

Management of a rapidly expanding celiac artery aneurysm with the chimney technique

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ABSTRACT

Infective celiac artery aneurysm is an extremely rare diagnosis, with few reported cases in the literature. We present the case of a rapidly expanding celiac artery aneurysm involving the ostia, probably infectious, successfully treated in an urgent setting by aneurysm exclusion resorting to the chimney technique. On follow-up, computed tomography angiography revealed complete aneurysm thrombosis and patent celiac artery. Previous reports of endovascular treatment of infective celiac artery aneurysm involved its embolization. This is the first reported case of chimney technique used to exclude a celiac artery aneurysm, with a clinical suspicion of infectious etiology, preserving celiac artery patency. Short-term results are encouraging, but implantation of prosthetic material in an infected environment is a concern. (*J Vasc Surg Cases and Innovative Techniques* 2018;4:252-6.)

Keywords: Aneurysm; Infected; Celiac artery; Endovascular procedures

Visceral artery aneurysm is an infrequent but potentially lethal condition. The most commonly involved vessels are the splenic, hepatic, and superior mesenteric arteries, in decreasing order of frequency. Aneurysms of the celiac artery represent <4% of the aneurysms of visceral vessels, and most are atherosclerotic in etiology. Isolated infective celiac artery aneurysm (ICAA) is an exceedingly rare diagnosis.¹⁻⁷

We describe a case of a rapidly expanding celiac artery aneurysm involving the ostia, probably infectious, successfully treated by aneurysm exclusion resorting to the chimney technique.

METHODS

Relevant medical data were collected from the hospital database regarding the clinical case. A review of the literature was also performed using the MEDLINE database. The patient's consent was obtained for case publication.

RESULTS

The patient is a 54-year-old man with medical history of arterial hypertension and immunoglobulin A nephropathy in chronic kidney disease stage 5 on hemodialysis. A left radial-cephalic arteriovenous fistula (AVF) was created in 2010, and he was started on regular

hemodialysis 2 years later. Since 2014, cannulation has been performed by the buttonhole technique, with no previous history of AVF local or systemic complications, namely, infection.

In September 2017, he was referred to the emergency department because of lumbosacral pain, asthenia, anorexia, and fever in the last 4 days. There were no respiratory, gastrointestinal, or genitourinary symptoms. Physical examination revealed a particularly frail patient, with no remarkable findings other than mild abdominal epigastric pain. The AVF had no clinical signs of infection.

Serologic evaluation revealed anemia (hemoglobin, 8.0 mg/dL), thrombocytopenia ($74 \times 10^9/L$), normal white blood cell count, and elevated C-reactive protein (13.28 mg/dL; normal, <3.0), with no other significant finding. Findings on thoracic radiography were normal. He was admitted to the medical ward because of fever of unknown origin for further study and started on broad-spectrum antibiotherapy.

Blood cultures were positive for methicillin-sensitive *Staphylococcus aureus* (MSSA), and antibiotherapy was accordingly adjusted. Transthoracic echocardiography revealed no vegetations or any other data suggestive of endocarditis.

Computed tomography angiography (CTA) was performed to exclude spondylodiscitis. The examination was negative for that clinical suspicion but revealed a saccular aneurysm of the origin of the celiac artery, 17 mm in maximum diameter (Fig 1, A). Three days later, repeated CTA revealed aneurysm growth to a maximum width of 32 mm (Fig 1, B and C).

The aneurysm was interpreted as impending for rupture, and an urgent endovascular procedure was planned in the angiographic suite with aneurysm exclusion, resorting to the chimney technique. Percutaneous bilateral femoral artery access and surgical exposure of the right brachial artery were obtained. The celiac artery

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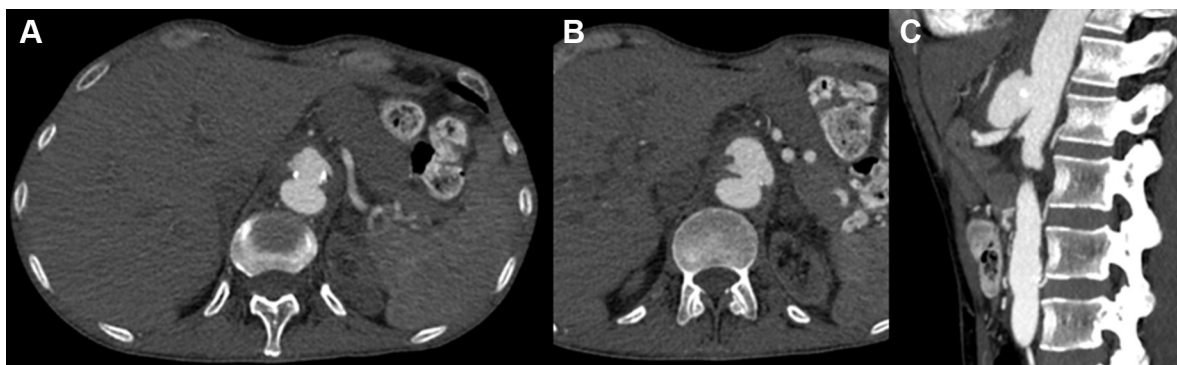


