



Acromioclavicular Injuries in Baseball

Baseball Sports Medicine: Game-Changing Concepts

 Cleveland Clinic

Mark S. Schickendantz, M.D.
Professor of Surgery
Director of Sports Medicine
Cleveland Clinic


Head Team Physician
Cleveland Indians



AC I Baseball Medicine | NYC Nov 2017

Disclosures

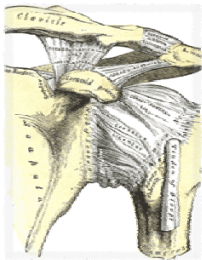
- Arthrex: Consultant
- DJO: Education
- Smith Nephew: Education
- American Journal of Sports Medicine
- Journal of Bone and Joint Surgery
- Journal of Shoulder and Elbow Surgery
- Orthopaedic Journal of Sports Medicine
- The Physician and Sports Medicine
- American Orthopaedic Society for Sports Medicine (AOSSM):
Education and Industry Relations Committee


 Cleveland Clinic

AC I Baseball Medicine | NYC Nov 2017

Anatomy of the AC Joint

- Diarthrodial joint
- ROM: 5-8 degrees
- Thin capsule stabilized on all side by ligaments
- AC ligaments
 - Primarily control anterior/posterior displacement
 - Superior > Inferior
 - 55 % of posterior-directed force



 Cleveland Clinic

AC I Baseball Medicine | NYC Nov 2017

Coracoclavicular Ligaments

- Suspensory ligaments of the upper extremity
- Primary restraint to **superior translation**
- 2 ligaments
 - Medial: conoid (46 mm)
 - Lateral: trapezoid (26 mm)

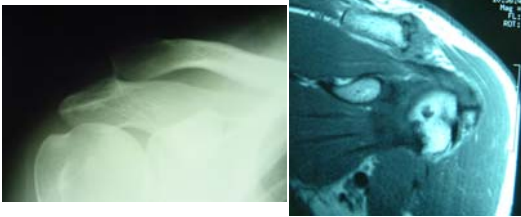


Cleveland Clinic

AC | Baseball Medicine | NYC Nov 2017

Pathology

- Relatively uncommon in baseball
- Fielders more likely to experience traumatic injury (e.g. sprain)
- Pitchers can develop DJD, distal clavicular osteolysis (DCO)



Cleveland Clinic

AC | Baseball Medicine | NYC Nov 2017

Diagnosis

- Careful History
 - Mechanism of Injury
 - Level of Activity
 - Previous Shoulder/AC Joint injuries
- Physical Exam
 - Contour of shoulder
 - Palpate joint, assess mobility
 - Cross-arm Adduction sign
 - Check Neurovascular status



Cleveland Clinic

AC | Baseball Medicine | NYC Nov 2017

DJD/DCO Treatment

- Limit excessive cross body activities
- Oral NSAIDS
- Topicals work well here
- Kinesiotape
- CSI very useful and safe
 - US guided best



Cleveland Clinic

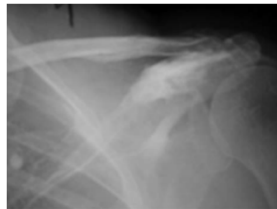
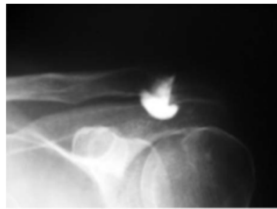
AC I Baseball Medicine I NYC Nov 2017

Accuracy of Acromioclavicular Joint Injections

Bradley R. Wasserman,¹ MD, Sarah Pettrone,¹ MD, Lath M. Jazrawi,¹ MD, Joseph D. Zuckerman,¹ MD, and Andrew S. Rokko,^{1,2} MD



- Level IV Case series (2013)
- 30 patients injected with 1% lidocaine and Isovue
 - Radiographs taken after injection
 - 13 IA, 7 partial, 10 EA

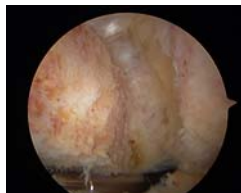
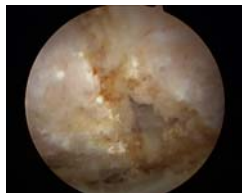


