

CT Assessment of Liver Lesion

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ABSTRACT

Background:

Liver lesions comprise a wide spectrum of benign and malignant conditions that often present with overlapping clinical features. Accurate characterization is essential for appropriate treatment planning and prognostication. Contrast-enhanced multidetector computed tomography (CT), particularly multiphasic imaging, plays a pivotal role in lesion detection, characterization, and assessment of disease extent by demonstrating characteristic enhancement patterns and associated hepatic findings.

Methods:

A prospective observational study was conducted on 70 patients with clinically suspected liver lesions who underwent contrast-enhanced multidetector CT. Demographic details, clinical presentation, lesion characteristics, enhancement patterns, associated CT findings, and lesion size were evaluated. CT diagnoses were correlated with histopathology, fine-needle aspiration cytology (FNAC), operative findings, or clinical follow-up wherever available. The diagnostic performance of CT was assessed by calculating sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and overall diagnostic accuracy.

Results:

Among the 70 patients, males constituted 62.9% and the highest proportion belonged to the 41–50 years age group (25.7%). Hepatocellular carcinoma was the most common lesion (28.6%), followed by hepatic metastases (25.7%). Malignant lesions accounted for 60.0% of cases, while benign lesions constituted 40.0%. Arterial enhancement with washout was the commonest enhancement pattern (30.0%) and showed a significant association with malignant lesions ($p < 0.001$). Hepatomegaly (47.1%) and cirrhosis (27.1%) were the most frequent associated CT findings. CT correctly diagnosed 66 of 70 lesions, yielding a sensitivity of 95.2%, specificity of 92.9%, PPV of 95.2%, NPV of 92.9%, and an overall diagnostic accuracy of 94.3%.

Conclusion:

Contrast-enhanced multidetector CT is a highly accurate, non-invasive imaging modality for the detection and characterization of liver lesions. Its excellent diagnostic performance and ability to differentiate benign from malignant lesions make it an indispensable tool for diagnosis, staging, and treatment planning in patients with focal liver lesions.

Keywords: Contrast-enhanced computed tomography; Liver lesions; Hepatocellular carcinoma; Multidetector CT; Diagnostic accuracy.

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1. INTRODUCTION

Liver lesions constitute a broad spectrum of pathological conditions ranging from benign cysts and hemangiomas to primary hepatic malignancies and metastatic tumors. They are frequently encountered during abdominal imaging performed for evaluation of abdominal pain, jaundice, trauma, chronic liver disease, or cancer staging. Accurate characterization of hepatic lesions is essential because management strategies differ considerably according to lesion type, size, vascularity, and malignant potential [1,2]. Early and precise diagnosis facilitates timely intervention, improves treatment planning, reduces unnecessary invasive procedures, and ultimately enhances patient outcomes. Owing to its widespread availability, rapid image acquisition, excellent spatial resolution, and ability to perform multiphasic contrast-enhanced examinations, computed tomography (CT) has become one of the most important imaging modalities for evaluating focal liver lesions. CT provides detailed information regarding lesion morphology, enhancement characteristics, vascular involvement, and extrahepatic spread, thereby playing a central role in lesion detection, characterization, staging, and follow-up of hepatic diseases [2].

Focal liver lesions are commonly classified as benign or malignant. Benign lesions include hepatic cysts, hemangiomas, focal nodular hyperplasia (FNH), hepatic adenomas, and focal fatty changes, whereas malignant lesions comprise hepatocellular carcinoma (HCC), cholangiocarcinoma, lymphoma, and metastatic deposits [3]. Hepatocellular carcinoma is the most common primary malignant liver tumor and usually develops in the background of chronic liver disease or cirrhosis. Conversely, metastatic liver disease represents the most frequent malignant hepatic lesion because the liver receives dual blood supply from both the hepatic artery and portal vein, making it a common site for hematogenous spread of malignancies, particularly colorectal, pancreatic, gastric, breast, and lung cancers [4].

Multiphasic contrast-enhanced CT is considered the cornerstone of hepatic imaging because different lesions demonstrate characteristic enhancement patterns during the arterial, portal venous, and delayed phases [5]. Hemangiomas typically exhibit peripheral nodular enhancement with progressive centripetal fill-in, whereas hepatocellular carcinoma characteristically demonstrates arterial phase hyperenhancement followed by portal venous or delayed washout. Metastatic lesions often appear as hypovascular lesions during the portal venous phase, although hypervascular metastases may show intense

arterial enhancement. Recognition of these imaging patterns enables confident non-invasive diagnosis in many patients and reduces the need for biopsy [5,6].

