

# Right Hepatectomy Using Combination of Three Hepatic Portal Dissection and Liver Hanging Maneuver: A Case Report

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**Abstract** In traditional right hepatectomy, complete mobilization of the liver is usually conducted before parenchymal transection which may cause unfavourable complications like mass bleeding. So, people put forward the “anterior approach” and the “liver hanging maneuver”. We report a 60-year-old female was admitted to our hospital with the complaint of one-week of implicit inflation and discomfort of the right upper abdomen. In this case, combination of three hepatic portal dissection and liver hanging maneuver were successful used to resect the right liver with giant hemangioma.

**Keywords:** right hepatectomy, three hepatic portal dissection, liver hanging maneuver

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## 1. Introduction

In traditional right hepatectomy, complete mobilization of the liver is usually conducted before parenchymal transection. However, in some cases, such as in patients with huge tumor (>10cm) and tumors adherent to the diaphragm, the surgical approach is likely to cause bleeding or spread of tumor by forcibly freeing or rotating the liver [1,2]. So, Lai et al [3] put forward the “anterior approach”. This technique involves initial vascular inflow control, completion of parenchymal transection, and complete venous outflow control before the right liver is mobilized. This technique needs no complete mobilization of the live before liver resection, thereby avoiding tumor dissemination caused by liver tumor rotation and ischemic injury caused by compression of the remaining liver [4]. But it is difficult to control bleeding from deeper parenchymal planes around the inferior vena cava, hepatic veins or caudate lobe. Belghiti et al [5] reported the liver hanging maneuver by using a tape passed between the liver and the anterior surface of the vena cava by an anterior approach. Because of its advantages, such as facilitation of parenchymal transection in deep sites, better control of blood loss, it is widely used in open liver resection [6]. The establishment of the tunnel after the liver is the key to this technique. However, the establishment of a tunnel behind liver cannot be fulfilled under direct vision and may damage the liver capsule or short hepatic veins while might increase blood loss. Thus, for cases of the right liver with giant hemangioma, we successfully do right

hepatectomy using combination of three hepatic portal dissection and liver hanging maneuver. This method combines the advantages of traditional hepatectomy and liver hanging maneuver, with better control of bleeding and benefits from anatomic hepatic resection.

## 2. Case Report

A 60-year-old female was hospitalized with the complaint of one-week of implicit inflation and discomfort of the right upper abdomen. She was once treated by interventional embolization for right hepatic hemangioma 4 years before. Physical examination showed no positive signs. Laboratory examination indicated normal results of routine blood examination, liver function and blood coagulation. Abdominal plain and enhanced computed tomography (CT) scan images of hepatic hemangioma at arterial phase (Figure 1) and venous phase (Figure 2) showed normal liver size and shape, a slightly irregular low dense shadow of 13\*10.3 cm with irregular liquid dark area and clear boundary in the right lobe of liver, nodular enhancement of lesion edge, and contrast agent filled in the central lesion at hepatic portal phase. Delayed CT scan showed slightly dense lesion without enhanced region in the central zone. She was diagnosed as giant hepatic hemangioma in the right liver lobe.

On November 13 2015, she was subjected to surgery under general anesthesia. An L-shaped incision was made on the right upper abdomen. Further examinations showed normal liver size and shape, adhesion of right liver to abdominal wall, a 13\*10 cm tumor with soft texture

and clear boundary in the right lobe, and normality of other abdominal organs. Thus, right liver resection was performed. In detail, 1) after freeing the ligament around liver, expose anatomical structure of the first hepatic portal without removing the gallbladder, and then separate, ligate and cut off the right hepatic duct and hepatic artery. Cut and suture the right branch of the portal vein; 2) separate the connective tissue of the second hepatic portal. Then expose, separate and suture the right hepatic vein; 3) rotate the liver to the left to expose the short hepatic veins and right inferior hepatic vein. The blood vessels at the third hepatic port are exposed (Figure 3). Isolate and ligate the venous; 4) place the Fr8 catheter around the right lobe of liver with one end at the vena fossa among the common branch of the right, middle and left hepatic veins and the other end at the right side of the gallbladder, and then tighten the catheter with a vascular clamp (Figure 4); 5) let the assistant pull up the catheter while splitting liver parenchyma with a forcep along the catheter, and ligate all the encountered ducts to complete right liver resection (Figure 5) and the resected liver specimen (Figure 6). The total intraoperative blood loss was less than 100 ml. The postoperative pathological examination confirmed the diagnosis of hepatic cavernous hemangioma. Postoperative examination at the 5th day showed normal liver function, and the patient was discharged.



