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Case Report

Direct percutaneous access to an omental vein for embolization of Roux-en-Y limb varices in a child ☆

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ABSTRACT

An 11-year-old boy with a history of hepatoblastoma treated with chemotherapy, radiation therapy, and liver transplantation presented with bleeding from Roux-en-Y limb varices. The transhepatic approach for portal intervention posed a risk of liver graft injury. An omental vein that was dilated as a collateral vein due to portal hypertension was found and compressible under ultrasound. The omental vein was percutaneously punctured, and the varices were embolized through a jejunal vein. No complication occurred. Direct percutaneous access to the portal venous system is a useful technique for portal embolization.

Introduction

Ectopic varices are a rare cause of life-threatening bleeding. Reported treatments include surgery, endoscopy, and interventional radiology [1], and endovascular variceal embolization is a treatment option among various interventional radiology techniques [2]. When portal venous access is obtained percutaneously for embolization, transhepatic, and transsplenic approaches are mainly used [3,4]. However, these approaches are not always optimal, and a different approach may be suitable in some patients. One option of approach is direct percutaneous access to the portal venous system. Herein, we report a pediatric case of bleeding Roux-en-Y (RY) limb varices after liver transplantation treated with embolization using direct access to an omental vein.

Case report

An 11-year-old boy underwent chemotherapy and radiation therapy, followed by living donor liver transplantation using left liver lobe graft for hepatoblastoma with portal vein invasion 3 years ago. For complete tumor resection, the hepatic duct was resected, and choledochojejunostomy was performed during liver transplantation. After liver transplantation, the patient developed cholangitis repeatedly in the lat-

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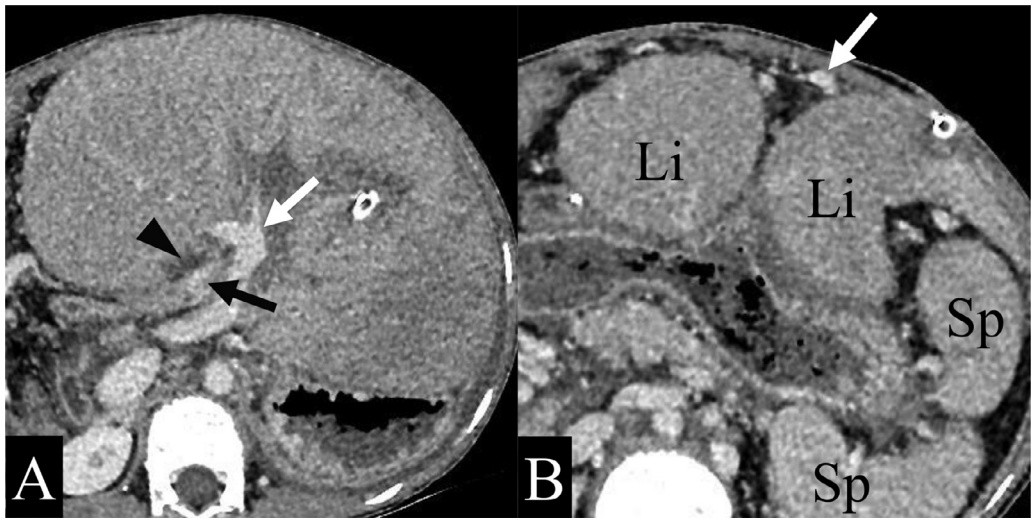

Fig. 1 – Contrast-enhanced computed tomography (CT) scan of the upper abdomen. (A) CT reveals increased enhancement (black arrow) at the Roux-en-Y (RY) limb (arrowhead) compatible with RY limb varices. The umbilical portion (white arrow) of the left portal vein is also observed. (B) CT taken at 3 cm below (A) reveals an omental vein running directly below the peritoneum. Li, liver; Sp, spleen.

eral segment of the liver due to humoral rejection associated with ABO-incompatible liver transplantation; a percutaneous transhepatic biliary drainage (PTBD) tube had been placed for 2.5 years. Repeated cholangitis caused hepatic fibrosis and portal hypertension. The patient experienced bleeding from the dilated vessels at the wall of the bile duct several times because of portal hypertension. He was treated with argon plasma coagulation using percutaneous transhepatic cholangioscopy for the past 6 months.

