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Total endovascular repair of aortic arch using a triple-branched graft in acute non-A non-B aortic dissection

Short title: Triple-branched graft for endovascular repair of acute aortic arch dissection

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The management of aortic arch dissection, alternatively known as non-A non-B aortic dissection, poses a complex challenge for cardiac surgeons. Conventional open surgery remains the standard treatment approach for this condition, which typically involves deep hypothermic circulatory arrest with selective brain perfusion [1]. However, in selected high-risk patients, thoracic endovascular aortic arch replacement (TEVAR) with isolated or two branched stent-grafts has been introduced into clinical practice [2, 3]. Despite this, the complete TEVAR procedure with triple-branched stent-graft in acute arch dissection involving an entry tear in the aortic arch has not yet been described.

We present the case of a 65-year-old man with peripheral arterial disease, critical limb ischemia, and a history of right limb revascularization, as well as type 2 diabetes, hypertension, multivessel coronary artery disease with reduced ejection fraction. He was admitted to the hospital because of non-specific chest pain. A computed tomography angiography (CTA) scan revealed a non-A non-B aortic dissection involving all three branches: the brachiocephalic trunk (BCT), the left carotid artery (LCCA), and the left subclavian artery (LSA), with a primary entry tear between LCCA and the LSA. The ascending aorta was not dissected, and

the dissection extended into zone 10. Due to the patient's extremely high operational risk (EuroSCORE — 16.93%), severe atherosclerosis with "porcelain aorta" image in the CTA, he was considered for total endovascular aortic arch repair.

The procedure was performed using the Relay Branch Thoracic Stent-Graft System (Terumo Aortic, Glasgow, United Kingdom), a custom-made, triple-branched endograft with a wide window on its superior portion to accommodate inner tunnels for BCT, LCCA, and LSA connection. The stent graft was manufactured according to preoperative CTA scan measurement, and the system was delivered to our hospital within seven days.

The procedure was carried out under general anesthesia, angiography guidance, NIRS (near infrared spectroscopy) monitoring, and systemic heparinization. A stiff guidewire was placed into the left ventricle via a common femoral artery access, and the main stent graft was advanced into the aortic arch. Rapid pacing through a temporary trans-venous pacemaker was established while the endoprosthesis was deployed. Soft guidewires were advanced in a retrograde fashion to BCT via left cervical accesses for catheterization of the inner tunnels. Once the target tunnel was engaged, a stiffer wire was introduced, and the correct positioning was monitored under fluoroscopy. Then, the extension graft was deployed and a molding balloon was inflated to ensure the correct sealing of the components. The same procedure was done for LCCA. Next, the LSA fenestration was catheterized, and covered stent placement was secured via left femoral access. There were no intraoperative complications, and the patient was extubated directly in the operating theatre. The 30-day follow-up visit did not reveal any disease progression.

Aortic arch dissection involving an entry tear in the aortic arch is a complex condition with a higher mortality rate than other types of aortic dissection [4]. Therefore, it is essential that these patients are treated in high-volume cardiac surgery centers with an aortic team on board. This is the only way to provide the entire range of treatment options (conventional surgery, hybrid procedures, and total endovascular aortic arch exclusion) and effectively manage any potential complications that may arise [5].

Article information

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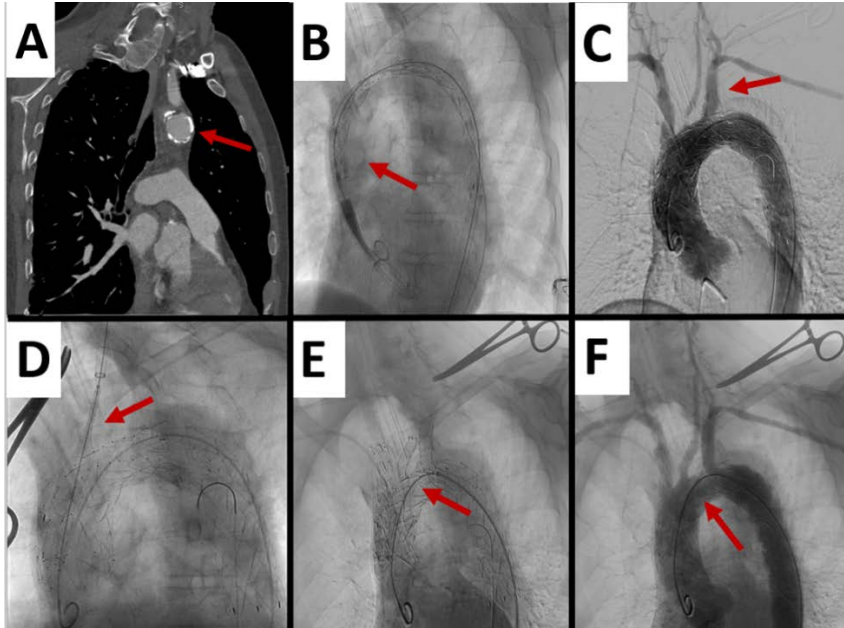


Figure 1. **A.** CTA — non A non B aortic dissection — porcelain aortic arch (arrow). **B.** Aortic stand graft — Landing zone 0 (arrow). **C.** Dissection of all arterial branches of the aortic arch (arrow). **D.** BCT stent-graft implantation (arrow). **E.** Complete, triple-branched stent-graft in aortic arch (arrow). **F.** Final results

Abbreviations: CTA, computed tomography angiography; BCT, brachiocephalic trunk