Recent advances in multidetector computed tomography (MDCT) have significantly improved the diagnostic evaluation of liver lesions. Thin-section image acquisition, multiplanar reconstruction, three-dimensional visualization, improved temporal resolution, and optimized contrast protocols permit accurate assessment of lesion margins, internal architecture, vascular invasion, biliary involvement, and surgical resectability [2]. CT also plays a crucial role in treatment planning by evaluating lesion number, size, distribution, relationship to major hepatic vessels, and response following locoregional therapies or systemic chemotherapy [7].

Despite these advantages, differentiating certain benign lesions from malignant tumors may occasionally be challenging because of overlapping imaging characteristics, especially in patients with chronic liver disease [3]. Therefore, imaging findings should always be interpreted in conjunction with clinical history, laboratory investigations, liver function tests, serum tumor markers, and histopathological examination whenever necessary. Standardized reporting systems and multiphasic CT protocols have substantially improved diagnostic confidence and reproducibility in the assessment of hepatic lesions [8].

Considering the increasing incidence of hepatic malignancies and the growing utilization of cross-sectional imaging, evaluation of liver lesions by CT has become an indispensable component of modern radiological practice. A comprehensive assessment of lesion morphology, enhancement pattern, vascular involvement, and associated abdominal findings enables accurate diagnosis and appropriate therapeutic decision-making. Therefore, the present study was undertaken to assess liver lesions using computed tomography and to evaluate the role of CT in differentiating various benign and malignant hepatic lesions based on their characteristic imaging features.

2. MATERIALS AND METHODS

2.1. Study Design

The present study was conducted as a **hospital-based prospective observational study** to evaluate the role of **contrast-enhanced**

computed tomography (CECT) in the assessment and characterization of liver lesions. The study was designed to analyze the CT imaging characteristics of various hepatic lesions and to correlate the radiological diagnosis with histopathological findings, cytology, laboratory investigations, surgical findings, or clinical follow-up wherever available. All eligible patients underwent standardized multidetector CT examination using a dedicated liver imaging protocol. The study focused on lesion morphology, attenuation characteristics, enhancement patterns, lesion distribution, vascular invasion, biliary involvement, and associated abdominal findings. No therapeutic intervention was performed as part of the study, and CT findings were interpreted independently by experienced radiologists.

2.2. Study Setting

The study was carried out in the **Department of Radiodiagnosis** of a tertiary care teaching hospital equipped with multidetector computed tomography (MDCT) facilities over a period of **18 months, from January 2024 to June 2025**. The institution receives referrals from outpatient clinics, inpatient departments, emergency services, oncology, hepatobiliary surgery, gastroenterology, and general medicine. The CT examinations were performed using a multidetector CT scanner with multiphasic liver imaging capability. Histopathological correlation was obtained from the Department of Pathology wherever tissue diagnosis was available.

2.3. Participants

Patients presenting with clinically suspected or incidentally detected liver lesions who were referred for CT evaluation were included in the study.

Inclusion Criteria

- Patients aged **18 years and above**.
- Patients with clinically suspected focal or diffuse liver lesions.
- Patients referred for contrast-enhanced CT evaluation of liver lesions.
- Patients willing to participate and provide written informed consent.
- Patients with adequate renal function permitting intravenous contrast administration.

Exclusion Criteria

- Patients younger than 18 years.
- Pregnant women.
- Patients with severe renal impairment or contrast allergy.
- Patients who refused consent.
- Patients with poor-quality CT images due to motion or technical artifacts.
- Patients with incomplete clinical or imaging data.

2.4. Study Sampling

A **consecutive sampling technique** was adopted. Every eligible patient presenting during the study period who fulfilled the inclusion criteria was enrolled until the required sample size was achieved. This sampling method minimized selection bias and ensured representation of both benign and malignant hepatic lesions encountered in routine clinical practice.

