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Case Report

Incidental aortic coarctation in traumatic subclavian artery injury

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ABSTRACT

Subclavian artery injuries are complex and challenging due to anatomy and exposure during surgery. The surgical management depends on the mechanism of injury, the patient's haemodynamic stability and other injuries sustained. If control of bleeding is lost during surgery, it results in immediate exsanguination, with high mortality and morbidity rates. New techniques with endovascular surgery have changed the approach and outcome of these injuries. In this case report, an incidental finding of coarctation of the aorta in a 32-year-old man after sustaining a gunshot to the chest, with a subsequent subclavian artery injury is reported.

(See [Figs. 1–6.](#))

Introduction

In trauma, subclavian artery injuries are common and complex injuries, reported to have a mortality rate of 14–25% in South Africa (1). It is believed that historically these injuries were underreported on the battlefield (2), as exsanguination leads to immediate death (2). These injuries were approached with open surgical techniques, which proved to be a high risk (4). In the last two decades, with new advances in endoscopic management, haemodynamically stable patients are frequently treated with this minimally invasive method (5).

Case report

A thirty-two-year-old man arrived from the local clinic escorted by Emergency Medical services in a wheelchair, after sustaining a single gunshot to the neck. He was hit by a stray bullet, that went through the car window. On arrival, he had a blood pressure of 168/82 mmHg and a pulse rate of 101 beats per minute. The wound was reported to have been bleeding, for which a compressive dressing was applied. The patient was maintaining his airway, was alert and orientated. Resuscitation was initiated with the insertion of two large-bore intravenous lines, and he was transferred to our Trauma Centre.

On arrival at Charlotte Maxeke Academic Hospital, the patient was assessed according to ATLS® principles. He was maintaining his airway. On auscultation of the chest, the patient was found to have decreased air entry on the left. An intercostal drain was placed for a haemopneumothorax. He was haemodynamically stable with a blood pressure of 153/105 mmHg and a pulse rate of 58 beats per minute and saturating at 100% on nasal prong oxygen with a Glasgow Coma Scale of 15/15.

On further examination, a single entrance wound over zone II of his neck on the left was found. The wound was 2 cm in diameter, had a palpable haematoma, which was not actively expanding. There was no active bleed from the wound. The only hard signs of

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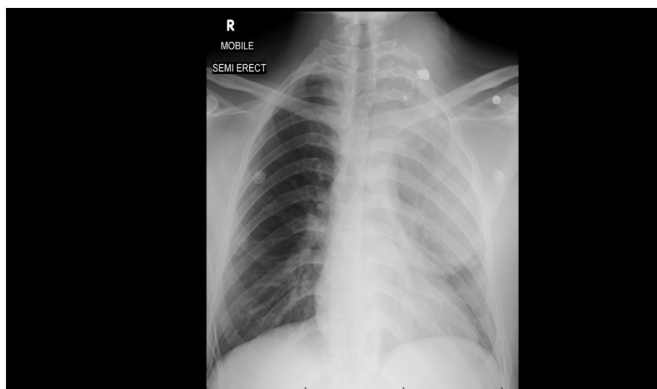


Fig. 1. CXR on admission, pre-ICD insertion.



Fig. 2. CT angiogram neck: subclavian artery injury indicated.

vascular injury were an audible bruit and a palpable thrill over the affected area. He had good distal pulses palpable in his left arm, with no evidence of ischaemic changes. The patient clinically had a motor and sensory nerve fallout of the ulnar distribution of the left arm.

Subsequently, a CT-Angiogram of the neck and chest was requested to assess the extent of the penetrating injury. This study demonstrated a left subclavian artery injury, as well as a linear defect with decreased calibre in the arch of the aorta. The patient had marked distension of the great vessels and multiple mediastinal peri-stenotic collaterals. In retrospect, the aortic abnormality was an incidental finding of a post-ductal coarctation of the aorta.

We consulted the vascular surgery unit as the patient was hemodynamically stable; he was booked for endovascular stenting on their next available list.

He was admitted to a High Care Unit (HCU) for monitoring and was given appropriate analgesia and fluid resuscitation.