Cleveland Clinic

AC I Baseball Medicine I NYC Nov 2017

Distal clavicle excision

- Effective in treating refractory AC joint pain due to arthrosis or osteolysis due to stable grade 1 or 2 AC joint separations
- Technique may accentuate instability when present
 - Increased horizontal clavicular motion in 10/23 type I and II injuries (Tibone AJSM 1988)



Cleveland Clinic

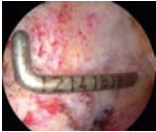
AC I Baseball Medicine I NYC Nov 2017

Arthroscopic Versus Open Distal Clavicle Excision

A Comparative Assessment at Intermediate-Term Follow-up

William J. Robertson,¹ MD, Matthew H. Griffith,⁴ MD, Kaitlin Carroll,⁴ BS, Thomas O'Donnell,⁴ BS, and Thomas J. Gill,⁴ MD
Investigation performed at Massachusetts General Hospital, Boston, Massachusetts

- 32 arthroscopic, 17 open
- Mean follow-up ~ 5 years
- Results:
 - Less pain in arthroscopy cohort at final follow-up
 - No difference: ASES, amount resected, operative time

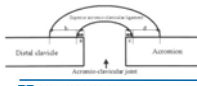
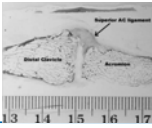



Cleveland Clinic AC | Baseball Medicine | NYC Nov 2017

Ligamentous anatomy of the distal clavicle

Kevin J. Renfree, MD,¹ Michael K. Riley, MD,² Donna Wheeler, PhD,³ Joseph G. Hertz, MS,⁴ and Thomas W. Wright, MD,⁵ Scottsdale, AZ, and Ocala and Gainesville, FL

- **Superior AC ligament**
 - **Women:**
 - 5.2 mm distal clavicle
 - 4.7 mm medial acromion
 - **Men:**
 - 7.6 mm distal clavicle
 - 8 mm medial acromion
- **Coracoclavicular ligaments**
 - 24 mm- conoid
 - 11 mm- trapezoid

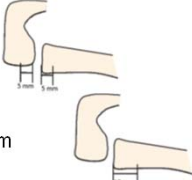
Cleveland Clinic AC | Baseball Medicine | NYC Nov 2017

The Biomechanical Stability of Distal Clavicle Excision Versus Symmetric Acromioclavicular Joint Resection

Nikhil G. Pandhi,¹ DO, MPH, Amanda O. Esquivel,² PhD, Jason D. Hanna,³ MD, David W. Lemos,⁴ MD, Jeffrey S. Staron,⁵ MD, and Stephen E. Lemos,¹ MD, PhD

3)

- Evaluate ant to post load to failure and stiffness of AC joint after DCE as symmetric ACJR
- Peak load to failure
 - DCE: 387.8 N, ACJR 468.5 N
- Average stiffness
 - DCE: 35.2 N/mm, ACJR 37.4 N/mm
- Authors conclude that ACJR may improve joint stability and lead to fewer complications



Cleveland Clinic AC | Baseball Medicine | NYC Nov 2017

Acromioclavicular Sprains

Cleveland Clinic

AC | Baseball Medicine | NYC Nov 2017

Mechanism of Injury

- **Direct**—fall onto shoulder with adducted arm
- **Indirect**—fall onto outstretched hand with force transmission up arm through humeral head into the acromion
- **Continuum of ligament injury**
 - AC ligament → CC ligament → Deltoid and trap muscles → fascial tears

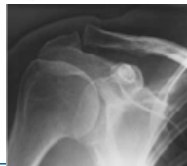
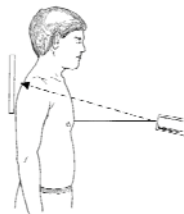


Cleveland Clinic

AC | Baseball Medicine | NYC Nov 2017

Radiographic Evaluation

- Initial views
 - Anteroposterior views
 - Zanca views (15 deg cephalic tilt)
- Other views
 - Axillary: AP displacement
 - Stress views: minimal impact on treatment decisions

