The American Journal of Surgery (2008) 196, e38–e42

The American Journal of Surgery®

How I Do It

Intrahepatic Glissonian approach for laparoscopic right segmental liver resections

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KEYWORDS:
Llaparoscopy;
Liver;
Surgery;
Glissonian;
Anatomy

Abstract

BACKGROUND: Experience with laparoscopic procedures and recent advances in laparoscopic devices have created an evolving interest in the application of these techniques to liver resection. However, laparoscopic liver resection has not been widely developed and anatomical segmental liver resection is not currently performed due to difficulty to control segmental Glissonean pedicles laparoscopically.

METHODS: Seven consecutive patients underwent laparoscopic liver resection using an intrahepatic Glissonian approach from April 2007 to September 2007. Three patients underwent laparoscopic bisegmentectomy 6–7 and 4 patients underwent laparoscopic right hemihepatectomy.

RESULTS: Blood transfusion was required in 1 patient. Mean operation time was 460 minutes (range 300–630 minutes). The median hospital stay was 5 days (range 3–8 days). One patient developed bile leakage that was treated conservatively. No patient had postoperative signs of liver failure. No postoperative mortality was observed.

CONCLUSIONS: The main advantage over other techniques is the possibility to gain a rapid and precise access to the right posterior and anterior sheaths facilitating right hemihepatectomy, and right anterior and posterior sectionectomies. We believe that the described technique facilitates laparoscopic liver resection by reducing the technical difficulties in pedicle control and may increase the development of segment-based laparoscopic liver resections.

Experience with laparoscopic procedures and recent advances in laparoscopic devices have created an evolving interest in the application of these techniques to liver resection.[1,2] However, laparoscopic liver resections are technically demanding and potentially hazardous procedures. Although several authors have described increasing numbers of patients, laparoscopic liver resection has not been widely developed.[2–5]

Pedicle control is an important step of liver resection. Anatomic hemihepatectomies usually requires extensive hilar dissection with portal vein and hepatic artery control, whereas sectional resections are often performed without pedicle control. To facilitate pedicle control and to reduce operating time, we have previously described a standardized technique to perform right segmental liver resections, including right hemihepatectomy, and posterior and anterior sectionectomies, using 3 small incisions around the hilar plate.[6] Using the same concept, we describe a novel technique for laparoscopic right segmental liver resections using an intrahepatic Glissonian approach.

Patients and Methods

Seven consecutive patients underwent laparoscopic liver resection using an intrahepatic Glissonian approach from

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Manuscript received September 25, 2007; revised manuscript October 19, 2007

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doi:10.1016/j.amjsurg.2007.10.027

April 2007 to September 2007. There were 7 women with a mean age of 46.8 years (range 23–75 years). Four patients had liver metastasis and 3 patients had hepatocellular adenoma with a mean size of 7.6 cm (range 6–10 cm). The surgical procedure, postoperative course, and outpatient follow-up were evaluated and the following data collected prospectively: duration of surgery, average time to inflow pedicles control, perioperative transfusions, postoperative complications, and hospital stay. The interval timing to control portal pedicles was defined by the time between beginning of intrahepatic dissection of Glissonian sheaths and establishment of ischemic delineation.

Operative technique

The patient is placed in a left semi-lateral decubitus position (Figure 1a) with the surgeon standing between the patient's legs. This technique uses 5 trocars. A 12-mm trocar is placed 3 cm above the umbilicus. Pneumoperitoneum is established at a pressure of 12 mm Hg. The other 4 trocars are located as shown in Figure 1b. The round ligament is transected using laparoscopic coagulation shears (LCS; Ethicon Endo Surgery Industries, Cincinnati, OH), and the falciform and coronary ligaments are then dissected to expose the suprahepatic inferior vena cava (IVC). Exploration of the abdominal cavity and ultrasound liver examination are performed.

