Percutaneous Repair of a Giant Chronic TAAA Dissection

An endovascular approach utilizing a combination of stent graft and covered stents is feasible in thoracoabdominal aortic aneurysm repair.

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The gold standard surgical treatment for chronic aneurysmal aortic dissection (CAAD) is open surgical repair. Most dissecting aneurysms involve the visceral arteries. Despite significant improvements in surgical techniques and perioperative management, the morbidity and mortality rates of open repair for such patients are unsatisfactory. Endovascular exclusion with visceral revascularization for thoracoabdominal aortic aneurysm (TAAA) repair is an alternative to open repair, but its application for CAAD has been limited.[1-3] Endovascular repair of CAAD is particularly challenging because of aortic wall weakness, as well as the complex nature of the disease, including the presence of multiple connections (entries and re-entries) between the true and false lumens. We present a case of a patient who underwent successful endovascular repair of a large CAAD.

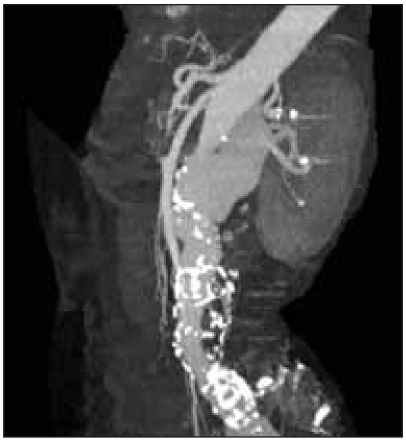

Figure 1. CTA of the chest and abdomen showed a 9-cm X 5.5-cm CAAD extending from the level of the celiac artery to the bifurcation.

CASE REPORT

The patient was a 63-year-old woman with a medical history significant for aortic disease and hypertension. Her chief complaint included a symptomatic giant CAAD. She had undergone open repair of an abdominal aortic aneurysm in 1991 at another facility. She had been well until 2001, when she underwent emergent open repair for proximal anastomotic site dehiscence and subsequent rupture, both of which developed secondary to acute type B aortic dissection. At that time, repair and reinforcement of the rupture and dissecting site were performed with direct suture using felt strips. Unfortunately, the patient had complete paraplegia after this second operation. Her surgical history also included radical hysterectomy for endometrial carcinoma in 2004 and total replacement of the aortic arch for type A aortic dissection in 2005. When she underwent total arch replacement, a CT scan revealed a CAAD involving all four visceral arteries. However, it was thought that open repair for this CAAD was impossible due to the multiple thoracotomies and laparotomies previously performed. Thus, conservative management, including blood pressure control was undertaken. Unfortunately, the CAAD rapidly expanded to 9 cm and became symptomatic. The patient was transferred to our hospital for possible endovascular repair. Chest and abdominal CT scans showed a 9-cm X 5.5-cm CAAD extending from the level of the celiac artery to the aortic bifurcation (Figure 1). The celiac artery, superior mesenteric artery, and bilateral renal arteries (RAs) were mainly supplied via the true lumen. The site of the entry communicating to the true lumen and the false lumen appeared to be present immediately distal to the left RA. Another communication seemed to be present within the right RA. Our treatment strategy

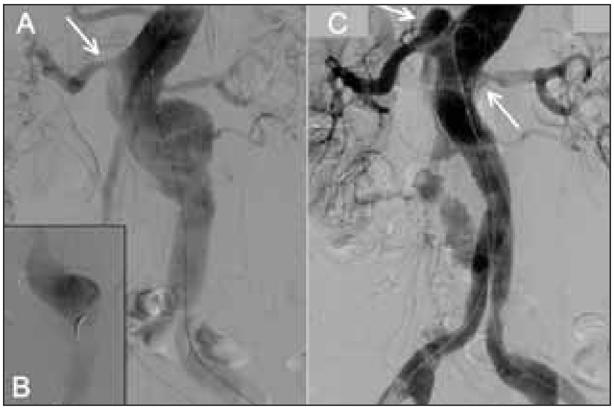

Figure 2. Aortography revealed a CAAD with a large entry at the abdominal aorta. The bilateral RAs were perfused via the true lumen but also showed signs of minor re-entries (A). The false lumen was easily cannulated through this entry site (B). Angiography after deployment of the Excluder AAA endoprosthesis (Gore & Associates, Flagstaff, AZ) to seal the main entry site. Note the resolution of the large entry site, but the unsealed communication channel within the RAs (white arrows) (C).

