Case Report

Total Laparoscopic Right Hepatectomy for Large Hepatocellular Carcinoma: The First Report in Thailand

Sa-ard Treepongkaruna MD*

** Department of Surgery, Rajavithi Hospital, College of Medicine, Rangsit University Bangkok, Thailand*

Limited cases of total laparoscopic right hepatectomy have been reported worldwide due to technically difficulty, especially in a large hepatocellular carcinoma (HCC). The objective of this article is to describe a simple technique for total laparoscopic right hepatectomy which was successfully performed in two patients with large HCC. Anterior approach technique combined with glissonian approach and principle of liver hanging maneuver were used. The detailed surgical technique was described. Total laparoscopic right hepatectomy for large HCC is feasible and safe.

Keywords: *Laparoscopic surgery, Laparoscopic hepatectomy, Liver resection, Hepatocellular carcinoma*

J Med Assoc Thai 2011; 94 (Suppl. 2): S123-S128
Full text. e-Journal: *http://www.mat.or.th/journal*

Since the first laparoscopic cholecystectomy was reported, minimally invasive surgery has expanded into almost every surgical field. The first laparoscopic hepatectomy was reported by Reich in 1991[1] then Gagner reported a more complex laparoscopic hepatic resection of 6 cm focal nodular hyperplasia in 1992[2]. Since then, few thousands of laparoscopic hepatectomy have been reported worldwide. It took many years following the first report of laparoscopic hepatectomy until Huscher, et al[3] reported the first laparoscopic right hepatectomy in 1997. However, laparoscopic right hepatectomy has progressed very slowly[4]. The latest review of 2,804 patients underwent laparoscopic liver resection, laparoscopic right hepatectomy, including hand-assisted laparoscopic right hepatectomy and total laparoscopic, accounts for only less than 9% or hundred of cases[5]. The reason for small numbers of laparoscopic right hepatectomy is that right hepatectomy is very technical demanding operation and it is more difficult when laparoscopic approach is used and even more diffucult when performing total laparoscopic technique especially in patients with large hepatocellular carcinoma (HCC).

The objective of this article is to describe a simple technique for total laparoscopic right hepatectomy which was successfully performed in two patients with large HCC.

Correspondence to:
Treepongkaruna S, Department of Surgery, Rajavithi Hospital, College of Medicine, Rangsit University, 2 Phyathai Road, Ratchathewi, Bangkok 10400, Thailand
Phone: 0-2354-8080 Ext. 3149, Fax: 0-2354-8080
E-mail: satreepong@gmail.com

Case report

Case 1

A 61-year-old Thai male was referred to Rajavithi Hospital due to abdominal pain and computerized tomography showed a large HCC in right lobe liver. The diagnosis of HCC was confirmed by elevated alpha-fetoprotein (AFP) level of 1,604 IU/mL and the computerized tomography findings which were compatible with a large hepatocellular carcinoma, size 10 cm involving segment V, VI, VII, VIII.

Right hepatectomy was planned, therefore the functional reserve of liver was evaluated by Indocyanine green retention (ICGR) test. The test result was 19.2% which meaned borderline hepatic reserve. Thus transarterial chemoembolization followed by portal vein embolization was done prior to right hepatectomy which was scheduled at 4 weeks later. Computerized tomography at 4 weeks after portal vein embolization showed slightly increased size of left lobe of liver. The computerized tomography of the patient before and after transarterial chemoembolization and portal vein embolization is shown in Fig. 1.

Total laparoscopic right hepatectomy was successfully done without complication. Operative time is 385 minutes and blood loss is 1,200 mL. Post-operative period was uneventful. Drain was removed on the

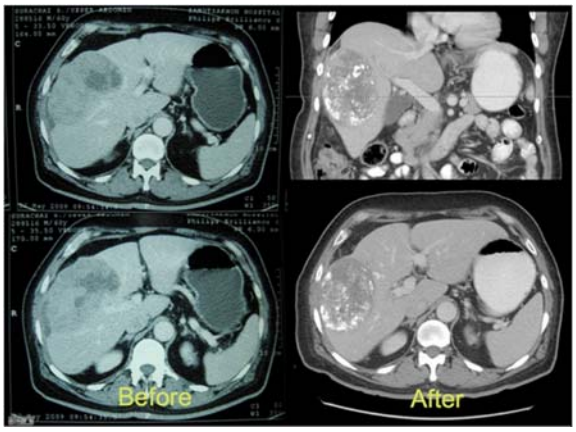

Fig. 1 CT scan of patient 1. Before and after chemoembolization and portal vein embolization. Left lobe show hypertrophy after embolization.

