



Case Report

Physician-modified Zenith Alpha® endovascular stent-graft for complex pararenal aneurysm

Endoprótesis endovascular Zenith Alpha® modificada manualmente (fabricada en casa) para el tratamiento de un aneurisma pararenal complejo

L. Cruz¹, Cáterin Arévalo Zamora²

¹Department of Interventional Radiology. Universidad de Antioquia. Medellín, Colombia. ²Department of Angiology, Vascular Surgery, and Endovascular Surgery. Fundación Santa Fe. Bogotá, Colombia

Keywords:

Endovascular treatment.
Endovascular repair. Abdominal aortic aneurysm.
Endoprosthesis.

Abstract

We present a case report showing our experience, step by step, on the adaptation of a modified prosthesis to treat a pararenal aneurysm in a 70-year-old patient who had an abdominal pain. He smokes. And in the surgical history he had an appendectomy and colecistectomy. Without relevant comorbidities.

Palabras clave:

Reparación endovascular.
Tratamiento endovascular.
Aneurisma abdominal aórtico. Endoprótesis.

Resumen

Presentamos un caso clínico que muestra nuestra experiencia, paso a paso, en la adaptación de una prótesis modificada para el tratamiento de un aneurisma pararenal en un paciente de 70 años con dolor abdominal. Fumador. Como antecedentes quirúrgicos, se le realizó una apendicectomía y una colecistectomía. Sin comorbilidades relevantes.

Received: 04/10/2025 • Accepted: 05/05/2026

Conflicts of interest: the authors declared no conflicts of interest whatsoever.

Artificial intelligence: the authors declare that they did not use artificial intelligence (AI) or any tool using AI in the writing of this article.

Cruz L, Arévalo Zamora C. Physician-modified Zenith Alpha® endovascular stent-graft for complex pararenal aneurysm. Angiología 2026;78(4):188-192

DOI: 10.20960/angiologia.00759

Correspondence:

Cáterin Arévalo Zamora. Department of Angiology, Vascular Surgery, and Endovascular Surgery. Fundación Santa Fe. Carrera 7, 117-15. A.A. 220246 Bogotá, Colombia
e-mail: cate-90@hotmail.com

INTRODUCTION

Repair of a pararenal abdominal aortic aneurysm (AAA) is more complex than repair of a standard infrarenal AAA (1). Modified fenestrated grafts extend the benefits of endovascular therapy to patients with aortic aneurysms and hostile anatomy (2). Homemade physician-modified fenestrated grafts are not a highly costly solution (3). The long manufacturing times of custom-made stent-grafts are a limitation for patients who require an immediate solution for their disease; therefore, this may be the best option for the treatment of complex aneurysms (4,5).

CASE REPORT

In this article, we examine and analyze the repair of a complex AAA in a 70-year-old patient with abdominal pain and no associated comorbidities. Imaging studies, including dynamic computed tomography angiography, showed a pararenal aortic aneurysm with suitable diameters for endovascular treatment, with a proximal thoracic aortic diameter of 22 mm (Fig. 1). For this reason, we did not implant a conventional T-Branch de-

vice, because it is designed for a 34-mm diameter and would have generated marked infolding, potentially causing type Ia endoleaks. Therefore, we decided to repair the aneurysm by adapting a homemade stent-graft to the diameter of the thoracic aorta intraoperatively. In addition, intraoperatively, the patient was found to have an unusual origin of the right hepatic artery from the superior mesenteric artery (SMA). This finding may be present in up to 20% of patients and is highly relevant, because inadvertent catheterization of this vascular structure can lead to procedural errors and prolong the intervention. As shown on computed tomography angiography, the aneurysm presented several anatomical features consistent with hostile anatomy, according to the identification of factors that modify the prognosis of endovascular aneurysm repair.

