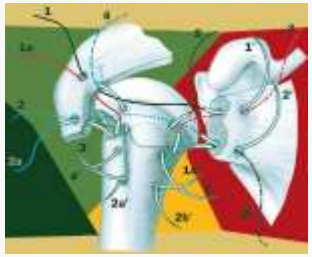
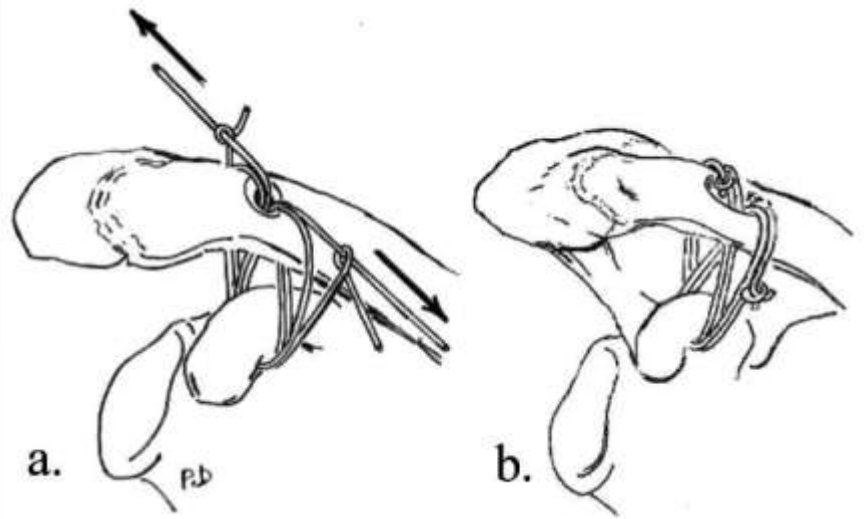


4ο ΣΕΜΙΝΑΡΙΟ ΤΡΑΥΜΑΤΟΣ ΩΜΟΥ & ΑΓΚΩΝΑ
19-20 Ιουνίου 2009
ΣΥΝΕΔΡΙΑΚΟ & ΠΟΛΙΤΙΣΤΙΚΟ ΚΕΝΤΡΟ ΠΑΝΕΠΙΣΤΗΜΙΟΥ ΠΑΤΡΩΝ

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)

Rockwood CJ, ET AL. Disorders of the acromioclavicular joint. In: Rockwood CJ, Matsen FA III, eds. The Shoulder. 2nd ed. Philadelphia, PA: WB Saunders; 1998:483-553.

Anatomy

- **static stabilizers**: AC ligaments (4), CC ligaments (trapezoid and conoid)
- **dynamic stabilizers:** deltoid and trapezius muscles

Fukuda K, et al. Biomechanical study of the ligamentous system of the acromioclavicular joint. J Bone Joint Surg Am. 1986;68:434-440.

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

Fukuda K, et al. J Bone Joint Surg Am. 1986;68:434-440.

Klimkiewicz J, et al. J Shoulder Elbow Surg. 1999;8:119-124.

Biomechanics

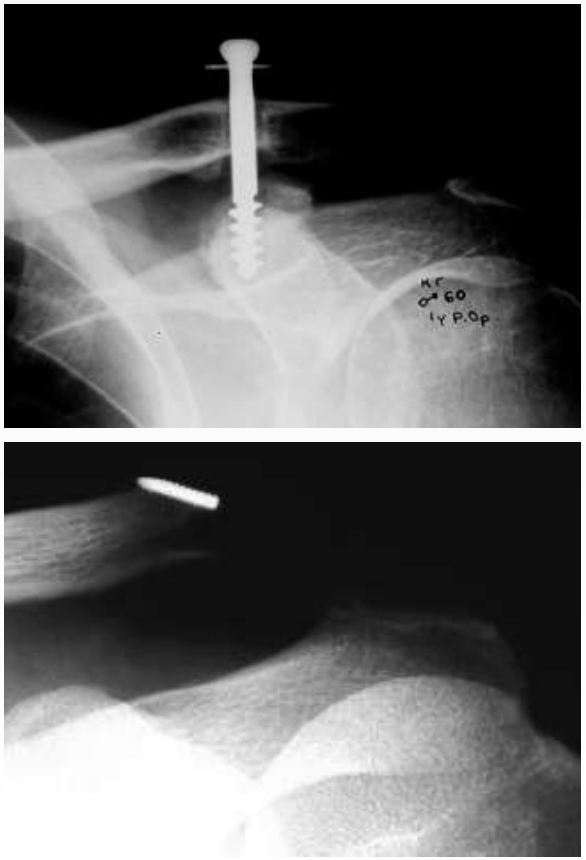
- With forward elevation-abduction to 180° there is **5°** to **8°** of rotation at the AC joint
- During arm elevation, the clavicle, with respect to the thorax, undergoes **elevation** (11° to 15°) and **retraction** (15° to 29°).
- When AC joint is intact, scapular motion (3 planes, 2 translations) is **synchronously coupled** with arm motion by the clavicle

Codman EA. The Shoulder. Malabar, FL: Robert E. Krieger Publishing Company Inc; 1934.

Ludewig PM, et al. Three-dimensional clavicular motion during arm elevation: reliability and descriptive data. J Orthop Sports Phys Ther. 2004;34:140-149.

