

China's expert consensus on laparoscopic liver resection and guidelines on surgical procedures: an interpretation

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“Minimally invasive” represents a new trend in modern surgery. Laparoscopic surgeries bring many advantages including smaller local trauma, milder systemic reactions, and faster postoperative recovery. The laparoscopic techniques have been increasingly used for the treatment of liver diseases. In December 2012, the Chinese Society of Hepatic Surgery issued the Expert Consensus on Laparoscopic Liver Resection and Guidelines on Surgical Procedures (2013 Edition), in which the laparoscopic liver resection is divided into anatomic resection and non-anatomic resection. According to the expert consensus, lesions located in segments II, III, IVb, V, and VI as well as lesions that are near the surface of liver (segments VII, VIII, and IVa) and have not invaded the major hepatic veins should be treated with laparoscopic non-anatomic resection. In contrast, the anatomic resection includes left lateral liver resection, left liver resection, resection of right posterior hepatic lobe, and right liver resection. However, the laparoscopic techniques for hepatic caudate lobe resection, left lobectomy, right lobectomy, middle lobectomy (for segments IV, V, and VIII), and liver graft procurement still have many limitations and cannot be widely applied.

According to the consensus, laparoscopic liver resection is feasible for benign diseases including: symptomatic or relatively large (sized >10 cm) cavernous hemangioma of the liver; symptomatic focal nodular hyperplasia/adenoma; symptomatic or relatively large (sized >10 cm) liver cysts; and intrahepatic bile duct stones. Also, it is feasible for malignancies including primary liver cancer, secondary liver cancer, and some rare malignant liver tumors.

The contraindications of laparoscopic liver resection include: (I) contraindications of open hepatectomy; (II)

patients who cannot tolerate insufflation; (III) the lesion cannot be exposed or dissected due to intraperitoneal adhesions; (IV) the lesion is close to or directly invade the large vessels; (V) the lesion is close to the first, second, or third porta hepatis, and therefore is difficult to expose or dissect; and (VI) the porta hepatis has been invaded, or an extensive hilar lymph node dissection is needed due to the lesion itself.

Before the surgery, the general conditions and local lesion should be assessed to decide whether the laparoscopic liver resection is indicated. For malignant tumors, any potential tumor thrombus in the portal vein or extrahepatic metastasis should be carefully screened.

Both endotracheal intubation under general anesthesia and combined epidural-general anesthesia are feasible for the surgery.

The equipment required for laparoscopic liver resection includes: high resolution electrical or optical laparoscopic system; automatic high-flow insufflation unit; irrigation and suction devices; video and picture collection/storage equipment; ultrasonic equipment and adjustable laparoscopic ultrasound probes; conventional endoscopic instruments; and instruments for open hepatectomy. The surgeons can select endoscopic dissecting sealer, high-intensity focused ultrasound (HIFU), cut-ultrasound aspiration (CUSA), and Ligasure vascular closure system according to hospital conditions and personal habits.

Start with the patient in supine position with the head higher than the feet. Four- or five-hole method is recommended; for small lesions located at the edge of liver, three-hole method can also be employed. The observation hole was above or below the umbilicus. The location of the

operation hole was based on that of the targeted lesion.

According to the consensus, the occlusion of hepatic vascular inflow and outflow is not required for lesions ≤ 3 cm in diameter or when performing resection of left lateral lobe. However, the hepatic vascular inflow and outflow must be occluded when removing lesions >5 cm in diameter or when performing anatomic liver resection.

An immediate shift from laparoscopic surgery to open surgery is needed when: (I) bleeding cannot be stopped; (II) patients cannot tolerate insufflation; and (III) the resection is extremely difficult due to poor exposure and/or large tumor size.

The Guidelines on Surgical Procedures proposes that laparoscopic liver resection has two key steps: hepatectomy and management of the cut surface. The selection of instruments used for laparoscopic dissection of liver parenchyma should be based on the hospital condition and the surgeon's technical skills. HIFU is the most commonly used instrument. Typically, HIFU is employed to dissect the liver parenchyma from front to back and from the surface to the deep along a pre-cut line. Vascular structures ≤ 3 mm in diameter can be directly coagulated and cut off, whereas those >3 mm in diameter should be clamped with titanium clamps or biological clamps firstly before dissection. For vascular structures >7 mm in diameter, ligation with silk suture or management with dissecting sealer is required. Dissecting sealer is also recommended for large vascular structures and hepatic pedicles. When laparoscopic liver

resection is applied for the treatment of hepatolithiasis, after cut off the hepatic segments where the lesion is located, remove the stones in the hilar bile duct or in the dilated bile duct via the cut surface of the liver using lithotomy forceps, choledochoscope, and urinary catheter. For stones in the right posterior lobe of the liver, after the resection of the right posterior lobe, the residual bile duct stones may be difficult to remove due to the restriction in visual angle. Hand-assisted stone removal may be performed when necessary.

After liver resection, bipolar electrocoagulation or argon-plasma coagulation may be performed to stop bleeding at the cut surface. The small blood vessels and bile ducts can be closed off by electrocoagulation. If bleeding continues even after repeated electrocoagulation, suture ligation should be implemented. Vessels/bile ducts larger than 3 mm should be carefully clamped with titanium clamp. Upon the completion of the cut surface management, the cut surface should be rinsed with saline solution to ensure that there is no hemorrhage or bile leak; in some cases, topical hemostatic agents may be used. Generally, one or two rubber surgical drainage tubes should be placed beneath the cut surface.

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