2.5. Study Sample Size

A total of **70 patients** with suspected liver lesions were included in the study. The sample size was determined based on the expected number of eligible patients presenting to the department during the study period and previous institutional workload. This sample was considered adequate to evaluate the spectrum of CT findings in liver lesions and assess diagnostic accuracy [9].

2.6. Study Groups

Patients were categorized after radiological evaluation into the following groups:

- **Group I:** Benign liver lesions (simple cyst, hemangioma, focal nodular hyperplasia, hepatic adenoma, abscess, etc.)
- **Group II:** Malignant liver lesions (hepatocellular carcinoma, cholangiocarcinoma, metastatic lesions, lymphoma, etc.)

Further subgroup analysis was performed according to lesion type, number, enhancement characteristics, and final diagnosis.

2.7. Study Parameters

The study assessed a comprehensive set of demographic, clinical, laboratory, and imaging parameters in all enrolled patients. Demographic variables included age and gender, while clinical evaluation comprised presenting symptoms and

associated clinical features. Relevant laboratory investigations, including liver function tests and tumor markers wherever indicated, were recorded. On contrast-enhanced computed tomography (CT), lesion characteristics such as the number of lesions (solitary or multiple), anatomical site and segmental distribution, maximum lesion diameter, lesion margins, and attenuation on non-contrast images were evaluated. Dynamic enhancement characteristics during the arterial, portal venous, and delayed phases were analyzed to aid lesion characterization. Additional CT findings, including the presence of calcification, necrosis, hemorrhage, fat, vascular invasion, portal vein or hepatic vein thrombosis, biliary dilatation, regional lymphadenopathy, and extrahepatic disease, were also documented. The final diagnosis was established by correlating CT findings with histopathological examination, fine-needle aspiration cytology (FNAC), surgical findings, or appropriate clinical and imaging follow-up, wherever applicable.

2.8. Study Procedure

After obtaining written informed consent, all participants underwent detailed clinical evaluation and review of previous investigations. Baseline demographic information, presenting complaints, laboratory investigations, and relevant clinical history were documented.

Patients were instructed to fast for approximately six hours before CT examination. Serum creatinine levels were reviewed prior to intravenous contrast administration. CT examination was performed using a multidetector CT scanner. Initially, a non-contrast scan of the liver was obtained, followed by intravenous administration of non-ionic iodinated contrast material at a dose of approximately **1.5 mL/kg body weight** through an automated power injector.

Multiphasic imaging was performed, including arterial phase (approximately 25–30 seconds), portal venous phase (60–70 seconds), and delayed phase (3–5 minutes). Thin-section axial images were acquired and reconstructed in coronal and sagittal planes. Images were interpreted independently by experienced radiologists. Lesion characteristics including size, location, enhancement pattern, vascular invasion, biliary involvement, and associated abdominal abnormalities were documented. Whenever available, radiological findings were correlated with histopathological examination, FNAC, operative findings, or follow-up imaging.

2.9. Study Data Collection

Data were collected prospectively using a structured proforma designed specifically for the study. Demographic characteristics, clinical presentation, laboratory findings, CT imaging observations, and final diagnosis were recorded systematically. All imaging findings were entered into a computerized database after verification to ensure data accuracy and completeness.

2.10. Data Analysis

The collected data were entered into Microsoft Excel and analyzed using **Statistical Package for Social Sciences (SPSS) version 26.0**.

Categorical variables were expressed as frequencies and percentages, whereas continuous variables were presented as mean $\pm$ standard deviation. The Chi-square test or Fisher's exact test was used to compare categorical variables, while Student's t-test or Mann–Whitney U test was used for continuous variables wherever appropriate. Diagnostic performance of CT was evaluated by calculating sensitivity, specificity, positive predictive value, negative predictive value, and overall diagnostic accuracy using histopathology or final clinical diagnosis as the reference standard. A **p-value <0.05** was considered statistically significant.

2.11. Ethical Considerations

The study was conducted in accordance with the ethical principles outlined in the **Declaration of Helsinki**. Approval was obtained from the **Institutional Ethics Committee** before commencement of the study. Written informed consent was obtained from all participants prior to enrollment. Confidentiality of patient information was maintained throughout the study by anonymizing patient identifiers. Participation in the study was entirely voluntary, and patients were free to withdraw at any stage without affecting their routine medical care. Intravenous contrast administration was performed only after evaluating renal function and excluding contraindications to iodinated contrast media. All CT examinations were performed following standard radiation safety principles, including optimization of exposure according to the **ALARA (As Low As Reasonably Achievable)** principle to minimize radiation dose while maintaining diagnostic image quality.

