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## Treatment of an aneurysm of the celiac artery arising from a celiomesenteric trunk. Report of a case



G. Lipari\*, T.F. Cappellari, F. Giovannini, O. Pancheri, R. Piovesan, E. Baggio

Vascular and Endovascular Unit, Surgical and Oncological Department, University of Verona, Verona, Italy

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### ABSTRACT

**INTRODUCTION:** Visceral artery aneurysms (VAA) are rare, frequently present as a life-threatening emergency and are often fatal.

The celiomesenteric trunk (CMT), a common origin of the celiac trunk (CT) and the superior mesenteric artery (SMA) from abdominal aorta, is quite rare. Aneurysms that involve this celiomesenteric anomaly are even rarer and in the last 32 years have been reported in only 20 cases in the literature.

**PRESENTATION OF CASE:** We describe a case with 30 mm aneurysm arising from a CMT. In general, an aneurysm that is 20 mm or greater in size is considered to be significant enough to warrant treatment. Abdominal VAA sometimes can be treated with low-invasive procedures: our patient required open surgical repair with the celiac artery replanted on to the aorta.

**DISCUSSION:** The clinical course was complicated only by an increase of hepatic cytolysis enzymes, and by a low output pancreatic fistula, treated conservatively. The patient was discharged on the fifteenth postoperative day. One month after discharge, imaging revealed a good patency of all reconstructed arteries. In the subsequent 36-month follow-up period, the patient reported no clinical episodes.

**CONCLUSION:** Our finding of a very rare case of a celiomesenteric anomaly with a concurrent aneurysm is extremely rare (20 cases in word literature in the last 32 years). The feasibility of the endovascular approach for aneurysms originating from the common celiomesenteric trunk depends mainly on aneurysmal location, diameter and neck size. In case of specific unfit anatomy, a careful surgical treatment can ensure the best results.

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### 1. Introduction

Visceral artery aneurysms (VAA) are rare, with an incidence of 0.1%–0.2% in routine autopsies [1]. They frequently present as a life-threatening emergency and are often fatal (14–100%) if associated with rupture and intra- or retroperitoneal bleeding [2,3]. Rupture occurs in a percentage varying from 15 to 22% [4]. However most patients are asymptomatic and aneurysms are detected incidentally during diagnostic imaging for other reasons. In general, an aneurysm that is 20 mm or greater in size is considered to be significant enough to warrant treatment if the patient's overall condition permits it [4].

The celiomesenteric trunk (CMT), a common origin of the celiac trunk (CT) and the superior mesenteric artery (SMA) from the abdominal aorta, is quite rare, accounting for less than 1% of all splanchnic arterial anomalies, and its incidence is estimated at 0.25% (just 0.01%–0.2% in routine autopsies) [4]. Aneurysms that involve this celiomesenteric anomaly are even rarer and in the last 32 years have been reported in only 20 cases in the literature [4–14].

### 2. Presentation of case

A 52-year-old man presented at our vascular surgery unit with a 9-month history of various episodes of abdominal pain; an abdominal ultrasound detected gallstone disease and a 30 mm aneurysm supposedly arising from the SMA. Angio MRI and CT-angiography with vascular reconstruction both detected an anatomical variant; the celiac trunk was not visible in its normal site. The SMA originated from the front of a common artery (CMT) while a hepato-gastro-splenic trunk (CT) originated from its left side (Fig. 1A). After 12 mm the CT presented a 30 mm aneurysmal dilation in contact with the uncinate process of the pancreas. The walls of the aneurysm were regular; without calcifications or thrombus (Fig. 1B). The course of the artery was particularly twisted, with the common hepatic, gastroduodenal and splenic arteries all originating after the aneurysm. The abdominal aorta was normal. On admission, the patient showed good general conditions as well as normal laboratory parameters; body mass index was 24.2 kg/m<sup>2</sup>, blood pressure 120/80 mm Hg, heart rate 72 beats/min.

He also had no history of pancreatitis or trauma, and no evidence of arterial dysplasia or systemic disease (Marfan's syndrome,

\* Corresponding author. Tel.: +39 45 8124783; fax: +39 45 8124622.



Fig. 1. Aneurysm: A, CMT: long arrow, SMA: arrow head; CT: arrow.

Ehlers–Danlos syndrome, Behçet’s syndrome, or Takayasu’s arteritis) that might have been a risk factor for aneurysms.