At that time, the patient presented with abdominal pain, intermittent bleeding from the PTBD tube, and bloody stool. Percutaneous transhepatic cholangioscopy showed multiple dilated vessels in the RY limb near the choledochojejunostomy. Argon plasma coagulation of the vessels was performed; however, bleeding persisted, and the patient required 4 or 6 units of red blood cells every day. Contrast-enhanced computed tomography (CT) showed increased enhancement of the RY limb wall, which was compatible with RY limb varices (Fig. 1A). The varices were fed by a proximal jejunal vein. The percutaneous embolization of the varices was planned. CT showed atrophy of the lateral segment of the liver and segment 4 hypertrophy, suggesting that segment 4 was responsible for the most part of hepatic function. On ultrasonography, only the segment 4 portal vein or umbilical portion of the left portal vein seemed accessible. The transhepatic approach to the portal venous system was considered inappropriate because of the risk of damage to segment 4. Notably, CT showed an omental vein, which was dilated (4 mm in diameter) as a collateral vein due to portal hypertension (Fig. 1B). The collateral vein was a branch of the left gastroepiploic vein and compressible using ultrasonography at the liver surface (Fig. 2). Therefore, we decided to puncture the omental vein to access the varices. The portal venous vascular anatomy and access plan to the varices are shown in Figure 3. Under conscious sedation, the omental vein was punctured using a 22-gauge coaxial needle. A 0.018-inch guidewire in a 4-F Merit MAK401 Mini Access Kit (Merit Medical, South Jordan, UT) was advanced, followed by the placement of an introducer in the kit. The introducer had an outer diameter of 4-F and was used as a vascular sheath. Using a 2.9-F microcatheter, angiography of a proximal jejunal vein revealed RY limb varices fed by 2 branches of the jejunal vein (Fig. 4A). The 2.9-F microcatheter was exchanged to a 2.6-F balloon microcatheter (Scepter C; Terumo, Tokyo, Japan), and 5% ethanolamine oleate (EOI) (Oldamine; Fuji Chemical Industry Co, Toyama, Japan) was injected to one feeding branch under balloon inflation. Ten minutes later, the balloon was deflated, and the branch was occluded with microcoils. Similarly, the other feeding branch was embolized. In total, 1.2 mL of 5% EOI was used, and angiography from the jejunal vein revealed no opacification of the varices (Fig. 4B). The introducer was removed, followed by manual compression for ten minutes. No complication developed during and after intervention. Bleeding stopped, and the patient was discharged home 6 days later.

However, bleeding from the PTBD tube recurred 1 week after discharge. Subsequently, second percutaneous intervention was performed. The omental vein that was accessed in the first intervention was patent, and a 4-F introducer was placed in the vein in the same way as in the first intervention. A 2.9-F microcatheter was advanced, and angiography of the proximal jejunal vein that was embolized in the first intervention demonstrated the development of 2 new feeding branches to the RY limb varices with active bleeding (Fig. 5A). No embolized veins were recanalized at the first intervention. One feeding branch was embolized with N-butyl cyanoacrylate (NBCA) mixed with iodized oil (Lipiodol; Guerbet, Aulnay-sous-Bois, France) at a ratio of 1:3. The other feeding branch was embolized by slowly injecting a small amount of 5% EOI. In total, 0.3 mL of NBCA mixture, and 0.5 mL of 5% EOI was used. After embolization, angiography of the jejunal vein re-

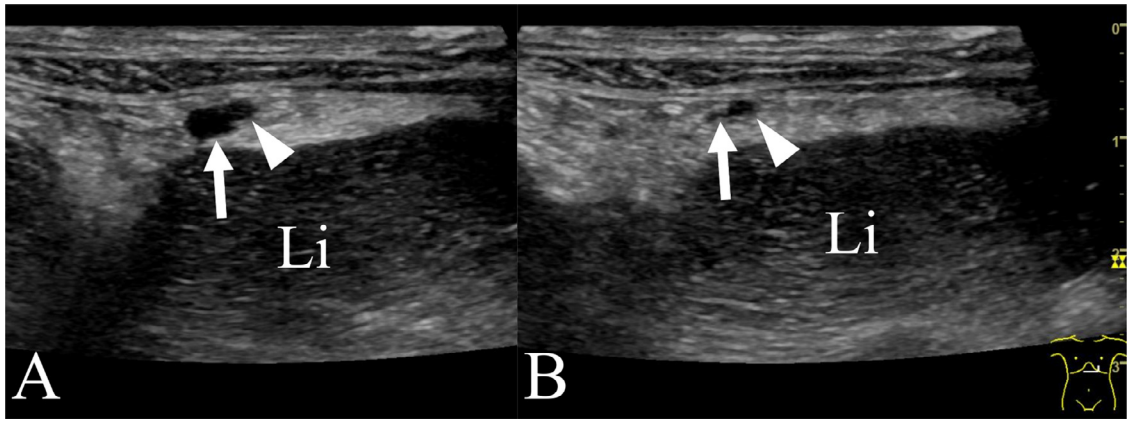

Fig. 2 – Abdominal ultrasound image of an omental vein. (A) Ultrasonography reveals that the omental vein (arrow) runs between the peritoneum and liver surface. A small artery (arrowhead) is observed next to the vein. (B) With compression using the ultrasound probe, the vein (arrow) is flattened. The artery (arrowhead) next to the vein keeps its shape. Li, liver.