We conducted multiplanar reconstruction using computed tomography angiography to ensure the accuracy of the fenestrations, followed by printing of a 1:1-scale 3D aortic model based on the patient's DICOM file. Using this model as a physical template, the orifices corresponding to the renal arteries and the celiac trunk were marked on the Zenith Alpha® device. The fenestrations were created manually and reinforced with



Figure 1. Computed tomography angiography of the pararenal aorta used for ex vivo mapping of the fenestrations.

polypropylene suture and radiopaque markers. Selective cannulation was performed through bilateral femoral vascular access and right subclavian access. The stent-graft was implanted using conventional methods. The images show how the stent-graft was manufactured by creating manual fenestrations with a disposable cautery device used in conventional cardiac valve surgery. To reinforce the fenestrations, we used Ethibond® suture with the assistance of a Medtronic retrieval device. Finally, the image of the homemade stent-graft is shown (Fig. 2).

We show the intraoperative completion arteriography performed to verify procedural success after stent-graft implantation and aneurysm correction. It is very important not to overlook the care required when cannulating structures in patients with anatomical variants. In this case, we recognized the error because of the direction of flow and the position

of the guidewires. We show 2 images, before and after the procedure (Fig. 3); this is the final result of treating a complex aneurysm anatomy when there is neither the money to pay for nor the time to wait for a custom-made stent-graft.

DISCUSSION

Although open surgery remains a valid option in young patients with a low comorbidity burden, a minimally invasive endovascular approach was chosen given the complex pararenal anatomy and the aim of reducing surgical trauma, aortic clamping time, and hospital stay. Detailed planning with a 3-dimensional model allowed us to mitigate the technical risks associated with a hostile sealing zone, offering a personalized alternative with lower perioperative morbidity.