Due to the high risk of splanchnic ischemia because of vessel positioning and the winding course of the artery. Endovascular treatment was rejected and a surgical procedure was planned.

Surgery was performed via a median laparotomy; following exploration of the abdominal cavity, the gastrohepatic ligament was divided and following the superior margin of the pancreas the CMT was located and dissected up to the aorta. A 30 mm aneurysm was found at the distal end of the CMT, after the bifurcation of the SMA, before the origin of celiac branches. The aneurysm was carefully dissected. After systemic heparinization the CMT, the SMA and the distal part of the CT were clamped and the resection of the aneurysm was performed dividing the CT from the CMT. The origin of the CT at the CMT was sutured via 6/0 Prolene suture. The celiac branch of the CMT was reimplanted end-to-side to the aorta using 6–0 polypropylene sutures. There was a good pulsation in the SMA and in the CT branches after anastomosis, with no sign of visceral ischemia. Additional cholecystectomy was performed (gallstone disease). After haemostasis and drain positioning, the abdomen was then closed in the standard fashion. The patient was transferred

back to the recovery room in stable conditions. The patient presented fever on the fifth post-operative day: a chest X-ray showed a right inferior pulmonary density treated with 400 mg/die of moxifloxacin and 1 g × 3/die of ceftazidima with complete remission. The clinical course was also complicated by an increase of hepatic cytolysis enzymes, perhaps due to ischemia during clamping. These values progressively returned to normal. A low output pancreatic fistula (about 20 cc/die) was treated conservatively. The patient was discharged on the fifteenth postoperative day.

One month after discharge, imaging with three-dimensional computed tomography, revealed a good patency of all reconstructed arteries (Fig. 2A and B). The pancreatic fistula was spontaneously eliminated after 2 months. In the subsequent 36-month follow-up period, the patient reported no subsequent clinical episodes.

3. Discussion

Visceral arteries develop during the fourth week of gestation, and variations in the origin of the celiac artery and superior mesenteric arteries are attributed to embryologic anomalies.

In rare situations, the CT and SMA may arise from a single, common trunk of the abdominal aorta. This condition, otherwise known as a CMT, is thought to occur in less than 1% of all anomalies involving the celiac axis, moreover, aneurysms involving the celiacomesenteric trunk are exceptionally rare [4].

As in the current case, patients with abdominal visceral artery aneurysms often have no physical evidence of the disorder, and the diagnosis is frequently made incidentally on abdominal CT or ultrasound scanning. About 80% of these cases are only found after rupture [5]. Some patients present with hemorrhagic shock and sudden death for unknown reasons.

Visceral artery aneurysms have been reported in approximately 0.2% of the population, and most are located in the hepatic and splenic arteries. Incidence of the various types of VAAs are reported in (Table 1).

Abdominal visceral artery aneurysms can be caused by medial degeneration, trauma, surgery, inflammation, infection, arteritis, collagen vascular disease, fibromuscular dysplasia, or congenital anomalies [5].

In this regard the CMT, which is an embryologic error, may result in an increased risk for aneurysm formation due to the absence of a separate celiac trunk and an excessive blood influx into the origin of the CMT [4,12]. However, the relationship between the existence of a celiacomesenteric anomaly and aneurysm formation remains



Fig. 2. A-B. - A: SMA: arrowhead; CMT: long arrow; CT and aneurysm: short arrow - B: reimplanted new CT: arrow; SMA: arrowhead.

**Table 1**  
Incidence of visceral aneurysms.

Aneurysm location	Marone et al. [18]		Fankhauser et al. [19]		Ferrero et al. [17]		Grottemeyer et al. [1]		Pulli et al. [20]	
	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n
Splenic	47,8	44	34,2	63	56,3	18	16,1	5	50,8	30
Hepatic	18,7	17	30,4	56	15,6	5	19,4	6	11,9	7
Superior mesenteric	6,3	6	3,3	6	9,4	3	22,6	7	3,4	2
Pancreatic-duodenal	4,2	4	8,7	16	9,4	3	3,2	1	6,8	4
Celiac trunk	3,1	3	2,2	4	6,3	2	29,0	9	5,1	3
Gastro-duodenal	2,1	2	15,2	28	3,1	1	6,5	2	1,7	1
Renal	19,1	18	na	–	na	–	na	–	15,3	9
Gastric	na	–	2,2	4	na	–	na	–	na	na
Gastroepiploic	na	–	2,2	4	na	–	na	–	1,7	1
Inferior mesenteric	na	–	1,1	2	na	–	na	–	1,7	1
Middle colic	na	–	0,5	1	na	–	na	–	1,7	1
Superior mesenteric branch	na	–	na	–	na	–	3,2	1	na	na