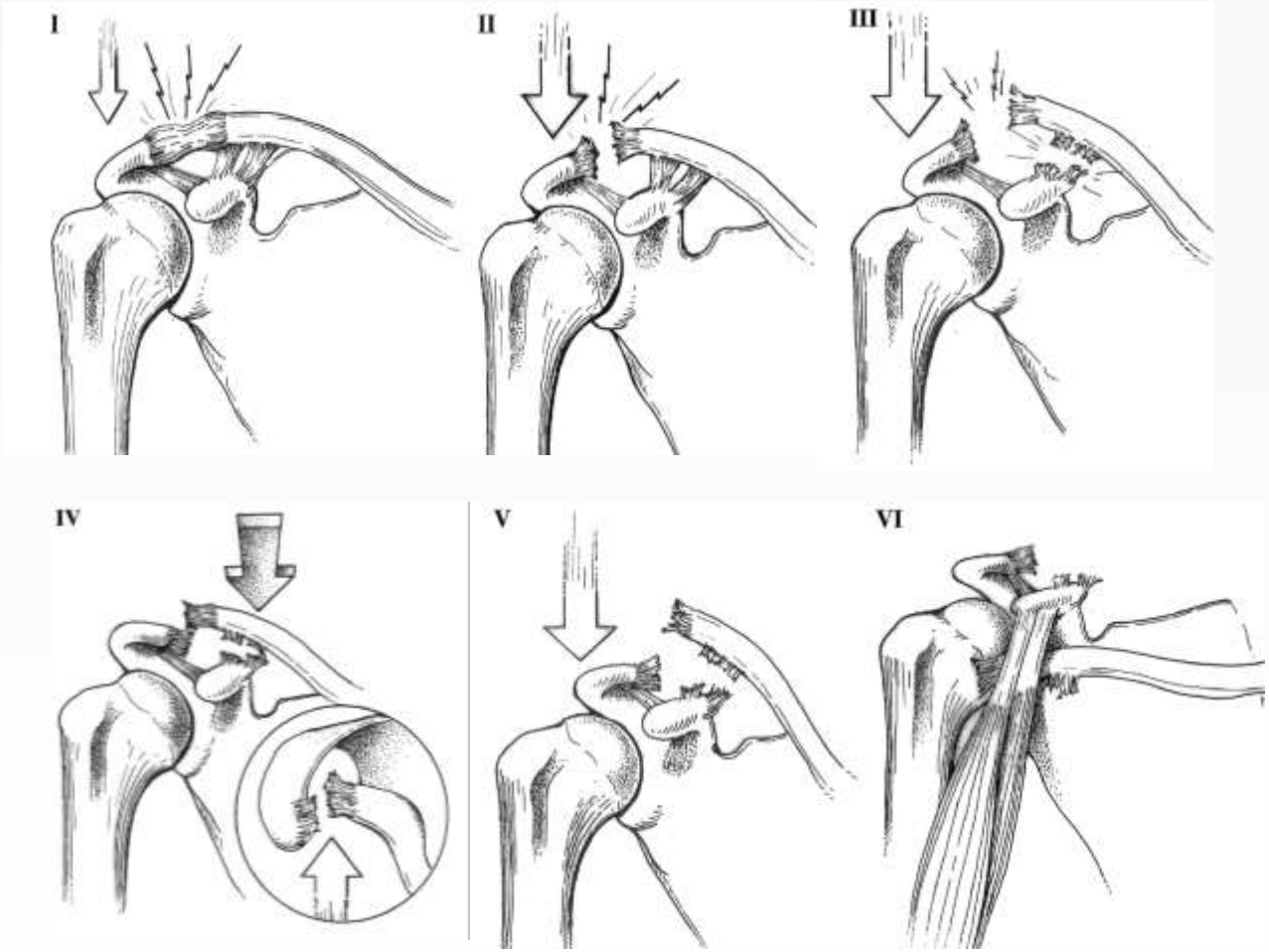
Biomechanics

- 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



Mazzocca AD et al Evaluation and Treatment of Acromioclavicular Joint Injuries. Am J Sports Med 2007;35:316-329

Classification



Rockwood CA, Jr: Injuries to the acromioclavicular joint, in Rockwood CS, Jr, Green DP (eds): Fractures in Adults. Philadelphia 974-982, Saunders, 1984, pp 860-910

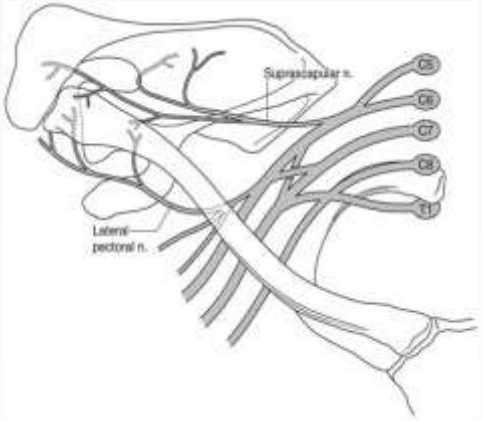
Mechanism of injury

- 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

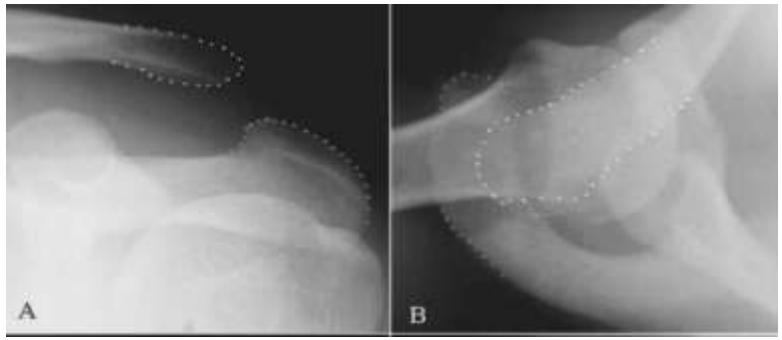
- Step-off, point tenderness, **pain** at the AC joint with cross-arm adduction, and relief of symptoms by injection of local anesthetic.

