A New Surgical Challenge: Reconstruction of Aortic Arch Aneurysm Late after Norwood Procedure in a Patient with Fontan Circulation – a case report

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Background
• 27 y.o. male with Fontan circulation palliation for transposition of the great arteries and tricuspid valve atresia
• Now presenting with aneurysmal degeneration of ascending aorta (63x58x57mm, abutting sternum), dilated neo-aortic root, 2-3+ neo-aortic valve regurgitation, mildly reduced ventricular function (Figure 1)

Challenges
• High-risk chest reentry
• Risk of left recurrent nerve and left pulmonary artery injury during arch aneurysm dissection
• Reconstruction of the aortic arch without kinking at acute angle of transition between ascending and aortic arch

Procedure
1. Redo-sternotomy
2. Aortic arch reconstruction (26 mm Dacron graft)
3. Mechanical Bentall procedure (#29 SJM valve with 32 mm Dacron graft)
Cardiopulmonary (CBP): 218 min | X-Clamp: 150 min | Deep hypothermic circulatory arrest (DHCA): 50 min | Antegrade cerebral perfusion (ACP): 30min

Operative Steps
1. Peripheral axillary artery cannulation using a Dacron side graft prior to uneventful redo-sternotomy and for ACP.
2. CBP with axillary arterial & bicaval cannulation.
3. Antegrade cardioplegia to achieve cardiac arrest.
5. Direct coronary ostial cardioplegia.
6. Aneurysmal aorta was resected.
7. Hemiarch replacement at DHCA of 20°C
8. Remaining aortic arch reconstruction performed under ACP.
9. The native pulmonary valve (i.e., the neo-aortic valve) excised and composite mechanical Bentall implanted.
10. End-to-side anastomosis of Bentall graft to proximal aortic arch graft.
11. A rectangular opening at the anterior aspect of the ascending aortic graft for anastomosis of the native aorta (Figure 2).
12. CBP termination, hemostasis, chest closure.

Postoperative course & complications
1. Acute right branch middle cerebral artery infarct <24h from surgery, resulting in left hemiparesis – upper limb paralysis and lower limb paresis.
2. Acute respiratory distress syndrome from H. influenzae pneumonia and volume overload, requiring re-intubation and proning.
3. Atrial fibrillation
Patient was discharged to stroke rehab on POD22.

Follow-up at 3mo
• Left hand paralysis at 75% baseline, ambulating without gait aid
• Returned to work

Conclusion
• End-to-side anastomosis supports patency of the neo-aorta

Figure 1. Preoperative cardiac computed tomography (CT)

Operative Steps

Figure 2. A) surgical illustration and B) CT of complete repair with end-to-side graft anastomosis.