# 견봉 쇄골 관절 손상 및 원위 쇄골 골절

# Acromioclavicular Joint Injury And Distal Clavicular Fracture

Joint center, Sun General Hospital, Daejeon, Korea

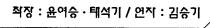
Seung-Ki Kim, M.D., Ph.D.

#### Acromioclavicular Joint Injury

- #9% of Shoulder Girdle Injuries
- # Adults in 20s. (43.5%)
- # M:F=5:1
- # Incomplete vs. Complete=2:1
- # Two categories
  - 1. Acute Traumatic Injury
  - 2. Chronic Degeneration: Repetitive Microtrauma

#### Anatomy & Biomechanics

- diarthrodial joint involving the medial facet of the acromion and the distal clavicle.
- Six degrees of freedom moving in Ant./Post. as well as Sup./Inf. Planes.
- meniscus like fibrocartilaginous disk covered with hyaline cartilage.
- Stabilizers: Static and Dynamic
  - #Static Stabilizer
  - 1. Capsular (AC) ligament: Sup. Inf. Ant. Post.
  - 2. Extracapsular (CC) ligament: Trapezoid and Conoid
  - 3. CA ligament
  - # Dynamic Stabilizer: Deltoid and Trapezius
- # AC ligament: primary horizontal stability(AP translation)
- Average Insertion on the capsule
- 16.7 mm Post.-Sup.
- 12.8 mm Ant.-Sup.
- Max. average distance: 16.1 mm from the joint line.
- Greatest distance: 20 mm from the joint line.



Keep in mind during distal clavicle excision!!

- Post. Horizontal instability can cause abutement of the posterolateral portion of the clavicle into the spine of the scapula.
- Serial section Study (Contribution of resistance to post. Displacement)

56% Superior Ligament

25% Posterior Ligament

Saving Sup. & Post. Ligament!!

- # CC ligament: vertical stability(superoinferior)
  - Trapezoid and Conoid ligaments
  - Both are post. To the Pectoralis minor attachment on the coracoid
  - Two function
    - 1) Synchronous scapulohumeral motion by attaching the clavicle to the scapula
    - 2) Strengthen the acromioclavicular articulation
- # Motion of the AC Joint
  - -5 to 8 degrees of motion
  - Elevated 35 degrees with full elevation
  - Ap translation 35 degrees with abduction and extension
  - Rotated 45 degrees to full overhead position
  - Synchronous scapular-clavicular rotation coordinated by the CC ligaments.

CC fixation can migrate as well as to break over time.

## AC joint injury classification (Rockwood)

- Type I: sprain of the AC ligament with intact AC and CC ligaments and a stable joint
- Type II: AC ligaments disrupted CC ligaments intact
- Type III: disruption of both the AC and CC ligaments complete dislocation of the AC joint and an unstable joint
- Type IV: posterior displacements of the clavicle distal clavicle becomes interposed within the fibers of the trapezius m.
- Type V: Exaggerated superior dislocation of the joint of 100% to 300%, increasing the CC distance two to three times, including disruption of the deltotrapezial fascia.
- Type VI: tearing of both the AC and CC ligaments the displacement is interior with the clavicle in a subacromial or subcoracoid position

## Injury mechanism

- direct force: falling onto the position of the shoulder with the arm at the side in an adducted position

: most common cause of acromioclavicular injury

- indirect force: upward indirect force by the upper extremity

downward indirect force through the upper extremity

# Physical Exam

Type III vs. Type V Clinically - See Video!!

## X-ray evaluation

- Anteroposterior views: usually overpenetrated
- Axillary views and lateral
- Zanca views: 10~15 degree upward tilt of the x-ray beam affords a clear view of the acromioclavicular joint (50% of the standard shoulder AP penetration strength)
- Anteroposterior stress views: type II, III injury
  10 to 15 lb of weight hanging from the wrists
  CC distance
- Stryker notch view: demonstrate fractures of the base of the coracoid

# Treatment

Type I, II AC joint injury: Nonsurgical treatment

Type III AC joint injury: Controversial

Type IV, V, VI AC joint injury: Surgical treatment

# Treatment of Type III

- Trend toward initial nonoperative treatment in most cases
- Rockwood: nonoperative treatment particularly in patients who participate in contact sports.
- Philips et al.: Mata-analysis 1172 patients

88% of operative group, 87% of nonop. group-satisfactory results

The need for further surgery (59% operative vs. 6% nonop.)

Infection(6% vs. 1%)

Deformity(3% vs. 37%)

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Pain and ROM were not significantly affected. The authors did not recommend surgery for Type III in patients.

- McFarland: Survey of Major-league baseball team
- consider later reconstruction in Athlete and Laborer

Nonsurgical treatment

Phase I: Pain control, immediate protective ROM, isometric exercise

Phase II: Strengthening exercise using isotonic contraction

Phase III: Unrestricted functional participation with the goal of increasing strength, power, endurance, and neuromuscular control

Phase IV: Return to activity with sports-specific functional drills

# Surgical Treatment

- 1) Primary AC Stabilization
- 2) Dynamic Muscle Transfer
- 3) Primary CC and Extra-articular Stabilization
- 4) Distal Clavicle Resection and CA Ligament Reconstruction

### # Primary AC Stabilization

- smooth or threaded Steinmann pins with AC or CC ligament repair
- \_ Transfixing is demanding (thin acromion and curved clavicle)
- Hardware removal, Pin migration, Breakage
- -Surgical trauma to the joint
- Wolter plate

#### # Dynamic Muscle Transfer

- : transfer of the short head of the biceps with or without the coracobrachilais
- : Transferred tendon act as a dynamic depressor of the clavicle.
- : Ferris et al.-20 patients. Half with continued aching at AC joint
- variable results and risk of nonunion or injury to the musculocutaneous nerve.

