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Case Report

Two-session embolization of portosystemic shunt presenting with hepatic encephalopathy via transvenous and trans-paraumbilical approaches: A case report☆,☆☆

Hiroki Kamada, MD, PhD[a,*], *Tomomi Sato, MD, PhD*[b], *Sota Oguro, MD, PhD*[a], *Hideki Ota, MD, PhD*[a], *Kei Takase, MD, PhD*[a]

[a] *Department of Diagnostic Radiology, Tohoku University Hospital, Sendai, Japan*
[b] *Department of Radiology, Tohoku Medical and Pharmaceutical University Hospital, Sendai, Japan*

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ABSTRACT

We describe the endovascular embolization of a 65-year-old man with chronic hepatic encephalopathy. A contrast-enhanced computed tomography demonstrated a splenorenal shunt and a recanalized paraumbilical vein as a continuous portal shunt connecting the left branch of the portal vein and the right common femoral vein. A 2-session embolization was performed for the splenorenal shunt. First, the transvenous approach was used for coil embolization of the splenorenal shunt. It was difficult to advance the catheter system to the embolization site, and it was unstable during coil placement. Second, the paraumbilical venous approach was used to place additional coils. The catheter system had good maneuverability and easily reached the embolization site. Additionally, the stable system allowed for densely packed additional coil implantations. This report demonstrated the paraumbilical venous approach's effectiveness in catheter maneuverability and system stability during coil embolization.

Introduction

Recurrent hepatic encephalopathy is often present in patients with portosystemic shunts [1]. Endovascular embolization has been reported to improve symptoms and prognosis [2]. Among approach routes for portosystemic shunt embolization, although the usefulness of the paraumbilical venous approach has been reported, it is still unfamiliar to clinicians [3–7]. This case report describes a patient with chronic

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* Corresponding author.
E-mail address: hkamada@rad.med.tohoku.ac.jp (H. Kamada).

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hepatic encephalopathy due to a splenorenal and paraumbilical venous shunt. Consequently, a 2-session coil embolization was performed by the transvenous and trans-paraumbilical venous approaches. The paraumbilical venous approach provided stable coiling with a robust system backup force.

Case presentation

A 65-year-old man with alcohol use disorder and cirrhosis was admitted to our hospital with chronic hepatic encephalopathy. Laboratory examination revealed elevated serum ammonia (251 μg/dL), serum albumin (2.7 g/dL), serum total bilirubin (0.8 mg/dL), prothrombin time (107%), and prothrombin time-international normalized ratio of (0.96).

A contrast-enhanced CT scan revealed a splenorenal shunt dilated to a maximum diameter of 33 mm and a dilated paraumbilical vein as a continuous portal shunt connecting the left branch of the portal vein and the right common femoral vein (Fig. 1A). The paraumbilical vein was approximately 10 mm in diameter and distributed along the abdominal wall at a depth of 23 mm below the skin (Fig. 1B). The CT scan also showed slight ascites in the pelvic floor. The patient's Child–Pugh score was 8 (class B).

Embolization was performed for the splenorenal shunt from the left femoral vein. A 10-Fr guiding sheath could not be inserted into the left renal vein due to the steep confluence angle of the left renal vein to the inferior vena cava. Therefore, we changed to a right internal jugular vein approach and inserted a 10-Fr guiding sheath. A coaxial double-balloon catheter with diameters of 20 and 10 mm was retrogradely advanced from the left renal vein to the splenorenal shunt using a 0.035-inch guide wire (Fig. 2A). The balloon catheter was advanced as far as possible toward the portal vein; however, occlusion was not obtained with a dilated balloon, and thus, portal pressure could not be measured. A 2.8/3.0-Fr microcatheter was inserted using a 0.016-inch micro-wire (Fig. 2B), and 9 60-cm-Ruby coils with different first-loop diameters were placed in the shunt (Fig. 2C). Although coil embolization decreased blood flow, a sufficient volume of coils could not be placed due to insufficient catheter system stability. The operative time was approximately 4.5 hour. After embolization, the patient's consciousness improved, and his serum ammonia decreased to 153 μg/dL; however, his symptoms flared up two months later with elevated serum ammonia (218 μg/dL). A CT scan showed a contrast agent traveling through the placed coils, and the overall splenorenal shunt was enhanced, as it was before procedure (Figs. 3A and B). No increase in ascites was noted.

