Acromioclavicular joint injuries: indications for treatment and treatment options

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Injuries to the acromioclavicular (AC) joint are common, representing about 9\% of all shoulder injuries,\textsuperscript{55} although they are even more common in athletes. They are the third most common injury seen in college hockey players\textsuperscript{31} and account for 41\% of all shoulder injuries seen in elite college football players.\textsuperscript{43} However, despite the high frequency of AC separations, there continues to be substantial controversy about their management. Type III injuries are the most controversial because there has long been debate over whether they should be treated operatively or nonoperatively. Furthermore, numerous surgical techniques have been described for the surgical management of AC separations, and controversy remains over which method is the most effective.

This article reviews the indications and treatment of AC joint injuries. An analysis of the literature involves both operative and nonoperative treatment options, pitfalls of treatment, and clinical outcomes. A discussion of the pathoanatomy, biomechanics, mechanism of injury, classification, and clinical and radiographic evaluation of AC joint injuries is also included.

Anatomy and biomechanics

The AC joint is a diarthrodial joint with the distal clavicle articulating with the medial aspect of the acromion. (Fig. 1). The joint is surrounded by a capsule and contains a synovial lining and an intraarticular disc. The intraarticular disc is variable in its presence and degenerates with age, typically becoming nonfunctional by the fourth decade.\textsuperscript{24,74} The capsule is reinforced by the AC ligamentous complex, which is composed of the superior, inferior, anterior, and posterior ligaments. The posterior and superior ligaments have attachments to the deltotrapezial fascia and are the thickest and strongest portions of this ligamentous complex.\textsuperscript{32,74} The insertion of the AC ligaments on the distal clavicle extends medially a maximum of 5.2 mm in women and 7.6 mm in men.\textsuperscript{71} Excision of the distal clavicle greater than this amount is likely to disrupt the superior AC ligament.

The coracoclavicular (CC) ligaments consist of the conoid ligament medially and the trapezoid ligament laterally. The trapezoid origin is more anterior on the coracoid, whereas the insertion is along the inferior surface of the clavicle, approximately 2.5 cm from the AC joint.\textsuperscript{72,75} The conoid originates more posterior on the coracoid and inserts at the conoid tubercle on the posterior-inferior portion of the clavicle, approximately 4.6 cm from the AC joint.\textsuperscript{72,75}

Although motion at the AC articulation is minimal, it is important for maintaining normal shoulder function. The clavicle rotates approximately 40° with elevation of the
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The primary static stabilizers to anteroposterior (AP) translation of the distal clavicle are the AC ligaments, which are responsible for limiting posterior translation, with 56% of the constraint resulting from the superior ligaments and 25% from the posterior ligaments. Despite the limited motion of the AC joint, the use of CC screws or alternative fixation that rigidly spans the AC joint and eliminates this motion may lead to hardware failure.

The reproducible pattern of injury to the stabilizing structures of the AC joint was originally classified by Tossy et al into types I, II, and III. In 1984, Rockwood et al expanded this classification to include types IV, V, and VI (Fig. 3).

A type I injury is an isolated sprain of the AC ligaments. There is no clinical deformity, and radiographs appear normal. Diagnosis is made by the mechanism of injury and tenderness over the AC joint.

A type II injury consists of a complete tear of the AC ligaments and a sprain of the CC ligaments. Minimal clinical deformity is present, but the radiograph shows a more vertical translation of the CC interval (<25%) compared with that of the uninjured shoulder. The normal coracoclavicular distance measures approximately 1.1 to 1.3 cm. Because of the injury to the AC ligaments, there is AP instability of the AC joint, which has biomechanically been shown to cause an increase in 3.6 mm in anterior and 6.4 mm in posterior translation. In most patients, this horizontal instability remains asymptomatic, but long-term problems with AC joint pain are not uncommon after type II injuries.

In a type III injury, AC joint dislocation occurs secondary to complete disruption of the AC and CC ligaments, creating increased vertical translation of the CC distance (25% to 100%) compared with that of the uninjured shoulder and an obvious clinical deformity. Although the distal clavicle appears superiorly translated, loss of the
A type IV injury is less commonly seen and consists of posterior dislocation of the distal clavicle into the trapezius muscle. This injury is best visualized on an axillary radiograph but can also be identified on an AP radiographic view. Although there is often an increased CC interval because of the disruption of the CC ligaments, the ligaments remain intact in some cases, resulting in minimal vertical displacement of the CC interval. Examination of the sternoclavicular joint should also be performed with this injury because associated sternoclavicular dislocations have been described. A type V AC joint dislocation includes the same injury to the ligamentous structures as identified with a type III dislocation, with the addition of deltotrapezial fascia disruption. The radiograph can show as much as 100% to 300% displacement between the coracoid and the clavicle, which often results in tenting or compromise of the skin covering the AC joint.

