AC JOINT TYPE III INJURIES - SURGICAL TREATMENT

Andreas M. Panagopoulos MD, PhD
Lecturer in Orthopaedics, University Hospital of Patras
Consultant Orthopaedic Surgeon, OLYMPION Hospital, Patras
Epidemiology

- 9% of shoulder girdle injuries
- 43.5% occur in adults in their 20s
- more common in men than in women (ratio 5:1)
- more often incomplete than complete (2:1)

Anatomy

- **static stabilizers:** AC ligaments (4), CC ligaments (trapezoid and conoid)

- **dynamic stabilizers:** deltoid and trapezius muscles

Anatomy

- For small displacements the capsule and AC ligaments are the primary restraints to posterior (89%) and superior (68%) translation.

- For larger displacements, the conoid ligament is the primary restraint (62%) to superior translation, while the AC ligaments are still the primary restraint to posterior translation.

- Trapezoid ligament is the primary restraint to compression at both small and large displacements.

With forward elevation-abduction to 180° there is 5° to 8° of rotation at the AC joint.

During arm elevation, the clavicle, with respect to the thorax, undergoes elevation (11° to 15°) and retraction (15° to 29°).

When AC joint is intact, scapular motion (3 planes, 2 translations) is synchronously coupled with arm motion by the clavicle.
Biomechanics

- AC joint **should not be fixed**, either by fusion, hardware (screws, plates, pins) or coracoclavicular screws

- Motion will be lost, limiting shoulder function, or the hardware may fail

Classification

Mechanism of injury

- Direct trauma (fall or blow with the arm in the adducted position)
- Indirect injury (fall on adducted outstretched hand or elbow, causing the humerus to translocate superiorly, driving the humeral head into the acromion)
Clinical examination

- Step-off, point tenderness, **pain** at the AC joint with cross-arm adduction, and relief of symptoms by injection of local anesthetic.

- Positive Paxinos test (thumb pressure at the posterior AC joint) and O’Briens test.
Radiological examination

- **Zanca view** (cephalic tilting of 10° to 15° and use of only 50% of the standard shoulder anteroposterior penetration strength)

- **Axillary view** is useful for evaluating dislocation in the horizontal plane

- **Stress views**
Treatment

- The optimum treatment for AC joint separations is controversial and a source of continuing debate in the literature.

- Of the more than 500 articles written for this injury, approximately half of them contributed a new technique or a new approach to an old technique or management...
Evidence based medicine

AC joint separation
We, on the other hand, agree with the current consensus opinion that all type III injuries should initially be treated conservatively, regardless of occupation. The only advantage to operative intervention consistently borne out in the literature is an increased probability of anatomic reduction. There is no correlation between reduction and improvement in pain, strength, or motion, however. These patients usually are able to return to full sport with no deficits if rehabilitation is emphasized. For those patients who fail conservative management,
Evidence based medicine

- 27% of conservatively treated types I and II AC joint separations required further surgery at 26 months after injury [1]

- Successful treatment of failed types I and II AC joint separations with arthroscopic management [2]

- 20% rate of suboptimal outcome with conservative treatment for type III injuries [3]

Evidence based medicine

- Systematic review: 469 articles were found. 56 of these references met the inclusion criteria of pertaining to Grade III separations. Only 9 Level II or III studies in which a nonoperatively treated cohort of patients was compared with a cohort of operatively treated patients were included. 3 were prospective and randomized.

- Despite the limitations this systematic review concludes that nonoperative treatment is superior to traditional operative treatment in the management of Grade III AC separations.

