Case Report of a 58-Year-Old Woman with Anatomic Segment IV and VII Liver Metastases from a Primary Colonic Adenocarcinoma Who Underwent Laparoscopic Cone Segmental Partial Hepatectomy

Yusuke Takahashi
Akira Kobayashi
Hitoshi Seki

Corresponding Author: Yusuke Takahashi, e-mail: yusuke_takahashi@hospital.nagano.nagano.jp

Financial support: None declared
Conflict of interest: None declared

Patient: Female, 58-year-old
Final Diagnosis: Liver metastases
Symptoms: No symptom
Medication: —
Clinical Procedure: Laparoscopic liver resection
Specialty: Oncology • Surgery

Objective: Unusual setting of medical care

Background: Compared with wedge resection, anatomic segmental resection of liver metastases from primary colon cancer can improve tumor clearance and patient survival. We present the case of a 58-year-old woman with liver metastases from primary colon cancer who underwent laparoscopic cone unit resection for undetectable liver metastasis of segment VII.

Case Report: The patient was a 58-year-old woman. Giant uterine myoma and advanced sigmoid colon cancer were detected on computed tomography. Two liver metastases (segments IV and VII) were simultaneously detected. The lesion of segment VII (5.0 mm in size) was not detected by echography and was located in the root of the hepatic vein, which connects to the right hepatic vein. However, the echography detected the hepatic vein. Therefore, we set the vein as the landmark of the undetectable liver tumor and planned to perform cone unit resection of segment VII with resection of the hepatic vein laparoscopically. We detected the landmark-set hepatic vein on intraoperative echography and transected the peripheral Glisson VII. Subsequently, the right hepatic vein was exposed from the root to the peripheral side and transected in its root. Cone unit resection was performed without tumor exposure. Operation time and blood loss were 582 min and 200 g, respectively. Pringle maneuver time, including hepatectomy of segments IV and VII, was 146 min. She was discharged on postoperative day 5 with no postoperative complications.

Conclusions: This case demonstrated the use of laparoscopic cone unit hepatectomy using an anatomical landmark in a patient with undetectable liver metastasis.

Keywords: Anatomic Landmarks • Hepatectomy • Laparoscopy • Margins of Excision • Neoplasm Metastasis

Full-text PDF: https://www.amjcaserep.com/abstract/index/idArt/936115
**Background**

Surgery is the standard approach for resectable colorectal liver metastases, and laparoscopic hepatectomies have been increasingly performed [1,2]. However, laparoscopic surgery for segments VII and VIII can be challenging [3]. In addition to this anatomically difficult approach, undetectable tumor resection is technically complex even in open surgery. Intraoperative ultrasonography is similarly important for laparoscopic surgery since its effectiveness for hepatectomy has been reported [4]. In detecting liver tumors, the usefulness of indocyanine green and Sonazoid has also been reported; however, not all liver tumors are identified by these diagnostic means [5,6]. Moreover, these materials require specific devices such as near-infrared fluorescence cameras and Sonazoid-adapted echography. For undetectable liver tumors, anatomical structures beside the tumor become a good landmark. By setting anatomical landmarks, laparoscopic radical resection, even for undetected liver tumors placed in segment VII, can be possible. In addition to tumor clearance, anatomic segmental hepatectomy is associated with improved survival [7]. This report presents the case of a 58-year-old woman with anatomic segment VII undetectable liver metastasis from a primary colon cancer who underwent laparoscopic cone unit resection.

**Case Report**

The patient was a 58-year-old woman. A giant uterine myoma and advanced sigmoid colon cancer with 2 concurrent liver metastases (segment IV and VII, respectively) were detected on contrast-enhanced computed tomography (CT), and the patient had asymptomatic iron-deficiency anemia and a positive occult fecal blood test. On gadolinium-etbybenzyldiethylenetriamine pentaacetic acid-enhanced (GD-EOB-DTPA) magnetic resonance imaging (MRI), there was no metastasis other than the 2 metastases detected on CT. Of these liver metastases, the tumor located in segment IV (6.8 mm in size) was detected by echography, while the tumor in segment VII (5.0 mm in size) was not. The carcinoembryonic and carbohydrate antigen 19-9 levels were 7.4 ng/mL and 10.9 U/mL, respectively.

The tumor in segment VII was located beside the root of the hepatic vein (V7), which connects to the right hepatic vein. Furthermore, V7 was detectable in echography (Figure 1). Therefore, we set V7 as the landmark for undetectable metastasis and planned to perform cone unit resection of segment VII. Figure 2 shows the thematic surgical strategy (3-dimensional (3D) image made in SYNAPSE VINCENT®, 3D medical image analysis system using Fujifilm image recognition technology to construct 3D images compiled from CT, FUJIFILM Corporation, Tokyo, Japan).

