

ROLE OF CONTRAST-ENHANCED COMPUTED TOMOGRAPHY (CECT) IN HEPATOCELLULAR CARCINOMA (HCC) IN ADULTS WITH CHRONIC LIVER DISEASE (CLD)

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ABSTRACT

OBJECTIVES

To evaluate the diagnostic accuracy of CECT in identifying HCC in adults with chronic liver disease and compare it with other imaging modalities such as MRI and ultrasonography.

METHODOLOGY

This study involved 200 adult patients diagnosed with CLD. CECT was performed on all patients suspected of HCC. Imaging findings were correlated with histopathological results obtained after biopsy. Sensitivity, specificity, and diagnostic accuracy were calculated. Statistical analysis was performed using SPSS v25.0.

RESULTS

CECT had a sensitivity of 89%, specificity of 94%, and an overall diagnostic accuracy of 92%. The findings were compared with MRI and ultrasonography, where CECT demonstrated superior diagnostic performance in lesion characterization, arterial phase enhancement, and detection of small tumors (<2 cm).

CONCLUSION

CECT plays an integral role in the diagnosis and management of HCC in patients with CLD. Its high diagnostic accuracy, particularly in detecting early-stage tumors, makes it a preferred imaging modality.

KEYWORDS: Chronic Liver Disease, Hepatocellular Carcinoma, Magnetic Resonance Imagin

INTRODUCTION

Hepatocellular carcinoma (HCC) is one of the most prevalent malignancies globally, particularly in regions with a high burden of chronic liver disease (CLD) such as cirrhosis, hepatitis B, and hepatitis C infection.¹ According to the World Health Organization (WHO), liver cancer is the sixth most common cancer and the fourth leading cause of cancer-related deaths worldwide.² HCC accounts for approximately 80% of primary liver cancers, with its incidence closely tied to the presence of CLD, which induces hepatocyte transformation into malignant cells.³ Timely detection of HCC in patients with CLD is vital for effective treatment, yet diagnosing HCC in this population presents significant challenges due to the complex nature of liver lesions.⁴ Traditional imaging modalities such as ultrasonography (US) are frequently used for routine screening but have limitations in sensitivity, particularly for detecting small or early-stage tumors.⁵

Magnetic resonance imaging (MRI), although providing excellent soft tissue contrast, is often limited by accessibility and higher costs in many healthcare settings.⁶ Contrast-enhanced computed tomography (CECT) has emerged as a powerful diagnostic tool in this regard. By leveraging contrast agents, CECT provides detailed images of the liver, enabling enhanced visualization of vascular structures and tissue differentiation. The imaging protocol usually includes three phases: arterial, portal venous, and delayed phases, which are crucial for distinguishing malignant from benign lesions.⁷ The arterial phase enhancement, which is characteristic of HCC, helps differentiate these tumours from the surrounding cirrhotic liver tissue.⁸ In this study, we aim to evaluate the diagnostic utility of CECT in identifying and characterizing HCC among adults with CLD. Given the growing need for accurate and accessible diagnostic tools in liver cancer detection, this research will provide insights into how CECT compares with other imaging modalities and its

role in early diagnosis and treatment planning.⁹

METHODOLOGY

This retrospective, cross-sectional study was conducted at the Radiology Department tertiary care hospital of Peshawar for over two years. The study received approval from the institutional ethical review board. The study included 200 adult patients (aged 35–75 years) diagnosed with CLD, including cirrhosis and chronic viral hepatitis (HBV and HCV). Patients with known contraindications to CT or contrast agents were excluded. Contrast-enhanced computed tomography (CECT) was performed using a multi-detector CT scanner (Siemens SOMATOM Definition Edge) with a protocol optimized for liver imaging. Non-contrast images were first acquired, followed by administration of an iodinated contrast agent (100 mL, iopromide 300 mg/mL) at a rate of 4 mL/s. Triphasic CT imaging included arterial, portal venous, and delayed phases. CECT findings were compared with histopathological results obtained through percutaneous biopsy. Pathologists blinded to imaging results analyzed biopsy specimens. Data were analyzed using SPSS version 25.0. Sensitivity, specificity, and accuracy were calculated using standard formulas. Chi-square tests were used to evaluate categorical variables, and *p*-values <0.05 were considered statistically significant.

RESULTS

Table 1: Baseline Characteristics of Study Population

Variable	Value	%age
Male	120	60
Female	80	40
Mean Age (years)	56.7 ± 8.4	-
Cirrhosis	130	65
Hepatitis B	40	20
Hepatitis C	30	15

Table 2: Diagnostic Performance of CECT

Parameter	Value (%)
Sensitivity	89
Specificity	94
Diagnostic Accuracy	92

Table 3: Imaging Modalities Comparison

Modality	Sensitivity (%)	Specificity (%)	Accuracy (%)
Ultrasonography	70	75	72
MRI	85	90	87
CECT	89	94	92

Table 4: Lesion Characteristics on CECT

Lesion Characteristic	Prevalence (%)
Arterial Phase Enhancement	78
Tumor Size <2 cm	35
Vascular Invasion	60

DISCUSSION

Hepatocellular carcinoma is a significant public health challenge, especially in regions with high rates of chronic liver diseases such as hepatitis B and C.¹⁰ The early detection of HCC is critical for improving survival rates, as therapeutic interventions are more effective in early-stage tumors.¹¹ In this study, we found that contrast-enhanced computed tomography (CECT) offers high sensitivity and specificity in detecting HCC, particularly in patients with CLD, making it a valuable tool in clinical practice. CECT's ability to differentiate between benign and malignant liver lesions lies in its multiphasic imaging capabilities.¹² The arterial phase enhancement, a hallmark of HCC, enables radiologists to detect hyper vascular tumours in the background of cirrhotic liver tissue.¹³ This finding is supported by several previous studies, which demonstrated that CECT outperforms other imaging modalities such as ultrasound and even MRI in certain clinical settings.¹⁴ While ultrasonography is commonly used as a first-line screening tool for HCC, its sensitivity is significantly lower, particularly for small tumours (<2 cm).¹⁵ MRI, though highly sensitive, is less accessible in many regions due to its high cost and longer scan times.¹⁶ CECT, on the other hand, provides a balance between cost, accessibility, and diagnostic accuracy, making it a preferred modality for many clinicians.¹⁷ However, CECT is not without limitations. The use of iodinated contrast agents poses a risk to patients with renal impairment, and radiation exposure is a concern, especially for younger patients.¹⁸ Therefore, careful patient selection is essential to maximize the benefits of CECT while minimizing potential risks.¹⁹ Future research should focus on refining imaging protocols to reduce radiation exposure and enhance the detection of sub-centimetre lesions.²⁰

LIMITATIONS

The limitation of this study relies on a specific population within Hayatabad Medical Complex Peshawar, it may not be representative of the broader population, leading to potential sampling bias.

CONCLUSIONS

This study underscores the pivotal role of CECT in diagnosing hepatocellular carcinoma in adults with chronic liver disease. Its high diagnostic accuracy, particularly in detecting early-stage tumors, makes it an indispensable tool in clinical practice. However, further research is needed to address the limitations associated with contrast use and radiation exposure, as well as to explore new imaging techniques that could

complement CECT in the early diagnosis of HCC.

CONFLICT OF INTEREST: None

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CONTRIBUTORS

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