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How I do it

Anatomic left hepatic trisegmentectomy

Marcel Autran C. Machado, M.D.*, Paulo Herman, M.D., Fabio F. Makdissi, M.D., Telesforo Bacchella, M.D., Marcel C.C. Machado, M.D.

Department of Surgery, University of São Paulo, São Paulo, Brazil

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Abstract

The technique of left trisegmentectomy was first published in 1982 and consists in the removal of the left liver (segments II, III, and IV) along with the right anterior sector (segments V and VIII). This procedure is based on the knowledge of the segmental liver anatomy. There are only a few technical reports describing this complex procedure. We describe an anatomic and standardized way to identify and isolate the glissonian sheaths of the left liver segments along with the portal pedicles from right anterior sector (segments V and VIII). The middle and left hepatic veins are dissected using Arantius ligament as landmark. With this technique, it is possible to achieve inflow and outflow control of the involved liver segments without hilar dissection or clamping. This technique provides a safe way to perform a left extended hepatectomy without warm ischemia of the relatively small remnant liver.

Keywords: Liver; Left trisegmentectomy; technique

Extended left hepatectomy, also referred to as left hepatic trisegmentectomy, consists in the removal of liver segments II, III, IV, V, and VIII. This difficult surgical procedure may be required when the left liver and portions of segments V and VIII are involved.

The authors describe an anatomic and standardized way to identify and isolate the glissonian sheaths of the left liver segments along with the portal pedicles from right anterior sector (segments V and VIII) avoiding hilar dissection. This technique employs a combination of techniques previously reported [1–3] in order to achieve inflow and outflow control of the liver parenchyma to be resected without hilar dissection or clamping and therefore without warm ischemia of the relatively small remnant liver.

Technique

Preoperative investigation includes liver and renal function tests, complete blood count, and electrolytes. Magnetic resonance imaging and magnetic resonance cholangiography and angiography are recommended preoperatively to provide accurate information as to involvement of the hepatic and portal veins and the biliary anatomy.

The goal of the present technique is to obtain a safe control of all vascular structures involved in the left hepatic trisegmentectomy before division of the liver parenchyma. After induction of general anesthesia, the patient is placed in supine position. Bilateral subcostal incisions are made and extended superiorly in the midline to the xiphoid, and a self-retaining retractor is placed. This improves visualization of the confluence of the hepatic veins.

The liver is mobilized by sectioning the falciform, left triangular, and coronary ligaments. At this time, intraoperative ultrasound is performed and it is used to identify the course of the right hepatic vein (Fig. 1). The left lobe is pulled upward, and the lesser omentum is divided exposing the Arantius' ligament (ligamentum venosum) that is encircled and divided. This ligament runs from the left branch of portal vein to the left hepatic vein or to the common trunk and is a useful anatomic landmark for the identification of left hepatic and portal veins [4]. The cephalad stump is used to dissect the recess under the confluence of the middle and left hepatic veins as described elsewhere [3]. Careful dissection in this recess is

* Corresponding author. Tel.: +55-11-32891188; fax: +55-11-32891188.

E-mail address: dr@drmarcel.com.br

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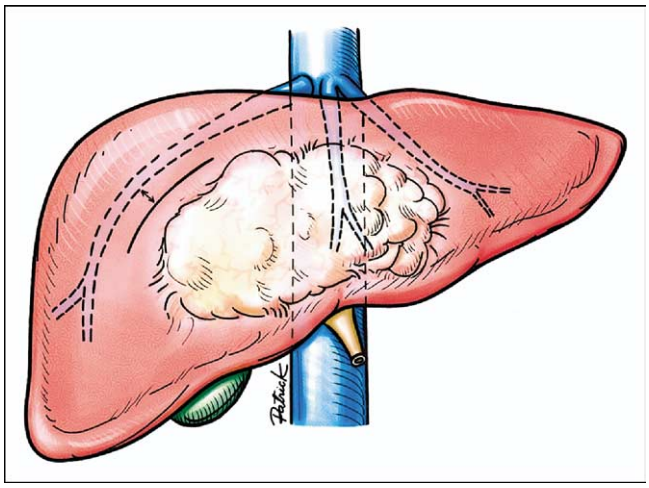

Fig. 1. Schematic view of intraoperative demarcation of a safe line to be positioned 1 cm away from the right hepatic vein course in order to preserve it.