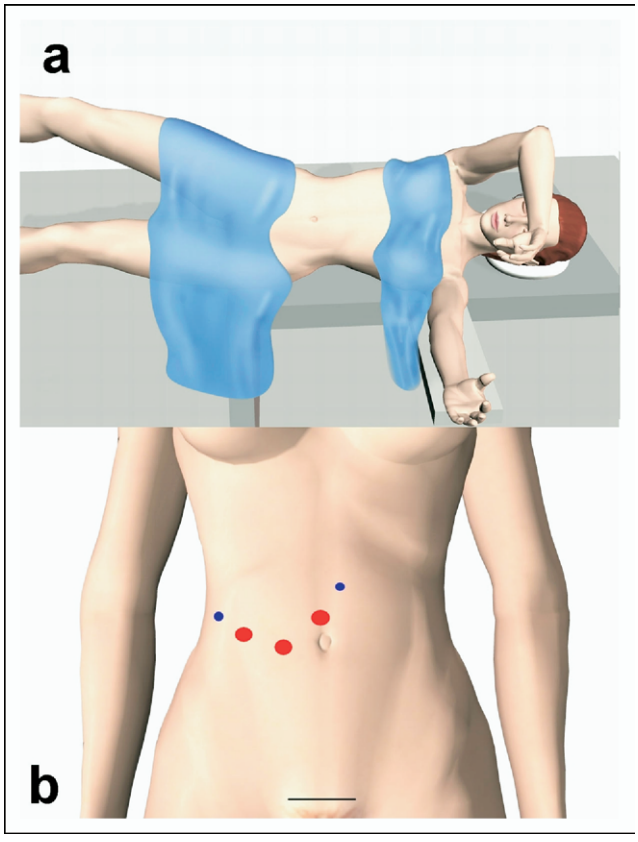

Figure 1 Diagrams of patient position and trocar placement for laparoscopic right liver resections. (a) Patient is placed in a left semi-lateral decubitus position. (b) Three 12-mm trocars (red) and two 5-mm trocars (blue) are needed.

After cholecystectomy, a small (3 mm) anterior incision is made in front of the hilum (shown at A in Figure 2a). A second incision (B in Figure 2a) is performed on the right edge of the gallbladder. A third incision is made perpendicular to the hepatic hilum in the segment 7, where it connects to the caudate lobe (C in Figure 2a). By combining 2 of these 3 incisions it is possible to control the portal pedicle of right liver (A to C), anterior section (A to B), and posterior section (B to C).

For right hemihepatectomy (segments 5, 6, 7, and 8) a large laparoscopic vascular clamp is introduced through incisions A and C to occlude right Glissonian pedicle as displayed in the Figure 2b. The vascular clamp is then replaced by an endoscopic vascular stapling device, the right liver ischemic delineation is confirmed, and the stapler is fired. For right posterior sectionectomy (segments 6 and 7) the same maneuver is done using incisions B and C, and for right anterior sectionectomy (segments 5 and 8) we can use a combination of incisions A and B (Figures 2c and 2d).

All of these steps are performed without the Pringle maneuver and without hand assistance. Liver transection and vascular control of the hepatic veins are accomplished with harmonic scalpel and endoscopic stapling device as appropriate. The specimen is extracted through a suprapubic incision. One round 19-F Blake abdominal drain (Ethicon, Inc, Cincinnati, OH) was left in place in all patients. In order to safely perform the described technique, the knowledge of liver anatomy is imperative. Careful analyses of preoperative imaging and intraoperative ultrasound are needed to determine portal anatomy.

Results

Three patients underwent laparoscopic bisegmentectomy 6–7 (Figure 3) and 4 laparoscopic right hemihepatectomy (Figure 4). Blood transfusion was required in 1 patient (1 unit). Mean operative time consumed to achieve complete control of pedicles was 5.8 minutes (range 4–12 minutes) and mean operation time was 460 minutes (range 300–630 minutes).

The median hospital stay was 5 days (range 3–8 days). One patient developed bile leakage that was treated conservatively. No patient had postoperative signs of liver failure. No postoperative mortality was observed.

Three patients were operated on for benign primary tumor while the remaining 4 were operated on due to malignant secondary tumors. These 4 patients had negative surgical margin, and were greater than 1 cm in all patients. Two patients exhibited moderate post-chemotherapy steatohepatitis and 1 had mild steatosis. Intraoperative laparoscopic liver ultrasound confirmed the site and size of the lesions diagnosed by computed tomography scan and/or magnetic resonance imaging.

