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Case Report

Successful endovascular treatment of a recurrent giant celiac artery aneurysm

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ABSTRACT

Visceral artery aneurysms are very rare and aneurysms of the celiac trunk are the rarest ones: they are in most cases asymptomatic and their detection is frequently incidental. In this article we report the case of a man affected by severe abdominal pain with a huge aneurysm of the celiac trunk, first successfully treated with coil embolization, but, after 10 months, another endovascular embolization was required for deployment of the metallic coils previously released, ahead into the fund of the sac with recanalization of the aneurysm. A second endovascular treatment was performed with other coils and Amplatzer-Plug. The high risk of rupture makes treatment of such aneurysms mandatory and surgery is still considered the gold standard therapy of VAA, but, due to its high morbidity and mortality risks, in the last years, it has been widely replaced by endovascular embolization. An effective endovascular embolization requires not only the complete filling of the aneurysmal sac, but also the complete vascular exclusion of its in-flow and out-flow tracts, to reduce the risk of its anterograde or retrograde reperfusion.

Competing Interest: Authors declare that they have no conflict of interest. All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

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Introduction

Visceral artery aneurysms (VAA) are very rare—with an incidence reported of 0, 1%-2%—and aneurysms of the celiac trunk (CAA) are the rarest ones, since they constitute 4, 8-6, 3% of all VAA cases [1–6]. CAAs are in most cases asymptomatic and, due to the wider application of sonography, computed tomography (CT) and endovascular aneurysm repair, they have been recognized with increased frequency in the recent past [5–8]. Thus, their detection is frequently incidental. In 15%-20% of cases, CAAs can manifest with rupture, with a mortality rate of about 80% [9,10]. In this way, their early detection and treatment is really crucial, since the operative mortality rate of ruptured CAAs is 40% compared with 5% for elective repair [4,6]. An aneurysm greater than 20 mm is worth to be treated, due to the risk of rupture: surgical treatment constitutes the traditional therapy, but it is related to a significant postoperative morbidity and mortality. As a consequence, endovascular repair has been progressively replacing surgery [3,5,8,11]. This has been performed by employing embolization techniques, mainly using coils, N-BCA (Glue), or a combination of them, but this kind of approach is often complicated by difficult endovascular access to the aneurysm and a significant percentage of limited longevity of this kind of repair due to revascularization of the aneurysm. An alternative approach is the application of endovascular stent grafts, in few limited and appropriate cases (Figs 1–5) [7,8,12].

We report the case of a man affected by severe abdominal pain with a huge aneurysm of the celiac trunk and ostial occlusion of its visceral branches, revascularized by collateral flow from superior mesenteric artery (SMA) circle. It was at first successfully treated with coil embolization. Then, after 10 months, another endovascular embolization was required due to recanalization of the aneurysm. The second treatment was performed with coils and Amplatzer-Plug.

Case report

A 57-year-old man affected by recurrent and severe abdominal pain in the last 2 weeks. His medical history was notable for smoke and hypertension and there was no history of trauma, fever, abdominal or chest infections. His general physical examination was unremarkable and his laboratory tests were normal. A contrast-enhanced CT scan revealed the presence of a big aneurysm of the celiac trunk measuring 60 × 57 mm, with large part of its sac filled with thrombus and a true lumen measuring 22 × 27 mm. Visceral artery branches of celiac trunk were occluded at their origin and revascularized by extensive collaterals coming from the pancreatic-duodenal artery and SMA.

In the angiography suite, a selective celiac trunk angiography was performed through a standard percutaneous right transfemoral approach, which confirmed the CT findings. An endovascular exclusion of the aneurysm was performed by transcatheter coils embolization and packing of the aneurysmal sac (Nester coils, Cook-Medical,Bloomington, IN- with diameter between 10 and 18 mm). Final angiography showed a complete exclusion of the aneurysmal sac and patency of the collateral vessels and the celiac visceral artery branches. The patient was asymptomatic after the procedure and was discharged 3 days after the embolization.