During the course of his HCU admission, the patient's haemoglobin remained static, with no active bleeding. His neck haematoma was unchanged, airway patent, and the thrill and bruit were present until the day of the intervention. The patient had hypertensive episodes for which a calcium channel blocker (Amlodipine) was initiated.

Two days after admission, the patient was taken for elective endovascular stenting. Access was achieved via a brachial artery cutdown. An angiogram was done, which identified the injury site. A size 12 covered stent was inserted. During the procedure, it was confirmed that he had a prominent subclavian artery with an evident coarctation of the aorta.

The patient was transferred back to HCU and started on Aspirin 150 mg per os daily. He was alert and haemodynamically stable



Fig. 3. CT Angiogram chest: aortic arch defect identified- coarctation of the aorta.

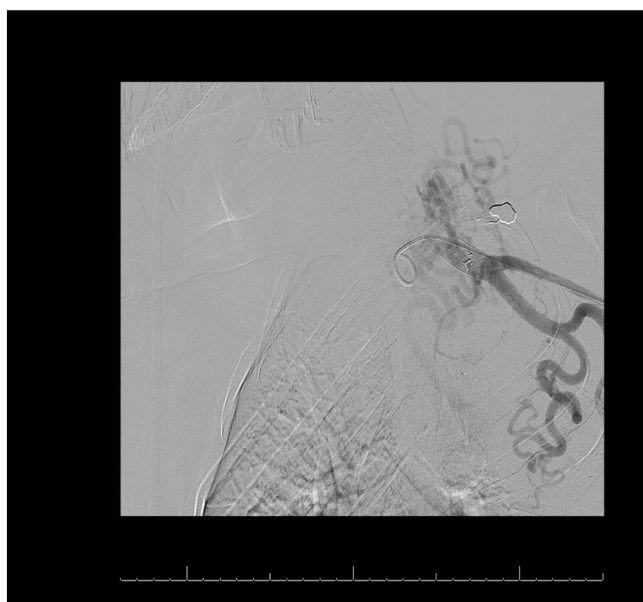


Fig. 4. Angiogram- size 12 covered stent placed in the Subclavian artery, multiple collaterals observed.

after the procedure.

The plastic surgery team was consulted for the ulnar nerve fallout. Nerve conduction studies subsequently confirmed brachial plexus involvement. Occupational therapy assisted the patient with exercises and braces.

Post-operatively, the patient started mobilising, tolerating full ward diet, fully orientated. He will require cardiothoracic surgery follow up for the coarctation of the aorta, but has been successfully managed by a minimally invasive procedure. The morbidity associated with a sternotomy and thoracotomy was avoided, and the patient had a good outcome.

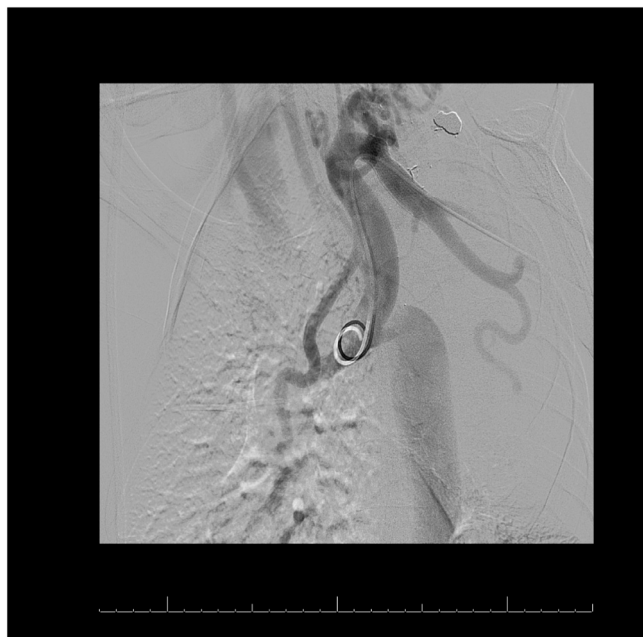


Fig. 5. Angiogram post stent placement- coarctation of aorta identified.