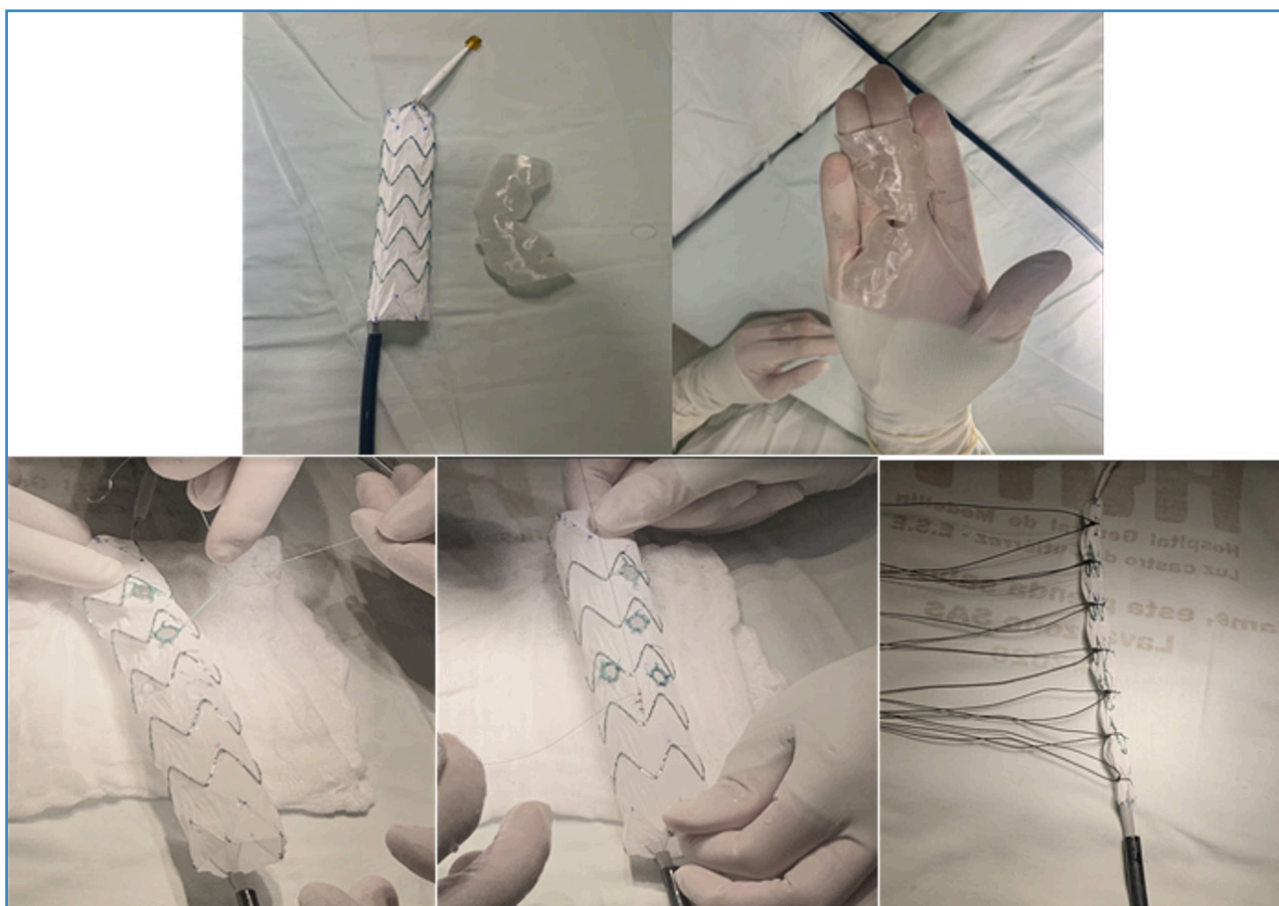


Figure 2. Manual fenestrations created during the operation.

