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Case Report

Iatrogenic giant subclavian artery pseudoaneurysm following clavicle fracture repair: A case report ^{☆,☆☆}

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ABSTRACT

Subclavian artery aneurysms are infrequently observed in clinical settings, and are divided into intrathoracic and extra-thoracic segments. Atherosclerosis, cystic necrosis of the tunica media, trauma, or infections are more common. Blunt trauma or piercing is more frequently the cause of pseudoaneurysms, and broken bones following surgery should be evaluated.

A 78-year-old woman attended the vascular clinic with a closed mid-clavicular fracture due to plant trauma before 2 months. Physical examination revealed a well-healed wound and no palpable pain, but a massive pulsating mass with normal overlying skin in the superior side of the clavicle. Thoracic CT angiography and a neck ultrasound revealed a distal right subclavian artery pseudoaneurysm of 50 × 49 mm. Arterial injuries were repaired by a ligation and bypass.

The recovery from surgery was successful, and a 6-month follow-up examination revealed a right upper limb that was symptom-free and well-perfused.

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Introduction

Less than 1% of all aneurysms are subclavian artery aneurysms, which are infrequently observed in clinical set-

tings [1]. According to their anatomical placements, which often reflect the etiology, subclavian artery aneurysms are divided into intrathoracic and extra-thoracic aneurysms [2]. Extrathoracic aneurysms are more prevalent, and thoracic outlet syndrome or prior injuries account for roughly 75% of these

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aneurysms at this location [3]. Atherosclerosis, cystic necrosis of the tunica media, trauma, or infections can all contribute to intrathoracic segmental aneurysms of the subclavian artery [2,4].

Blunt trauma or piercing is more frequently the cause of pseudoaneurysms. About 80% of all clavicle fractures occur in the mid-portion of the clavicle [5]. Broken bones following surgery should be evaluated. Radiological investigations can quickly identify the majority of postoperative complications, which should be clinically correlated with history and physical examination.

Osteosynthesis, often known as plate and screw fixation, is frequently used to treat clavicle fractures. Iatrogenic artery damage can occasionally occur, most frequently as a result of a screw-induced pseudoaneurysm. This could manifest right away or years down the road with complications including subcritical limb ischemia [3]. Clavicle plates and screw fixations also put the brachial plexus and subclavian vein in danger. While nerve injury may result in immediate, excruciating arm pain and paralysis, subclavian vein injuries may produce hemorrhage and air embolism [6]. Orthopedic screws should be securely fastened to the plate and reach into the proximal and distal cortex of the bone, but they shouldn't be too lengthy to endanger important structures beyond the distal cortex.

Traditional treatment for this involves open surgery, which has a high rate of morbidity because it requires significant exposure through clavicle excision, thoracotomy, or median sternotomy [7]. Endovascular stent grafting has captivated surgeons in recent years due to technological advancement and rising operator experience, allowing them to treat these injuries noninvasively and with less morbidity [8].

Case presentation

A 78-year-old woman attended the vascular clinic with past history of closed mid-clavicular fracture due to plant trauma before 2 months, the fracture was fixed on the same day as the trauma with a reconstruction plate and screws by another hospital.

The patient noticed swelling in the superior side of the clavicle during the second week after surgery, but she did not seek any medical advice because she through normal postoperative changes, the mass gradually increased in size when he started to complain neck pain, swelling, and heaviness in the right shoulder associated with numbness and tingling sensation that extend to include the whole right upper limb

Physical examination revealed a well-healed wound and no discernible palpable pain. However, there was a massive pulsating mass with normal overlying skin in the superior side of the clavicle (Fig. 1). A bruit was audible on stethoscope auscultation. The distal extremity neurovascular examination was unremarkable. Laboratory examinations including CRP, ESR, and WBC were normal.

Thoracic CT angiography and a neck ultrasound were performed. A significant pseudoaneurysm was discovered during a neck ultrasound Doppler assessment in the right supraclavicular fossa. On color Doppler flow can be seen within it in a characteristic yin-yang pattern (Fig. 2).



