

Currently, there is a lack of stents available with IFU (Instruction for Use) to treat this type of aneurysm [1]. BeGraft Aortic stents (Bentley InnoMed GmbH, Hechingen, Germany), which are usually used for aortic coarctation and improving the patency of the iliac arteries, were chosen for this procedure off label. One of the main reasons is due to its low-profile delivery system as well as a high flexibility and good radial force properties [6,7]. It is a balloon-expandable Cobalt-Chromium (L605) stent with ePTFE tubing (Polytetrafluoroethylene covered stent graft). The graft is pre-mounted on the balloon with guidewire (Over-The-Wire) delivery system [7]. Although not in IFU, there has been emerging reports for its successful use to exclude subclavian artery aneurysms [8] and visceral artery aneurysms such as superior mesenteric artery and splenic artery [9]. For this patient, two BeGraft Aortic stents (12 × 39 mm and 12 × 19 mm) were deployed in satisfactory position, excluding the saccular aneurysm from circulation (Figures 2 and 3). The stent graft delivery was smooth and compliant. The stent graft deployment was easily visualised on fluoroscopy without the need for magnification. The second stent placement was also easily managed without evidence of stent 'jump' or migration. Following successful deployment, the puncture site haemostasis was achieved via closure device (Perclose, Abbott Laboratories).

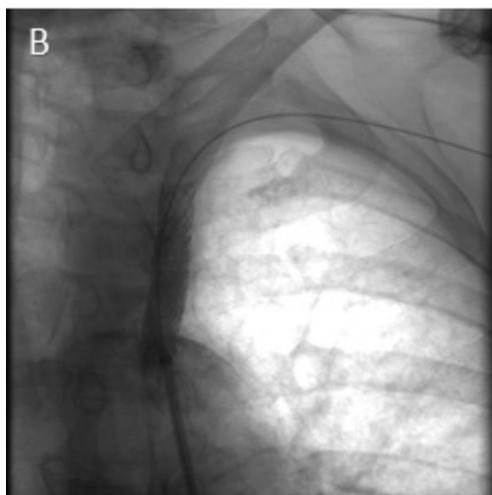


Figure 2: With 0.035 wire and 9 French sheath, 12 × 39 mm and 12 × 19 mm BeGraft Aortic stents were deployed to exclude the left subclavian artery aneurysm.

Discussion

SAA is traditionally treated by open surgical repair. Surgical access site varies depending on the aneurysm location and size. Extrathoracic aneurysm usually involves infra-clavicular or supra-clavicular incision whereas intrathoracic aneurysm usually requires thoracotomy and sternotomy for access [1-4]. These open repairs are associated with high complication rates such as recurrent ischaemic arm, laryngeal nerve injury and chylothorax [4]. Similar to several other types of aneurysm, endovascular approach to treat SAA has been emerging. The main advantage is that it acquires access through common femoral artery or brachial artery, and therefore does not require surgical incisions on the neck or chest. In a scenario when there is a difficulty to access SAA due to aortic or arterial tortuosity, both of these access sites may be cut down and a stiff wire can be inserted from one access point

to the other, so called 'through-and through technique' [1]. Although there is currently limited evidence to decisively support its superiority over open repair, several literatures have supported endovascular treatment having high success rate, low recurrence rate and low complications [1,2,4].

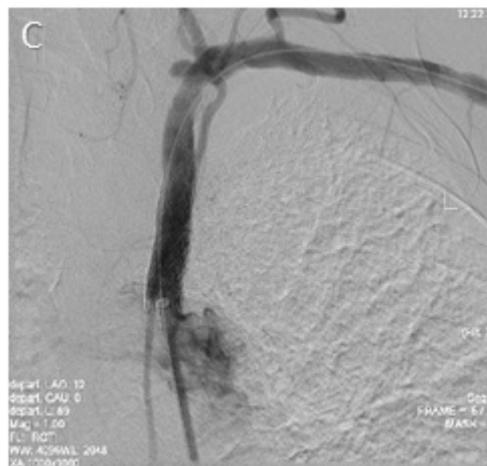


Figure 3: Full exclusion of the left subclavian artery aneurysm without compromise to its origin or branches.

Endovascular technique for SAA is generally performed using covered stent to exclude aneurysm. Complications often include in-stent thrombosis, stenosis, endoleaks, and embolisation. Endomaterial used in covered stent such as Dacron, Nitinol and PTFE (Polytetrafluoroethylene) may contribute to these complication rates [1-2]. A literature review from Maskanakis et al. [1] described self-expanding stents used in 54.4% of the cases in which 60.5% of those were PTFE covered stent. However, no definite conclusion could be drawn on the advantages and disadvantages of each endomaterial type.

This case reports illustrates the potential use of BeGraft Aortic stents in a small saccular subclavian aneurysm with good result, where alternative operable options were not possible. Its ease of deployment and placement makes it a reasonable option for future similar cases, even though this type of stent is not commonly used outside aortic coarctation and iliac arteries [7].

Conclusion

Subclavian artery aneurysm is a rare peripheral artery aneurysm which carries serious risk of rupture and thromboembolic events. Although it has been traditionally treated with open surgical repair, the operation carries substantial complication rate due to its difficulty of gaining access. Similar to several other types of aneurysm repair, there are increasing literatures describing endovascular approach to be effective with high success rate and lower complication. Because of its rarity, varied aneurysm dimension and limited case reports available, there is currently no specific guidance endorsing a single most appropriate type of endovascular treatment. This case report has described the use of Bentley's BeGraft Aortic stent to be reasonable option in the treatment of small peripheral subclavian aneurysms including those involving major aortic branch vessels.

References

1. Maskanakis A, Patelis N, Moris D, Tsilimigras DI, Schizas D, et al. (2018) Stenting of subclavian artery true and false aneurysms: A systematic review. *Annals of vascular surgery* 47:291-304.
2. Gao X, Li L, Gu Y, Guo L, Cui S et al. (2017) Endovascular repair of subclavian artery aneurysms: Results from a single-center experience. *Perfusion* 32:670-674.
3. Mengal MN, Ashraf T, Badini AM (2016) Successful percutaneous intervention for subclavian arterial aneurysm. *Vascular Disease Management* 13:275-280.
4. Davidovic LB, Zlatanovic P, Ducic S, Koncar I, Cvetic V, et al. (2019) Single center experience in the management of a case series of subclavian artery aneurysms. *Asian Journal of Surgery*.
5. Ivar Seldinger S (2008) Catheter replacement of the needle in percutaneous arteriography: A new technique. *Acta Radiologica* 49:47-52.
6. Vos CG, Schuurmann RC, de Vries JP (2018) The BeGraft balloon expandable covered stent as a proximal extension to an iliac branch device for endovascular repair of isolated common iliac artery aneurysms. *EJVES Short Reports* 39:1-4.
7. Bentley Global (2019) BeGraft Aortic-Aortic Stent Graft System Brochure. Bentley InnoMed GmbH.
8. Yap HY, Chong TT, Lee QS, Chng JK, Wang CC, et al. (2019) Fenestrated Endovascular Repair of Zones 1 and 2 Aortic Arch Pathologies. *Annals of Vascular Surgery* 54:145.
9. Kraft GM, Erling N, Lichtenfels E, Aerts NR, Leal GA, et al. (2018) Endovascular Treatment of Visceral Artery Aneurysms with Stent-Graft.