Cutting balloon septotomy for repair of right common iliac artery aneurysm in the setting of type B aortic dissection

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ABSTRACT

We report a case of using cutting balloon septotomy for a 5-cm right common iliac artery aneurysm repair in a patient with a chronic type B aortic dissection after open repair 10 years before. This technique uses intravenous ultrasound to facilitate deployment of a cutting balloon to shear through the dissection flap, allowing for optimization of the landing zone for endovascular repair of a right common iliac artery aneurysm. Various methods are available for performing septotomy, and the use of a cutting balloon is one that helps with stent placement and position. (J Vasc Surg Cases Innov Tech 2024;10:101448.)

Keywords: Aortic dissection; Common iliac artery aneurysm; Cutting balloon septotomy; Intimal flap septostomy

Common iliac artery (CIA) aneurysms are defined by a CIA transverse diameter measuring >1.85 cm for men and >1.5 cm for women.[1] Although these aneurysms are rare, they can be associated with abdominal aortic aneurysms in ≤20% of patients.[1] A CIA aneurysm developing after type B aortic dissection (TBAD) repair is a rare and challenging case.[2] Previous literature described safe proximal control using balloon endoclamping.[2] The use of septotomy has been described in several case reports, mainly for TBADs, to optimize and create suitable landing zones. Cutting balloon septotomy has been described multiple times in fenestrating dissection flaps in coronary artery dissections to prevent extension of the intramural hematoma.[3] Doing so allows for optimal stenting of the coronary artery.[3] Our case demonstrates a useful technique of using cutting balloon septotomy in a chronic TBAD septum to create an adequate proximal landing zone for stent graft repair of a right CIA aneurysm.

This case report does not require institutional review board approval. All Health Insurance Portability and Accountability Act of 1996 identifiers were removed before submission for publication. The patient provided written informed consent for the report of his case details and imaging studies.

CASE REPORT

The patient is a 67-year-old man with multiple medical problems, including hypertension, type 2 diabetes mellitus, chronic obstructive pulmonary disease, asthma, and heart failure. The patient had a chronic TBAD from the left subclavian artery through the CIA ($B_{3,11}$ aortic dissection) for which he underwent open repair approximately 10 years earlier. The repair was done for visceral degeneration and high-risk features (ie, an aortic diameter >4 mm) with a Dacron graft and Carrel patch of the visceral vessels. This was complicated by thrombosis of the left renal artery and spinal cord ischemia, which resulted in quadriplegia, a neurogenic bladder, and multiple sacral decubitus ulcers. The patient was subsequently lost to follow-up because he relocated.

The patient was first known to us during his admission for an infected sacral decubitus ulcer. A computed tomography (CT) scan showed a right CIA aneurysm. Subsequent CT angiography (CTA) demonstrated a 5-cm degenerative right CIA aneurysm and a chronic residual dissection flap beneath the preexisting graft, which terminated, with the bifurcation following the visceral reimplantation (Figs 1 and 2). Given the size of his right CIA aneurysm and his chronic right-sided groin and lower abdomen pain, the team offered operative management, which the patient agreed to. Although the residual septum began 17 mm distal to the implanted right renal artery, it was unclear whether the thickened chronic septum would be mobile enough to allow for the proximal sealing stent to fully open. Hence, it was decided to optimize the proximal landing zone by performing endovascular septotomy.

The patient had an acute kidney injury and hyperglycemia due to sepsis from his pressure ulcer. He required tighter glucose control and hydration. He was also seen by cardiology given his comorbidities and underwent an echocardiogram, with normal findings. After optimization, the patient underwent staged repair, starting with coil embolization of the right hypogastric artery. A Sos catheter (AngioDynamics) was used to catheterize the right hypogastric artery, and this artery was tightly packed with two 10-mm and two 8-mm Nester coils (Cook Medical). An angiogram showed successful packing of the artery

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Fig 1. Axial computed tomography (CT) scan showing 5-cm right common iliac artery (CIA) aneurysm.

