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CASE REPORT

A Case of Jejunal Artery Aneurysm Successfully Treated with Endovascular Embolization

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Abstract:
Jejunal artery aneurysms are extremely rare; only 58 cases have been reported up to 2022. The high rupture rate necessitates a curative treatment. Only four cases of true jejunal artery aneurysms treated with endovascular embolization were reported. We report a case of a 75-year-old man with a true jejunal artery aneurysm who was successfully treated with endovascular embolization. The aneurysm was located in the third jejunal branch. The proximal and distal distance to the superior mesenteric artery and the first bifurcation of the third jejunal branch, respectively, were too short to perform isolation. First, we performed packing in the aneurysm, followed by secondary parent artery embolization. Finally, we achieved total occlusion of the aneurysm and its parent artery with preserved distal intestinal blood flow.

Keywords:
jejunal artery aneurysm, visceral artery aneurysm, endovascular embolization

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Introduction

Visceral artery aneurysms (VAAs) are found in only 0.1% of autopsies. Their distributions are 60% in the splenic artery, 20% in the hepatic artery, 8% in the SMA, and 3.5% in SMA branches (inferior pancreaticoduodenal, jejunal, ileal, and colic arteries) [1]. Jejunal artery aneurysms (JAAs) are rare, accounting for less than 1% of all VAAs [2]. As of 2022, only 58 cases have been reported in the English literature. JAAs are classified as true or false. True JAAs are caused by atherosclerosis and fibromuscular dysplasia. Meanwhile, false JAAs are caused by trauma, infection, vasculitis, inflammation, or iatrogenic factors. The main clinical symptoms of ruptured JAAs are acute abdominal pain and gastrointestinal bleeding. Conversely, non-ruptured JAAs are generally asymptomatic, although acute or chronic abdominal pain may occur occasionally [3].

The rate of JAA rupture is reportedly 60%, whereas that of VAA rupture is 15%-20% [2]. According to the clinical practice guidelines of the Society for Vascular Surgery, elective intervention is recommended for JAAs > 20 mm in maximum diameter. Another report indicated that aneurysms of the SMA and its branches (<20 mm) with degenerative etiology can be safely monitored without treatment [4].

The suggested treatment option for JAAs is endovascular embolization. In case laparotomy is considered for hematoma evacuation or bowel assessment for viability, open surgery is recommended [5]. However, only four true JAA cases treated with endovascular embolization have been reported [3].

In this paper, we report a case of true JAA that was successfully treated with endovascular embolization and resulted in no complications.

Case Report

The patient was informed of the details of this case report and provided written informed consent for the use of medical records. Approval from the Institutional Review Board was not required according to the ethical guidelines of our institution.

A 75-year-old male patient with a history of acute pan-

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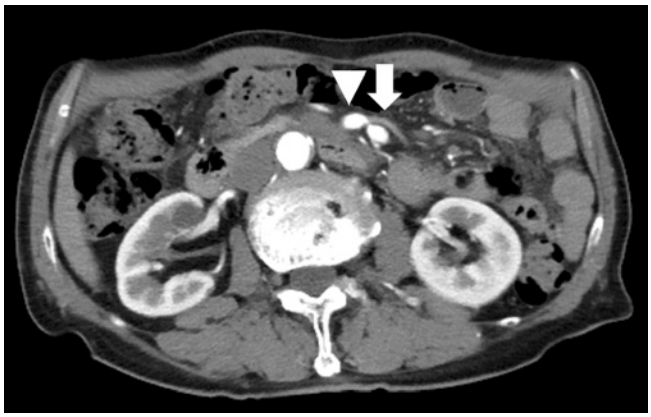

Figure 1. Contrast-enhanced CT shows a jejunal artery aneurysm (arrow) near the SMA (arrowhead), with a diameter of 12 mm.

