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# Incidence of Associated Injuries With Acute Acromioclavicular Joint Dislocations Types III Through V

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**Background:** Traumatic acromioclavicular (AC) joint dislocations are common injuries among the active population. The injury mechanism requires excessive force delivered by a fall or blow to the shoulder. Associated injuries may occur and remain undetected if they are masked by the painful and prominent AC joint injury.

**Hypothesis:** Intra-articular injuries associated with high-grade AC joint dislocations are common.

**Study Design:** Case series; Level of evidence, 4.

**Methods:** Between 2002 and 2007, 77 patients (68 male, 9 female; average age, 35.5 years; range, 17-62 years) were surgically treated for acute AC joint dislocations (Rockwood type III, 5; type IV, 30; and type V, 42). All patients underwent diagnostic glenohumeral joint arthroscopy. Concomitant intra-articular injuries were identified and treated.

**Results:** Intra-articular injuries were found in 14 of 77 patients (18.2%). Superior labral anterior posterior (SLAP) lesions were observed in 11 of 77 patients 14.3% (SLAP I, 3; II, 2; III, 3; and IV, 3). Nineteen percent of Rockwood V lesions had associated SLAP lesions (SLAP I excluded), whereas only 3.4% of Rockwood IV lesions showed SLAP lesions. A complete supraspinatus tear was detected in 1 case, and partial articular-sided supraspinatus tears were detected in 2 cases. Four patients sustained an accompanying fracture.

**Conclusion:** Concomitant injuries to the shoulder girdle obtained during traumatic AC joint separation may be more frequent than previously thought. Clinical diagnosis may be difficult in the setting of an acute and painful dislocated AC joint. Shoulder arthroscopy during arthroscopic AC joint stabilization may aid in detecting associated injuries.

**Keywords:** acromioclavicular joint; AC joint; dislocation; concomitant injuries; SLAP

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Traumatic acromioclavicular (AC) joint dislocations are common injuries among the active population.<sup>6,19</sup> Nonoperative treatments are recommended for Rockwood I and II separations, while the management of Rockwood III dislocations still remains controversial.<sup>18,23</sup> Rockwood IV through VI dislocations are usually treated surgically. A plethora of operative techniques for AC joint reduction and fixation has been described, yet no gold standard has been defined.<sup>2,5,8,12,14,15,26</sup> The postoperative outcome is still variable.<sup>9,14</sup> Unsatisfactory results may be related to redislocations, AC joint arthritis, or postsurgical pain.

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The mechanism of AC joint separations is direct trauma, caused by a fall or blow with the arm in the adducted position.<sup>14</sup> Indirect injury may occur by falling on an adducted outstretched hand or elbow, causing the humerus to translocate superiorly and driving the humeral head into the acromion.<sup>14</sup> Because the injury mechanism of complete AC joint separation is usually forceful, associated injuries may occur and go unnoticed if they are masked by the painful and prominent AC joint. In the pathogenesis of superior labral anterior posterior (SLAP) lesions, many causes are described in the literature—compression of the biceps anchor by the humeral head, traction injuries, shoulder instability, and microtraumatic overuse injuries; current concepts are still evolving.<sup>3,7,13,17,22</sup> In case of a forceful blow or direct fall, the injury mechanism can be similar to the mechanism leading to AC joint separations.<sup>21</sup> Simultaneous injury may occur, while only the AC joint is being addressed during surgical treatment. Persistent shoulder pain after AC joint reduction may be related to concomitant injuries that are initially missed

during preoperative evaluation and thus are not addressed.

Therefore, identification of associated injuries may improve the clinical outcome of severe AC joint injuries. To our knowledge, there are no data on shoulder injuries associated with acute, high-grade AC joint dislocations. In this study, we describe associated shoulder girdle injuries found within a group of consecutive patients who were treated operatively for an acute AC joint separation, grades III through V.

## MATERIALS AND METHODS

Between 2002 and 2007, 77 consecutive patients (68 male, 9 female) with an average age of 35.5 years (range, 17-62 years) were surgically treated for acute AC joint dislocations at our department. According to the classification of Rockwood et al,<sup>19</sup> there were 5 grade III, 30 grade IV, and 42 grade V separations. In 37 cases, the left arm was injured and in 40, the right arm; in 53%, the dominant arm was injured. Every patient was assessed radiographically by trauma series (true AP, axial, scapula-Y). In addition, true AP and axial views were performed on the uninjured shoulder. The Zanca view was only performed in special cases to rule out osteoarthritis. Stress views were not routinely performed in the setting of acute AC joint injuries. Indications for surgery included all acute grade IV and V separations, while grade III dislocations were surgically treated (n = 5) only in either manual laborers or active athletes. Time between injury and surgery was, on average, 11.0 days (range, 2-50 days). No prior shoulder complaints were reported before the injury. Not included in this series were 4 patients with arthroscopic AC joint stabilization; 3 of them had persistent pain and instability after lateral clavicle resection and 1 had chronic AC joint pain after conservative treatment.