performed and a vascular tape is placed around the confluence of the middle and left hepatic veins. The caudal stump of the ligament is grasped and dissected downward toward the left portal vein. This maneuver discloses the posterior aspect of the left glissonian pedicle. A small (3 mm) anterior incision is made in front of the hilum, and a large curved clamp is introduced through the left side of the left glissonian sheath behind the caudal stump of Arantius' ligament toward anterior incision, allowing the encircling of the left main sheath for further stapling as described elsewhere [2]. This maneuver spares the caudate lobe (segment I) portal branches. Another small incision performed on the right edge of the gallbladder bed permits access to the right anterior pedicle (segments V and VIII) for further division as previously described by the authors [1]. Once the anterior sector glissonian

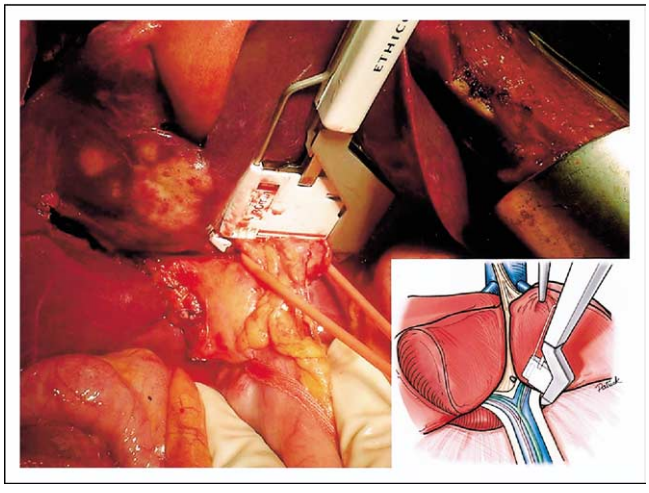

Fig. 2. The left main sheath (containing arterial, portal, and bile ducts branches of segments II, III, and IV) is divided using vascular stapling device.

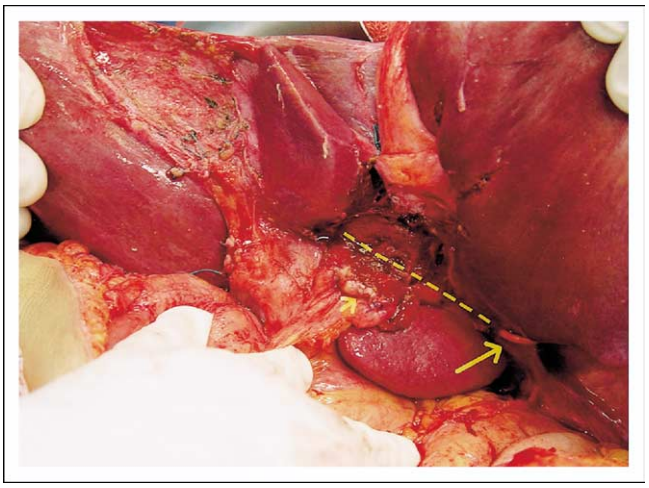

Fig. 3. The left main sheath is already divided (small arrow). This maneuver along with the dissection of the Arantius' ligament superiorly to the segment I show the posterior plane of liver transection (dotted line). The confluence of middle and left hepatic veins is encircled (large arrow).

sheath is identified, it is clamped resulting in a clear demarcation of segments V and VIII anterior to the right hepatic vein previously identified by ultrasound. This maneuver delimitates the right lateral fissura between the anterior and posterior right liver sectors.

Inflow and outflow control of the liver parenchyma containing the tumor without hilar dissection or clamping is then accomplished. The left main sheath (containing arterial, portal, and bile ducts branches of segments II, III, and IV) and the right anterior sheath (segments V and

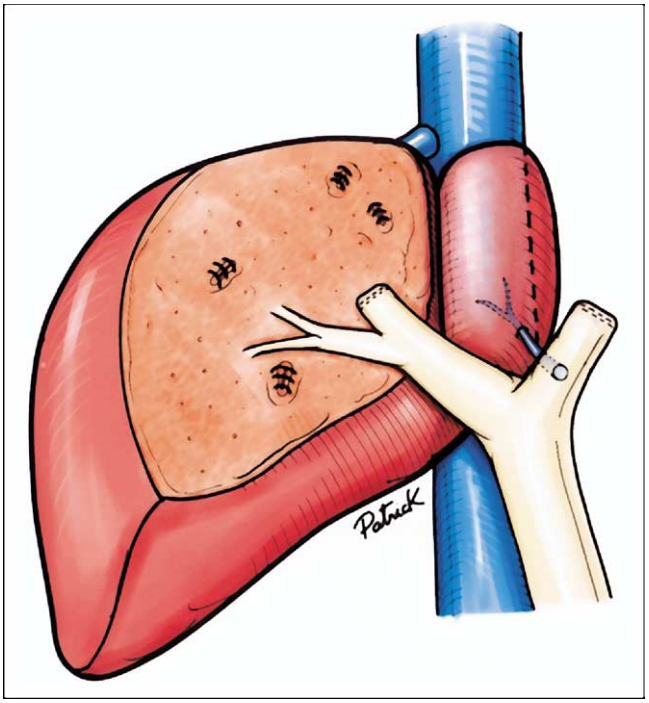

Fig. 4. Schematic view of remnant liver after removal of segments II, III, IV, V, and VIII. The caudate lobe is preserved.

