Clinical Case Reports International

Surgical Technique
Published: 25 Jun, 2024

Standardized Branch Closure of a Zenith t-Branch with the Amplatzer Vascular Plug-in Visceral Vessel Occlusion

Bonanno P[1], Donato F[2], Ottavi P[1], Grasselli F[1], Gugliotta MC[1], Silvestri GP[1] and Micheli R[1]*

[1]*Unit of Vascular Surgery, Azienda Ospedaliera Santa Maria, Terni, Italy*

[2]*Unit of Vascular Surgery, Fondazione Policlinico Universitario Gemelli IRCCS, Roma - Università Cattolica del Sacro Cuore, Italy*

Abstract

The Zenith t-Branch endograft (Cook Medical, Bloomington, IN) is an off-the-shelf multibranched prosthesis available for the treatment of thoracoabdominal aortic aneurysm in patients unfit for open repair. In challenging aortic anatomies, because some branches may not have a patent target vessel for connection, the plugging of the unusable branch can increase the anatomic applicability of off-the-shelf devices. We report an approach using a 12-mm Amplatzer Vascular Plug for intraoperative closure of celiac artery branch and a 10-mm Amplatzer Vascular Plug for renal artery branch closure.

Keywords: Zenith T-branch; Multibranched stent graft; Endovascular repair; Thoracoabdominal aortic aneurysm

Introduction

Fenestrated and branched endograft provide a less invasive treatment option for complex aortic aneurysms in patients at high surgical risk [1]. To increase the use of these technologies in the acute setting, off-the-shelf solutions have been proposed to adapt as many different anatomical configurations as possible [2].

The Zenith t-Branch endograft (Cook Medical, Bloomington, IN) is the first off-the-shelf multi-branched stent graft available in Europe for the treatment of thoracoabdominal aneurysm in an emergency setting. The characteristics of the endograft have been extensively described in previous reports [3].

We report a standardized approach using a 12-mm Amplatzer Vascular Plug (AGA Medical Corporation, Plymouth MN, USA), for intraoperative closure of the Celiac Trunk (CT) branch and a 10-mm Amplatzer Vascular Plug for closure of renal artery branch, in five consecutive patients.

Patients provided written informed consent for the report of case details and imaging studies.

Technique

All procedures were performed in a hybrid operating room and all patients underwent general anesthesia. The usual technique for multi-branched device implantation has been widely previously described [3,4].

The Zenith t-Branch endograft was introduced through the femoral artery and led to the level of the visceral aortic vessels. Subsequently, deployment was performed keeping each branch cuff above the target vessels to facilitate subsequent cannulation and bridging with peripheral stent grafts.

After complete release of the endograft, branch cuff bridging was achieved with a balloon-expandible peripheral stent graft through cranial access.

To overcome the problem of the occluded visceral vessel, the side branch catheterization was performed *via* axillary artery access through a 6-F sheath into a 12-F sheath, using a coaxial technique. The Amplatzer Vascular Plug was deployed within the branch cuff according to the deployment technique described by Ferreira et al. [5]. The disk of the vascular plug was released within the branch and, by gradually pulling the device backward toward the aortic lumen, complete deployment of the remainder of the body inside the 21- or 18-mm-long side branch (CT or renal arteries) was achieved. The 12-mm-wide plug was oversized for the 8-mm-diameter side branch (CT) while the 10-mm-wide plug was oversized for the 6-mm-diameter side branch (renal arteries)

OPEN ACCESS

***Correspondence:**
Paolo Bonanno, Unit of Vascular Surgery, Azienda Ospedaliera Santa Maria, Viale Tristano di Joannuccio- 05100 Terni, Italy, Tel: +39 3314483136;

Received Date: *04 Jun 2024*
Accepted Date*: 20 Jun 2024*
Published Date*: 25 Jun 2024*

Citation:
Bonanno P, Donato F, Ottavi P, Grasselli F, Gugliotta MC, Silvestri GP, et al. Standardized Branch Closure of a Zenith t-Branch with the Amplatzer Vascular Plug-in Visceral Vessel Occlusion. Clin Case Rep Int. 2024; 8: 1693.

***Copyright** © 2024 Bonanno P. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.*

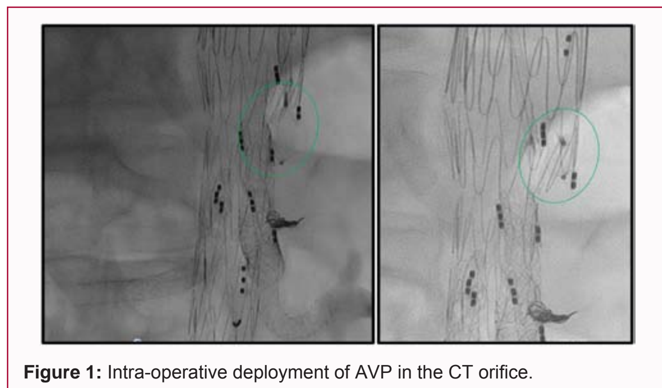

Figure 1: Intra-operative deployment of AVP in the CT orifice.

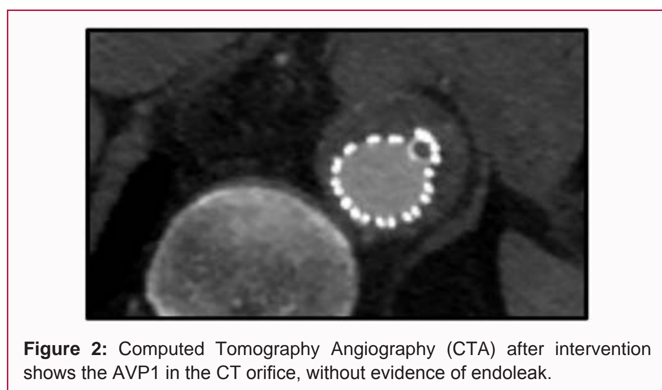

Figure 2: Computed Tomography Angiography (CTA) after intervention shows the AVP1 in the CT orifice, without evidence of endoleak.

