



CASE REPORT

Diagnosis and management of grade II acromioclavicular joint separation

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KEYWORDS

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Shoulder injuries

Abstract An acromioclavicular (AC) joint separation or sprain is a traumatic separation or compression of the AC joint causing the capsular holding elements and soft to be stretched beyond their plastic limit.

Acromioclavicular joint separation is most commonly caused by direct trauma to the shoulder. The signs and symptoms are local tenderness over the AC joint; a typical painful range of motion (ROM) and, in the case of a serious (grade III) sprain, obvious anatomical deformity. Diagnosis is made by the history of the complaint; observation; local digital palpation; orthopaedic and ROM tests and by diagnostic imaging. The degree of AC joint separation is classified by three grades of increasing severity. This single case report documents successful conservative management of a severe grade II injury. Diagnostic classification is discussed together with treatment options.

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Introduction

Most acromioclavicular (AC) joint separations are caused by a direct blow to the shoulder.¹ Therefore, AC joint separation is more common in the sporting population because of the increased likelihood of direct injury or trauma to the shoulder. This is reflected in the patient profile, with more than half of all AC joint injuries occurring in the first three decades of life.²

The diagnosis of AC joint pathology is usually straightforward as the pain is normally well localised to the region of the joint and there is often a clear history of injury to this region. The treatment of grades I and II injuries is well established and agreement is seen in the literature for conservative management. The treatment of AC dislocation (grade III) remains an area of controversy between surgical and non-surgical intervention, although some studies have shown that the results for conservative treatment are better than those for

operations.³ In the case of grade III injuries, conservative treatment does not restore the anatomy but allows patients to adapt and rehabilitate more rapidly.⁴ This case report outlines successful management of a severe grade II sprain and appraises the available literature on management strategies for both luxation and subluxation of the AC joint.

Case presentation

Mr. B, a 65-year-old retired store manager, presented complaining of pain over the AC joint and "a joint in the shoulder out of place" of 4 months' duration following a bicycle accident. He was cycling at walking pace whilst taking a sharp left turn on a surface covered with loose gravel. He slipped and fell into a 'pothole'. He was found, 10 min later, in an unconscious state. Mr. B did not remember anything about the fall, but he thought that he must have fallen straight onto his right shoulder given his initial position before the fall. He described his symptoms as a combination of

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both sharp and dull pain. The sharp pain radiated down the arm over the front and the back of the shoulder simultaneously. The severity of the pain had decreased slightly in intensity and frequency since the initial incident. On the day of presentation, he felt the pain intermittently and graded it as 7 out of 10 in intensity.

After the accident, he was sent to hospital where he stayed 3 weeks due to fracture of the right hemipelvis. Although his shoulder had been X-rayed, no treatment had ever been administered. Using crutches to walk subsequently aggravated his shoulder condition. Two months later, he saw a consultant orthopaedic surgeon who, after examination and review of new shoulder X-rays, told him he would require surgery. This was never followed-up and Mr. B had received no further communication from the hospital.

Upon further questioning about his daily activities (ADLs), Mr. B confirmed that he was limited in many activities including dressing, carrying bags, opening drawers and sleeping on his right side.

Observation showed obvious deformity on the right AC joint, with prominence of clavicle superiorly (shoulder pointer sign). Asymmetry of the upper trapezius muscle was noted, with a slight hollowing of the muscle on the right associated with a slight inferiority of the right shoulder.