- 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**



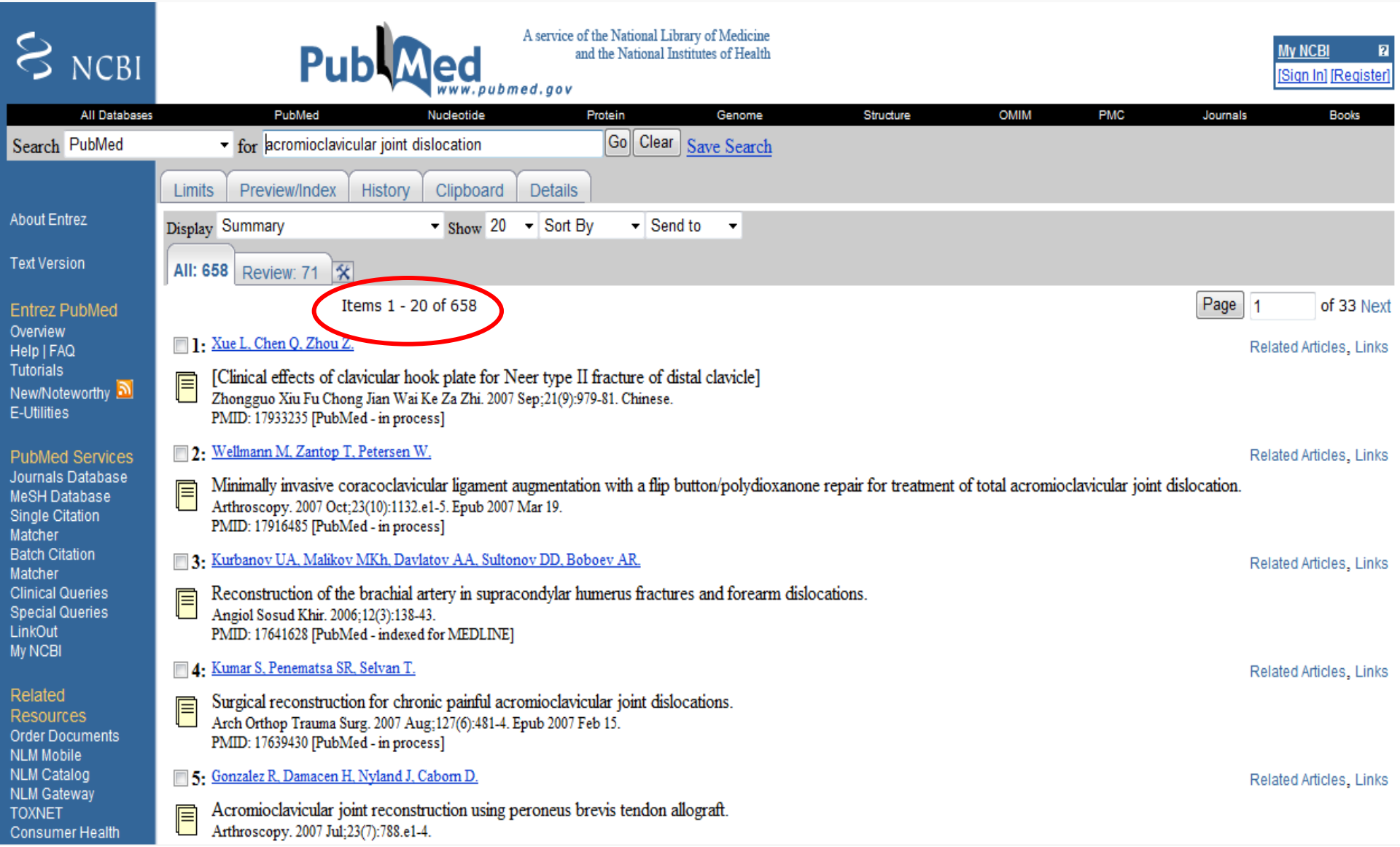
Treatment

- 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



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Items 1 - 20 of 658

Page 1 of 33 Next

1: Xue L, Chen Q, Zhou Z. Related Articles, Links

[Clinical effects of clavicular hook plate for Neer type II fracture of distal clavicle]
Zhongguo Xiu Fu Chong Jian Wai Ke Za Zhi. 2007 Sep;21(9):979-81. Chinese.
PMID: 17933235 [PubMed - in process]

2: Wellmann M, Zantop T, Petersen W. Related Articles, Links

Minimally invasive coracoclavicular ligament augmentation with a flip button/polydioxanone repair for treatment of total acromioclavicular joint dislocation.
Arthroscopy. 2007 Oct;23(10):1132.e1-5. Epub 2007 Mar 19.
PMID: 17916485 [PubMed - in process]

3: Kurbanov UA, Malikov MKh, Davlatov AA, Sultonov DD, Boboev AR. Related Articles, Links

Reconstruction of the brachial artery in supracondylar humerus fractures and forearm dislocations.
Angiol Sosud Khir. 2006;12(3):138-43.
PMID: 17641628 [PubMed - indexed for MEDLINE]

4: Kumar S, Penematsa SR, Selvan T. Related Articles, Links

Surgical reconstruction for chronic painful acromioclavicular joint dislocations.
Arch Orthop Trauma Surg. 2007 Aug;127(6):481-4. Epub 2007 Feb 15.
PMID: 17639430 [PubMed - in process]

5: Gonzalez R, Damacen H, Nyland J, Caborn D. Related Articles, Links

Acromioclavicular joint reconstruction using peroneus brevis tendon allograft.
Arthroscopy. 2007 Jul;23(7):788.e1-4.

Evidence based medicine

1: Clin Sports Med. 2003 Apr;22(2):277-90.

Decision making: operative versus nonoperative treatment of acromioclavicular joint injuries.

Bradley JP, **Elkousy H**.

University of Pittsburgh Medical Center, 200 Delafield Road, Suite 4010, Pittsburgh, PA 15215, USA.

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]

1. Mouhsine E, et al. Grade I and II acromioclavicular dislocations: results of conservative treatment. *J Shoulder Elbow Surg.* 2003;12:599-602.
2. Nuber GW, Bowen MK. Arthroscopic treatment of acromioclavicular joint injuries and results. *Clin Sports Med.* 2003;22:301-317.
3. Schlegel TF, Burks RT, Marcus RL, Dunn HK. A prospective evaluation of untreated acute grade III acromioclavicular separations. *Am J Sports Med.* 2001;29:699-703.

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.

Edwin E. Spencer, Jr. Treatment of Grade III Acromioclavicular Joint Injuries. *A Systematic Review Clin Orthop Related Research 2006;455:38-44*

Evidence based medicine

TABLE 1. Demographic Data and Description of Treatment

Study	Number of Patients	Average Age (years)	Description of Treatment	Followup	Level of Evidence
Imatani et al[19]	11 Operative	23.5	Operative: AC pinning or Bosworth method	12-month minimum	II
	12 Nonoperative		Nonoperative: sling × 3 weeks		
Larsen et al[23]	41 Operative	36	Operative: AC pinning	13 months	
	43 Nonoperative		Nonoperative: Sling × 4 weeks		II
Bannister et al[4]	27 Operative	32.5	Operative: Bosworth method	4 years	
	33 Nonoperative		Nonoperative: sling × 2 weeks		
Powers et al[28]	19 Operative	Not given	Operative: AC pinning, DCE, and fascial weave	12 years	II
	28 Nonoperative		Nonoperative: 20 via arm cast; 8 not given		III
Rosenorn et al[32]	11 Operative	37 (operative)	Operative: Bosworth method	12 months (operative)	
	13 Nonoperative	41.5 (nonoperative)	Nonoperative: bandage, PT, no treatment	84 months (nonoperative)	III
Galpin et al[13]	16 Operative	28.9 (operative)	Operative: Bosworth method	35 months (operative)	
	21 Nonoperative	36.7 (nonoperative)	Nonoperative: sling and early ROM	33.7 months (nonoperative)	III
Taft et al[36]	52 Operative	93 were between 18 and 25, but no average given	Operative: 26 AC pinning and 26 Bosworth method	10.8 years (operative)	
	63 Nonoperative		Nonoperative: 43 sling, 11 splint, 9 taping	9.5 years (nonoperative)	III
	12 No treatment			13 years (no treatment)	
MacDonald et al[25]	10 Operative	25 (operative)	Operative: 5 AC pinning and 5 Bosworth method	5.7 months (operative)	
	10 Nonoperative	31.7 (nonoperative)	Nonoperative: taping or sling	6.3 months (nonoperative)	III
Press et al[29]	16 Operative	30.7 (operative)	Operative: 9 Weaver-Dunn and 7 suture CC fixation	32.3 months (operative)	
	10 Nonoperative	49.6 (nonoperative)	Nonoperative: Sling	33.4 months (nonoperative)	III