An additional embolization was performed via the paraumbilical vein 3 months after the first. Doppler ultrasonography showed the cranial direction of blood flow in the dilated paraumbilical vein. The anterior wall of the paraumbilical vein covered by the falciform ligament was punctured with a micropuncture kit under ultrasound guidance, and a 5-Fr sheath was inserted in the cranial direction (Fig. 4A). A 4-Fr catheter was inserted and advanced toward the splenorenal shunt.

Compared to the first session, there were fewer steep bends and meanders in this route, which allowed for easy advancement of the catheter. Subsequently, a 2.8/3.0-Fr microcatheter was inserted and positioned close to the implanted coils. (Fig. 4B). One 45-cm POD packing coil and four 60-cm coils were additionally placed (Fig. 4C). Angiography did not delineate the renal vein side from the splenorenal shunt coils. While the portal venous pressure was not measured, we decided to preserve the paraumbilical shunt without embolization to avoid a sudden increase in portal pressure. The operation time was approximately 2 hour. After the second embolization, the patient's symptoms improved with a decrease in serum ammonia to 140 μg/dL, and he was discharged home 4 days after embolization. Follow-up CT revealed that the splenorenal

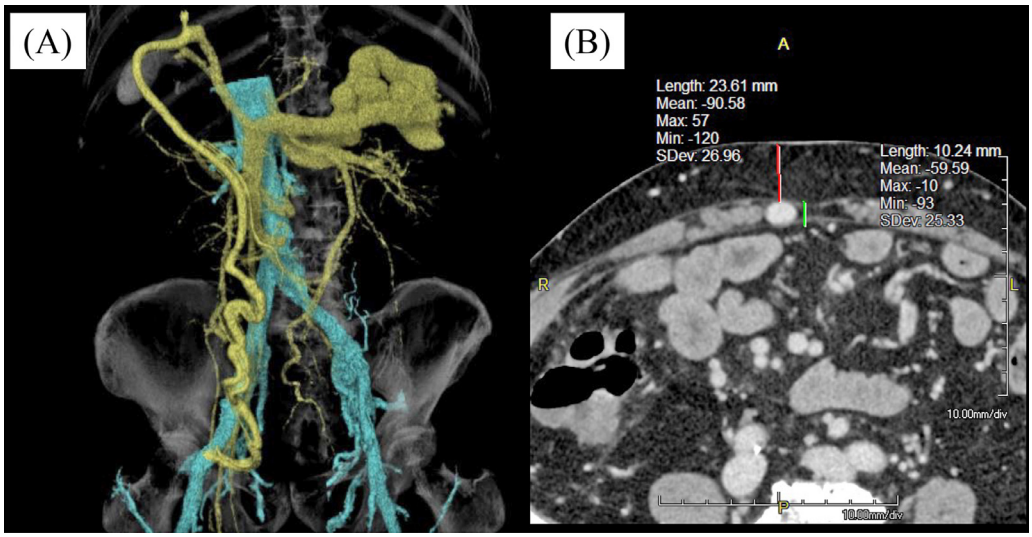

Fig. 1 – Three-dimensional volume-rendering image of the portal venous phase of a contrast-enhanced computed tomography (CT) scan demonstrating the splenorenal and paraumbilical venous shunt connecting the left branch of the portal vein and the right common femoral vein (A). Recanalized paraumbilical vein with a diameter of 10 mm distributes at a depth of 25 mm from the skin layer (B).