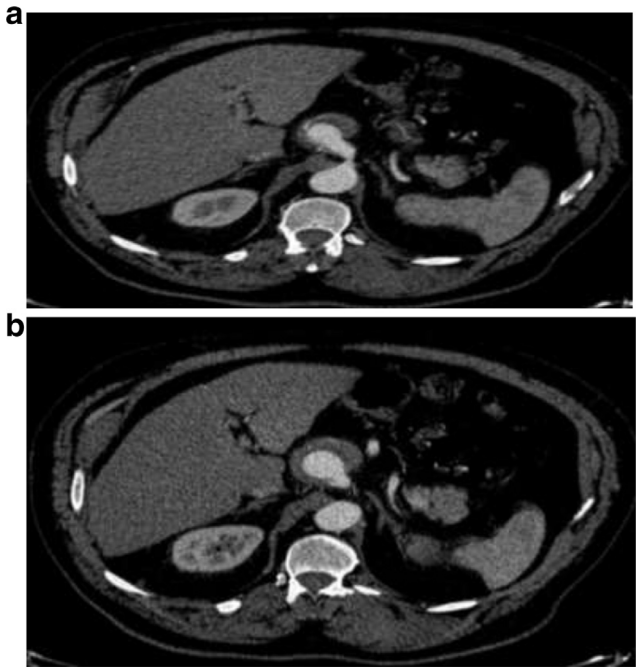

Fig. 1 – (A, B) Pre-embolization CT scan (arterial phase) showing the presence of a huge aneurysm of the celiac trunk. 1 cm after the origin, the sac is mostly filled with thrombus and occlusion of its visceral branches origin ostium.

Ten months later, the patient came back to our hospital for new episodes of abdominal pain. A contrast-enhanced CT scan was performed and showed recanalization of the aneurysm treated (44 × 46 mm) with a true lumen measuring 27 × 26 mm. Recurrence was due to the deployment of the metallic coils ahead into the fund of the sac of the aneurysm. Celiac visceral artery branches were patent.

A new selective angiography was performed and confirmed the CT findings. We decided to perform a second embolization of the aneurysm: a 5-Fr visceral catheter (Cobra catheter, Merit Medical System Inc., South Jordan, UT) was used to catheterize the celiac trunk and multiple coils (Nester, Cook-Medical,Bloomington, IN—diameters between 14 and 16 mm) were released again into the sac. Afterwards, we positioned a 7-Fr long introductor-catether (Flexor—Cook-Medical, Bloomington, IN) to completely embolize the aneurysm releasing an Amplatzer-plug (16 mm, AGA Medical Corporation, Plymouth, MN) at the ostium of the celiac trunk to seal it. The final angiographic control showed successful and complete exclusion of the aneurysm with patency of the celiac visceral artery branches. Patient was asymptomatic after the procedure and discharged 3 days after treatment; in addition, 2 years after treatment, he is still asymptomatic and the second endovascular transcatheter embolization revealed

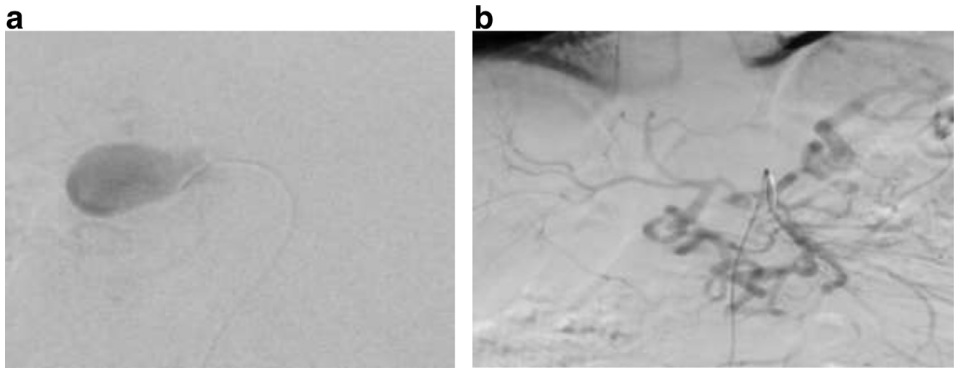

Fig. 2 – (A, B) Digital angiographic study; selective catheterization of the celiac trunk (A) and of the superior mesenteric artery (B) confirming the presence of the huge visceral aneurysm with its visceral branches occluded at their origins (A) but revascularized by collateral inverted arterial flow from superior mesenteric artery circle (B).