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

Edwin E. Spencer, Jr. Treatment of Grade III Acromioclavicular Joint Injuries. *A Systematic Review Clin Orthop Related Research 2006;455:38-44*

Treatment

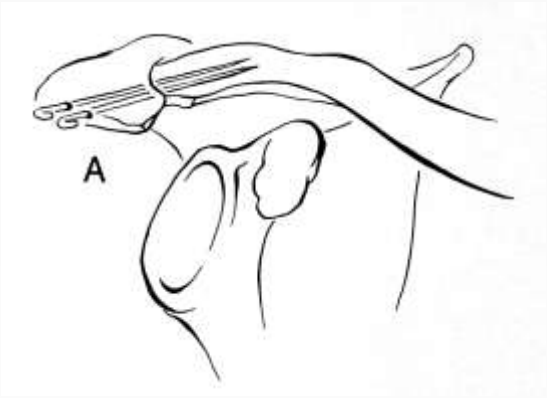
Types of operative procedures:

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



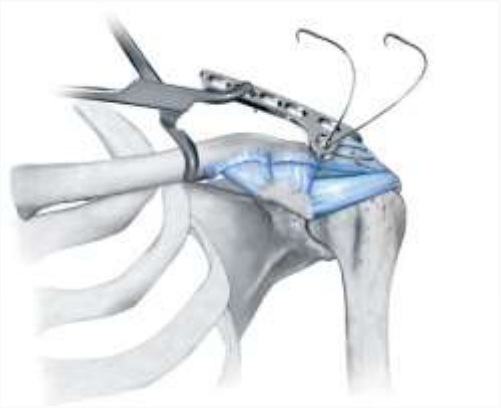
- pin migration or breakage
- pin-site infection
- redislocation after pin removal
- damage to the articular cartilage or meniscus

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

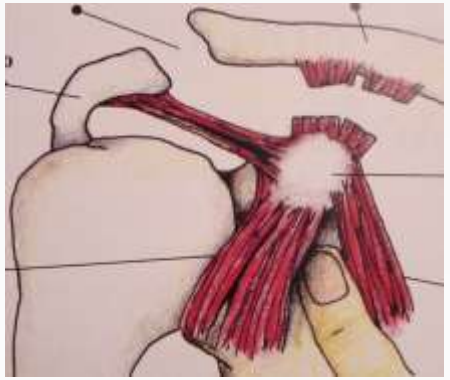


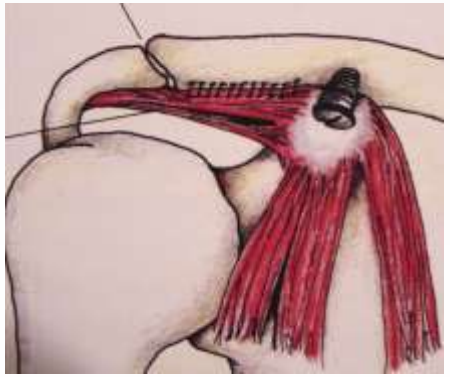
Sim E, Schwarz N, Hocker K, et al: Repair of complete acromioclavicular separations using the acromioclavicular-hook plate. Clin Orthop 314:134–142, 1995

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





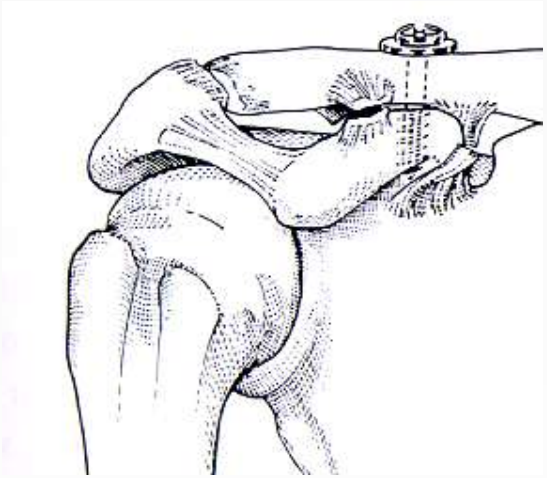
- Skjeldal et al reported 10 complications in 17 patients, including coracoid fragmentation, infection, and pain

Skjeldal S, Lundblad R, Dullerud R. Coracoid process transfer for acromioclavicular dislocation. *Acta Orthop Scand.* 1988;59:180-182.

Treatment

3. Fixation between the clavicle and the coracoid

a. Bosworth screw



± repair of the ligaments

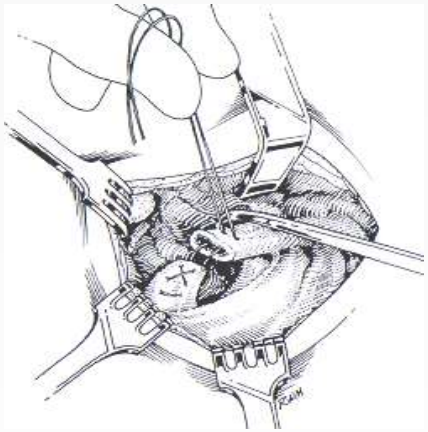
removal of the screw (8-10 weeks postop)

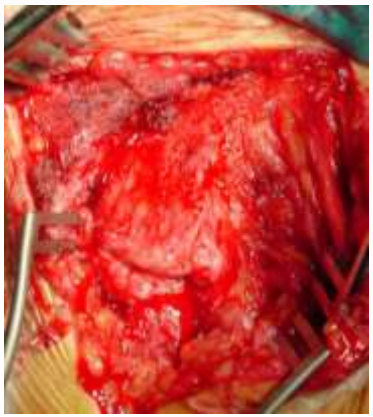
- ossification between coracoid-clavicle
- osteolysis
- loosening
- screw breakage

Treatment

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)



