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Case Report

Embolization of a paraumbilical shunt by the transparaumbilical venous approach and one-sheath inverse method: A case report☆☆☆

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ABSTRACT

We describe treatment of a 53-year-old man with chronic hepatic encephalopathy. Contrast-enhanced computed tomography demonstrated a recanalized paraumbilical vein as a portosystemic shunt connecting the left branch of the portal vein and bilateral iliac veins. Percutaneous embolization was performed. The paraumbilical vein was punctured under ultrasonographic guidance; a 7-Fr sheath was inserted in the cranial direction. The hepatic side of the shunt was embolized with a vascular plug. The sheath direction was inverted to the caudal side; the pelvic side of the shunt was then embolized with another vascular plug. This report demonstrates that the percutaneous transparaumbilical venous approach is useful and safe for portosystemic shunt intervention. Moreover, the one-sheath inverse method was useful for embolization of upstream and downstream sides of the puncture site.

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Introduction

A portosystemic shunt, which is typically associated with portal hypertension, allows the passage of nitrogenous substances from the portal vein to a systemic vein without liver depuration, leading to hepatic encephalopathy [1]. Percutaneous embolization of a portosystemic shunt has

been developed for treatment of patients with hepatic encephalopathy [2]. Approaches for embolization of a portosystemic shunt include percutaneous transhepatic, transjugular, transfemoral, transparaumbilical, and mesenteric venous routes. A percutaneous approach to the portal venous system via the paraumbilical vein has been reported [3–7]; however, it remains unfamiliar to many clinicians, compared with other routes. We describe a patient who exhibited chronic hepatic encephalopathy due to a paraumbilical shunt; embolization was successfully performed by means of a percutaneous transparaumbilical venous approach. The one-sheath inverse method was used to embolize the hepatic and pelvic sides and isolate the puncture site.

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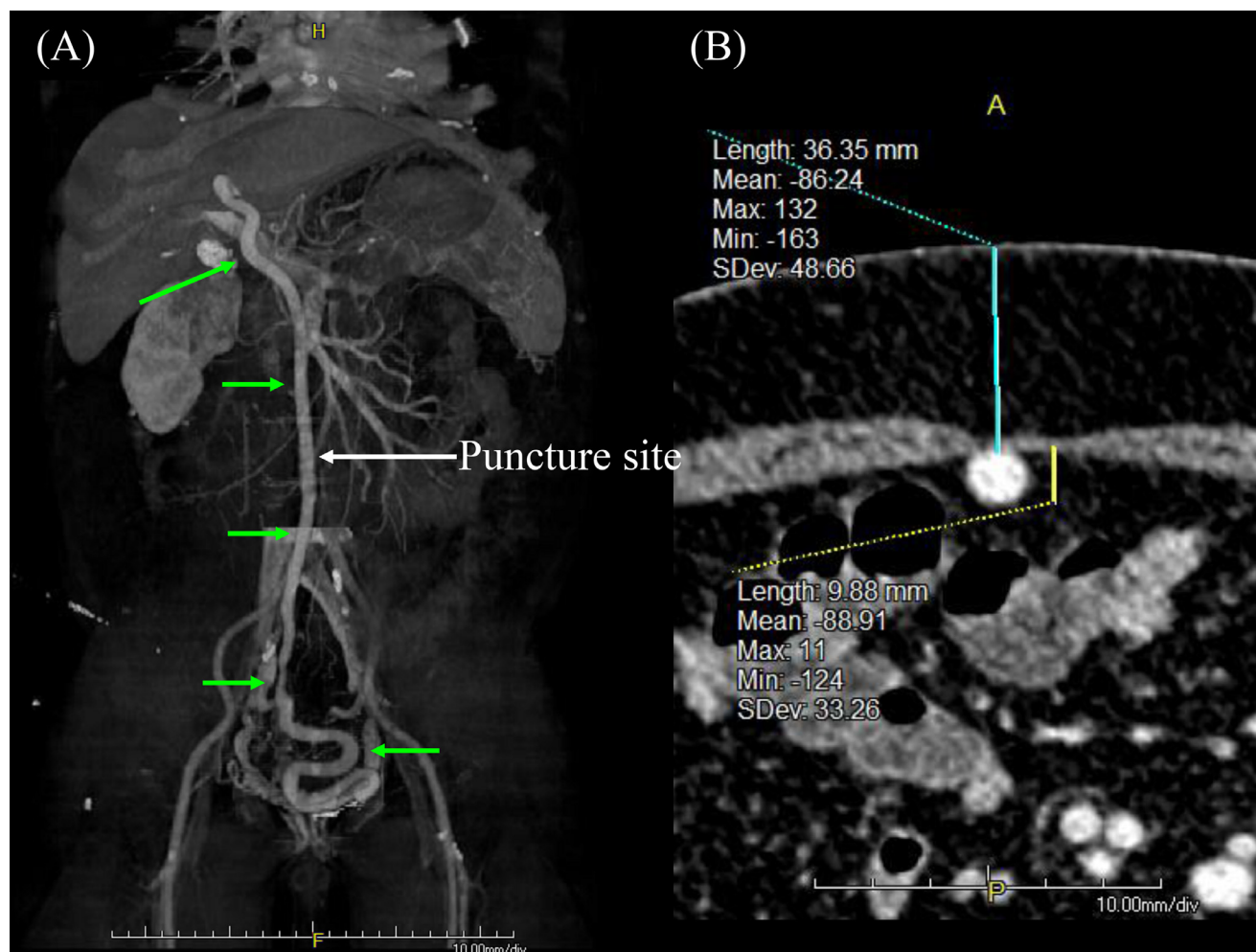