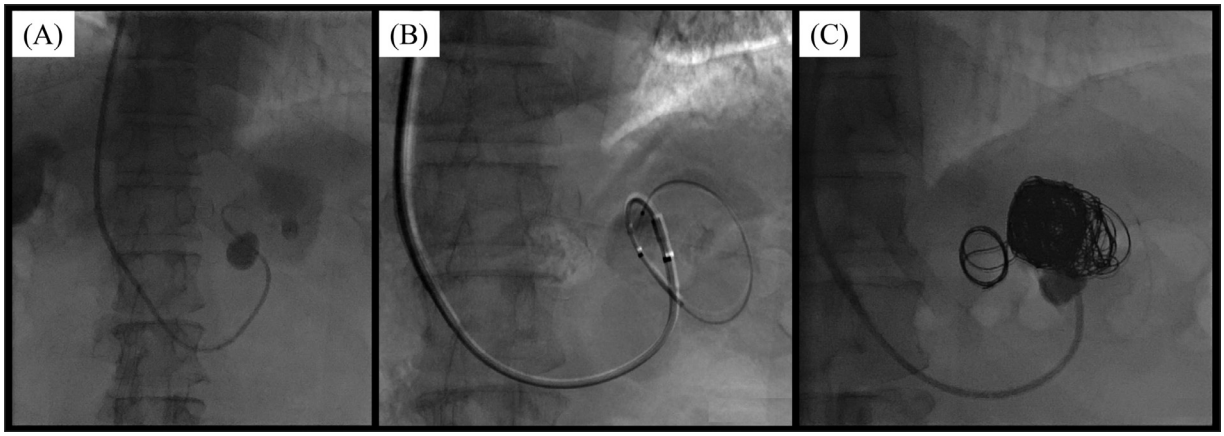

Fig. 2 – Percutaneous embolization approached from the right internal jugular vein. A 10-Fr guiding sheath is inserted, and a double-balloon catheter with diameters of 20 and 10 mm is advanced to a splenorenal shunt via the left renal vein (A). Catheter system is difficult to advance within the portosystemic shunt (B). Backup force of the catheter system is inadequate to implant sufficient volumes of coils (C).

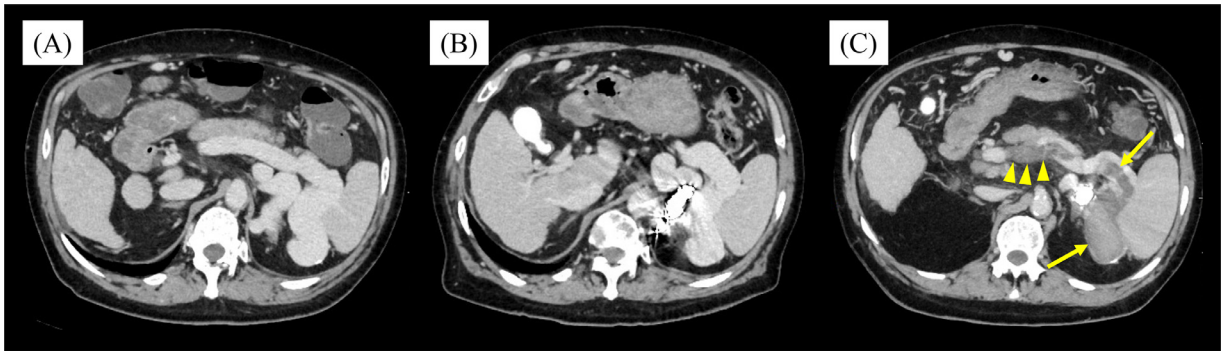

Fig. 3 – Time course of the portosystemic shunt in contrast-enhanced CT before and after embolization. After the first embolization session, a CT scan showed a contrast agent traveling through the placed coils, and the overall splenorenal shunt was enhanced (B), as it was before procedure (A). After the second session, the splenorenal shunt was embolized (C, arrows), and portal venous thrombi developed in the splenic vein (C, arrowheads).