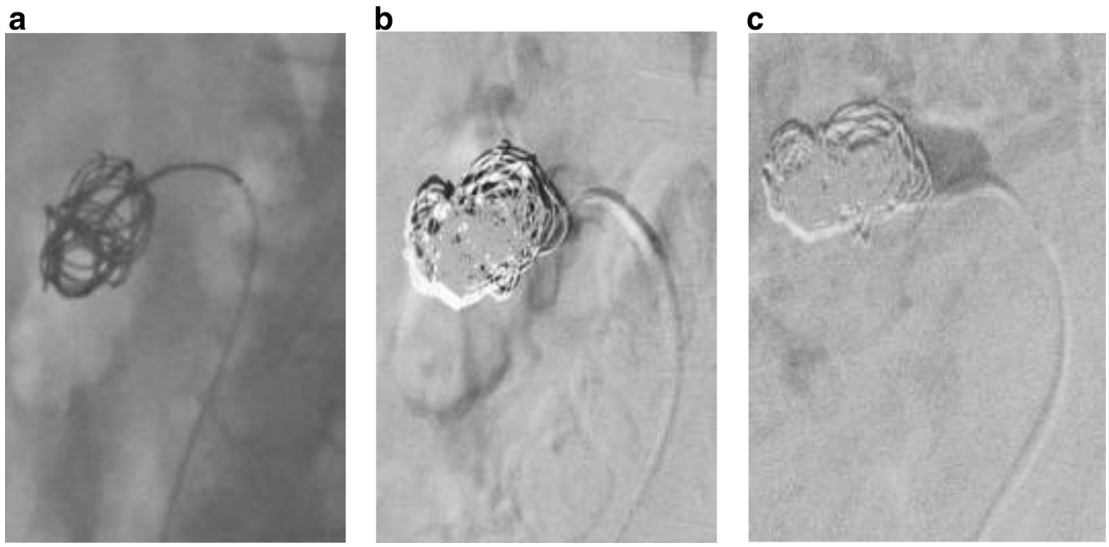

Fig. 3 – (A, B, C) Arterial embolization. First selective embolization and packing of multiple metallic coils in the aneurysmal sac (A, B). Final angiographic check (C) shows patency of the in-flow tract of the aneurysm.

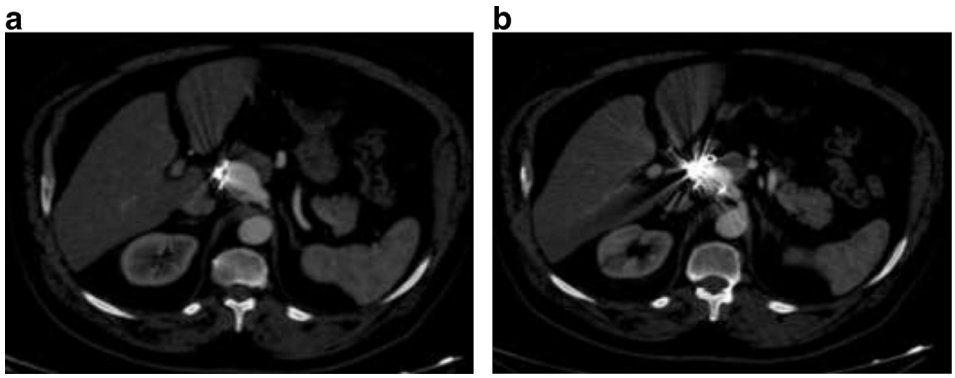

Fig. 4 – (A, B) CT scan (arterial phase) 8 months after the embolization showing the recurrence of the celiac trunk aneurysm and the deployment of the metallic coils ahead into the fund of its sac.

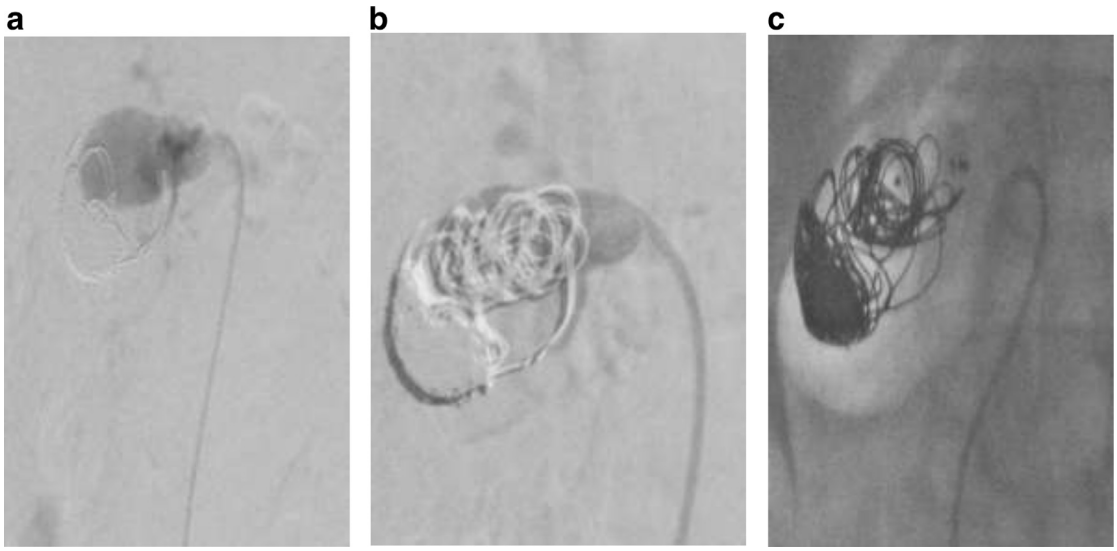

Fig. 5 – (A, B, C) Digital angiographic study and arterial embolization. Selective catheterization of the celiac trunk confirming the recanalization of the aneurysm and the deployment of the metallic coils ahead (A), followed by new packing of metallic coils to completely fill the aneurysmal sac again (B) and complete vascular exclusion of the in-flow tract (C) by releasing the Amplatzer-plug device.

effective, as confirmed by color-Doppler follow-up performed after 1, 3 and then every 6 months.