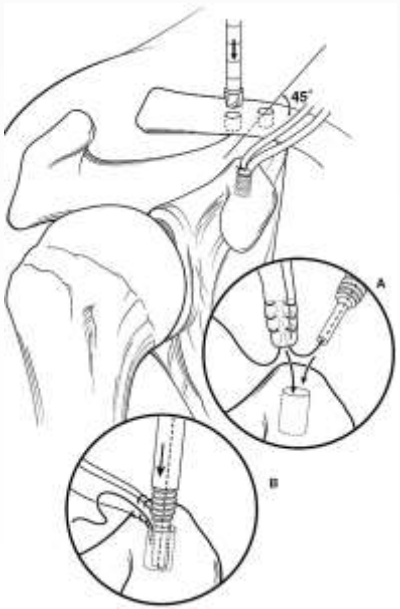


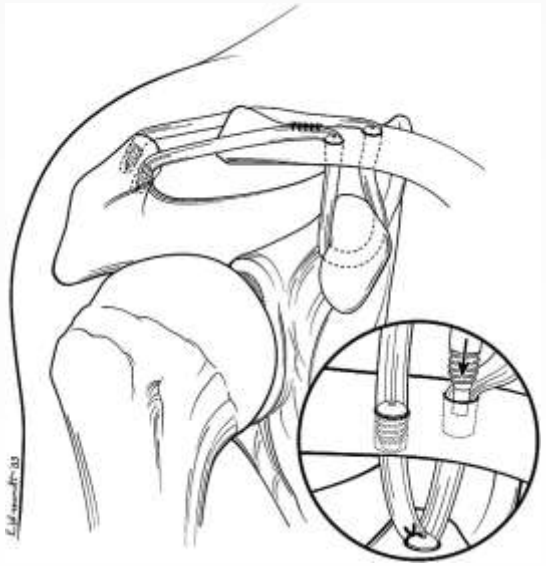
Tienen TG, Oyen JF, Eggen PJ. A modified technique of reconstruction for complete acromioclavicular dislocation: a prospective study. *Am J Sports Med.* 2003;31:655-659.

Treatment

5. Anatomical reconstruction techniques

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

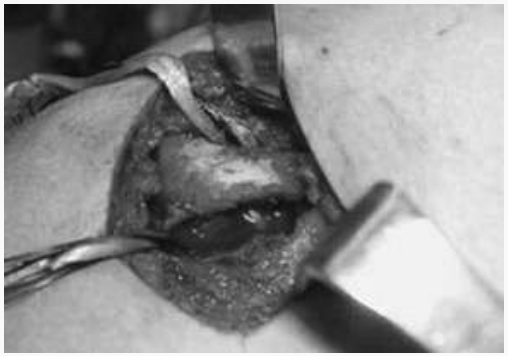




Mazzocca A, et al. The anatomic coracoclavicular ligament reconstruction. Operative Techniques in Sports Medicine, Vol 12, 2004: pp 56-61

Treatment

5. Anatomical reconstruction techniques



AJSM PreView, published on August 8, 2007 as doi:10.1177/0363546507304715

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

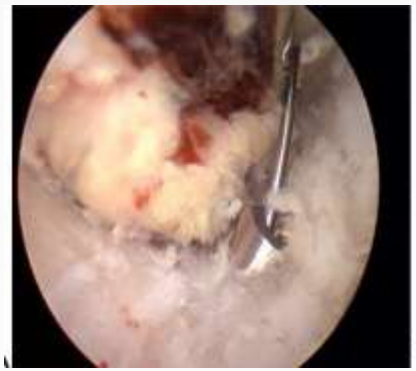
6. Arthroscopic techniques

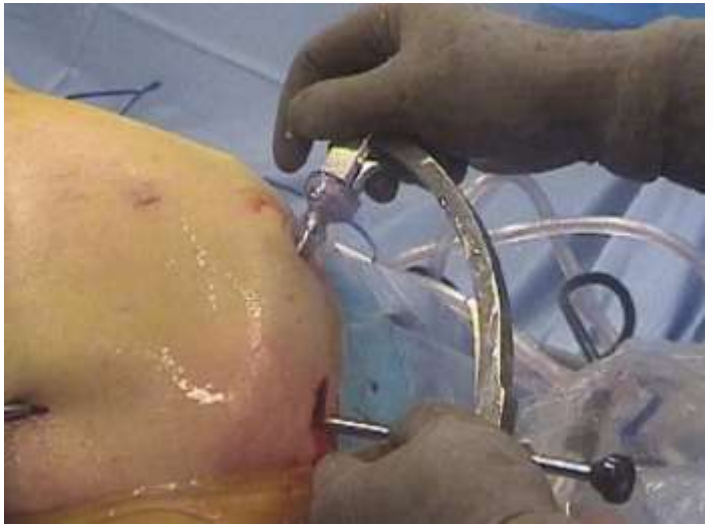
Arthroscopy: The Journal of Arthroscopic and Related Surgery, Vol 17, No 5 (May-June), 2001: pp 558–563

