efficacy of MDCT in the present study was high, with sensitivity 90.91%, specificity 97.14%, PPV 83.33%, NPV 98.55%, and accuracy 96.30%. These findings were closely comparable with Jain et al.[1], who reported 83.3% sensitivity, 97.2% specificity, 83.3% PPV, 97.2% NPV, and 95.2% accuracy. Ahirwar et al., as cited by Jain et al.[1], also reported 91.3% sensitivity and 97.8% specificity, further supporting the high diagnostic reliability of multiphasic MDCT.

CONCLUSION

Quadriphasic contrast-enhanced 128-slice MDCT showed high diagnostic efficacy in the detection and characterization of focal liver lesions. It demonstrated strong correlation with histopathology and was highly reliable in differentiating benign and malignant lesions, with sensitivity of 90.91%, specificity of 97.14%, and overall accuracy of 96.30%. Thus, quadriphasic MDCT can be considered a useful and practical imaging modality for pre-histopathological evaluation of focal liver lesions.

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