

Treating Residual Dissection: When and How to Prepare an Infrarenal Landing Zone in a Dissected Aorta for EVAR

Using the “cheese wire” technique to help improve the proximal landing zone in type B aortic dissection.

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After aortic dissection, patients are prone to develop late aneurysmal degeneration of the thoracic, abdominal, or entire thoracoabdominal aorta. Among patients with type B aortic dissection (TBAD), > 50% will experience aneurysmal degeneration within 5 years.¹ Although thoracic endovascular aortic repair (TEVAR) is effective for the management of complicated TBAD in the acute or subacute setting and promotes favorable aortic remodeling, it does not effectively prevent late aneurysmal degeneration in a large percentage of patients.^{2,3} Accordingly, it is important to develop improved endovascular treatments for both TBAD and chronic postdissection aortic aneurysms.

Endovascular aneurysm repair (EVAR) of an abdominal aortic aneurysm (AAA) in chronic TBAD presents additional dissection-specific challenges, which may include the presence of a thickened chronic dissection septum, two or more lumens, true lumen compression, and differential perfusion of the visceral arteries from true and false lumens. Consequently, despite the presence of a proximal neck of appropriate diameter and length, EVAR with commercially available stent

grafts may be unsuccessful if the chronic dissection flap prevents successful reexpansion of the true lumen and elimination of flow into the false lumen. In the setting of persistent false lumen perfusion, this can result in device compression and continued aneurysm expansion. One solution is to repair the entire dissected thoracoabdominal aorta using fenestrated and/or branched stent grafts; however, the risk of spinal cord injury from extensive aortic coverage and the complexity of the repair are difficult to justify in a patient with anatomy that is otherwise suitable for standard EVAR (Figure 1).⁴

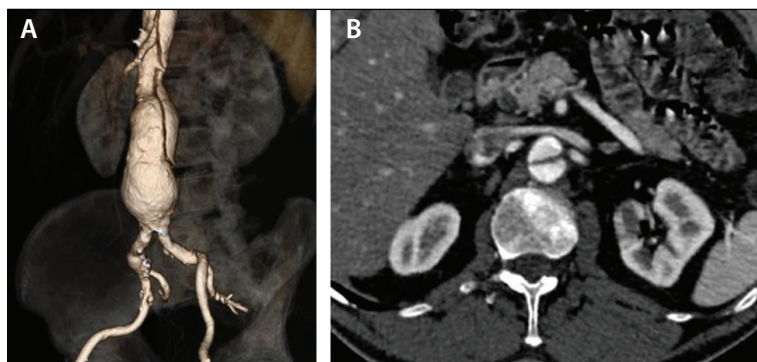


Figure 1. Preoperative CTA showing virtual-rendered (A) and axial images (B) of a patient with AAA and chronic TBAD.

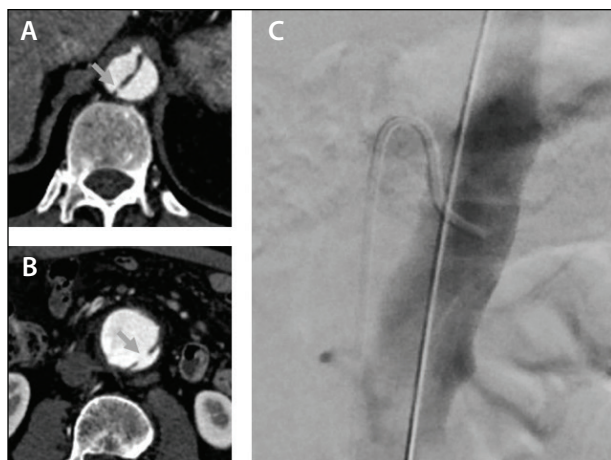


Figure 2. Existing fenestrations of the dissection septum in the paravisceral (A) and infrarenal aorta (B) that can be accessed to pass between the true and false lumen (C).