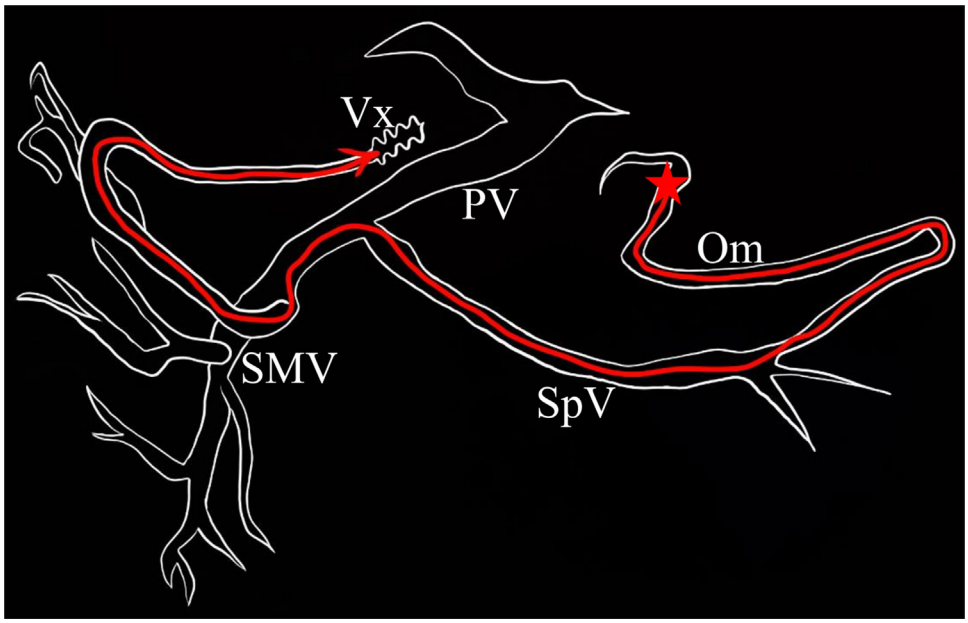

Fig. 3 – Schematic drawing of the portal venous system and access plan to the Roux-en-Y limb varices. The curved red line with the arrow shows the access route to varices. The star shows the access point to an omental vein. The red arrow reaches the varices through the omental vein, splenic vein, and a proximal jejunal vein. Om, omental vein; PV, portal vein; SMV, superior mesenteric vein; SpV, splenic vein; Vx, varices (Color version of the figure is available online).

vealed no variceal opacification (Fig. 5B). There were no complications. Liver retransplantation was performed 1 month later for recurrent bleeding from the bile duct and RY limb varices and repeated cholangitis. No life-threatening bleeding occurred from the varices, and the patient did not require blood transfusion until liver retransplantation.

Discussion

The transhepatic approach is the standard technique for portal venous intervention. However, in patients who have undergone liver transplantation, this technique poses a risk of graft injury, such as intrahepatic hematoma [5]. The transsplenic approach is another technique to obtain access to the portal venous system. This technique has a high risk of intraabdominal bleeding in pediatric patients, reported to be 27% in one study [5], and 7.7% in another [6].

Direct percutaneous access to the portal venous system is not widely known, and a small number of case series and case reports have reported the usefulness of direct access to the portal venous system [7–11]. When direct access is performed, hemostasis at the puncture site becomes the problem. Previous reported methods of puncture site hemostasis