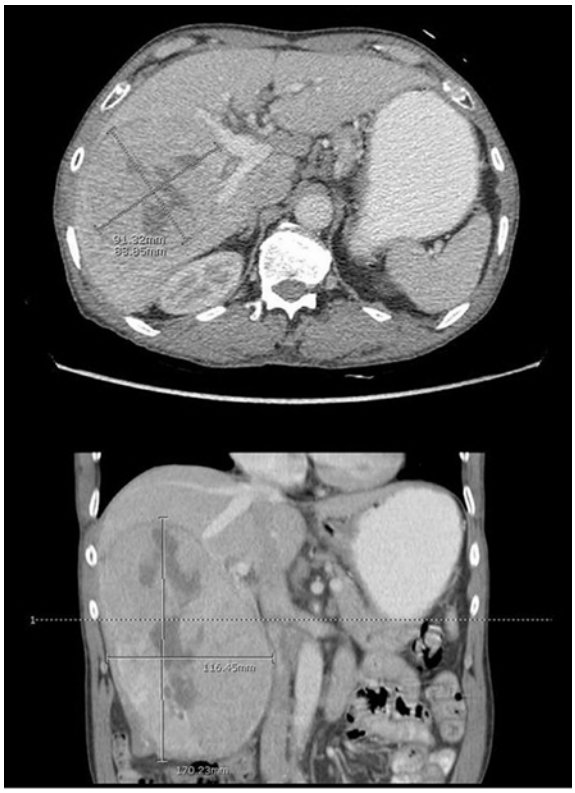

Fig. 2 CT scan of patient 2 show the size and location of hepatocellular carcinoma.

fourth day and the patient was discharged from hospital on the sixth post-operative day. The patient required only 4 doses of intravenous analgesic drug. Pathological report was hepatocellular carcinoma and free resected margin.

Case 2

A 67-year-old Thai male went to local hospital due to abdominal discomfort. Ultrasonography showed large right hepatic mass suspected of hepatocellular carcinoma. He was referred to Rajavithi Hospital. Diagnosis of HCC was confirmed by AFP level of 3,636 IU/mL and the computerized tomography findings of 12 x 17 cm mass at right lobe of liver that characterized HCC (Fig. 2).

The result of ICGR test was 14.7% which meaned the patient had sufficient hepatic reserve, therefore he was scheduled for right hepatectomy without any intervention before operation.

Total laparoscopic right hepatectomy was successfully done using the same surgical technique as in case 1 but Pringle maneuver was not performed in this case. Operation time was 450 minutes and blood loss was 1,600 ml. Post-operative period was uneventful. Drain was removed on the seventh day and patient was discharged from hospital on nineth post-operative day. The patient required continuous intravenous analgesic drug for only 1 day. Pathological report was well-differentiated HCC and free resected margin.

Surgical technique

Both patients went through almost same course of operation except that Pringle was not done in case 2.

The patients were operated under general anesthesia, on supine position with spreading legs (French position) and surgeon standing between the legs. First port was introduced at subumbilical area by opened technique and pneumoperitoneum was established through this port, pressure of 15 mmHg was maintained during operation. Flexible laparoscope was used for good visualization in abdominal cavity. Then another two 10-12 mm port and two 5 mm port were inserted as in Fig. 3.

Identification of anatomic right liver

After whole abdominal laparoscopy was done, laparoscopic ultrasound was inserted through 10-12 mm port and the mass was located and anatomic right liver was identified by using middle hepatic vein as a landmark and resection line of right liver was marked with electric cautery.