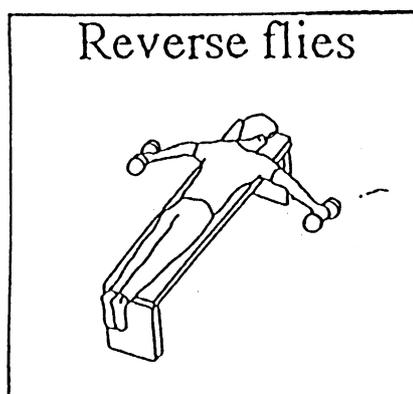
Neurological examination of upper and lower limbs was unremarkable. Active and passive shoulder ROM revealed pain on horizontal adduction and at end range of abduction and extension. Scapulohumeral rhythm was normal. Palpation revealed tenderness locally over the AC joint. In addition, palpation of the right coracoid process, the insertion of the right pectoralis minor, and the right fourth and fifth costosternal joints was painful. Orthopaedic testing revealed a positive apprehension test. Resisted drop arm test was also painful in the coracoid area and Speed's test, although negative,

reproduced pain in the same area. All other shoulder testing for subacromial bursitis, bicipital tendinitis and supraspinatus pathology was negative. Chiropractic spinal examination revealed segmental dysfunction in the cervical and thoracic area (left C2/3, right C3/4, C5/6, right fourth and fifth costotransverse joints, left T2/3 and right T6/7).

Only one anteroposterior (AP) view of the right shoulder was available for viewing at hospital, the views taken at the time of the trauma having been 'lost'. This view was taken 2 months after the accident. The unilateral view did not allow comparison and no stress X-rays had been effected. The average AC joint space was 6 mm, that is slightly above the usual normal limit for a male (4.1 mm), but the lack of a comparative view made it hard to assess the relevance of this finding. Superior displacement of the distal clavicle involved almost the full width of the clavicle. All other joint spaces and soft tissues were within normal limits.

The history and clinical examination of Mr. B strongly suggested the diagnosis of acute, post-traumatic, grade II, AC joint separation.

A shoulder rehabilitation programme was instigated, comprising proprioceptive taping, proprioceptive neuromuscular facilitation (PNF), myofascial release and stabilisation exercises of the involved musculature. Soft tissue work (STW) was applied to the infraspinatus, teres minor and supraspinatus muscles. This included trigger point therapy and cross-friction massage. During the second session, an exercise programme was devised in order to stabilise the shoulder girdle. The specific goals of the programme were to strengthen the dynamic stabiliser, infraspinatus, with "reverse flies" (Fig. 1) and "hitch hiker" (Fig. 2) types of exercises. Strengthening of the deltoid and upper trapezius was targeted with shoulder flexion (Fig. 3) and shoulder abduction (Fig. 4) exercises focused on strengthening the supraspinatus and deltoid



- Shoulders down and back
- Lead with the elbow, not the hands
- Make sure the arms stay perpendicular to the body

Figure 1 Strengthening of the infraspinatus muscle by reverse fly exercises.

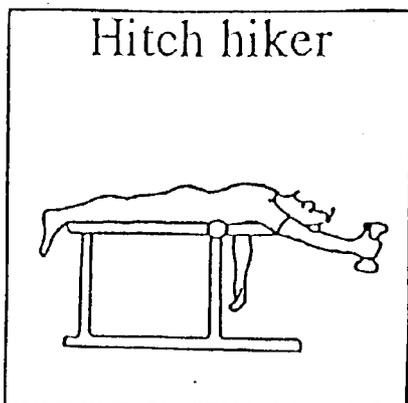


Figure 2 Strengthening of the infraspinatus muscle by hitch-hiker exercises.

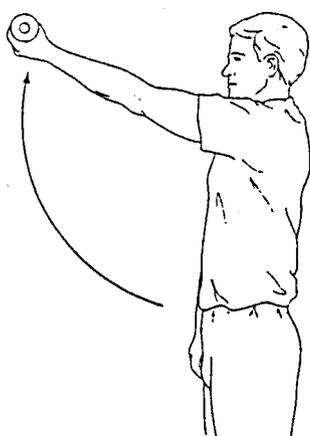
- Keep the shoulders down and back
- Use a surface which supports the head and does not cause any rotation in the neck
- Keep thumbs pointing up towards the ceiling at all time

muscles. The “reverse flies” and “hitch hiker” exercises were also used in order to facilitate and strengthen the lower scapula stabilisers (serratus anterior and lower traps) that are often inhibited. Emphasis was placed on doing the exercises in a slow and controlled manner. Proprioceptive taping was also applied at the end of each treatment in order to facilitate rotator cuff muscles (synergists) and optimise AC joint alignment. Four months after the onset of the treatment, Mr. B had been very compliant with the exercise programme and he reported a gradual and definite improvement (rated 70%) both symptomatically (he overall felt less pain) and functionally (his ADLs were improved and he could sleep on his shoulder once more), although he was still limited in his ability to carry heavy loads.

