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## Case Report

## Case report-Vascular injury in association with posteriorly displaced medial clavicle fracture

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## ARTICLE INFO

## Keywords:

Subclavian  
Vascular  
Physéal  
Fracture  
Posterior  
Dislocation

## ABSTRACT

The primary stabiliser of the diarthrodial sterno-clavicular (SC) joint is the costo-clavicular ligament, this holds the clavicle to the first costal cartilage and the end of the first rib. The costo-clavicular and surrounding ligaments help maintain the stability and strength of the SC joint. As a result, SC joint dislocations are far less common than fractures to the clavicle due to the relatively larger forces required to disrupt these ligaments. Medial physéal injuries occur when there is a fracture through the physis of a clavicle which is yet to complete the ossification process, this can often be mistaken for sterno-clavicular joint dislocation. This report looks at a case of a posteriorly displaced medial physéal fracture in an adolescent male sustained while playing rugby. We hope this case provides the reader an insight into the potentially life threatening consequences that should be considered in such presentations and highlight the importance of prompt and appropriate imaging and specialist intervention.

## Case

Here we review a case of a usually fit and well 14-year-old male who presented to a peripheral hospital following a Rugby tackle. The patient was tackled with a direct blow over the clavicle. On initial assessment he demonstrated no signs of airway, respiratory or circulatory distress. There was swelling over the right sternoclavicular joint with no signs open injury or tenting. He reported pain and tenderness over the right sternoclavicular joint and shoulder.

Initial X-rays did not demonstrate pathology in the shoulder or S-C joint. The patient proceeded to non-contrast CT of the clavicles which demonstrated a posteriorly displaced right clavicle (Fig. 1). Follow up physical exam showed decreased and delayed radial and brachial pulses, the patient therefore returned for a CT carotid angiogram to define a vascular injury. The right medial clavicle was noted to come in close contact with the right subclavian artery's origin. There was presence of small volume fluid consistent with haematoma increasing in volume in comparison to the prior CT performed 2 h earlier. On returning from these scans the patient developed tingling with "mild reduced sensation" in the ulna nerve distribution below the elbow. The patient was then transferred to the regional paediatric trauma hospital.

Vascular and radiology opinions were sought at the trauma hospital and it was thought that compression from the clavicle on vital structures was the cause of the patient's symptoms. The patient was therefore taken to the operating room for closed reduction under general anaesthetic. A closed manoeuvre and use of a towel clip both failed to achieve reduction. The following morning the patient proceeded to CT guided closed reduction of right SCJ posterior dislocation. This achieved partial reduction however radial pulse

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<https://doi.org/10.1016/j.tcr.2021.100483>

Accepted 17 April 2021

Available online 21 April 2021

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remained weak and delayed.

Two days after the injury the patient was referred to an orthopaedic subspecialist who obtained opinions from Consultant Cardiac and Vascular Surgeons. It was at this point the true extent of the injury was appreciated. He was noted in fact to have a fracture of the medial clavicle which in its posterior displacement resulted in transection of the right Subclavian artery. CT demonstrated further Right brachiocephalic artery injury with dissection and a 7 mm aneurysm distal to the origin of the right carotid artery with a small amount of mediastinal blood below the medial head of the fractured clavicle, the trachea was noted to be compressed by the brachiocephalic artery (Fig. 2). This fitted in with the clinical findings of altered pulse and neurovascular injury.

That day, when the appropriate personnel and resources were available an operation was performed with Orthopaedics, Vascular and Cardiothoracic surgeons all present. An open-fixation of a medial physeal fracture and repair of the vascular injuries. The cardiovascular Surgeon performed a sternotomy, next the orthopaedic surgeon stabilised the clavicle to the sternum with a temporary K-wire to allow the Vascular Surgeon the ideal exposure to perform the repair. The Vascular surgeon performed an exploration of the right subclavian artery, saphenous vein interposition graft. At the end of the vascular repair the temporary K-Wire stabilising the fracture was removed and a suture fixation was performed. The patient was commenced on anticoagulants. Immediately post-operatively the patient had return of strong pulses and improvement to the sensation in his hand. He was placed in a sling on the ward and kept this on for 2 weeks. He was continued on a 3 month course of Aspirin on discharge. He was followed up at the 2 and 6-week mark with an USS and follow up X-rays. At his 6 week follow up the patient was pain free with normal range of motion in the shoulder. He was cleared for light activities but was advised against any contact sports at this point as per orthopaedic and vascular advice. The patient was reviewed again 4 months' post-op and to be cleared for strength training and a return to rugby the following season (Fig. 3).

