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Case Report

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Modified Chimney Technique for the Emergent Treatment of Abdominal Aortic Graft Rupture: A Cardiologist's Point of View

Bernardo Cortese[1*], Elisa Peretti[2], Nicola Troisi[2], Marco Setti[2] and Antonino Piti[3]

Abstract

We describe the case of an emergent endovascular intervention due to the detachment of a graft previously implanted in the abdominal aorta for a ruptured aortic aneurysm. We managed this emergency with positioning of abdominal aortic endoprosthesis and protection of main visceral vessels. Recently, the use of the Chimney technique showed to allow a rapid management of abdominal aortic aneurysms along with the saving of important visceral vessels. We here report a case of a modified chimney technique that possibly will improve the long term vessel patency.

Keywords: Modified chimney technique; Aortic graft detachment; Bare metal stents; Radial approach

Introduction

Secondary prosthesis detachment after open repair of ruptured abdominal aortic aneurysms (AAAs) is a condition of difficult management and is usually caused by infection, perigraft seroma, progression of the disease, or a technical fault at the time of first intervention; reintervention is often considered a second choice because too risky [1,2]. Many experts suggest that this often fatal condition, rarely reported in the literature, should be treated with an endovascular intervention as the first choice. The 2 main issues of its treatment are secure proximal fixation of the endoprosthesis and sparing of important visceral vessels. The technique called "Chimney" has already been described in this emergent situation [3,4]. We here describe a variant of this technique, that in our opinion would improve the long term patency of involved visceral vessels.

Description of the Case of Modified Chimney Intervention

The 74-year-old male referred to our department had a complex surgical history mainly consisting in previous femoro-femoral bypass in crossover (occlusion of the right iliac axis) and a recently operated 55-mm inflammatory infrarenal abdominal aortic aneurysm. The patient had undergone open surgery with aneurysm resection and Dacron graft positioning just proximally to the infrarenal aorta, up to the left common iliac artery (right common iliac artery was occluded and the left-to-right bypass was patent).

Two days after the intervention the patient developed fever (>38°C) and abdominal pain; a CT-scan showed the presence of perigraft fluid collection. The drainage was negative for bacterial infection, thus we hypothesized a perigraft seroma and treated it conservatively. We strictly followed the patient, but three days later he experienced acute lumbar pain and developed a shock status. Urgent CT-scan showed proximal complete detachment of the prosthesis with a giant pseudoaneurysm; moreover, left renal artery appeared occluded due to compression ab extrinseco (Figure 1).

The patient thus was brought to our catheterization laboratory; we obtained two percutaneous accesses, a left femoral and a 6 Fr left radial. The angiography showed a still supplied big pseudoaneurysm (Figure 2). From the left radial approach we engaged the right renal artery, the celiac trunk and the superior mesenteric artery with three common hydrophilic 0.014" guidewires (Balance Middle Weight, Abbott, Illinois, USA) (Figure 3). Then we deployed a tube aortic endograft (Zenith Flex, Cook, Indiana, USA) through the femoral access via a 0.035" super-stiff wire (Lunderquist, Cook, Indiana, USA); this endograft has a proximal free-flow zone intended to spare visceral vessels. Its proximal landing zone in this case was above the right renal artery, whereas distal landing zone reached the left external iliac artery.

After successful deployment of the graft, from the radial access we

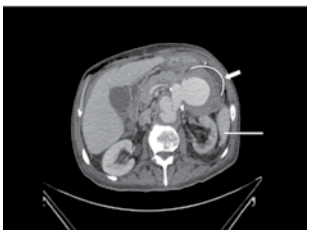

Figure 1: Left renal artery appeared occluded due to compression ab extrinseco.

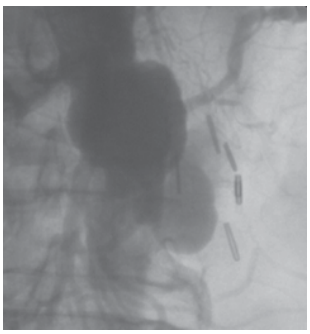

Figure 2: Angiography showing supplied big pseudoaneurysms.