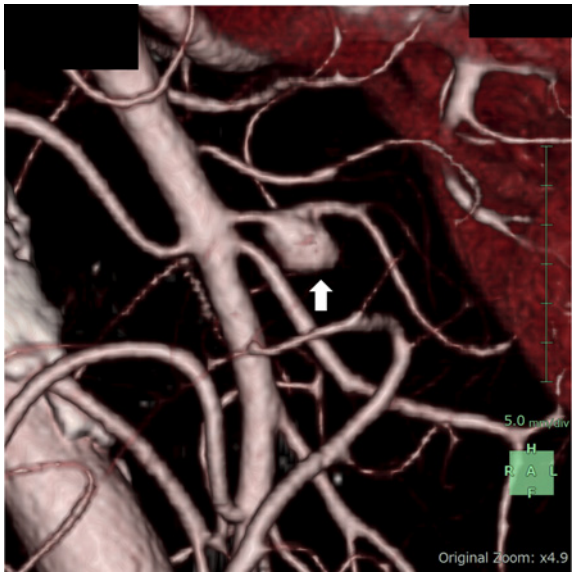

Figure 2. Three-dimensional contrast-enhanced CT shows the aneurysm is located in the third jejunal branch (arrow).

creatitis, intraductal papillary mucinous neoplasm of the pancreas, and JAA was referred to our gastroenterology department. The patient's chief complaint was epigastric abdominal pain. The amylase levels in the blood were elevated to 1566 U/I. However, the white blood cell count and C-reactive protein levels were within the normal range. Contrast-enhanced CT was performed to determine the severity of pancreatitis. Swelling of the pancreatic tail and turbidity of the surrounding adipose tissue were observed. The patient was diagnosed with acute pancreatitis and was admitted. The size of the JAA observed on CT was 12 mm (**Fig. 1**), compared to 8 mm reported 63 months ago. It was located in the third jejunal branch (**Fig. 2**). No other aneurysms were observed within the scanning range. We informed the attending physician that the aneurysm required endovascular embolization; thus, we decided to perform it on the patient's readmission. The patient recovered from acute pancreatitis and was discharged after treatment with a protease inhibitor and a 2-week fasting period. He was readmitted for JAA treatment 2 months later.

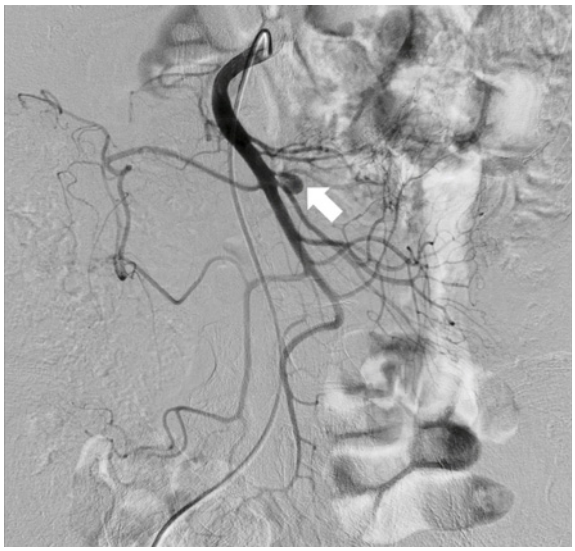

Figure 3. DSA from the SMA. The aneurysm is located in the third jejunal branch (arrow).

The procedure was performed under local anesthesia. The right femoral artery was punctured, and a 4.5 Fr guiding sheath (Parent Plus; Medikit Japan, Tokyo, Japan) was placed in the SMA. To prevent thrombosis, a bolus of 2000 units heparin was injected, followed by 1000 units injections every hour until finishing the procedure. Total 4000 units was used. The DSA of the SMA revealed a JAA in the third jejunal branch (**Fig. 3**). To select the third jejunal branch, a 4 Fr diagnostic catheter (Bernstein; Hanaco Medical, Saitama, Japan) with a 0.035-inch guidewire (Radifocus; Terumo Japan, Tokyo, Japan) was inserted into the SMA; however, it was difficult to select the third jejunal branch by using the 4 Fr system, which we only managed to locate near the orifice of the third jejunal branch. Next, we used the combination of a 2.6 Fr high-flow catheter (Masters HF; ASAHI INTECC, Aichi, Japan) and a 1.9 Fr microcatheter (Carnelian MARVEL; Tokai Medical Products, Aichi, Japan) with a 0.014-inch microwire (ASAHI Meister; ASAHI INTECC, Aichi, Japan) and successfully inserted it into the third jejunal branch. The tip of the high-flow catheter was inserted into the origin of the parent artery, and coiling was performed using the 1.9 Fr microcatheter. To perform stable coil embolization, backup support for the high-flow catheter was essential. The proximal distance to the SMA was 3 mm, whereas the distal distance to the first bifurcation of the third jejunal branch was 8 mm (as revealed by the DSA from the third jejunal branch) (**Fig. 4**). First, we performed packing in the aneurysm and used the coil mass as a foothold, followed by secondary parent artery embolization. We used three types of metallic coils (MICRUSFRAME C, Johnson and Johnson, Tokyo, Japan; AZUR Soft 3D, Terumo Japan, Tokyo, Japan; and Target coils, Stryker Japan, Tokyo, Japan) and achieved complete embolization of the aneurysm and its parent artery (**Fig. 5a**). The details of the coils are as follows: MICRUSFRAME C: 10 mm × 25 cm, 9 mm × 22 cm, 8 mm × 20 cm; AZUR Soft 3D: 9