**Table 2**  
Mortality for open repair of VAAs in elective surgery.

Author	Year	Patients	Mortality (%)
Ferrero et al. [17]	2011	24	4.2
Marone et al. [18]	2011	74	1.3
Grottemeyer et al. [1]	2009	29	0.0
Pulli et al. [20]	2008	52	1.9

unclear [15]. Only twenty-one cases, including the current, have been reported in literature.

VAAs are treated with the goal of preventing rupture and bleeding, due to poor prognosis after rupture: so treatment of CMT aneurysms is mandatory even for asymptomatic patients. Mortality of ruptured visceral aneurysms reported in the literature varies from 8 to 25% [1,3].

The risk of aneurysm rupture is determined primarily by the size of the aneurysm, although other factors may also play a role. However, this risk of rupture is much higher in certain subtypes of patients such as pregnant women and patients with portal hypertension. In general, a size of 2 cm or greater is considered significant enough to warrant treatment if the patient’s overall condition permits it. The presence of a symptomatic aneurysm, an aneurysm in a woman of childbearing age, or an aneurysm with documented enlargement is also an indication for treatment [4].

The exact natural history of CMT aneurysms is unknown; an understanding of its clinical relevance, given the infrequency of this anomaly, is in fact very difficult. Nevertheless, it appears that most incidentally diagnosed CMTs without intrinsic disease will remain with no or few symptoms such as in our case. Despite low morbidity in open operation, various endovascular techniques, (embolization and/or stenting), have been developed to achieve technical success. The use of endovascular stent grafts for the treatment of VAAs is an option in patients with adequate arterial anatomy and location, particularly those who are categorized as being at high risk [16]. The size of the sac and of the neck of the aneurysm and the relationship of the neck to its parent artery or branches are the main technical problems encountered in selective endovascular treatment. Moreover end-organ ischemia, painful splenic infarction, and late-term vessel recanalization are potential problems of endovascular treatment. On the other hand the morbidity/mortality for open repair of visceral aneurysms in elective surgery is favorable, especially in young patients like ours (see Table 2).

The choice of the right surgical technique for a CMT area aneurysm depends on the location, size, and features of the lesion. If the aneurysm is saccular, aneurysm resection with end-to-end anastomosis or with reimplantation is preferred when possible, however dissection with patch angioplasty may be feasible; fusiform aneurysms should generally be treated with replacement using a graft.

Although abdominal visceral artery aneurysms can be treated with endovascular procedures, our patient required open surgical repair because of a large aneurismal neck and also because of the length, the tortuosity, and the position of the vessels involved; in fact the placement of a stent graft would have covered the SMA or the CT branches. Because our patient was young and sufficient dissection of the aneurysm, SMA, common hepatic and splenic arteries was achieved, we performed a direct end-to-side anastomosis, with complete excision of the aneurysm.

**4. Conclusions**

In conclusion, this report described a very rare case of a celiomesenteric anomaly with a concurrent aneurysm (20 cases in literature in the last 32 years). The feasibility of the endovascular approach for aneurysms originating from the common celiomesenteric trunk depends on aneurysmal location, as well as on the size of the sac and neck, and on initial clinical presentation (ruptured or nonruptured aneurysm). In our opinion the size of the neck of the aneurysm and the relationship with its branches were the main technical problems for selective endovascular treatment. Specific patient anatomy, with a favourable morbidity/mortality percentage of the surgical treatment, led us to choose the surgical option.

**Conflict of interest**

All authors disclose any financial and personal relationships with other people or organisations that could inappropriately influence this paper.

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**Ethical Approval**

This is not a research study.

**Consent**

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

**Author contribution**

G. Lipari: Pt surgery, Study concept, writing paper.  
T. Cappellari: writing paper.

F. Giovannini: Data Interpretation.  
 R. Piovesan: Data collection.  
 O. Pancheri: Data collection.  
 E. Baggio: Pt Surgery, Article review.

### Guarantor

Prof. C. Bassi is the Guarantor of this paper: he accept full responsibility for the work and/or the conduct of the study, had access to the data, and controlled the decision to publish.

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