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## SYMPOSIUM: REFINED SURGICAL TECHNIQUES IN LAPAROSCOPIC HEPATECTOMY

# Ultrasound Liver Map Technique

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## SYMPOSIUM: REFINED SURGICAL TECHNIQUES IN LAPAROSCOPIC HEPATECTOMY

# Hepatic Vein-guided Approach

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Hepatic vein guide laparoscopic liver resection has several advantages.
When performing a right hepatectomy, the middle hepatic vein (MHV) should guide the parenchymal transection. During right hepatectomy, its most proximal tributaries can be difficult to identify, and injury to its tributaries can be a source of major bleeding. The constant relationship between the portal bifurcation and the V5 ventral and dorsal allows for easy intraparenchymal identification of the MHV. The parenchymal transection is performed in a convex fashion to optimize exposure of the MHV. Using MHV guidance, the parenchymal transection is continued and V8 is safely identified. For left hepatectomy, after relatively easier control compared to right hepatectomy, parenchymal transection can follow MHV. Hepatic vein guide laparoscopic liver resection (LLR) can facilitate easy, safe, and fast anatomical major liver resection.
Especially, LLR for S7 is difficult because the access of instruments is limited, bleeding control is difficult, major LLR is sometimes required. To overcome these obstacles, and to obtain competent resection margin, LLR through right hepatic vein (RHV) first approach can be performed for mass located near the RHV.

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# Approach to the Inflow Control in Difficult Liver Hilum Including Anatomical Variation and Adhesion

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## SYMPOSIUM: REFINED SURGICAL TECHNIQUES IN LAPAROSCOPIC HEPATECTOMY

# Operative Techniques to avoid near Misses and Fatal Intraoperative Complications

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In the past, the mortality rate of liver resection was very high. The operative mortality rate of hepatectomy ranged from 17% to 24% (1). Due to better understanding of liver anatomy and accumulation of surgical experience, modern series have reported lower operative mortality rates in the past few decades(2). Operative blood loss was one of the risk factors of operative mortality after hepatectomy (3-7). Increased intraoperative blood loss is an independent prognostic factor of tumor recurrence after resection of hepatocellular carcinoma and colorectal liver metastases (8-9).

Compared with open liver resection (OLR), laparoscopic liver resection (LLR) performed by trained surgeons in selected patients may offer improvement of short-term outcomes, and the safety of LLR will continue to improve (10). As with OLR, bleeding still remains a concern for surgeons performing LLR, and it represents the most common cause of conversion to open surgery (11). Intraoperative and postoperative bleeding of LLR is one of the causes of mortality (10). In Japan, surgical blood loss exceeding 1000ml occurs in about 20% of LLR cases (12). Risk factors for bleeding includes a high difficulty score (13) and surgeon experience (14).

The key to bleeding control during LLR is prevention. Experts have developed several skills to reduce bleeding. The 2nd International Consensus Conference on Laparoscopic Liver Resection was held in October 2014 at Morioka, Iwate, Japan. Low central venous pressure (<5 mmHg) is recommended during LLR, as in OLR. A temporary increase in CO2 pneumoperitoneum pressure can be used to help control bleeding during LLR. Laparoscopic suturing skills are essential for LLR (15). It is widely accepted today that the main reasons for reduced blood loss during LLR are the positive pressure of CO2 pneumoperitoneum, the emergence of new transection devices, and the facilitation of inflow and outflow control (16).

A swine model has been used to prospectively demonstrate that multiple gas embolism (CO2) frequently occur during total LLR without significant alterations in hemodynamics (17). Control of bleeding from the hepatic vein is feasible with a high pneumoperitoneum, but there is a possibility of CO2 gas embolism (18). The CO2 pneumoperitoneum is generally established at 10 to 14 mm Hg (15), and this provides for fairly good control of back bleeding during liver transection(19-21).

Transection of the superficial layer of the liver parenchyma can be done with an energy device. Deeper transection should be performed meticulously by exposing the intraparenchymal structure with an ultrasonic aspirator, clamp-crushing technique, or stapler. Hemostasis is usually achieved with bipolar cautery for vessels of 2 mm or less, and with vessel sealing devices or clips for vessels of 3 to 7 mm. Locked clips or staplers are used for vessels of more than 7 mm (15). Although the energy device is effective and reliable, it cannot replace the basic skills of liver surgery: sharp dissection, vascular control, and elective sealing (22).

Intracorporeal intermittent Pringle's maneuver with a self-made loop is feasible and can facilitate safer LLR (23). Selective prior vascular control during LLR is feasible and improves intraoperative and postoperative results (24). Selective clamping of hepatic arterial inflow helps reduce bleeding in high-risk patients (25). The introduction of the Pringle maneuver reduces the blood loss for HCC located in segments 7 or 8 (26).

Patients who had an elective conversion for unfavorable intraoperative findings had better outcomes than patients who had an emergent conversion secondary to unfavorable intraoperative events (11). In the meanwhile, conversion should not be seen as a failure of the laparoscopic approach but must be considered as soon as the surgeon perceives increased difficulty or fails to progress. Surgeons should be proficient in laparoscopic suturing and other techniques of laparoscopic hemorrhage control to avoid emergent conversion. In emergent situations, efforts should be made to control the bleeding before converting to hand-assisted or laparotomy, as significant blood loss can occur during the process of conversion (27).

I will demonstrate operative techniques that may avoid near misses and fatal intraoperative complications and how to deal with bleeding events during laparoscopic liver resection.

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