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Retrograde migration of a subclavian artery stent requiring open surgical trimming

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Abstract

A young woman presented with the left upper limb critical ischaemia caused by the ipsilateral Subclavian Artery stenosis. She underwent an elective Subclavian Artery stenting that was complicated by a significant stent migration into the aortic arch. In effect, the stent was abutting the inner curvature of the aortic arch. An endovascular approach was considered to be high risk for a potential aortic penetration. Therefore, an open surgical trimming of the stent was performed. Overall, the patient has made a good post-operative recovery.

Keywords

subclavian artery; critical ischaemia; endovascular stenting; stent migration

Abbreviations

SCA: Subclavian Artery; CTA: Computed Tomography Angiography; BA: Brachial Artery; DSA: Digital Subtraction Angiography; MRA: Magnetic Resonance Angiography

Introduction

The precise incidence of the Subclavian Artery (SCA) disease (stenosis, occlusion) remains unknown, but it has been reported as high as 18% [1,2]. The disease primarily affects left SCA and treatment is recommended in symptomatic cases only [1,3]. Although endovascular techniques are significantly less invasive, they can still lead to various complications that may require additional open salvage procedures. Therefore, we feel it is important to report this case that highlights key aspects regarding management of the SCA disease including a rare, but serious post procedural complication.

Case Presentation

A 28 year old woman presented with several months history of the left upper limb critical ischaemia (dominant limb). She complained of coldness, weakness and severe rest pain affecting particularly her forearm and hand. The patient had no past medical history including trauma, infection or any previous surgical interventions. She was a heavy smoker.

On examination, all left upper limb pulses were absent, but the limb had no sensomotory deficit. There was no evidence of any tissue loss. On the right side, there was a full complement of upper limb pulses.

Duplex ultrasound scan revealed a complete occlusion of the left SCA. Computed Tomography Angiography (CTA) showed soft plaque causing tight focal stenosis in the proximal left SCA. There were no other arterial abnormalities. Blood tests excluded vasculitis. The patient stopped smoking and was started on the best medical therapy. Following a discussion at the vascular multidisciplinary meeting the patient underwent an elective SCA angioplasty and stenting.

A 6 French sheath was placed in the proximal SCA via a retrograde left Brachial Artery (BA) puncture under fluoroscopic guidance. Digital subtraction angiography (DSA) confirmed an occluded origin of the left SCA (Figure 1). The SCA stenosis was easily crossed with a Terumo wire (Figure 2) and vertebral catheter that was exchanged for a standard Pigtail catheter. Subsequently, 7mm x 37mm EV3 Covidien VisiPro balloon expandable stent (Figure 3) was deployed at the origin of SCA ensuring that the proximal stent portion protruded 2-3 mm into the aortic lumen. Unfortunately, repeated fluoroscopy demonstrated a significant stent migration (Figure 4). In effect, the proximal portion of the stent was abutting the inner curvature of the aortic arch (Figure 5). There was a localised area of dissection in the SCA just beyond the stent, with preserved flow in the SCA and vertebral artery. The BA was closed surgically as the manual compression failed to achieve satisfactory haemostasis. At operation, the patient was found to have very soft and fragile BA. Moreover, she required a topical administration of Papaverine with an embolectomy catheter dilatation to overcome the BA spasm. The patient had restored radial artery pulse at the end of a procedure. Given the SCA dissection, fragile arteries, and fully viable upper limb, no attempt was made to reposition or retrieve malpositioned stent by endovascular means. Following a referral to cardiothoracic tertiary centre the patient underwent a successful open thoracotomy.

At operation, the protruding aortic stent was trimmed, and the reminder of the stent was left in situ in the SCA. There were no complications related to the open surgery and post-operative CTA revealed fully expanded and patent stent (Figure 6). After a period of a routine follow-up, the patient was discharged.

Discussion

The SCA disease primarily affects left sided vessel and aetiology include atherosclerosis (most common), arteritis, vasculitis, fibromuscular dysplasia, previous radiation exposure and thoracic outlet syndrome [1,3]. The majority of cases remain asymptomatic owing to a rich upper limb collateral circulation. However, when symptomatic it can lead to a significant morbidity due to ischaemia, subclavian steal syndrome, intermittent claudication and coronary-subclavian syndrome in cases when the Internal Mammary Artery has been used for coronary revascularisation [1,3,4]. Diagnosis is usually established by a combination of clinical and radiological findings. Radiological confirmation can be achieved by Duplex ultrasound scan, CTA and Magnetic Resonance Angiography (MRA). Duplex ultrasound scan is simple, non-invasive first line imaging modality that allows identification of SCA stenosis or occlusion [1]. Additionally, it detects reversed flow within an ipsilateral vertebral artery that may indicate the presence of subclavian steal syndrome [1]. Both CTA and MRA provide an excellent anatomical assessment of an entire aortic arch that is essential prior to any form of intervention [3].