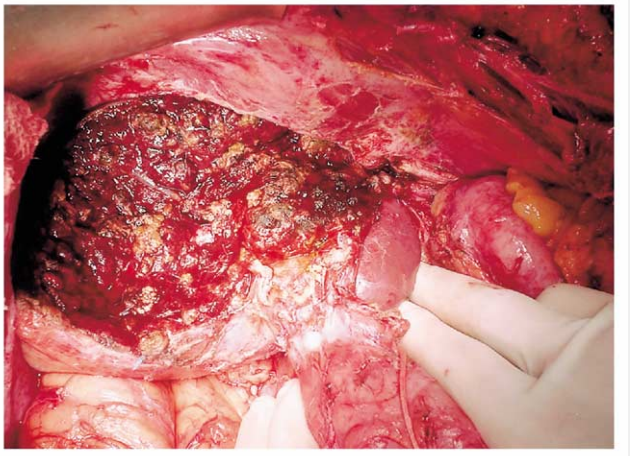

Fig. 5. Intraoperative view of raw surface of the liver (segments VI, VII, and I) after extended left trisegmentectomy.

VIII) are then divided using vascular stapling devices (Fig. 2). The division of the left main pedicle along with the dissection of the Arantius' ligament superiorly to the segment I discloses the posterior plane for the subsequent hepatic transection (Fig. 3). The middle and left hepatic veins are then divided. Finally, the liver parenchyma is transected to free the specimen (Figs. 4 and 5), and caution must be taken during hepatectomy in order to spare the right hepatic vein.

Results

This technique has been successfully used in 3 patients between July 2002 and September 2003. There were 2 men and 1 woman. Two patients presented with intrahepatic cholangiocarcinoma, and 1 underwent liver resection for colorectal liver metastasis. Blood transfusion was required in 2 patients. The first patient underwent preoperative left portal vein embolization. Caudate lobe (segment I) was preserved in all patients. Median hospital stay was 8 days (range 7–10 days). No patient presented postoperative liver failure. No postoperative mortality was observed.

Comments

The technique of left trisegmentectomy or left extended hepatectomy was first published by Starzl et al in 1982 [5] and consists in the removal of the left liver (segments II, III, and IV) along with the anterior sector of the right liver (segments V and VIII). This procedure is based on the knowledge of the segmental liver anatomy described by Claude Couinaud [6]. There are few technical reports of this intricate procedure [5,7,8].

Anatomic removal of liver segments can be accomplished by several methods [9–11]. The authors have recently reported a systematized technique for right and left segmental liver resections [1,2] in order to reach the glissonian pedicles and remove any liver segments. The division of the Arantius' ligament is a useful step to obtain quick access to the main left sheath. This maneuver along with a very small incision anterior to the hilar plate allows direct access to the main left sheath in less than a minute [2]. This maneuver can also be used to expose the middle and left hepatic veins [3,8]. The left main sheath is long and relatively easy to expose facilitating the use of stapling devices (Figs. 2 and 3). Vascular stapling devices also can be used for transection of the right anterior pedicle and hepatic veins.

The intrahepatic dissection and further division of the glissonian pedicles of all segments involved in left trisegmentectomy clearly exposes the posterior plane of transection, increasing the safety of this procedure. This plane runs parallel to the inferior vena cava until the space between right and middle hepatic vein and spares the portal pedicle of right posterior sector (segments VI and VII).

The preclusion of the Pringle maneuver was not followed by any additional bleeding, and it was crucial to spare the relatively small remnant liver from warm ischemia. The transection of the liver can be safely performed, and the remainder liver can be instantaneously checked for viability during the procedure.

The technique described in this article is a combination of 3 procedures described elsewhere [1–3], and it is an overt application of the modern liver principles proposed by Launois and Jamieson [10]. The main advantage over other techniques is the ability to gain rapid and safe access to portal pedicles of the liver segments, precluding other subsidiary techniques. Although technically challenging and rarely performed, left hepatic trisegmentectomy is feasible and can be safely performed without preoperative portal embolization as done in our last 2 cases.

We believe that this technique allows an easy and logical approach for anatomical extended left hepatectomy. It may reduce the need for main hepatic pedicle clamping and may facilitate the recognition of the right lateral fissura, which delimitates the plane of transection between the anterior and posterior right liver sectors.

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