Fig. 1 – Shows a large pulsatile mass in the right supraclavicular region.

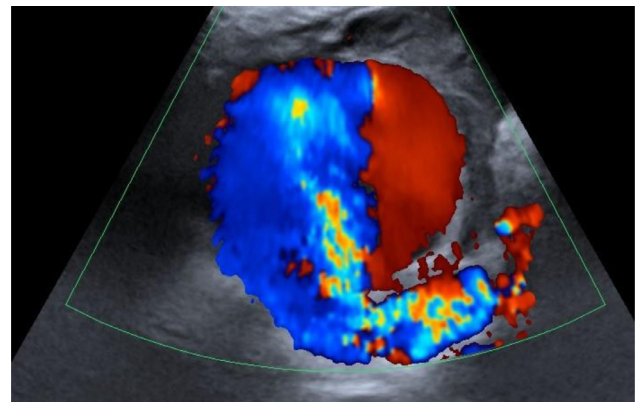


Fig. 2 – Transverse color Doppler ultrasound image revealed a “yin-yang” sign, compatible with right subclavian pseudoaneurysm.

A computed CT angiography revealed a distal right subclavian artery pseudoaneurysm of 50 × 49 mm (Fig. 3).

As the patient was brought into the operating room, following the incision to expose the distal portion of the right subclavian artery, there was a large pseudoaneurysm with an orthopedic screw implanted nearby. Arterial injuries were repaired by a ligature and subsequent bypass, the clavicle was fixed with a second reconstruction plate after the removal of the first plate and a 2 long screws.

The recovery from surgery was successful, and a 6-month follow-up examination revealed a right upper limb that was symptom-free and well-perfused.

Discussion

Aneurysms in the subclavian artery make up roughly 1% of all peripheral arterial aneurysms [1,2]. Hobson et al. conducted a review of the literature and discovered that only

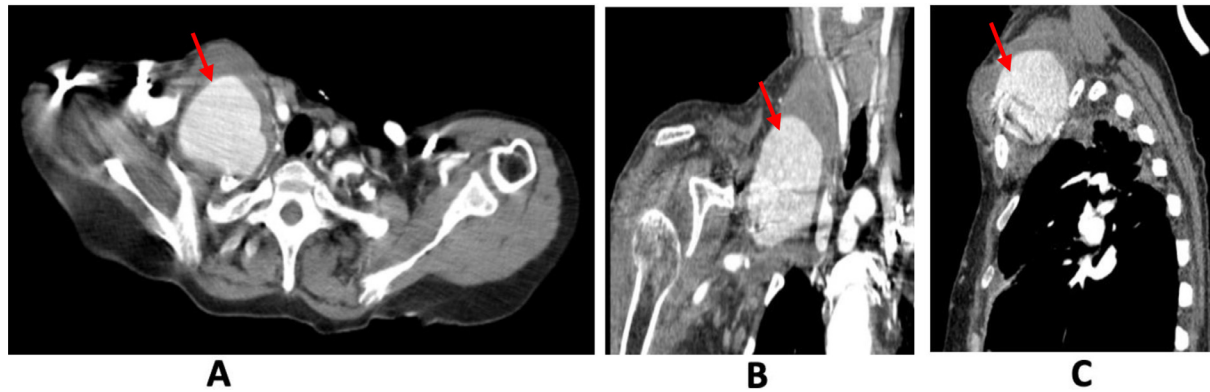


Fig. 3 – Computed tomography angiography (CTA) images (A) Axial, (B) Coronal and (C) Sagittal views showing a large partially thrombosed saccular pseudoaneurysm (Red arrow) originating from the right subclavian artery (RSA) displacing the trachea and adjacent neck structures. It measures 50 x 49 mm.