Fig 1. **A**, Computed tomography angiography (CTA) performed to exclude spondylodiscitis, revealing an aneurysm of the origin of the celiac trunk, 17 mm in width. **B**, Axial view of repeated CTA performed 3 days later, revealing aneurysm growth to 32 mm. **C**, Sagittal view of repeated CTA performed 3 days later, revealing aneurysm growth to 32 mm.

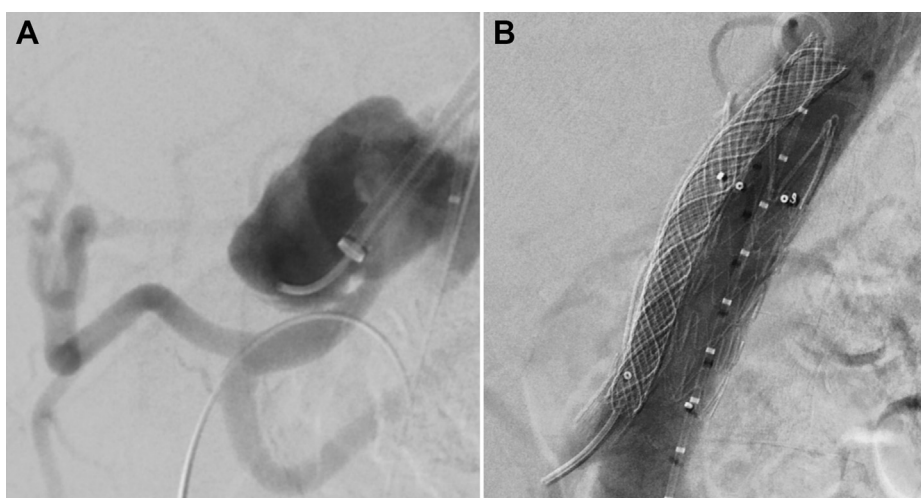


Fig 2. **A**, Digital subtraction angiography revealing saccular aneurysm of the origin of the celiac trunk. **B**, Final angiogram after chimney technique exclusion of infective celiac artery aneurysm (ICAA) revealing patent distal celiac artery and successful aneurysm exclusion.

was selectively catheterized from the right brachial access, and diagnostic angiography was performed (Fig 2). Subsequently, a sheath was positioned distal to the aneurysm. The superior mesenteric artery ostium was 14 mm distal to the celiac trunk and was also selectively catheterized from the left femoral access; an Amplatz guidewire (Boston Scientific, Marlborough, Mass) was positioned to avoid accidental superior mesenteric artery occlusion. An Endurant II (Medtronic, Santa Rosa, Calif) endoprosthesis (28 × 28 × 49 mm) was positioned in the aorta above the superior mesenteric artery through right femoral access. A Viabahn (W. L. Gore & Associates, Flagstaff, Ariz) stent graft (10 × 100 mm) was positioned and released in the celiac artery, excluding aneurysm and protruding into the aorta. The chimney technique was completed with the release of the previously positioned aortic

endoprosthesis. Control angiography revealed a slight kink in a segment of the Viabahn stent graft protruding above the aortic endoprosthesis. Accordingly, radial force strengthening with Wallstent (10 × 70 mm; Boston Scientific) was performed. Final angiography revealed patent distal celiac artery and successful aneurysm exclusion (Fig 2). Right brachial access was surgically closed, right femoral access was closed with the Perclose ProGlide suture-mediated system (Abbott Vascular, Abbott Park, Ill), and left femoral access was closed with manual compression.

The patient did well after the procedure, becoming afebrile after 5 days of antibiotherapy, with sustained decrease in inflammatory markers. He maintained mild epigastric pain that gradually subsided. CTA was performed 5 days after the procedure and revealed a well-positioned endoprosthesis, with no endoleak (Fig 3). After

