

Balloon-occluded retrograde transvenous obliteration of gastric varix with multiple drainage veins performed with temporal occlusion of the pericardiacophrenic vein with a micro-balloon

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Abstract

We encountered a case with a gastric varix that drained into the gastro-renal shunt, left pericardiacophrenic vein, and several other dilated collateral veins. This patient had a circum-aortic venous ring. For this case we successfully performed balloon-occluded retrograde transvenous obliteration in which sclerotic agents were infused from the balloon catheter advanced to the left pre-aortic renal vein and the tip was wedged into the end of the gastro-renal shunt. Before injection of sclerotic agents, collateral veins other than the left pericardiacophrenic vein were embolized with micro-coils. During the injection, the left pericardiacophrenic vein was occluded temporarily with a micro-balloon catheter coaxially advanced from the catheter inserted from the femoral vein to the left pericardiacophrenic vein through the left brachiocephalic vein.

Keywords

Balloon-occluded retrograde transvenous obliteration, circum-aortic venous ring, gastric varix, pericardiacophrenic vein

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Introduction

Balloon-occluded retrograde transvenous obliteration (B-RTO) has been widely accepted as a treatment for a gastric varix with a gastro-renal shunt (1–5) since its safety and effectiveness were reported by Kanagawa et al. (6). There is, though, the possibility of worsening of symptoms of portal hypertension other than gastric varices after the procedure, as well as hemolysis or subsequent renal failure depending on the sclerosing agent used (1). Since most gastric varices drain into the dilated gastro-renal shunt (7), B-RTO is commonly performed from this route. However, if a large collateral vessel has developed as a drainage vein, the sclerotic agents do not remain within gastric varices even when the gastro-renal shunt is occluded by balloon inflation. It is then necessary to perform an additional procedure for sufficient obliteration of the gastric varix (1,4,8).

Recently, we experienced a case of a gastric varix with various large collateral vessels for which B-RTO was performed. At that time, various interventional radiological procedures were additionally performed to obtain sufficient obliteration of the gastric varix.

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Fig. 1. A 62-year-old man with a gastric varix located at the gastric cardia and fornix. (a) Abdominal contrast-enhanced multi-detector row computed tomography (MDCT) showed a gastric varix located in the cardia and fornix of the stomach (arrow). (b) The initial retrograde venography obtained while the balloon (arrowhead) was inflated in the gastro-renal shunt revealed two branches of the left inferior phrenic vein and the left inferior pericardiophrenic vein (arrow), a vessel communicating with the left retro-aortic renal vein (small arrowhead), and other small veins, all of which had developed as collateral vessels. Note that the gastric varix could not be visualized. (c) Retrograde venography performed after embolization of two branches of the left inferior phrenic vein with microcoils (arrowheads) demonstrates the vessel communicating with the retro-aortic vein (arrows) and other small collateral vessels. Note that the gastric varix is still not evident. (d) Retrograde venography shows the dilated left pericardiophrenic vein (arrows) that developed as a drainage vein after embolization of the vessel communicating with the retro-aortic vein using micro-coils (arrowhead). (e) Roentgenogram obtained after injection of sclerotic agents performed while the micro-balloon positioned in the left pericardiophrenic vein was inflated (arrow) showed complete filling of sclerotic agents in the gastric varix (arrowheads). (f) Contrast-enhanced MDCT scan obtained 1 month after the balloon-occluded retrograde transvenous obliteration confirmed complete disappearance of enhancement in the gastric varix (arrow).

Case report

A 62-year-old man with Child's A class liver cirrhosis caused by hepatitis C virus infection was admitted for treatment of a large gastric varix for prevention of rupture. The patient had an earlier history of bleeding. Endoscopic examination revealed a bead-shaped moderate varix without the red color sign located at the gastric cardia and fornix. Abdominal contrast-enhanced multi-detector row computed tomography (MDCT) confirmed that the gastric varix was located in the cardia and fornix of the stomach (Fig. 1a). There was no sign of ascites. Additionally, the CT images revealed that the patient had a circumaortic venous ring.

After written informed consent was obtained from the patient, B-RTO was performed.

After an 8-Fr catheter sheath-introducer (Medikit, Tokyo, Japan) was inserted from the right femoral vein with the patient under local anesthesia, a 6-Fr balloon catheter with a balloon 20 mm in diameter (Clinical Supply, Gifu, Japan) was advanced to the left pre-aortic renal vein through the sheath-introducer, and the tip was wedged into the end of the gastro-renal shunt. The balloon was inflated to occlude the gastro-renal shunt. Retrograde venography was performed to identify the gastric varix. This retrograde venography revealed two branches of the left inferior phrenic vein that had developed as collateral vessels, a vessel communicating with the left retro-aortic renal vein, and

other small collateral veins. The gastric varix could not be visualized. The left inferior pericardiacophrenic vein had also developed as a collateral vein (Fig. 1b). Then, two branches of the left inferior phrenic vein were embolized with two and four micro-coils (VortX Diamond; Boston Scientific, Watertown, MA, USA), respectively, through a micro-catheter (Masters; Asahi Intecc, Nagoya, Japan) coaxially advanced into each branch from the 6-Fr balloon catheter (Fig. 1c). Subsequently, the micro-catheter was reinserted into the vessel communicating with the retroaortic vein and this vessel was embolized with three micro-coils (VortX Diamond; Boston Scientific; and C-stopper; Solution, Tokyo, Japan). On retrograde venography obtained after these embolization procedures, the gastric varix still was not demonstrated. However, the left pericardiacophrenic vein that had developed as another drainage vein had become clearly visible (Fig. 1d). The left pericardiacophrenic vein entered the left brachiocephalic vein. Then, a 4-Fr headhunter-shaped catheter (Clinical Supply) was inserted from the right femoral vein followed by advancement to the cranial segment of the left pericardiacophrenic vein thorough the left brachiocephalic vein. Subsequently, an 1.8-Fr micro-balloon catheter (Logos; Piolax, Yokohama, Japan) was coaxially advanced. The tip of the micro-balloon catheter was positioned in the left pericardiacophrenic vein close to the point where this vein derived from the left inferior phrenic vein. Then, the micro-balloon was inflated. Finally, retrograde venography obtained while contrast material was infused from the 6-Fr balloon catheter positioned in the gastro-renal shunt showed the gastric varix, although some of the small collateral vessels remained.

