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# Superior Shoulder Suspensory Complex Fracture Dislocation Case Report

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## Highlights

- Search for associated fractures in acromioclavicular joint dislocation
- Assess the clavicle, acromion process and coracoid process in particular
- Do not end the shoulder X-ray examination after seeing one injury
- Both axial and cranially angulated anteroposterior projections are beneficial
- Acromioclavicular joint fracture dislocation treatment may require further research

## Key Words

**Case Report, Superior Shoulder Suspensory Complex, Acromioclavicular, Coracoid, Fracture, Dislocation**

## Abstract

**Background:** Acromioclavicular joint dislocation can be more complex than it first appears. The presented case had an unusual combination of injuries to the superior shoulder suspensory complex, which yielded some interesting learning points.

**Case Summary:** The injuries were sustained after a fall from a push bike and included acromioclavicular dislocation with coracoid process, clavicle and acromion process fractures. These were identified on the initial X-ray examination, which was followed by computed tomography for surgical planning. The injuries were successfully treated by internal fixation.

**Conclusion:** The unexpected complexity of the injuries could have led to subtle but important findings being overlooked. This case highlights the importance of a thorough search strategy, consideration of injury biomechanics and knowledge of associated injuries.

## Introduction

Acromioclavicular joint (ACJ) subluxation or dislocation is a relatively common injury of the shoulder although sometimes this can be more complex than it first appears<sup>1</sup>. The bone and soft tissue ring of the shoulder girdle is described as the superior shoulder suspensory complex; this includes the glenoid process, the clavicle and its acromioclavicular ligament attachment to the acromion process, and the coracoid process and its coracoclavicular ligament attachment to the clavicle<sup>2</sup>. The presented case had a complex injury to this structure including Rockwood Type III ACJ dislocation combined with each of the described associated fractures; acromion process, clavicle and coracoid process<sup>3</sup>.

## Discussion

### Clinical Presentation and Examination

The patient presented to the emergency department after falling from a push-bike onto his shoulder. An emergency nurse practitioner (ENP) took a clinical history and performed a clinical examination. On inspection there was local pain, swelling and deformity to the superior shoulder.

The arm was held to the chest, protected from movement, and was too tender to allow full palpation or range of movement assessments. The outer third of the clavicle was particularly painful to palpate and abduction was also painful. Although, the examination was incomplete the ENP was able to localise the patient's pain to the superolateral shoulder area and the clinical features were characteristic of ACJ dislocation<sup>3</sup>. On the basis of the findings the ENP requested a shoulder X-ray examination to look for any dislocation or fracture.

### Diagnostic Imaging

The X-ray examination began with an anteroposterior shoulder projection on which the radiographer identified that the ACJ was dislocated with the inferior border of the outer end of the clavicle being superiorly displaced from the acromion process (Fig. 1). Due to their suspicion of clavicle and coracoid process fractures, the radiographer performed a cranially angulated anteroposterior clavicle projection (Fig. 2). The coracoid process is an anterior bony projection of the superoanterior aspect of the scapula, which can be difficult to visualise on standard anteroposterior shoulder projections; an anteroposterior projection with 35 degrees or more cranial angulation and axial shoulder projection are required to see it clearly<sup>4-5</sup>. In this case, the cranially angulated projection demonstrated a minimally displaced fracture at the superior aspect of the outer end of the clavicle and a fracture of the base of the coracoid process, which was markedly displaced from its normal position attached to the scapula. The modified axial projection also demonstrated an undisplaced acromion process fracture (Fig. 3). A subsequent true axial projection demonstrated the anterior displacement of the coracoid process fragment and also showed that there was no significant anterior or posterior displacement of the ACJ dislocation (Fig. 4).

