

Hepatic Tumor Ablation



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KEYWORDS

- Liver • Percutaneous • Microwave • Radiofrequency • Hepatocellular carcinoma • Metastasis

KEY POINTS

- Hepatic tumor ablation allows for local control of tumors that are not amenable to surgical resection, increasing potentially curative treatment options.
- For hepatocellular carcinoma, tumor ablation is the preferred treatment of patients within the Milan criteria who are not surgical candidates and the first-line treatment of tumors less than 2 cm in patients ineligible for transplant.
- Adjunctive techniques should be used to ensure an adequate safety margin, while allowing maximum energy delivery.
- Multiapplicator synergy can be utilized to maximize treatment effectiveness.
- Optimal applicator placement to create margins of at least 5 mm in hepatocellular carcinoma (HCC) and 10 mm in metastatic disease is key to a successful ablation.



Video content accompanies this article at <http://www.surgical.theclinics.com>

INTRODUCTION

Tumor ablation is a safe and effective technique for managing both primary and metastatic liver tumors that are not amenable to surgical resection. In the Barcelona Clinic Liver Cancer (BCLC) staging system for HCC, which has been adopted by the American Association for the Study of Liver Diseases (AASLD), tumor ablation is considered curative and the treatment of choice for patients with Stage 0 and Stage A HCC not amenable to resection or transplantation.¹ The newest BCLC staging system has

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been updated to recommend tumor ablation over resection for patients with stage 0 HCC who are not eligible for transplantation.² Ablation is also successful in bridging patients to transplantation, decreasing patient drop-off from the wait list.^{3,4} In the setting of metastatic disease, ablation is a treatment strategy available in the multidisciplinary management of oligometastatic disease that is not amenable to surgical resection or in conjunction with a resection when all sites of disease can be controlled.⁵

Ablation covers a wide range of treatment modalities that allow focal destruction of tumors utilizing a needle-like device to deliver energy or chemicals to the targeted tissue. Chemical ablation is most frequently performed via the injection of ethanol, although other substances have been used and are currently under research. Energy-based treatment is most frequently used in modern tumor ablation practice; the largest reported experiences have been using thermal modalities (radiofrequency [RF] ablation, microwave [MW] ablation, and cryoablation). Other modalities with early clinical data include noninvasive high-intensity focused ultrasound (HIFU) and irreversible electroporation (IRE) via electrode applicators.

This article reviews the approach to hepatic tumor ablation, including patient selection, procedure planning, procedure technique with associated adjunctive maneuvers, and outcomes.

PREPROCEDURE PLANNING

Patient Selection

Hepatocellular carcinoma

The AASLD and European Association for the Study of the Liver (EASL) have adopted the BCLC staging and treatment algorithm in their guidelines for the treatment of HCC.^{1,6} Within this strategy, patients with very early (stage 0, Child-Pugh A liver function, Eastern Cooperative Oncology Group [ECOG] performance status of 0, and a single HCC less than 2 cm) and early (stage A, Child-Pugh A-B liver function, ECOG performance status of 0, and single HCC up to 5 cm or less than 3 tumors that are smaller than 3 cm) are recommended to undergo RFA for curative treatment when a patient is not eligible for surgical resection or transplantation. Studies comparing RFA and resection for stage 0 HCC have been mixed, although overall demonstrating equivalent survival with an improved safety profile for ablation, leading to a recent update to the BCLC treatment algorithm recommending ablation over resection for this stage.^{2,7-9} RFA has also been shown successful at bridging patients to transplantation by preventing tumor progression that would place a patient beyond the Milan criteria.^{3,4} Because the mechanisms of action for tissue destruction with RF and MW are identical, tissue heating with MW is more efficient, the literature for MW treatment of HCC is rapidly expanding (and compares favorably to RF), and the procedures are virtually identical, the use of MW for treating stage 0 and an HCC is a reasonable alternative to RF.^{10,11}

Metastatic disease

Patients with oligometastatic disease who have unresectable tumors, who are not surgical candidates or who have recently undergone resection, or who will have inadequate liver reserve after resection are appropriate candidates for tumor ablation.⁵ National Comprehensive Cancer Network guidelines for colorectal and neuroendocrine malignancies include ablation among the treatment options. For colorectal metastasis, all sites of disease should be amenable to either ablation or resection for ablation to be considered. Recent guidelines from an expert panel of interventional oncologists suggest treating 3 tumors or fewer with the largest treated tumor up to 3 cm as the preferred patient population, although up to 5 tumors and tumors up to

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