Fig. 1 – Maximal intensity projection image of portal venous phase of contrast-enhanced computed tomography (CT) scan demonstrates the recanalized paraumbilical vein acting as a portosystemic shunt connecting the left branch of the portal vein and bilateral iliac veins (A). A transverse portal venous phase CT scan shows the paraumbilical vein was approximately 10 mm in diameter and located at a depth of 36 mm from the skin layer (B).

Case presentation

A 53-year-old man with cirrhosis was admitted to our institute with chronic hepatic encephalopathy. Laboratory tests revealed elevated serum ammonia of 256 $\mu\text{g/dL}$, as well as serum albumin of 3.4 g/dL, serum total bilirubin of 0.8 mg/dL, prothrombin time of 86.6%, and a prothrombin time-international normalized ratio of 1.07.

A contrast-enhanced computed tomography (CT) scan demonstrated a recanalized paraumbilical vein as a portosystemic shunt, which connected the left branch of the portal vein and the bilateral iliac veins (Fig. 1A). The paraumbilical vein was approximately 10 mm in diameter and located at a depth of 36 mm from the skin layer (Fig. 1B). CT scan also showed a small volume of ascites around the liver. The patient's Child-Pugh score was 9 (class B).

Percutaneous embolization was performed. Doppler ultrasound demonstrated a craniocaudal blood flow direction in the paraumbilical vein. The anterior wall of the paraumbilical

vein was punctured using a 4-Fr micropuncture kit under ultrasonographic guidance; a 7-Fr sheath was inserted in the cranial direction (Fig. 2A). Portal venous pressure was 394 mmH₂O under balloon occlusion using a 6-Fr wedge pressure catheter (Fig. 2B). Based on the pressure measurement, embolization with a vascular plug was planned to avoid migration of embolic material. The wedge pressure catheter was changed to a 5-Fr guiding sheath (sheath-in-sheath technique). The hepatic side of the shunt was embolized using an Amplatzer vascular plug (12 mm in diameter, 9 mm in length: St Jude Medical, Saint Paul, MN), which did not migrate (Fig. 2C).

