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ORIGINAL ARTICLE – HEPATOBILIARY TUMORS

Glissonian Approach During Robotic Mesohepatectomy for Recurrent Colorectal Liver Metastasis

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Minimally invasive liver resection is one of the most complex procedures in hepatobiliary surgery.[1,2] We have described a standardized technique for Glissonian approach that has been used since 2001 in open and laparoscopic resections.[3] Hepatectomy is the standard treatment for colorectal liver metastases. However, the high recurrence rate is a persistent problem, in some situations being related to missed metastases.[4] Repeat hepatectomy is a feasible treatment and may offer favorable survival.[5] Repeat hepatectomy is also technically demanding, so minimally invasive repeat hepatectomy has been used in few patients.[5] Adhesions from previous operations may increase operative time, complications, and conversion, especially in patients with previous open surgeries.[5] Laparoscopic repeat hepatic resections can be performed safely in patients with previous minimally invasive resections but are more difficult after open liver surgeries.[6]

We present here a video of a robotic mesohepatectomy in a patient with recurrent colorectal liver metastasis. A 75-year-old man underwent open resection of a sigmoid colon cancer with synchronous liver metastases (T3N1M1) in October 2018. Preoperative magnetic resonance imaging (MRI) showed six liver metastases confirmed by positron emission tomography–computed tomography (PET-CT) to have size from 1.3 to 4.5 cm. He then received 12 cycles of chemotherapy (FOLFOX) with objective response and was referred to a liver surgeon for surgical treatment. Preoperative MRI showed five metastases (one missing metastasis), and PET-CT showed tumor activity in only one metastasis (located in S1). The liver metastasis in segment 8/4a that was present on preoperative MRI was not seen. He then underwent nonanatomical resection of four liver metastases located in segments 3, 8, and 6 (two contiguous lesions) followed by radiofrequency ablation of the S1 metastasis, also via an open approach. Complete pathological response was seen in two resected lesions (tumor regression grade 1), but grade 2 (rare residual cancer cells scattered throughout the fibrosis) in the other two resected metastases.[7] Despite the missing metastasis and based on the pathological response, the referring team decided for observation only. However, during follow-up, he presented with a local recurrence at the same location as the missing metastasis (S8/S4a). He was initially treated by radiofrequency ablation but presented with early local recurrence. At this time, the patient asked for a second opinion, and he was referred to us. MRI showed a large metastasis occupying the central liver segments. PET-CT showed activity only in this tumor. No other sites of activity were seen. The S1 ablated lesion showed no activity. The multidisciplinary team decided on neoadjuvant chemotherapy followed by liver resection. After four cycles of chemotherapy, MRI showed tumor stability, and mesohepatectomy was indicated. Liver volumetry showed a future liver remnant of 73.3%. Robotic approach was proposed, and consent was obtained (Fig. 1).

The da Vinci Xi system was used, and four robotic arms (four 8-mm trocars) were placed along with one additional laparoscopic port (12 mm) (Fig. 2). The surgeon was seated at the robotic console, and the assistant surgeon stood on the patient's left side to perform suction, irrigation, clipping, and change the robotic instruments. The operation began with the division of adhesions from previous laparotomies. Intraoperative ultrasound was

