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Surgery for Liver Cancer

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Introduction

Liver cancer, primarily hepatocellular carcinoma represents a significant global health burden due to its high incidence and poor prognosis. Surgical intervention plays a pivotal role in the management of liver cancer, aiming to achieve complete tumor resection while preserving sufficient liver function. This paper explores the principles, techniques, outcomes, and advancements in surgical approaches for liver cancer.

Liver cancer arises from hepatocytes, the primary functional cells of the liver, and is often associated with underlying chronic liver diseases such as hepatitis B and C infection, cirrhosis, non-alcoholic fatty liver disease and alcohol-related liver disease. Hepatocellular carcinoma accounts for the majority of primary liver cancers worldwide, although intrahepatic cholangiocarcinoma and other rare histological types also occur [1].

Description

Diagnosis of liver cancer typically involves imaging studies such as ultrasound, computed tomography, magnetic resonance imaging and sometimes positron emission tomography scans to characterize the tumor, assess its size, location, and extent of intrahepatic involvement, and detect any extrahepatic metastases. Biopsy is occasionally performed to confirm the histological diagnosis, especially in cases with atypical radiological findings or suspicion of metastatic disease.

Surgical resection remains the cornerstone of curative treatment for selected patients with early-stage hepatocellular carcinoma and some cases of intrahepatic cholangiocarcinoma. The main goals of surgery are to achieve complete tumor clearance (R0 resection) while preserving adequate functional liver tissue to prevent postoperative liver failure. Liver resection involves the surgical removal of the tumor along with a margin of healthy liver tissue. The extent of liver resection depends on the tumor size [2], location, number of lesions, and proximity to major vascular and biliary structures. Anatomical resection, which follows the Couinaud liver segments, ensures complete removal of the tumor and preservation of segmental liver function. Non-anatomical resection may be performed for tumors located in less critical regions of the liver, aiming to achieve adequate surgical margins.

Technological advancements, such as intraoperative ultrasound and surgical navigation systems, aid in accurate tumor localization, assessment of vascular anatomy, and planning of the optimal surgical approach. Laparoscopic and robotic-assisted liver resection techniques have gained popularity in selected cases, offering advantages such as reduced blood loss, shorter hospital stays, and faster recovery times compared to traditional open surgery.

Liver transplantation is considered for selected patients with early-stage HCC who meet specific criteria, such as tumor size, number of lesions, absence of vascular invasion, and adequate liver function. The Milan criteria, based on tumor size and number (solitary tumor ≤5 cm or up to three tumors each ≤3 cm), are widely used to select candidates for liver transplantation. The principle of transplantation is to remove the diseased liver and replace it with a healthy donor liver, thereby eliminating both the tumor and the underlying liver disease [3]. In patients with small, unresectable liver tumors or those who are not candidates for surgery due to poor liver function or comorbidities, ablative therapies such as radiofrequency ablation, microwave ablation and percutaneous ethanol injection may be employed. These minimally invasive techniques aim to destroy tumor tissue while preserving as much of the surrounding healthy liver parenchyma as possible. Ablative therapies are effective for small tumors (<3 cm) and may be used as a bridge to liver transplantation or as palliative treatment to alleviate symptoms and prolong survival [4,5].

The prognosis for patients undergoing surgical treatment of liver cancer varies widely depending on factors such as tumor stage, extent of liver resection, underlying liver function, and patient's overall health status. For patients with early-stage HCC who undergo curative liver resection or transplantation, the 5-year survival rates can exceed 50-70%, especially when tumors are detected and treated at an early stage. However, outcomes are less favorable for patients with advanced-stage disease, multifocal tumors, vascular invasion, or extrahepatic metastases, where surgical options may be limited to palliative measures or combined with systemic therapies.

Conclusion

Bone sarcomas represent a rare and challenging group of malignancies requiring a multidisciplinary approach to treatment. Surgical resection, chemotherapy, and, in select cases, radiation therapy remain integral components of treatment aimed at achieving local control and improving survival outcomes. On-going research efforts focused on personalized medicine and innovative therapeutic strategies are essential to addressing the complexities of bone sarcoma management and improving outcomes for patients in the future.

Acknowledgement

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Conflict of Interest

None.

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