

## Glissonian approach for laparoscopic mesohepatectomy

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### Abstract

**Background** Experience with advanced techniques has increased the indications for laparoscopic liver resection. This video demonstrates technical aspects of a pure laparoscopic mesohepatectomy using intrahepatic Glissonian technique. To the best of our knowledge, this is the first case of anatomic laparoscopic mesohepatectomy using the Glissonian approach published in the English literature.

**Methods** A 62-year-old man with colorectal liver metastasis occupying central liver segments was referred for surgical treatment. The first step is the control of segment 4 pedicle. Using the round ligament as a guide, one incision is performed on its right margin and another is made at the bottom of segment 4. A vascular clamp is introduced through those incisions to occlude segment 4 Glissonian sheath. The next step is to control the right anterior pedicle. The first incision is made in front of the hilum and another is performed on the right edge of gallbladder bed. Laparoscopic clamp is introduced through these incisions and closed producing ischemic discoloration of segments 5 and 8. Vascular clamp is replaced by an endoscopic vascular stapling device and stapler is fired. Line of liver transection is marked along the liver surface following ischemic area. Liver transection is accomplished with bipolar vessel sealing device and

endoscopic stapling device as appropriate. Specimen was extracted through a suprapubic incision. Liver raw surfaces were reviewed for bleeding and bile leaks.

**Results** Operative time was 200 min with minimum blood loss and no need for blood transfusion. Recovery was uneventful, and the patient was discharged on the fifth postoperative day. Histological examination revealed clear surgical margins.

**Conclusions** Mesohepatectomy can be safely performed laparoscopically in selected patients and by surgeons with expertise in both liver surgery and laparoscopic techniques. The use of the intrahepatic Glissonian approach may help to identify the exact limits of the mesohepatectomy to avoid ischemic injury of the remnant liver.

**Keywords** Liver · Surgery · Laparoscopy · Metastasis · Colorectal · Technique · Glissonian

Liver resection prolongs survival time of patients with colorectal liver metastases [1]. Preservation of liver parenchyma should always be attempted to prevent postoperative liver failure and to increase the opportunity to perform resections in cases of recurrent or bilateral malignancy.

Recent advances in laparoscopic devices and experience with advanced techniques have increased the indications for laparoscopic liver resection [2]. However, most reported laparoscopic liver resections are hemihepatectomies or nonanatomical resection of liver segments. We recently published a technique for laparoscopic intrahepatic Glissonian approach, which is useful for laparoscopic resection of right and left liver segments [3, 4]. This video demonstrates the technical aspects of a pure laparoscopic mesohepatectomy using the intrahepatic Glissonian technique.

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There is only one report of central liver resection performed by using laparoscopy [5], and to the best of our knowledge, this is the first case of anatomic laparoscopic mesohepatectomy using the Glissonian approach in the English literature.

### Patients and methods

A 62-year-old man suffering from metachronous colorectal liver metastasis was referred for surgical treatment after neoadjuvant chemotherapy. CT scan disclosed two liver metastases: one located between segments 5 and 8, and another one in segment 4. Surgical decision was to perform a totally laparoscopic liver resection.

The patient is placed in a left semilateral decubitus position with the surgeon standing between the patient's legs. This technique uses five trocars. Type and location of trocars are described elsewhere [3, 4]. Pneumoperitoneum is established at a pressure of 12 mmHg.

The operation began with liver examination. The hepatic bridge between segments 3 and 4 is divided with bipolar vessel sealing device (LigaSure, Valleylab, Boulder, CO), exposing the umbilical fissure. The first step is the control of the Glissonian pedicle from segment 4. Two liver incisions are needed. Using the round ligament as a guide, one small incision is performed on the right margin of this

ligament. A second incision is made in front of the hilum, at the bottom of segment 4. A large vascular clamp is then introduced through those incisions to occlude segment 4 Glissonian sheath (Fig. 1). After a few moments, discoloration of segment 4 is obtained.

The next step is to control the right anterior pedicle (liver segments 5 and 8). Two incisions are used to reach the right anterior Glissonian pedicle. The first incision is made in front of the hilum. The second incision is performed on the right edge of the gallbladder bed. A large laparoscopic vascular clamp is introduced through these incisions (Fig. 1). The clamp is closed and, after few moments, ischemic discoloration of the right anterior section (segments 5 and 8) is achieved and marked with cautery along liver surface. The vascular clamp is replaced by an endoscopic vascular stapling device and the stapler is closed. If discoloration is coincident with previous demarcation, the stapler is correctly positioned and is fired. Segment 4 Glissonian pedicle is then divided with vascular endoscopic stapler, resulting in ischemic discoloration of central liver segments 4, 5, and 8.