Discussion

CAAs are extremely unusual VAAs [8,10,13,14]. Although almost 40% of all CAAs are idiopathic [5,8,15,16], the most common etiology is atherosclerosis. Infection, trauma, polyarteritis nodosa, fibromuscular dysplasia with medial degeneration, poststenotic dilatation occasionally progressing to aneurysm, and Beçhet's disease are other etiologies implicated [6,8,15–18]. Men are affected by CAA more often than women and CAAs usually present in the sixth decade of life. Fifty percent of CAAs are associated with abdominal aortic aneurysms or other visceral ones [5,8,14,19,20].

Recent advances in abdominal imaging led to an increased frequency in the detection of VAAs [6,8,21]. On the one hand, CAAs are mostly asymptomatic. On the other hand, symptoms, when present, are vague and not specific and epigastric discomfort is the most common clinical presentation. In 30% of the cases, they manifest as abdominal mass and only 22% are identified incidentally before they rupture [4–6,8,22]. Other (rare) symptoms are: intestinal angina, abdominal bruit, gastrointestinal bleeding, hemoptysis, and jaundice [5,8].

VAAs are usually detected as a vascular mass on ultrasonography, CT imaging or magnetic resonance imaging of the abdomen, but the gold standard diagnostic exam is CT angiography [6,22]. Management options include follow-up (if small aneurysms), surgery or endovascular repair by transcatheter embolization or stent-graft implantation [6,21]. Many authors in literature suggest that asymptomatic CAAs should be repaired if the diameter is >20 mm or the diameter ratio to the parent vessels is >2 mm, to avoid the high morbidity and mortality rates reported for ruptured aneurysms [5,23–26]. The high risk of rupture makes treatment of such aneurysms mandatory even in asymptomatic patients [10,19]. Surgery is the gold standard therapy of VAAs with a mortality rate of 5% for elective repair compared to 40% for ruptured aneurysms [4,6]. Surgeon could perform aneurysmectomy, aneurysmorrhaphy, graft interposition or simple ligation [23,27,28]. However, in the last few years, surgery has been replaced by endovascular intervention and percutaneous embolization for the low morbidity, mortality and high success rate of this therapeutic choice [6,21,29–31]. Embolization success rates have been reported from 75% to 100%, with morbidity rates between 14% and 25% and with mortality rates boarding on 0%, even in emergency [27,30,32–34,39]. As a consequence, transcatheter embolization techniques have become widely accepted methods for managing visceral artery aneurysms, including CAAs, but not all aneurysms are amenable for this kind of treatment. Saccular or fusiform CAAs with good collateral flow are considered most favorable for embolization [8,39]. Endovascular treatment can be carried out using different techniques and different devices. The choice of the right embolization technique depends on the site and morphology of the CAA: arterial patency can be preserved in saccular aneurysms (where catheterization of the neck allows embolization of the sac). Embolization is commonly performed with coils and/or cyanoacrylate, and sometimes with stent-graft implantation [12,30,32,33,35–37].

Coils embolization of the proximal and distal aneurysmal neck is the most reported endovascular therapy, because it is essential to exclude both in-flow and out-flow tracts and reduce the risk of anterograde and retrograde reperfusion [6,30].

In the reported case, the presence of collateral inverted flow coming from SMA circle to the visceral branches of the celiac trunk, occluded at their origins, suggested us that the complete filling of the sac could be the right endovascular

approach [36,38]. We chose, at first, the only packing of multiple coils into the sac, but the main problem was that the in-flow of the aneurysm was still patent and, moreover, directly exposed to the high-pressure of arterial blood flow of abdominal aorta. In fact, 10 months later, the patient experienced the recurrence of the aneurysm, owing to the deployment of the metallic coils, previously released, ahead into the fund of the sac, under the strength and high-pressure of aortic blood flow. In the second treatment, the packing of other metallic coils in the patent aneurysmal sac was followed by its complete vascular exclusion and sealing of its in-flow tract by releasing an Amplatzer-plug device. The patient, 2 years after treatment, is still asymptomatic. US color-Doppler follow-up confirms the effectiveness of treatment reported.

In conclusion, endovascular arterial transcatheter embolization is a feasible, effective, and minimally invasive technique for treatment of patients affected by VAAs, celiac trunk aneurysms included, with lower morbidity, mortality, and higher success rate compared to surgery. Moreover, it is possible to repeat the procedure in case of incomplete exclusion or reperfusion of the sac. However, an effective endovascular embolization requires not only the complete filling of the aneurysmal sac, but also the complete vascular exclusion of its in-flow and out-flow tracts and vessels, to reduce the risk of arterial anterograde or retrograde reperfusion.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.radcr.2019.03.024.

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