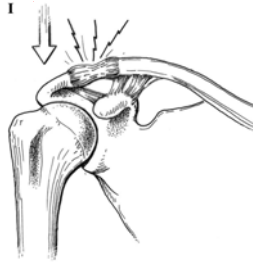


Cleveland Clinic

AC | Baseball Medicine | NYC Nov 2017

Type I

- AC ligament sprain
- AC joint tenderness
- Minimal pain with arm motion
- No pain in coracoclavicular interspace
- XR: normal

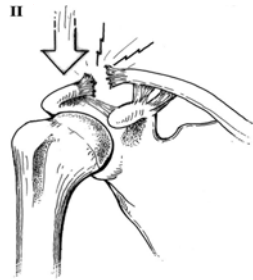


Cleveland Clinic

AC I Baseball Medicine I NYC Nov 2017

Type II

- AC ligament disruption, CC ligament sprain
- AC Joint widening
- XR: Distal clavicle slightly superior to acromion, -CC distance inc ~25%

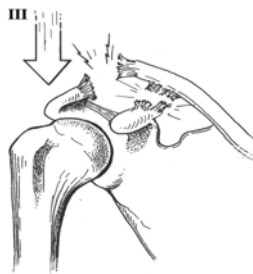


Cleveland Clinic

AC I Baseball Medicine I NYC Nov 2017

Type III

- AC and CC ligament disruption
- AC Joint dislocation
- Deltoid and Trapezius detached from distal clavicle
- CC distance increased 25-100%

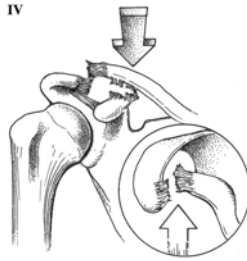


Cleveland Clinic

AC I Baseball Medicine I NYC Nov 2017

Type IV

- Type III injury w distal clavicle driven **posterior** into/through trapezius
- Axillary XR: posterior displacement of distal clavicle

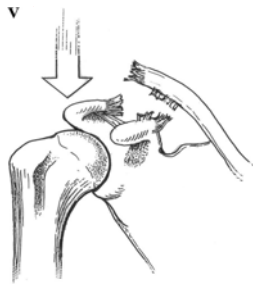


Cleveland Clinic

AC | Baseball Medicine | NYC Nov 2017

Type V

- Type III injury w distal clavicle **superiorly** displaced
- Tenting of skin
- CC distance increased **100-300%**

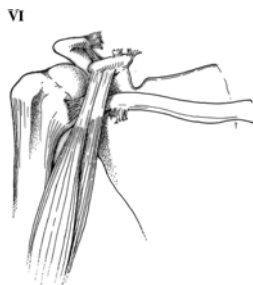


Cleveland Clinic

AC | Baseball Medicine | NYC Nov 2017

Type VI

- AC joint dislocated with distal clavicle driven **beneath** coracoid or acromion
- Deltoid and Trapezius detached
- Brachial plexus injury common



Cleveland Clinic

AC | Baseball Medicine | NYC Nov 2017

Treatment

- Type I and II: non-operative
 - rest, ice, sling, progressive therapy
 - Chronic pain—CSI, DCE
- Type IV, V, and VI: early surgical stabilization
 - Open reduction and repair/recon CC ligaments
 - Restore vertical stability
- Type III: ideal treatment remains controversial

Grade III

Treatment guidelines much less clear;

- WHO** do we fix?
- WHEN** do we fix?
- HOW** do we fix?



The literature doesn't help much!

Acromioclavicular Joint Injuries in the National Football League

Epidemiology and Management

T. Sean Lynch,^{*†} MD, Matthew D. Saltzman,[‡] MD, Jason H. Ghodasra,[‡] MD, Karl Y. Bilimoria,[‡] MD, Mark K. Bowen,[‡] MD, and Gordon W. Nuber,[‡] MD



- Descriptive epidemiologic study—
 - all positional players
- AC joint injuries made up 30% of all shoulder injuries
 - Majority of injuries were type I, II, III
- QB and ST most susceptible to these injuries
- Mean time lost 9.8 days; **QB's longer: 17.3 days**
- 13 athletes requires surgical intervention

Shoulder Injuries to Quarterbacks in the National Football League



Bryan T. Kelly,¹ MD, Ronnie P. Barnes,¹ MS, ATC, John W. Powell,² PhD, ATC, and Russell F. Warren,¹ MD

- Descriptive epidemiologic study—only QBs
- AC Joint injuries #1 shoulder injury (40%)
 - Type 1 44%
 - Type 2 20%
 - Type 3 20%
- **Mean time lost was 12.5 days**
- Majority treated without surgery

Cleveland Clinic

AC | Baseball Medicine | NYC Nov 2017

Treatment of grade III acromioclavicular separations in professional throwing athletes: results of a survey.