The superimposed clinical manifestations of the injuries sustained demonstrate the importance of performing relevant projections and not prematurely ending the examination after identifying an abnormality on the anteroposterior projection. Each projection unveiled a different injury, which may have otherwise been missed. When interpreting the radiographic images, the unexpected complexity of the injuries sustained combined with satisfaction from identifying the ACJ dislocation could have led to significant injuries being overlooked, highlighting the importance of using a thorough systematic search strategy, considering injury biomechanics and knowing about associated injuries<sup>6</sup>.

Coracoid process fractures are uncommon but can occur with ACJ dislocation<sup>3-4</sup>. The main mechanisms postulated to cause coracoid process fractures are: superior avulsion by the coracoclavicular ligament in ACJ dislocation, direct blow to the superior shoulder region, extreme sudden traction avulsion through the biceps or coracobrachialis muscle attachments or collision from the humeral head in anterior dislocation<sup>6-8</sup>. In this case, the patient's description and radiographic findings suggested that the injuries were caused by a direct anterior blow to the superior shoulder suspensory complex.

The reporting radiographer practitioner identified the abnormalities and discussed the case with the ENP. The patient was urgently referred to fracture clinic with a computed tomography (CT) scan booked and the injured shoulder immobilised in a sling. The CT scan revealed no further scapula fractures that would change the surgical treatment and also provided three dimensional reconstructions for orthopaedic surgical planning (Fig. 5).

## Injury Classification

A number of classification systems could have been applied to this injury depending on whether the coracoid process fracture or ACJ dislocation was considered the primary injury. Coracoid process fractures may be classified as posterior (type I) or anterior (type II) to the coracoclavicular ligament, with type II only requiring conservative treatment and type I requiring consideration for surgical treatment<sup>9</sup>. Our case could be described as a type I coracoid process fracture; however, this does not convey the full extent of the injuries that were sustained.

This case probably fits best with a more detailed Rockwood type III ACJ injury classification description that includes possible associated fractures of the lateral clavicle, acromion process or coracoid process, with our patient having suffered all three of these injuries<sup>3</sup>. However, using this classification could cause confusion as most Rockwood type III ACJ injuries involve coracoclavicular ligament rupture rather than the coracoid process fracture<sup>3</sup>.

These classification based descriptions of radiographic appearances may help to communicate a visual image of the injury and categorise treatment; however, their usefulness in this case is debatable. They probably do not save any words in a report and can over complicate an already complex injury description while being unclear to those who are not familiar with the chosen classification system (Tables 1 and 2).

**Summary of Ogawa et al. Coracoid Process Fracture Classifications<sup>9</sup>**

Type	Summary of Appearances
I	Fracture posterior to the coracoclavicular ligament
II	Fracture anterior to the coracoclavicular ligament

**Table 1**

**Summary of Rockwood ACJ Injury Classifications<sup>3</sup>**

Type	Summary of Appearances
I	Acromioclavicular ligament sprain Clavicle is not elevated in relation to the acromion
II	Widening of ACJ or superior subluxation of the clavicle Clavicle is not displaced above the superior border of the acromion
III	Superior dislocation of the clavicle Clavicle is displaced above the superior border of the acromion
IV	Posterior dislocation of the clavicle Clavicle is displaced into the trapezius muscle
V	Marked superior dislocation of the clavicle More severe than type III, coracoclavicular distance more than doubled
VI	Inferior dislocation of the clavicle Displaced into subacromial or subcoracoid location

**Table 2**

## Treatment

ACJ dislocation treatment is controversial and there is a lack of high quality evidence to provide recommendations on the indications for surgical or conservative management<sup>3, 10</sup>. It has been suggested that most Rockwood type III ACJ dislocations can be treated conservatively, with sling immobilisation and pain control, and still obtain good functional results. However, for ACJ

dislocation and coracoid process fractures, if the arm is used above the horizontal plane, in active young patients or in severe displacement, surgery may be preferential to prevent cosmetic deformity and reduced function<sup>6,11</sup>. Literature regarding surgical management of coracoid process fractures is uncommon and largely consists of lower quality evidence such as case reports<sup>2</sup>. Authors have described an isolated coracoid process base fracture where the ACJ was not dislocated and conservative treatment was successful<sup>5</sup>. However, when there is a type I coracoid process fracture and the scapuloclavicular connection is disrupted, surgical fixation is recommended<sup>9</sup>.