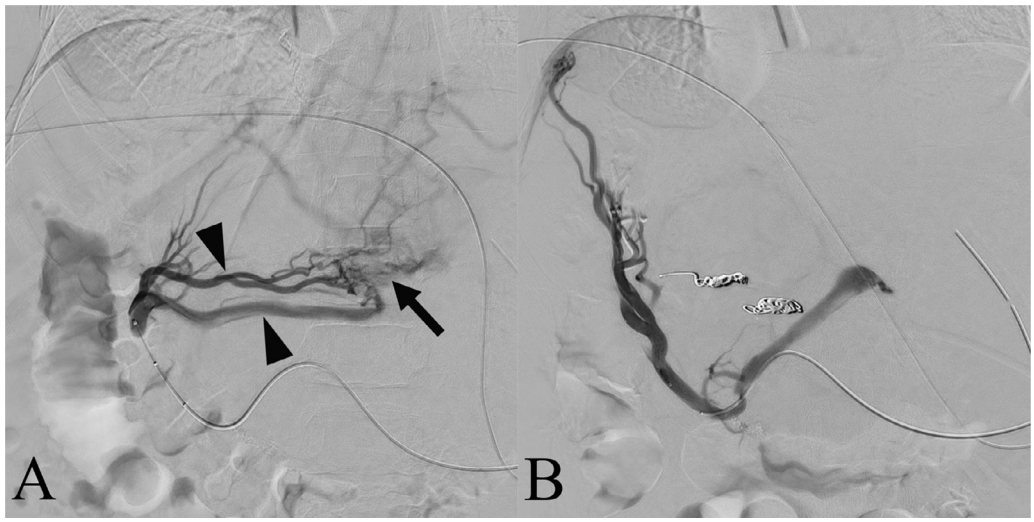

Fig. 4 – Angiography during the first embolization of the Roux-en-Y (RY) limb varices. (A) Angiography of a proximal jejunal vein shows RY limb varices (arrow) fed by 2 branches (arrowheads). (B) After the embolization of 2 branches, angiography of the proximal jejunal vein reveals no variceal opacification.

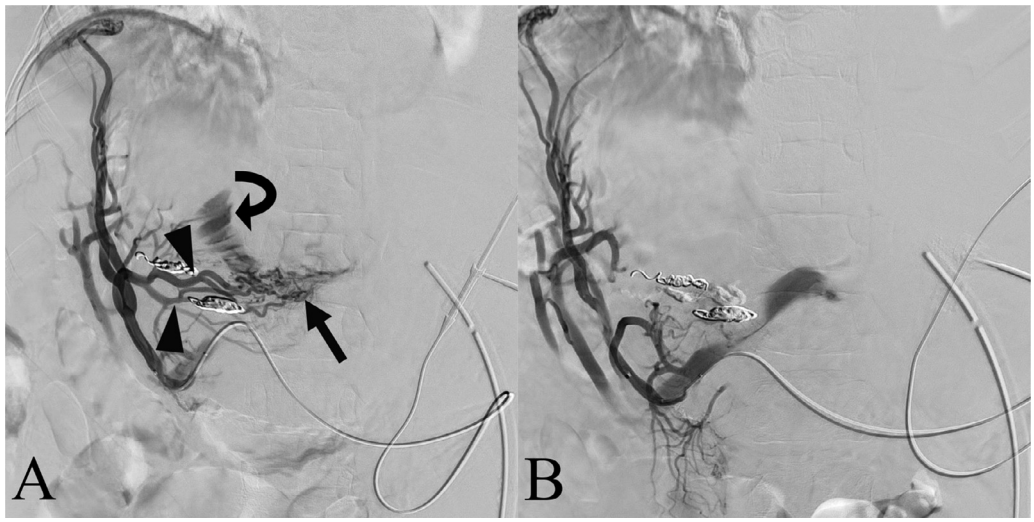

Fig. 5 – Angiography during the second embolization of the Roux-en-Y (RY) limb varices. (A) Angiography of a proximal jejunal vein shows RY limb varices (arrow) fed by 2 newly developed branches (arrowheads). Extravasation of the contrast medium (curved arrow) into the RY limb is observed. It is worthy to note that the 2 branches that were embolized during the first embolization are not recanalized. (B) After embolization of 2 branches, angiography of the proximal jejunal vein reveals no variceal opacification.

were tract embolization using NBCA mixed with lipiodol [7,8], usage of a closure device [9], and manual compression [11]. Manual compression is the most basic and simple method of hemostasis, and we used this method because ultrasonography confirmed that the vein was compressible. One advantage of manual compression over tract embolization is that manual compression has the possibility of preserving access vessel, enabling repeated intervention through the same vessel as shown in the present case. We believe that direct access to the portal venous system is the viable alternative approach when a compressible vein is found. However, the safety of the direct percutaneous access to the portal venous system is unclear, and more data is necessary to evaluate the hemorrhagic risk of this approach.

To reduce the risk of access site complication, including intraperitoneal bleeding and vessel obstruction due to thrombus formation, we tried to decrease the sheath size used in the intervention. Thus, we used an introducer in the Mini Access Kit as a vascular sheath. The outer diameter of the introducer is 4-F, which is smaller than that of a 3-F vascular sheath. Through

the introducer, variceal embolization can be performed using a microcatheter. We consider that the usage of the introducer as a vascular sheath is a feasible method to reduce access site complications.

In conclusion, the direct percutaneous approach to the portal venous system is a reasonable alternative to conventional methods when a vein that is suitable for puncture is found.

Funding

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Ethical approval

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed consent

Informed consent was obtained from all individual participants included in the study.

Patient consent

Written consent for publication was obtained from the legal gurdian of the patient.

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