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Extra-Glissonian Approach for Laparoscopic Liver Right Anterior Sectionectomy

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ABSTRACT

Background: Open right anterior sectionectomy, which involves resection of liver segments 5 and 8, has been reported to have similar postoperative mortality rates as right hepatectomy, but it has a decreased risk in developing posthepatectomy liver failure. Totally laparoscopic right anterior sectionectomy is technically demanding and has rarely been reported in hepatocellular carcinoma (HCC) patients with cirrhosis.

Methods: Our experience in carrying out totally laparoscopic right anterior sectionectomy on four consecutive HCC patients with cirrhosis from November 2016 to August 2017 using the extraglissonian approach formed the basis of this report.

Results: All four patients had hepatitis B–related HCC. The mean operation time was 502 ± 55 minutes. All patients underwent intermittent Pringle's Maneuver with cycles of clamp/unclamp times of 15/5 minutes for the left-sided liver transection plane, and intermittent right hemihepatic vascular inflow occlusion with cycles of clamp/unclamp times of 30/5 minutes for the right-sided liver transection plane. The mean Pringle's Maneuver time was 58.8 ± 11.4 minutes and the mean right hemihepatic vascular inflow occlusion time was 66.3 ± 11.1 minutes. The mean intraoperative blood loss was 512 ± 301 mL. No patients required any blood transfusion. There was no conversion to open surgery. Postoperative complications included intra-abdominal bleeding requiring reoperation for hemostasis (n = 1), intra-abdominal collection requiring percutaneous drainage (n = 1), and right pleural effusion requiring percutaneous drainage (n = 1). There was no 90-day postoperative mortality. The mean hospital stay was 10.7 ± 2.9 days. After a median follow-up of 10 (range, 6–16) months, one patient developed HCC recurrence in the liver remnant.

Conclusion: Totally laparoscopic right anterior sectionectomy using the extraglissonian approach was technically feasible and safe in expert hands. More data are needed to assess the long-term oncological survival outcomes.

Key Words: Extraglissonian approach; Totally laparoscopic right anterior sectionectomy; Hepatocellular carcinoma.

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INTRODUCTION

Posthepatectomy liver failure (PHLF) is the most dreaded complication after liver resection and it is the major cause of perioperative death. The risk of PHLF is related to the size and quality of the remnant liver left after liver resection. Patients with cirrhosis, fatty liver, or chemotherapy-induced liver disease are at an increased risk of PHLF. Parenchymal-sparing liver resection to avoid unnecessary sacrifice of functional liver parenchyma should be carried out if technically feasible on these patients. In patients with hepatocellular carcinoma (HCC), anatomical liver resection is recommended because tumor dissemination commonly occurs through the portal venous system.[1] In cirrhotic HCC patients, right anterior sectionectomy has the advantages over the more extensive right hepatectomy in attaining both parenchymal sparing and anatomical oncologic resection. Right anterior sectionectomy is a

form of central hepatectomy. Recent studies and meta-analyses showed that central hepatectomy has a similar postoperative mortality rate compared to the more extended hepatectomy, but it has fewer postoperative complications, including PHLF, and a shorter hospital stay.[2,3]

Recent developments in laparoscopic instruments and improved surgical techniques have made laparoscopic liver resection safe. Up to the year 2016, over 9,000 cases of laparoscopic liver resection have been reported worldwide.[4,5] Totally laparoscopic right anterior sectionectomy involves resection of liver segments 5 and 8, the liver territory between the right and the middle hepatic veins, is technically challenging. The operation requires two transection planes and control of numerous branches coming from the two hepatic veins and portal pedicles. This is a report on four cirrhotic patients who underwent totally laparoscopic right anterior sectionectomy for HCC.

MATERIALS AND METHODS

Four consecutive cirrhotic patients with HCC underwent totally laparoscopic right anterior sectionectomy in our hospital from November 2016 to August 2017 using the extraglissonian approach. The data on operative and postoperative outcomes, hospital stay, and short-term oncological outcomes were collected prospectively and analyzed retrospectively.

Procedures

The patient was put in a supine reverse-Trendelenburg position with legs splitting. Five ports were used as shown in **Figure 1**. Intraoperative ultrasonography was performed routinely to delineate the size and extent of the liver tumor(s), and its relationship with the major vessels. The right liver was mobilized after cholecystectomy.

