

Intrahepatic Glissonian approach for single-port laparoscopic liver resection

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Abstract

Background: Minimal access surgery is moving towards reduced size and fewer ports. The aim of this paper is to describe our experience with the intrahepatic Glissonian approach for single-port laparoscopic left lateral sectionectomy. **Methods:** We have performed this procedure on eight consecutive patients. A transumbilical incision is performed, and a single-incision platform is introduced. The operation begins with ultrasound examination of the liver. Intrahepatic Glissonian access of the portal pedicle from segments 2 and 3 is performed, and the pedicle is divided with a stapler. The liver is transected, and the left hepatic vein is divided with a stapler. A surgical specimen is retrieved through the single umbilical incision. No drains are left in place. **Results:** The median operative time was 68 minutes and there was minimal bleeding. The median hospital stay was 1 day. Six patients were operated on for liver adenoma. There was no morbidity or mortality. During follow-up (median: 12 months), no patient developed incisional hernia. The cosmetic appearance of the incision was excellent in all cases. **Conclusions:** Single-port laparoscopic left lateral sectionectomy is feasible and can be safely performed in specialized centers.

Introduction

In the past decade, minimal access surgery has been moving towards minimizing surgical trauma by reducing the number and size of portals. In the last few years, a novel technique using a single-incision laparoscopic approach has been described.¹ However, this technique has mainly been used for laparoscopic cholecystectomy.²⁻⁴

Liver surgery is an extremely challenging field, and surgical management of liver diseases continues to grow. Laparoscopic liver resection has been increasingly used in the past decade.⁵⁻⁷ However, among the several types of laparoscopic liver resection, left lateral sectionectomy, i.e. the removal of segments 2 and 3, is the only one being considered as the gold standard.⁸ The purpose of this paper is to describe our initial experience with 8 consecutive cases of single-port laparoscopic left lateral sectionectomy. A detailed technical description with standardization is provided.⁷ To the best of our knowledge, this is the largest single-port laparoscopic left lateral sectionectomy series in the English literature.

Methods

Between July 2012 and July 2013, eight single-port laparoscopic left lateral sectionectomies were performed. The patients were informed about the advantages and risks of the technique, and they gave their consent for its use.

Surgical Technique

The patient is placed in a supine and reverse Trendelenburg position with the surgeon between the patient's legs. The first assistant is positioned on the right side of the patient with the monitor placed on the patient's cranial side. With the patient under general anesthesia, a transumbilical 3-cm skin incision is performed. A single-incision advanced access platform with a gelatin cap, a self-retaining sleeve, and a wound protector (GelPoint®, Applied Med. R.S. Margarita, CA, USA) is introduced through this incision (Fig. 1a).

Three trocars (5-11mm) are introduced through the single-port device. No articulated instruments are required due to the gel cap and sleeves. CO₂ pneumoperitoneum is established at 12 mmHg. A rigid 30-degree 10-mm laparoscope is introduced. This single-port platform is able to accommodate three or four instruments at the same time with no triangulation prejudice (Fig. 1b). We used two large instruments, such as a 10-mm laparoscope and a 12-mm flexible stapler with a 5-mm instrument. This configuration allows for enough mobility and triangulation with a 30-mm skin and aponeurosis opening, which was applied in all cases.

The operation begins with exploration of the abdominal cavity with the laparoscope. An intraoperative laparoscopic ultrasound probe is introduced (SonoSite®, Inc., Bothell, WA, USA). The liver is examined to rule out other lesions and to ascertain liver anatomy (Fig. 1c). It may be useful to locate the Glissonian pedicle from segments 2 and 3. The left liver is then mobilized by sectioning the falciform and the left triangular and left coronary ligaments with a harmonic scalpel (Ultracision®, Ethicon Endo Surgery, Cincinnati, OH). The left lobe is pulled upward, and the lesser omentum is divided.

