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CASE REPORT

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Acute thrombotic occlusion of a brachiocephalic branch graft and pseudoaneurysm formation after debranching surgery for a "non-A non-B" aortic dissection

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Abstract

Non-A non-B aortic dissection is a pathology with potentially life-threatening consequences, and aortic debranching followed by thoracic endovascular aortic repair is one of the possible treatment options. Branch graft occlusion is an infrequent complication and no definite guidelines exist about postoperative antithrombotic therapy nor preoperative evaluation of individual anatomical characteristics—in particular regarding cerebral circulation—in such patients. We present the case of a 54-year-old man undergoing an aortic debranching procedure for a thoracoabdominal aortic dissection originating in the aortic arch, complicated by thrombotic occlusion of the brachiocephalic branch of the prosthesis and pseudoaneurysm of the ascending aorta, with our management and considerations.

KEYWORDS
antithrombotic therapy, aortic dissection, debranching, pseudoaneurysm, thrombosis, vascular complications

1 | INTRODUCTION

Aortic dissection is a pathology with potentially life-threatening consequences.[1] According to the Stanford classification, aortic dissection is divided into Type A and Type B.[1–3] The two types differ substantially from their clinical presentation to their treatment modalities and prognosis. However, there is still some disagreement regarding dissection involving the aortic arch, since some authors define it as "proximal Type B," while others refer to it as "non-A non-B."[3–5] Although apparently trivial, this definition can radically change the choice of treatment and outcome of each patient. Aortic arch debranching followed by endovascular aortic repair is one of the surgical treatment options[3,5] and can be complicated, among others, by branch occlusion of the prosthesis, which is rare but potentially lethal.[6–8] However, to this day, no consensus regarding postoperative antithrombotic treatment and preoperative functional and anatomical neurological assessment exists. We present our management approach for the case of a

Abbreviations: FET, Frozen elephant trunk; LCA, left carotid artery; LSA, left subclavian artery; MDT, multidisciplinary team; TEVAR, thoracic endovascular aortic repair.

Sara Saltarocchi and Paolo De Orchi contributed equally to this study.