Pringle maneuver

Lesser omentum was opened widely and portal

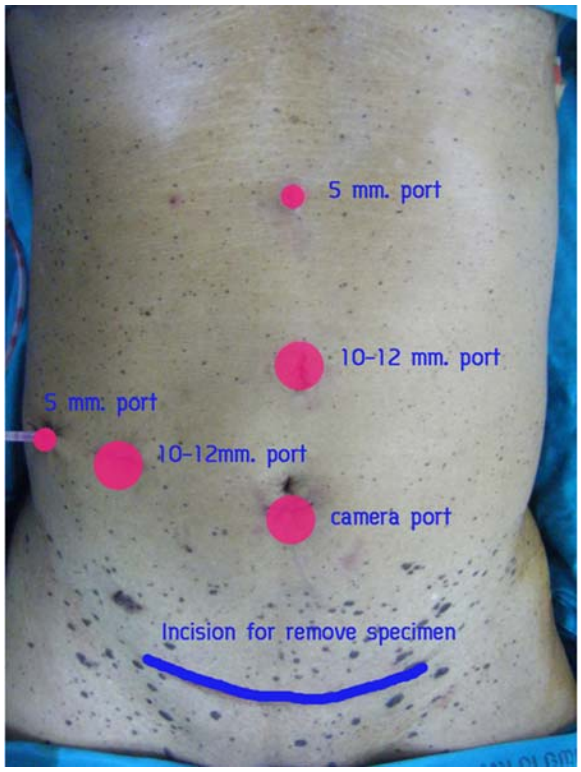

Fig. 3 Show 5 ports placement of both patient and suprapubic incision for specimen retrieval.

triad was double encircled through foramen of Winslow and the opening of lesser omentum with a small penrose drain (Fig. 4) then Pringle maneuver was done by tying the penrose drain very tightly.

Parenchymal transection

This step was done in the same manner as in opened hepatectomy. Liver parenchyma was transected along the marked line by ultrasonic scapel (Harmonic scapel)™. When branch of vessels or hepatic duct were encountered, they were double clipped and divided.

Transection of right portal pedicle

After parenchymal transection for two-third to three-fourth of anterior liver tissue the anterior surface of right portal pedicle was seen, then caudate lobe was transected along inferior vena cava (IVC) at 11 o'clock position of IVC. After transection of caudate lobe beyond hepatic hilum, the portal triad pedicle to right lobe came to vision. The right portal pedicle was transected with laparoscopic gastrointestinal anastomosis stapling device (endoGIA™) (Fig. 5) and Pringle maneuver by penrose drain was removed to restore blood flow to

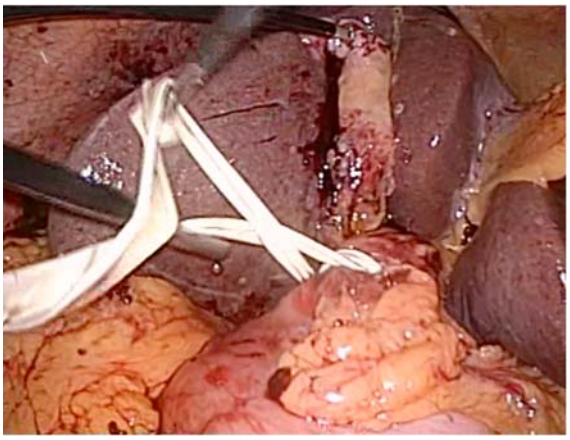

Fig. 4 Pringle maneuver was done by using small penrose drain double encircled hepatic hilum and tied (patient 1).

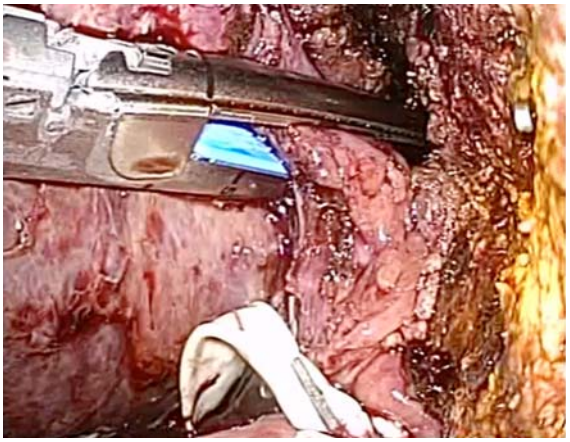

Fig. 5 Pedicle to right liver was divided with laparoscopic gastrointestinal anastomosis staple (endoGIA™).

remaining liver in case 1.

Separation of whole right liver from remaining liver

After right portal pedicle was transected, the remaining parenchyma that connected right liver to the remaining liver was transected with the same technique until right liver was completely separated from the remaining liver (Fig. 6).