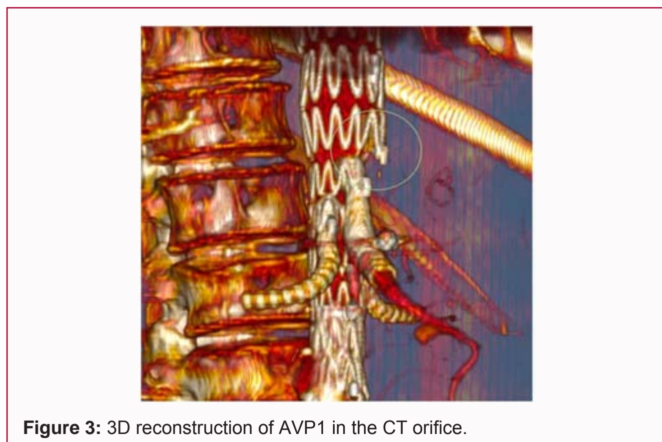

Figure 3: 3D reconstruction of AVP1 in the CT orifice.

(Figure 1).

Technical success, with branch occlusion and without plug-related endoleak, was achieved in all treated patients (Figure 2, 3).

Discussion

Customization of fenestrated or branched endoprostheses usually requires about 6 to 8 weeks and may limit the availability of these devices in the acute setting.

According to the instruction-for-use, implantation of the Zenith T-branch device requires four patent visceral arteries.

Therefore, the plugging of the unusable branch can increase the anatomical applicability of these devices in the acute setting in cases with challenging aortic anatomies, such as in patients with CT occlusion or with a single kidney.

Although the use of plugs for embolization of peripheral vascular lesions or potential sources of type II endoleaks is well known [6,7], only a few reports have described their use in multi-branch stent-graft branch closure.

Figure 4: AVP.

We propose a standardized approach using an AVP-12-mm for CT side branch and an AVP-10-mm for renal arteries. The choice of plug diameter is in accordance with the recommended oversizing, which is generally ~30%. Contrary to previous reports, we preferred an AVP and not an AVP-II. Although AVP-II is more thrombogenic than AVP and can give good results in a high-flow situation [8,9], we believe that AVP can provide greater stability within the cylindrically shaped side branches of the endograft. AVP-II has three components and requires a long deployment zone, therefore its application outside a native vessel in relatively short branch cuffs may be challenging because of its instability. In comparison, AVP consists of a single-layer cylindrical disk that provides rapid occlusion with precise and easy deployment (Figure 4).

Conclusion

Endovascular branch closure of a Zenith t-Branch with the 12- or 10-mm AVP is simple and effective. It shows advantages in cases of challenging aortic anatomies, erasing the long manufacturing time needed for a customized endograft. In addition, the plugging of the unusable branch cuff can increase the anatomic applicability of off-the-shelf devices in the acute setting.

References

1. Anderson JL, Adam DJ, Berce M, Hartley DE. Repair of thoracoabdominal aortic aneurysms with fenestrated and branched endovascular stent grafts. J Vasc Surg. 2005;42:600-607.
2. Sweet MP, Hiramoto JS, Park K-H, Reilly LM, Chuter TAM. A Standardized multi-branched thoracoabdominal stent-graft for endovascular aneurysm repair. J Endovasc Ther. 2009;16(3):359-64.
3. Bosiers MJ, Bisdas T, Donas KP, Torsello G, Austermann M. Early experience with the first commercially available off-the-shelf multibranched endograft (t-Branch) in the treatment of thoracoabdominal aortic aneurysms. J Endovasc Ther. 2013;20(6):719-25.
4. Chuter TA, Rapp JH, Hiramoto JS, Schneider DB, Howell B, Reilly LM. Endovascular treatment of thoracoabdominal aortic aneurysms. J Vasc Surg. 2008;47(1):6-16.
5. Ferreira M, Monteiro M, Lanziotti L. How to occlude a side branch on a branched stent-graft during an endovascular thoracoabdominal aortic aneurysm repair. J Endovasc Ther. 2009;16(4):454-6.
6. Burbelko M, Kalinowski M, Heverhagen JT, Piechowiak E, Kiessling A, Figiel J, et al. Prevention of type II endoleak using the AMPLATZER vascular plug before endovascular aneurysm repair. Eur J Vasc Endovasc Surg. 2014;47(1):28-36.
7. Lopera JE. The Amplatzer vascular plug: Review of evolution and current applications. Semin Intervent Radiol. 2015;32(4):356-69.

8. Mihlon F, Agrawal A, Nimjee SM, Ferrell A, Zomorodi AR, Smith TP, et al. Enhanced, rapid occlusion of carotid and vertebral arteries using the AMPLATZER Vascular Plug II device: The Duke Cerebrovascular Center experience in 8 patients with 22 AMPLATZER Vascular Plug II devices. World Neurosurg. 2015;83(1):62-8.

9. Schwartz M, Glatz AC, Rome JJ, Gillespie MJ. The Amplatzer vascular plug and Amplatzer vascular plug II for vascular occlusion procedures in 50 patients with congenital cardiovascular disease. Catheter Cardiovasc Interv. 2010;76(3):411-7.