TABLE 1. Demographic Data and Description of Treatment

<table>
<thead>
<tr>
<th>Study</th>
<th>Number of Patients</th>
<th>Average Age (years)</th>
<th>Description of Treatment</th>
<th>Followup</th>
<th>Level of Evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Imatani et al (^2)</td>
<td>11 Operative</td>
<td>23.5</td>
<td>Operative: AC pinning or Bosworth method</td>
<td>12-month minimum</td>
<td>II</td>
</tr>
<tr>
<td></td>
<td>12 Nonoperative</td>
<td></td>
<td>Nonoperative: sling × 3 weeks</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Larsen et al (^2)</td>
<td>41 Operative</td>
<td>36</td>
<td>Operative: AC pinning</td>
<td>13 months</td>
<td>II</td>
</tr>
<tr>
<td></td>
<td>43 Nonoperative</td>
<td></td>
<td>Nonoperative: sling × 4 weeks</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bannister et al (^4)</td>
<td>27 Operative</td>
<td>32.5</td>
<td>Operative: Bosworth method</td>
<td>4 years</td>
<td>II</td>
</tr>
<tr>
<td></td>
<td>33 Nonoperative</td>
<td></td>
<td>Nonoperative: sling × 2 weeks</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Powers et al (^2)</td>
<td>19 Operative</td>
<td>Not given</td>
<td>Operative: AC pinning, DCE, and fascial weave</td>
<td>12 years</td>
<td>II</td>
</tr>
<tr>
<td></td>
<td>28 Nonoperative</td>
<td></td>
<td>Nonoperative: 20 via arm cast; 8 not given</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rosenom et al (^2)</td>
<td>11 Operative</td>
<td>37 (operative)</td>
<td>Operative: Bosworth method</td>
<td>12 months (operative)</td>
<td>III</td>
</tr>
<tr>
<td></td>
<td>13 Nonoperative</td>
<td>41.5 (nonoperative)</td>
<td>Nonoperative: bandage, PT, no treatment</td>
<td>84 months (nonoperative)</td>
<td>III</td>
</tr>
<tr>
<td>Galpin et al (^1)</td>
<td>16 Operative</td>
<td>28.9 (operative)</td>
<td>Operative: Bosworth method</td>
<td>35 months (operative)</td>
<td>III</td>
</tr>
<tr>
<td></td>
<td>21 Nonoperative</td>
<td>36.7 (nonoperative)</td>
<td>Nonoperative: sling and early ROM</td>
<td>33.7 months (nonoperative)</td>
<td>III</td>
</tr>
<tr>
<td>Taft et al (^2)</td>
<td>52 Operative</td>
<td>93 were between 18 and 25, but no average given</td>
<td>Operative: 26 AC pinning and 26 Bosworth method</td>
<td>10.8 years (operative)</td>
<td>III</td>
</tr>
<tr>
<td></td>
<td>63 Nonoperative</td>
<td></td>
<td>Nonoperative: 43 sling, 11 splint, 9 taping</td>
<td>9.5 years (nonoperative)</td>
<td>III</td>
</tr>
<tr>
<td>MacDonald et al (^2)</td>
<td>12 No treatment</td>
<td>25 (operative)</td>
<td>Operative: 5 AC pinning and 5 Bosworth method</td>
<td>13 years (no treatment)</td>
<td>III</td>
</tr>
<tr>
<td>Press et al (^2)</td>
<td>10 Nonoperative</td>
<td>31.7 (nonoperative)</td>
<td>Nonoperative: taping or sling</td>
<td>6.3 months (nonoperative)</td>
<td>III</td>
</tr>
<tr>
<td></td>
<td>16 Operative</td>
<td>30.7 (operative)</td>
<td>Operative: 9 Weaver-Dunn and 7 suture CC fixation</td>
<td>32.3 months (operative)</td>
<td>III</td>
</tr>
<tr>
<td></td>
<td>10 Nonoperative</td>
<td>49.6 (nonoperative)</td>
<td>Nonoperative: Sling</td>
<td>33.4 months (nonoperative)</td>
<td>III</td>
</tr>
</tbody>
</table>

AC = acromioclavicular; CC = coracoclavicular; DCE = distal clavicular excision; ROM = range of motion

**Treatment**

**Types of operative procedures:**

1. Fixation across the acromioclavicular joint
   a. Kirschner wires
   b. Hook plate
2. Dynamic muscle transfer
3. Fixation between the clavicle and the coracoid
   a. Bosworth screw
   b. Coracoclavicular loop
4. Reconstruction of ligaments (Weaver-Dunn)
5. Anatomical reconstruction
6. Combinations, including arthroscopic techniques
Treatment