To obliterate these small collateral veins as well as the entire gastric varix, the sclerosing agent was injected slowly as a stepwise injection (4) from the balloon catheter that had been inserted into the gastro-renal shunt (Fig. 1e). This sclerosing agent consisted of a 50% glucose solution and 5% ethanolamine oleate-iopamidol (EOI) in which 10% ethanolamine oleate (Oldamin; Takeda Pharmaceutical, Osaka, Japan) and the same volume of a nonionic contrast medium (370 mg of iodine, iopamidol) were mixed. A total of 20 mL of the 5% EOI and 10 ml of the 50% glucose solution were administered by six manual injections over a 40-min period. As a result, the entire gastric varix was opacified with sclerotic agents, which was confirmed on fluoroscopy. Then the 4-Fr catheter and micro-balloon catheter, both of which had been inserted into the left pericardiacophrenic vein, were withdrawn after deflation of the micro-balloon. The balloon positioned in the gastro-renal shunt was kept inflated until the next morning when it was deflated and the 6-Fr balloon catheter was finally withdrawn.

During injection of 5% EOI, human haptoglobin (4000 units) (Mitsubishi Tanabe Pharma, Osaka, Japan) was administered intravenously to prevent hemolysis and subsequent renal failure, which may be induced by ethanolamine oleate (1).

Complete disappearance of enhancement in the gastric varix was confirmed by a contrast-enhanced MDCT scan obtained 1 month after the procedure (Fig. 1f). A significant reduction in the size of the varix was confirmed on endoscopic examination performed 1 month later. There were no complications during the procedure. Hepatic function, renal function, and blood cell counts did not worsen after the procedure.

Discussion

Recently B-RTO has become widely known as an effective therapy for a gastric varix where a gastro-renal shunt exists (1–5). This shunt corresponds to a dilated left adrenal vein potentially having communication with the gastric varix (3). Ninoi et al. (5) reported that B-RTO is a minimally invasive and effective technique for gastric varices with a gastro-renal shunt: the 5-year recurrence rate was 2.7% and the 5-year bleeding rate was 1.5%. Considering such low recurrence and bleeding rates, they suggested that B-RTO could become a standard treatment for a gastric varix with a gastro-renal shunt. Because retaining an indwelling balloon for hours for a B-RTO procedure is a logistical burden, some physicians substitute the balloon with hardware such as coils and amplatzer vascular plugs (9).

The presence of large collateral vessels from the gastric varix that drain into the systemic venous circulation other than a gastro-renal shunt is one of the most difficult situations encountered during B-RTO procedures. Hirota et al. (1) classified gastric varices into five grades according to findings by retrograde venography during balloon occlusion of collateral vessels other than the gastro-renal shunt. Grade 1 indicated a gastric varix entirely opacified without evidence of collateral veins; grade 2 referred to collateral veins small in size and few in number, with contrast medium remaining in the entire gastric varix for 3 min or more; grade 3 was assigned to medium-to-large collateral veins, with contrast medium partially filling the gastric varix and disappearing within 3 min; grade 4 indicated the presence of many large collateral veins and a gastric varix that were not opacified; and, finally, grade 5 meant that the gastro-renal shunt could not be occluded with a balloon catheter because of a very large gastro-renal shunt accompanied by rapid blood flow. For patients with grade 3 or 4, it has been recommended that an additional procedure to occlude the collateral veins

should be performed before B-RTO to obtain sufficient distribution of sclerotic agents in the gastric varix (1). Among methods to occlude collateral veins, embolization with coils is most widely performed (1,4,8).

In the present case, on the first retrograde venography many large collateral veins were revealed and the gastric varix was not visualized, which corresponded to a gastric varix classified as grade 4. Thus embolizing collateral vessels other than the left pericardiacophrenic vein with micro-coils and occlusion of the left pericardiacophrenic vein with a micro-balloon were performed, which resulted in sufficient distribution of sclerotic agents in the entire gastric varix. The left pericardiacophrenic vein was reported as one of the routes to be selected for B-RTO in cases without a gastrorenal shunt (10). In the present case, we temporarily occluded this route instead of embolizing it with coils before infusing sclerotic agents in B-RTO for the following reason. The reason was to keep this route available for the addition of sclerotic agents if the sclerotic agents infused from the gastro-renal shunt were not sufficiently distributed in the entire gastric varix. However, in this case, distribution of sclerotic agents from the gastro-renal shunt was sufficient.

In conclusion, there have been no reports of B-RTO in which sclerotic agents were infused from the gastrorenal shunt while the left pericardiacophrenic vein was temporarily occluded with a micro-balloon. Additionally, this might be the first report of B-RTO performed for a patient with a circum-aortic venous ring.

Conflict of interest

Dr Awai receives honorarium or fees for promotional materials (more than 500,000 yen) from Eizai Co. Ltd., and research funding (more than 2,000,000 yen) from Daiichi-Sankyo Co. Ltd., Bayer-Yakuhin Ltd., and Toshiba Medical Systems.

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