Transection of right hepatic vein

Traction on cut surface of right liver was done in order to dissect from IVC, numbers of small hepatic vein from IVC were seen and divided between clips. After the right liver was dissected from IVC, right hepatic vein was clearly seen (Fig. 6) and was divided by

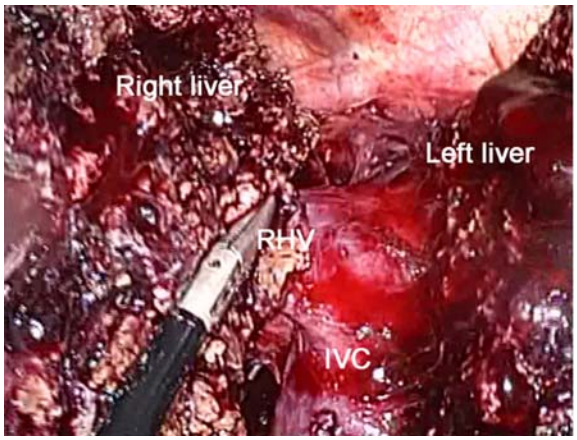

Fig. 6 Right and left liver were completely separated after parenchymal transection and right hepatic vein (RHV) was clearly dissected and ready for transection with endoGIA™. Note IVC was clearly seen whole length

endoGIA™ staple.

Dissection of right liver specimen from all ligaments

At this stage, the right liver was attached only by surrounding ligament without any blood supply, so the right liver specimen was easily freed by transection of all the ligament and surrounding soft tissue. The liver specimen was then put in a plastic bag.

Retrieval of liver specimen

Suprapubic transverse incision was done and the bag of liver specimen was removed through this incision. After closure of this incision, laparoscopy was done to check any bleeding and a closed suction drain was placed beside the cut surface of liver before closure of all wounds.

Discussion

Many authors have shown the feasibility and safety of laparoscopic hepatectomy, however, most of the operations are left lateral segment hepatectomy, S IV, V, VI segment hepatectomy or subsegmentectomy[5-10]. Laparoscopic right hepatectomy has been rarely reported[4,5]. To the best of my knowledge, this is the first report of laparoscopic right hepatectomy in Thailand.

The important factor for successful laparoscopic right hepatectomy is the good retraction of right liver with laparoscopic instrument[11,12]. Some surgeons recommend a hand-assisted laparoscopic technique for major hepatectomy, especially right hepatectomy because it provides a better retraction and prompt hemostasis when active bleeding is encountered[12]. Although total laparoscopic right hepatectomy was successfully done and reported[3,5,11], the operation is still technically difficult especially in large hepatocellular carcinoma.

Total laparoscopic right hepatectomy for large hepatocellular carcinoma may be easier if some techniques from opened hepatectomy are adopted. In this article, anterior approach technique, pioneered by Lin[13] and Liu[14] in open surgery, was employed in order to avoid mobilization of liver before parenchymal transection which is one of most difficult step in laparoscopic approach. Furthermore, by adopting the principle of liver hanging maneuver proposed by Belghiti[15] which shown that no short hepatic vein from IVC between 10 to 11 o'clock position of IVC, liver could be transected from anterior surface down to IVC (bisect) without mobilization of the right liver. Mobilization can be done easier in the last step of the operation when the right liver has no blood supply. Moreover, principle of glissonian approach, pioneered by Launois & Jamieson[16] was used instead of hilar dissection to reduce operative time and blood loss. Control of the glissonian sheath was done after transection of liver parenchyma rather than before transection of liver parenchyma in posterior intrahepatic approach[17]. After transection of right glissonian pedicle and liver parenchyma until right and left liver were completely separated, hepatic veins were easily identified and controlled by slight retraction of the right liver (Fig. 6). When all hepatic vasculatures of the right liver were divided, the right liver could be mobilized without major hemorrhage from liver and the large hepatocellular carcinoma.

By combining principle of above mentioned surgical techniques together, total laparoscopic right hepatectomy for large hepatocellular carcinoma was successfully done in these 2 cases without difficulty and complications.

Conclusion

Total laparoscopic right hepatectomy for large hepatocellular carcinoma by anterior approach technique combined with glissonian approach and liver hanging maneuver is feasible and safe.

Potential conflicts of interest

None.