1. Fixation across the acromioclavicular joint
   a. with wires, threaded pins, screws

- pin migration or breakage
- pin-site infection
- redislocation after pin removal
- damage to the articular cartilage or meniscus
Treatment

1. **Fixation across the acromioclavicular joint**
   b. with hook plates

   - violation of the AC joint
   - need for implant removal
   - bending or redislocation
   - increased risk of infection

Treatment

2. **Dynamic muscle transfer** (chronic injuries)

- bypasses the site of disruption
- injury to the musculocutaneous nerve
- nonunion of the transferred coracoid
- loss of fixation or screw breakage

- Skjeldal et al reported 10 complications in 17 patients, including coracoid fragmentation, infection, and pain

3. Fixation between the clavicle and the coracoid
   a. Bosworth screw

± repair of the ligaments
removal of the screw (8-10 weeks postop)
- ossification between coracoid-clavicle
- osteolysis
- loosening
- screw breakage
4. Reconstruction of ligaments (Weaver-Dunn)

- residual subluxation or dislocation
- CA lig. is important restraining mechanism to ↑ migration of the shoulder
- less strength of the intact CC ligament (additional augmentation needed, such as sutures, tapes, screws, or tendons)

5. Anatomical reconstruction techniques

- FCR tendon, gracillis, semitendinosus, allografts….
- complex & expensive operations
- a normal tendon is sacrificed
- risk from the allografts

5. Anatomical reconstruction techniques

Clinical Outcomes of Coracoclavicular Ligament Reconstructions Using Tendon Grafts

Stephen J. Nicholas, MD, Steven J. Lee,* MD, Michael J. Mullaney, DPT,
Timothy F. Tyler, MS, PT, ATC, and Malachy P. McHugh, PhD
From the Nicholas Institute of Sports Medicine & Athletic Trauma (NISMAT),
Lenox Hill Hospital, New York, New York

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

Methods: Nine patients underwent coracoclavicular ligament reconstruction using augmented cadaveric semitendinosus tendon allografts after a grade V acromioclavicular separation. All patients were evaluated for range of motion, strength, closed kinetic

Conclusion: Outcome for coracoclavicular ligament reconstructions using augmented semitendinosus tendon grafts was excellent with full recovery of strength, minimal range of motion loss, and no clinical or radiographic loss of reduction of the acromioclavicular joint.

Clinical Relevance: This procedure provides an excellent treatment for grade V acromioclavicular separations.
Treatment

6. Arthroscopic techniques

Technical Note
Arthroscopic Reconstruction for Acromioclavicular Joint Dislocation

Eugene M. Wolf, M.D., and William T. Pennington, M.D.
Treatment

3. Fixation between the clavicle and the coracoid
   
   b. Coracoclavicular loop

   - wires, sutures, PDS, Dacron-Mersilene tapes, other synthetic (LARS) loops, or bone anchors
   - loss of reduction
   - erosion through the distal clavicle
   - anterior displacement
   - infection, nerve damage
Double-Loop Suture Repair for Acute Acromioclavicular Joint Disruption

Panayotis Dimakopoulos, MD, Andreas Panagopoulos,* MD, PhD, Spyros A. Syggelos, MD, Elias Panagiotopoulos, MD, and Elias Lambiris, MD
From the Orthopaedic Clinic, Shoulder and Elbow Surgery Unit, University Hospital of Patras, Patras, Greece

Functional Coracoclavicular Stabilization for Acute Acromioclavicular Joint Disruption

Panayotis Dimakopoulos, MD, PhD; Andreas Panagopoulos, MD
Surgical technique
Surgical technique
Surgical technique
Surgical technique
Surgical technique
Take home message

- Types I and II AC joint separations are treated nonsurgically.

Types III injuries are usually evaluated on a case-by-case basis, taking into account hand dominance, occupation, heavy labor, position or sport requirements (pitchers), scapulothoracic dysfunction, and the risk for re-injury.

Types IV, V, and VI injuries are generally treated operatively.

- Need for prospective-randomized multicenter studies

THANK YOU