Treatment of the SCA disease is indicated in symptomatic cases only. Although level I evidence is lacking regarding an optimal approach, the overall consensus favours endovascular techniques as the first treatment option [2,4-6]. Angioplasty with or without stenting is relatively safe option that can be performed either from the brachial or femoral arteries approach and has a high success rate [2,3,6]. Complications can be local or remote, and those related to an access site vessel include haematoma, SCA rupture, thrombosis, dissection, median nerve compression and infection [3]. Post operative stroke is rare because SCA disease is usually associated with a radiological steal syndrome (non clinical) where a retrograde flow within an ipsilateral vertebral artery acts as a protective mechanism [2]. Another remote complication is distal embolisation that if threatens viability of a limb occasionally may require an emergency surgery. Finally, delayed stent fractures with migration or maldeployment have been reported [5,7]. These are rare and have been demonstrated by a hand full of case reports only. Nevertheless, these can be serious and may require an open salvage procedure. We have used a balloon expandable stent (Figure 1 and 2) that is recommended for an ostial SCA disease. These stents generate high radial force allowing for a precise deployment when compared with a self-expanding stent [5]. Despite that, we have encountered a significant stent migration. There are several potential explanations including stent undersizing, presence of soft plaque, catheter exchanges, incorrect image reference during deployment and high arterial flow that exhibited a possible drag on the stent. The stent size matched the size of the SCA on the pre-procedural CTA. Hence, it was undersized and the addition of soft plaque within the artery potentially reduced radial force of the stent. Furthermore, catheter manipulations with subsequent exchanges could also be responsible for the stent migration. On the other hand, the occlusive ostial SCA disease should theoretically provide enough anchorage for the stent to prevent maldeployment. Finally, an accidental change in the position of the mini C-arm after the reference image has been obtained remains a possible explanation for the described complication.

In the presented case, we did not attempt endovascular retrieval with a bigger sheath and a snare due to high risk for of serious complication including an aortic penetration. However, such approach has been successfully reported by others [5,7]. One might argue that surgical approach was too invasive, but this form of intervention was deemed necessary by the multidisciplinary team of cardiothoracic surgeons in the tertiary centre. Also, it demonstrates that aggressive surgical treatment remains a feasible option. Although this should be assessed on an individual case basis.

Overall, endovascular treatment provides acceptable primary patency rates at 2 years of 90% and as high as 95% at 5 years [2,3,6]. Furthermore, it offers less morbidity and quicker post-procedural recovery. Although this comes at the expense of a long-term durability which is still superior with an open approach [2]. On the other hand, traditional surgery remains a viable option if the future intervention is required. An open surgery can be contemplated only if an ipsilateral internal carotid artery is patent and disease free. The reconstruction options include a carotid transposition and carotid-SCA or carotid-carotid bypasses [2,4]. An arterial conduit with a Polytetrafluoroethylene gives superior results when compared with a vein. The reported primary patency rates of 100% at 10 years for carotid transposition, 95% at 10 years for carotid-SCA bypass and 88% for carotid-carotid cross over bypass graft have been described [2-8].

Conclusion

Although endovascular treatment offers many advantages and is currently the primary treatment option, one must remember to inform patients regarding this rare but potentially serious consequences requiring further major open surgery.

Figures

Figure 1: DSA: occluded origin of the SCA.

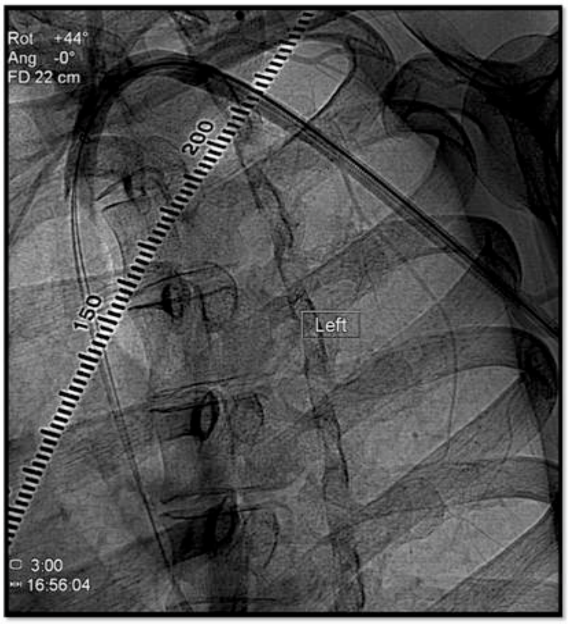

Figure 2: DSA: Terumo wire crossing the SCA lesion.

Figure 3: Details of the balloon expandable stent.

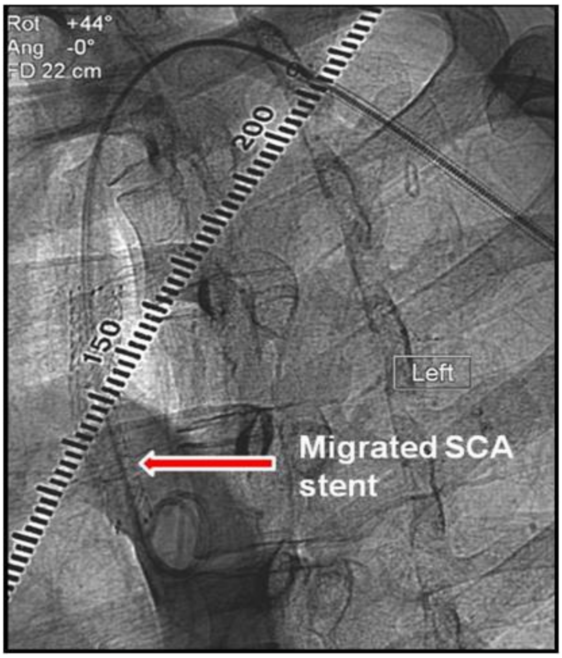

Figure 4: DSA: Migrated SCA stent.

