Role of hybrid arch debranching in the treatment of newly diagnosed aortic arch malperfusion after repair of acute type A aortic dissection

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ABSTRACT

We present the case of a 41-year-old man who underwent repair of an acute DeBakey type A aortic dissection with a Bentall-De Bono operation and presented with an early aortic arch malperfusion. The malperfusion was successfully treated with a hybrid arch debranching procedure. In this setting, the hybrid arch debranching procedure offers a safe alternative for repair.

KEYWORDS Acute DeBakey type A aortic dissection; arch debranching; endovascular stent implantation

Conventional open total arch replacement with the frozen elephant trunk (FET) technique is the treatment of choice for surgical aortic arch pathologies in specific subgroups of patients. However, the FET procedure has significant morbidity and mortality. It is invasive, requiring cardiopulmonary bypass (CPB) and deep hypothermic circulatory arrest (HCA).¹ Hybrid aortic arch debranching procedures without (type A) or with (type B) ascending aorta replacement seek to limit operative, CPB, and HCA times by making the arch repair procedure simpler and shorter.²

CASE REPORT

A 41-year-old man with an acute DeBakey type A aortic dissection presented with symptoms of pericardial tamponade and moderate to severe aortic valve regurgitation. The patient had no family history of aortic dissection and no signs of Marfan syndrome. The primary entry tear was located circumferentially just above the aortic valve (*Figures 1a, 1b*). He underwent a Bentall-De Bono operation with a composite graft (25 mm) and mechanical valve (St. Jude Medical, St. Paul, MN) and a linear interposition graft (24 mm; Vascutech, Inchinnan, Scotland); the distal anastomosis was performed under moderate HCA and antegrade cerebral perfusion. CPB and HCA times were 184 and 29 minutes, respectively (*Figures 1c, 1d*).

The next day, a follow-up computed tomography (CT) aortography showed a newly diagnosed aortic arch

malperfusion (with a ratio of true to false lumen of 1:4 in the arch and descending aorta), which was not present on the initial CT. To treat this new malperfusion, the patient underwent a hybrid arch debranching type B procedure with an endovascular aortic repair through the transfemoral approach with a Zenith TX2 (Cook Medical, Limerick, Ireland) endovascular stent graft (28 mm and length of 82 mm) with extension to the level of the 12th vertebra with two Valiant endovascular stent grafts (28 mm; Medtronic, Dublin, Ireland) (*Figures 1e, 1f*). The arch debranching procedure was performed through the previous median sternotomy, with a side clamp on the aortic Dacron graft, debranching of all the major arch vessels with Dacron grafts of 10 mm and 8 mm, and partial heparinization.³

The hospitalization was complicated by postoperative delirium and pneumonia that were treated appropriately. On postoperative day 32, the patient was discharged in stable condition. Seven months after the operation, he was in good condition.

DISCUSSION

Total arch replacement with the FET technique during repair of acute DeBakey type A dissection is indicated in cases of aortic arch malperfusion, presence of an entry tear, arch dilatation, positive family history, and presence of Marfan syndrome.^{1,4} This is also our institutional policy, but this patient did not have any of the above indications, so the Bentall-De

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Figure 1. (a, b) CT images showing the acute DeBakey type A aortic dissection, coronal and sagittal views. (c, d) CT images showing the Bentall-De Bono operation (composite valve graft) and the dissection in the aortic arch and descending aorta, coronal and sagittal views. (e, f) CT images showing the Bentall-De Bono operation (composite valve graft), the arch debranching, and the endovascular stent implanted in the aortic arch and descending aorta, 3D and sagittal views. TL indicates true lumen; FL, false lumen; CVG, composite valve graft; DEBR, debranching; TEVAR, thoracic endovascular aortic repair.

Bono operation was performed. Moreover, the arch malperfusion was diagnosed the next day in a repeat CT angiogram that was performed to rule out any early malperfusion after the initial repair. Any early malperfusion as in this case is treated with endovascular techniques.⁵

To treat the arch malperfusion, we chose the hybrid arch debranching procedure instead of the FET technique because it is simpler and less risky. This technique has been described previously⁶ for delayed presentation with arch malperfusion

after initial surgical repair, but this case report presents the value of this procedure when malperfusion presents acutely within days of a primary and standard surgical repair of a type A dissection. The incidence of arch malperfusion after repair of type A dissection is low according to published data. Lescan et al⁶ reported only 9 patients from 2012 to 2018.

Finally, in this setting, Ma et al⁷ reported a median hospital stay of 24.5 days, which is comparable to that in our case report; however, other authors⁸ reported shorter hospitalization times. Our patient had a prolonged hospital stay due to postoperative complications (delirium and pneumonia).

In conclusion, in patients with new aortic arch malperfusion after repair for acute DeBakey type A aortic dissection, the hybrid arch debranching procedure offers a safe alternative.

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