A type VI dislocation is very rare and typically results from high-energy trauma. An inferior dislocation of the distal clavicle can be subacromial or subcoracoid and may be associated with other potentially severe injuries, such as rib fractures and brachial plexus injuries. The mechanism of injury has been postulated to result from forced hyperabduction and external rotation of the arm with associated scapular retraction. The CC ligaments remain intact as the clavicle is driven inferiorly.

Clinical and radiographic evaluation

History and physical

AC joint injuries should be considered in patients who have an acute shoulder injury with pain involving the AC joint and limited, painful shoulder motion. In more severe injuries, an AC joint deformity will also be present.

The physical examination should be performed with the patient’s arm hanging freely at the side, with the weight of the arm pulling the scapula inferiorly, accentuating any AC joint deformity. Inspection will often reveal superior prominence of the distal clavicle with swelling and tenderness involving the AC joint. The extent of the deformity can be compared with the uninjured shoulder. Type V injuries can be severe enough to cause tenting of the skin, potentially placing the skin at risk for pressure ulceration. It is important to evaluate the entire clavicle and sternoclavicular joint because biclavicular dislocations have been described.

Crossed-arm adduction and the active compression test are both used to localize abnormalities involving the AC joint, and direct palpation of the area is the most reproducible clinical sign. Additional provocative tests include forced passive internal rotation behind the back and forced adduction with internal rotation (Hawkins-Kennedy sign), both of which will reproduce AC joint symptoms.

Differentiating a type III and type V injury depends on the integrity of the deltotrapezial fascia, which is best...
evaluated by asking the patient to shrug his or her shoulders. Type III, but not type V, injuries are reducible with a shoulder shrug. Reduction of the AC joint may also be attempted by stabilizing the clavicle and gently pushing superiority on a flexed elbow, although this maneuver can be quite painful in the acute setting.81

Horizontal AC joint stability should also be assessed. For this evaluation, the clinician grasps the midshaft of the patient’s clavicle between the thumb and index finger, stabilizes the acromion with the opposite hand, and translates the clavicle anteriorly and posteriorly.81 It is often difficult to quantify joint translation with this test, particularly in the acute setting.

Figure 3 Classification of acromioclavicular joint injuries. (Reprinted with permission from Rockwood CA Jr, Williams GR Jr, Young DC. Disorders of the acromioclavicular joint. In: Rockwood CA Jr, Matsen FA III, editors. The Shoulder. Philadelphia: WB Saunders; 1998: p. 483-553.)
Radiographic evaluation

With suspected AC joint injuries, a standard shoulder series (AP, scapular Y, and axillary views) should be obtained, with the addition of a Zanca view of the AC joint. In an AP shoulder radiograph, the scapular spine often overlaps the AC joint, obscuring detail. This is corrected with a Zanca view by tilting the x-ray beam 10° to 15° cephalad toward the AC joint and decreasing the penetrance to 50%. In many circumstances, bilateral Zanca views are necessary, allowing for a direct comparison of the normal and injured shoulders. Weighted stress radiographs of the AC joint have been used to differentiate a type II from an occult type III injury, but studies indicate that these views do not improve the diagnostic accuracy of this injury.

The AP radiograph of the shoulder is best used for evaluating vertical CC translation, and the axillary radiograph best identifies posterior dislocations (Fig. 4). The CC interval should also be measured and compared with that of the contralateral shoulder. Bearden et al found that a 25% to 50% increase was indicative of complete CC disruption. In cases where there is superior translation of the distal clavicle with a normal CC space, the coracoid should be checked closely for fractures with an axillary or Stryker notch radiographic view.

Treatment

Type I and type II injuries

Nonoperative treatment is recommended for type I and type II AC separations. Treatment typically includes the use of a simple sling for comfort in addition to icing and antiinflammatory medications for pain relief. The sling is used until the pain subsides, usually 1 week for type I injuries and up to 2 to 3 weeks for type II injuries. Specific AC braces for the treatment of AC separations have been described. However, sling usage remains the preferred treatment, allowing for patient comfort and acceptable results.