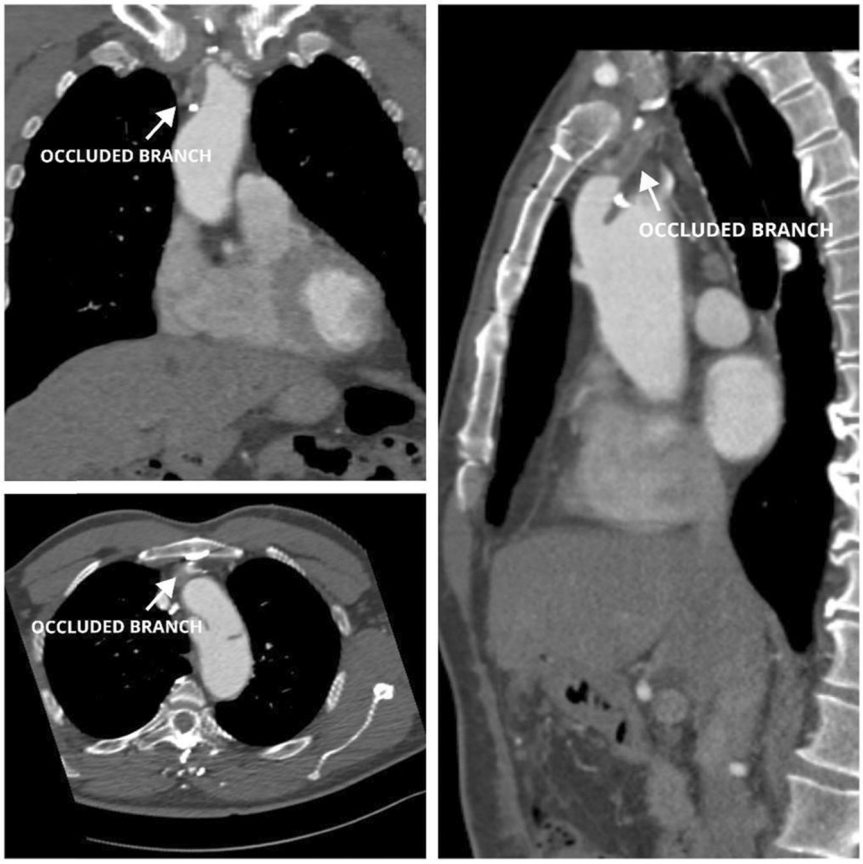

FIGURE 1 Computed tomography scan revealing innominate artery branch occlusion.

54-year-old man who underwent aortic debranching, complicated by thrombotic occlusion of the graft's brachiocephalic branch and pseudoaneurysm of the ascending aorta.

2 | CASE PRESENTATION

A 54-year-old man presented to the emergency department with diffuse abdominal pain radiating to the back; his past medical history was characterized by long-standing, drug-resistant hypertension and a smoking habit. A computed tomography (CT) scan revealed a thoracoabdominal aortic dissection with the intimal tear entry located in the aortic arch at the level of the origin of the left subclavian artery (LSA). The dissection extended down to the iliac arteries, with the left renal artery originating from the false lumen; both iliac arteries were aneurysmatic with eccentric thrombotic apposition (Supporting Information: Video 1). A multidisciplinary team (MDT) agreed to adopt a hybrid approach: a debranching operation was scheduled as the first step (leaving the dissected LSA in place), followed by carotid–subclavian bypass, thoracic endovascular aortic repair (TEVAR), and aortobiiliac bypass surgery. The patient successfully underwent off-pump supra-aortic trunks debranching with an Intergard Silver Knitted Bifurcated prosthesis (16 × 8 mm). No intraoperative complications occurred.

On the fifth postoperative day, the patient developed neurological and psychiatric symptoms, including elevated mood with hypomanic episodes, amaurosis fugax, right-sided muscle weakness, and hypoesthesia. A brain magnetic resonance (MR) imaging showed bilateral frontal and parietal ischemic lesions (Supporting Information: Video 2). An intracranial angio-CT, performed 2 days later, revealed complete occlusion of the brachiocephalic branch of the prosthesis (Figure 1). Consequently, progression to TEVAR was momentarily contraindicated. After a few days of observation, the MDT decided to re-evaluate the patient after a period of neuromuscular rehabilitation therapy, since his clinical conditions were improving. A control angio-CT scan, 2 months later, confirmed thrombosis of the brachiocephalic branch of the graft and revealed a pseudoaneurysm of the ascending aorta, located inferiorly to the anastomosis with the vascular prosthesis (Figures 2 and 3); the ischemic lesions were unmodified. It was then decided to perform aortobiiliac bypass surgery to treat the aneurysms of the iliac arteries, and aortic arch surgery was programed to be performed as a second-stage procedure at a later time. The postoperative course following the aortobiiliac bypass was uneventful and the patient was discharged home on the 12th day after surgery. Five months later, the patient was rehospitalized to be submitted to arch replacement. A Hemashield Platinum vascular graft (26/10/8/8/10) was implanted in moderate hypothermia, utilizing selective antegrade cerebral perfusion with a thromboendarterectomy of the occluded branch (Figure 4). The postoperative course was uneventful and the patient was discharged home on the 14th postoperative day, with antihypertensive medications and dual antiplatelet therapy.

FIGURE 2 Control computed tomography scan was performed during the second hospitalization and revealed the pseudoaneurysm of the ascending aorta.