For the surgical procedure, the patient was placed in the beach-chair position and an initial glenohumeral diagnostic arthroscopy was conducted through the standard posterior portal. In this study, associated intra-articular injuries were all diagnosed by arthroscopic visualization. Concomitant injuries were identified and treated accordingly. The AC joint reconstruction procedure was begun with a subacromial arthroscopy. The AC joint was visualized through a second anterolateral portal within the rotator cuff interval, the disc removed if damaged, and the acromial undersurface debrided with an electrothermal device. Finally, the AC joint was reduced and stabilized under arthroscopic control using either 2 suture anchors placed in the anatomic coracoclavicular ligament insertions and 1 titanium plate in the clavicle in 39 cases<sup>2</sup> or by 2 TightRope devices (Arthrex, Naples, Florida) also placed at the anatomic insertions in 38 cases.<sup>10</sup> All surgeries were performed by the senior author (A.B.I.) of this study.

Postoperatively, the shoulder was protected in a sling for 6 weeks. Limited passive range of motion for 6 weeks was allowed. If associated injuries were treated, postoperative rehabilitation was adjusted accordingly.

TABLE 1

### Activities Leading to Acromioclavicular Joint Dislocation

Activity	N
Bicycle accident	29
Skiing/snowboarding	10
Soccer	5
Motorcycle accident	5
Horse fall	3
Ice hockey	3
Judo accident	2
Other fall	14
Undetermined	6

## RESULTS

The activities leading to AC joint separation are listed in Table 1. In the majority of cases, a simple fall caused the shoulder injury, but the exact injury mechanism could not be remembered. None of the study patients had shoulder pain before the injury. Intra-articular injuries were found in 14 of 77 patients (18.2%) (Table 2). Superior labral anterior posterior lesions were observed in 11 of 77 patients (14.3%). The SLAP lesions, according to Snyder et al,<sup>22</sup> included 3 type I, 2 type II, 3 type III, and 3 type IV lesions. No SLAP lesion occurred with Rockwood III injuries and only 3 occurred in Rockwood IV injuries (SLAP I, 2; SLAP III, 1). If SLAP I lesions were excluded, only 1 case (3.4%) of the Rockwood IV injuries had a concomitant SLAP lesion that required operation. The majority of SLAP lesions occurred in association with Rockwood V injuries (8 of 42 patients [19.0%]; 16.7% remaining after exclusion of 1 SLAP I lesion; Table 2). The average age of patients with SLAP lesions was slightly higher than the average age of this sample group (42.1 vs 35.5 years; not statistically significant different,  $P = .058$ ). The SLAP I lesions were debrided while other SLAP lesions were debrided, arthroscopically fixed with 2.8-mm titanium suture anchors (FASTak, Arthrex), or treated by a mini-open tenodesis of the long head of the biceps tendon using a biotenodesis screw (8.0-mm diameter, Arthrex) (Table 2).<sup>1,24</sup>

There was 1 acute complete supraspinatus tear (Snyder C III), which was repaired using a mini-open technique with 2 titanium corkscrew suture anchors (5.0-mm diameter, Arthrex). Two small articular-sided rotator cuff tears (Snyder A II; age of patients, 24 and 47 years) were identified and repaired using arthroscopic debridement.

Four patients sustained accompanying fractures of the upper extremity—2 caused by indirect trauma, including 1 distal radius fracture (this patient also suffered a SLAP II lesion) and 1 radial head fracture, and 2 caused by direct trauma, including one nondisplaced scapula fracture and one lateral clavicle fracture. The lateral clavicle fracture was treated by AC joint stabilization using 2 TightRope devices. Other fractures were treated accordingly (Table 2). All patients were followed up as described by Chernchujit et al.<sup>2</sup> No complications concerning the associated injuries were recorded during follow-up.