***Corresponding author:** Bernardo Cortese, MD, FESC, Corso di Porta Nuova, 21, 20100 Milano, Italy, Tel: +390263632210; Fax: +390263632210; E-mail: bcortese@gmail.com

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deployed two steel bare metal stents (Express SD 5x19 mm, Boston Scientific, Massachusetts, USA) into the proximal part of the right renal and the superior mesenteric artery, proximally protruding inside the free-flow portion of the endograft. The celiac trunk was patent, thus we decided to leave it without further treatment. Final angiogram showed a complete exclusion of the giant pseudoaneurysm and patency of the celiac trunk, right renal and superior mesenteric arteries (Figures 4 and 5).

Patient was discharged 7 days later, asymptomatic and without further complications. After 12 months the patient was still asymptomatic and CT-scan showed graft and stents patency with good flow (Figure 6).

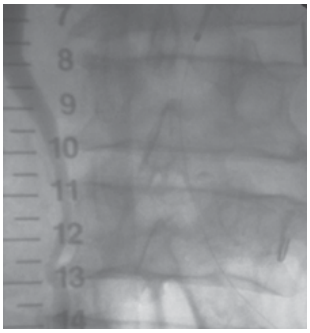

Figure 3: Right renal artery, the celiac trunk and the superior mesenteric artery with three common hydrophilic 0.014" guidewires.

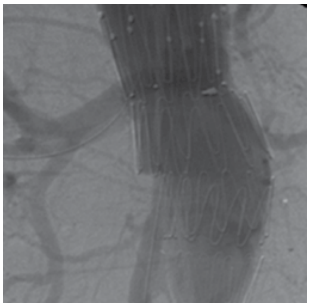

Figure 4: Giant pseudoaneurysms and patency of the celiac trunk, right renal and superior mesenteric arteries.

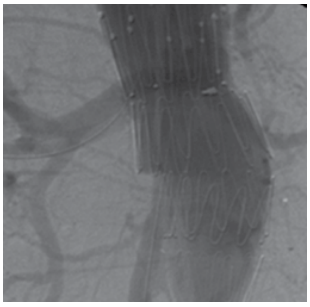

Figure 5: Giant pseudoaneurysms and patency of the celiac trunk, right renal and superior mesenteric arteries.

Figure 6: CT-scan showing graft and stents patency with good flow.

Discussion

Mid and long-term failure of abdominal aortic grafts is an emergent situation requiring rapid diagnosis and treatment [1]. Reintervention is often contraindicated due to the very high operative risk, therefore some endovascular techniques have been developed to face this situation, assuring lower mortality and better medium term outcomes [5,6].

One of the proposed techniques for this emergent intervention is the creation of a dedicated, custom-made fenestrated graft; however this option is not feasible in case of emergencies [7]. The other chance is to use the Chimney technique, that contemplates the placement of long stents protruding proximally to the endograft, in order to protect main visceral vessels. Greenberg [8] reported the placement of self-expanding or balloon-expandable stents into the renal artery with a long segment running parallel to the aortic wall, between the wall and the graft material during EVAR. Later Criado and Donas among other authors described the "Chimney grafts" intervention with the interposition of a stent between a thoracic endograft and the aortic wall [9].

We decided to adopt a Chimney technique in this patient mainly due to his critical condition. In our report, the peculiarity that distinguishes our intervention from the other previously described was the decision to place two short bare metal stents protruding up to the free flow portion of the endograft, a zone where a normal perfusion pressure is warranted; in fact, we felt that longer stents like those used in the classic Chimney technique would have inadequate radial strength to resist the long term compression of the endograft, and would result in their occlusion or fracture.

Moreover, we felt safe to use common coronary bare metal stents because they have a lower thrombotic occlusion rate than covered stents, and warrant a more precise deployment if compared to self-expanding stents.

Finally, the radial approach used to wire the visceral vessels and to stent them is feasible and easy also due to the high uptake of their ostium.

Conclusions

This case shows a new, modified Chimney technique used to spare visceral vessels during emergent endoprosthesis intervention. At 12-month follow up the short bare metal stents used were patent. Bigger series of patients treated with this technique will show if this technique is a valuable alternative to the common Chimney technique, to obtain long term visceral vessels patency.

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Author Affiliations

Top

[1]*Interventional Cardiology, A.O. Fatebenefratelli, Milano, Italy*
[2]*Vascular Surgery, Cardiovascular Dpt., Humanitas Gavazzeni, Bergamo, Italy*
[3]*Interventional Cardiology, Cardiovascular Dpt., Humanitas Gavazzeni, Bergamo, Italy*