Once the pain resolves, a physical therapy program is initiated with passive and active range of motion exercises. After full range of motion is restored, patients begin strengthening exercises. A return to athletics is delayed until full, painless range of motion is achieved, which often requires 2 weeks for type I injuries and 6 to 8 weeks for type II injuries.

To our knowledge, there is no evidence for recommending surgical intervention for type I or type II injuries, but many studies have indicated that persistent symptoms are common after symptomatic treatment. Pain after nonoperative treatment is typically secondary to posttraumatic arthritis, which has been seen radiographically in 29% to 75% of individuals. These patients do not require operative intervention, but when pain or activity limitation are severe enough, distal clavicle excision has been a successful treatment option. Mouhsine et al noted that of 33 patients with type I or type II injuries, 27% required surgery at an average of 26 months after injury and 52% remained asymptomatic after 4 to 8 years. Mikek monitored 23 patients for 10 years and found that 52% continued to have minor symptoms. Function was significantly worse when compared with that of the contralateral extremity (Table I). Persistent AC joint pain that affects athletic performance has been found in 8% to 9% of type I injuries and in 13% to 23% of type II injuries at 6 months to 5 years after injury.

Type III injury

Management of type III AC separations has long been controversial, although recent evidence supports nonoperative treatment. In the last 20 years, 3 physician surveys have been completed to determine physician preferences in the treatment of these injuries. Results indicate that nonoperative treatment was the initial choice of 69% to 86% of respondents, including 69% of major league baseball team physicians. In 2007, Nissen and Chatterjee reported that 86% of American Orthopaedic Society for Sports Medicine members selected nonoperative treatment. This represented a major change in the treatment of this injury from past surveys. In a published study from 1974, most residency program directors selected the surgical treatment of acute type III injuries as their preferred treatment.

Nonoperative treatment of type III injuries is similar to that of types I and II, although the duration of time in a sling may extend to 3 to 4 weeks. Postinjury rehabilitation is initiated with range of motion exercises, followed by progressive strengthening. Rehabilitation protocols should be followed diligently because inadequate rehabilitation can be a source of persistent pain and instability of the AC joint.
Return to sports should be delayed until full, painless range of motion is obtained, which may require 3 months. Schlegel et al\(^7\) showed favorable outcomes in 80% of their patients after nonoperative treatment at 1 year of follow-up, and others have found similar success with up to 5 years of follow-up.\(^2,6\) Functional deficits are minimal, with the objective evaluation of shoulder strength reported to be similar to that of the contralateral shoulder at midterm follow-up.\(^7,8,4,8\) However, there has been a reported 17% loss of bench press strength.\(^7\) Complaints of persistent AC joint tenderness, instability, shoulder stiffness, and cosmetic deformity may require subsequent surgical intervention.\(^8,7,9\)

Studies comparing the results of nonoperative and surgical treatment of type III AC separations have shown that surgical intervention does not have a substantial benefit.\(^3,4,7,5,4,8,6,9,8,2\) In a randomized controlled trial with 4 years of follow-up, Bannister et al\(^3\) compared nonoperative and operative management (with a CC screw) for 42 patients with a type III AC separation and 12 with type V. The patients with type III injuries who were treated nonoperatively obtained full shoulder motion more quickly, returned to work or sport earlier, and had fewer unsatisfactory results than those treated surgically. Taft et al\(^82\) also found that those treated nonoperatively had satisfactory clinical results and a lower complication rate than those who were treated surgically with CC screw fixation or AC fixation. Other studies have shown that strength testing in patients treated nonoperatively is superior or equal to that of those treated surgically with CC or AC fixation.

In a 1998 meta-analysis comparing nonoperative and various surgical treatments for grade III injuries, Phillips et al\(^6\) found that the overall satisfaction rates were 88% for patients treated surgically and 87% for those treated nonoperatively. Complication rates were higher after operative intervention, return to activity and pain relief was equivalent, and range of motion and strength were more often normal in the nonoperative group (Table II). The 4 comparative studies in Table II have indicated that nonoperative treatment should be chosen for most grade III injuries.

Criticism of the conclusions from these studies has focused on the surgical treatment used. In many of these studies, AC joint fixation was performed without CC ligament reconstruction.\(^4,7,5,4,8,2\) The conclusions from these studies may not be comparable with current surgical techniques that use CC ligament reconstruction for these injuries. Biomechanical studies have shown the importance of CC ligament reconstruction in the surgical treatment of this injury.\(^3,2,7,4\) However, randomized, prospective studies comparing nonoperative vs surgical treatment using CC ligament reconstruction for AC joint instability are lacking.