Discussion

In 1984, Rockwood and Green⁵ published a classification of AC joint injuries that recognises three different types of injury (Table 1). These were graded on the basis of the direction and amount of displacement. In Rockwood and Green’s classification of the grade III injury, the deltoid and trapezius muscle aponeuroses were intact.

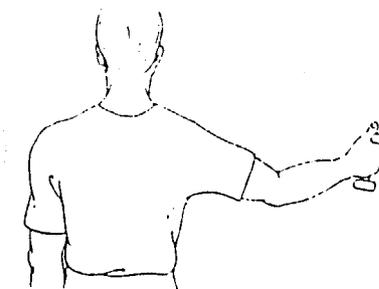
There are two groups of ligaments stabilising the shoulder girdle. The AC ligaments restrain the posterior translation and posterior axial rotation. The coracoclavicular ligaments are the more important stabilisers of the joint and provide vertical stability and prevent excessive movements of the clavicle on the acromion. Dynamic stability is accomplished via the deltoid and trapezius muscles, which have insertions at the site of the AC joint.^{6,7} This is important factor to consider when devising a rehabilitation programme for moderate to severe separations and most of the rehabilitation programmes devised to



FLEXION

- Performed palm up
- May be poorly tolerated in bicipital tendinitis / impingement

Figure 3 Strengthening of the deltoid and upper trapezius muscle by flexion exercises.



SUPRASPINATUS / DELTOID ABDUCTIONS

- Performed with thumbs up and arm 30° to the body
- The arm should not go above shoulder level

Figure 4 Strengthening of the deltoid and upper trapezius muscle by abduction exercises.

Table 1 Classification of AC joint injuries.

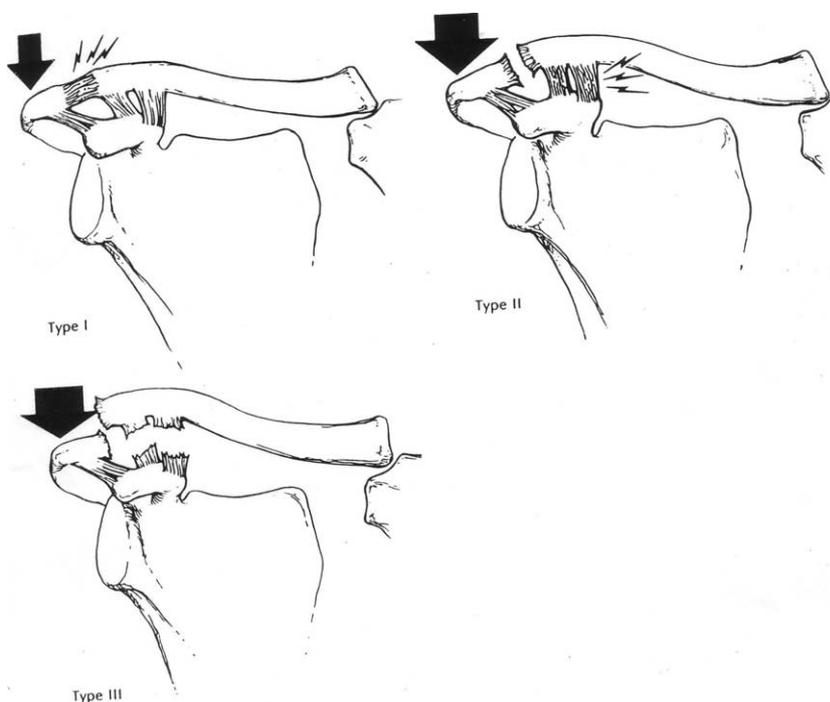
Degree of injury	Explanation
Grade I	<ul style="list-style-type: none"> • Partial tear of the AC joint ligament • No change in position of distal clavicle in relation to the acromion
Grade II	<ul style="list-style-type: none"> • Rupture of the AC ligament • Partial tear of the coracoclavicular ligament • Displacement of the distal clavicle (less than the full width of the clavicle)
Grade III	<ul style="list-style-type: none"> • Rupture of the AC ligament and of the coracoclavicular ligament • Displacement of the distal clavicle (more than the full width of the clavicle)