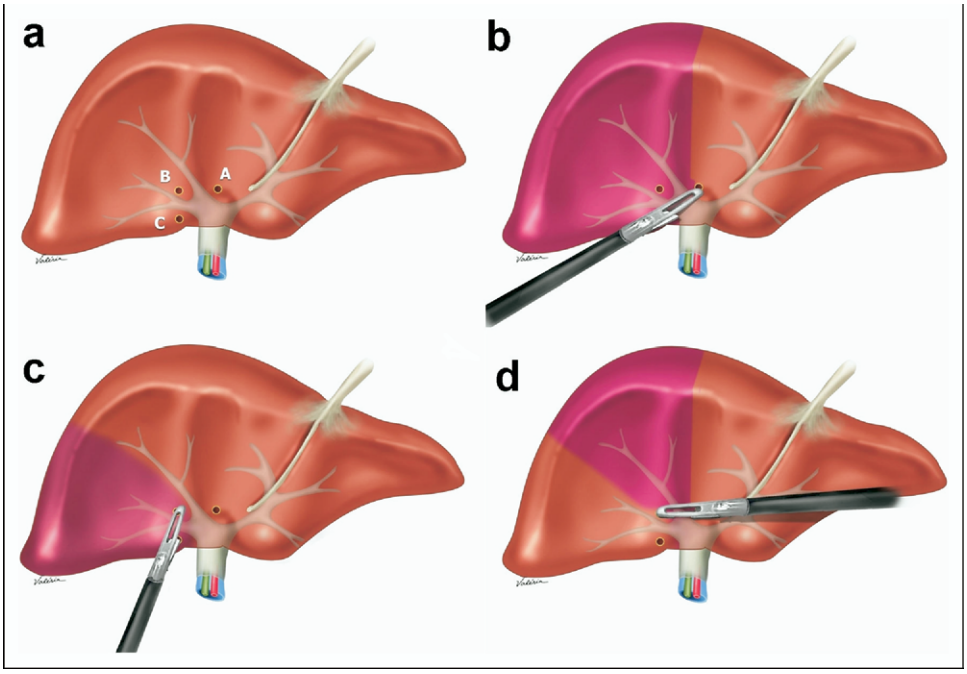

Figure 2 Schematic view of intrahepatic Glissonian access for laparoscopic right liver resections. (a) Incisions for the intrahepatic approach of Glissonian pedicles. A = anterior incision in front of the hilum. B = incision on the right edge of gallbladder bed. C = vertical incision on the segment 7 perpendicular to the hepatic hilum. (b) Right hemihepatectomy—a large laparoscopic vascular clamp is introduced through incisions A and C to occlude right Glissonian pedicle. (c) Right posterior sectionectomy—combining incisions B and C it is possible to occlude the Glissonian pedicle of segments 6 and 7. (d) Right anterior sectionectomy—combining incisions A and B and using the same maneuver it is possible to occlude the Glissonian pedicle of segments 5 and 8.

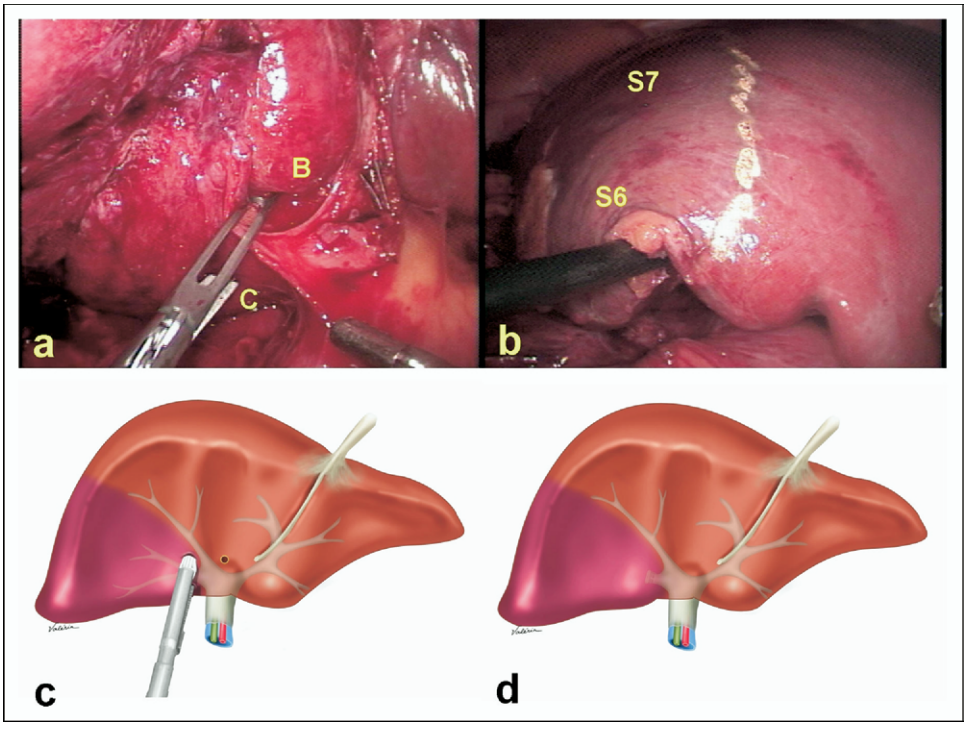

Figure 3 Laparoscopic right posterior sectionectomy (resection of segments 6 and 7). (a) A large laparoscopic vascular clamp is introduced through incisions B and C. (b) Glissonian pedicle is occluded and ischemic delineation of right posterior section (S6 and S7) is obtained. (c) Schematic view—vascular clamp is replaced by a vascular stapler. (d) Schematic view—stapler is fired and ischemic delineation of right posterior segments is seen.