During traditional open surgical repair of postdissection aneurysms, the thickened dissection septum is directly excised to create a single lumen for anastomosis to a graft. Similarly, endovascular fenestration techniques can be used to tear or remove the dissection septum to prepare a suitable proximal neck for EVAR. A “cheese wire” fenestration technique has been described, where the dissection flap is removed from the proximal neck, creating a single lumen to allow for effective stent graft expansion, fixation, and sealing and achieve successful exclusion of the AAA.⁵⁻⁷

This article describes the cheese wire technique, which involves passage of a guidewire from the true to the false lumen, followed by application of downward traction on the ends of the through-wire to create a large longitudinal tear in the septum. Use of this technique

creates a proximal neck with a single lumen, improving the proximal landing zone for EVAR. We have also used cheese wire fenestration of the abdominal aorta, followed by placement of an EVAR stent graft in the setting of acute TBAD to successfully treat true lumen compromise of the abdominal aorta and iliac arteries in patients with visceral, pelvic, and/or lower extremity malperfusion.

TECHNIQUE

Candidates for the technique include patients with chronic TBAD who have a proximal neck of suitable length and diameter for EVAR but require removal of the dissection septum to prepare a single-lumen proximal landing zone for the aortic stent graft (Figure 1). Patients with acute TBAD and persistent visceral or lower extremity malperfusion despite TEVAR may also benefit from cheese wire fenestration of the abdominal aorta to equalize pressures between the true and false lumens and restore distal perfusion.

High-resolution CTA is essential for appropriate preoperative planning and to identify existing fenestrations of the dissection septum within the abdominal aorta and iliac arteries. When fenestrations are present, they can be used to traverse the septum for the cheese wire fenestration procedure (Figure 2).⁷ Alternatively, the septum can be traversed at the desired level using sharp needle fenestration with either a transjugular liver access set (Cook Medical), a 21-gauge Chiba needle, or reentry devices such as the Outback Elite catheter (Cordis, a Cardinal Health company).^{5,6} Intravascular ultrasound and fusion image guidance are also useful adjuncts for identifying fenestrations and visceral artery origins and confirming wire location within either the true or false lumen(s).

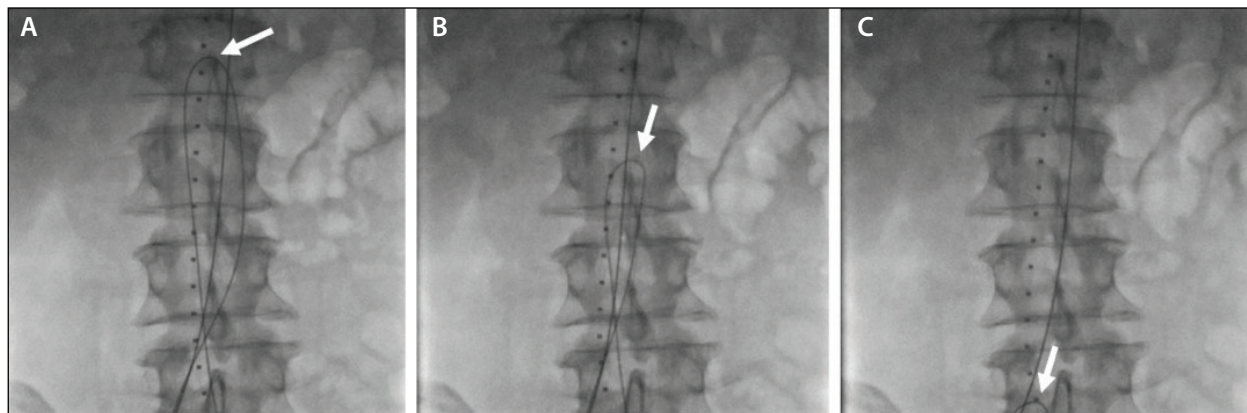


Figure 3. The cheese wire technique is used to produce a longitudinal tear or displacement of the dissection septum. A through-wire has been passed from the true to the false lumen (A, arrow), and caudal traction is applied to the ends of the through-wire to tear the septum (B, arrow) until the wire reaches the aortic bifurcation (C, arrow).