Technical Note

Arthroscopic Reconstruction for Acromioclavicular Joint Dislocation

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

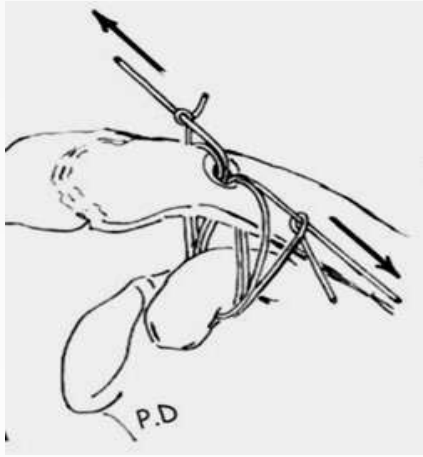




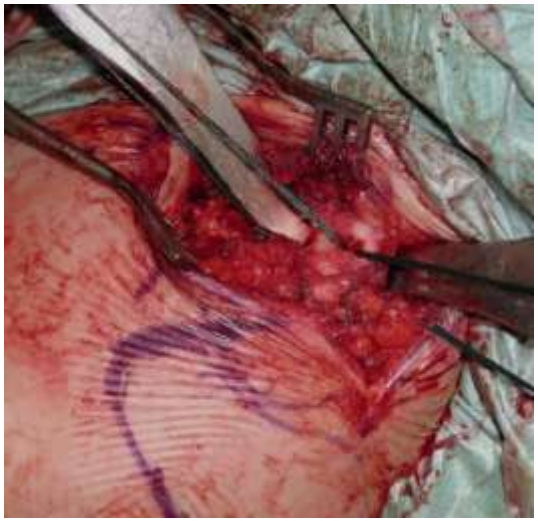
Treatment

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



Publications

The American Journal of Sports Medicine

Vol. 34, No. 7, 2006

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

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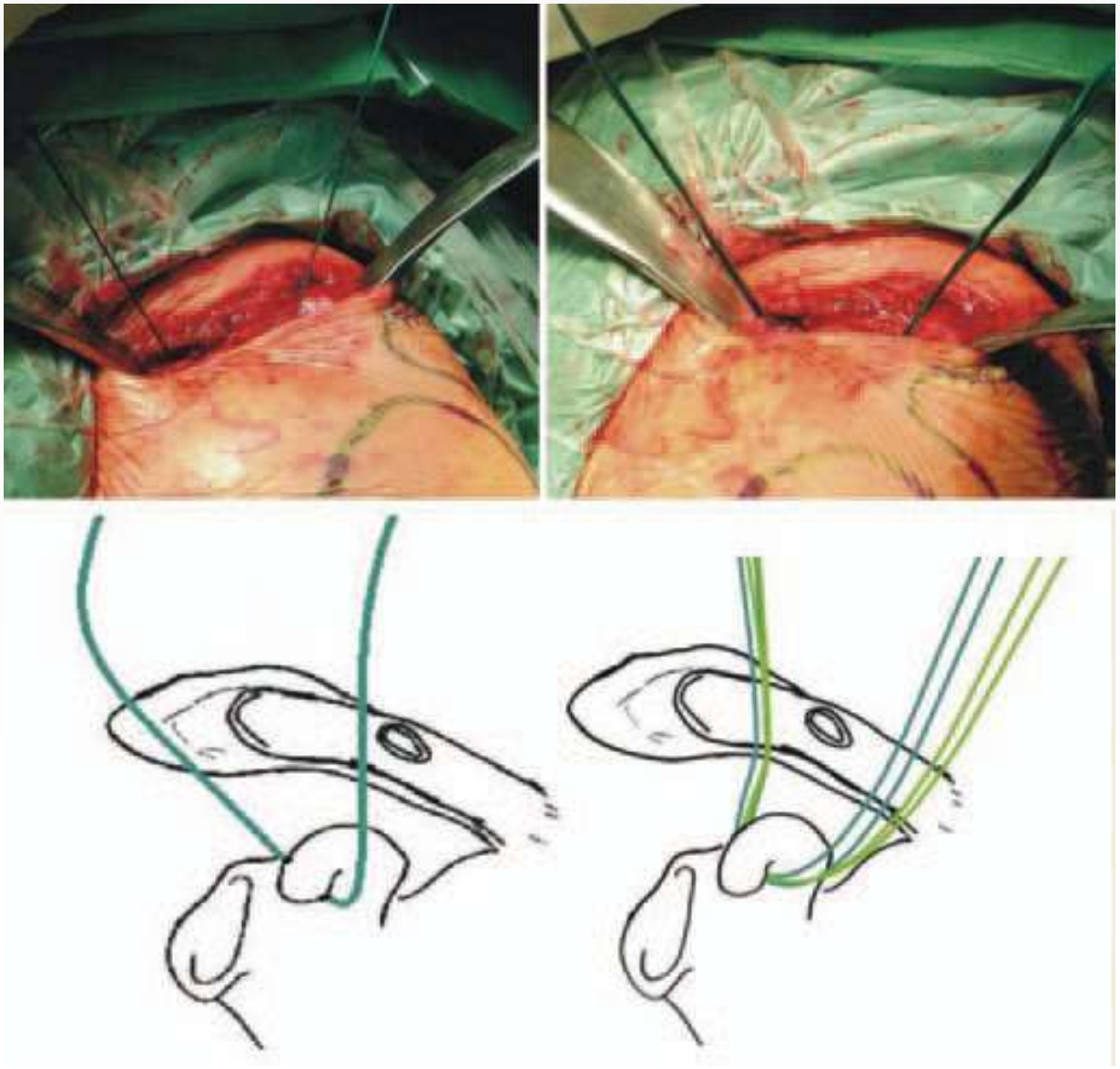
tips & techniques

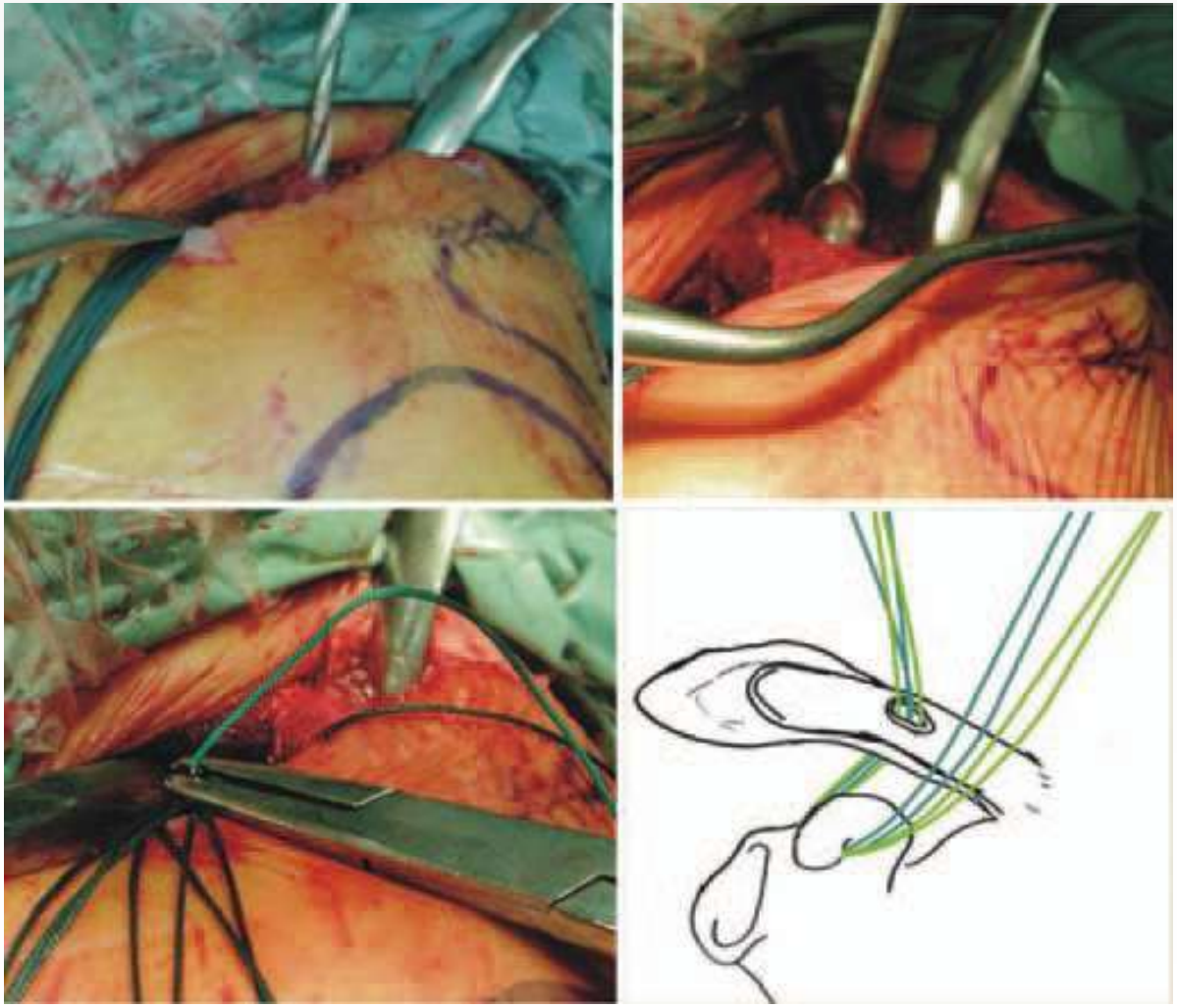
Functional Coracoclavicular Stabilization for Acute Acromioclavicular Joint Disruption