Figure 1. arterial phase



Figure 2. venous phase

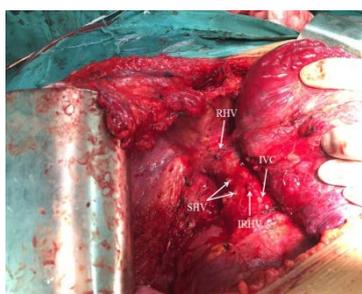


Figure 3.

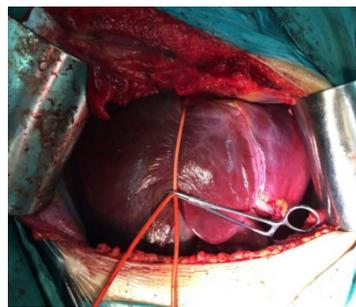


Figure 4.

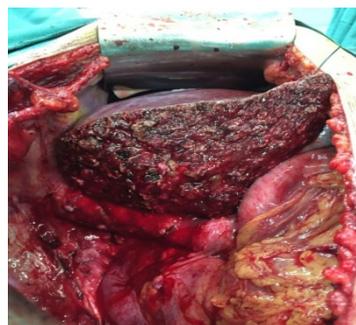


Figure 5.



Figure 6.

### 3. Discussion

Due to the nature of the anatomical features, there are numerous vessel systems in and around the liver. In addition, liver itself is thick and protected by the diaphragm, and some of its important structures are buried deeply and difficult to reveal. Therefore, liver resection is prone to complications such as acute bleeding. Anatomical liver resections are the recommended technique for most of the hepatic tumors. Compared with anatomical liver resections, enucleation offers the advantage of maximal hepatic parenchymal preservation [7]. There are also some difficulties during the enucleation of a hepatic tumor not visible in the hepatic surface, such as the control of bleeding resulting from the rupture of small or medium vessels and difficulty in finding the lesions. Hepatic surgeons have attempted to accomplish complex hepatectomy using different methods, including free and non-free liver hepatectomy. The former is the so-called conventional liver resection, in which, liver is firstly freed by releasing its surrounding ligaments and adhesions, then the related macrovessels are separated and ligated, and liver parenchyma is resected [8]. However, the method is risky in patients with giant right hepatic lesions or caudate

lobe lesions. Forcefully separating and flipping liver is likely to cause spontaneous bleeding of liver tumors, rupture of inferior vena cava [9,10] and local and systemic tumor spread and metastasis in the cases of malignant tumors [4].

The anterior approach as one of the non-conventional approaches to advanced liver cancer in an attempt to avoid causing impairment. It confers many advantages over the conventional method. It could avoid the risk of squeezing-induced tumor spread, and is more in line with the principle of no remaining tumor in tumor resection [11]. And it does not compress the remnant lobe, thus could reduce the risk of liver failure [12]. But it has reported that the anterior approach had no advantages over the conventional approach in relation to blood loss, morbidity or hospital stay after right hepatectomy [10]. The method also has some drawbacks. The anterior approach may lead to incomplete exposure of ducts at the cross section due to insufficient release of the liver and concerns about bleeding control in the deeper parenchymal plane as a result of limited operation space.

Belghiti et al [5] first reported the liver hanging maneuver on the basis of the anterior approach. Right hepatectomy uses the anterior approach without prior liver mobilization is an accepted technique and the liver hanging maneuver facilitates this procedure. A study has showed that anterior approach for right hepatectomy with hanging maneuver for large hepatocellular carcinoma can provide better overall survival rates with a decrease in intraoperative blood loss and transfusion rates than conventional right hepatectomy, especially survival impact was evident especially in patients with hepatocellular carcinoma  $\geq 10$  cm [13]. Also, the use of right hepatectomy using the liver hanging maneuver markedly improves the amount of intraoperative blood loss, operative time and postoperative outcome [14,15]. But the key to implementing the procedure is to establish the tunnel behind the liver, or the potential gap between the inferior vena cava at posterior liver segment and hepatic parenchyma. Some scholars believed that there is an avascular zone in the gap, and the right hepatic vein, and several short hepatic veins are situated at both sides of the gap. In contrast, Hirai et al [16] believed that the avascular zone is not absolute. They performed autopsy of 176 cases and found that the so-called avascular zone refers to the gap between the caudate vein and the right hepatic vein and is present in only 85%~93% of the samples. The other 7%~15% of the samples had low density vascular areas. The major drawback of liver hanging maneuver is that it is unable to establish a tunnel behind liver under direct vision and may damage the liver capsule or short hepatic veins, causing bleeding. In addition, the liver is not completely free and the bleeding site is not clear under direct vision, making it difficult to stop bleeding.