- Survey of MLB team physicians
- 69% would manage player non-op
 - 60% surveyed actually had the scenario
 - 63% of players were treated non-op
 - >80% players regained normal ROM, pain relief and function

Treatment of grade III acromioclavicular separations in professional throwing athletes: results of a survey. Am J Orthop. 1997 Nov;26(11):771-4. McFarland EG et al.

Cleveland Clinic

AC | Baseball Medicine | NYC Nov 2017

Arthroscopy. 2009 Jan;25(1):40-5. doi: 10.1016/j.arthro.2008.08.019. Epub 2008 Oct 10.
Scapular dyskinesis and SICK scapula syndrome in patients with chronic type III acromioclavicular dislocation.
Gumina S¹, Carbone S, Postacchini F.

- Chronic type III AC dislocation causes scapular dyskinesis in 70.6% of patients.
- 58.3% have SICK scapula syndrome

BMC Musculoskelet Disord. 2016 Nov 17;17(1):480.

Influence of disruption of the acromioclavicular and coracoclavicular ligaments on glenohumeral motion: a kinematic evaluation.

Walley KC¹, Haqpanah B^{1,2}, Hingsammer A¹, Harlow ER¹, Vaziri A², DeAngelis JP³, Nazarian A^{1,3}, Ramappa A^{1,4,5}.

- A combined injury of the AC and CC ligaments significantly alters GH kinematics during abduction.
- Type III AC separations result in a significant change in the shoulder's motion

Cleveland Clinic

AC | Baseball Medicine | NYC Nov 2017

Historical Literature Review: Operative vs. Non-operative

Table II Comparative studies evaluating the results of operative and nonoperative treatment of type III acromioclavicular injuries

Study (year)	Patients, No.	Length of follow-up	Treatment	Surgical method	Good or excellent results, %
Larsen, et al ²⁷ (1986)	41	13 mos	Surgical	AC joint fixation	97
	43	13 mos	Non-surgical	...	98
Taft, et al ²⁸ (1987)	63	9.5 y, avg	Surgical	CC screw or AC joint fixation	94
	52	9.5 y, avg	Non-surgical	...	91
Bannister, et al ³ (1989)	27	4 y	Surgical	CC screw	76
	33	4 y	Non-surgical	...	88
Phillips, et al ²⁹ (1998)	602	...*	Surgical	Multiple methods	88
	231	...*	Non-surgical	...	87

And the winner is...

THE COCHRANE LIBRARY

Surgical versus conservative interventions for treating acromioclavicular dislocation of the shoulder in adults

Authors' conclusions

There is **insufficient evidence from randomised controlled trials to determine when surgical treatment is indicated** for acromioclavicular dislocation in adults in current practice. Sufficiently powered, good quality, well-reported randomised trials of currently-used surgical interventions versus conservative treatment for well-defined injuries are required.

Rehabilitation

- **Phase I:** Pain control, protected ROM, isometric exercises
- **Phase II :** Strengthening with isotonic exercises and proprioceptive neuromuscular facilitation
- **Phase III :** Unrestricted functional participation with a goal to increase power, endurance and neuromuscular control
- **Phase IV :** Return to activity with sport-specific drills

Surgical Options

- **Primary fixation across the AC joint**
 - K-wires (1940)
 - AC ligament repair/augmentation
 - Hook plate
- **Fixation between the clavicle and coracoid**
 - Bosworth screw (1941)
 - Dacron Tape; other non-absorbable sutures
- **Primary CC ligament reconstruction**
 - CA ligament transfer
 - CC ligament repair
- **Dynamic muscle transfer**
 - Conjoint tendon to the inferior clavicle
- **Ligament reconstruction with graft or synthetic tissue**
- **Combinations**



Techniques I have tried....