References

1. Reich H, McGlynn F, DeCaprio J, Budin R.

Laparoscopic excision of benign liver lesions. Obstet Gynecol 1991; 78: 956-8.
2. Gagner M, Rheault M, Dubic J. Laparoscopic partial hepatectomy for liver tumor. Surg Endosc 1992; 6: 97-8.
3. Huscher CG, Lirici MM, Chiodini S, Recher A. Current position of advanced laparoscopic surgery of the liver. J R Coll Surg Edinb 1997; 42: 219-25.
4. Dagher I, O'Rourke N, Geller DA, Cherqui D, Belli G, Gamblin TC, et al. Laparoscopic major hepatectomy: an evolution in standard of care. Ann Surg 2009; 250: 856-60.
5. Nguyen KT, Gamblin TC, Geller DA. World review of laparoscopic liver resection-2,804 patients. Ann Surg 2009; 250: 831-41.
6. Hashizume M, Shimada M, Sugimachi K. Laparoscopic hepatectomy: new approach for hepatocellular carcinoma. J Hepatobiliary Pancreat Surg 2000; 7: 270-5.
7. Antonetti MC, Killelea B, Orlando R III. Hand-assisted laparoscopic liver surgery. Arch Surg 2002; 137: 407-11.
8. Buell JF, Thomas MT, Rudich S, Marvin M, Nagubandi R, Ravindra KV, et al. Experience with more than 500 minimally invasive hepatic procedures. Ann Surg 2008; 248: 475-86.
9. Laurence JM, Lam VW, Langcake ME, Hollands MJ, Crawford MD, Pleass HC. Laparoscopic hepatectomy, a systematic review. ANZ J Surg 2007; 77: 948-53.
10. Kaneko H. Laparoscopic hepatectomy: indications and outcomes. J Hepatobiliary Pancreat Surg 2005; 12: 438-43.
11. O'Rourke N, Fielding G. Laparoscopic right hepatectomy: surgical technique. J Gastrointest Surg 2004; 8: 213-6.
12. Cuschieri A. Laparoscopic liver resections. J Minim Access Surg 2005; 1: 99-109.
13. Lin TY, Sridharan M, Ho ST. Retrograde resection of hepatic lobe for extensive carcinoma of the liver. Med Chir Dig 1977; 6: 87-8.
14. Lai EC, Fan ST, Lo CM, Chu KM, Liu CL. Anterior approach for difficult major right hepatectomy. World J Surg 1996; 20: 314-7.
15. Belghiti J, Guevara OA, Noun R, Saldinger PF, Kianmanesh R. Liver hanging maneuver: a safe approach to right hepatectomy without liver mobilization. J Am Coll Surg 2001; 193: 109-11.
16. Launois B, Jamieson GG. The importance of Glisson's capsule and its sheaths in the intrahepatic approach to resection of the liver. Surg Gynecol Obstet 1992; 174: 7-10.
17. Launois B, Jamieson GG. The posterior intrahepatic approach for hepatectomy or removal of segments of the liver. Surg Gynecol Obstet 1992; 174: 155-8.

การผ่าตัดตับกลีบขวาผ่านกล้องวีดิทัศน์ทั้งหมดเพื่อรักษามะเร็งตับปฐมภูมิขนาดใหญ่: รายงานแรกในประเทศไทย

สอาด ตรีพงษ์กรุณา

การผ่าตัดตับผ่านทางกล้องวีดิทัศน์มีรายงานมานานเกือบ 20 ปี แต่การผ่าตัดตับกลีบขวาออกผ่านทางกล้องวีดิทัศน์ทั้งหมด (Total laparoscopic right hepatectomy) ยังมีรายงานจำนวนน้อยเนื่องจากเทคนิคการผ่าตัดที่ยากโดยเฉพาะในผู้ป่วยที่มีมะเร็งตับปฐมภูมิขนาดใหญ่ วัตถุประสงค์ของรายงานนี้คือ การนำเสนอเทคนิคการผ่าตัดตับกลีบขวาออกผ่านทางกล้องวีดิทัศน์ทั้งหมดที่ใช้ในผู้ป่วยที่มีมะเร็งตับปฐมภูมิขนาดใหญ่ 2 ราย โดยการผ่าตัดผ่านทางด้านหน้าของตับ (Anterior approach) ร่วมกับเทคนิคการผ่าตัดโดยการแขวนตับ (Liver hanging maneuver) และการผ่าตัดเข้าทางผังพืดกลิสสัน (Glissonian approach) รายละเอียดเทคนิคการผ่าตัดได้บรรยายไว้ในบทความ โดยสรุปการผ่าตัดตับกลีบขวาออกผ่านกล้องวีดิทัศน์ทั้งหมด โดยเทคนิคดังกล่าวสามารถทำได้ด้วยความปลอดภัย