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Thoracic endograft repair for a complicated type B aortic dissection

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Clinical vignette

A 50-year-old female with no relevant medical history, presented with acute onset substernal chest pain. Imaging demonstrated a type B aortic dissection (TBAD) without complication and the patient was admitted to the intensive care unit. Twelve days after presentation the patient developed a significant acute kidney injury with blunted waveforms on renal artery duplex. Computed tomography angiography demonstrated an anomalous origin of the left vertebral artery from the aortic arch (small and non-dominant). The dissection appeared to extend proximally abutting the left subclavian artery (LSA) requiring a thoracic endovascular aortic repair (TEVAR) device landing in zone 2. This dissection was classified as a type $B_{2,10}$ (1). TEVAR with laser fenestration and stenting of the LSA was offered.

Surgical technique

Preparation

The patient was placed in the supine position and general anesthesia induced. Neuromonitoring was used intraoperatively to assess for any evidence of spinal cord malperfusion. The chest to anterior thighs including the left arm were prepped and draped in standard sterile fashion.

Exposition

Ultrasound-guided percutaneous bilateral common femoral access was obtained. The patient was systemically heparinized for a goal activated clotting time (ACT) >250 s for the duration of the case. Left brachial artery cut-down with direct access was performed.

Operation

An iliac arteriogram was obtained to ensure access within the true lumen bilaterally. In the right femoral artery, two Perclose devices were deployed and the wire advanced to the aortic arch. Frequent hand injections were performed to confirm the wire was true luminal throughout advancement. Intravascular ultrasound (IVUS) confirmed access within true lumen throughout the length of the aorta. IVUS recording in systole measurements confirmed correct graft size selection. A Zenith TX2 dissection endovascular graft 32×142 (Cook Medical, Bloomington, IN, USA) was advanced into the thoracic aorta and deployed just distal to the LSA, allowing for coverage of the entry tear and accurate deployment of the proximal piece. The second device (32×82) was deployed immediately distal to the left common carotid artery covering the left vertebral artery and LSA origins.

Laser fenestration was promptly performed to avoid stagnant flow and thrombus accumulation. The left brachial artery was accessed directly and an 8.5-French Oscor sheath advanced (Oscor, Palm Harbor, FL, USA). A 2.3 mm laser was advanced through the Oscor sheath to abut the TEVAR device. The laser was fired and a Bentson wire (Cook Medical) advanced. Multiple gantry angles confirmed the wire had traversed the endograft. Pre-dilation, followed by placement of an 8 L × 29 mm VBX stent (WL Gore & Associates, Newark, DE, USA) was performed. Aortogram at completion demonstrated no evidence of proximal retrograde type A dissection and there was robust flow in the arch vessels. IVUS was passed again to confirm this.

An additional Cook dissection stent graft (34×154) was deployed with a 5 cm overlap proximally, landing 6 cm above the celiac axis. Next, a 36×180 Cook dissection bare metal stent was deployed through the visceral segment with one stent overlap.

Completion

The post-stenting aortogram demonstrated adequate results and IVUS confirmed the absence of a retrograde type A dissection. The Perclose was deployed in the right femoral artery, a Mynx deployed in the left and the brachial artery repaired. The patient had complete renal recovery by post-operative day 2. Repeat imaging at 1 and 6 months demonstrated positive aortic remodeling and no complications.

Comments

Clinical results

The majority of TBAD's are treated with medical management. However, when these dissections become complicated, they require surgical intervention. Complications include rupture, malperfusion, early aneurysmal degeneration and, in some centers, uncontrolled hypertension or refractory pain. We continue to use TX2 Cook endograft for treatment. At our institution, frank malperfusion is the most frequent indication for surgical intervention of TBAD's in the acute phase. Regardless of indication we have seen positive aortic remodeling in these patients after treatment with the TX2 stent. Since 2019, we have deployed the TX2 Cook devices in 23 patients. Eight were performed for renal malperfusion. Five of these patients, including this case, had complete renal recovery and two were able to cease dialysis.

Advantages

In our institution, the use of the TX2 Cook device for the treatment of TBAD's has been safe and effective, with minimal complications. We continue to see positive aortic remodeling in these patients at follow-up. Laser fenestration to perfuse the LSA is useful in the treatment of complicated TBAD's, which do not always provide time for carotid-subclavian bypass prior to TEVAR, and in whom coverage with delayed revascularization may be higher risk. Neuromonitoring can help with early detection of spinal cord ischemia, as well as setting postoperative blood pressure goals.

Caveats

It is reasonable to land the initial TEVAR device in zone 3 if the entry tear is excluded. If the entry tear is more proximal, deployment of the stent graft can lead to a retrograde type A dissection. Therefore, it is particularly important to ensure that the entry tear is covered upon initial stent placement. Retrograde dissection extension from a zone 3 entry tear can then be addressed by proximal extension. It is also critical to optimize the gantry for visualization of your target landing zone. In patients with an anomalous vertebral artery, left internal mammary artery (LIMA)-left anterior descending (LAD) bypass, absent right vertebral artery or vertebral-posterior inferior cerebellar artery (PICA) terminus, LSA reperfusion can be critical. Laser fenestration can facilitate immediate reperfusion of the subclavian artery. Experience with this modification is critical before attempting (2). At the end of the case, the choice to deploy additional stent graft coverage is based on whether the true lumen has adequately expanded, if there is inadequate support, stent compression can occur. The use of bare metal dissection stents is often indicated when dealing with known paravisceral malperfusion.

Lastly, regarding spinal cord monitoring, if the institution does not have neuromonitoring capabilities or emergent lumbar drain protocol, it is safer to pre-operatively place a lumbar drain. If lumbar drain placement is not available at an institution, it is safest to consider transfer to another facility where time allows (3).

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Footnote

Conflicts of Interest: The authors have no conflicts of interest to declare.

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