A 0.035-inch guidewire was placed as a safety wire toward the hepatic side of the shunt (Fig. 2D); the sheath was then inverted to the caudal direction using another 0.035-inch guidewire and a 4.2-Fr OmniFlush catheter (Figs. 2E and F). Thrombogenesis was detected on the caudal side of the shunt (Fig. 2G). Accordingly, another vascular plug (12 mm in diameter, 9 mm in length: St Jude Medical, Saint Paul, MN) was placed on the pelvic side of the shunt with a 5-Fr guiding sheath

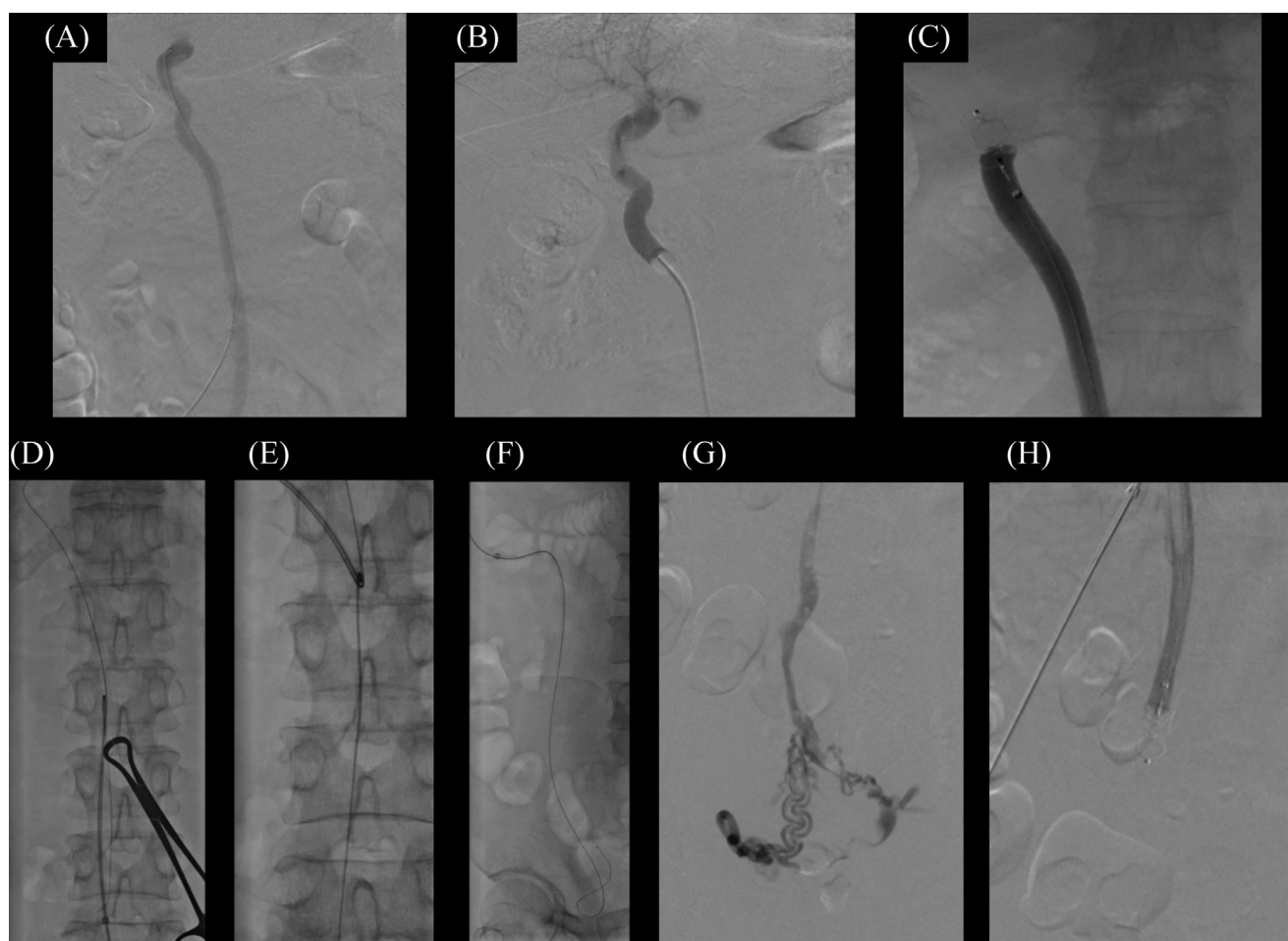


Fig. 2 – Percutaneous embolization approached from the paraumbilical vein. A 7-Fr sheath was inserted in the cranial direction (A). Portal venous pressure was 394 mmH₂O using a 6-Fr wedge pressure catheter (B). The wedge pressure catheter was changed to a 5-Fr guiding sheath. The hepatic side of the shunt was embolized using an Amplatzer vascular plug (12 mm in diameter, 9 mm in length: St Jude Medical, Saint Paul, MN) (C). The one-sheath inverse method was used. A 0.035-inch guidewire was placed as a safety wire toward the hepatic side of the shunt (D); the sheath was then inverted to the caudal side using another 0.035-inch guidewire and a 4.2-Fr OmniFlush catheter (E and F). Thrombogenesis was detected on the caudal side of the shunt (G). Thus, another vascular plug (12 mm in diameter, 9 mm in length: St Jude Medical, Saint Paul, MN) was placed on the pelvic side of the shunt with a 5-Fr guiding sheath (H).

(sheath-in-sheath technique) (Fig. 2H). Postembolization angiography and sonography demonstrated hemostasis of the paraumbilical veins and disappearance of blood flow. The duration of the procedure was approximately 2 hours. The patient's consciousness improved with a decrease in serum ammonia to 53 μ g/dL, and he was discharged home 4 days after the embolization.

Discussion/Conclusion

In this report, we described treatment of a patient with chronic hepatic encephalopathy due to cirrhosis. We directly punctured the recanalized paraumbilical vein as a portosystemic shunt and safely achieved embolization of the hepatic and pelvic sides of the shunt by using the one-sheath inverse method.

The paraumbilical vein is an important collateral in portal hypertension. A recanalized umbilical vein has been reported to occur in more than 20% of patients with portal hypertension [8]. Previous case reports have demonstrated the usefulness of the transparaumbilical venous approach for embolization of gastroesophageal and ectopic varices due to cirrhosis [3–7]. The benefits of the transparaumbilical venous approach include reduced invasiveness and enhanced