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## Endovascular Stent-Graft Treatment of Giant Celiac Artery Pseudoaneurysm

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### Summary

**Background:**

Visceral artery aneurysms (VAAs) comprise an uncommon but life-threatening vascular disease. When rupture is the first clinical presentation, mortality rate reaches 70%. Increased use of cross-sectional imaging has led to a greater rate of diagnosis (40–80%) of asymptomatic VAAs. In the past, surgery was the treatment of choice for VAAs carrying high risk of mortality and morbidity.

**Case Report:**

A 22-year-old man, who had undergone gastric, pancreatic and aortic surgery 2.5 years earlier, presented with progressive abdominal pain. Multidetector computed tomography scan revealed an 8-cm celiac pseudoaneurysm. We report a giant celiac pseudoaneurysm treated with stent-graft implantation.

**Conclusions:**

Endovascular treatment of VAA is a safe and effective method alternative to surgery.

**MeSH Keywords:**

Aneurysm, False • Celiac Artery • Endovascular Procedures

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### Background

Etiologies of visceral artery pseudoaneurysms include trauma, surgery, interventional procedures, and pancreatitis. They are distinguished from aneurysms by lack of a true wall and high risk of rupture [1]. Even in asymptomatic patients, considering a high mortality risk, surgical or endovascular treatment should be undertaken promptly. We report a case of a patient with a giant celiac pseudoaneurysm who had suffered gunshot wounds and underwent operative repair in the past.

### Case Report

A 22-year-old man presented with progressive abdominal pain over the previous 15 days. He had a history of gastric, pancreatic, and aortic surgery following a gunshot wound 2.5 years previous. Bridectomy was performed because of ileus three months after initial surgery. There was no other major medical history or trauma.

A multidetector computed tomography (MDCT) angiography scan (Brilliance CT 16-slice, Philips Medical Systems, The Netherlands) obtained at the time of admission revealed an 8-cm celiac pseudoaneurysm, displacement of blood vessels, and marked erosion of thoracic vertebrae due to continuous compression over an extended period of time (Figure 1).

It was decided that a stent-graft should be implanted in order to to exclude the pseudoaneurysm, given the patient's history of retroperitoneal surgery. Patient was informed about the treatment and written consent was obtained. The procedure was then performed under local anesthesia combined with conscious sedation. Presence of a giant pseudoaneurysm originating from the celiac trunk was confirmed through initial angiography, which was performed via transfemoral approach (Figure 2). We placed a 7F guiding catheter in the celiac trunk. Systemic heparinization (5,000 IU Heparin intravenously) was administered. A 6×40-mm vascular stent graft (Fluency; Bard-Angiomed,



**Figure 1.** MDCT angiography image: partially thrombosed pseudoaneurysm (white arrow) is visible, markedly eroding the vertebral body (black arrow) and compressed liver parenchyma (arrowhead).

Arizona, USA) was delivered to the celiac artery over a stiff hydrophilic guidewire; following stent-graft implantation, intra-stent-graft balloon dilatation was performed to achieve optimal sealing at the ends of the stent-graft (Figure 2). Control angiography performed at the end of the procedure showed complete exclusion of the aneurysm with no endoleak and preserved celiac arterial flow (Figure 3A). The catheter and the sheath were removed from the femoral artery, and hemostasis was achieved by manual compression at the entry site. There was no hematoma in the groin area. The patient was discharged five days after the procedure without any notable abnormalities on control ultrasonography (US). During a three-month follow-up, no endoleak was detected via MDCT angiography (Figure 3B) or Doppler US (Figure 3C); additionally, it was found that normal blood flow through celiac artery was preserved. At a three-year follow-up, the patient was found the patient asymptomatic and leading a normal. Institutional ethics committee approval was not required for the case report. Informed patient consent was obtained.

## Discussion

Celiac artery aneurysms are rare; they account for 4% of all reported visceral artery aneurysms (VAAs) [1,2]. Causes of aneurysm and pseudoaneurysm formation include arteriosclerosis, infection, trauma, fibromuscular dysplasia, congenital inflammatory disease, and iatrogenic lesions [2]. The etiology in our case was a shotgun wound and subsequent surgery. Patients may be asymptomatic but frequently present with abdominal pain, gastrointestinal bleeding, fever, and jaundice [3]. The incidence of VAA is increasing due to increased use of interventional procedures and transplantation. Early diagnosis of asymptomatic VAAs is of great importance, given a high mortality rate in the event of rupture: if rupture occurs, mortality rate increases to 35% for hepatic aneurysms and to 50% for gastroduodenal aneurysms. The risk of rupture seems higher for pseudoaneurysms than for true aneurysms [2]. Predictive factors related to rupture described in the literature include