Using the technique described by Takasaki,[6] the right anterior Glissonean pedicle supplying the liver segments 5 and 8 was dissected and isolated (**Figure 2**). Clamping of the pedicle resulted in an ischemic zone over the right anterior section (**Figure 3**). The boundaries of the right anterior section were then marked with coagulative diathermy. The positions of the middle and right hepatic veins were determined by intraoperative ultrasound. Parenchymal transection was performed using a Harmonic scalpel (Ethicon), and monopolar and bipolar diathermy. Large vessels were controlled with titanium clips. After completion of the medial (left) parenchymal transection, transection of the lateral (right) side was performed along the demarcation line between the right anterior and posterior sections. The left-sided liver parenchymal transection was performed under intermittent Pringle's Maneuver with cycles of clamp/unclamp times of 15/5 minutes (**Figure 4, 5, 6**), and the right-sided parenchymal transection was performed under intermittent right hemihepatic vascular inflow occlusion with cycles of clamp/unclamp times of 30/5 minutes (**Figure 7**). The right anterior pedicle was then transected with an endostapling device (**Figure 8**). The specimen was put into a plastic bag and retrieved via a Pfannenstiel incision (**Figure 9, 10**).

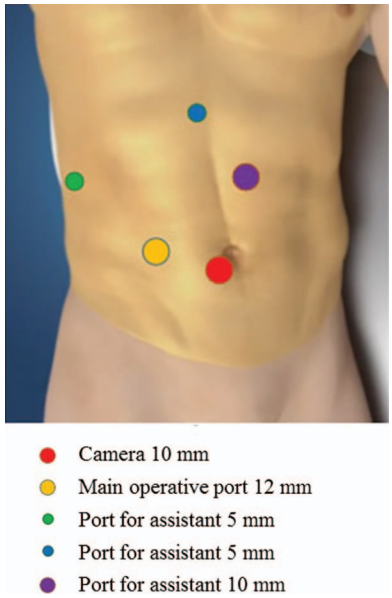

Figure 1. Port sites.

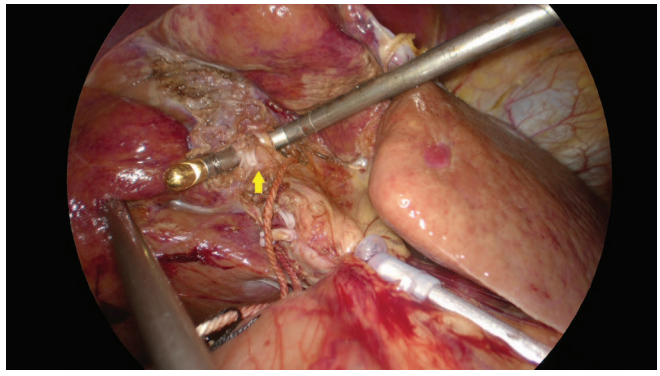

Figure 2. Dissection of right anterior pedicle (arrow).

Statistical Method

Continuous variables were expressed as mean and standard deviation.

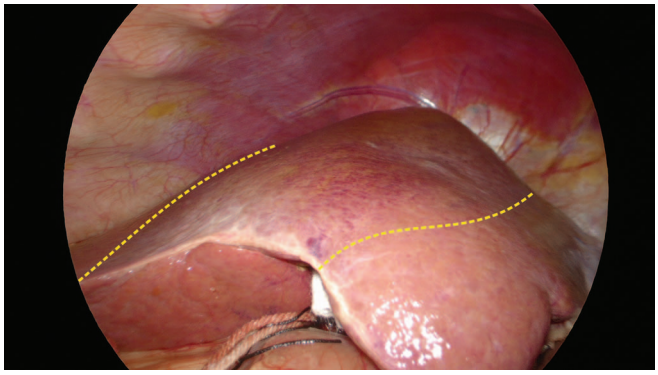

Figure 3. Ischemic zone of the right anterior section after control of the right anterior pedicle (shown in dotted line).

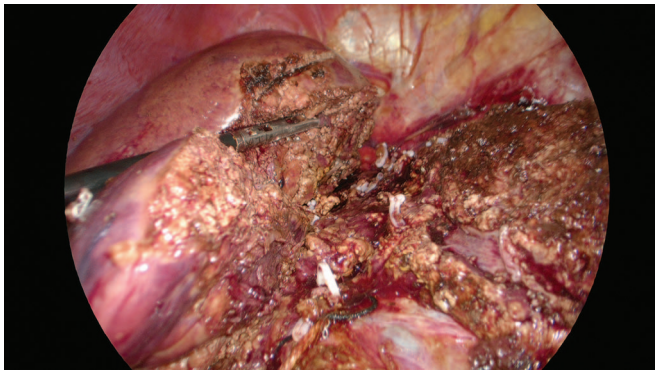

Figure 6. Endostapler inserted and the right anterior pedicle transected.

