

Complex aortic reconstruction using "double barrel" frozen elephant trunk

Objective: We present a complex aortic reconstruction with "double barrel" frozen elephant trunk for a 60 year old woman with chronic obstructive pulmonary disease who presented with chronic type B aortic dissection (SVS/STS classification B3,9) with aneurysmal degeneration to 6.5 cm. Computed tomography angiography demonstrated a large proximal entry tear, aneurysmal degeneration to 6.5 cm in the distal arch, and no evident septal fenestrations. The celiac, superior mesenteric and left renal arteries arose from the false lumen whereas the right renal artery arose from the true lumen. Magnetic resonance angiography with 4D flow confirmed the absence of major septal fenestrations and demonstrated poor distal communication between the true and false lumens. She was not a candidate for open thoracoabdominal surgery due to comorbidities and body habitus. Endovascular options were limited by poor proximal landing zone, difficulty excluding arch pseudoaneurysm while maintaining true and false lumen flow, and lack of septal fenestrations. We describe a hybrid aortic arch replacement with "double barrel" frozen elephant trunk (stent-grafts in both true and false lumens) and extension TEVAR to address her complex pathology.

Case Video Summary: The procedure was performed in a hybrid operating room. Prior to sternotomy, separate wires were advanced into the true and false lumen under Intravascular ultrasound and fluoroscopic guidance via bilateral retrograde femoral access. The patient was placed on cardiopulmonary bypass via right axillary artery and central venous cannulation and cooled to 20 °C. The heart was arrested and circulatory arrest was initiated with antegrade cerebral perfusion via the right axillary artery graft. The supra-aortic vessels were divided from the arch and the base of the left subclavian artery was oversewn in preparation for a zone 2 anastomosis. Both the true and false lumen wires were retrieved from the descending aorta and true and false lumen stent-grafts were advanced over their respective wires in an antegrade fashion. Both stent-grafts were then concomitantly deployed and a zone 2 anastomosis was created with the "double-barrel" frozen elephant trunk. A trifurcated arch graft was then anastomosed at zone 2 incorporating both native aorta and the stent-grafts to exclude a potential type 1a endoleak. Lower body perfusion was re-initiated via the perfusion limb of the graft while antegrade cerebral perfusion was continued. The left subclavian, left common carotid, and innominate arteries were sequentially reimplanted into the branches of the graft. Once the patient was rewarmed, we weaned from cardiopulmonary bypass and achieved hemostasis. Next, the bilateral common femoral artery accesses were upgraded to large-bore sheaths and both true and false lumen elephant trunks were extended via retrograde TEVAR. An on-table cone beam computed tomography scan demonstrated a technically satisfactory result with good device apposition, exclusion of the proximal pseudoaneurysm and patency of all branch vessels. The patient had an uneventful recovery.

Conclusions: This case of a hybrid arch reconstruction with "double barrel" frozen elephant trunk and extension TEVAR highlights an innovative approach to address a complex chronic aortic dissection. This technique may be useful in select cases of aortic dissection with limited alternative options.

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