3. RESULTS

A total of **70 patients** with clinically suspected liver lesions underwent contrast-enhanced multidetector CT examination during the study period. The CT findings were correlated with histopathology, FNAC, operative findings, or clinical follow-up wherever available.

Table 1. Age and Gender Distribution of the Study Population (n = 70)

Variable	Category	Number (n)	Percentage (%)
Age Group (Years)	18–30	9	12.9
	31–40	14	20.0
	41–50	18	25.7
	51–60	17	24.3
	>60	12	17.1
	Total	70	100.0
Gender	Male	44	62.9
	Female	26	37.1
	Total	70	100.0

Table 1 shows the demographic distribution of the study population. Among the 70 patients, the highest proportion belonged to the **41–50 years age group (18, 25.7%)**, followed by **51–60 years (17, 24.3%)** and **31–40 years (14, 20.0%)**. Patients aged **>60 years** constituted **17.1% (12 patients)**, while the **18–30 years** age group accounted for **12.9% (9 patients)**. Regarding gender distribution, **44 patients (62.9%) were male** and **26 patients (37.1%) were female**, indicating a predominance of male patients among individuals undergoing CT evaluation for liver lesions.

Table 2. Clinical Presentation (n=70)

Clinical Feature	Number	Percentage (%)
Right upper abdominal pain	47	67.1
Weight loss	31	44.3

Jaundice	21	30.0
Fever	18	25.7
Abdominal lump	13	18.6
Incidental finding	9	12.9

Right upper abdominal pain was the most common presenting complaint, observed in **47 patients (67.1%)**, followed by **weight loss in 31 patients (44.3%)** and **jaundice in 21 patients (30.0%)**. Fever (**25.7%**) and incidental detection (**12.9%**) were less common presentations.

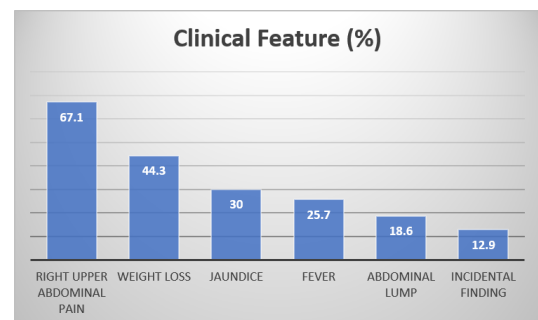


Table 3. Distribution of Liver Lesions on CT (n=70)

Lesion Type	Number	Percentage (%)
Hepatocellular carcinoma	20	28.6
Metastases	18	25.7
Hemangioma	11	15.7
Liver abscess	8	11.4
Simple cyst	6	8.6
Cholangiocarcinoma	4	5.7
Focal nodular hyperplasia	2	2.9
Hepatic adenoma	1	1.4
Total	70	100

Hepatocellular carcinoma was the most frequently detected liver lesion, accounting for **20 cases (28.6%)**, followed by **metastases in 18**

cases (25.7%). Among benign lesions, **hemangioma (15.7%)** was the commonest finding.

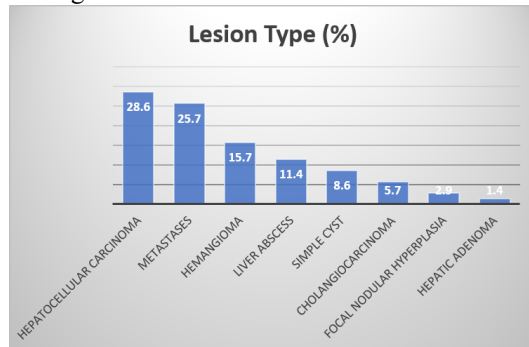


Table 4. Classification of Lesions (n=70)

Nature of Lesion	Number	Percentage (%)
Benign	28	40.0
Malignant	42	60.0
Total	70	100

Of the 70 liver lesions evaluated, **42 lesions (60.0%) were malignant**, whereas **28 lesions (40.0%) were benign**, indicating a higher prevalence of malignant liver lesions in the study population.