Patients with type III injuries who may be considered for surgical treatment are heavy laborers, elite athletes with an injury to the dominant extremity, and patients who object to the cosmetic deformity of type III injuries. Clinical studies indicate that the return to work or sports is no faster with surgical than with nonoperative intervention and that shoulder function at long-term follow-up is essentially the same with the 2 methods. In general, type III injuries should be treated with an initial trial of nonoperative treatment, with surgical intervention reserved for those with chronic pain or instability.

### Type IV and type V injuries

High-grade injuries involving the AC joint are relatively rare. To our knowledge, there is no evidence-based literature recommending a specific treatment for these injuries, with surgery the preferred treatment. Although nonoperative treatment for these injuries may be uncommon, there are reports of its use. Miller et al\(^2\) reported the successful use of manual reduction for 4 patients with type IV injuries. All patients had increased CC distances of less than 4 mm, and the CC ligaments were intact on magnetic resonance images. With manual reduction, the injuries were converted to type II injuries. Nuber and Bowen\(^6\) discussed closed reduction for type IV injuries, but no clinical outcomes were reported. Chronic unreduced grade IV injuries are often painful, resulting from distal clavicle incarceration into the trapezius muscle, requiring surgery.

Bannister et al\(^3\) reported the treatment of 12 type V AC joint injuries in a randomized controlled trial and showed markedly better results with CC screw and AC joint fixation.
than nonoperative treatment. Only 1 of 5 patients treated nonoperatively had a good or excellent result compared with 5 of 7 patients treated surgically. Although grade V injuries may be corrected to a type III deformity with an isolated deltotrapezial closure, CC with AC ligament reconstruction is recommended for most patients.

Surgical treatment options

Surgical treatment for AC joint injuries remains controversial. More than 75 surgical procedures have been described for the treatment of AC injuries, but none have established a gold standard. Currently, the 4 main surgical options for AC joint disruptions are (1) AC joint fixation with pins, screws, suture wires, plates, and hook-plates, (2) coracoacromial (CA) ligament transfer, (3) CC interval fixation, and (4) ligament reconstruction. Each of these techniques has had numerous modifications with inherent potential complications. Although good results have been reported for each surgical option, the literature is generally limited to case series of small sample size. Evidence-based, prospective randomized studies using validated outcome measures are needed to identify the best surgical treatment for AC injuries.

AC joint fixation

Early surgical treatment techniques for AC joint injuries involved AC joint fixation techniques with Kirschner wires or pins placed across the AC joint. These techniques fell out of favor because of their high complication rates, including loss of reduction and pin migration (Fig. 5).

Current AC joint fixation techniques emphasize the use of hook-plates (Fig. 6), which can be used with or without CC ligament reconstruction. These plates must be removed at 8 to 16 weeks after surgery and have been associated with plate bending, plate dislocation, and surgical-site infection. Gstettner et al found that type III AC separations treated with hook-plates had better outcomes than those treated nonoperatively. The mean Constant score was 80.7 points for nonoperative treatment and 90.4 points for the hook-plate group, with a mean CC distance of 19.9 mm and 12.1 mm, respectively. Failure with the hook-plate eroding through the acromion was noted as early as 32 days postoperatively.

In a retrospective case-control study, Bostrom Windham et al compared a modified Weaver-Dunn technique with hook-plated treatment of chronic AC dislocations and found no advantage for hook-plate fixation. The mean Constant score was 85 points for the modified Weaver-Dunn group and 75 points for the hook-plate group. Patients in the hook-plate group had pain at rest and more pain with shoulder motion than did the other patients. There was no difference in the degree of AC joint reduction between the 2 groups.

CA ligament transfer

CA ligament transfer techniques remain popular, and despite various modifications, are generally referred to as the Weaver-Dunn procedure (Fig. 7). Results have generally been good to excellent, but up to 20% loss of AC joint reduction has been reported. Multiple biomechanical studies have shown the inferior characteristics of the CA ligament compared with the native AC joint. Given the biomechanical limitations of the CA ligament for reconstruction of AC joint instability, contemporary CA ligament transfer techniques include the addition of CC ligament reconstruction using tendon grafts, suture anchors, screws, or suture loops.