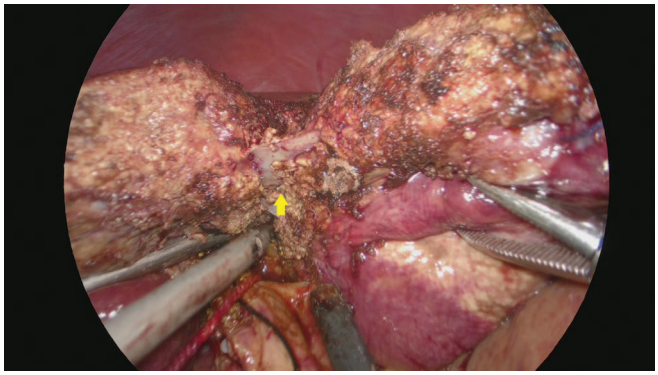

Figure 4. Left-sided liver parenchymal transection with control of a segment 5 venous branch from the middle hepatic vein (arrow).

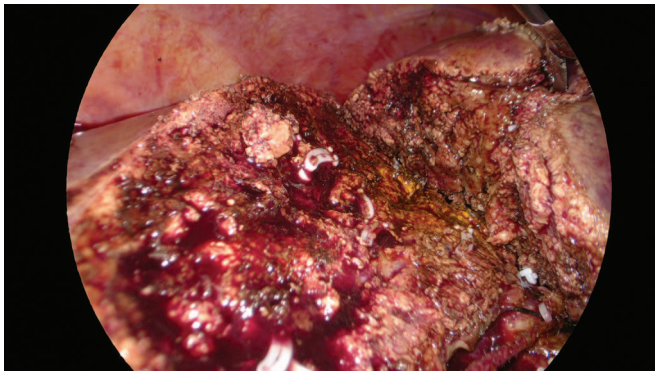

Figure 7. Left-sided liver parenchymal transection along the plane of the middle hepatic vein.

Figure 5. Left-sided liver parenchymal transection with control of a segment 8 venous branch from the middle hepatic vein (arrow).

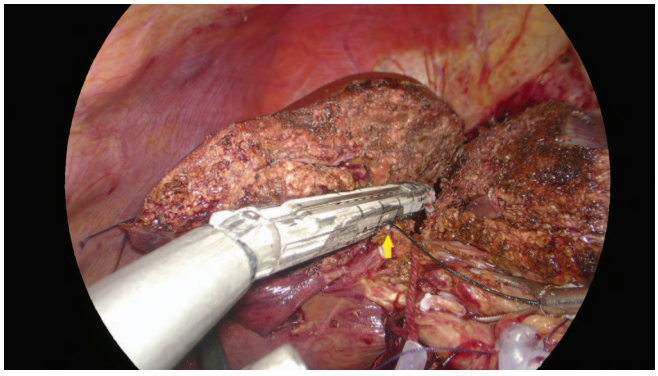

Figure 8. Right-sided liver parenchymal transection along the plane of the right hepatic vein.

RESULTS

The four patients all had hepatitis B–related HCC and cirrhosis. The mean operation time was 502 ± 55 minutes. All patients underwent intermittent Pringle's Maneuver followed by intermittent right hepatic vascular inflow occlusion. The mean Pringle's Maneuver time was 58.8 ± 11.4 minutes and the mean right hemihepatic vascular inflow occlusion time was 66.3 ± 11.1 minutes. The mean intraoperative blood loss was 512 ± 301 mL. No patients required any blood transfusion. There was no conversion

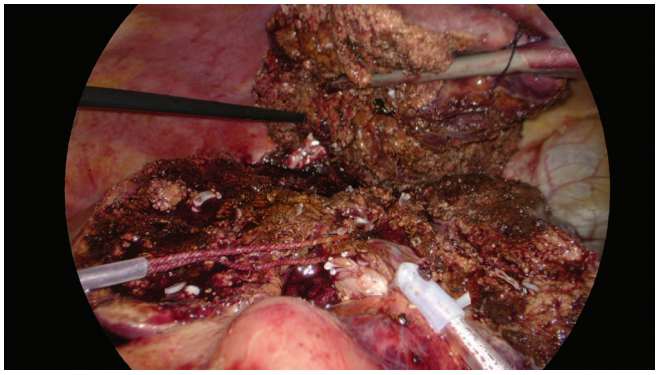

Figure 9. Raw hepatic parenchymal transection planes left after anatomical resection of right anterior section (liver segments 5, 8).

