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TECHNICAL NOTE

Subclavian Artery Chronic Total Occlusion (CTO) Recanalization Using the Truepath Device

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INTRODUCTION

A 57 year old woman presented with dizziness and vertigo, and on physical examination was found to have asymmetric blood pressure in the upper extremities (80/50 mmHg on the left versus 150/80 mmHg on the right), as well as a decreased left radial pulse. She had a history of left lower extremity weakness, residual from a cerebrovascular accident in 2009. She was referred to interventional radiology (IR), after transfer from an outside hospital with left subclavian artery occlusion, noted on a CT angiogram of the chest. Before presentation at the study institution, surgical treatment had been offered; however, the patient refused open surgical treatment and instead opted for non-surgical or endovascular treatment, if available.

SURGICAL TECHNIQUE

This is a single case, therefore exempt from the study institutional board review. Aortic arch arteriography was performed with a 120 cm, 5 Fr sizing Pigtail catheter (Cook Medical, Bloomington, IN), which showed occlusion of the left subclavian artery with a minute stump. Delayed phase arteriography demonstrated retrograde opacification of the left subclavian artery about 2 cm distal to its origin, via the left vertebral artery and collaterals from the external carotid and maxillary arteries (Fig. 1A). Next, a 5 Fr Pinnacle (Terumo, Somerset, NJ) sheath was placed in the left brachial artery under ultrasound guidance, and heparin (5000 units) was administered. A Bentson wire (Cook Medical, Bloomington, IN) was advanced to the left axillary artery. Then a 65 cm, 4 Fr angled Glidecath (Terumo, Somerset, NJ) was advanced to the left subclavian artery to traverse the total occlusion with a hydrophilic guidewire such as Glidewire (Terumo, Somerset, NJ). Contrast injection into the subclavian artery demonstrated flow reversal in the left vertebral artery, with flow directed towards the head. This reversal of flow was likely caused by partial occlusion of the left brachial artery with the 5 Fr sheath. At this time, it was decided to place a 4 mm Spider (EV3 Endovascular, Plymouth MN) distal protection device, which was advanced into the mid left vertebral artery. Then a 0.035 inch Glidewire (Terumo, Somerset, NJ) was used to perform recanalization through the subclavian artery into the arch from the aorta; however, this was unsuccessful because of the shallow stump, a near flush occlusion at the aortic arch. Then multiple recanalization attempts via subclavian artery also failed, with use of Glidewires (Terumo, Somerset, NJ) including regular and stiff forms, which created subintimal tracts without re-entry to the aorta. At this point the options were either aborting the procedure or using a low profile CTO crosser which was not designed for this application. Next, a 135 cm length, 2.5 Fr Cantata (Cook Medical, Bloomington, IN) microcatheter was advanced coaxially through the macrocatheter. Then, triaxially, a 165 cm length, 0.018 inch TruePath CTO device (Boston Scientific, Marlborough, MA) successfully recanalized an intraluminal path from the occluded left subclavian artery, through the arch, and into the proximal descending aorta (Fig. 1B). Next the microcatheter was advanced over the True Path CTO device and followed by a Glidecath (Terumo, Somerset, NJ).

Through the common femoral arterial access, a 6 Fr, 70 cm Flexor Ansel sheath (Cook Medical, Bloomington, IN) was advanced into the descending thoracic aorta. A 5 Fr Amplatz Gooseneck snare device (EV3 Endovascular, Plymouth, MN) was used to gain "flossing access" (Fig. 1C) and exchanged with an Amplatz guidewire (Boston Scientific, Marlborough, MA) for intervention. Then a 6 mm × 22 mm ICAST (Atrium, Hudson, NH) covered balloon expandable stent was advanced and deployed across the occlusion of the proximal left subclavian artery. Completion arteriogram from the aortic arch demonstrated wide patency of the recanalized subclavian artery with near complete resolution of collateralized flow (Fig. 1D). The embolization protection device was removed and evaluated, demonstrating a few small fragments of tissue. Immediate neurologic examination was unremarkable. The recovery period was uneventful and the patient was discharged 3 days after the transfer from the prior hospital with a prescription of clopidogrel. At follow up (3 months) the patient reported marked improvement of presenting symptoms of vertigo and dizziness.