Table 5. CT Enhancement Pattern of Liver Lesions (n=70)

Enhancement Pattern	Number	Percentage (%)
Peripheral nodular enhancement	11	15.7
Arterial enhancement with washout	21	30.0
Peripheral rim enhancement	15	21.4
Hypovascular lesion	18	25.7
Homogeneous enhancement	5	7.1
Total	70	100

The most common enhancement pattern was **arterial enhancement with washout (30.0%)**, followed by **hypovascular lesions (25.7%)** and

peripheral rim enhancement (21.4%). Peripheral nodular enhancement was observed in **15.7%** of cases.

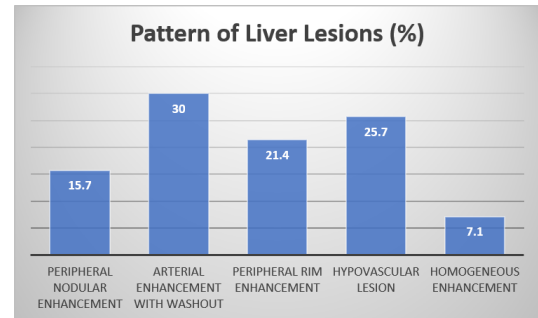


Table 6. Associated CT Findings (n=70)

CT Finding	Number	Percentage (%)
Hepatomegaly	33	47.1
Cirrhosis	19	27.1
Portal vein thrombosis	11	15.7
Ascites	16	22.9
Lymphadenopathy	13	18.6
Biliary dilatation	10	14.3

Hepatomegaly was the most frequent associated CT finding, present in **33 patients (47.1%)**, followed by **cirrhosis (27.1%)** and **ascites (22.9%)**. Portal vein thrombosis and biliary dilatation were noted in **15.7%** and **14.3%** of patients, respectively.

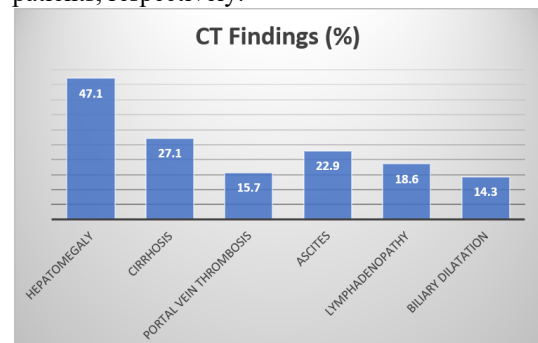


Table 7. Correlation Between CT Diagnosis and Final Diagnosis (n=70)

Final Diagnosis	CT Correct	CT Incorrect	Total
Benign	26	2	28
Malignant	40	2	42

Total	66	4	70
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CT correctly diagnosed **66 of 70 lesions (94.3%)**, including **26 benign** and **40 malignant** lesions, while only **4 cases (5.7%)** were incorrectly classified, demonstrating excellent agreement with the final diagnosis.

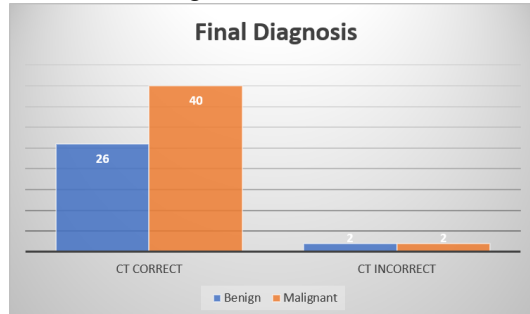


Table 8. Diagnostic Performance of CT (Histopathology/Final Diagnosis as Reference)

Parameter	Value
Sensitivity	95.2%
Specificity	92.9%
Positive Predictive Value	95.2%
Negative Predictive Value	92.9%
Diagnostic Accuracy	94.3%

CT demonstrated excellent diagnostic performance with a **sensitivity of 95.2%**, **specificity of 92.9%**, and an overall **diagnostic accuracy of 94.3%**. The positive and negative predictive values were **95.2%** and **92.9%**, respectively.