Laparoscopic partial hepatectomy for 2 metastases was performed 1 month after an open simultaneous hysterectomy and sigmoidectomy. The patient’s position was left semi-lateral, and the trocar placement is shown in Figure 3. After mobilizing the right liver, we discriminated between segment VII and the caudate lobe and detected target V7 in intraoperative echography. A parenchyma transaction was performed with caivitrin ultrasonic surgical aspirator. The peripheral Glissonian pedicle of segment VII was identified and divided. The right hepatic vein was exposed from the cranial to the caudal side, and the root of target V7 was divided. Thereafter, small anatomic segmental resection (cone unit resection) of segment VII was performed (Figure 4), and the tumor was resected without exposure (Figure 5). The total time required for this laparoscopic surgery, including resection of metastasis in segment IV, was 582 min, and blood loss was 200 g.

The postoperative course was uneventful, and the patient was discharged on postoperative day 5. The pathological diagnosis was metastasis from colon cancer. No residual resection for the 2 metastases was required.

**Discussion**

This case report demonstrated the process of resecting undetectable liver metastases laparoscopically. For resectable liver metastases from colorectal cancer, hepatectomy is the
standard strategy under the oncological control of the primary tumor [1,2]. However, hepatectomy for undetectable small metastases is not easy to perform. Major hepatectomies, such as segmentectomy, sectionectomy, and lobectomy, can include undetectable metastasis, but these hepatectomies are too invasive because parenchymal-sparing hepatectomy is a basic procedure for liver metastases [8]. Contrarily, the remnant liver ischemia following hepatectomy, often caused by non-anatomic

**Figure 2.** Thematic surgical strategy for the metastasis in segment VII (3-dimensional (3D) image made in SYNAPSE VINCENT®, 3D medical image analysis system using Fujifilm image recognition technology to construct 3D images compiled from CT, FUJIFILM Corporation, Tokyo, Japan) (right lateral view). The hepatic vein of segment VII (V7) (dotted line) was set as the anatomical landmark and identified in intraoperative echography. Surgical procedure: a) As recognition of the root of right the hepatic vein and hepatic hilum, discriminate between the caudate lobe (paracaval portion) and segment VII. b) Resect liver parenchyma from caudal of V7. c) Transect the peripheral Glissonean pedicle of segment VII. d) Expose the right hepatic vein from the root to peripheral. Arrow: metastatic tumor.

**Figure 3.** Trocar placement. The operator stood to the right of the patient, and the assistant and scope operator to the left. Number: trocar size (mm), * intercostal trocar in the 10th space.

**Figure 4.** Transection plane of segment VII (right lateral view). The right hepatic vein (arrowhead) was exposed. Arrow: V7, which was set as the anatomical landmark before surgery.

**Figure 5.** Cut surface of the metastasis in segment VII. The metastasis of segment VII was resected and negative surgical margin was achieved. Arrow: cranial side (the root of the right hepatic vein), dotted line: transaction line. Arrowhead: metastatic tumor.
resection, is an important prognostic factor for colorectal liver metastasis [9]. Anatomic segmental hepatectomy has been reported to be superior to wedge resection in terms of survival; however, in our case, segmentectomy of segment VII may have been too invasive [7]. Therefore, the concept of cone unit resection, which Takasaki et al reported as a small anatomical hepatectomy, is quite reasonable for colorectal liver metastasis [10]. In the present case, the segment VII metastasis was small (5.0 mm) and undetectable through echography; therefore, cone unit resection was the best option for tumor clearance and improved survival.

Conversely, despite the prevalence of laparoscopic hepatectomy, the approach for segment VII remains challenging. As shown in the difficulty scoring system by Ban et al, the location of segments VII and VIII is recognized as problematic compared with other locations [3]. In open hepatectomy for tumors located in the hepatic dome and posterior segment, the thoracoabdominal approach is safer and more effective than the conventional approach (l-shape incision) [11]. In the present case, as shown in Figure 1, the metastasis in segment VII was located near the root of the right hepatic vein. Therefore, thoracotomy might be required in an open surgery. Laparoscopic surgery minimizes destruction of the abdominal wall, and accordingly, our approach for this case was minimally invasive compared with that of open surgery. We applied the surgical method of laparoscopic cone unit resection for segment VII, as illustrated by Ome et al [12].

To the best of our knowledge, this case report is the first to present cone unit resection with the landmark setting of V7. Technical merit is not necessary for specific devices such as near-infrared fluorescence-adapted laparoscope and Sonazoid-adapted echography; however, preoperative surgical simulation using 3D images is critical. Moreover, the first step before performing cone unit resection is using intraoperative laparoscopic echography to identify anatomical landmarks beside the target tumor, which has been set in the preoperative image.

Conclusions

This case has demonstrated the use of laparoscopic cone unit resection using anatomical landmarks of segment VII in a patient with liver metastases from primary colon cancer. Our surgical concept, which was to set anatomical landmarks beside the undetectable tumor, such as the Glissonean pedicle and hepatic vein, and perform cone unit resection, considering the landmark, may have involved segments other than segment VII. Preoperative surgical simulation of what we set as an anatomical landmark and how we approached the landmark and target Glissonean pedicle to achieve cone unit resection was critical.