stabilise the shoulder girdle take this into account.⁷⁻⁹ It is also important to consider the role of the other joints of the shoulder girdle, as normal motion is also required in the glenohumeral and sternoclavicular joints as well as the scapulothoracic articulation. Movement of the scapula requires rotation of the AC and sternoclavicular joints. Although there is a total of 40–50° of clavicle rotation, only 5–18° occurs at the AC joint.²

Because of its functional role in suspending the upper extremity from the trunk, the AC joint is exposed to a high level of stress. A 1979 study by Nielson¹ reviewed 101 patients with AC joint injuries and found that 70% were caused by a direct blow to the shoulder. Because of its subcutaneous location, the AC joint is very susceptible to direct trauma, especially in sport. For the stabilising ligaments of the acromion and clavicle to be injured or

disrupted, the acromion must be forced inferior on the clavicle (Fig. 5). This mechanism is the most common cause, usually due to a fall on to the tip of the shoulder. Other mechanisms are a fall on the hand or elbow of an outstretched arm. Either mechanism will lead to a sequence of stress acceptance. First, the sternoclavicular ligaments tense (Fig. 6). This results in a stress distribution to the clavicle itself and to the AC and coracoclavicular ligaments resulting in either an osseous fracture or varying degrees of tearing of the ligaments.⁷

Provocative manoeuvres can be helpful when a presenting pain pattern is less clear-cut, or masked by chronic associated complaints. The AC joint can be tested by maximally compressing the joint (close packed position). The typical evoked pain pattern is local over the anterior shoulder. Range of motion testing can also produce a diagnostically suggestive

**Figure 5** Grading of AC joint injuries.

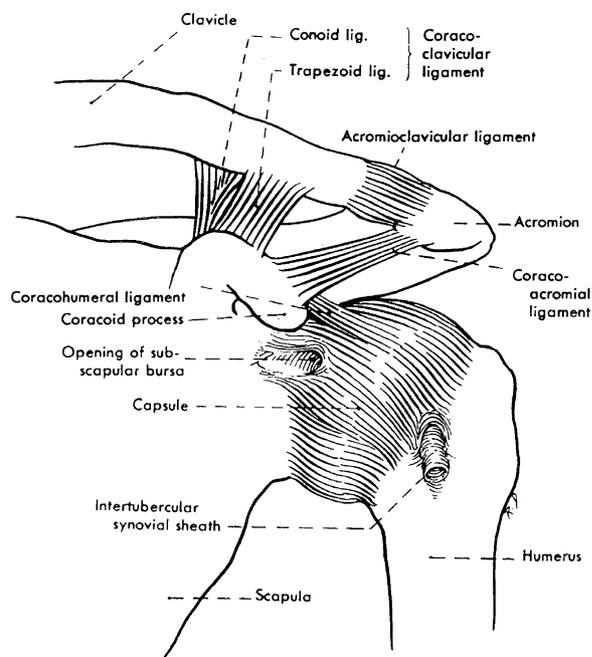


Figure 6 Ligaments of the glenohumeral articulations.

pattern of pain. Local symptoms are increased with abduction and internal rotation and also with downward pressure or dangling of arm.¹⁰ Active and passive horizontal adduction give a clear reproduction of patient pain towards the end range (horizontal adduction test). Classically, AC joint involvement will have a pain-free arc between 70 and 110° with passive movement of arm into full abduction.⁷ Codman's arm drop and the apprehension test are also often positive.¹¹ The differential diagnosis of AC joint separation includes shoulder dislocation, anterior humerus subluxation and rotator cuff tear.