1% of all peripheral aneurysms originated from the subclavian artery. They identified 195 cases of aneurysms. Only 2%–5% of acute vascular injuries involve the subclavian artery. False aneurysms, or pseudoaneurysms, are described as a contained rupture of the arterial wall layers in which the actual blood collection has no walls and is in direct contact with the artery defect. The common femoral artery has the most traumatic pseudoaneurysms [9], and the majority of these are caused by surgical procedures, infections, arterial catheterization, and/or radiological interventions. Subclavian vessel injury from a clavicle plate screw is exceedingly rare. In this case, the patient had a surgical plate and screw fixation for a fractured right clavicle.

Galley et al. [5] conducted a statistical examination of the clavicle thickness and distance from the subclavian and axillary arteries at various times throughout the dissection of 12 shoulders from 6 cadavers and 40 dry clavicles in an anatomical investigation. At the lateral edge of the first rib, the subclavian artery changes into the axillary artery. According to the research, the clavicle and nearby veins were most closely spaced between the medial quartile and the clavicle's midway [5]. The study also determined that the median clavicle thickness over the subclavian artery was 11 mm and over the axillary artery was 15 mm [5]. The safest length for a screw is 26 mm, which is the median distance between the superior aspect of the clavicle and the superior aspect of the subclavian artery (range: 22–35 mm) [5]. The thickest clavicle in this danger zone, which is between one-fourth and three-fourths of the length of the clavicle, measured 17.6 mm [5]. The Galley study, therefore, recommended an approximately 18 mm drill stop such that the screw can pierce the superior and inferior cortices but not the nearby vessels [5].

According to a case study by Lewis, a subjacent subclavian artery was impinged upon by an inappropriately lengthy screw, resulting in a symptomatic pseudoaneurysm [10].

The location and size of the pseudoaneurysm in the subclavian artery affect the symptoms. Extrathoracic aneurysms typically manifest as a pulsatile lump over the supraclavicular fossa with vascular murmurs; intrathoracic aneurysms or poststenotic dilated aneurysms compress the brachial plexus

or upper extremity vessels, resulting in ischemia of the limb; while the mass bodies that erode the apex of the lung may cause hemoptysis [11]. Right upper limb and neck pain was evident in the case. Physical examination revealed a large, pulsing mass with normal-looking skin overlaying in the right supraclavicular region.

Due to its ability to display the location, size, and extension, chest CT angiography is crucial in the diagnosis process. CTA is helpful for an operational strategy in addition to being a valuable diagnostic investigation [12]. Since color ultrasonography is a noninvasive method that may be used repeatedly as needed, it has obvious utility for providing preoperative diagnosis and assessing postoperative therapy effects during follow-up. In this case, both CT angiography and color ultrasonography were performed. Ultrasound revealed a pseudoaneurysm in the right supraclavicular fossa with color flow. While CT angiography revealed a large pseudoaneurysm coming from the right subclavian artery (RSA) displaying the trachea and other neck structures,

Complications of untreated pseudoaneurysm include continued enlargement, which may result in its rupture, arterial thrombosis, compression of the nearby neurovascular systems, and erosion through the skin surface, resulting in external bleeding [13]. Historically, surgical repair was the first treatment option. Recently, less intrusive techniques for treating the pseudoaneurysm have been developed. Due to the unavailability of noninvasive treatments in Somalia at the time, the patient in this case underwent surgery and was discharged without any symptoms.

Conclusion

Our case study illustrates that the subclavian vessel injury from a clavicle plate screw is an exceedingly rare but potentially morbid complication. Due to its ability to display the location, size, and extent of the lesion, CT angiography is crucial in the diagnosis and surgical planning processes.

Patient consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

Ethical approval

Waived by the ethical committee of Mogadishu Somali Turkey, Recep Tayyip Erdogan Training and Research Hospital as we have acquired consent from the patient.

Author contribution

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis, and interpretation, or in all these areas; took part in drafting, revising, or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

Guarantor

Hamdi Mohamed Isse and Yahye Garad Mohamed

Provenance and per review

Not commissioned, externally peer-reviewed.

Availability of data and materials

The information used and/or analyzed during this case report is available from the corresponding author upon reasonable request.

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