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Intrahepatic Glissonian Approach for Laparoscopic Right Trisectionectomy

Marcel A.C. Machado, MD, Fabio F. Makdissi, Rodrigo C.T. Surjan, Andre C. Oliveira, Victor F. Pilla, and Antonio R. Teixeira

Introduction

Liver resection is the definitive treatment for several benign and malignant liver diseases. Experience with laparoscopic procedures and recent advances in laparoscopic devices have created an evolving interest in the application of these techniques to liver resection.[1–3] However, laparoscopic liver resections may be technically demanding. Pedicle control is an important step of liver resection. Anatomic hepatectomies usually require extensive hilar dissection. To facilitate pedicle control and reduce operating time, we have previously described a technique for laparoscopic right-liver resections by using the intrahepatic Glissonian approach.[4] Laparoscopic right-liver trisectionectomy is a very complex procedure, and, to our knowledge, there is only one technical description, so far, in the English literature.[5] This video demonstrates technical aspects of a totally laparoscopic right trisectionectomy, using the intrahepatic Glissonian approach. Our technique differs from that previously described[5] by intrahepatic pedicle control and total control of venous outflow, which makes the procedure easier and safer for laparoscopy.

Patient and Methods

A 22-year-old woman with a giant angiomyolipoma was referred for surgical treatment. The patient was placed in a left semilateral decubitus position with the surgeon between the patient's legs. Five trocars (three 12 and two 5 mm) were used. The pneumoperitoneum is established at a pressure of 12 mm Hg. Round and falciform ligaments are taken down close to the abdominal wall in order to facilitate left-liver fixation at the end of the procedure. The falciform and coronary ligaments are divided by using laparoscopic coagulation shears (Harmonic Scalpel LCS; Ethicon Endo-Surgery Industries, Cincinnati, OH) to expose the suprahepatic inferior vena cava. After cholecystectomy, the right hepatic artery is ligated, resulting in an ischemic delineation of the right liver. Due to previous right-portal-vein embolization in this patient, the hepatic pedicle was not fully dissected. The right liver is then fully mobilized, and the inferior vena cava is dissected. A large inferior right hepatic vein arising from segment 6 is ligated and divided between metallic clips. Another accessory right hepatic vein from segment 7 (middle-right hepatic vein) is divided with a vascular endoscopic stapler. The right hepatic vein is finally encircled, and downward retraction permits the safe application of a vascular endoscopic stapler. The stapler is fired, leaving three lines of metallic clips. With this maneuver, the anterior surface of the retrohepatic vena cava is completely exposed. The main trunk, including the middle and left hepatic veins, is now the only venous drainage of the liver. It is encircled and traction or temporary clamping permits complete outflow control of the liver, minimizing bleeding during liver transection. At this time, the intrahepatic access to the main right Glissonian pedicle is achieved with two small incisions: An incision is performed on the right portion of the caudate lobe and another anterior incision is made in front of the hilum. An endoscopic vascular-stapling device is inserted between these incisions, and the stapler is fired. All these steps are performed without the Pringle maneuver and without hand assistance.

The line of liver transection is marked along the liver surface, including segment 4. To avoid possible damage to pedicles from segments 2 and 3, the line of transection should be placed 1 cm right from the falciform ligament. The division of the liver parenchyma should be performed under central venous pressure as low as possible. The Glissonian pedicle from segment 4 is divided during liver transection. Liver transection should be performed toward the main trunk to prevent damage to the left hepatic vein. Liver transection is accomplished with a Harmonic Scalpel and endoscopic stapling device, as appropriate. The specimen is extracted through a suprapubic incision, and the pneumoperitoneum is reestablished. Raw surface area is then checked for hemostasia and biliary leakage, and absorbable hemostat tissue (Surgicel; Ethicon Industries, Cincinnati, OH) is applied. The falciform ligament is then fixed to the abdominal wall in order to prevent the remnant liver from rotating spontaneously into the right subphrenic space and causing left-hepatic-vein kinking.[6] One round 19-F Blake

Department of Gastroenterology, University of São Paulo, São Paulo, Brazil.
Videos of this technique can be found online at www.liebertpub.com/lap.

abdominal drain (Ethicon) is left in place. The right hepatic trisectionectomy is then completed.

