

Imaging of Hepatocellular Carcinoma



New Approaches to Diagnosis

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KEYWORDS

• Liver • Imaging • HCC • LI-RADS • MRI

KEY POINTS

- The liver imaging reporting and data system (LI-RADS) is a form of structured reporting that is being made congruent with the US Organ Procurement and Transplant Network (OPTN) classification of liver nodules in cirrhotic patients.
- Major diagnostic imaging features for hepatocellular carcinoma (HCC) are arterial phase hyperenhancement, tumor size (diameter), washout, capsule presence and appearance, and interval threshold tumor growth.
- LI-RADS and OPTN class 5 are essentially equivalent, conveying almost 100% certainty for HCC using imaging features for lesions greater than 10 mm in size.

INTRODUCTION

Hepatocellular carcinoma (HCC) is the sixth most frequent tumor and second leading cause of cancer death worldwide.¹ A variety of treatment options are available for HCC,^{2,3} such as surgical resection for an early-stage tumor with normal portal pressures and serum bilirubin and liver transplantation (LT) in patients with early-stage cancer and without prohibitive comorbid disease. Locoregional therapy, such as transarterial chemoembolization, radiofrequency ablation, and other destructive techniques, might be appropriate for patients who are poor surgical candidates. The multi-kinase inhibitor, sorafenib, has been recently approved for systemic therapy for the treatment of advanced disease HCC patients.

In clinical practice, the appropriate management of a given specific stage of HCC depends on the accuracy of the imaging diagnosis of HCC, because negative outcome risk factors are usually not known unless a biopsy of the tumor is obtained, and this is becoming increasingly uncommon. Abdominal ultrasound is the initial imaging test suggested in all guidelines for screening and surveillance of HCC in

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high-risk individuals,^{2,3} followed generally by contrast-enhanced computed tomography (CT) or MRI. The American Association for the Study of Liver Diseases (AASLD), the European Association for the Study of the Liver, the Organ Procurement and Transplantation Network (OPTN) in the United States (which is administered by the United Network for Organ Sharing), the Japan Society of Hepatology, and several other organizations have published guidelines for the imaging diagnosis of HCC,^{4–12} such as “arterial phase hyperenhancement” and “washout,” after intravenous contrast administration; some also incorporate an evaluation of nodule growth on serial examinations. Heretofore, the AASLD and other organizations generally stratified imaging diagnoses simply as positive, negative, or indeterminate for HCC,^{2,3} but there is now a move toward greater precision and expression of degree of certainty.

American Association for the Study of Liver Diseases-Organ Procurement and Transplant Network Criteria for Hepatocellular Carcinoma Diagnosis

According to the latest AASLD guidelines,¹³ imaging surveillance for HCC should be based on serial ultrasound. However, in practice, surveillance is often performed with serial dynamic multiphasic CT or MRI (**Table 1**). Also, a 10- to 20-mm nodule initially detected by ultrasound, according to the AASLD guidelines, can be definitively diagnosed as HCC with arterial phase hyperenhancement and washout on CT or MRI.^{2,14,15} Diagnosis of HCCs between 10 and 20 mm is particularly important, because these tumors can be cured by LT, although they do not get priority points on the transplant wait list according OPTN criteria until the size exceeds 2 cm. The finding of “arterial phase enhancement and washout” provides only 87% to 95% specificity for diagnosis of HCC.^{5,8,14} However, the visualization of a liver nodule on surveillance ultrasound raises the probability of HCC in an at-risk population with a positive predictive value of approximately 100%.^{2,3,14}

The OPTN^{14,15} updated its liver imaging policy in October 2013 by requiring minimum technical specifications on CT and MRI, a structured reporting (the Liver Imaging Reporting and Data System [LI-RADS]), and for the scan to be interpreted by a

Table 1

US Organ Procurement and Transplant Network classification of cirrhotic nodules

Class	Description
0	Incomplete or inadequate study (repeat)
1	No evidence of HCC (normal follow-up)
2	Benign lesion or diffuse disease; no focal mass (transplant center discretion for further imaging)
3	Abnormal scan; indeterminate lesion not meeting criteria for HCC (follow-up imaging 6–12 mo)
4	Abnormal scan; intermediate suspicion for HCC (3 mo imaging follow-up)
5	Meets criteria for HCC
	5A: Greater than or equal to 1 cm and <2 cm (potentially eligible for automatic exception)
	5A-G: Lesion that has demonstrated threshold growth (potentially eligible for automatic exception)
	5B: Maximum diameter greater than or equal to 2 cm and less than or equal to 5 cm (potentially eligible for automatic exception)
	5T: Prior local regional treatment of HCC (potentially eligible for automatic exception)
	5X: Maximum diameter greater than or equal to 5 cm (not eligible for automatic exception)

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