

The Late Lesion of the Subclavian Artery as Rare Complication of a Nonunion of a Clavicular Fracture

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Abstract

Lesions of the subclavian artery are a rare complication in the acute trauma to the shoulder with a fracture of the clavicle. The close anatomy of the artery exposes it to fragment perforation. However, as fractures to the clavicle are common, associated vascular complications are very rare. We report on a patient that sustained a vascular perforation year after the trauma as a result of an ununited clavicular fracture.

Keywords: *Complications of Non-Union of the Clavicle; Pseudoaneurysm of the Subclavian Artery; Late Perforation of Subclavian Artery in Clavicle Fractures*

Introduction

Fractures of the clavicle are common and usually regarded as a benign injury with little complications. Their management in most cases remains conservative with good results, outcomes and without long-term sequelae. Complications mainly occur in the acute trauma or in a timely very close relationship to it. Only very few patients may develop late complications, mainly pseudoaneuysms in fractures with nonunion.

The Case

A 73-year-old retired builder was admitted to the hospital. He had noticed a swelling to the right lateral aspect of his neck. The swelling started one hour ago and occurred without any trauma (Figure 1).



Figure 1: *Clinical findings on admission.*

The Client has a history of an atrial fibrillation for which he receives anticoagulation. Besides, he suffers from Diabetes mellitus type 2, hypertension and a rheumatoid arthritis affecting the right shoulder with a massive rotator cuff lesion.

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2 years prior to admission, he was involved in a mechanical fall sustaining fractures to the right second to tenth ribs. He developed a hemopneumothorax leading to a pleura empyema for which he underwent a video assisted thoracoscopy with decortications. Following surgery, he became asymptomatic. After discharge, he sustained another fall with a fracture to the right collar bone. The fracture was displaced with comminution and shortening of the fragments. For the fracture, he was treated conservatively and was followed up in Fracture Clinic. It was documented that the fracture did not unite.

The Client's medication on admission consisted of Xarelto 10 mg, Ass 100 mg, Prednisolon 10 mg, and MTX.

The physical examination revealed a colored swelling over the right lateral aspect of the neck and the supraclavicular fossa. It had a fluctuant consistency with a diameter of approximately 8 to 10 centimeters. The movement in the right shoulder joint was painfully restricted and limited to 80° abduction and forward flexion. The patient indicated decreased sensation over the radial aspect of his forearm with reduced power. The chest had characteristics of a flail chest but appeared stable and moveable in in- and expiration. Breathing sounds were present bilaterally.

X-ray of the chest could exclude a haemato- or pneumothorax. However, it could show the non-union of the clavicle (Figure 2).



Figure 2: Non-union of the clavicle after 2 years.

X-ray of the right shoulder demonstrated the former fracture in shaft's mid with quite sharp fragment ends and relevant shortening.

A requested Doppler of the subclavian artery showed a massive soft tissue mass and raised suspicion of a pseudoaneurysma with active vascular leaking. The Angio-CT showed the following findings.



Figure 3: Angio CT of the chest. The arrow indicates the leakage.

The Angio-CT could demonstrate a lesion of the subclavian artery in the former fracture site with signs of active bleeding. The bleeding had already extended into the soft tissues of the neck, the apex of the lung and the arm pit.

The Client was transferred to the vascular surgeons. He underwent a two-stage intervention that consisted of an endovascular stenting of the subclavian artery via the brachialis artery. Due to the hematoma and the patient's anticoagulation, plating and bone grafting of the clavicle followed 6 days later.

Discussion

Fractures of the clavicle contribute to 5% of fractures in the adult population. Among them, mid-shaft fractures are considered to be the most common type. Unless displaced, fractures are usually managed non-operatively. Fracture associated complications are rare and occur more often in the acute phase, especially in polytraumatized patients, comminuted or displaced fractures as subclavian vessels injury, hemopneumothorax, scapula-thoracic dissociation or brachial plexus paresis.

In a meta-analysis by Zlowodzi [1], a 5.9% rate of non-union was reported in clavicle fractures. The incidence increases to 15.1% in patients with displaced fractures. Common causes for nonunion are the severity of the initial trauma, a higher degree of displacement and fragment shortening, comminution, soft tissue interposition, primary open reduction and internal fixation, refracture, open injuries, polytrauma, and inadequate initial immobilisation but also age [2,3].

Clinically, nonunion can become symptomatic leading to altered shoulder mechanics or a compression lesion involving the underlying brachial plexus or vascular structures [4]. In particular, the latter structures can make complications limb threatening. Robinson [5] took measurements of the neurovascular bundle and found that, in general, the main structures were medially the closest to the clavicle and moved away towards the distal end. Close to the sternum, the subclavian vein was as close as 4.8mm to the clavicle, whereas the artery and brachial plexus were both > 2 cm from the clavicle. In the mid third in contrast, the three structures were within 2 cm of the clavicle whereas towards the distal end, these structures moved further away. At the level of the acromioclavicular joint, they were 4.5 cm away from the clavicle. An MRI study by Quin [6] reported similar findings. It found the distance from the anterior surface of the clavicle to the sheath of the neurovascular bundle as 11 - 22 mm in the medial third and 16 - 64 mm in the middle third.

Despite the close anatomy, vascular complications are a rare event. They usually make their way into literature as case reports that describe the formation of pseudoaneurysms [7-10]. A pseudoaneurysm is defined as an extravascular haematoma that communicates with the intravascular space through a defect in the vessel wall. The wall is formed by the compressed tissues surrounding the haematoma [11]. The clinical presentation is that of a palpable mass or neurological compromise of the brachioradial plexus. It usually occurs within months after the trauma [12-15].

The incidence gets less with time from trauma, and a perforation at a late stage is an even rarer event [9]. In our case, it occurred two years after trauma. In the surrounding of regular immunosuppression with MTX and Prednisolone, fracture healing was regarded as crucial. The patient's previous images were not conclusive to assume osteoporosis as an additional risk factor. Also, the trauma leading to the fracture was regarded as adequate. With reference to his records, a screening for osteoporosis had not taken place in connection with his fractures. His records show documentation of non-union, but, following the patient's account of his history, it was decided to leave it untreated as it remained asymptomatic. It can be assumed that the perforation occurred after a movement over 90° as this is the range when the clavicle and the fragment ends start to move and engage with the neurovascular bundle.

Till today, there is debate how to treat displaced clavicle fractures primarily. Surgical management has advantages and appears to be superior to non-surgical management [16-18]. However, literature findings suggest that treatment should be tailored to the situation of each individual patient. Dealing with secondary complications, especially vascular injuries, there appears to be a common strategy by the previous authors for a treatment in two stages. Firstly, the vascular component is being addressed with an endovascular prosthesis followed by the secondary stabilization of the clavicle.

Conclusion

Injuries to the subclavian vascular bundle is a rare complication in mid shaft clavicle fractures. It occurs at the time of trauma or in a timely close relationship thereafter. Non-unions, however, bear the risk of late secondary lesions even after years. The clinical presentation is the swelling with possible neurological symptoms. The treatment consists of a staged concept consisting of the vascular repair with an endovascular prosthesis followed by secondary stabilization of the clavicle.

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