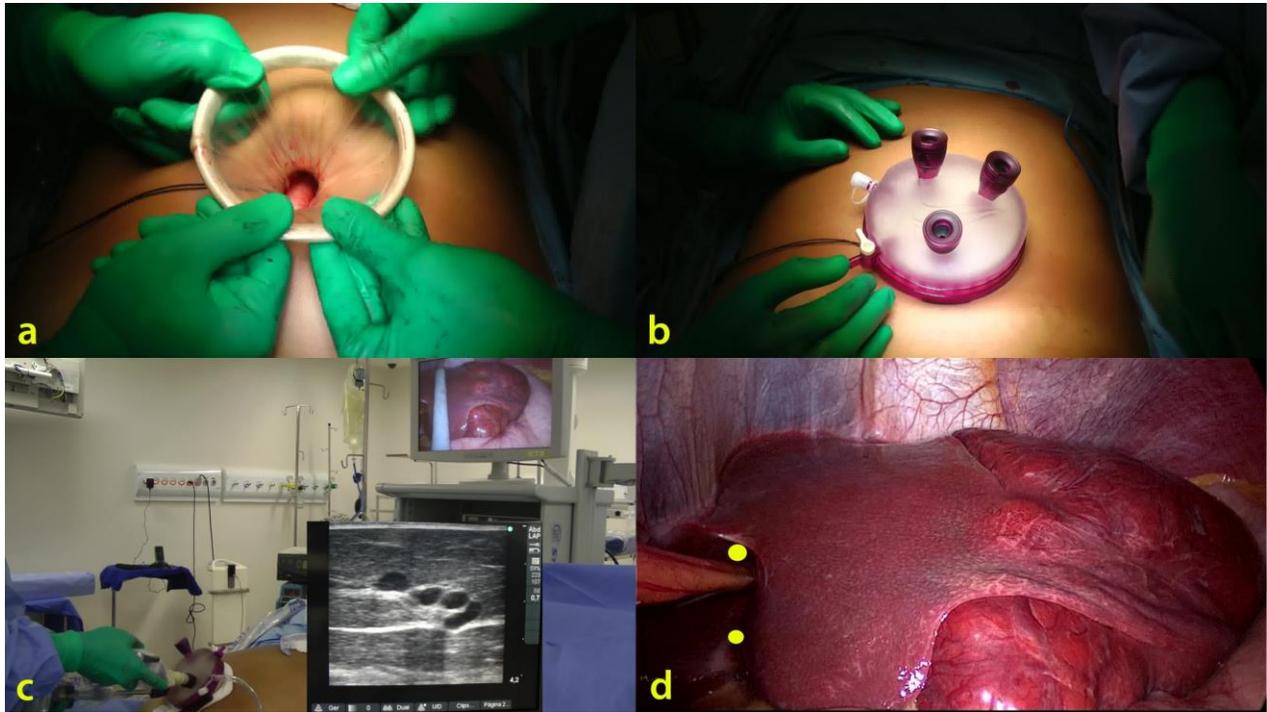


FIG. 1. The single-port platform setup and intraoperative ultrasound. (a) Self-retained sleeve and wound protector is inserted through umbilical incision (b) Gelatin cap is attached to the platform with three working (5 to 11-mm) ports (c) Intraoperative ultrasound is performed through the single port. A 30-degree 10-mm high-definition laparoscope is used together with the ultrasound probe. Intraoperative ultrasound shows the liver tumor and is useful for ascertaining localization of the Glissonian pedicle (picture-in-picture) for future stapling (d) Intraoperative view of liver shows location of incisions (yellow dots) used for intrahepatic Glissonian approach

The next step is to perform intrahepatic Glissonian access for retrieval of the portal pedicles from segments 2 and 3, as previously described.⁷ Two incisions are performed: one above the proximal part of the Arantius ligament and the second incision at the left side of the basis of the round ligament (Fig. 1d). A large vascular clamp is introduced through these incisions and closed. After a few moments, ischemic delineation of segments 2 and 3 is obtained (Fig. 2a). If the delineation confirms adequate access to the pedicles of segments 2 and 3, the clamp is replaced by a vascular endoscopic stapler (Fig. 2b). The stapler is fired, and the portal pedicle from segments 2 and 3 is divided. The future line of transection is marked with a cautery according to the ischemic delineation. The liver transection progresses with the harmonic scalpel. The last step is to divide the left hepatic vein with a stapler.

