

A secure taping technique for a liver hanging maneuver using a surgical probe

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Short running title: Hanging maneuver using a surgical probe

Key words: hepatectomy, hanging maneuver

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## Abstract

A liver hanging maneuver is currently being applied for various types of hepatectomies. The most difficult and important step of this technique is to encircle the liver with tape that is passed between the liver and the inferior vena cava, using a blind dissection. This report describes a secure technique for taping utilizing a surgical probe.

The liver hanging maneuver was originally introduced as a safe procedure to use during a right hepatectomy (1) and in a modified form it is now being applied for various types of hepatectomies and liver transplantations (2-5). When this technique is applied during a right hepatectomy or a left hepatectomy with the caudate lobe, the most difficult and important step is to encircle the liver with tape that is passed between the liver and the inferior vena cava (IVC), using a blind dissection. Several studies have so far proposed using a lightly curved Kelly clamp during this step with acceptable results (6, 7), but IVC injury is always a great concern during this step (8). Some technical inventions have also been introduced to avoid this significant injury, such as an ultrasonic- or endoscopic- assisted dissection between the liver and IVC (6, 9). This report describes a secure technique for taping which utilizes a surgical probe.

During the dissection of the cranial part of the liver, the space between the right hepatic vein (RHV) and the middle hepatic vein (MHV) is carefully exposed. After a subsequent cholecystectomy and hilar dissection, the hepatoduodenal ligament is encircled with the tape and then the ligament is lifted to allow a fine view of the caudal edge of the liver. The thin part of the caudate lobe is dissected away from the IVC and the surgical probe is carefully inserted in front of the IVC with or without ultrasound guidance to avoid significant short hepatic vein injury. After the tip of the surgical probe is identified at the space of the cranial end between the RHV and MHV, the probe is advanced while feeling the tip and bending it ventrally with the finger (**Figure 1**). After the probe is

fully inserted with a sufficient length above the space between the RHV and MHV (around 5 cm or longer), a 3-0 monofilament suture is tied at the tip of the probe and the tape is tied at the opposite end of the suture. The liver is finally encircled with the tape by pulling the probe down carefully (**Figure 2**). Thus far, this procedure has been employed in 4 living donor hepatectomies of the left liver with the caudate lobe and in 3 right hepatectomies for a huge hepatocellular carcinoma. In all cases, the taping was easily accomplished without any problems.

The liver hanging maneuver is a favorable procedure in various types of hepatectomies. However, a blind dissection between the liver and IVC is still a challenging procedure, with the risk of significant bleeding due to IVC injury. Several studies have described an ordinary procedure with a lightly curved Kelly clamp with acceptable results, but bleeding complications occurred (7). Among the 7 living donor hepatectomies so far performed with a blind dissection using a Kelly clamp, one patient had significant bleeding (3150 g) due to an IVC injury even under assistance with ultrasound. Based on this experience, a safer and more comfortable technique was therefore developed using a surgical probe.

The surgical probe is a conventional device found in any center and it has several advantages over the Kelly clamp. First, it is thin and light but the tip is blunt, so that the surgeon can easily feel resistance when it advances the wrong way and significant injury even of small short hepatic veins can thus be avoided. Second, the probe is relatively coarse but flexible, so that it can be used while

bending it ventrally, as shown in this study. With this maneuver, tape is easily attached with the surgical probe, interposed with a 3-0 monofilament suture. The feasibility of this technique should be determined by a prospective and randomized study. This simple technique to encircle the liver is easy to perform and it is recommended as a secure technique to use when carrying out a liver hanging maneuver.

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## Figure legends

### Figure 1.

Insertion of the surgical probe between the liver and IVC (A). The probe is inserted while bending it ventrally (arrow, B).

### Figure 2.

Tape (large arrow) is attached to the surgical probe (small arrow), interposed with a 3-0 monofilament suture (arrow head).



Figure 1.

A



B



Figure 2.