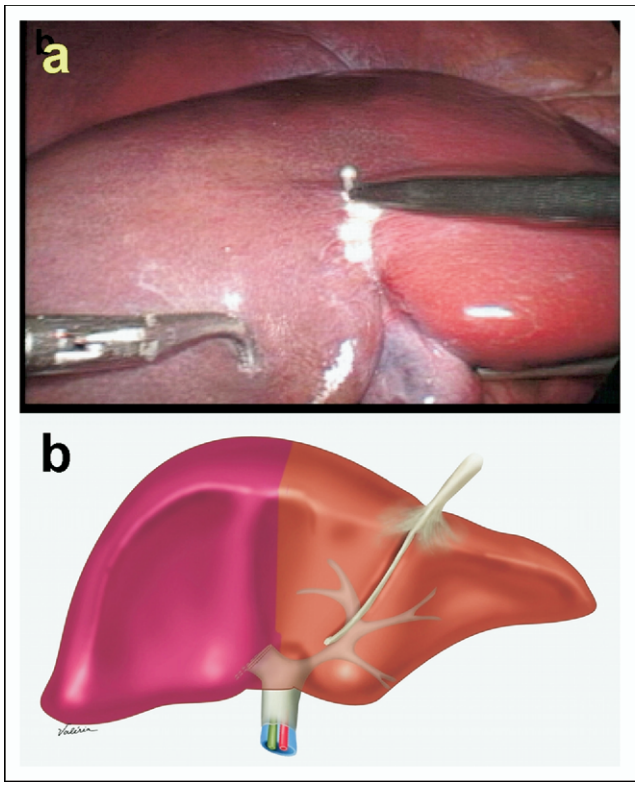

Figure 4 Laparoscopic right hemihepatectomy (resection of segments 5, 6, 7, and 8). (a) Intraoperative view of ischemic delineation of the right liver. (b) Schematic view—stapler is fired and ischemic delineation of right liver is obtained.

Comments

The development of segment-based resection using intrahepatic Glissonian access made it possible to develop techniques to identify and isolate the right and left segmental Glissonian pedicles.[6–8] These techniques permit a tailored liver resection by removing only the liver segments involved by the underlying disease. Respect of anatomic landmarks of liver segments during resection prevents impairment of the vascularization of the remaining parenchyma and excessive bleeding.

Recent advances in laparoscopic techniques have resulted in a growing indication for laparoscopic liver resection.[1–5] Most laparoscopic liver procedures are right or left hemihepatectomies, left lateral segmentectomies, and non-anatomical liver resections.[3] Anatomical segmental liver resection is not currently performed due to technical difficulties in controlling segmental Glissonian pedicles laparoscopically.

The Pringle maneuver is the main step during laparoscopic liver resection and it is used to avoid major bleeding but can be associated with prolonged ischemic time. Laurent et al[9] showed that laparoscopic liver resections are associated with higher ischemic times. The present technique precludes the use of the Pringle maneuver and permits not only hemihepatectomy but also sectional liver resections. Although not yet performed, laparoscopic right anterior sectionectomy (segments 5 and 8) may be facilitated using the present technique.

This novel technique can expand the indication for laparoscopic segment-based liver resection, sparing liver parenchyma. Preservation of liver parenchyma should always be attempted in order to prevent postoperative liver failure and to increase the opportunity for performing repeated resections in cases of recurrent malignancy.[10]

Several authors have described right hepatectomies using dissection of the right hepatic artery, duct, and portal vein separately,[5,11] which is tedious and time-consuming, and may jeopardize vascular and biliary control if anatomical variation is present. In order to overcome these facts, some authors report laparoscopic Glissonian approach. Topal et al[12] used a technique similar to the intrahepatic posterior approach[7] using incision of liver parenchyma posterior and anterior to the hilum and insertion of an endoscopic vascular stapling device under cholangiography guidance. Cho et al[13] described a laparoscopic hand-assisted procedure with dissection of the hepatic parenchyma covering the bifurcation of the right and posterior Glissonian pedicles. The present technique, based on small incisions following specific anatomical landmarks, allows a straight forward control of Glissonian pedicle without hilar or parenchymal dissection and no need for ultrasound or cholangiography guidance. It is important to comment that intraoperative ultrasound remains a necessary tool for safe hepatic surgery and should be routinely used regardless of the technical approach. The described technique precludes encircling of the Glissonian pedicles, thus simplifying the procedure and minimizing bleeding from this blunt maneuver, which is much more difficult to perform laparoscopically.

The main advantage over other techniques is the possibility of gaining rapid and precise access to the right posterior and anterior sheaths, facilitating right hemihepatectomy, and right anterior and posterior sectionectomies.

We believe that the described technique facilitates laparoscopic liver resection by reducing the technical difficulties in pedicle control and may increase the development of segment-based laparoscopic liver resections.

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