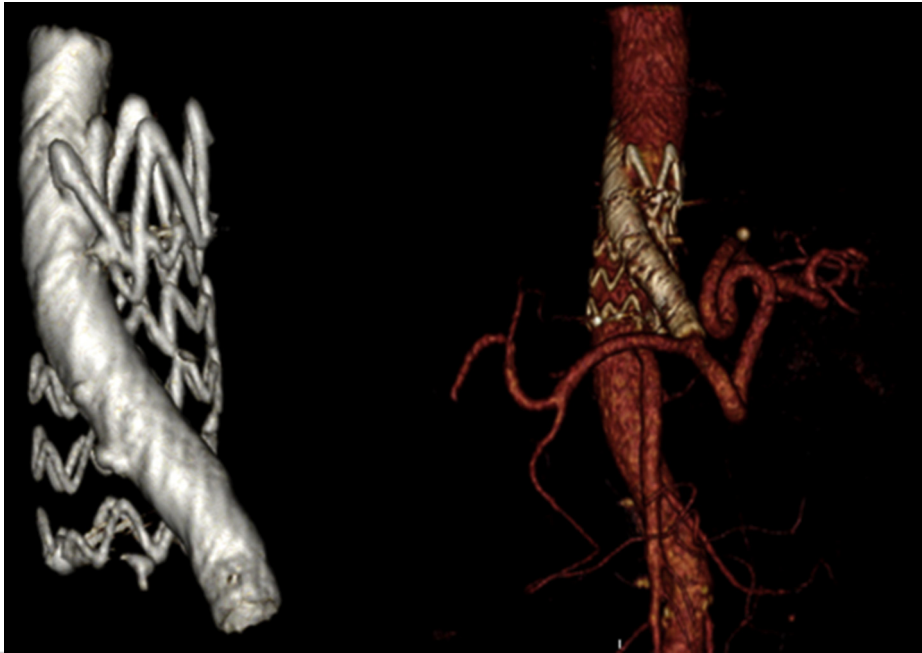


Fig 3. Computed tomography angiography (CTA) three-dimensional reconstructions of stent graft position at day 5 after the procedure.

a 2-week intravenous antibiotic course, the patient was discharged, and targeted lifelong intravenous antibiotics were prescribed (intravenous cefazolin according to the antibiogram administered on hemodialysis sessions).

On follow-up visits, the patient had no abdominal pain or new onset of fever. Serologic evaluation was unremarkable. CTA 3 months after the procedure revealed complete aneurysm thrombosis, adequately positioned endoprosthesis, and patent celiac artery (Fig 4). The patient was closely monitored with monthly analytic workup including inflammatory markers; imaging follow-up with CTA will be repeated at 6 and 12 months after the procedure.

DISCUSSION

ICAA is an extremely rare diagnosis, with few reported cases in the literature to date.¹⁻⁸ Literature review retrieved a total of 10 cases of isolated ICAA to date.^{1-7,9} Analysis of previous cases of ICAA revealed that the leading cause is infective endocarditis, and *S. aureus* is the leading microbiologic agent.

In this case, presumptive infective etiology was based on CTA findings, including saccular anatomy and rapid growth, as well as clinical and analytic findings: fever, back pain, elevated inflammatory markers, and MSSA bacteremia. Nonetheless, we admit the diagnosis cannot be sustained with total certainty as there was no tissue pathologic examination.

MSSA bacteremia was presumed by exclusion to be an infectious complication of AVF cannulation. In fact, the buttonhole cannulation technique used in this patient

has been reported to be associated with an increased risk for infectious complications, particularly *S. aureus* bacteremia.^{10,11}

Because of the rarity of ICAA, natural history and prognosis are unclear. A unique case report documented CTA evolution from normal celiac artery with minimal haziness of the surrounding fat to celiac aneurysm rupture within 2 weeks, enhancing the rapid and unpredictable nature of ICAA.⁵ Therefore, even though criteria for intervention have not been well established, consensus exists for repair regardless of size.⁷

Saltzberg et al¹² recommended endovascular repair as a first line of treatment for all visceral artery aneurysms in anatomically suitable cases, excluding those located in the distal splenic artery. The only two previous reports of endovascular treatment of ICAA involved its embolization.^{1,9} On the other hand, Batagini et al⁷ in 2015 described a case of ICAA with a similar anatomy that was treated with a two-stage approach: first, transperitoneal aortohepatic bypass with autologous conduit with ligation of the celiac artery; and second, retroperitoneal aneurysmectomy.

To our knowledge, this is the first case of resorting to the chimney technique to exclude an ICAA, given the unique anatomy of the aneurysm with involvement of the ostia of the celiac artery with no proximal normalizing neck and the additional advantage of maintaining celiac artery patency and diminishing the risk of hepatic ischemia. This was a solution in an emergent setting; the aneurysm was impending for rupture in a particularly frail patient not considered fit for open surgery.



Fig 4. Computed tomography angiography (CTA) 3 months after the procedure revealing complete aneurysm thrombosis and patent and adequately positioned endoprosthesis.

Even though this endovascular approach offers a minimally invasive and effective solution to a problem with a technically complex major open surgery alternative, implantation of prosthetic material in an infected environment is a concern. Although a few case reports showed good outcomes with the endovascular approach associated with antibiotic therapy, lifelong antibiotherapy is advisable as well as close monitoring, strict analytic follow-up, and repeated imaging to detect additional aneurysm formation because of theoretical concerns for recurrent infection or progression.¹³

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