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CLINICAL COMMENTARY

Endovascular three-vessel *in situ* fenestrated aortic grafts for thoracic aortic reconstruction in the management of complicated type B dissection

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Introduction

Breakthrough technological advancements in stent manufacturing, design, and deployment have facilitated the development of a dynamic range of low-profile stents catering to the requirement of complex aortic pathologies [1,2]. It has truly widened the spectrum of pathologies treated via a complete endovascular approach [3]. We share our experience with a novel approach used in the management of patients with complex type B aortic dissections via an endovascular approach.

A 62-year-old male, known hypertensive and diabetic on regular medication presented with complaints of acute onset of chest pain radiating to the back. On CT angiogram, a dissection flap was seen extending from the proximal descending thoracic aorta to the bifurcation of the right common iliac artery dividing the aorta into true and false lumens. The intimo-medial entry rent was in the proximal descending thoracic aorta and measured ~29 mm in dimension. The mesenteric vessels, right renal arteries, and left upper renal artery are arising from the true lumen. The left lower renal artery is arising from a false lumen. The left common iliac artery is arising from a false lumen. Delayed contrast uptake and excretion of both kidneys were present. The patient was started on best medical management with beta blockers for optimal control of blood pressure. In view of the friability of initimo-medial flap in acute phase and temporal expansion of the false lumen, the patient was planned for thoracic endovascular aortic repair in the sub-acute phase. A key challenge in closing the entry rent using a covered aortic graft lies in preserving cerebrospinal and bilateral upper limb perfusion. Adequate apposition of the stent to an adequate length of normal aortic wall proximally is of paramount importance to protect the deficient residual mural layers from the complex hemodynamic forces. The need for '*zone 0'* deployment in this case arising in view of the aneurysmal proximal descending thoracic aortic segment.

Traditionally, '*zone 0*' deployment of the aortic stent is performed as a hybrid procedure in close liaison with surgical debranching of the arch vessels and transposition of their origin to ascending aorta via grafts. The novelty in our case lies in the ideology to ambitiously find an endovascular alternative towards a similar goal. This was achieved by the creation of fenestrations *ex vivo* corresponding to the origins of the brachiocephalic trunk, left common carotid, and left subclavian arteries. The modified stent was loaded back into the deployment device. The deployment of these fenestrations overlying the origins of the corresponding vessel was facilitated by the sutural markers placed prior to de-

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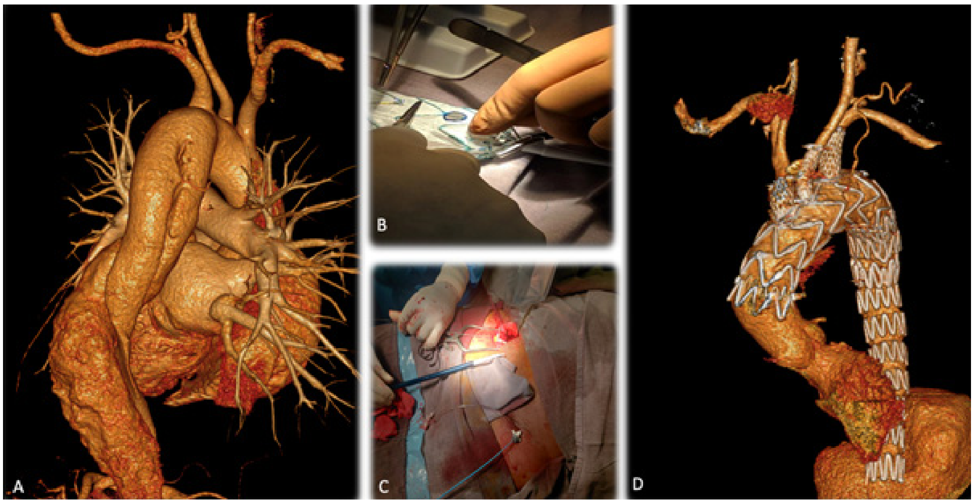

Fig 1: CT angiogram showing type B dissecting aneurysm (A) . The aortic graft was fenestrated (B) after the femoral cutdown (C). Follow up CT after 1 year (D) shows the aortic graft with all the 3 fenestrated grafts in the arch vessels with complete resolution of the dissecting aneurysm

ployment. The proximal and distal fenestrations were cannulated from bilateral brachial accesses. The middle fenestration was cannulated from carotid artery cannulation. Three covered stent grafts of diameters were deployed in the brachiocephalic trunk, left common carotid left subclavian arteries respectively. Post-procedure course in the hospital was uneventful. The patient was discharged on postoperative day-6. Follow-up imaging done at 1 month revealed moderate expansion of false lumen with evidence of type 3 endoleak from the innominate fenestration. Following the deployment of a larger 13.5mm stent graft across the fenestration, no further endoleak was seen. Follow-up imaging done at 2 and 3 years post-procedure showed good wall apposition of stent with thrombosis of the false lumen and maintained patency of aortic arch vessel grafts.

The lack of need for sternotomy, quicker post-operative recovery, and lesser immediate post-operative morbidity support the preference for an endovascular approach in the thoracic aorta. Fenestrated thoracic endovascular aortic repair is a technically complex endovascular procedure that ambitiously aims to complement open surgical repair in the management of patients with technically challenging aortic dissection. The lack of length of optimal landing zone, presence of aneurysmal proximal segment, and anomalous origin of arch vessels are common indications necessitating the need for the creation of fenestration. The positioning of the fenestrated stent grafts and their alignment with the branch vessels demand precision and accuracy. The. Endovascular alternatives to this technique include the use of the chimney technique if proximal landing zones necessitate single-vessel reconstruction. The island technique is another improvisation of the frozen elephant trunk technique with limited applicability in the resource-depleted clinical setting.

In the right clinical situation, with optimal procedural expertise, fenestrated TEVAR is a technically feasible endovascular procedure to reconstruct aorta and arch vessels and maintain cerebral and upper limit perfusion with an acceptable safety profile. A dynamic multidisciplinary team is crucial in improving clinical outcomes in patients with complicated type B aortic dissection.

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