- "Weaver Dunn" with CA ligament transfer:
 - ✓ with and without bone block
 - ✓ with and with out material back up (fiber wire, fiber tape, dacron tape, braided PDS; +/-cuff link gromets)
 - ✓ with and with out repair of CC ligaments
- "Weaver Dunn" with free tendon graft:
 - ✓ Around the coracoid; through the coracoid
 - ✓ Single bundle; double bundle anatomic
 - ✓ Interference screws; suture anchors
 - ✓ Arthrex Tight Rope and Graft Rope; Biomet Toggle Lock
 - ✓ Augmentation/reconstruction of AC ligament

Current Method



My Opinion

- Position player with Grade III sprain:
 - Individualized approach
 - Ok to treat non-op
 - RTP based on symptoms and function
 - If able to RTP but still having symptoms can fix off season
 - Arthroscopically assisted with graft
- Grade III + injury in the dominant arm of a pitcher likely not tolerated very well
 - Acute arthroscopic repair without need for graft

Cleveland Clinic

ACI Baseball Medicine I NYC Nov 2017

Case

Return to Play after Nonoperative Treatment of Type III Acromioclavicular Injury in a Professional Baseball Player

Annals of Sports Medicine and Research. 2017 July 4 (3).

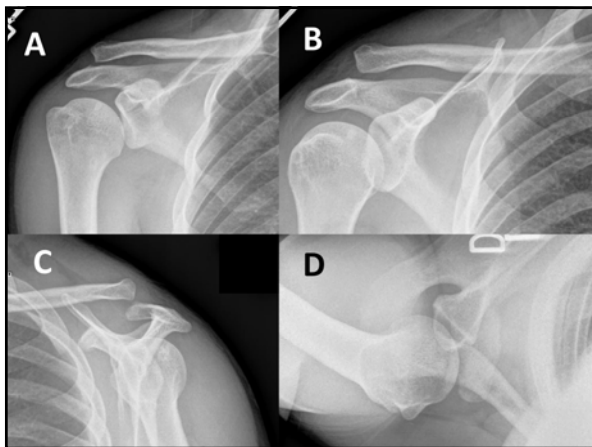
29 yo R/R MLB catcher

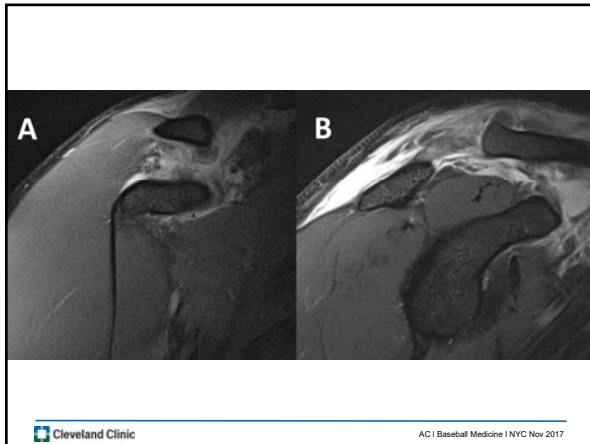
Fell directly onto the shoulder tripping over first base



Cleveland Clinic

ACI Baseball Medicine I NYC Nov 2017






Recovery Progression

Post-Injury Day	Treatment
0	Sling, cryotherapy, oral methylprednisolone, MicroCurrent, and passive rotation
5	Sling discontinued
8	Active motion and isometric exercises
15	Table-height push-ups, rotation with resistance bands
27	Two-handed swings
32	Batting front flips
33	Interval throwing program
43	Batting practice on field
47	Minor league designated hitter
52	Medically cleared from injury

Final Thoughts


- No "best" way to reconstruct CC ligaments
- Why do they "fail"?
 - ✓ Non-anatomic placement
 - ✓ Insufficient materials (biologic and manufactured)
 - ✓ Poor healing potential (blood supply??)
 - ✓ Biomechanics not reproducible; difficult to control vertical and horizontal translation
- Best surgical candidate: high grade, unstable AC sprain (mobile distal clavicle); dominant side; individualized timing (probably best to fix early if you decide to fix it)

 **Cleveland Clinic**
Sports Health

Thank You!

schickm@ccf.org
@doctorschick

877-440-TEAM
sports-health.org

 Cleveland Clinic AC | Baseball Medicine | NYC Nov 2017
