Coexistence of infrarenal and supra-celiac aortic aneurysm. Endovascular Treatment using the Chimney technique

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Abstract:

During last decade, the complete endovascular approach in complex aortic aneurysm improved the morbidity and mortality rates in these cases. A 69-year-old male patient presented with a coexistence of an infrarenal abdominal aortic aneurysm (AAA) and an additional saccular aortic aneurysm, just above the orifice of the celiac trunk. The two separate aneurysms were treated simultaneously by endovascular means; the infrarenal aneurysm using a conventional infrarenal endograft, while the supra-celiac one combining a short custom thoracic endograft and a covered stent for the celiac axis, applying the chimney technique. The computed tomography angiography of discharge showed a patent celiac stent graft with complete aneurysms exclusion without any endoleak. During a 5-year follow-up, the graft remained patent and the diameter of both sacs was diminished. Nowadays, combining several endovascular techniques, complex aortic pathologies can be treated with a minimal invasive approach.

INTRODUCTION

During the last decade, a widespread interest in the completely endovascular treatment of the complex aortic anatomy aneurysms has been presented.[1] The improved morbidity and mortality rate make more attractive a completely endovascular approach in many cases, especially in patients presenting several comorbidities. Short-term results could be favorably compared to open repair, with a mortality rate at 3.7%, primary patency at 94.8%, and primary-assisted patency at 95.1%.[2] Even in long-term follow-up, a total endovascular repair of complex aortic anatomy aneurysms seems safe and durable with an aneurysm-related survival rate at 91% and late occurring visceral stent occlusion at 4.4% at 5 years.[3]

We herein report a case of a patient diagnosed with two coexisting aortic aneurysms; an infrarenal and a supra-celiac one, treated by endovascular means, using the chimney technique.

CASE PRESENTATION

A 69-year-old man presented with the diagnosis of an infrarenal abdominal aortic aneurysm (AAA) of 56 mm and a suprarenal saccular aneurysm of 40mm, just above the orifice of the celiac axis (Image 1). His medical history was significant for hypertension, dyslipidemia, coronary artery disease with previous CABG and heart failure with an ejection fraction at 40%, under treatment.

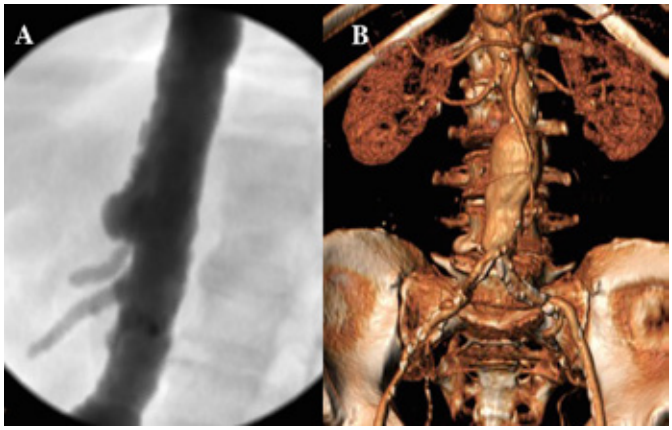

Image 1. Pre-operative CTA revealed a para-visceral saccular aneurysm just above the orifice of the celiac axis (Panel A) and an infrarenal AAA (Panel B).

After an extensive discussion with the patient about the different management options, an endovascular approach with a conventional graft for the infrarenal aneurysm and a custom-made tapered graft, combined with a self-expanding graft for the celiac axis to exclude the supra-celiac aneurysm using the chimney technique was decided. Under general anesthesia, a bifemoral and a left brachial access were used. The celiac trunk was catheterized and stented using the self-expanding covered stent (Viabahn, Gore, 8x100 mm). For the treatment of the suprarenal aneurysm, a custom-made conical graft (Bolton Relay 34-30x80mm) was inserted in the proximal aortic aneurysm. (Image 2) The distances between the splanchnic vessels permitted such a solution, as an adequate

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sealing zone of 15mm between the coeliac trunk and the superior mesenteric artery (SMA) was available. The proximal landing zone had a median diameter of 29mm while the distal supra-SMA diameter was 25.7mm. The tapered morphology of the aorta at this level set the indication of a custom-made endograft. For the infrarenal AAA, an Excluder endograft (Gore & Associates, Inc, CA, USA) was used (main body 26-14.5x160 mm, contralateral limb 16x120mm). Completion angiography confirmed successful sac exclusion with no endoleak (Image 3). Post-operatively, the patient remained stable, while the renal or hepatic function were recorded within normal limits. No spinal cord ischemia symptoms were arisen post-operatively. The computed tomography angiography of 5th day showed a complete exclusion of the aneurysms, a patent celiac stent graft and no endoleak. The patient was discharged the 6th post-operative day under double antiplatelet treatment with aspirin 100mg and clopidogrel 75mg daily for the first 6 months and single antiplatelet therapy with aspirin 100mg thereafter. During a 5-year follow-up, the aneurysmal sacs were eliminated, the graft of the celiac artery remained patent, and no endoleak was detected. (Image 4) This case presentation was approved by the Institution's Review Board.