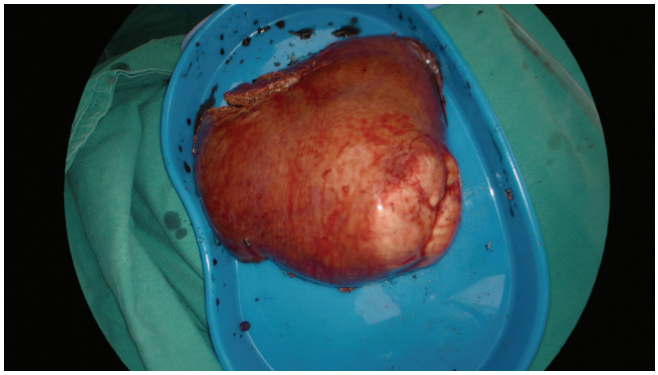

Figure 10. Specimen of the resected right anterior section (liver segments 5, 8).

to open surgery. Postoperative complications included intra-abdominal bleeding requiring reoperation (n = 1), intra-abdominal collection requiring percutaneous drainage (n = 1), and right pleural effusion requiring percutaneous drainage (n = 1). The patient with postoperative bleeding required reoperation for surgical plication for dislodgement of a clip for a segment 4 venous branch. There was no 90-day mortality. The mean hospital stay was 10.7 ± 2.9 days. The mean resection margin was 16.3 ± 4.8 mm and the mean tumor size was 3.6 ± 0.29 cm. All surgical margins were negative. After a median follow-up of 10 ± 3 months, one patient developed HCC recurrence in the liver remnant, which was treated with transarterial chemoembolization and percutaneous radiofrequency ablation. This patient was still alive at the time when this study was censored in June 2018.

DISCUSSION

Recent advances in minimally invasive surgery over the last three decades, with development of new instruments that allow better liver parenchymal transection and bleeding control, have made laparoscopic partial hepatectomy widely adopted by surgeons around the world. When compared with open hepatectomy, laparoscopic hepatectomy for HCC in selected patients showed similar oncological outcomes, but with less intraoperative blood loss, shorter hospital stay, and fewer postoperative complications.[7–10] Laparoscopic hepatectomies have now been considered as the standard procedures for small tumors located in the anterolateral peripheral segments of the liver,[11] while highly complex hepatectomies, major anatomical resections, and laparoscopic donor hepatectomies should be performed only in specialized centers. Laparoscopic central hepatectomy is one of the complex hepatectomies that has rarely been reported on cirrhotic patients.

Right anterior sectionectomy carried out for centrally located tumors is technically demanding, as it involves transection of two hepatic parenchymal planes, in addition to controlling numerous branches coming from the right and middle hepatic veins, and from the Glissonean pedicles in the operative field. The risks of bleeding and/or bile leakage becomes higher with a larger plane of liver parenchymal transection. Right anterior sectionectomy is a form of central hepatectomy. It can be used to resect HCC located in liver segments 5 and 8. As a larger volume of functional liver parenchyma is preserved than in right hepatectomy, it provides a less chance for cirrhotic patients to develop PHLF. Careful dissection and adequate control of vascular structures are essential for the safe and successful operation, particularly in the hepatic hilum and in the deep portion of the liver around the hepatic veins and inferior vena cava.

Takasaki[6] described the concept of "hepatic segmentation" as the basis of hepatectomy using the Glissonean pedicle transection method. The hilar structures are approached without dissecting the Glisson's sheath to isolate and to control the relevant hepatic pedicle. This technique is based on the pioneering works of Launois[12] and Galperin,[13] who described the fibrous sheath that envelops the entire portal triad which extends into the liver. Fusion of the Glisson's capsule with the connective tissue sheaths surrounding the portal triad, which consists of the portal venous branches, hepatic arterial branches, and bile ducts at the inferior region of the liver constitutes the plate system. This plate system consists of the "hilar plate" above the confluence of the hepatic ducts, the "cystic plate" related and above the gallbladder, the "umbilical plate" above the unbilical portion of the left portal vein. and the "Arantian plate" covering the ligamentum venosum. The Glissonian approach as presented here was first

used in open surgery. However, this anatomical characteristic was used in laparoscopic surgery by us to expose the relevant hepatic pedicle(s). Our group has previously reported on a series of patients who underwent laparoscopic hemi-hepatectomy using the Glissonian pedicle control by lowering of the hilar plate.[14,15] With the related experience in hemihepatectomy, this technique was then applied to laparoscopic right anterior sectionectomy. This technique requires appropriate preoperative imaging planning, adequate knowledge in liver anatomy, and use of intraoperative ultrasound and hepatic vascular inflow occlusion techniques. The feasibility of carrying out totally laparoscopic right anterior secionectomy for cirrhotic patients with HCC is clearly shown in our four patients. The Korean groups have demonstrated that similar surgical outcomes could be obtained using totally laparoscopic liver resection as compared with open liver resection for centrally located liver tumors.[16,17]

This study has limitations. The number of patients is small and the experience is preliminary. More comparative and large scale studies are required to verify the safety and feasibility of laparoscopic right anterior sectionectomy in cirrhotic patients.

In conclusion, the technique of totally laparoscopic right anterior sectionectomy using the extraglissonian approach was feasible and safe in expert hands. More data are needed to define its long-term survival outcomes.

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