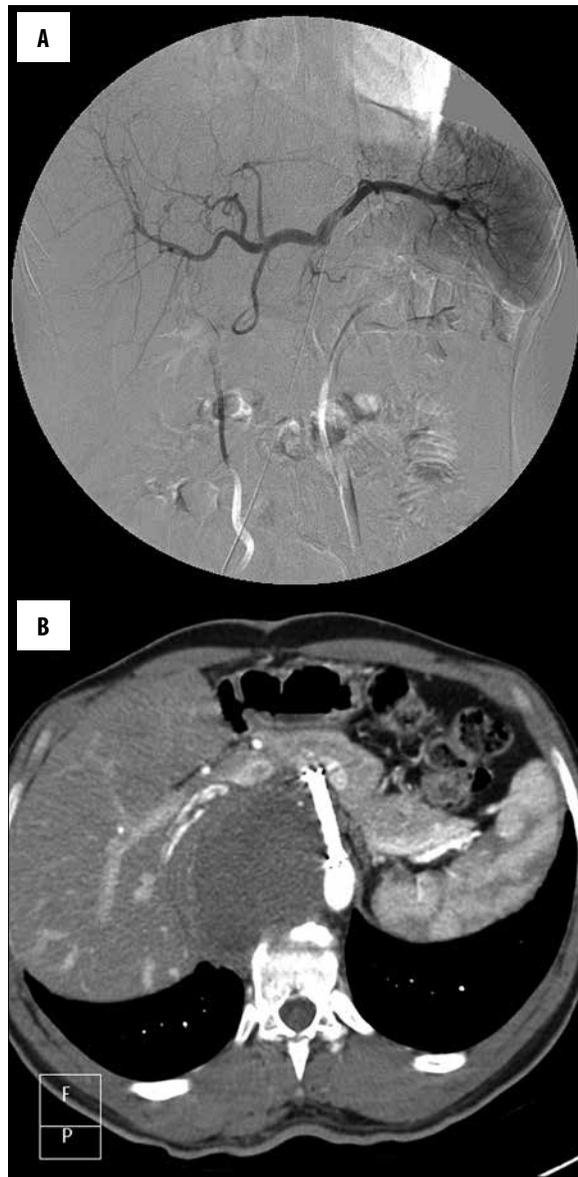
**Figure 2.** Digital subtraction angiogram demonstrates a giant pseudoaneurysm (arrow) arising from the celiac trunk.

absence of wall calcification, young age, and not taking beta-blockers [4]. Additionally, degeneration of the intima media of the splenic artery secondary to hormonal changes and increased splenic blood flow associated with pregnancy are important factors [5]. Trastek et al. advocate treating any aneurysm that is symptomatic, has grown, is found in a woman who is pregnant or expecting to be pregnant, or one measuring >2 cm [6]. Moreover, every pseudoaneurysm should be treated as soon as possible, regardless of its size [4,7].

Traditional surgical treatments such as bypassing, excision or ligation and – especially in emergency cases – resection of the end-organ have been used for many years [8]. On the other hand, high operational morbidity and mortality rates are important problems.

In the recent years endovascular (or percutaneous) treatment options have been offered for treating VAAs: coil embolization, gelfoam, thrombin injection, stent-graft implantation, or a combination of these techniques [9]. These procedures can be performed repeatedly or used in combination if intervention is unsuccessful. In addition, combined endovascular and surgical approach has been reported in the literature [10].

Coil embolization has been an accepted therapeutic option in the past, since the risk of splenic infarction and/or abscess formation associated with it is relatively low. Most complications reported in the literature concern end-organ ischemia, pain, fever and a transient increase in pancreatic or hepatic enzymes (i.e. post-embolization syndrome). One of the major problems following coil embolization is the risk of recanalization, occurring with an incidence of 9–42.9% [2]. If treatment of pseudoaneurysm with coil embolization is associated with high risk and vascular anatomy is eligible for stent-graft implantation, as in our case, this treatment option is suitable. If vascular anatomy



**Figure 3.** Following interventional procedure: control angiogram (A), MDCT angiography (B), and colored Doppler US (C) show exclusion of pseudoaneurysm by the stent-graft.

is not favorable, uncovered stent and stent-assisted coil embolization can be performed [8].

Percutaneous embolization by ultrasound-guided thrombin injection has been used to treat iatrogenic pseudoaneurysm of the femoral artery and, in some specific cases visceral artery, usually as a second procedure following unsuccessful embolization [9,11].

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In particular cases, aneurysm of splenic, hepatic or superior mesenteric artery was treated with stent-graft implantation, as reported in the literature. Stent-graft procedure is a valid option following retroperitoneal surgery, transplantation or for patients in poor medical condition that requires preservation of distal arterial flow [2,12]. Length of the neck, tortuosity of the arteries, precise location of the aneurysm, and angulation of the aneurysmal tract should be evaluated carefully prior to implantation. Moreover, selecting a stent graft of appropriate dimensions and mechanical properties, as well as releasing the stent in a proper position, should be taken into consideration when aiming to successfully repair a VAA with stent-graft therapy [13]. Stent-graft therapy is contraindicated in patients with infected aneurysms; on the other hand, there were several reports of stent-graft therapy for infected aneurysms [14,15]. Lagana et al. report rates of primary and secondary technical success to be 87.9% and 100%, respectively [15]. Endovascular approach to VAA therapy is frequently cited as a first-line treatment, given its advantages [8].

## Conclusions

To the best of our knowledge, there are no reports in PubMed of a pseudoaneurysm as large as the one reported here, causing marked vertebral erosion and subsequently treated with endovascular approach. Since stent-graft implantation is a new therapeutic option in treatment of VAAs, little data have been published on long-term outcomes. We consider endovascular treatment a feasible and effective approach to treating VAAs.

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