included placement of a stent graft to close the main entry site, as well as the use of a covered stent to seal the communications present within the RAs.

PROCEDURE

The patient was taken to an operating suite equipped with a Flat Panel Detector (Innova 4100 GE Healthcare, Waukesha, WI). The procedure was performed under epidural anesthesia. Bilateral femoral accesses were established percutaneously using a 5-F introducer sheath. The technique involved deployment of two ProStar XL closure devices (Abbott Vascular, Santa Clara, CA) before insertion of the large sheaths with the sutures left extracorporeally for closure after the removal of the sheaths (preclose technique). Aortography revealed a CAAD with a large entry at the abdominal aorta (Figure 2A).

The false lumen was easily cannulated selectively through this entry site (Figure 2B). The bilateral RAs were perfused via the true lumen but also showed signs of minor re-entries. The interventionist decided to close the large entry using the Excluder AAA endoprosthesis. An 18-F sheath was inserted percutaneously via the right femoral artery, and a 12-F sheath was inserted via the left femoral artery. A 23-mm Excluder trunk-ipsilateral stent graft was inserted via the right femoral artery and was deployed in the infrarenal abdominal aorta. An iliac Extender (Gore & Associates) was deployed via the right femoral artery. A contralateral Excluder limb and an Extender were deployed through the left femoral artery

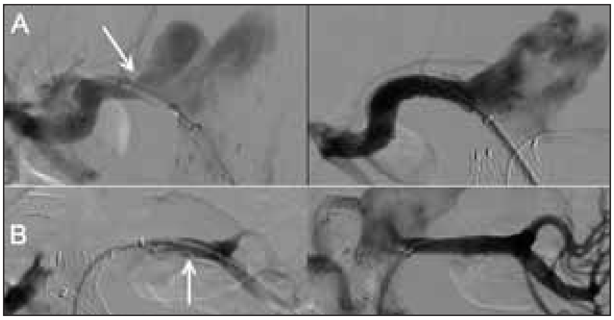

Figure 3. A selective right RA angiogram demonstrates a small communication (white arrow) that was closed using the Advanta V12 covered stent. The exaggeration of the right RA re-entry was secondary to the fact that the pressure within the CAAD was lowered by the closure of the main entry site (A). Left RA stent deployment. A selective left RA angiogram shows a small communication (white arrow) that was closed using the Advanta V12 covered stent (B).

(Figure 2C). Aortography after endovascular aneurysm repair (EVAR) revealed complete closure of the main entry site along with the presence of residual small communication at the right RA and left RA dissection. At this point, a decision was made to close these communications by deploying covered stents into each RA. The right RA was catheterized, and a 7-F Ansel 2 introducer sheath (Cook Medical, Bloomington, IN) was inserted, through which a 7-mm X 22-mm, balloon-expandable covered stent (Advanta V12, Atrium Medical, Hudson, NH) was deployed (Figure 3A). Finally, another Advanta covered stent was deployed in the left RA (Figure 3B).

Selective RA angiography showed successful closure of all the communication between the true and false lumens, with no evidence of an endoleak (Figure 4). The sheaths were removed from the femoral arteries, and the ProStar XL sutures were tied using a sliding knot technique. The total operation time was 170 minutes, the volume of contrast used was 190 mL, the duration of fluoroscopy was 62 minutes, and blood loss was 150 mL.