In combination with liver hanging tape, blood flow from the unaffected side of liver was blocked, which significantly reduced the bleeding of liver resection and

avoided the risk of blindly establishing the tunnels behind liver in the anterior approach. Considering its successful implementation in this case. We believe that right hepatectomy using combination of three hepatic portal dissection and liver hanging maneuver has more advantages for such cases.

## References

- [1] Wang CC, Jawade K, Yap AQ, Concejero AM, Lin CY and Chen CL. Resection of large hepatocellular carcinoma using the combination of liver hanging maneuver and anterior approach. *World J Surg* 2010; 34: 1874-8.
- [2] Oldhafer KJ, Donati M, Lipp M, Keller B, Ojdanic D and Stavrou GA. [anterior approach liver resection with the liver hanging maneuver. Technique and indications]. *Chirurg* 2012; 83: 65-70.
- [3] Lai EC, Fan ST, Lo CM, Chu KM and Liu CL. Anterior approach for difficult major right hepatectomy. *World J Surg* 1996; 20: 314-7; discussion 318.
- [4] Nanashima A, Abo T, Takagi K, Arai J, To K, Kunizaki M, Hidaka S, Takeshita H, Sawai T and Nagayasu T. Prognostic influence of the liver hanging maneuver for patients with hepatobiliary malignancies who underwent hepatic resections. *Eur J Surg Oncol* 2014; 40: 1540-9.
- [5] Belghiti J, Guevara OA, Noun R, Saldinger PF and Kianmanesh R. Liver hanging maneuver: A safe approach to right hepatectomy without liver mobilization. *J Am Coll Surg* 2001; 193: 109-11.
- [6] Kim JH, Ryu DH, Jang LC and Choi JW. Lateral approach liver hanging maneuver in laparoscopic anatomical liver resections. *Surg Endosc* 2016; 30: 3611-7.
- [7] Surjan RC, Makdissi FF, Basseres T and Machado MA. Enuclation of liver tumors: You do not have to feel blue about it. *J Surg Case Rep* 2015; 2015:
- [8] Earl TM and Chapman WC. Conventional surgical treatment of hepatocellular carcinoma. *Clin Liver Dis* 2011; 15: 353-70, vii-x.
- [9] Kobayashi M, Mizuno M, Hasegawa Y, Nitta H and Wakabayashi G. Major liver resection by a hanging maneuver for an infant with hepatoblastoma. *Am J Case Rep* 2012; 13: 140-2.
- [10] Li L, Wang HQ, Wang Q, Yang J and Yang JY. Anterior vs conventional approach hepatectomy for large liver cancer: A meta-analysis. *World J Gastroenterol* 2014; 20: 17235-43.
- [11] Agrawal S and Belghiti J. Oncologic resection for malignant tumors of the liver. *Ann Surg* 2011; 253: 656-65.
- [12] Pai M, Frampton AE, Mikhail S, Resende V, Kornasiewicz O, Spalding DR, Jiao LR and Habib NA. Radiofrequency assisted liver resection: Analysis of 604 consecutive cases. *Eur J Surg Oncol* 2012; 38: 274-80.
- [13] Beppu T, Imai K, Okuda K, Eguchi S, Kitahara K, Taniai N, Ueno S, Shirabe K, Ohta M, Kondo K, Nanashima A, Noritomi T, Shiraishi M, Takami Y, Okamoto K, Kikuchi K, Baba H and Fujioka H. Anterior approach for right hepatectomy with hanging maneuver for hepatocellular carcinoma: A multi-institutional propensity score-matching study. *J Hepatobiliary Pancreat Sci* 2017; 24: 127-136.
- [14] Chen HW, Lai EC, Wang FJ, Li JY, Deng FW, Hu JY and Lau WY. Anterior approach for right hepatectomy using the 5-steps stapling technique: A preliminary study. *Int J Surg* 2016; 32: 19-23.
- [15] Nanashima A and Nagayasu T. Development and clinical usefulness of the liver hanging maneuver in various anatomical hepatectomy procedures. *Surg Today* 2016; 46: 398-404.
- [16] Hirai I, Murakami G, Kimura W, Kanamura T and Sato I. How should we treat short hepatic veins and paracaval branches in anterior hepatectomy using the hanging maneuver without mobilization of the liver? An anatomical and experimental study. *Clin Anat* 2003; 16: 224-32.