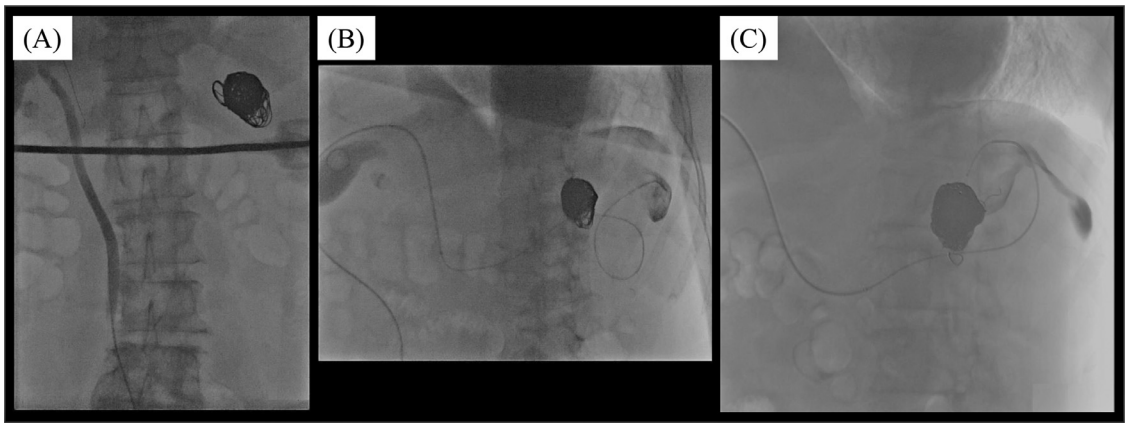

Fig. 4 – Second embolization session approached from the recanalized paraumbilical vein. The paraumbilical vein is punctured under ultrasound guidance, and a 5-Fr sheath is inserted (A). 4F catheter system is easily inserted into the embolization site (B). Catheter system is stable; thus, dense coil embolization is achieved (C).

shunt was well embolized, and portal venous thrombi developed in the splenic and paraumbilical veins (Fig. 3C). The patient did not experience a flare-up of hepatic encephalopathy for approximately 1 year.

Discussion

This report describes the treatment of a patient with chronic hepatic encephalopathy due to portosystemic shunt. In the first session, the portal shunt was accessed using a transvenous approach, and coil embolization was performed as far as possible. The portal shunt was accessed via a dilated paraumbilical vein in the second, and additional coils were successfully placed.

The paraumbilical vein is an essential portosystemic collateral in portal hypertension. Recanalization of the paraumbilical vein has been reported in more than 20% of patients with portal hypertension [8]. Previous case reports have shown the usefulness of the trans-paraumbilical venous approach for the embolization of gastroesophageal varices and ectopic varices due to cirrhosis [3–7]. The advantage of the trans-paraumbilical venous approach is accessibility to the target vessel compared with other approaches. Furthermore, it can be safely punctured under ultrasound guidance. Patients with cirrhosis often present with coagulation disorders, such as prolonged prothrombin time and thrombocytopenia. Therefore, bleeding from the puncture tract is a significant complication. Previous reports showed that intra-abdominal hemorrhage can be safely avoided by puncturing the anterior wall of the umbilical vein [4,7]. The paraumbilical venous approach showed usefulness regarding accessibility to the target vessel and stability of the catheter system in this case. In the first session, the diameter of the splenorenal shunt was large. Therefore, we used a balloon catheter with a larger diameter. The catheter diameter was also large, making the insertion of the catheter system into the shunt difficult due to reduced maneuverability. After advancing the system into the shunt, adequate coil embolization could not be achieved, suggesting that system backup was inadequate. In the second session, the target point of embolization was easily accessed via the paraumbilical vein. System stability in coil embolization was also high, and sufficient coil addition was achieved. Regarding safety, the risk of bleeding may be limited due to the paraumbilical vein being punctured anteriorly within the hepatic falciform ligament. Although there is no definitive consensus on the treatment strategy for embolizing portosystemic shunts, complications due to a sudden increase in portal venous pressure after embolization should be carefully noted. Some reports have described refractory ascites, rupture of esophageal varices, and hepatic failure resulting from elevated portal venous pressure after shunt embolization [9,10]. Balloon-occluded retrograde transvenous obliteration, which is useful in hepatic encephalopathy due to portosystemic shunts, has demonstrated that the combination of partial splenic embolization reduces portal pressure elevation and prevents long-term worsening of esophageal varices [11]. A previous report pointed out the effectiveness of keeping one shunt open without embolizing all shunts when multiple shunts are present [12]. Therefore, a 2-session embolization was performed for portal hypertension in this case. The paraumbilical venous shunt, which served as the access route, was not embolized. Although portal pressure measurements could not be conducted under balloon occlusion, the embolization strategy may have avoided the rapid elevation of portal pressure and associated postoperative complications.

Conclusion

We described a 2-session embolization of a patient with chronic hepatic encephalopathy by a portosystemic shunt. Compared with the transvenous approach, the paraumbilical venous approach demonstrated usefulness regarding catheter maneuverability and system stability during coil embolization.

Patient consent

Written informed consent for the publication of this case report was obtained from the patient.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.radcr.2024.02.057.

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