## Discussion

Injury to the sternoclavicular joint is rare in athletes and comprises only 3–5% of shoulder injuries. In younger patients it is important to be aware of the osteology of the clavicle. The clavicle is the first bone to ossify in utero however the physis is the last to ossify between the age of 20–25 years old and for this reason medial physeal fractures should always be considered in the younger

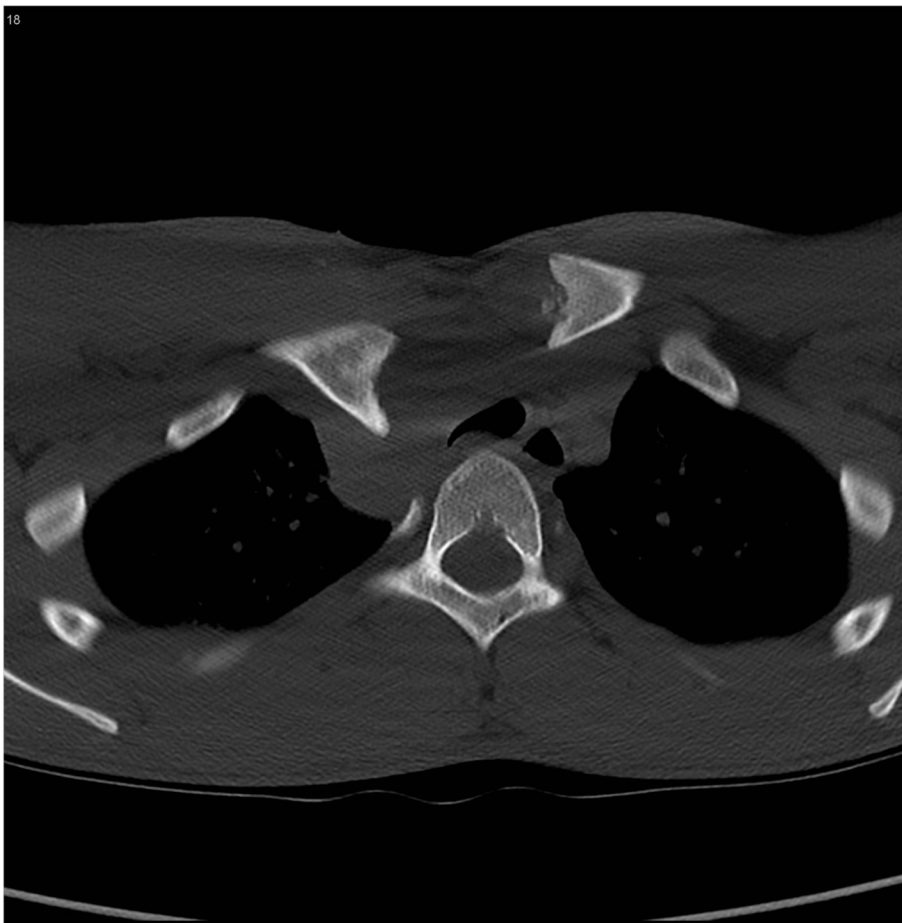
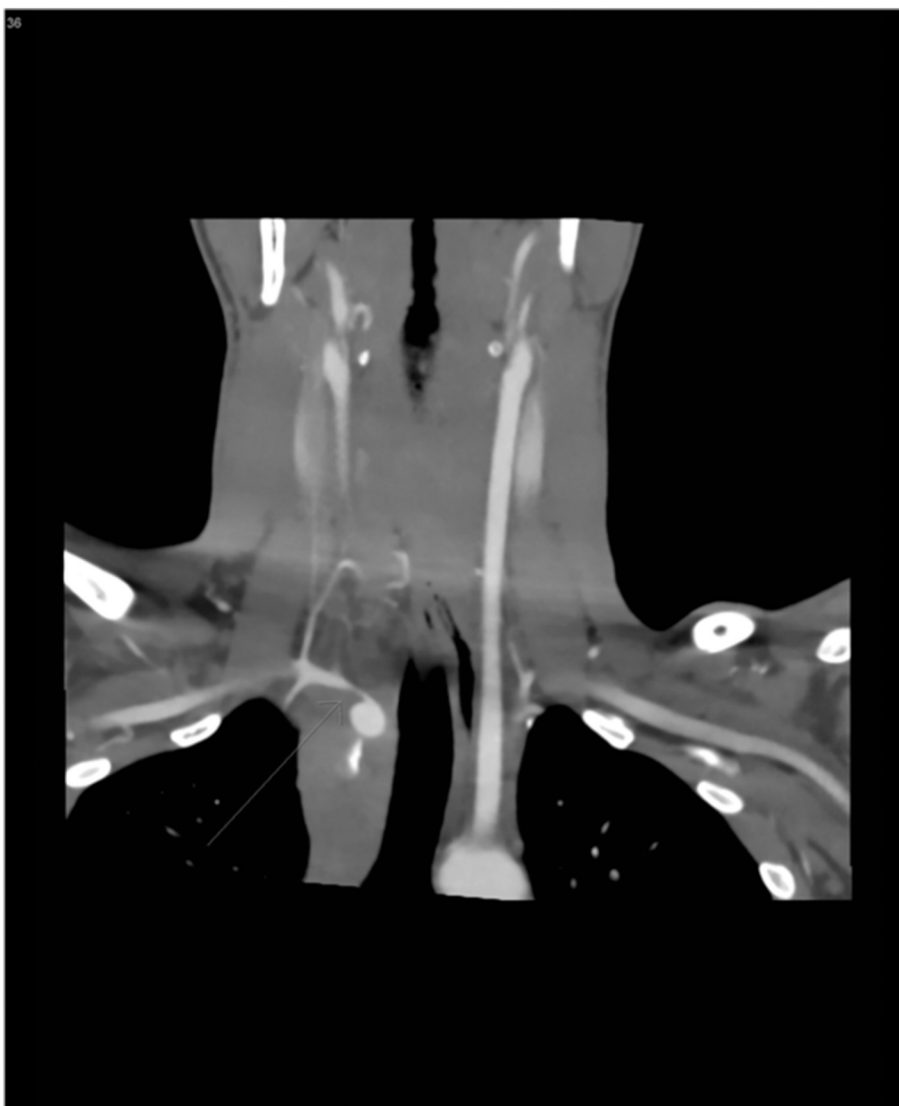