mm × 31 cm, 7 mm × 15 cm, 6 mm × 12 cm; Target XL: 4 mm × 12 cm, 3 mm × 9 cm. After embolization, the DSA of the SMA revealed that the first bifurcation of the third jejunal branch and intestinal blood flow was preserved (**Fig. 5b**).

The patient had an uneventful recovery and was discharged on postoperative day 5.

Discussion

JAAs are very rare. Most patients with JAA exhibit symptoms due to the high rupture rate [2]. Vincenzi et al. summarized case series and single-case reports of JAAs and ileal artery aneurysms. According to their report, four of nine (44%) patients with true non-ruptured JAAs exhibited symptoms such as acute pain, chronic pain, vomiting, and gastrointestinal bleeding [3]. This contradicts the fact that JAAs typically present with vague symptoms [6].

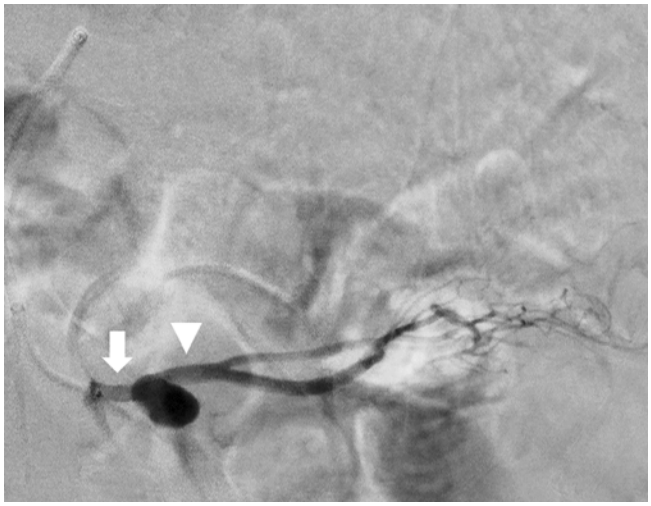

Figure 4. DSA from the third jejunal branch. The proximal distance to the SMA (arrow) is 3 mm, whereas the distal distance to the first bifurcation of the third jejunal branch is 8 mm (arrowhead).

In this case, the type of the aneurysm was thought to be true. The aneurysm was detected 63 months before the procedure. If the aneurysm was false, it may have ruptured before the treatment. Although the patient underwent CT when pancreatitis recurred, no signs of ruptured aneurysm were observed. In addition, the form of the aneurysm was atypical of false aneurysm; it was a well-formed saccular aneurysm.

The treatment indications for JAAs remain controversial. For JAAs > 2 cm in maximum diameter, elective intervention is recommended [5]. However, Pitcher et al. reported that 10 degenerative aneurysms, including SMA and its branches > 20 mm, which were conservatively managed, grew by 0.11 ± 0.23 mm/year [4]. Vincenzi et al. compared these two reports by Chaer et al. and Pitcher et al. and concluded that the size criterion may be insufficient to predict the risk of rupture. Therefore, they emphasized that other factors, such as location, type, and etiology of the aneurysm, are important to predict the risk [3]. In this case, the patient experienced recurrent acute pancreatitis and the aneurysm was located in an area where pancreatitis could have spread. Furthermore, the aneurysm had a slight tendency to grow. Thus, we decided to treat it to avoid rupture, even though its diameter was <20 mm.

