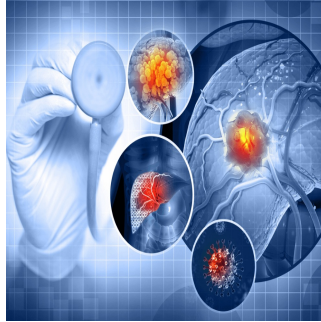


Radiologic Factors Influencing Rapid Growth in Early-Stage HCC



Hepatocellular carcinoma (HCC) is the most common primary liver cancer and a significant cause of cancer-related mortality globally. Early-stage HCC offers better treatment prospects compared to advanced cases, yet predicting tumour growth rates remains a major clinical challenge. Tumour volume doubling time (TVDT) can vary significantly among individual lesions, which influences treatment timelines and patient outcomes. Radiologic evaluations, particularly CT and MRI, have shown promise in predicting tumour growth patterns more effectively than clinical and laboratory metrics alone.

Imaging Techniques and Growth Rate Stratification

CT and MRI imaging have proven effective in stratifying tumour growth rates in early-stage HCC cases. The Liver Imaging Reporting and Data System (LI-RADS) categories, which classify lesions based on imaging features, play a significant role in growth prediction. A recent study involving 322 patients categorised HCC lesions into LR-3, LR-4, LR-5 and LR-M groups based on their baseline imaging results. The study revealed varying growth rates among these categories, with LR-M showing the highest rate of rapid growth. Median TVDT differed significantly, with LR-M lesions averaging 79 days compared to 170 days for LR-3 lesions.

Imaging-based risk stratification helps identify patients requiring expedited treatment due to rapid tumour progression. Rapid growth, defined as a TVDT of less than 3 months, was present in 70% of LR-M classified lesions, while lower categories exhibited slower progression. This approach highlights the importance of detailed radiologic assessments in patient management, influencing follow-up intervals and treatment urgency. Imaging techniques have not only enabled risk stratification but also allowed for the development of more individualised treatment plans that can be tailored to the growth patterns observed.

Key Factors Associated with Rapid Growth

Several factors contribute to the accelerated growth of HCC tumours, with radiologic findings providing critical insights. The study identified three primary independent factors linked to rapid growth:

- LI-RADS Category LR-M:** LR-M classification was the strongest predictor of rapid growth, with a 70% likelihood of fast tumour expansion. These lesions often exhibit aggressive imaging features, including targetoid appearances linked to poor differentiation and higher malignancy potential. Such features necessitate heightened clinical vigilance and early intervention strategies to manage the aggressive nature of these tumours.
- Serum α -fetoprotein Levels:** Elevated α -fetoprotein levels (>400 ng/mL) were associated with faster tumour growth, reinforcing its value as a complementary biomarker in HCC risk assessment. This biomarker serves as a useful adjunct to radiologic findings, offering an additional layer of prognostic information when determining patient management strategies.
- Baseline Tumour Diameter:** Interestingly, smaller baseline tumour diameters were also correlated with faster growth rates, possibly due to the higher cellular proliferation in early tumour stages before reaching a size where nutrient limitations slow expansion. This finding challenges the conventional assumption that smaller tumours are less aggressive and highlights the need for careful monitoring regardless of tumour size.

Clinical Implications and Management

The findings on radiologic predictors for rapid HCC growth have significant implications for clinical practice. Patients with LR-M category lesions or elevated α -fetoprotein levels may require more frequent monitoring and earlier intervention strategies. Treatment approaches can be tailored based on these predictive factors, enhancing curative outcomes and reducing recurrence risks. Close collaboration between radiologists, oncologists and hepatologists is crucial to ensure a comprehensive approach to patient care, combining imaging insights with clinical assessments.

Furthermore, the identification of LR-M lesions as a high-risk category necessitates careful consideration in clinical decision-making. Patients with rapid tumour growth profiles might benefit from closer surveillance post-treatment to mitigate recurrence risks. The use of a multidisciplinary approach, where radiologic and biochemical data are integrated, can support more effective and personalised treatment planning.

Radiologic factors, particularly LI-RADS classifications and serum biomarkers, play a critical role in predicting rapid growth in early-stage hepatocellular carcinoma. The integration of CT and MRI assessments into clinical practice can improve patient risk stratification, enabling more precise treatment planning. As imaging technologies continue to advance, their contribution to personalised oncology care in HCC management will become increasingly indispensable. Early identification of rapidly growing tumours allows for more effective intervention, reducing recurrence rates and improving long-term patient outcomes.

Source: [Radiology](#)

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