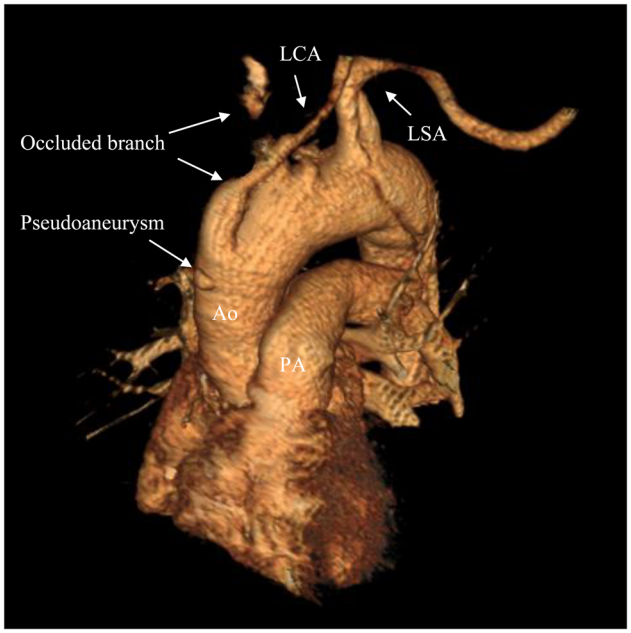

FIGURE 3 Three-dimensional computed tomography reconstruction. A reconstruction showing the pseudoaneurysm in the ascending aorta and the occluded brachiocephalic branch with patent left carotid branch. Ao, aorta; LCA, Left carotid artery; LSA, left subclavian artery; PA, pulmonary artery.

3 | DISCUSSION

Classification of aortic dissection involving the aortic arch but not the ascending aorta is still debated. The 2010 AHA guidelines suggest categorizing patients with descending aortic dissection and entry within the arch as proximal Type B dissection, referring to the original classification proposed by Stanford, although in the 2014 ESC guidelines the subject is not addressed.[1–3] On the other hand, clinical presentation, treatment, and outcome in these patients differ substantially from those presenting with standard Type B aortic dissection; hence, it seems reasonable to consider thoracoabdominal aortic dissection involving the aortic arch to be "non-A-non-B" dissections, even though some authors define as non-A non-B dissections only those confined to the aortic arch.[1–5] Different patient-tailored approaches may be applied in aortic arch surgery, such as aortic arch replacement with either the island technique or the selective reimplantation technique and standard or frozen elephant trunk (FET).[3,5] In case of extended thoracoabdominal dissections involving the aortic arch, hybrid procedures should be considered, the most common of which consists of transposition (debranching) of the supra-aortic trunks followed by TEVAR.[1–3,5] The principle lies in reimplanting the aortic arch vessels on the healthy ascending aorta to create a suitable landing zone for endovascular stent-graft deployment without compromising cerebral and upper limbs perfusion. Alternatively, total endovascular aortic arch repair is also feasible.[3,5]

In our case, planning total arch replacement, in particular with the FET technique, could have been a viable alternative to performing a hybrid procedure. However, the MDT decided to opt for a less aggressive approach to avoid prolonged periods of cardiopulmonary bypass, myocardial ischemia, and hypothermic circulatory arrest as the patient's aorta was not aneurysmatic, which made it suitable for TEVAR,[3,5] the ascending aorta was not dissected, and there was no concomitant aortic valve pathology; at the same time, risk factors for Type A retrograde dissection were not present, since the patient had no bicuspid valve or aortic dilation nor arch abnormalities, and presented normal aortic length and preserved sinotubular junction.[3] Moreover, the patient had recently developed acute kidney injury, probably due to the left renal artery originating from the false lumen of the dissected aorta.