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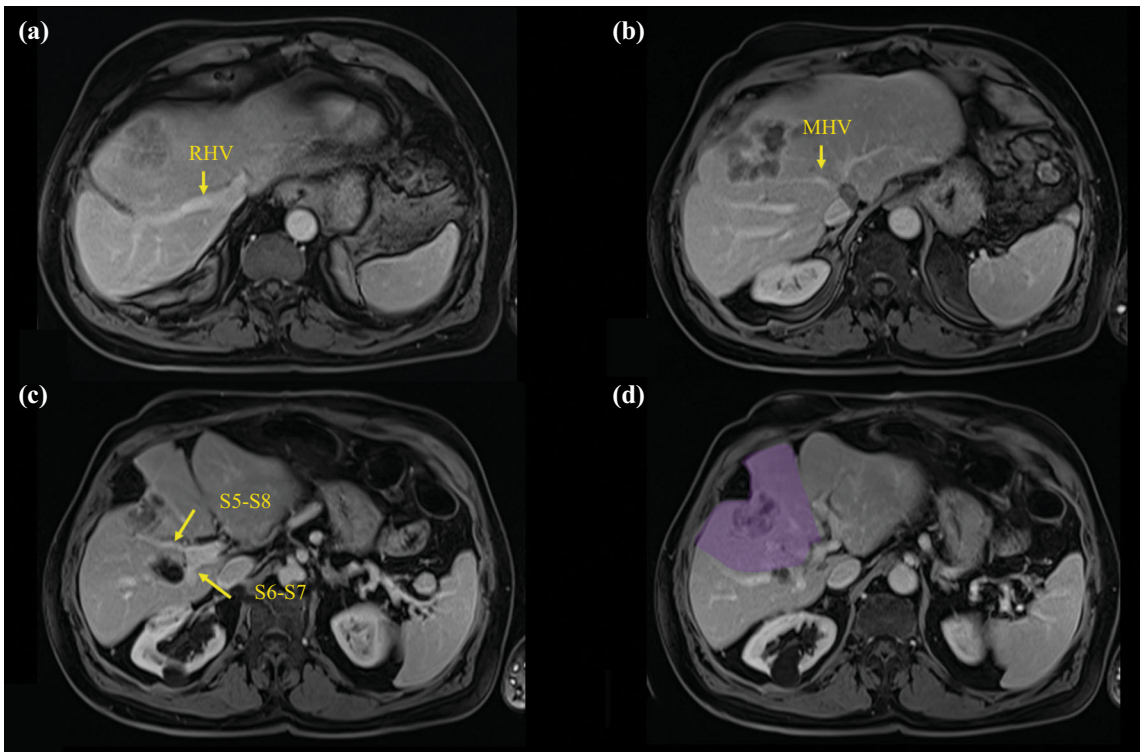

FIG. 1 Preoperative MRI. **A** Axial view shows recurrent metastasis. RHV, right hepatic vein. **B** Axial view shows metastasis in close contact with the middle hepatic vein (MHV). **C** Axial view shows metastasis in close contact with the right anterior sector pedicle (S5–8). Right posterior pedicle is free (S6–7). **D** Drawing showing future liver resection, mesohepatectomy, removal of liver segments 4, 5, and 8

performed to locate the tumor and to establish relationship with the middle and right hepatic veins and portal pedicles. Hepatoduodenal ligament was encircled with a Foley catheter for intermittent intracorporeal Pringle maneuver. Under Pringle maneuver, the bridge between segments 3 and 4b is divided, exposing the Rex recessus. Two small incisions are made to access the Glissonian pedicle of S4b, which is divided between hem-o-locks. The liver parenchyma is divided along falciform ligament, and the S4a pedicle is found and divided between hem-o-locks. The liver is divided using robotic bipolar forceps under continuous saline irrigation. Hilar plate is opened, and the Glissonian pedicle from the right anterior section (segments 5 and 8) is found and encircled with robotic grasper. Right anterior pedicle is temporary clamped with vascular detachable clamp. Intraoperative fluorescent imaging showed complete devascularization of the central liver segments (4, 5, and 8). The future line of resection is marked with cautery following ischemic discoloration. The liver is then divided between the right posterior and anterior section. The plane between the left lateral section and segment 4 is divided, and the middle hepatic vein is found, encircled, and divided between hem-o-locks. Liver division resumes, and the superior part of resection is divided until the root of the right hepatic vein, which is identified and preserved. Finally, the anterior pedicle is divided between hem-o-locks, and the mesohepatectomy is completed. Raw liver surface is checked for bile leak and bleeding. The surgical specimen was removed through an extension of the incision for 8 mm along previous J-shape laparotomy, and the abdominal cavity was drained with a closed suction drain. The total operative time was 420 min with no transfusion. Pathology confirmed the diagnosis with free surgical margins. Recovery was uneventful, and the patient was discharged on the fourth postoperative day. The patient is well with no evidence of the disease 14 months after the procedure.