Various treatment strategies for JAAs are available. Open surgery is generally performed, including aneurysmectomy, ligation, bypass with venous graft or prosthetic vascular graft and intestinal resection, endovascular embolization and/or stent placement, or a combination of these treatments [3]. The usefulness of open surgical repair for the assessment of distal flow to the organ has been reported [3, 5]. Recently, endovascular treatment has become more common as a first-line treatment, even in cases of rupture [3]. This treatment is less invasive and takes less time than surgery [1]. Furthermore, it has low mortality (about 0%) and morbidity (8%-20%) rates [7, 8]. Another factor that influenced the decision regarding the treatment strategy in this case was the

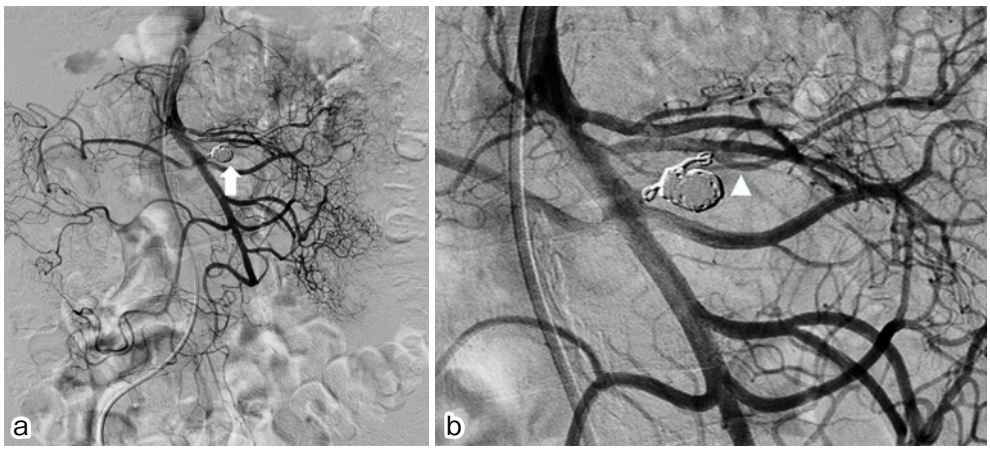

Figure 5. a) DSA from the SMA post embolization. The aneurysm and its parent artery are angiographically occluded completely (arrow). b) The first bifurcation of the third jejunal branch is preserved (arrowhead), as well as the intestinal blood flow.

aneurysm location. The possibility of bowel ischemia was low because the aneurysm was located proximally to the third jejunal branch. If it was located distally, parent artery embolization could cause ischemia, thus requiring bowel resection. For these reasons, we selected endovascular treatment alone.

The embolization strategy for VAAs involves isolation, packing, and a combination of both (isolation and packing) [7]. In this case, the proximal distance to the SMA and the distal distance to the first bifurcation of the third jejunal branch were too short to perform isolation. Isolation can cause distal migration or protrusion of the SMA. Preservation of the first bifurcation of the third jejunal branch may be important for distal intestinal blood flow. Furthermore, avoiding protrusion of embolization materials into the SMA may prevent SMA thrombosis. Packing alone can cause coil compaction and aneurysm recurrence in the future, whereas the combination of packing and isolation have a low risk for these effects. Therefore, we performed packing in the aneurysm first, used the coil mass as a foothold, and then performed secondary parent artery embolization. Consequently, we achieved aneurysm embolization and parent artery without coil displacement. In previous reports on JAA embolization, ischemic complications did not occur [1, 7, 8]. This may be due to the abundant collateral pathways in the jejunal branches.

Various embolization materials are currently available, including gelatin sponges, N-butyl cyanoacrylate, metallic coils, and plugs. In previous studies, metallic coils and plugs have been used for the treatment of true JAAs [1, 3, 7, 8]. In this case, we selected metallic coils for the following reasons. First, tight packing in the short segment was needed due to the location of the aneurysm. Second, the parent artery was small (2 mm), making it impossible to insert the plug delivery catheter; even if it could be successfully inserted, there was a risk of injury in such a small vessel.

In conclusion, we encountered a rare case of true JAA that was successfully treated with endovascular embolization, with no complications.

Conflict of Interest: None

Author Contribution: Natsuhiko Saito, Masayoshi Inoue, Junko Takahama: Contributions to the submitted work: Conception or design of the work

Masayoshi Inoue, Ryota Nakano, Hidehiko Taguchi, Masayo Haga, Emiko Shimoda, Kengo Morimoto, Toshihiro Tanaka, Junko Takahama: Contributions to the submitted work: Drafting and revision of the text.

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