Fig. 1. Initial CT scan of right physeal fracture/posterior dislocation – mass effect on upper mediastinum including vasculature and trachea.



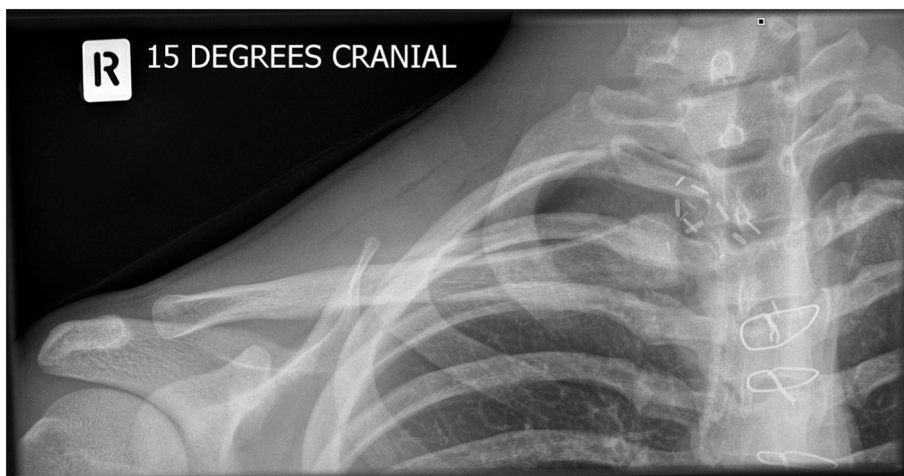
**Fig. 2.** CT arteriogram demonstrating injury to proximal right subclavian artery.

population as an alternative diagnosis to sterno-clavicular joint dislocation [1]. When a SC joint dislocation does occur however, the vast majority of these occur in the anterior direction [2]. Conversely, posterior SC dislocations while rarer (approximately 10% of cases) must always be considered due to their potentially fatal consequences involving damage to superior mediastinal structures [3]. Damage can include trauma or compression to the subclavian artery, brachiocephalic artery and vein, internal jugular vein, phrenic or vagus nerves as well as the trachea and oesophagus [4].

This case highlights the importance of appropriate assessment, investigation and management in what is a life threatening condition. The initial management of this case could certainly be viewed as suboptimal. The patient could well have had a catastrophic bleed in the initial procedure or subsequent procedure in the CT suite. The fact that this did not happen and we managed to achieve an excellent outcome only proves that “sometimes it is better to be lucky than to be good”. We believe that this case highlights an excellent learning opportunity to the reader in future cases such as this.

The key points of the clinical assessment are history; with the mechanism of injury, location of pain and presence of neurologic or respiratory symptoms. The physical exam; looking for altered pulses, neurological signs, deformity in the region of the sternoclavicular joint and assessment of JVP is also helpful as this can be elevated secondary to venous congestion. The most prudent investigation when clinically indicated would be a CT arteriogram to characterise the vasculature [5].

It is important to differentiate the sterno-clavicular joint dislocation from physeal fracture which is more common in a paediatric population. The fractures can typically be managed non-operatively in the absence neurovascular injury as these will heal and remodel without an operation due the periosteal sleeve generally remaining intact. This is in contrast sternoclavicular joint dislocation, in many cases where there is displacement noted, reduction is indicated. Long term outcomes in terms of return to physical activity are typically



**Fig. 3.** 4 month right clavicle follow up radiograph.

positive and in the majority of cases patients will be able return to full contact sports.

### Conclusion

Medial physal fractures of the clavicle are a potentially life threatening injury when the clavicular fragment is displaced posteriorly. A systematic and thorough history combined with the appropriate examinations and investigations will ensure that this injury is not missed allowing early specialist consultation to be sought. In the case of posterior dislocations, it has been estimated that close to a third of cases result in mediastinal injury and hence call for urgent relocation in an appropriately staffed and equipped operating room. Finally, it is important to always consider the age of the patient keeping in mind that a large proportion of children/adolescent patients will have suffered a medial physal fracture as opposed to a sterno-clavicular joint dislocation due to the late age of ossification of this part of the clavicle.

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