CC interval fixation

CC interval fixation has been described with screw fixation, suture loop fixation, endobutton fixation (flip buttons), and suture anchors. These techniques transfer the combined forces normally exposed to the AC joint complex and CC ligaments to fixation points on the clavicle and coracoid process. The concern with these techniques is that the

<table>
<thead>
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<th>Study (year)</th>
<th>Patients, No.</th>
<th>Length of follow-up</th>
<th>Treatment</th>
<th>Surgical method</th>
<th>Good or excellent results, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Larsen, et al (1986)</td>
<td>41</td>
<td>13 mos</td>
<td>Surgical</td>
<td>AC joint fixation</td>
<td>97</td>
</tr>
<tr>
<td>Taft, et al (1987)</td>
<td>63</td>
<td>9.5 y, avg</td>
<td>Surgical</td>
<td>CC screw or AC joint fixation</td>
<td>94</td>
</tr>
<tr>
<td></td>
<td>231</td>
<td>...</td>
<td>Nonsurgical</td>
<td>...</td>
<td>87</td>
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</tbody>
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AC, acromioclavicular; CC, coracoclavicular.
* Meta analysis.
fixation is rigid and the concentrated forces placed on the fixation points may lead to hardware failure, osteolysis of the clavicle or coracoid by the devices, or fracture of the clavicle or coracoid process.\textsuperscript{2,8,10,76,89,90}

CC fixation techniques initially involved screw fixation with or without CC ligament repair (Fig. 8). CC screw fixation provided good to excellent results in more than 77\% of patients.\textsuperscript{15} Although this technique has been shown to biomechanically provide the highest load to failure and the stiffest reconstruction, its rigidity can lead to complications of screw pullout and coracoid or clavicular fracture.\textsuperscript{15,56}

A recent retrospective study reviewed 10 patients with a complete CC ligament disruption who were each treated with two #5 Ethibond sutures (Ethicon, Somerville, NJ) placed through drill holes in the clavicle and looped around the coracoid process.\textsuperscript{40} This technique afforded good functional outcomes and no loss of reduction at a minimum follow up of 14 months (average, 34.8 months).\textsuperscript{40} At 12 months after surgery, the mean University of California—Los Angeles shoulder rating score was 33.8 points, and the mean Western Ontario Shoulder Instability Index aggregation score was 93.4 points. The study excluded 2 patients treated surgically (including 1 who had sustained a coracoid fracture) because of loss to follow-up.

Yoo et al\textsuperscript{93} reported 21 patients treated with a CC ligament fixation technique in which 3 strands of #5 Ethibond suture as well as a semitendinosus autograft were looped around the coracoid and through a drill hole in the clavicle. The authors reported 48\% “excellent” and 52\% “good” results. The mean final Constant score was 84.7 points, and the University of California—Los Angeles score was 30.0 points, with 81\% of patients maintaining reduction in the AP plane and 1 patient having a complete loss of reduction. Although this technique uses a semitendinosus graft, its biomechanical characteristics are dependent on the three #5 Ethibond sutures, which have biomechanical
characteristics similar to those of other rigid fixation techniques.93

Endobutton (flip-button) device techniques for CC ligament repair have been reported to provide satisfactory outcomes through open and arthroscopic techniques (Fig. 9). One study (Fig. 9) showed statistically significant improvement in Constant scores from preoperative scores at 24 months, although 35% of patients had unsatisfactory radiographics, with loss of reduction.76 DeBerardino et al22 reported satisfactory outcomes for 10 patients with 6 months of follow-up who had been treated with a sub-coracoid button secured by nonabsorbable sutures to a special clavicular washer and augmented by a centrally placed soft-tissue graft.

CC ligament reconstruction

Anatomic AC and CC ligament reconstruction techniques have become increasingly popular. Several clinical and biomechanical studies have shown their superiority in reproducing the strength and stiffness of the native AC joint complex compared with other reconstructive techniques.4,18,25,38,42,45,62 In one prospective, comparative clinical study, anatomic ligament reconstruction of the conoid and trapezoid ligaments with tendon grafts resulted in superior outcomes compared with a modified Weaver-Dunn technique.83 Repair of the AC joint capsule has also been shown to be beneficial.21 Biomechanical studies of AC joint reconstruction with free-tissue graft for both the CC and the AC ligamentous complex provides AC joint stability similar to that of intact AC joints and is significantly better than that of a modified Weaver-Dunn procedure.36,58