Fig 2. Coronal computed tomography (CT) scan showing chronic type B aortic dissection (TBAD) and 5-cm right common iliac artery (CIA) aneurysm.

(Fig 3). Two days later, the patient underwent staged repair of the right CIA aneurysm endovascularly. Bilateral percutaneous common femoral artery (CFA) accesses were performed, with

Fig 3. Successful right hypogastric artery coiling.

placement of PerClose devices (Abbott Laboratories). Through the left CFA, a 0.035-in. angled glidewire was used to access the true lumen from the CFA to the visceral aorta. Intravascular ultrasound (IVUS) was used to confirm that the left-sided glidewire was within the true lumen throughout its length. This 0.035-in. glidewire was then exchanged for a Lunderquist wire (Cook Medical), followed by a 20F Gore DrySeal sheath (W.L. Gore & Associates). Next, through the right CFA access, a 0.035-in. angled glidewire was used to access the false lumen. IVUS was used to confirm that this wire was within the false lumen throughout its length until the level of the visceral aorta (where there was no dissection and just one aortic lumen).

Next, the right CFA 0.035-in. wire was exchanged for a 0.014-in. wire. A "buddy" 0.035-in. wire was inserted into the right CFA access and confirmed via IVUS to be in the true lumen. A 20F Gore DrySeal sheath (W.L. Gore & Associates) was positioned into the proximal right external iliac artery. Then, over the left-sided Lunderquist wire (Cook Medical), a snare catheter captured the right-sided 0.014-in. wire at the level of the visceral aorta. The snared 0.014-in. wire was brought out of the left-sided 20F sheath, establishing "through and through" access (Fig 4). A 4-mm × 15-mm-long cutting balloon with atherotomes 0.28 to 0.33 mm in height was threaded over the 0.014-in. wire and pulled down over the septum in a seesaw fashion until it reached the aortic bifurcation. The 0.014-in. wire was then pulled

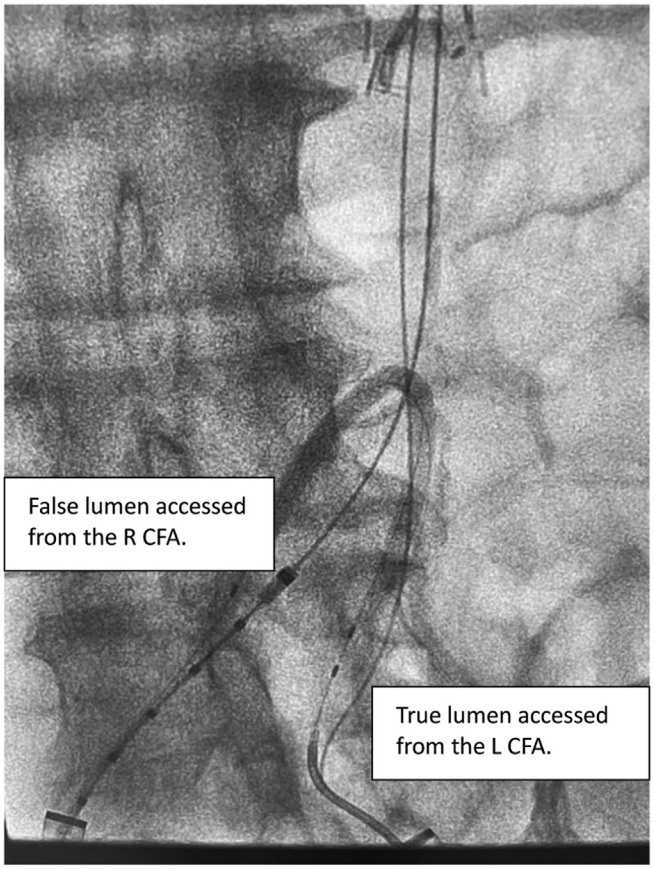

Fig 4. Successful entry into false and true lumens. *CFA*, Common femoral artery; *L*, left; *R*, right.