TABLE 2  
Frequency of Associated Injuries Depending on Type of Acromioclavicular Joint Dislocation

Injury	n	Rockwood Type IV/V		Treatment
Superior labral anterior posterior	11/77 (14.3%)			
Type I	3	2	1	Debridement (3 ×)
Type II	2		2	Refixation (1 ×), tenodesis (1 ×)
Type III	3	1	2	Debridement (3 ×) + refixation (2 ×)
Type IV	3		3	Refixation (2 ×), tenodesis (1 ×)
Rotator cuff tear	3/77 (3.9%)			
Partial supraspinatus	2	2		Debridement (2 ×)
Complete supraspinatus	1	1		Refixation
Fracture	4/77 (5.2%)			
Distal radius	1		1	Plate fixation
Radial head	1		1	Screw fixation
Scapula (nondisplaced)	1	1		Conservative treatment
Lateral clavicle	1	1		Acromioclavicular joint stabilization

## DISCUSSION

Injuries to the AC joint are one of the most commonly occurring problems in the athletic population.<sup>6</sup> However, optimal outcome is not achieved in every case.<sup>9,14</sup> The cause for persistent pain or mechanical symptoms is often unclear. Because the injury mechanism requires excessive force delivered by a fall or blow to the shoulder, associated injuries may occur. Therefore, all patients treated at our department for acute AC joint separation were carefully evaluated for additional injuries. One advantage of this study was the documentation of intra-articular injuries by glenohumeral arthroscopy, which has a high sensitivity and specificity to diagnose intra-articular lesions and is the current gold standard. The sensitivity and specificity of arthroscopy is superior to MRI, even with intra-articular contrast enhancer.<sup>25</sup> Other strengths of the study are treatment by a single surgeon (A.B.I.) and the consecutive population.

Within our group of patients, 14.3% had SLAP lesions. In comparison, the incidence of SLAP lesions observed in another series of patients with glenohumeral arthroscopy (N = 1392) was 5.6% (n = 78), including 7 SLAP I lesions.<sup>25</sup> The percentage of accompanying SLAP lesions identified in our study was quite high, especially in the subgroup of Rockwood type V AC joint dislocations (19.0%). The most common injury mechanism for SLAP lesions is a fall or direct blow to the shoulder,<sup>13,21</sup> similar to AC joint dislocations.<sup>14</sup> As Snyder et al<sup>21</sup> showed in their study of 140 SLAP lesions, 31% were caused by a fall or direct blow. Maffet et al,<sup>13</sup> in their study of 84 SLAP lesions, further differentiated the mechanism as being caused by a fall onto the shoulder in 15% (most important mechanism) and on the outstretched arm in 8%. Lifting heavy objects (13%) and insidious onset (9%) were further main mechanisms. Clavert et al<sup>3</sup> confirmed in their biomechanical study that a simulated forward fall on the outstretched arm produced SLAP type II lesions in 100% of specimens (5 of 5). In a recent study by Funk and Snow,<sup>7</sup> the authors showed a high incidence of SLAP lesions (35%) in contact athletes (rugby players). In the series of Snyder et al,<sup>21</sup> 15% of patients with SLAP lesions also had symptoms similar to

AC joint pain on physical examination. As others have reported, SLAP lesions are difficult to diagnose and the symptoms often difficult to distinguish from AC joint pathologies.<sup>4,11</sup> This fact is especially emphasized by the O'Brien test, which can be positive in superior labral tears and AC joint injuries.<sup>16</sup> Clinically, SLAP lesions may be easily overlooked in the setting of acute AC joint dislocations. Whereas the natural outcome of SLAP lesions is not known, surgical treatment is recommended for SLAP II through IV lesions.<sup>4</sup> Failure to recognize such concomitant injuries may explain some cases of resistant pain after AC joint stabilization. For example, in the study by Schlegel et al,<sup>20</sup> some patients complained of power loss during bench press and pain during overhead activities after conservative treatment, which can correspond to SLAP lesions.

From our data, we have no arthroscopic information on intra-articular soft tissue shoulder injuries related to minor AC joint dislocations (types I and II) because all those patients were treated conservatively. We assume, based on the level of AC joint injury, that SLAP lesions and rotator cuff tears are much less common in this group of patients. We did not observe any associated injuries within our patients suffering from grade III AC joint dislocations. Excluding SLAP I lesions, within the 30 grade IV AC joint separations from our collective, we documented only 1 SLAP lesion. Importantly, we recorded 7 SLAP type II through IV lesions within 42 grade V AC joint separations (16.7%), which may be related to the amount of energy required to cause grade V dislocations. Surgeons should carefully consider the possibility of associated shoulder injuries with high-grade AC joint injuries, particularly type V. A preoperative MRI may be useful when enhanced by application of intra-articular contrast medium to identify rotator cuff injuries and SLAP lesions in Rockwood grade V AC joint dislocations; it may also be useful in the case of persistent postoperative pain to rule out intra-articular injury.<sup>25</sup> Because our current treatment protocol includes surgical reduction of high-grade AC joint injuries with shoulder arthroscopy, we do not perform MRI.

In conclusion, acute high-grade AC joint separations may be accompanied by concomitant injuries to the shoulder girdle.

Untreated injuries may cause persistent pain within the shoulder after AC joint injury.

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