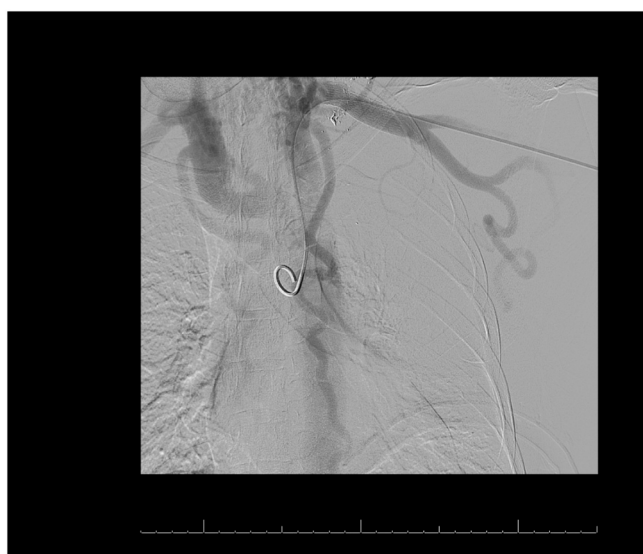


Fig. 6. Angiogram- stent in-situ.

Discussion

Due to the high rate of interpersonal violence in South Africa, there is a large number of penetrating thoracic injuries (1). The anatomic position of the subclavian artery protects it from injury, with a barrier from the clavicle and first rib (1). Paradoxically during surgical exploration, these structures complicate the procedure by limiting exposure (2). Injury to the vessel is rare and presents mostly due to penetrating injury, with the ease of surgical exposure depending on the portion of the vessel that is injured, and whether it presents on the left or right (2).

Anatomically, the subclavian artery is divided into three parts in relation to the anterior scalene muscle. The first portion is usually challenging to expose, due to its course behind the sternoclavicular joint. Similarly, exposure of the left subclavian artery is difficult due to its posterior origin from the aortic arch. A thoracotomy incision gives exposure on the left, and a sternotomy is preferred for adequate access to the right (2).

Due to the obstacles in exposure; it is a high-risk operation with difficulty in haemorrhagic control. The complications of open surgery include haemorrhage, brachial plexus injury and pleural injuries. Since the introduction of endoscopic therapy, penetrating injury surgeries have had a decrease in mortality rates of 10–40% for open surgery compared to 5% for minimally invasive methods (3).

A study done in South Africa showed that a subclavian artery injury is critical and that patients present in extremis. Endovascular surgery has become the first choice of management in the stable patient. Although concerns have been raised about the feasibility of a stent in a young patient in this area of maximum strain and movement, it was found that the study showed a definitive decrease in the mortality rate of 9% and prevented the morbidity associated with open sternotomy or thoracotomy (5).

In our case report, the patient was incidentally found to have coarctation of the aorta. This is usually a discrete narrowing of the aorta to the left of the left subclavian artery. Coarctation of the aorta causes a significant afterload on the left ventricle, resulting in left ventricular hypertrophy, and the formation of multiple arterial collaterals (6).

The presentation of coarctation in adulthood is usually a representation after failed treatment or a missed case. In adult life, the majority of these cases present with hypertension and discrepancies in upper and lower extremity pulses (6). Campbell demonstrated that 50% of untreated patients would demise by the age of 30, 75% by 46 years and 90% by 58 years (7). The management of patients with coarctation includes open surgical repair, balloon angioplasty and endovascular stenting (7).

Operative management in adults have technical difficulties as the aortic wall is thick, and large collaterals have formed. (7) Survival in these patients depends on the collaterals formed from the subclavian arteries, which can be seen on plain X-ray film as rib notching. Untreated, these patients have a high risk of death due to congestive heart failure, aortic rupture, and bacterial endocarditis. (8)

Conclusion

This case report presents an adult man, with an incidental finding of coarctation of the aorta, surviving three decades with collateral formation of the subclavian artery with no previous intervention. The signs can be subtle and overlooked on physical examination. The complex subclavian artery injury was successfully managed by minimally invasive treatment, even with the anomalous presentation.

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