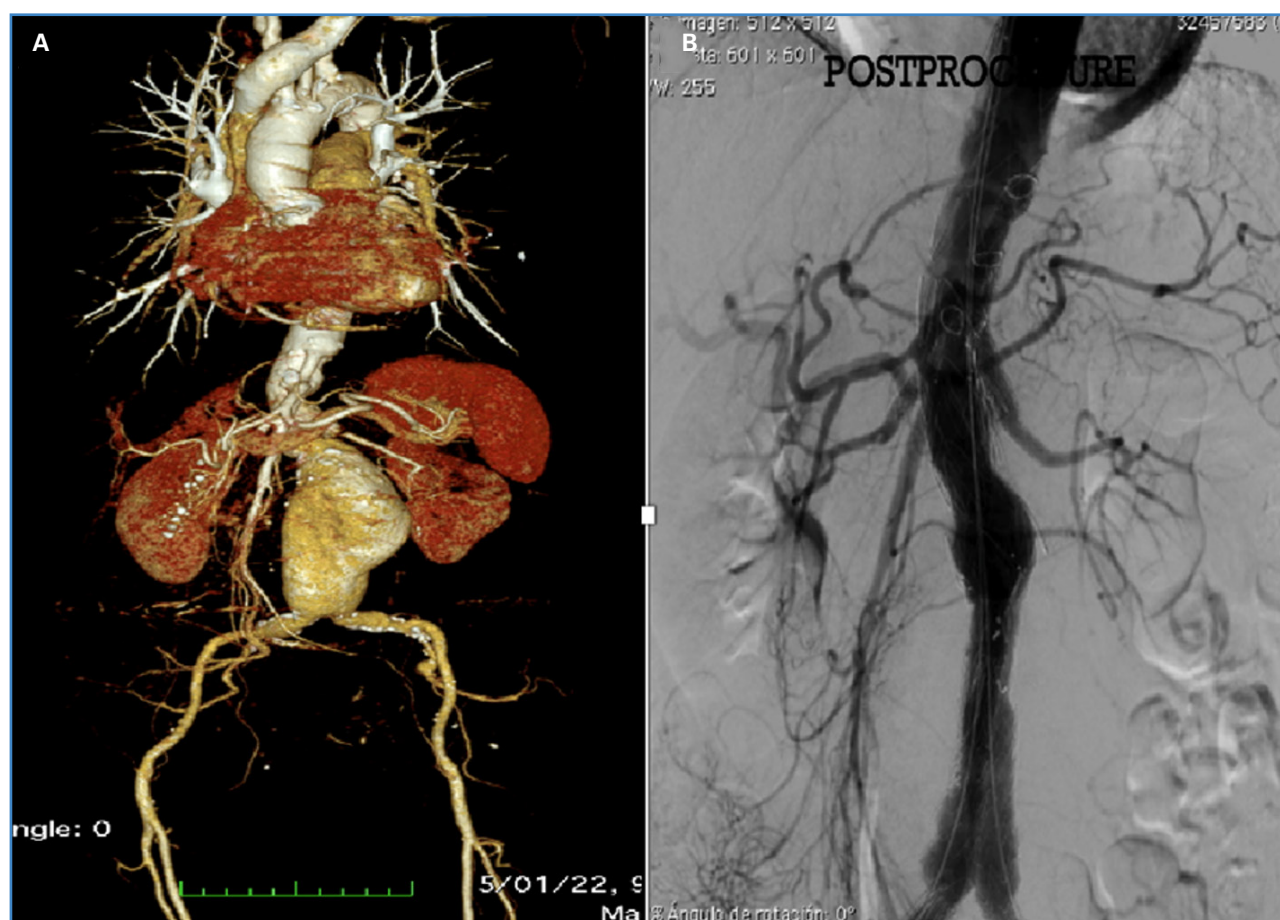


Figure 3. A. Aneurysm before the procedure. B. Final completion angiography showing patency of all visceral branches and complete exclusion of the aneurysm sac, with no evidence of endoleaks.

The need to manually modify Zenith Alpha® stent-grafts, that is, to manufacture them in-house, has become necessary in our setting because of the cost of custom-made stent-grafts and the waiting time required for their arrival. In some cases, T-Branch® devices are not feasible because of their proximal diameter and the anatomical configuration of the patient. Endovascular therapy has expanded significantly and is currently considered a first-line alternative in clinical practice for the management of AAA, particularly when the anatomy is suitable. Although international guidelines maintain open surgery as a cornerstone in patients with low comorbidity, the development of complex techniques such as fenestrated prostheses has broadened the spectrum of patients successfully treated by minimally invasive means. Similarly, commercial branched and fenestrated devices have been developed as a treatment option for short necks and

juxtarenal or pararenal aneurysms. However, the lack of availability in some countries and centers, manufacturing time, and, in our country, the importation and delivery of grafts, in addition to their high cost, mean that they are not a viable primary option.

REFERENCES

1. Chaikof EL, Brewster DC, Dalman RL, Makaroun MS, Illig KA, Sicard GA, et al. Reporting standards for endovascular aortic aneurysm repair. *J Vasc Surg* 2002;35(5):1048-60. DOI: 10.1067/mva.2002.123763
2. Bergoeing M, Mertens R, Valdés F, Mariné L, Krämer A, Vergara J. Uso de endoprótesis fenestrada para la reparación de aneurismas aórticos complejos: Reporte de dos casos. *Rev Chil Cir* 2011;63(5), 519-523. DOI: 10.4067/S0718-40262011000500014
3. Zenith(R) Fenestrated Abdominal Aortic Aneurysm (AAA) Endovascular Graft Clinical Study. ClinicalTrials.gov ID

- NCT00875563. 2017. Available from: <https://clinicaltrials.gov/study/NCT00875563>
4. Different stent graft types to repair thoracic aortic aneurysms. Cochrane Database of Systematic Reviews; 2015. Available from: https://www.cochrane.org/evidence/CD008448_different-stent-graft-types-repair-thoracic-aortic-aneurysms
 5. Prinssen M, Verhoeven ELG, Buth J, Cuypers PWM, van Sambeek MR, Balm R; Dutch Randomized Endovascular Aneurysm Management (DREAM Trial Group. A randomized trial comparing conventional and endovascular repair of abdominal aortic aneurysm. *N Engl J Med* 2004;351(16):1607-18. DOI: 10.1056/NEJMoa042002