Bilateral aberrant vertebral arteries from descending thoracic aorta in open thoracoabdominal aneurysm repair

Iván Martín-González, PhD,^a Jesús Gómez-Planas, PhD,^b and Eduardo Tebar Botí, MD^b

▶ Video clip is available online.

A 53-year-old male who had undergone a previous ascending aorta replacement (acute type A aortic dissection 4 years earlier) developed a type 1 thoracoabdominal aneurysm with distal arch involvement. The maximum diameter at the proximal descending thoracic aorta (pDTA) was 65 mm. A computed tomography scan showed that both vertebral arteries (VAs) were aberrant, arising from the pDTA (Figure 1).

An open repair was performed with several adjuncts, including left heart bypass, mild systemic hypothermia (33°C), sequential aortic clamping, cerebrospinal fluid drainage, visceral perfusion with isothermic blood, and somatosensorial/motor evoked potentials. A prefabricated multibranched 28-mm Dacron graft (Coselli graft; Vascutek, Inchinnan, United Kingdom) was interposed between the arch distal to the left common carotid artery (LCCA) and the abdominal aorta distal to the celiac axis (CA), with 3 additional 10-mm Dacron grafts for reimplantation of the left subclavian artery (LSA), VA patches, and T7 to T12 intercostal arteries (“snake” graft)¹ (Figures 2-4). After proximal aortic clamping distal to the LCCA and pDTA opening, severe bradycardia with short transient auditive potential loss occurred (brainstem ischemia), which was recovered after controlling VA backflow with

Computed tomography scan showing the vertebral arteries from the descending aorta (arrows).

CENTRAL MESSAGE

An aberrant origin of vertebral arteries arising from the descending thoracic aorta is a rare anomaly. If unrecognized, potential complications may occur during open or endovascular procedures.

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4 F Fogarty catheters. A distal aortic clamp was placed at the suprarenal position for distal anastomosis and CA grafting. Additional intraoperative data were long left heart bypass and cross-clamp times (374 and 293 minutes, respectively) and severe bleeding necessitating multiple transfusions.

The duration of hospital stay was 41 days (including 30 days in the intensive care unit) due to transient encephalopathy/dialysis, prolonged mechanical ventilation with tracheostomy, left recurrent nerve injury, and wound infection. At postoperative month 6, the patient was clinically recovered, and computed tomography scans indicated a stable repair (Videos 1 and 2).

Aberrant origin of vertebral artery (AOVA) is an anatomic variant that may be misdiagnosed, with subsequent neurologic risk (spinal cord or brainstem ischemia) related to an unintentional VA occlusion in some endovascular/open thoracic aortic procedures. The reported prevalence of the most common AOVA, a left VA from the arch between the LCCA and the LSA, is 2.5% to 8.3%.^{2,3} To our knowledge, only 1 case of bilateral AOVA distal to

From the ^aCardiovascular Surgery Department, Department of Surgery, Hospital Universitari i Politècnic La Fe, University of Valencia, Valencia, Spain and ^bCardiovascular Surgery Department, Hospital Universitario del Vinalopó, Elche, Spain.

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Address for reprints: Iván Martín González, PhD, Cardiovascular Surgery Department, Hospital Universitari i Politècnic La Fe, Av Fernando Abril Martorell 106, 46026 Valencia, Spain (E-mail: ivan.martin@uv.es).

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FIGURE 1. Preoperative computed tomography scan. A, Sagittal view on the left. Proximal aortic clamp site (*dashed red line*) during surgery, left subclavian artery (*black point*), and left vertebral artery (*pink point*) are shown. B, Coronal view on the right. Both vertebral arteries (*arrows*) arising from the true lumen (*red point*) in Ishimaru's zone 3 are visible. No Kommerell diverticula were identified. The false lumen (*blue point*) is partially thrombosed.

FIGURE 2. Surgical picture (surgeon's view, upper side is cranial). A proximal clamp was placed just distal to the left common carotid artery, allowing a vertebral artery (VA) patch and a proximal aortic and left subclavian artery (LSA) anastomosis to be performed in this sequential fashion. This step was technically difficult for this scarred area. The VA and LSA grafts were perfused from the extracorporeal circuit as soon as each distal anastomosis was performed. The *black points* indicate the proximal aortic anastomosis with felt reinforcement at Ishimaru's zone 2. The *red arrow* indicates the direction of blood flow in the Dacron graft for the left subclavian artery. The *purple arrow* indicates the direction of blood flow from the extracorporeal circuit into the Dacron graft for both vertebral artery patches. Its proximal anastomosis was not yet performed at the aortic graft.

FIGURE 3. Surgical picture (surgeon's view, right side is cranial), thoracic view after type 1 thoracoabdominal repair. The *black arrow* indicates the direction of blood flow in the aortic tube graft. The *red arrow* indicates the direction of blood flow in the Dacron graft for the left subclavian artery. The *purple arrow* indicates the direction of blood flow in the Dacron graft for both vertebral artery patches. The *light-blue arrows* indicate the direction of blood flow in the "snake" Dacron graft for intercostal artery reimplantation (felt reinforcement).

FIGURE 4. Postoperative computed tomography scan (*right anterior oblique view*) showing a 3-dimensional reconstruction of the ascending/arch aorta and descending aorta Dacron graft (*dark green point*), superior vena cava (*yellow point*), sectioned innominate artery and left common carotid artery (*light green*), vertebral artery Dacron graft (*purple*), both vertebral arteries (*pink*) and their entry in the transverse foramen (*beige*), left subclavian artery and its Dacron graft (*red*), and "snake" Dacron graft for intercostal artery reimplantation (*blue*).

VIDEO 1. Postoperative computed tomography (*axial view*) at 6 months, showing no radiologic complications of the aortic procedure. Both vertebral arteries were patent. Video available at: [https://www.jtcvs.org/article/S2666-2507\(21\)00162-0/fulltext](https://www.jtcvs.org/article/S2666-2507(21)00162-0/fulltext).

VIDEO 2. Postoperative computed tomography scan at 6 months after volume-rendering reconstruction of the aorta showing a patent graft reconstruction. The celiac axis graft and distal anastomosis of the “snake” graft were performed with 2 branches of the prefabricated multibranched 28-mm Dacron graft. The aorta and aortic Dacron graft are in *brown*, the superior vena cava is in *white*, the sectioned innominate artery and left common carotid artery are in *light green*, the vertebral artery Dacron grafts are in *purple*, both vertebral arteries and their entry into the transverse foramen are in *pink*, the left subclavian artery and its Dacron graft are in *red*, and the celiac axis Dacron graft is in *dark blue*. The “snake” Dacron graft for intercostal arteries reimplantation is in *light blue*; the area between their 2 points is less contrasted. Video available at: [https://www.jtcvs.org/article/S2666-2507\(21\)00162-0/fulltext](https://www.jtcvs.org/article/S2666-2507(21)00162-0/fulltext).

the LSA and retroesophageal right VA has been reported to date.^{4,5}

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