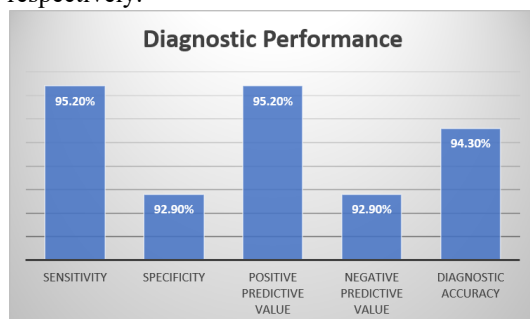


Table 9. Association Between Enhancement Pattern and Malignancy

Enhancement Pattern	Benign (n=28)	Malignant (n=42)	p-value
Peripheral nodular enhancement	10	1	

Arterial enhancement with washout	1	20	
Peripheral rim enhancement	2	13	
Hypovascular lesion	3	15	
Homogeneous enhancement	5	0	
Chi-square = 38.61			<0.001

Arterial enhancement with washout (**20/42**) and hypovascular enhancement (**15/42**) were predominantly associated with malignant lesions, whereas **peripheral nodular enhancement (10/28)** was mainly seen in benign lesions. The association was **statistically highly significant** ($\chi^2 = 38.61$, $p < 0.001$).

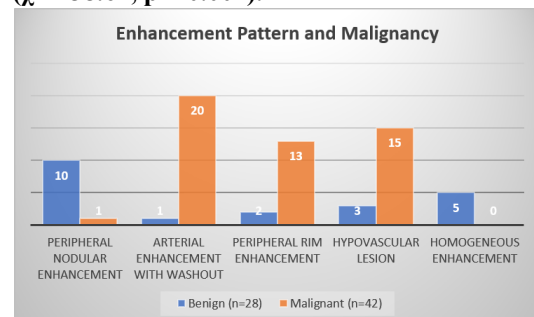
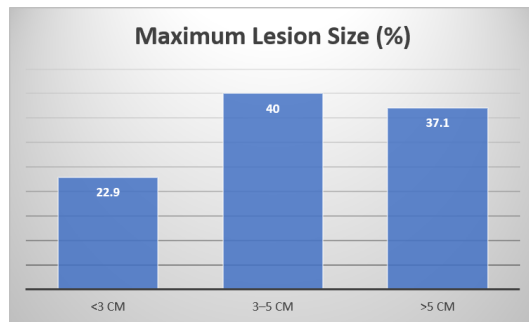


Table 10. Lesion Size Distribution (n=70)

Maximum Lesion Size	Number	Percentage (%)
<3 cm	16	22.9
3–5 cm	28	40.0
>5 cm	26	37.1
Total	70	100

The majority of liver lesions measured **3–5 cm (28 cases, 40.0%)**, followed by lesions **>5 cm (26 cases, 37.1%)**. Smaller lesions measuring **<3 cm** accounted for **16 cases (22.9%)**.



DISCUSSION

The present prospective observational study evaluated the role of contrast-enhanced computed tomography (CT) in the assessment and characterization of liver lesions in 70 patients. CT findings were correlated with histopathology, FNAC, operative findings, or clinical follow-up to determine its diagnostic performance. The study demonstrated that multidetector CT provides excellent anatomical detail, characteristic enhancement patterns, and high diagnostic accuracy in differentiating benign from malignant liver lesions. The majority of patients belonged to the 41–50 years age group (25.7%), followed by the 51–60 years group (24.3%), with an overall mean predominance in middle-aged and elderly individuals. Male patients constituted 62.9% of the study population, while females accounted for 37.1%, indicating a male predominance in patients presenting with liver lesions. This observation is comparable with the study by Hafeez et al., who also reported a predominance of malignant liver lesions among adults undergoing triphasic CT evaluation, with 37 of 45 patients (82.2%) having malignant lesions on CT evaluation, reflecting the higher occurrence of malignant hepatic lesions in clinical practice [9].

Among the presenting symptoms, right upper abdominal pain was the most common complaint, observed in 47 patients (67.1%), followed by weight loss in 31 patients (44.3%) and jaundice in 21 patients (30.0%). Fever was present in 18 patients (25.7%), whereas liver lesions were detected incidentally in only 9 patients (12.9%). These findings emphasize that liver lesions commonly present with non-specific clinical manifestations, highlighting the importance of imaging for early diagnosis and lesion characterization. CT therefore serves as an essential investigation because clinical features alone are often insufficient to differentiate benign from malignant hepatic lesions.

