

Modern Technical Approaches in Resectional Hepatic Surgery



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KEYWORDS

• Liver surgery • Primary liver tumors • Liver metastasis • Surgical techniques

KEY POINTS

- Major liver surgery can be performed safely.
- Precise preoperative treatment planning is required.
- Intraoperative ultrasound facilitates management of inflow and outflow to and from the liver.
- Low central venous pressure and meticulous transection are important for minimizing blood loss.

INTRODUCTION

Techniques and indications for resection of liver tumors have considerably evolved during the last 2 decades. Liver surgery can be performed more safely than ever and the number of liver resections has increased in the past years.^{1–3} Multimodal treatment for colorectal liver metastases has expanded the group of patients who are potentially eligible for liver resection. Surgical approaches to complex resection have been further augmented by a variety of electrosurgical devices and the increasing use of preoperative portal vein embolization to augment the size and function of the planned liver remnant.

The critical elements for safety in resectional hepatic surgery include meticulous preoperative evaluation, including assessment of liver function and delineation of hepatic anatomy. Intraoperative management involves the use of a low central venous pressure anesthetic technique and seamless communication between the anesthesiologist and the surgeon. Resection involves techniques to control the inflow into the liver, techniques to control the vascular outflow (hepatic veins), and techniques to

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divide the liver parenchyma and navigate within the liver. This article reviews these elements in detail.

INDICATIONS FOR LIVER RESECTION

Although most resectional surgery is performed for primary or metastatic liver cancer, in selected cases liver resection is also performed for benign disease.

Benign Neoplasms

The most common benign neoplasm requiring resection is hepatic adenoma. These lesions may grow to be large and symptomatic. They are associated with a small risk of malignant transformation,⁴ and a risk of rupture. Both focal nodular hyperplasia (FNH) and hemangioma are benign lesions, and resection is only indicated if patients are clearly symptomatic from the tumor. Because FNH is an entirely benign neoplasm, resection is restricted only to situations in which the neoplasm is associated with life-limiting symptomatology. These symptoms often involve persistent abdominal pain, fullness, and early satiety. Hepatic adenomas are associated with a risk of hemorrhage and a small risk of malignant transformation.⁵ Resection is generally recommended for lesions that are more than 5 cm in diameter, particularly if all hormonal therapy has been terminated and no additional regression in the size of the lesion has occurred. Unlike with malignant neoplasia, surgical margins are not critical in determining outcome and surgeons should not risk critical inflow or outflow structures in an effort to obtain wide surgical margins.

Metastatic Colorectal Cancer

Resectable metastatic colorectal cancer is the most common indication for liver resection. The prognosis after complete resection of colorectal liver metastases is variable and is associated with factors such as number of lesions, size of lesions, synchronicity of disease, extent of lymph node involvement.⁶⁻⁸ Patients that are treated with complete resection may be afforded long term survival. The 5 year survival rate varies between 30% and 45%.^{6,8}

From an oncologic standpoint, the most important aim is to clear all liver disease and to achieve negative margins. Because most liver resections are performed for colorectal cancer liver metastasis (CRLM), they frequently involve multimodal treatment, mainly preoperative chemotherapy with regimens including either oxaliplatin or irinotecan as the principle chemotherapeutic agent. A randomized trial conducted by the European Organisation for Research and Treatment of Cancer (EORTC) demonstrated that perioperative oxaliplatin-based chemotherapy improves progression-free but not overall survival.^{9,10} In addition to disease control, preoperative chemotherapy has the ability to render unresectable disease resectable in a small subset of patients, by virtue of substantial disease response. The optimal extent of surgical margin remains controversial; however, evidence suggests that microscopically positive surgical margins are associated with increased disease recurrence. Therefore, microscopically negative margins remain a focus for all hepatic resections. Numerous articles have shed light on this issue, and although it has been controversially discussed for some time, agreement now exists that a negative margin is a clear prognostic factor and that at least 1 mm is required for the definition of a negative margin.

Neuroendocrine Liver Metastases

Neuroendocrine tumors, particularly carcinoid, although often multifocal within the liver, tend to be indolent in progression, and patients will derive survival benefit

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