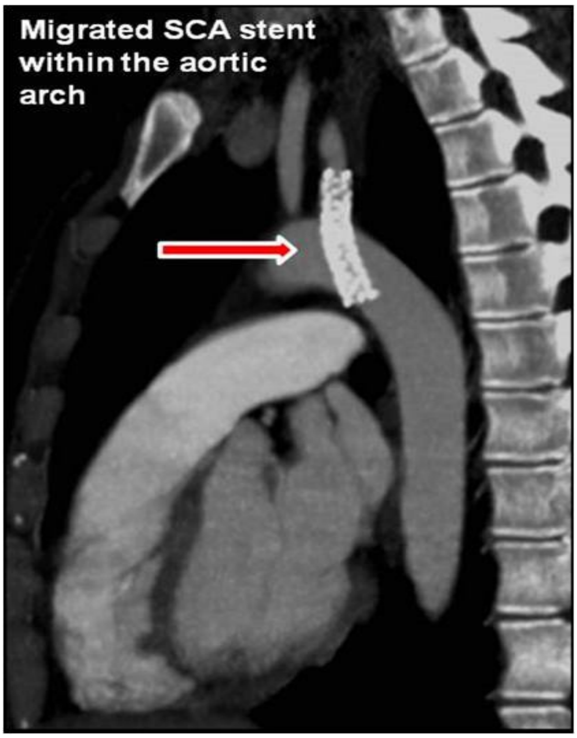

Figure 5: CTA (coronal view): SCA stent abutting the inner curvature of the aortic arch.

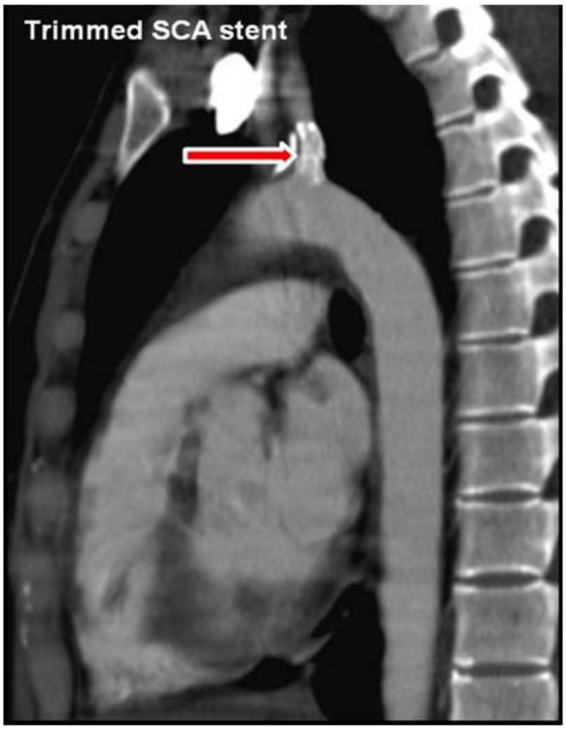

Figure 6: CTA (coronal view): Trimmed SCA stent.

References

1. Ochoa VM, Yeghiazarians Y. Subclavian artery stenosis: a review for the vascular medicine practitioner. Vasc Med. 2011; 16: 29-34.

2. Beard JD, Gains PA. Vascular and Endovascular Surgery. 4th edn. Edinburgh: Elsevier, 2009.

3. Stone PA, Srivastiva M, Campbell JE, Mousa AY. Diagnosis and treatment of subclavian artery occlusive disease. Expert Rev Cardiovasc Ther. 2010; 8: 1275-82.

4. Parvin SD. Rare Vascular Disorders: A practical guide for the vascular specialist. tfm Publishing Limited, 2005.

5. Grasso C, Costanzo L, Tamburino C. Subclavian transectional stent fracture and migration to the aortic carrefour: a case description of retrieval by snare system. Catheter Cardiovasc Interven. 2014; 83: 1010-3.

6. 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 JVasc Endovasc Surg; 2015; 50: 13-20.

7. Aggarwal VP, Malik A, Gupta SK. Percutaneous retrieval of a fully expanded maldeployed left subclavian artery stent: nightmares in cath lab. Indian Heart J. 2009; 61: 115-6.

8. Ozsvath KJ, Roddy SP, Darling RC3rd, Byrne J, Kreienberg PB, Choi D, et al. Carotid-carotid crossover bypass: is it a durable procedure? J Vasc Surg. 2003; 37: 582-5.