In the present study, hepatocellular carcinoma (HCC) was the most common lesion identified on CT, accounting for 20 cases (28.6%), followed by hepatic metastases in 18 patients (25.7%). Among benign lesions, hemangioma was the most frequent lesion (15.7%), followed by liver abscesses (11.4%), simple cysts (8.6%), focal nodular hyperplasia (2.9%), and hepatic adenoma (1.4%). Overall, malignant lesions constituted 42 of 70 cases (60.0%), whereas benign lesions accounted for 28 cases (40.0%). These findings are comparable with those of Hafeez et al., who reported malignant lesions in 35 of 45 patients (77.8%) on histopathology and benign lesions in 10 patients (22.2%), demonstrating that malignant liver lesions predominate among patients referred for advanced CT evaluation [9]. Similarly, Bhandari et al. demonstrated that spectral CT successfully differentiated hepatocellular carcinoma from benign lesions such as hemangioma, focal nodular hyperplasia, abscesses, angiomyolipoma, and regenerative nodules using quantitative iodine measurements, emphasizing the value of enhancement characteristics in lesion characterization [11].

Dynamic contrast enhancement patterns played a major role in lesion characterization in the present study. Arterial phase hyperenhancement with portal venous washout was the commonest enhancement pattern, observed in 21 patients (30.0%), followed by hypovascular lesions in 18 patients (25.7%), peripheral rim enhancement in 15 patients (21.4%), peripheral nodular enhancement in 11 patients (15.7%), and homogeneous enhancement in 5 patients (7.1%). Statistical analysis demonstrated a highly significant association between enhancement pattern and lesion nature ($\chi^2 = 38.61$, $p < 0.001$). Arterial enhancement with washout was predominantly associated with malignant lesions (20 of 42 cases), whereas peripheral nodular enhancement was mainly seen in benign lesions (10 of 28 cases). These findings closely agree with the observations of Hafeez et al., who differentiated benign and malignant liver lesions primarily on the basis of characteristic enhancement patterns using triphasic CT [9]. Likewise, Jensen et al. reported that spectral CT parameters, including spectral HU curve slope and iodine concentration, achieved excellent diagnostic performance with area under the ROC curves of 0.948 and 0.946, respectively, for differentiating benign from malignant liver lesions, further confirming the importance of enhancement characteristics in CT interpretation [14].

Associated CT findings also contributed significantly to diagnosis and staging. Hepatomegaly was observed in 33 patients (47.1%), cirrhosis in 19 patients (27.1%), ascites in 16 patients (22.9%), lymphadenopathy in 13 patients (18.6%), portal vein thrombosis in 11 patients (15.7%), and biliary dilatation in 10 patients (14.3%). These findings are particularly valuable in identifying underlying chronic liver disease, assessing tumor spread, and planning further management. Portal vein thrombosis and cirrhosis were predominantly associated with malignant lesions, especially hepatocellular carcinoma, reflecting disease progression and advanced-stage presentation.

The diagnostic agreement between CT and the final diagnosis was excellent. CT correctly identified 66 of the 70 lesions (94.3%), with only four cases (5.7%) being misclassified. Among benign lesions, CT correctly diagnosed 26 of 28 cases, whereas among malignant lesions, 40 of 42 cases were accurately identified. Consequently, CT demonstrated a sensitivity of 95.2%, specificity of 92.9%, positive predictive value of 95.2%, negative predictive value of 92.9%, and overall diagnostic accuracy of 94.3%. These findings closely parallel those reported by Hafeez et al., who demonstrated a sensitivity of 100%, specificity of 80%, positive predictive value of 94.5%, negative predictive value of 100%, and diagnostic accuracy of 95.5% for triphasic CT in differentiating benign and malignant focal liver lesions [9]. The slight differences in diagnostic performance between the two studies may be attributed to differences in sample size, lesion spectrum, imaging technology, and patient population.

Lesion size analysis in the present study showed that lesions measuring 3–5 cm were most common (40.0%), followed by lesions larger than 5 cm (37.1%), while lesions smaller than 3 cm constituted only 22.9% of cases. The predominance of medium- and large-sized lesions indicates that many patients present after lesions have reached clinically detectable dimensions. This observation corresponds with the findings of Vorontsov et al., who demonstrated that CT detection sensitivity improved substantially with increasing lesion size, being only 10% for lesions <10 mm, 71% for lesions measuring 10–20 mm, and 85% for lesions larger than 20 mm [12]. Thus, CT performs particularly well in detecting clinically significant liver lesions of moderate and large size.