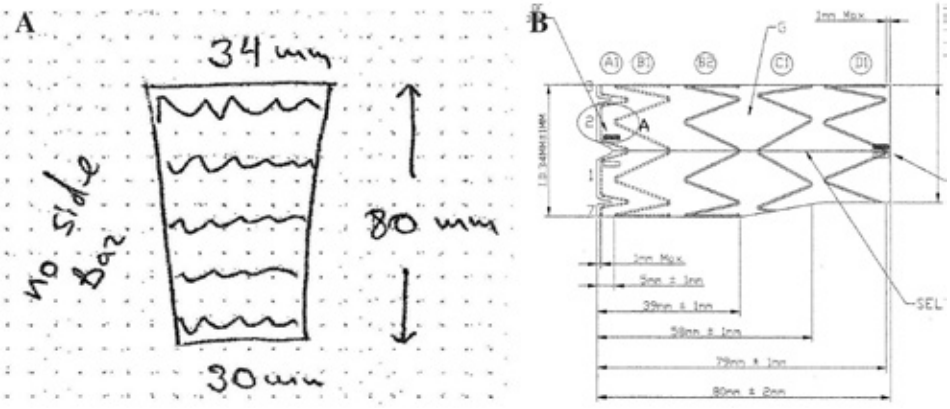

Image 2. A fast custom-made device offered an off-the-shelf solution to the patient (Panel A & B).

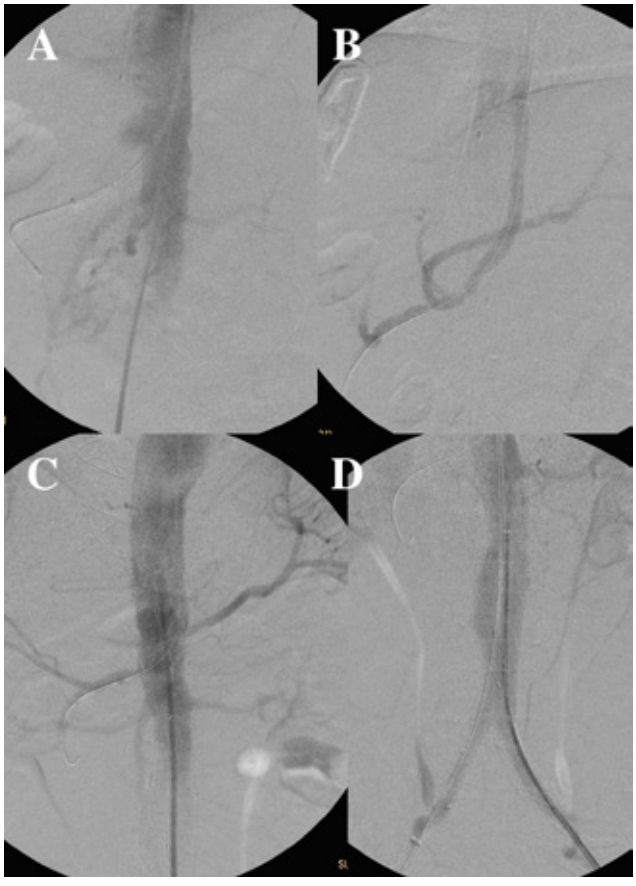

Image 3. The celiac trunk was catheterized and stented (Panel A & B). The custom-made endografts was deployed (panel C). Completion angiography revealed the exclusion of the sacs and the patency of the grafts (Panel D).