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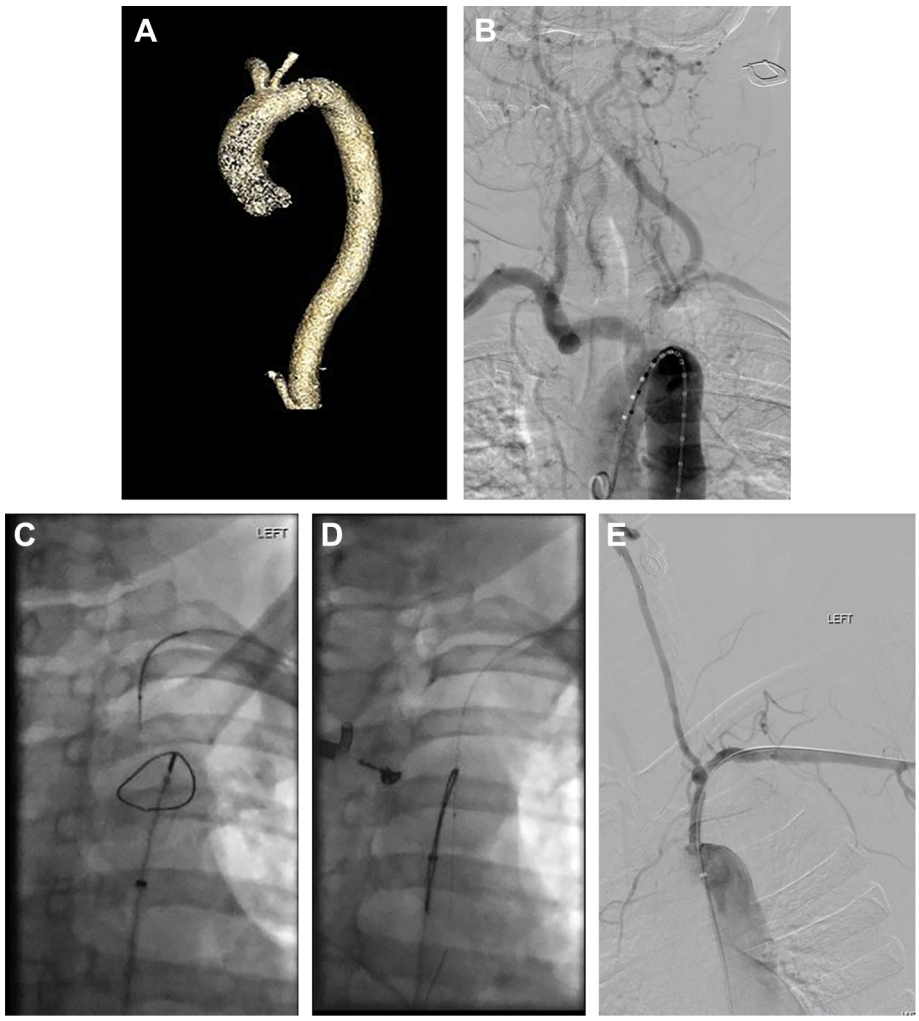

Figure 1. (A) Three dimensional CT reconstruction shows occlusion of the subclavian artery. (B) Initial evaluation thoracic aortic arch arteriogram demonstrating segment of occluded proximal left subclavian artery, with collateral flow to the more peripheral subclavian artery. The total occlusion length was 2.2 cm. The left vertebral artery origin was approximately 7 mm from the point of occlusion. (C) Simultaneous Truepath CTO device recanalizing the occluded segment of left subclavian artery, with snare device awaiting capture from the groin. (D) Successful capturing of the microglidewire passed through the recanalized subclavian artery. (E) After stenting of the left subclavian artery demonstrates appropriate antegrade flow, with lack of significant collateral flow.

DISCUSSION

Protecting the vertebral circulation during recanalization attempts is of great importance, as evidenced by the small tissue fragments retrieved from the protection device after removal.[1] There is a considerable lack of literature describing the use of CTO devices for chronic occlusions in the arch vessels. The present case is reported as an unusual technique utilizing a low profile CTO device in a patient presenting with subclavian steal syndrome and unsuccessful recanalization using conventional methods. Typically, most recanalizations are achieved with hydrophilic guidewires, which are primarily successful in subtotal occlusions.[2,3] However, there is well known significant difficulty and failures when encountering chronic total occlusions, mostly because of calcified caps at the ends of the CTO.[4] Other techniques employed for CTO crossing include controlled blunt micro-dissection, and optical coherence reflectometry guided RFA guidewires, again, however, not designed for this application.[5] Even though it is an off label application, there is a need for a lower profile CTO crosser device for larger vessels, and larger CTO crosser devices are not commonly used in these vessels because of a fear of potential complications such as arch aortic dissection.

CONCLUSION

In the present case, the Truepath device allowed completion of a procedure with technical success and without complications; however, it should be noted that this is an off label application of this device. Low profile CTO devices may be potentially beneficial in the greater arch vessels and in patients who are not good surgical candidates, or those patients refusing surgical treatment.

CONFLICT OF INTEREST

None.

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REFERENCES

1 Albuquerque FC, Ahmed A, Mitha A, Stiefel M, McDougall CG. Endovascular recanalization of the chronically occluded brachiocephalic and subclavian arteries: technical considerations and an argument for embolic protection. *World Neurosurg* 2013;**80**(6). e327—6.

2 Woo EY, Fairman RM, Velazquez OC, Golden MA, Karmacharya J, Carpenter JP. Endovascular therapy of symptomatic innominate-subclavian arterial occlusive lesions. *Vasc Endovasc Surg* 2006;**40**(1):27—33.

3 van de Weijer MA, Vonken EJ, de Vries JP, Moll FL, Vos JA, de Borst GJ. Technical and clinical Success and long-term durability of endovascular treatment for atherosclerotic aortic arch Branch origin obstruction: evaluation of 144 procedures. *Eur J Vasc Endovasc Surg* 2015;**50**(1):13—20.

4 Babic S, Sagic D, Radak D, Antonic Z, Ostasevic P, Kovacevic V, et al. Initial and long-term results of endovascular therapy for chronic total occlusion of the subclavian artery. *Cardiovasc Intervent Radiol* 2012;**35**(2):255—62.

5 Tesfaldet TM, Subash B, Emmanouil S, Bilakis VA. Use of the frontrunner catheter to cross a chronic total occlusion of the left subclavian artery. *Hellenic J Cardiol* 2011;**52**:86—90.