Recent technological advancements have further strengthened the diagnostic role of CT in hepatic

imaging. Wei et al. developed the Liver Lesion Network (LiLNet), an artificial intelligence-based multiphase CT system that achieved an overall diagnostic accuracy of 94.7% and an AUC of 97.2% for differentiating benign from malignant liver lesions, values remarkably similar to the diagnostic accuracy observed in the present study (94.3%) [13]. Likewise, Zhang et al. demonstrated that virtual non-enhanced CT derived from dual-energy CT detected 91% of hepatic focal lesions while simultaneously reducing radiation exposure, suggesting future improvements in liver CT protocols without compromising diagnostic performance [15]. Furthermore, McCollough et al. demonstrated that advanced image reconstruction and denoising techniques significantly improved liver metastasis detection in low-dose CT examinations, highlighting the continuing evolution of CT technology for hepatic lesion evaluation [10].

Overall, the present study confirms that contrast-enhanced multidetector CT is a highly reliable, non-invasive imaging modality for the evaluation of liver lesions. Characteristic enhancement patterns, lesion morphology, associated imaging findings, and excellent diagnostic accuracy enable CT to accurately differentiate benign from malignant lesions and guide subsequent patient management. The findings are consistent with previously published literature and reinforce the pivotal role of multiphase CT as the primary imaging modality for comprehensive assessment of focal liver lesions.

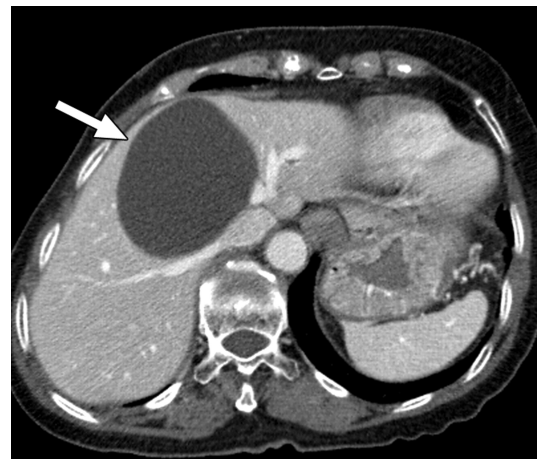


Fig. 1—Benign developmental hepatic cyst. CT scan shows hypodense lesion (*arrow*) with sharply defined margins and smooth thin walls and no evidence of nodularity.

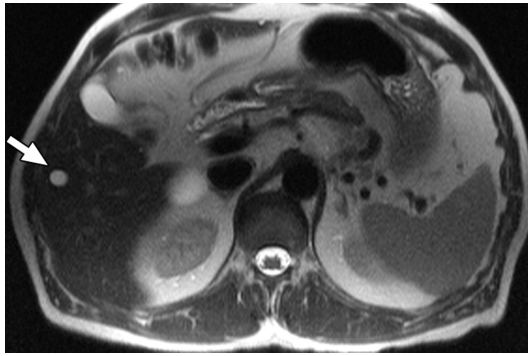


Fig. 2 —Benign developmental hepatic cyst.

Conclusion

The present study demonstrates that contrast-enhanced multidetector computed tomography (CT) is a highly effective and reliable imaging modality for the evaluation and characterization of liver lesions. CT accurately differentiated benign from malignant lesions based on lesion morphology, enhancement patterns, and associated imaging findings. Hepatocellular carcinoma (28.6%) was the most common lesion identified, and malignant lesions constituted 60.0% of all cases. Characteristic arterial enhancement with washout showed a significant association with malignancy ($p < 0.001$), while peripheral nodular enhancement was predominantly observed in benign lesions. CT showed excellent diagnostic performance, with a sensitivity of 95.2%, specificity of 92.9%, and overall diagnostic accuracy of 94.3%. These findings highlight the pivotal role of multiphasic CT in the early diagnosis, characterization, staging, and treatment planning of liver lesions. Therefore, contrast-enhanced CT remains an indispensable first-line imaging investigation for comprehensive evaluation of focal liver lesions in routine clinical practice.

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