Fig 5. Angiogram showing coiled right common iliac artery (CIA) aneurysm and stent graft.

back into the false lumen within the right CIA aneurysm. These maneuvers established an adequate length for a proximal landing zone. The Medtronic Endurant II (Medtronic) main body (36 × 14 × 199) was deployed via the left CFA access. The contralateral limb was cannulated via the right-sided true lumen and extended with a 16 × 13 × 199 limb into the right external iliac artery. The left-sided limb was extended to the distal left CIA bifurcation with a 16 × 20 × 124 iliac limb. Next, a 0.035-in. NaviCross catheter (Terumo Interventional Systems) was threaded over the 0.014-in. wire that was left positioned within the false lumen of the right CIA aneurysm. A 2.6F Lantern microcatheter (Penumbra) was threaded into the NaviCross (Terumo Interventional Systems), and multiple packing coils were deposited into the false lumen of the right CIA aneurysm given the size. The sealing site of the stent graft was then molded using a balloon, and completion angiography demonstrated no endoleak or opacification of the false lumen (Fig 5). Both sides of the groin were then closed with the previously placed PerClose devices (Abbott Laboratories).

Postoperative CTA 1 week later demonstrated a good position of the stent graft with no contrast seen in the right CIA aneurysm (Fig 6). A type II endoleak was seen within the abdominal aorta that is not aneurysmal (4 cm). The patient was seen 1 month later in the clinic for follow-up and was noted to be in stable condition with palpable bilateral femoral pulses. He will undergo CTA of the abdomen and pelvis in 6 months. He had since received a diverting ostomy, and his pressure ulcers were healing well.

DISCUSSION

Chronic TBADs complicated by aortic and CIA aneurysmal degeneration are complex. One challenge in treating chronic dissections with endografting is the absence of adequate landing zones.[4] Endovascular septotomy is one method to extend the limited landing zones. Different methods have been described.

The "cheese wire" technique involves shearing the dissection flap with a wire snared from the true to the false lumen across the flap in a sawing motion.[5,6] The "cheese wire" technique, however, has its drawbacks. The dissection septum between the true and false lumens is often thick and can be difficult to cut through with a blunt wire.[4] There is concern that the amount of resistance against the wire can lead to errors in manipulation, distal embolization, and aortic injuries.[4] The reverse "cheese wire" technique has been described in several reports to avoid some of these complications in the visceral segments of the aorta.[7,8] This technique

Fig 6. Postoperative computed tomography (CT) scan showing coiled right common iliac artery (CIA) aneurysm.

uses the "cheese wire" method of using a wire in a sawing technique to divide the intimal flap, but the wire is advanced in a cephalad direction to avoid dividing the septum in the visceral segment.[7] A later study reported using electrocautery to heat the wire to cut the intimal septum under IVUS and fluoroscopic guidance.[9] Kabbani et al[9] described a more controlled and precise septotomy compared with the traditional cheese wire fenestration technique because it allows for real-time monitoring of the wire position and less pulling of the wire itself. Endovascular fenestration using a cutting balloon over a wire was described by Saito et al[4] to successfully produce a sufficient landing zone for thoracic endovascular aortic repair. Fukuhara et al[10] described success in 91% of cases (10 of 11) using laser aortic septotomy to optimize the distal landing zones. Bozzani et al[11] prefer a endovascular scissor technique for aortic septotomy after creating a reentry tear. This scissor technique, which included three cases of creating a reentry tear via laser and five cases via needle fenestration, resulted in technical success for false lumen exclusion in 100% of cases.[9]

In septotomy for TBADs, a cutting balloon provides more control and requires less of a sawing motion compared with using a wire. Thrombus or plaque in the true or false lumen, however, poses the risk of distal embolism when using this technique.[4]

CONCLUSIONS

As endovascular treatments become more widely used, surgeons are finding more methods to optimize landing zones. Our case demonstrates that this technique is safe and can also be used to optimize stent grafting for repairing aortic and CIA aneurysms.

DISCLOSURES

None.

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