Robotic approach is safe and feasible for mesohepatectomy and may be a good indication for rehepatectomy after open surgery. Intrahepatic Glissonian approach is useful for anatomical central resection. This video may help oncological surgeons perform this complex procedure.

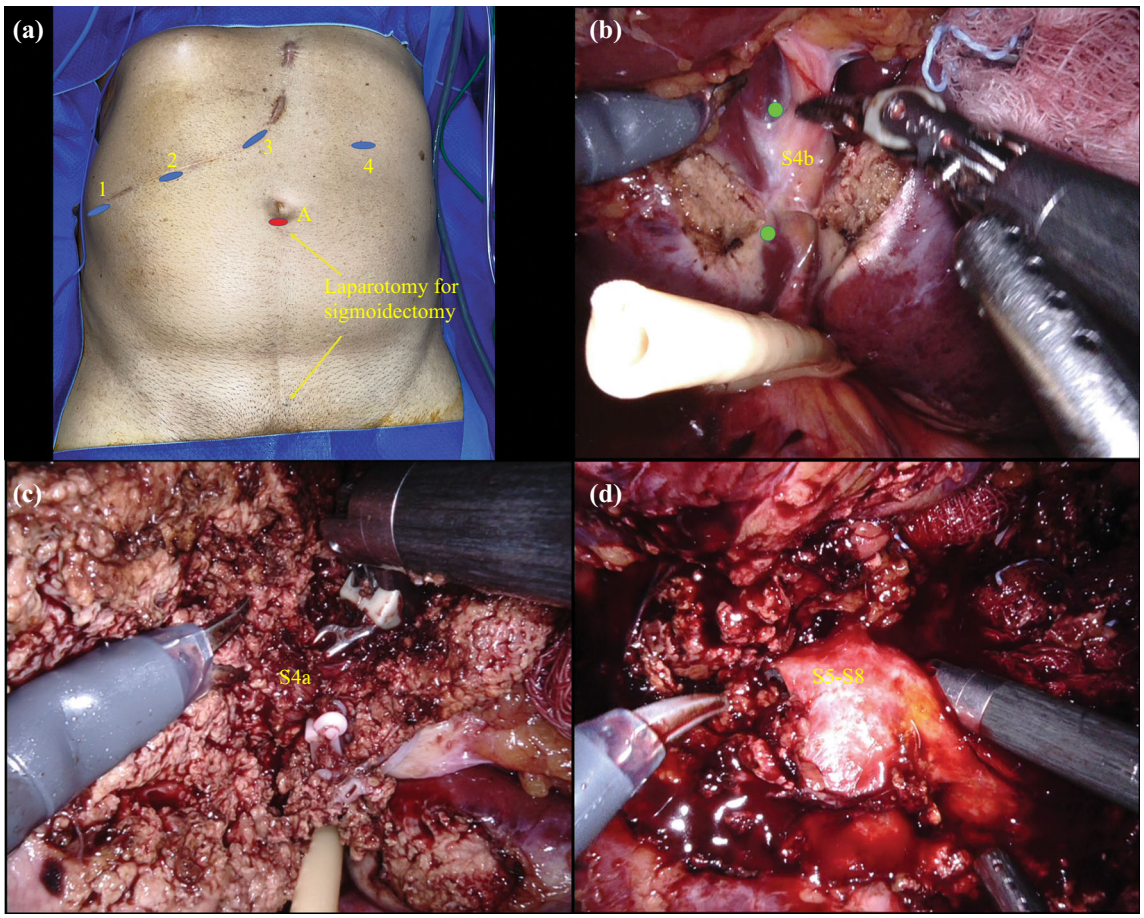

FIG. 2 Robotic mesohepatectomy. **A** Preoperative photograph of the abdominal wall showing previous incisions (infraumbilical median laparotomy for sigmoidectomy and J-shape incision for liver resection), incisions for the robotic arms (1-4), and the auxiliary (A) port (12 mm). **B** Intraoperative view shows incisions made for Glissonian access to segment 4b pedicle. **C** Intraoperative view during Glissonian access to segment 4a pedicle. **D** Intraoperative view during access to the right anterior Glissonian pedicle (segments 5 and 8)

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DISCLOSURES The authors declare no conflicts of interest.

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