Graft occlusion after aortic arch debranching is an uncommon complication that is reported to occur in 0%–4% of cases, with its most frequent cause being thrombosis.[6–8] Postoperative antithrombotic therapy could potentially reduce the risk of branch occlusion; however, evidence is lacking and there is no consensus regarding anticoagulation or antiplatelet therapy for thrombosis prophylaxis after aortic arch surgery.[8] In this case, the patient only received antiplatelet medications. Despite LSA dissection and brachiocephalic branch occlusion, our patient gradually improved his clinical and neurological conditions because of the integrity of his circle of Willis and blood–brain barrier, as confirmed by subsequent brain imaging. This allowed to postpone the reoperation to avoid the higher perioperative neurological risks associated with early reintervention. A functional neurological assessment before aortic arch surgery with intracranial Doppler ultrasound, as described by some authors,[9,10] intracranial angio-CT or MR,[11] in addition to the standard

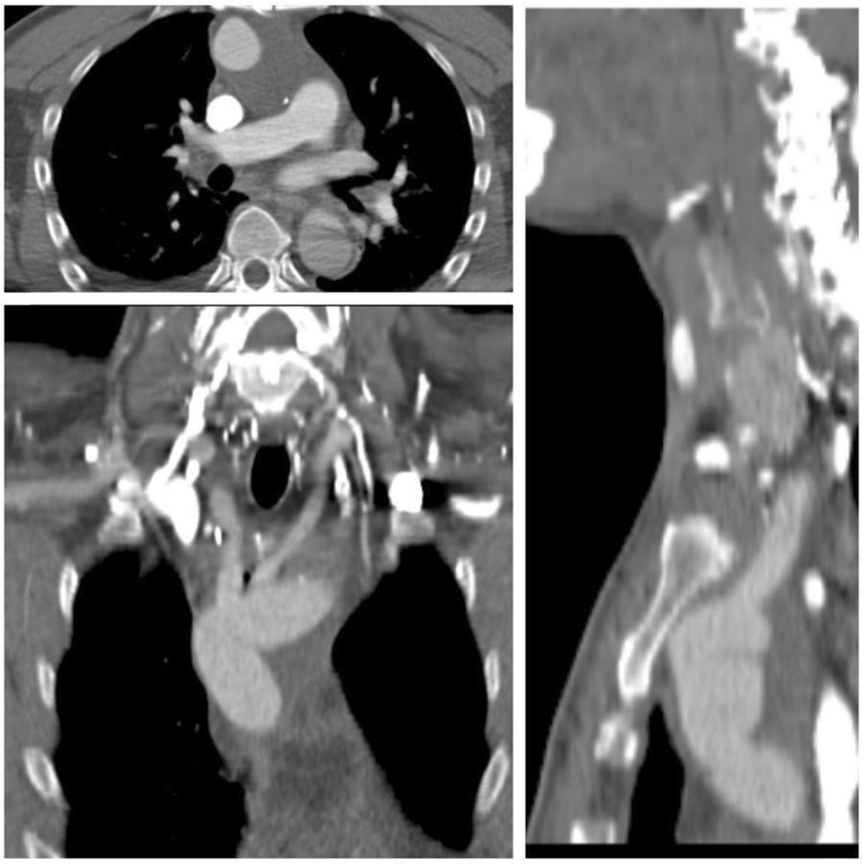

FIGURE 4 Computed tomography scan performed after arch replacement surgery.

preoperative examinations, could represent useful tools to be employed in this setting.

Our patient is currently in excellent clinical condition. Control CT scan confirmed neurological integrity and no progression of the dissection.

4 | CONCLUSIONS

Classification and treatment of complex thoracoabdominal dissections involving the aortic arch still represent a debated topic. Branch occlusion is a rare but potentially devastating complication of aortic debranching. Implementation of specific directives regarding anticoagulation/antiplatelet therapy in patients undergoing aortic arch surgery is an issue that should be tackled to avoid such complications. Preoperative evaluation of the circle of Willis to determine the adequacy of its collateral circulation would allow for the creation of a better risk-stratification system.

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AUTHOR CONTRIBUTIONS

All authors contributed to this study. Giuseppe Mazzesi and Fabio Miraldi conceived the case report. Sara Saltarocchi, Paolo De Orchi, and Emmanouela Chourda wrote the paper. Mizar D'Abramo, Wael Saade, Silvia Romiti, Mattia Vinciguerra, and Ernesto Greco revised it critically for important intellectual content. All authors approved the final version of this report.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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