

# Stabilization of Acromioclavicular Joint Separation

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## 1. Treatment Methods according to Injury Types

### 1) Problems after Acromioclavicular(AC) injury

- AC arthrosis
- Deformity (cosmesis)
- Instability: Pain, Limitation of motion,

### 2) Problems after AC injury in operation cases

- Timing, Age, Activity
- AC: mode of fixation
- CC(coracoclavicular): Repair or Reconstruction
- Lateral end resection

### 3) AC Arthrosis

- The result of old AC sprain or D/L or be associated with chronic overhead overuse injury
- Younger patients who involved in overhead sports (tennis, swimming, or pitching etc.)
- Conservative treatment
  - : Rest, Icing, NSAID, Physiotherapy, Steroid injection into AC joint
- Indication of Surgical treatment
  - : Failure of conservative treatment
- Methods of surgical treatment
  - : Excision of distal clavicle (Mumford procedure) - Open or A/S

### 4) Type I, II injury

- *No role for surgical treatment*

### 5) Type III injury

- *Many treatments of options have been proposed*
- *Controversial about Surgical or Nonsurgical Treatments*

- Currently, most advocate conservative treatments
- Nonoperative treatment particularly in patients who participate in contact sports (Rockwood)
- Nonoperative treatment in Young athlete regularly subject to violent and repeated injuries to the joint, such as a rugby player (*Clavert et al, Tech Shoulder Elbow Surg, 2005*)
- However, some authors recommended surgical treatments for
  - a. High laborer in dominant arms
  - b. Throwing athletes in dominant arms (esp, Baseball pitcher)
  - c. chronic injuries in which nonsurgical treatment fails

#### 6) Type IV, V, VI injury

- Most Surgeons agree on Surgical intervention because of the severe displacement of the clavicle (soft tissue injury)

## 2. Methods of Operative Treatments

- : Choice of specific procedure is based on multiple factors
  - Surgeon's preference and expertise
  - Available equipment and operative personnel
  - Patient's pathology and overall health
  - Patient's reliability and anticipated activity level
- : Choice of any specific surgery must be individualized for each patient

### 1) Primary AC Stabilization

- : Phemister technique (*Phemister, JBJS, 1941*)
- : Nevaizer technique (*Nevaizer, Bull Hosp Jt Dis Orthop Int, 1951*) etc.

#### (1) Transarticular fixation

- Pin(Smooth or Threaded), K-wire, Steinmann pin
- Plate system (Wolter plate)

#### (2) Advantages

- Relatively easy technique
- Firm fixation power

#### (3) Disadvantages

- Hardware problems
  - : Need of 2nd operation
  - : Breakage & Migration
  - : Voluminous
- Joint articular damage
- Technically demand

## 2) Secondary CC Stabilization

- Most popular type in USA (*Thomas et al. Current Opinion in Orthop, 2003*)
- No surgical trauma to AC joint

### (1) Types of fixation

#### A. Rigid form of fixation

: Stronger fixation & Minimal soft tissue dissection than Suture fixation

##### a. Screw

- Bosworth technique (*Bosworth, Surg Gynecol Obstet, 1941*)
- Modified Bosworth technique (*Kennedy etc., JBJS Br, 1954*)
  - : Bosworth technique + CC ligament repair
- Percutaneous cannulated screw fixation (*Tsou, Clin Orthop, 1989*)

##### b. Wire

- 2 Coracoclavicular loops of wire (*Bearden, J Sports Med, 1973*)

##### c. C-hook (*Ryhanen et al, J Shoulder Elbow Surg, 2003*)

#### B. Non-rigid form of fixation

: General guideline for placement of suture loop or suture anchor

- at the absolute base of the coracoid process
- the suture should pass through a drill holl at the junction between ant. and middle third of the clavicle

##### a. Suture Loop

: A cerclage around coracoid & clavicle

- Suture band (Dacron or synthetic band)
  - : currently most surgeon prefer suture band that are between 5~10 mm thickness (*Kwon et al. Clin Sports Med, 2003*)
- Absorbable suture (PDS suture etc.)
- Nonabsorbable suture (Ethibond suture etc.)
- Semitendinosis allograft (*Wolf et al. Arthroscopy, 2001*)
- Disadvantages
  - : Large exposure & technically demanding
  - : Difficult to obtain a proper reduction of AC joint
  - : Possible neurovascular injury
  - : Subsequent failure of sutures
  - : Erosion of the suture material through the bone

##### b. Suture Anchor

- Advantages
  - : Can avoid neurovascular injury

- : Accurate placement of suture at coracoid base
- Disadvantages
- : Large exposure & Technically demanding

### C. Biomechanics

#### a. Biomechanics of the CC ligament complex & augmentations used in its repair and reconstruction (*Motamedi et al, Am J Sports Med., 2000*)

- : No significant difference in the mean failure load between intact CC ligament complex & augmentation performed with braided PDS or braided polyethylene placed through or around the clavicle

#### b. Structural properties of the intact and the reconstructed CC ligament complex (*Harris et al, Am J Sports Med., 2000*)

- : The intact CC ligament failed by avulsion or midsubstance tear at 500 N, with a stiffness of 103 N/mm and elongation to failure of 7.7 mm.
- : CC slings and suture anchors provided strength similar to that of the CC ligament, but with significantly greater deformations.
- : Screw fixation resulted in comparable stiffness and superior strength to the CC ligament, but only if bicortical purchase was obtained.
- : CA ligament transfers were the weakest and least stiff, and augmentation with another form of CC fixation is recommended.

### D. Methods of suture fixation between distal clavicle & coracoid process

- : OR vs A/S assisted method

## 3) Clavicle lateral end resection

#### (1) Mumford technique (*Mumford, JBJS-Am, 1941*)

- Open or A/S

#### (2) Rockwood technique (*Rockwood et al., Orthop Trans, 1988*)

- excise the distal clavicle
- transfer the coracoacromial ligament to clavicle
- reapproximation of coracoclavicular ligament
- temporary coracoclavicular lag screw fixation

#### (3) Weaver-Dunn technique (*Weaver and Dunn, JBJS-Am, 1972*)

- excise the distal 2 cm of the clavicle
- transfer the coracoacromial ligament to clavicle
- cerclage of coracoid and clavicle
- repair of coracoclavicular ligament (if possible)

(4) Modified Weaver-Dunn technique

4) Dynamic Stabilization (Dynamic muscle transfer)

(1) Bailey & O'Conner (*JBJS-Am*, 1965)

: Transfer of the coracoid process with the coracobrachialis and the short head of the biceps to the clavicle

(2) Dewar & Barrington (*JBJS*, 1965)

: Tip of the coracoid process with its attachment to the short head of the biceps and coracobrachialis is mobilized

: Fixed to the undersurface of the clavicle

(3) Berson et al. (*Clin Orthop*, 1978)

(4) Brunelli et al. (*Brunelli, International Orthop*, 1988)

: Short head of biceps tendon is isolated and transferred to the distal clavicle immediately above the coracoid process

- Complication

: musculocutaneous nerve injury

: nonunion or delayed union of the transfer

: persistent AC joint instability

: high rate of continued shoulder girdle discomfort, esp. in old patients

- Dynamic stabilization without any mechanical augmentation, may allow excessive motion at the AC joint

- can lead to symptomatic joint instability and arthrosis

- has not been used as a primary surgical option for a majority of the cases

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