Immediately after this procedure, pulsation of the aneurysm as well as the abdominal pain resolved completely. The patient was discharged from the hospital 6 days after surgery without any complications. Follow-up CT scans obtained on day 2 and 2 months after the procedure showed complete exclusion of the CAAD without evidence of an endoleak (Figure 5). Furthermore, the aneurysm diameter had decreased from 9 cm (preoperative) to 8 cm at 2 months.

DISCUSSION

The goal of treating CAAD is to abolish the blood flow into the false lumen and/or the aneurysm while maintain-

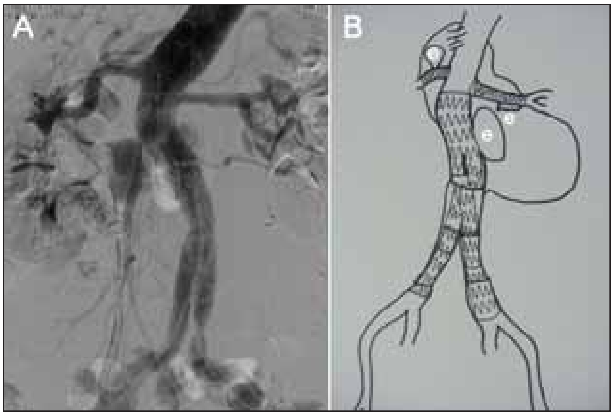

Figure 4. Completion angiography shows complete sealing of all entry/re-entry sites, with absence of visualization of the CAAD (A). A schematic illustration shows the three entry sites (e), as well as the procedure performed (B).

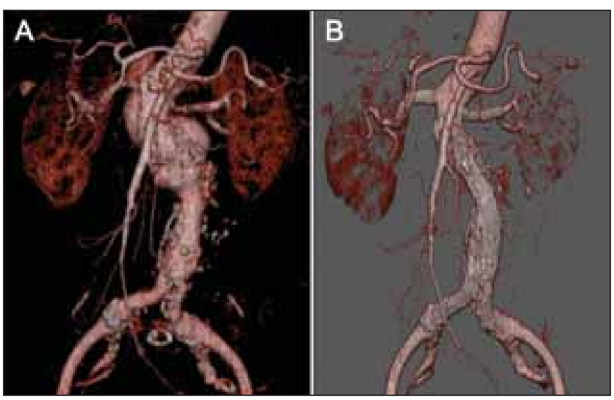

Figure 5. Preoperative three-dimensional CT scan (A). A follow-up CT scan shows complete exclusion, as well as preservation of the renal/visceral perfusion (B).

ing flow to the visceral organs. At present, the first-line treatment of CAAD is open repair. However, despite improvement of surgical techniques and perioperative management, complication rates after open repair for CAAD are still high and unsatisfactory. The fact that open repair for CAAD is often the second or the third operation makes the surgical procedure difficult, if not impossible. In addition, the presence of multiple entry and re-entries sites that are difficult to identify during open surgical repair further complicates the procedure. Endovascular treatment seemed to be the only realistic option in this patient, who had history of repeated laparotomies. Although the use of fenestrated/branched EVAR has been reported for the treatment of TAAA, because each entry/re-entry site was isolated from the other, the use of individual stent grafts/covered stents seemed to be a better option for our patient mainly due to the simplicity of the procedure compared with that of fenestrated and/or branched EVAR. We thought that the Excluder was better suited for treating the CAAD because of its flexible nature, as well as the fact that it does not possess a suprarenal stent that could potentially create new intimal tears, as well as retrograde type B dissection.[4] Because partial thrombosis of the false lumen has been shown to be a predictor of poor survival in patients with acute type B dissections, one needs to make a commitment to completely abolish flow to the false lumen. Otherwise, the procedure can do harm by sealing an entry site while leaving another entry/re-entry site untreated.[5]

CONCLUSION

An endovascular approach using a combination of stent grafts and covered stents is feasible and may be promising in select cases. A thorough analysis of preoperative imaging and understanding of the complex anatomy accompanying CAAD is of paramount importance. Close and lifelong follow-up are mandatory. ■

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