accessibility to target vessels, compared with other approach routes (eg, percutaneous transhepatic, transjugular, transfemoral, and mesenteric venous routes). Kim et al. demonstrated the usefulness of the transparaumbilical venous approach for embolization of a patient with a ruptured hepatic carcinoma and occluded hepatic arteries [3]. Patients with cirrhosis often present with a coagulation disorder, including elongated prothrombin time and thrombocytopenia; hemorrhage from the puncture tract is an important complication. Cho et al.

indicated that puncturing the anterior wall of the umbilical vein could safely avoid intraperitoneal hemorrhage [4]. Our report also demonstrates the usefulness of the transparaumbilical venous approach. We safely punctured the anterior wall of the recanalized paraumbilical vein under ultrasonographic guidance, then easily accessed the target point of embolization.

We inverted the sheath direction from cranial to caudal. The one-sheath inverse method has been used for vascular access in hemodialysis patients whose stenotic lesions are located upstream and downstream from the approach site [9]. The technique is relatively easy for experienced operators, as vascular access is typically located superficially. Takashima et al. described the advantages of the technique, including optimization of the procedure, reduced invasiveness, and cost-savings [9]. In our patient, the one-sheath inverse method was useful for embolization of the hepatic and pelvic sides of the paraumbilical shunt; it contributed to the reduced risk of complications due to puncture. Treatment of our patient was difficult, as the paraumbilical vein was located deep in the skin. Thus, we inserted a guidewire toward the cranial side of the shunt to prevent system decannulation; we selected the caudal side with another guidewire and an OmniFlush catheter. Moreover, careful reinsertion of the sheath was required to avoid subcutaneous injury.

In conclusion, we have described treatment of a patient with chronic hepatic encephalopathy due to a recanalized paraumbilical vein acting as a portosystemic shunt. Successful embolization of the paraumbilical shunt demonstrated the usefulness and safety of the transparaumbilical venous approach under ultrasonographic guidance, as well as the one-sheath inverse method for embolization of upstream and downstream sides of the puncture site.

Patient consent

This study was approved by the institutional review board, and written informed consent was waived because of the case report.

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