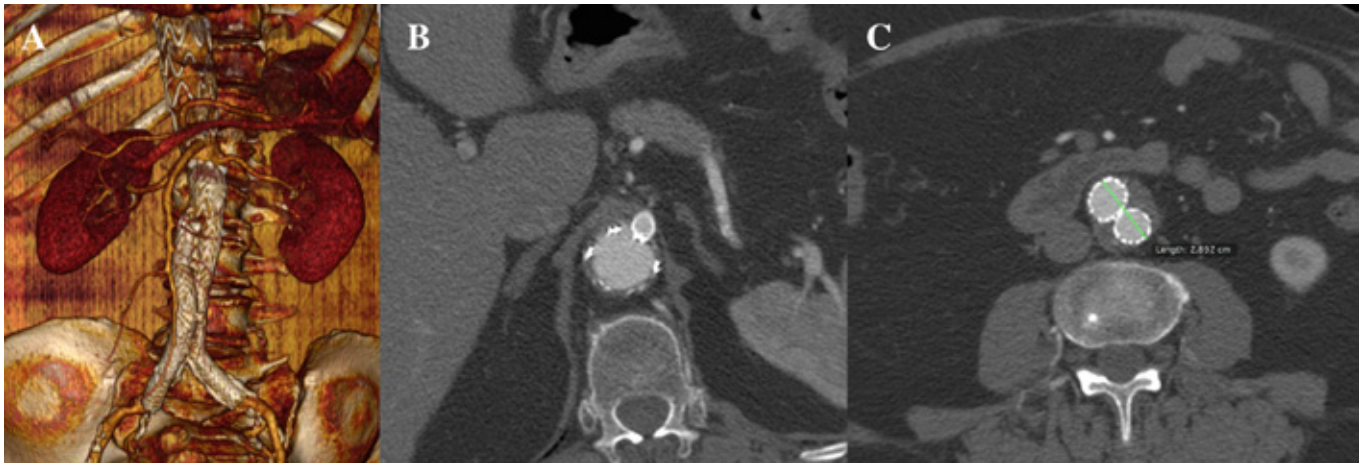

Image 4. 5-year follow-up CTA confirmed the patency of the grafts (Panel A & B) as well as the exclusion and shrinkage of the sacs (Panel C).

DISCUSSION

Chimney technique has gained popularity as an off-the-shelf technique for the treatment of complex abdominal aortic aneurysms, offering a safe and durable approach when fenestrated or branched endografts are contraindicated or unavailable.[4] It permits a tailor-made solution which is eligible to the specific anatomical characteristics of the patient, using common material that are available at the surgeon's daily routine practice.[5] The off-the-shelf endografts offer the advantage of the faster assessment-to-treatment time in a single or multiple stage procedures when aneurysmal deformation includes the para-visceral aorta.[5]

In this case, standard endovascular aortic aneurysm repair (EVAR) was applied for the infrarenal aneurysm. For the isolated para-visceral aneurysm, a custom-made solution was selected. Despite its minimal diameter (40mm), the saccular morphology of the aneurysm as well as its location, just above the orifice of the celiac axis, were the main indications for an immediate endovascular approach. According to the latest ESVS Guidelines for the management of the aorto-iliac aneurysms, saccular aneurysms should be confronted as a separate aortic pathology. An infection should be excluded in any case. The optimal treatment should be decided according to the patient's specific anatomy and risk factors. The higher risk of rupture should be kept in mind and an early interventional repair may be considered.[6] Furthermore, in this case, the extended comorbidities of the patient eliminated any option of open repair.

Chimney technique was feasible as celiac axis was patent and there was a sufficient distal landing zone at the moment of treatment. Although, no conventional thoracic endograft was applicable in this case, as all thoracic endografts have a minimum length of 100mm. As the parallel graft of the celiac trunk available was 100mm in length, a mismatch between the two endografts was inevitable. Furthermore, the conical formation of the aorta excluded any standard solution. In this case, a fast custom-made tapered endograft of 80mm offered a technically feasible alternative. A more complicated solution, as a branch or fenestrated device could be achievable in this patient. The need for a four-vessel catheterization and stenting for a limited aneurysmal disease, as well as the cost-effectiveness of these devices, enforced the decision through a parallel-graft technique.

In the current literature, there is scarce information concerning the isolated para-visceral aneurysms. A case report of a mycotic para-visceral aneurysm treated with fenestrated endograft has already been reported.[7] Chimney technique offers an alternative solution when fenestrated or branched devices are contraindicated or unavailable in complex aortic anatomies as well as in cases of para-visceral aneurysms.[5] The eligibility of the technique permits an endovascular approach at the majority of the patients with complex aneurysmal disease, excluding only the 17% of them at one series.[5] Furthermore, the short and long-term encouraging data confirm the safety and durability of the method in these cases.[2, 3]

CONCLUSION

Para-visceral aortic aneurysms could be completely treated with endovascular technique. In the few cases reported so far endovascular repair showed promising results, in terms of safety and durability. An extended pre-operative planning and knowledge of all disposable means is demanded to offer an efficient treatment to each patient's anatomic characteristics.

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