Currently, we favor a modification of a ligament reconstruction with a hamstring or anterior tibialis allograft for AC and CC ligament reconstruction (Fig. 10). Biomechanical testing has shown that this technique fails by pull-through of the lateral sutures into the acromion.36 This technique can be modified by passing the tendon graft under the clavicle and adding a button such as a Retrobutton (Arthrex, Naples, FL) or Endobutton (Smith & Nephew, Memphis, TN) laterally. Reconstruction of both the CC and AC joint ligaments has experienced clinical success. Carofino and Mazzocca11 have developed a reconstructive technique that involves tendon graft fixation in the clavicular drill holes by polyetheretherketone interference screws and placing the graft in a figure-of-eight fashion (Fig. 11). In a preliminary case series of 17 patients, those authors found improved pain levels and function, with American Shoulder and Elbow Surgeons scores increased from 52 to 92 points after their described reconstructive technique. They documented 3 failures in their series, but none were from fracture or erosion through bone. Arthroscopic techniques for CC ligament reconstruction have also been described, with good results reported in a small series.85.

Although reconstructive techniques that anatomically reconstruct both the AC and CC ligaments are appealing, their clinical utility has not yet been proven by comparative outcome studies to produce patient outcomes superior to those of other fixation techniques.

Complications of treatment

Nonoperative and surgical treatment of AC joint injuries both pose a risk of persistent pain, incomplete return of function, distal clavicle osteolysis, late-onset AC joint arthrosis, and recurrent AC joint instability.15

Because the AC joint is the prime suspensory joint of the upper extremity and is subject to extremely high-force
repetitive loads, reconstructive techniques that place a rigid AC joint fixation are subject to complications secondary to the construct stiffness they create. Pins placed in the AC joint have migrated into the spinal canal, lung, and subclavian artery.\(^{53,65,79}\) Hook-plate fixation has failed by erosion of the hook through the acromion.\(^{37}\) CC screw fixation has been complicated by screw pullout and coracoid or clavicle fracture.\(^{15}\) Loop fixation techniques with Mersilene tapes (Ethicon) or other nonabsorbable suture such as Fiberwire (Arthrex, Naples FL) can be complicated by erosion though the clavicle or coracoid process.\(^{27,61}\)

Techniques that pass grafts or synthetic material under the coracoid process pose a risk of brachial plexus or axillary artery injury.\(^{22}\) Reported complications of flip-button fixation techniques include coracoid fracture, clavicle fracture, loss of reduction, and erosion of the device through the clavicle.\(^{15,76}\) Other potential complications associated with the surgical treatment of AC joint injuries include infection, foreign body reactions, and CC ossification. CC ossification has been reported in 15% to 56% of patients at midterm follow-up, although it has not been shown to cause functional limitations.\(^{13,70,76}\)

**Postoperative rehabilitation**

Patients are immobilized in a sling or brace for 6 to 8 weeks. Examples of suitable braces include the Gunslinger Shoulder Orthosis (Hanger Prosthetics and Orthotics Inc, Bethesda, MA) and the Lerman Shoulder Brace (DJO Inc, Vista, CA). Patients are initially allowed full active elbow, wrist, and hand exercises and no more than 90° of passive shoulder elevation in the plane of the scapula. Gentle range of motion activities in the supine position can begin at 7 to 10 days after surgery. Range of motion with an unsupported arm should be delayed for 6 to 8 weeks, at which time full active shoulder motion can be instituted.\(^{55}\) A patient with pain-free range of motion at 12 weeks can advance to strengthening exercises, primarily directed toward scapular stabilization. Return to work without restrictions generally occurs at 12 to 16 weeks after surgery. Full-contact athletics can be resumed at 6 months, provided the patient has more than 90% of the range of motion and strength of the unaffected extremity.
Full recovery and return to maximum strength and function generally takes 9 to 12 months.55

Conclusions

AC joint injuries are common, especially in contact sports such as football, hockey, and rugby. Type I and type II AC joint injuries can be expected to have good outcomes with nonoperative treatment. Type III injuries should also be treated nonoperatively, except that surgical treatment may be considered when these injuries involve the dominant shoulder of overhead athletes or heavy laborers. Type IV, type V, and type VI injuries are uncommon and are best treated surgically. The optimal surgical treatment for AC joint injuries has not been established. Techniques that anatomically restore the AC and coracoclavicular ligaments have been shown to be superior in biomechanical studies but have not shown clinical superiority. Prospective randomized studies using validated outcome measures are needed to identify the best surgical treatment for AC injuries.

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