In this case, surgical treatment was favoured due to complete disruption of the scapuloclavicular connection by multiple injuries, significant coracoid process fracture displacement and because the patient was middle aged and physically active. The operation began with reduction of the ACJ dislocation using an acromion hook plate. A button hole suture device was then attached to the coracoid process tip and to the superior clavicle to angulate the coracoid process back into its correct anatomical position; this prevented the unopposed inferior pull of the muscle attachments of the short head of biceps and coracobrachialis causing persistent caudal angulation of the tip of the coracoid process. A cannulated screw was then used to re-unite the base of the coracoid process with the scapula. Similar cases have been successfully treated with these techniques<sup>6,12</sup>. The orthopaedic surgeon was satisfied that a plate for the acromion fracture would not be required as the patient would be instructed to limit movement and physical activity during the recovery phase. Intraoperative fluoroscopic imaging was provided by a radiographer with the use of an image intensifier to confirm the position of the internal surgical fixations and to ensure that anatomical alignment was restored.

## Outcome

At the first follow-up clinic appointment, X-ray examination was conducted and the internal fixation was considered to be in a satisfactory position with effective reduction of the coracoid process fracture and ACJ dislocation (Fig. 6). Acromion hook plates can be associated with complications such as acromion erosion, peri-prosthetic fracture or fixation failure if there is inadequate immobilisation; however, these did not occur and the plate was removed at six months post initial surgery to prevent any potential issues in the future<sup>12-13</sup>. The patient now has good function and range of movement that continues to improve with physiotherapy appointments.

## Conclusion

This case report adds a rare and interesting combination of injuries to the literature. It highlights the importance of assessing the superior shoulder suspensory complex as an entire structure on radiographic images, where one injury can be accompanied by others, which should always be considered. In ACJ dislocation this particularly includes assessment for the presence of associated fractures to the acromion process, clavicle and coracoid process. A thorough X-ray examination enabled all of the injuries to be identified and demonstrated the importance of making a considered judgement on which projections are necessary for full diagnosis. This involves looking beyond standard protocols and performing relevant projections for the individual patient presentation.

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## Diagnostic Images



**Figures 1-4: Initial X-ray Examination Images**

*Fig. 1: Anteroposterior Shoulder Projection.*

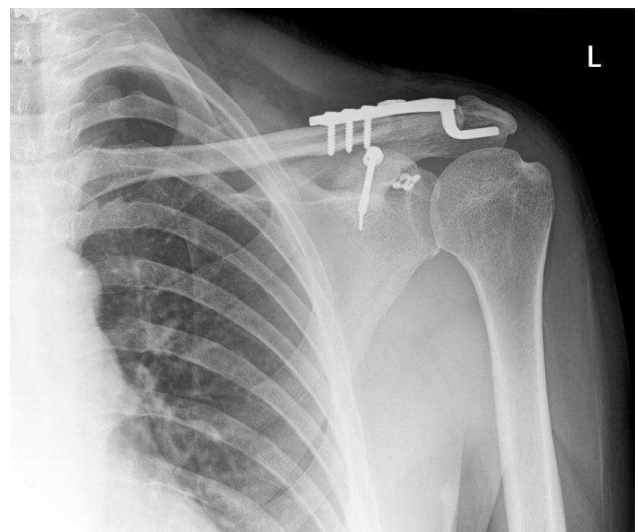
*Fig. 2: Cranially Angulated Anteroposterior Clavicle Projection.*

*Fig. 3: Modified Axial Shoulder Projection.*

*Fig. 4: True Axial Shoulder Projection.*



**Figure 5: Computed Tomography Scan  
Three Dimensional Reconstruction.**



**Figure 6: Post-Operative X-ray Examination**

*Anteroposterior Shoulder Projection.*