Acknowledgments

We would like to thank Editage (www.editage.com) for English language editing.

Declaration of Figures’ Authenticity

All figures submitted have been created by the authors who confirm that the images are original with no duplication and have not been previously published in whole or in part.

References:

1. Martin J, Petrillo A, Smyth EC, et al. Colorectal liver metastases: Current management and future perspectives. World J Clin Oncol. 2020;11:761-88
2. Hashiguchi Y, Muro K, Saito Y, et al. Japanese Society for Cancer of the Colon and Rectum. Japanese Society for Cancer of the Colon and Rectum (JSCCR) guidelines 2019 for the treatment of colorectal cancer. Int J Clin Oncol. 2020;25:1-42
3. Ban D, Tanabe M, Ito H, et al. A novel difficulty scoring system for laparoscopic liver resection. J Hepatobiliary Pancreat Sci. 2014;21:745-53
4. Makuchii M, Hasagawa H, Yamazaki S. Intraoperative ultrasonic examination for hepatectomy. Ultrasound Med Biol. 1983(Suppl. 2):493-97
5. van der Vorst JR, Schaafsma BE, Hutteman M, et al. Near-infrared fluorescence-guided resection of colorectal liver metastases using 3D images is critical. Moreover, the first step before performing cone unit resection is using intraoperative laparoscopic echography to identify anatomical landmarks beside the target tumor, which has been set in the preoperative image.

Conclusions

This case has demonstrated the use of laparoscopic cone unit resection using anatomical landmarks of segment VII in a patient with liver metastases from primary colon cancer. Our surgical concept, which was to set anatomical landmarks beside the undetectable tumor, such as the Glissonean pedicle and hepatic vein, and perform cone unit resection, considering the landmark, may have involved segments other than segment VII. Preoperative surgical simulation of what we set as an anatomical landmark and how we approached the landmark and target Glissonean pedicle to achieve cone unit resection was critical.

Acknowledgments

We would like to thank Editage (www.editage.com) for English language editing.

Declaration of Figures’ Authenticity

All figures submitted have been created by the authors who confirm that the images are original with no duplication and have not been previously published in whole or in part.

References:

1. Martin J, Petrillo A, Smyth EC, et al. Colorectal liver metastases: Current management and future perspectives. World J Clin Oncol. 2020;11:761-88
2. Hashiguchi Y, Muro K, Saito Y, et al. Japanese Society for Cancer of the Colon and Rectum. Japanese Society for Cancer of the Colon and Rectum (JSCCR) guidelines 2019 for the treatment of colorectal cancer. Int J Clin Oncol. 2020;25:1-42
3. Ban D, Tanabe M, Ito H, et al. A novel difficulty scoring system for laparoscopic liver resection. J Hepatobiliary Pancreat Sci. 2014;21:745-53
4. Makuchii M, Hasagawa H, Yamazaki S. Intraoperative ultrasonic examination for hepatectomy. Ultrasound Med Biol. 1983(Suppl. 2):493-97
5. van der Vorst JR, Schaafsma BE, Hutteman M, et al. Near-infrared fluorescence-guided resection of colorectal liver metastases. Ann Surg Oncol. 2016;23:3718-26
6. Yamashita S, Venkatesan AM, Mizuno T, et al. Remnant liver ischemia as a prognostic factor for cancer-specific survival after resection of colorectal liver metastases. JAMA Surg. 2017;152:e17986
7. DeMatteo RP, Palese C, Jarnagin WR, et al. Anatomic segmental hepatic resection is superior to wedge resection as an oncologic operation for colorectal liver metastases. J Gastrointest Surg. 2000;4:178-84
8. Matsumura M, Mise Y, Saiura A, et al. Parenchymal-sparing hepatectomy does not increase intrahepatic recurrence in patients with advanced colorectal liver metastases. Ann Surg Oncol. 2016;23:3718-26
9. Yamashita S, Venkatesan AM, Mizuno T, et al. Remnant liver ischemia as a prognostic factor for cancer-specific survival after resection of colorectal liver metastases. JAMA Surg. 2017;152:e17986
10. Takasaki K. Glissonean pedicle transection method for hepatic resection: A new concept of liver segmentation. J Hepatobiliary Pancreat Surg. 1998;5:286-91
11. Nanashima A, Sumida Y, Tobinaga S, et al. Advantages of thoracoabdominal approach by oblique incision for right-side hepatectomy. Hepatogastroenterology. 2007;54:148-51
12. Ome Y, Seyama Y, Doi M. Laparoscopic anatomic resection of segment 7 of the liver using the intrahepatic Glissonean approach from the dorsal side (with video). J Hepatobiliary Pancreat Sci. 2020;27:E3-6