A surgical specimen is retrieved inside a plastic bag through the single-port incision. The incision needs to be enlarged depending on the size of the specimen, but most of the time, the left lateral segment can be retrieved through the usual 3-cm umbilical incision. Benign liver tumors are macerated inside a plastic bag without enlargement of the umbilical incision. The raw area of the liver is checked for bleeding and bile leaks. Hemostatic tissue is applied to the raw surface of the liver (Fig. 2c). The single-port platform is then reattached. Meticulous closure of the incision is

performed in order to avoid incisional hernias, and the procedure is finished. No drains are left in place.

Results

We have performed this procedure on eight consecutive patients. Seven patients were women. The median duration of the procedure was 68 minutes (range: 45-100 minutes). Bleeding was minimal in all cases (less than 100 ml) with no need for blood transfusion. Intraoperative ultrasound was performed in all cases, and no unexpected lesions were found. The median hospital stay was 1 day (range: 1-2 days). The final pathology was liver adenoma in six cases, focal nodular hyperplasia in one, and cholangiocarcinoma in another (male patient). There was no morbidity and no mortality. The median follow up was 12 months (8-18 months), during which no patient developed incisional hernia. The cosmetic appearance of the incision was excellent in all cases (Fig. 2d).

Discussion

Laparoscopic liver surgery has experienced significant growth in the last few years. This technique has become a less invasive alternative to liver surgery, and both preoperative and intraoperative imaging advances have resulted in better anatomic assessment and better surgical

