Sandwich technique to preserve coeliac trunk during TEVAR

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Section: Interventional radiology
Area of Interest: Arteries / Aorta Vascular
Procedure: Diagnostic procedure
Imaging Technique: CT-Angiography
Imaging Technique: Catheter arteriography
Special Focus: Aneurysms Case Type: Clinical Cases
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Patient: 77 years, male

Clinical History:

77-year-old man, former smoker. He had a history of myocardial infarction (2007), gastrectomy for gastric cancer (January 2013) and dyspnoea. At a CT follow-up a descending thoracic aneurysm (DTA) (axial diameter: 6 cm) involving the origin of the coeliac trunk (Fig. 1) was discovered. An endovascular approach to exclude the thoracic aneurysm was scheduled.

Imaging Findings:

The procedure was done under general anaesthesia. Surgical exposure of right common femoral artery (CFA) and left axillary artery (LAA). Percutaneous approach of left CFA. Deployment of a first stent-graft (Captivia-Medtronic) from the LAA in the descending thoracic aorta (Fig. 2 a). Using the axillary approach the coeliac trunk was cannulated with a 4F Berenstein catheter (Tempo4-Cordis) and a .035 Amplatz Superstiff guidewire (Boston Sc) was advanced in the proper hepatic artery followed by a 10F 80 cm long introducer sheath (Arrow-flex) (Fig. 2 b). 2 self-expandable covered stents (Fluency-Bard: 9x100 mm and 9x80 mm) were deployed partially inside the coeliac trunk (Fig. 2c) and mainly in the descending thoracic aorta. The treatment was completed with the deployment of a last stent-graft with distal free-flow stents to avoid coverage of superior mesenteric artery origin (Fig. 2 d). CT examination after 1 month showed regular patency of splanchnic arteries and absence of endoleak (Fig. 3).

Discussion:

Thoracoabdominal aortic aneurysm (TAAA) is a life-threatening condition with a potentially high risk of rupture (46% to 74%) when left untreated [1]. Open repair of TAAAs is associated with significant morbidity and mortality with a variety of complications due to the cardiopulmonary stress of this large-scale operation. Some of these complications include respiratory failure, heart failure, and acute renal failure, as well as spinal cord ischaemia [2]. Mean elective surgical mortality rate is 6.6% at best, but values rising to 47% are reported for emergency operations [1]. Standard thoracic endovascular repair alone is currently not considered an adequate approach to treat TAAA because of the visceral arteries involved by the aneurysm sac. A hybrid procedure and other complex endovascular techniques (e.g., chimney graft, fenestrated and side-branched modular endograft systems) have been developed, but results are still conflicting; the procedures are not feasible for all patients and cost is still a concern. Lobato et al were one of the first to describe the "sandwich technique" to treat these aneurysms that still cannot be repaired in a safe, efficient, and cost-wise manner. In their experience started in 2008 elective and/or emergency sandwich
A technique repair was undertaken in 15 patients with TAAA. Technical success rate was 92.3%. Forty-eight visceral arteries (mean 3.4 arteries/patient) were successfully endorevascularized (22 renal arteries, 14 superior mesenteric arteries and 12 coeliac trunks) with self-expandable covered stents and bare stents inside it in 14 patients. The “sandwich technique” differs from “chimney” and “periscope” technique because it involves the use of two endografts plus an additional “sandwich” stent inserted between the overlapping zone of the two endografts to perfuse the vessel to be preserved [3]. In our case, after deployment of the first stent-graft at the level of the descending thoracic aorta, we cannulated the coeliac trunk and deployed two covered stents to maintain the patency of this vessel and then we completed the procedure by deploying a second stent-graft with the distal ends close to the superior mesenteric artery. This sequence of stents deployment was termed "sandwich" technique by Lobato et al and it can be applied also to aneurysms of other areas as in the case of iliac aneurysms involving the internal iliac artery to preserve this vessel [4].

**Differential Diagnosis List:** Sandwich technique to preserve coeliac trunk during TEVAR, Chronic aortic dissection, Suprarenal aortic aneurysm

**Final Diagnosis:** Sandwich technique to preserve coeliac trunk during TEVAR

**References:**


Description: Check angiogram after deployment of the first stent-graft: regular patency of the left subclavian artery. **Origin:** Pozzi-Mucelli F, SSD Radiologia Interventistica, Trieste, Italia
Description: Long stiff-wire and long introducer-sheath in the coeliac trunk. Origin: Pozzi-Mucelli F, SSD Radiologia Interventistica, Trieste, Italia
Description: Deployment of a covered stent in the proximal coeliac trunk and of a second stent-graft in the distal aorta. Patency of the superior mesenteric artery. Origin: Pozzi-Mucelli F, SSD Radiologia Interventistica, Trieste, Italia
Description: Final check: regular patency of the coeliac trunk. Origin: Pozzi-Mucelli F, SSD Radiologia Interventistica, Trieste, Italia
Description: CT follow-up (after 1 month): volume rendering elaboration shows the stent-grafts in the thoracic aorta and the covered stent in the coeliac trunk. Origin: Pozzi-Mucelli F, SSD Radiologia Interventistica, Trieste, Italia
Description: Volume Rendering: detail of the coeliac trunk. Origin: Pozzi-Mucelli F, SSD Radiologia Interventistica, Trieste, Italia
Description: Multiplanar Reformatted image showing the covered stents deployed inside the stent-grafts in a "sandwich" fashion. Origin: Pozzi-Mucelli F, SSD Radiologia Interventistica, Trieste, Italia
Description: Axial CT shows a 6 cm diameter aneurysm of the distal thoracic aorta. Origin: Pozzi-Mucelli F, SSD Radiologia Interventistica, Trieste, Italia
Description: Multiplanar reformatted image shows the aneurysm involving the distal thoracic aorta with a length of about 14 cm. Origin: Pozzi-Mucelli F, SSD Radiologia Interventistica, Trieste, Italia
Description: The sagittal elaboration clearly shows how the aneurysm involves the origin of the coeliac trunk. Origin: Pozzi-Mucelli F, SSD Radiologia Interventistica, Trieste, Italia