Results

Operative time was 360 minutes, and hospital stay was 7 days. Apart from self-limited biliary leakage, postoperative recovery was uneventful.

Conclusions

Totally laparoscopic right trisectionectomy is safe and feasible in selected patients and should be considered for patients with benign or malignant liver neoplasms. The described technique, with the use of the intrahepatic Glissonian approach and control of venous outflow, may facilitate laparoscopic extended liver resections by reducing the technical difficulties in pedicle control and may diminish bleeding during liver transection.

Disclosure Statement

No competing financial interests exist.

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Address correspondence to:
Marcel A.C. Machado, MD
Department of Gastroenterology, LIM-37
University of São Paulo
Rua Evangelista Rodrigues 407
São Paulo 05463-000
Brazil

E-mail: dr@drmarcel.com.br

Commentary on "Intrahepatic Glissonian Approach for Laparoscopic Right Trisectionectomy"

The role of minimal access surgery for resection of malignant neoplasms of the liver has been an area of controversy for hepatobiliary surgeons. Concerns for the ability to perform a safe, successful oncologic resection through a minimal access approach have prevented a rapid dissemination of the laparoscopic technique in liver surgery for malignant disease. More recently, several publications appear to indicate that the laparoscopic approach is becoming more widely utilized and deserves further efforts and allocation of resources to develop innovative approaches and assess its exact place within the armamentarium of surgical procedures of the liver.

The slow progress and acceptance of these minimal access techniques may also be related to the fact that in addition to the required training and experience in hepatobiliary surgery, a high level of advanced laparoscopic skills is required to perform these procedures. There are only a limited number of centers that offer advanced training in both areas in a single fellowship. As more hepatobliary centers around the world incorporate minimal access techniques for liver surgery, both the acceptance, as well as the development of innovative techniques, will likely come to fruition.

Other than the inherent advantages to the minimal access approach, which include decreased pain, shorter hospital stay, fewer incisional hernias, and earlier return to work, added benefits particular to liver surgery are better access and exposure to the ligaments and to the more superior segments of the liver. In fact, the ease with which the liver can be mobilized laparoscopically has resulted in the development of hybrid techniques where the liver is widely mobilized through a laparoscopic approach, and then, a small subcostal incision is performed to complete the parenchymal dissection and specimen removal.

In Dr. Machado's article, the authors show the feasibility of performing a trisegmentectomy. Surgical principles of open hepatic surgery are followed. Mobilization of the liver is readily obtained by dividing the ligamentus teres, falciform, and triangular and coronary ligaments. The exposure of the suprahepatic vena cava and its tributaries and the ligation of the right hepatic veins are nicely demonstrated. The authors' demonstration stresses the advantages in exposure of the laparoscopic over the open approach for this part of the procedure.

An intrahepatic Glissonian approach for ligation of the Glissonian vessels and ductal structures to the right lobe is demonstrated. It is important to emphasize that the authors have an extensive experience in this approach and have performed it not only in multiple laparoscopic, but also in open liver resections. This approach facilitates the procedure and may aid in avoiding tedious dissection of the portal vein, hepatic artery, and duct branches to the right liver. However, its safety in inexperienced hands is questionable. Prior to embarking on this technique laparoscopically, a surgeon should be intimally familiarized with the anatomic variations of the liver vasculature and gain experience with the Glissonian approach in open surgery. Intraoperative ultrasonography should be routinely used to confirm the anatomy and also to plan the resection.

It appears clear that minimal access techniques for liver surgery are here to stay. Its advantages are becoming more evident as more experience with major resections is gained. Innovative techniques and new laparoscopic technologic advances are likely to facilitate these procedures further. Intraoperative imaging and navigation technology as well as new ways to perform parenchymal dissection during liver resection are likely to play an important role and likely make this the preferred approach for liver surgery in the near future. Surgical principles of open hepatic surgery are to be followed, and therefore, the laparoscopic surgeon needs to have experience in liver surgery before embarking on laparoscopic, hand-assisted, or hybrid liver resections.

—Horacio J. Asbun, MD
Hepatobiliary and Pancreas Surgery
Mayo Clinic Florida
Jacksonville, Florida