In 1978, Bergfeld et al.¹² first recommended the use of X-rays to rule out clavicular fracture and determine the degree of injury. Stress X-ray will verify the stability of the joint and are taken using a 5 kg weight held by the dependent arm. Stressed and normal bilateral views are used to determine any increase in the coracoclavicular space. A space greater than 1.3 cm is consistent with a third degree AC separation with displacement due more to inferiority of the glenohumeral joint than superior displacement of the clavicle.¹² AC joint separation should be regarded as a form of shoulder instability requiring stabilisation and support more than clavicle relocation.¹² However, the use of stress views to differentiate grade II from grade III injuries is somewhat controversial. They add to patient discomfort and may not aid in treatment decisions, therefore many physicians have abandoned their use. Over the 25 years since Bergfeld's original article, the use of stress X-rays has been much debated, with doubt being increasingly cast on its

accuracy and reliability in differentiating the degree of AC joint separation.^{6,7}

More recently, Turnbull⁶ recommended only to take the routine series for suspected shoulder injury, comprising an AP, Y and axillary view and, specifically for AC joint injury, a 15° cephalad AP view. Bilateral pictures of the AC joint should be obtained for comparison. Numerous studies have compared the accuracy of X-ray in assessment of shoulder injuries with other forms of investigation, in particular magnetic resonance imaging (MRI).

In an observational study, Yu et al.¹³ found that the assessment of post-traumatic osteolysis of the distal clavicle following AC joint separation was more accurate with MRI than plain film radiographs. Observation on MRI typically included: soft tissue swelling, cortical irregularity, joint space widening, clavicular periostitis and marrow oedema in the acromion. Gabrielli et al.¹⁴ also found that the high level of anatomical detail made MRI the modality of choice for assessment of the precise structures involved in AC injury.

However, Jordan et al.¹⁵ do not regard MRI as being particularly reliable. He compared the physical findings in 116 patients with the appearance of their AC joints in MRI. The well-designed study found no real correlation between the MRI appearance and the clinical findings in the AC joint.

There is little disagreement as to the treatment of first and second-degree strains of the AC joint. Conservative care consisting of rest, ice and splinting is recommended.^{6,7,10,11} In the acute phase, treatment consists of cryotherapy, analgesia and a period of immobilisation using a sling. Usually, a Kinney–Howard type of sling is preferred because it supports the upper limb with the arm elevation and, at the same time, depresses the clavicle¹⁶ (Fig. 7). This action of encircling the limb approximates the AC joint. In the case of incomplete subluxation of the AC joint (grade II), a 6-week immobilisation is usually necessary.^{6,10} Advice regarding a progressive, incremental return to normal activities within 4–6 weeks is then given. Taping devices and orthotics have been used in the initial phase of treatment. Although Magee¹¹ considers that it is an integral role of rehabilitation programmes to attempt to minimise proprioception deficits with the use of proprioceptive taping, the efficacy of this has not been well demonstrated.⁶ The rehabilitation programme starts with the use of isometric exercises (using the opposite hand) whilst wearing the sling. After 1–2 weeks, elastic-tubing exercises can be introduced without the sling. These exercises aim to restore stability to the glenohumeral and AC joints whilst avoiding end range elevation and horizontal adduction. Later, isotonic exercises