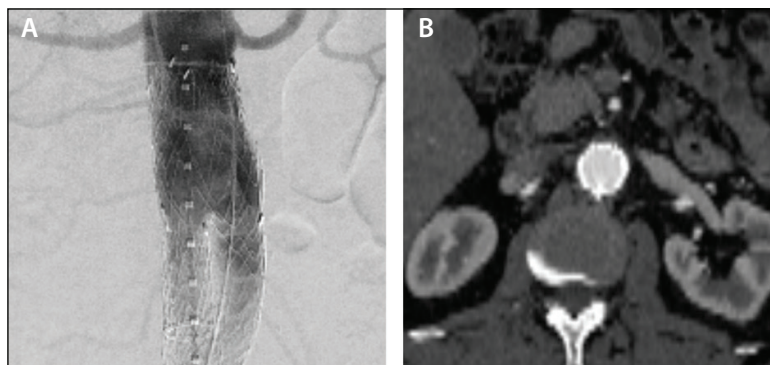


Figure 4. Completion angiogram (A) and postoperative CTA (B) after cheese wire technique and EVAR in patient shown in Figure 1.

Bilateral femoral artery access is achieved, guidewires are passed from both groins through the true lumen into the thoracic aorta, and appropriate sheaths are introduced. Additional guidewire access is then obtained into the false lumen from one access site by traversing an existing fenestration or crossing the septum with a needle within either the infrarenal aorta or iliac artery. Additional guidewire access into the false lumen is then secured from the opposite groin by traversing the septum in a second location more proximally within either the paravisceral or pararenal aorta. A snare is then introduced over one of the guidewires into the false lumen and used to snare the other false lumen guidewire, creating through-wire access across the septum. Traction is then applied to both ends of the through-wire to create a longitudinal tear, disrupting the septum to form a single lumen and creating a suitable infrarenal landing site for an EVAR stent graft (Figure 3). We have effectively used either 0.035- or 0.014-inch wires as through-wires, and a back-and-forth sawing motion can also be used to cut the septum. Application of significant caudal force on the ends of the through-wire is often necessary to initiate tearing of a thickened, chronic dissection septum. After completing the cheese wire fenestration, the through-wire is then removed and the true lumen wires from each groin are used to perform a standard EVAR procedure (Figure 4).

Ideally, the cheese wire technique creates a long longitudinal tear of the septum, but the septum may tear transversely and prolapse into the distal aorta. The prolapsed dissection septum tissue can acutely obstruct the aorta and iliac arteries; therefore, it is crucial to maintain true lumen wire access from both groins. Maintenance of guidewire access from both groins facilitates subsequent placement of a bifurcated aortoiliac stent graft (and additional iliac stents, if necessary) to reestablish normal

distal perfusion. Additionally, in the event that the torn septum obstructs a renal or visceral artery, selective cauterization and stenting of the renal or visceral arteries may be necessary. Presence of thrombus within the false lumen may also create a risk of arterial obstruction and distal embolization. In our modest experience, open surgical conversion has not been required; nonetheless, having the capability to perform an open surgical conversion to treat aortic rupture or visceral ischemia that cannot be managed with endovascular maneuvers seems appropriate.

CONCLUSION

Late aneurysmal degeneration is a common consequence of TBAD, and the use of EVAR to treat AAAs in patients with chronic TBAD is often precluded by the lack of suitable proximal and distal landing zones. Removal of the dissection septum using the cheese wire fenestration technique is a useful adjunct to create and prepare a landing zone(s) for EVAR in postdissection patients with AAA and in acute TBAD to restore visceral and distal perfusion in patients with true lumen compression within the distal abdominal aorta. ■

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