Determination of Resectability

Cecilia G. Ethun, MD, Shishir K. Maithel, MD*

KEYWORDS

• Liver tumors • Resectability • Oncologic assessment • Liver function

KEY POINTS

- Determining resectability of hepatic malignancies relies on 3 key concepts: oncologic appropriateness, host condition, and technical resectability.
- Oncologic appropriateness is based on tumor biology. Adequately defining the extent of disease and understanding the nature of the tumor in question are critical before pursuing operative intervention.
- Host condition refers a patient's general state of health and his or her ability to tolerate major surgery, or surgical fitness.
- Technical resectability of a liver tumor requires that the future liver remnant be of sufficient quantity and quality, with adequate inflow, outflow, and biliary drainage, in order to sustain function postoperatively.

INTRODUCTION

When determining the resectability of hepatic malignancies, several key considerations must be addressed:

1. Oncologic appropriateness. The surgeon's first responsibility is to determine those patients most likely to benefit from an operation. In malignancy, this is largely measured by the survival benefit of surgery, which is ultimately governed by tumor biology. Thus, it is critical to adequately define the extent of disease and understand the nature of the tumor in question before proceeding with operative intervention.
2. Host condition. This refers to the general health and surgical fitness of a patient. In most patients, this can be successfully evaluated through a careful history and physical examination, as well as any other indicated adjunct workup. Several additional assessment tools may be used to further stratify patients according to risk.

Disclosures: None.
Division of Surgical Oncology, Department of Surgery, Winship Cancer Institute, Emory University, 1365C Clifton Road NE, Building C, 2nd Floor, Atlanta, GA 30322, USA
* Corresponding author.
E-mail address: smaithe@emory.edu

Surg Clin N Am 96 (2016) 163–181
http://dx.doi.org/10.1016/j.suc.2015.12.002 **surgical.theclinics.com**
0039-6109/16/$ – see front matter

3. Technical resectability. Before pursuing any degree of hepatic resection, the remnant liver should be determined to have sufficient inflow, outflow, and biliary drainage, and be of adequate quantity and quality.

If surgery is determined to be reasonable from an oncologic perspective; the patient is deemed fit for surgery; and the extent of planned resection leaves an adequate functional liver remnant (FLR), nearly all patients should be candidates for liver resection. This article will elaborate on these 3 concepts within the context of liver tumors, both primary and metastatic, as well as discuss ways by which resectability rates can be potentially increased.

ONCOLOGIC APPROPRIATENESS

Understanding the resectability of a tumor from an oncologic perspective is paramount and should be the first consideration of any surgeon faced with a cancer patient. This is based on the concept of nonmalfeasance, often represented by the phrase, "first, do no harm." When performed with a curative intent, the value of surgery for malignancy is measured by its survival benefit. Tumor biology, however, ultimately dictates patient outcome. Thus, a thorough preoperative evaluation should be performed to assess the extent of spread, which, among other tumor-specific factors, can help predict the nature of disease. Whether a primary or metastatic liver tumor, extrahepatic spread is an indicator of aggressive tumor biology, and, while not always a preclusion of surgery,[1] the benefit of resection in these cases should be questioned strongly. Improvements in imaging technology, and, in appropriately selected patients, diagnostic laparoscopy, have increased surgeons' ability to identify those patients unlikely to benefit from surgery and avoid unnecessary hepatectomy. In certain cases where the oncologic appropriateness of surgery is in question, a trial of preoperative systemic or liver-directed therapy may help biologically select more favorable tumors for resection.

Preoperative Evaluation

Preoperative evaluation of the oncologic appropriateness of liver resection should focus on characterizing the lesion in question, defining the extent of disease, and determining its biologic behavior. Imaging modalities should include a staging chest radiograph or chest computed tomography (CT), and either a CT or MRI of the abdomen and pelvis, with preference depending on the type of tumor being evaluated, institutional expertise, and patient-related factors. In many cases, however, both CT and MRI may be necessary.[2] Positron emission tomography (PET) scan may also be a useful and important tool in evaluating the extent of disease in fluorodeoxyglucose (FDG)-avid tumors.[3–6] Preoperative biopsy for certain tumor types is often not necessary and should only be pursued in select cases where the information gained will alter the treatment plan, such as administering preoperative therapy.

Despite advances in various high-quality imaging modalities, roughly 9% to 36% of patients are still found to have occult metastatic disease at the time of surgery.[7–11] Staging laparoscopy has been advocated by some to identify peritoneal metastases not detected on cross-sectional imaging, thereby avoiding unnecessary laparotomy.[10–14] However, its routine use is subject to debate, and may only be of benefit in patients already identified as high-risk for having unresectable disease.[15–17]

Tumor-Specific Factors

Hepatocellular carcinoma

Hepatocellular carcinoma (HCC) is the most common primary liver tumor and the third most common cause of cancer-related death worldwide.[18] Although various