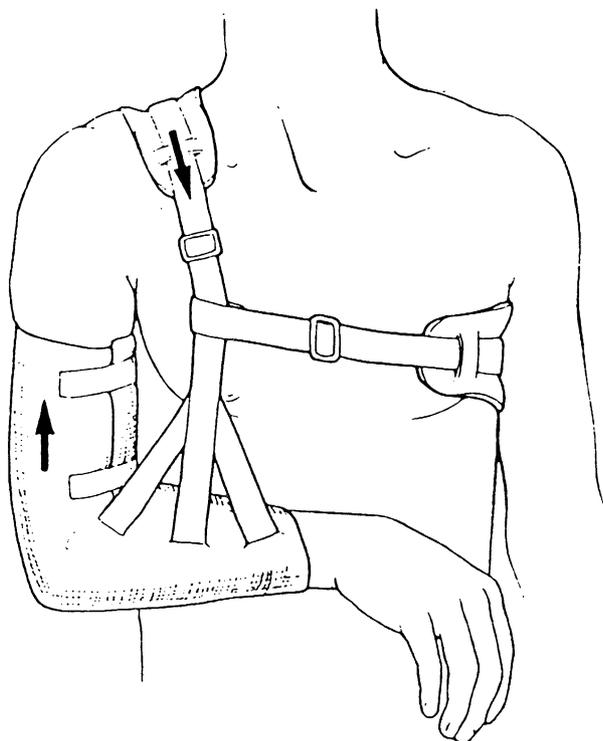


Figure 7 The Kinney-Howard sling.

(endurance over strength) should be introduced.⁹ The most valuable exercises in AC joint treatment are shoulder forward flexion (Fig. 3) and shoulder abduction (Fig. 4). These are designed to specifically strengthen deltoid, trapezius and supraspinatus muscles.⁶

Residual pain and crepitus are common with grade II separations. Relief can be achieved with mobilisation or manipulation of the joint and associated kinematic chain (glenohumeral, scapulothoracic and sternoclavicular joints).¹¹ The instigation of conservative protocols for grade II AC injuries recommended by the vast majority of the literature could not be applied in a normal chronological sequence because of the initial treatment priorities in Mr. B's case. In chronic presentations, the normal post-traumatic immobilisation period should not be applied because of the risk on precipitating adhesive capsulitis, particularly in a geriatric patient.¹⁷ At this stage, a rehabilitation programme is highly recommended in order to stabilise the shoulder girdle.^{6,9,11}

The preferred management of acute dislocation of AC joint (grade III) is controversial and the decision to use a given method of treatment is often based on teaching dogma or anecdotal experience. Grade III injuries have been managed successfully both surgically and conservatively (and, one would infer, unsuccessfully). Complete AC dislocation treatments were assessed in 1985 by Galpin et al.⁴

They compared operative versus non-operative treatments. They stated that non-operative treatment provided equal or superior results with better functional outcome (earlier return to activities) when compared to surgical repair. This study only compared one form of surgical treatment (Bosworth claviculocoracoid screw fixation) and, if this technique has specific flaws, it will bias the results of general surgical recommendations. A positive point for methodological quality in this study, and therefore an increased validity of their results, is the very well defined selection criteria with the detailed definition of AC dislocation.

Operative procedures for AC dislocation have a high incidence of complications such as failure of fixation and osteolysis. From a study in 1986, Larsen et al.³ stated that AC joint separation surgery was only justified in a few situations: thin patients with great prominence of the clavicle and in patients whose work necessitates having to lift heavy weights. Conservative treatment should be recommended for middle aged and elderly patients because of the associated decrease in strength and ROM. Additional advantages of conservative treatment are shorter period of rehabilitation, the freedom from hospitalisation and the chances of a successful outcome; the disadvantage is that there is no guarantee of symptomatic relief.

Conclusion

It is important for the chiropractor to know about the different possibilities of conservative and non-conservative treatment for different grades of AC joint separation so that they are able to inform and advise their patient about the benefits and risk of each one. The chiropractor should be able, with their knowledge, to develop individual treatment plans for grades I and II injuries, which are successfully managed with conservative treatment. In this regard, rehabilitation programmes are the appropriate long-term approach and, therefore, chiropractors should supervise their correct application.

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