Panayotis Dimakopoulos, MD, PhD; Andreas Panagopoulos, MD

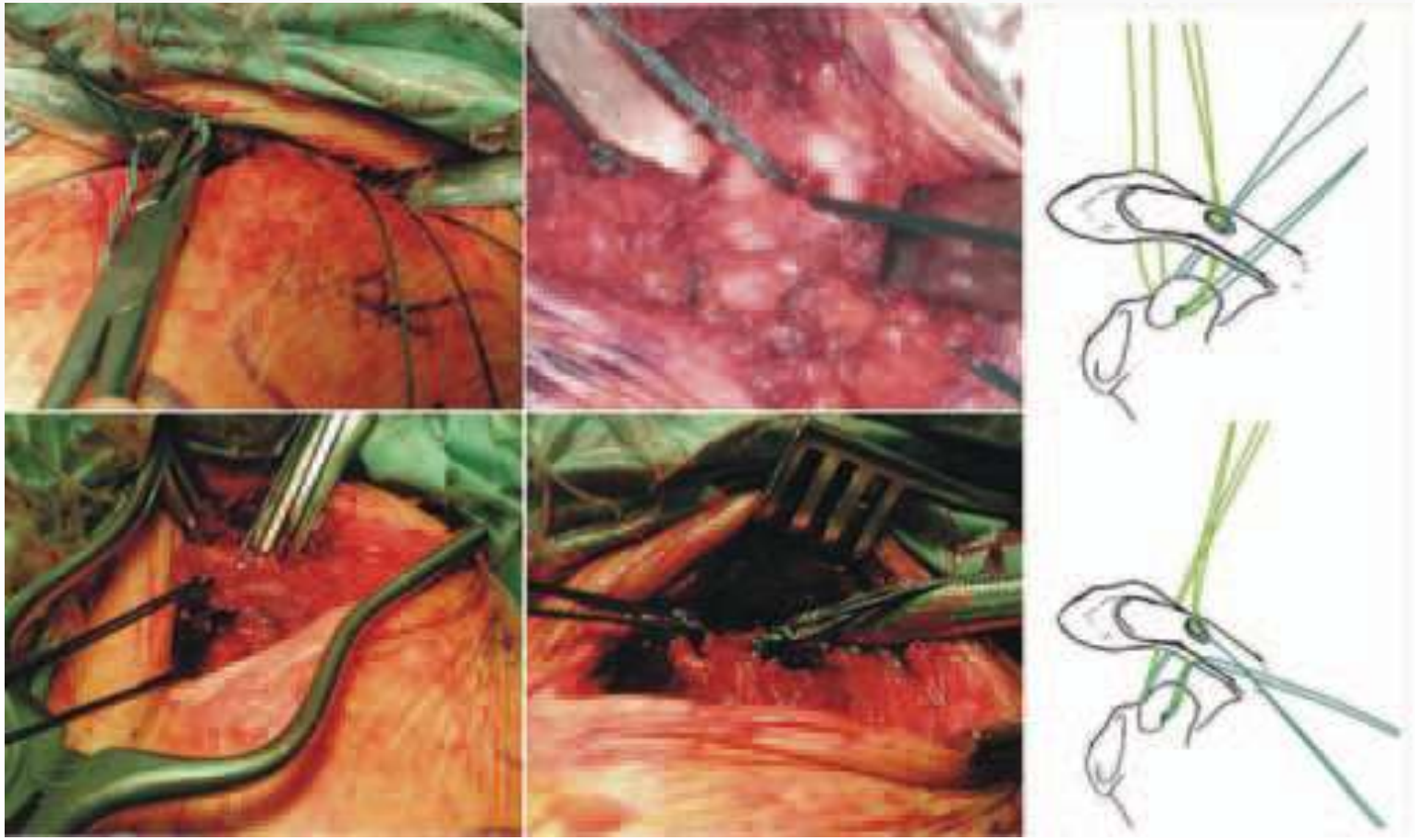
Surgical technique



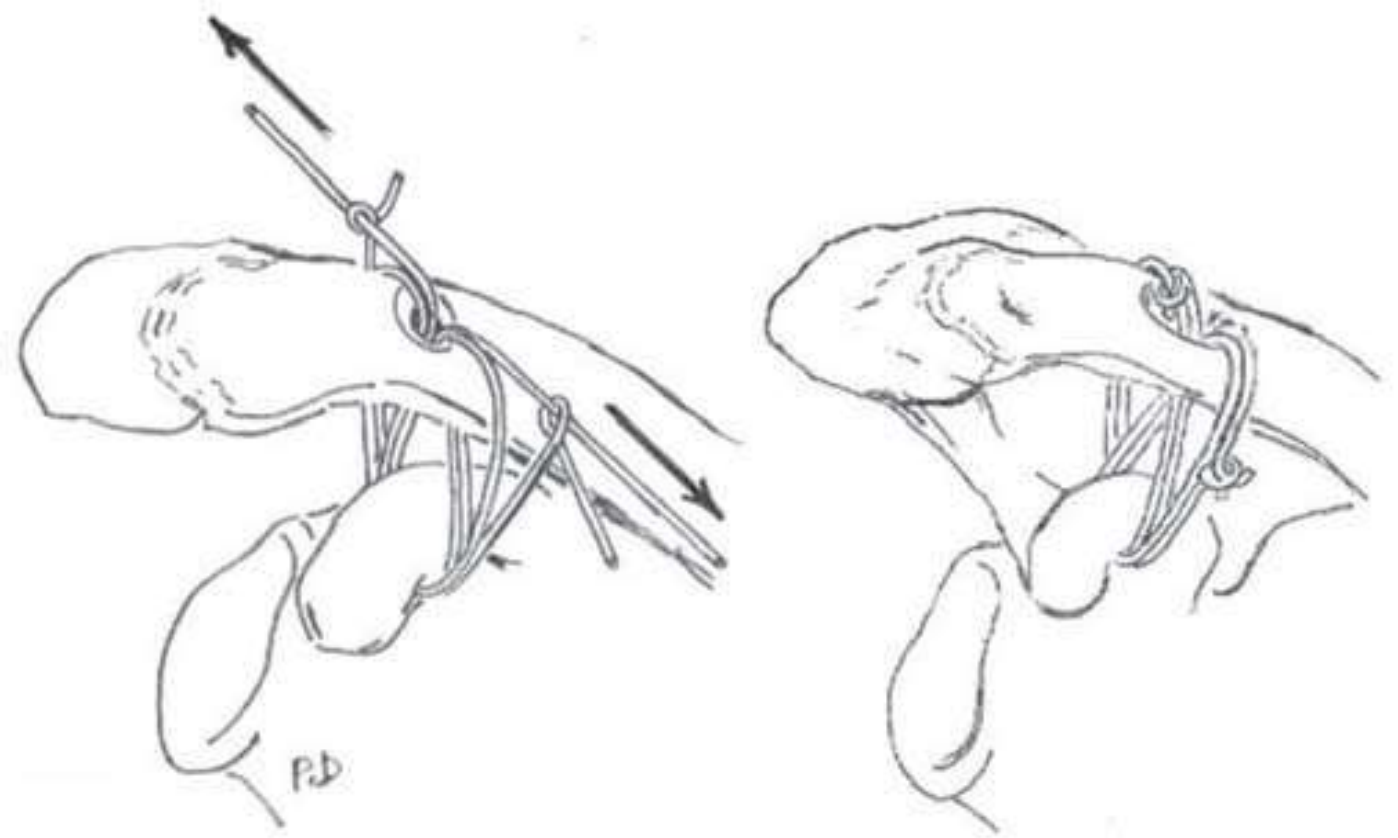
Surgical technique



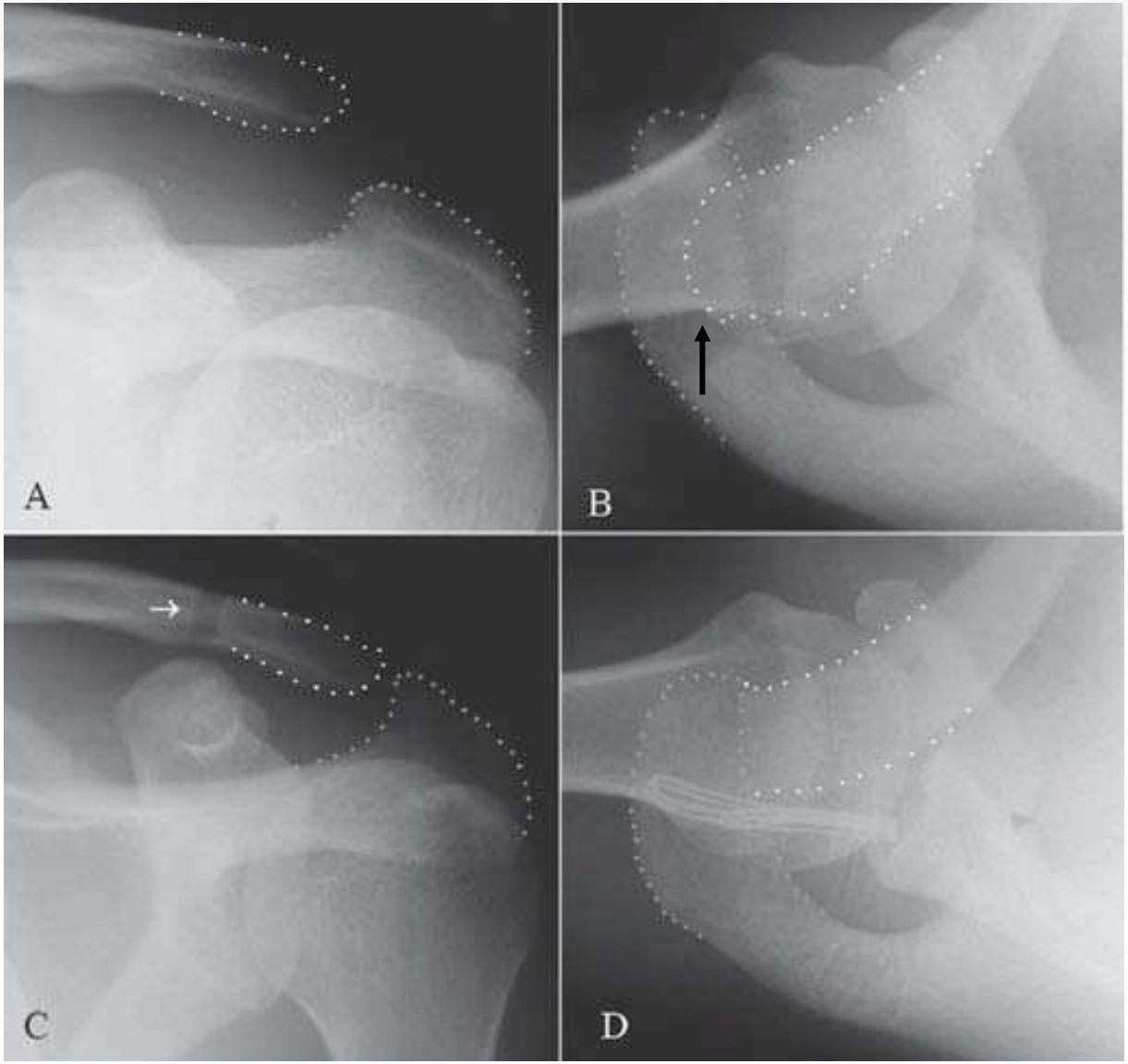
Surgical technique



Surgical technique



Surgical technique




A
B

Take home message

- Types I and II AC joint separations are treated non-surgically
  Type 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

Mazzocca AD et al Evaluation and Treatment of Acromioclavicular Joint Injuries. Am J Sports Med 2007;35:316-329

THANK YOU