Screening and Surveillance of Hepatocellular Carcinoma

An Introduction to Ultrasound Liver Imaging Reporting and Data System

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KEYWORDS

• Hepatocellular carcinoma • HCC • Screening • Surveillance • Ultrasound • Reporting

KEY POINTS

- Hepatocellular carcinoma has a high prevalence among populations with cirrhosis, is increasing in incidence, and is associated with significant morbidity and mortality. Therefore, a robust screening and surveillance program is needed.
- Most societies advocate ultrasound as the first-line screening and surveillance modality for at-risk populations, despite variability in sensitivity, which may in part be caused by the inherent user dependence and variability in performance between individuals and sites. A standardized imaging protocol, reporting language, and set of management recommendations may significantly improve patient care; this is the basis behind the American College of Radiology (ACR) Ultrasound Liver Imaging Reporting and Data System (US LI-RADS) for screening and surveillance.
- This article provides an introduction to US LI-RADS, discusses the applicable target population and impact on clinical work flow and patient management, and offers example cases and images.

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INTRODUCTION

Hepatocellular carcinoma (HCC) is the fifth most common cancer, and the second most common cause of cancer-related death in the world.[1] More than 80% of HCC cases worldwide are attributed to liver disease related to hepatitis B virus (HBV) and hepatitis C virus (HCV).[2] SEER (Surveillance, Epidemiology, and End Results) registries showed a 3-fold increase in incidence of HCC from 1975 to 2007 in the United States.[3] HCC is the fastest increasing cause of cancer-related death among Americans and in other parts of the world. In 2012, there were 782,000 new cases of HCC worldwide, with 746,000 deaths, resulting in a ratio of mortality to incidence of 0.95.[4]

Survival is poor in most cases because patients are typically diagnosed at a late stage. However, if detected early, HCC potentially may be cured by surgical resection, liver transplant, or local ablation.[5] Advancements in locoregional treatments, such as radiofrequency ablation, microwave ablation, and transcatheter arterial chemoembolization (TACE), have also extended survival of patients with HCC.[5,6] Therefore, a robust screening program is needed for high-risk populations to identify early-stage disease amenable to curative treatment.[7]

SCREENING AND SURVEILLANCE

Screening is an application of a diagnostic test in patients at risk for a disease but in whom there is no a priori reason to specifically suspect that disease is present. Surveillance is the repeated application of the screening test in the population at risk.[8] As described later, the goal of screening/surveillance is to detect suspected disease in at-risk populations, not necessarily to establish a diagnosis; the latter typically requires additional diagnostic testing.

Screening and surveillance is recommended for populations at high risk for HCC to detect suspected HCC at an early stage, thereby improving health outcomes and survival. A risk assessment is required to determine whether screening and surveillance is cost-effective, and in what target population screening and surveillance provides a benefit. Surveillance for HCC is deemed cost-effective if the expected HCC risk exceeds 1.5% per year in patients with cirrhosis, and 0.2% per year in patients with chronic HBV without cirrhosis.[8] The difference in thresholds reflects differences in underlying life expectancy: patients with HBV without cirrhosis are otherwise healthy and are expected to have long lives in the absence of HCC; by comparison, patients with cirrhosis are at risk of dying from liver disease even if HCC does not develop.

Target Population

HCC screening and surveillance is recommended in any patient with cirrhosis irrespective of cause, and in subsets of patients with HBV irrespective of cirrhosis (**Box 1**).[7–9] Some medical societies also include noncirrhotic chronic HCV carriers with stage 3 fibrosis in their target populations for screening and surveillance. Some populations, such as those with chronic right heart failure, hemochromatosis, or suspected nonalcoholic steatohepatitis, are not officially endorsed as a target population, although may be included in a screening and surveillance population depending on institutional and regional practices and policies. Minor risk factors such as older age, male sex, heavy alcohol use, and smoking do not increase the HCC incidence above the threshold needed to warrant HCC screening or surveillance.

Screening and Surveillance Strategies for Hepatocellular Carcinoma

Many retrospective studies have shown that surveillance resulted in smaller HCC tumor size and an earlier disease stage at initial diagnosis, as well as a survival benefit, compared with nonsurveillance populations.[10–12] Most major hepatology and cancer societies endorse ultrasound (US) for HCC screening and surveillance, based on a single randomized controlled trial[13] and multiple cost-effectiveness studies.[7–10,14,15] Alpha-fetoprotein (AFP) is a commonly used serum test and some societies endorse its use for HCC screening, typically in combination with US.[8,15] However, because of the suboptimal performance, as detailed later, the American Association for the Study of Liver Diseases (AASLD) and European

Box 1
Populations for whom hepatocellular carcinoma screening/surveillance is recommended

- Patients with cirrhosis, irrespective of cause
- Chronic HBV carriers in:
  - Asian men more than 40 years of age
  - Asian women more than 50 years of age
  - Africans and North American black people
  - HBV and cirrhosis
  - Family history of HCC

From Bruix J, Sherman M, American Association for the Study of Liver Diseases. Management of hepatocellular carcinoma: an update. Hepatology 2011;53(3):1020–2; with permission.