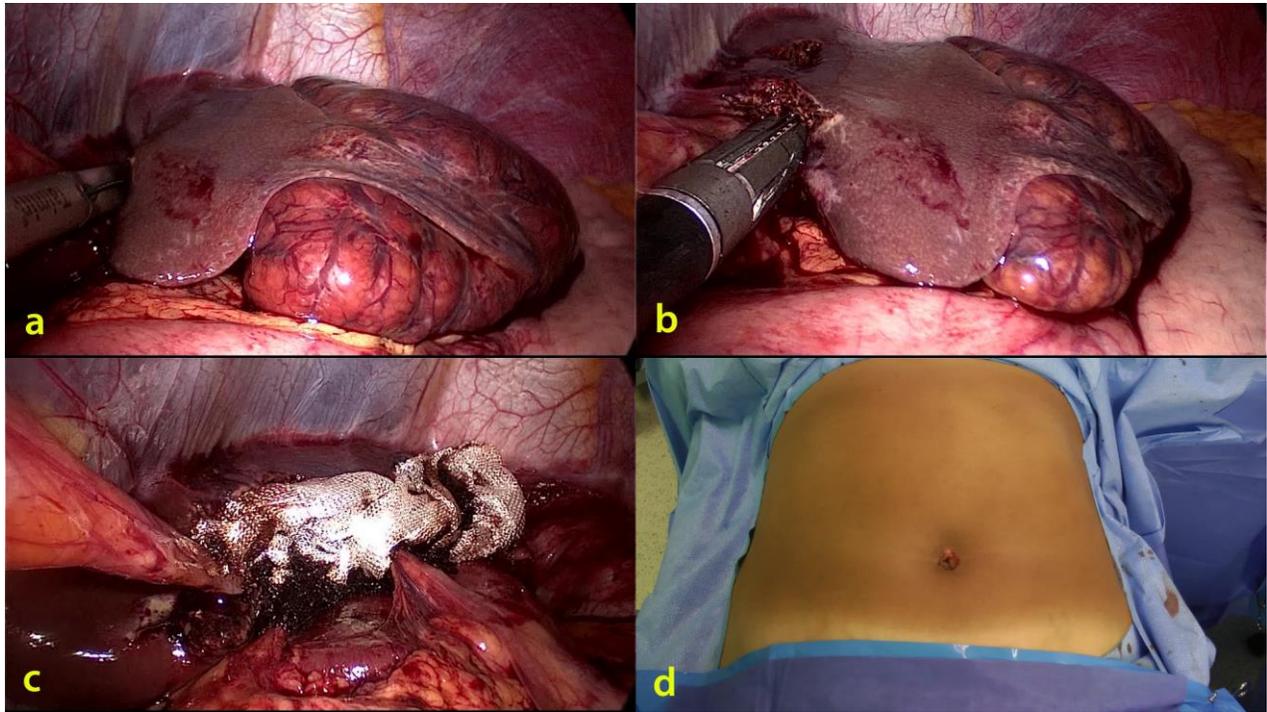


FIG. 2. Single-port laparoscopic left lateral sectionectomy. (a) Internal view shows Glissonian pedicle occluded by the vascular clamp resulting in ischemic delineation of the left lobe (segments 2 and 3). (b) Internal view shows Glissonian pedicle divided by the stapler (c) Internal view after completion of single-port laparoscopic left lateral sectionectomy. (d) Final view of umbilical wound.

surgical planning. 5 Our experience with laparoscopic liver resections began in 2007. 6 Progressive improvement of our expertise in laparoscopic surgery has allowed us to perform more complex operations, such as extended right hepatectomy, mesohepatectomy, and two-stage liver resection. 6 However, only a few centers are performing laparoscopic liver resection on a routine basis. 5,6 For most surgeons, the laparoscopic approach for left lateral sectionectomy is considered the gold standard. 8 Furthermore, we consider that any anatomical liver surgery can be done by laparoscopy, but we do agree that it should be done by experts only. 5,6

The single-incision laparoscopic method is less invasive than conventional multiport laparoscopy, but there may be unique difficulties for the laparoscopic surgeon. 9-15 First, retraction is significantly limited. The introduction of a camera and various instruments parallel to each other may result in decreased mobility and the collision of instruments. 9-77 The single-incision platform used in our series allows for the use of standard instruments. There was no loss of triangulation due to the presence of self-retaining sleeves, which maximize the internal working diameter. We were able to use a high-definition 10-mm laparoscope during all steps of the operation.

We have chosen to begin our experience in single-port hepatectomy with laparoscopic left lateral sectionectomies, because this procedure is the easiest to perform by laparoscopy and is already well standardized. 7,8 In the English literature, there are few papers dealing with single-port liver resection. 9-15 The main reason is that the

majority of systems available for a single-site laparoscopic surgery need specific articulating instruments, the use of small laparoscopes, and allow for poor triangulation. Our initial experience with single-port laparoscopic left lateral sectionectomy showed no exposure or triangulation difficulties. The operative time was not superior to our other laparoscopic cases, and there was no morbidity or mortality.

One of the potential disadvantages of the single-port surgery compared to conventional multiport laparoscopy is the development of incisional hernias. 16 However, prospective studies did not confirm these findings, which may be the result of the learning curve. In our series, there was no incisional hernia in late follow-up. Although several issues such as cost and the learning curve of this technique remain to be studied, the cosmetic benefits of single-incision approach are obvious. 10,12,15

In conclusion, single-port laparoscopic left lateral sectionectomy is feasible and can be safely performed in specialized centers by experienced laparoscopic surgeons. We believe that this new system may reduce the learning curve for single-port laparoscopy, as it provides better maneuverability than previous platforms. As soon as more experience is obtained in this technique, we expect that single-port left lateral sectionectomy may become the method of choice.

Disclosure

Drs. Machado, Surjan, and Makkdissi have no conflicts of interest or financial ties to disclose.

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