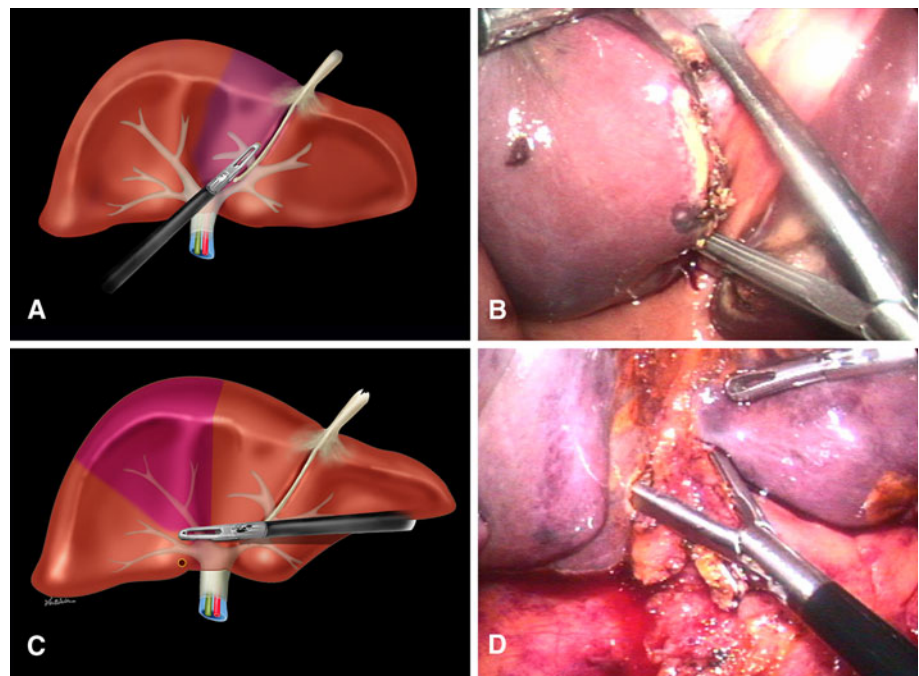
Line of liver transection is marked along the liver surface following the ischemic area. Liver transection is accomplished with bipolar vessel sealing device and endoscopic stapling device as appropriate (Autosuture, Mansfield, MA). The specimen was extracted through a

**Fig. 1** Glissonian approach for laparoscopic mesohepatectomy.

**A** Schematic view: laparoscopic vascular clamp is inserted to occlude segment 4 pedicle, according specific anatomical landmarks described elsewhere [4]. **B** Intraoperative view: laparoscopic vascular clamp is inserted to occlude segment 4 pedicle, according specific anatomical landmarks described elsewhere [4].

**C** Schematic view: laparoscopic vascular clamp is inserted to occlude right anterior pedicle (segments 5 and 8), according specific anatomical landmarks described elsewhere [3].

**D** Intraoperative view: laparoscopic vascular clamp is inserted to occlude right anterior pedicle (segments 5 and 8), according specific anatomical landmarks described elsewhere [3].



suprapubic incision. Liver raw surfaces were reviewed for bleeding and bile leaks, and hemostatic tissue sealant was applied.

## Results

The operative time was 200 min with minimum blood loss and no need for blood transfusion. Recovery was uneventful and the patient was discharged on the fifth postoperative day. Histological examination revealed clear surgical margins.

## Discussion

Several studies have demonstrated the safety and feasibility of laparoscopy for minor and major liver resections, and some have shown that laparoscopy is associated with less bleeding, fewer complications, and a better quality of life than open liver surgery [2–6].

Centrally located liver tumors can be removed by right or left trisectionectomies [7]. These procedures are technically demanding and remove 60% to 85% of the liver parenchyma, much of which may not be involved with the neoplasm and often are associated with severe complications, including hepatic failure. This extended operation can be safely performed by laparoscopy but often requires preoperative portal embolization to obtain hypertrophy of the future remnant liver [7]. Another option is to minimize the volume of normal liver resected by removing only the central hepatic segments (segments 4, 5, and 8), which can be facilitated by using the intrahepatic Glissonian technique [8].

The development of segmental-based resection using the laparoscopic intrahepatic Glissonian access made it possible to develop techniques to identify and isolate both the right and left segmental Glissonian pedicles [3, 4]. To achieve complete pedicle control, small incisions are made around hilar plate, according specific anatomic landmarks [3, 4]. These incisions often produce little or no bleeding even after insertion of a vascular clamp or stapler, because there are no major vessels around Glissonian sheath. These techniques allow complete ischemic demarcation of the central liver

segments, which facilitate anatomical mesohepatectomies, with sufficient residual liver. The intrahepatic Glissonian approach avoids total inflow occlusion because only the pedicles to segments 4, 5, and 8 are clamped, resulting in ischemic demarcation of the area to be resected. The technical difficulties of this procedure can be justified if morbidity of the alternative extended resections is considered.

In conclusion, mesohepatectomy can be safely performed laparoscopically in selected patients and by surgeons with expertise in both liver surgery and minimally invasive techniques. The use of anatomic-based techniques, such as the intrahepatic Glissonian approach, may help to identify the exact limits of the mesohepatectomy to avoid ischemic injury of the remnant liver.

**Disclosures** Drs. Machado and Kalil have no conflicts of interest or financial ties to disclose.

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