#### # Primary CC and Extra-articular Stabilization

- coracoclavicular screw: Bosworth (1941) screw: local anesthesia

Kennedy (1968): Modified Bosworth technique Tsou (1989): cannulated coracoclavicular screw

percutaneous insertion

coracoclavicular ligament repair deltoid and trapezius repair

- Cerclage fixation

#### 제 2시 대한건주 · 관절학회 초록집

Bearden: two coracoclavicular loops of wire

Dacron or other synthetic tape

PDS suture or cerclage

- Clavicle erosion, failure of fixation, infection reported
- Morrison and Lemos

loop should be placed at the base of the coracoid

inserted through a hole at the junction of the anterior and middle third of the clavicle

If loop is posterior or goes around the clavicle, it tends to displace the clavicle anteriorly

- # Distal Clavicle Resection and CA Ligament Reconstruction
- : Weaver and Dunn 1972
- : Kawabe and Shoji-acromial bone block
- # Arthroscopic Distal Clavicle Resection

Mumford(1941): type II dislocation with arthritis of the joint

if type III dislocation, in addition to the excision of the distal clavicle + reconstruction of the coracoclavicular ligaments

See Video!!

#### # Author's Approach

- Diagnostic Arthroscopy
- CA ligament release at the base of the acromion arthroscopically for preservation of length
- A suture is placed in the end of the ligament and brought out the anterior portal
- Straight incision
- Horizontal incision of the deltotrapezial fascia
- About 1 cm resection of the distal clavicle (2~3 mm from medial edge of the acromion and 7~8 mm from lateral edge of the clavicle)
- Two Drill holes are made 5~6 mm medial to the distal end of the clavicle
- Reduction using reduction clamp
- 9~10 PDS suture passed through the coracoid base and tied over the clavicle
- CA ligament transferred and tied
- Deltotrapezial fascia imbrication

# Complications of Surgical Treatment

- Hardware migration



- Loss of reduction
- Infection
- Calcification
- Erosion
- Osteolysis
- Chronic pain

#### Conclusion

- most patients do well with nonsurgical treatment and regain acceptable shoulder function

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- complication of nonsurgical management are relatively uncommon
- complication following surgical management are more common, but overall incidence remains low
- Type I, II, III needs a nonoperative management. and Type IV, V, VI needs a operative intervention.

Distal clavicular fracture

Allman's classification

Group I-fractures of the middle third

Group II-fractures of the distal third

Group III-fractures of the medial third

Crig's classification

Group I-fracture of the middle third

Group II-fracture of the distal third

type I-minimal displacement (interligamentous)

type II-displaced secondary to a fracture medial to the coracoclavicular ligaments

- A. Conoid and trapezoid attached
- B. Conoid torn, trapezoid attached

type III-fracture of the articular surface

type IV-ligaments intact to the periosteum(children) with displacement of the proximal fragment

type V-comminuted, with ligaments attached neither proximally nor distally, but to and inferior, comminuted fragment

#### Group III-fracture of the proximal third

type I-minimal displacement type II-displaced (ligaments ruptured) type III-intra-articular type IV-epiphyseal separation (children and young adults) type V-comminuted

#### Group II-fracture of the distal third

#### 12~15% of all clavicular fractures

subclassified according to the location of the coracoclavicular ligaments relative to the location of the coracoclavicular ligaments relative to the fracture fragments

## Neer's classification

type I-most common (4:1)

- ligaments remain intact to hold the fragments together and prevent rotation, tilting or significant displacement
- interligamentous fracture occurring between the conoid and the trapezoid or between the coracoclavicular and acromioclavicular ligaments

type II-coracoclavicular ligaments detached from the medial segment

- conoid and trapezoid may be on the distal fragment
- conoid ligament may be ruptured while the trapezoid ligament remains attached to the distal segment (IIB)
- four forces act on this fracture that may impair healing and may be contributing factors to the reported high incidence of nonunion

type III - involve the articular surface of the acromioclavicular joint alone

- \*\* Although type II fractures may have intra-articular extension, in type III fracture there is a break in the articular surface without a ligamentous injury
- \* the type III injury may be confused with a first-degree acromioclavicular separation
- \* 'weightlifter's clavicle' resorption of the distal end of the clavicle may occur from increased vascularity secondary to microfractures that lead to this resorption

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type IV-occur in children

may be confused with a complete acomioclavicular separation pseudodislocation of the acromioclavicular joint coracoclavicular ligaments remain attached to the bone or the periosteum, the proximal fragment ruptures through the thin superior periosteum and may be displaced upward by muscle forces

#### X-ray evaluation

anteroposterior and lateral vies of the trauma series, 40-degree cephalic tilt views

Neer' recommendation to accurately assess the extent of the injury and the presence or absence of associated ligamentous damage

- 1. anteroposterior view includes both shoulders on one plate with the patient erect and with 10 lb of weight strapped to each wrist.
- 2. anterior 45-degree oblique views, with the patient erect and the injured shoulder against the plate, gives a lateral view of the scapula and shows the medial fragment posteriorly with the outer fragment displaced anteriorly
- 3. posterior 45-degree oblique view, with the patient erect and the injured shoulder against the plate, also demonstrates the extent of separation of the two fragments.

### Treatment of the distal clavicle

- type I: with a sling for comfort
  - early isometric exercises and discontinuation of the immobilization
- type II: immobilization is difficult.
  - the fragment are distracted by muscle forces and the weight of the arm.
  - the proximal fragment is unstable and has no ligamentous attachment.
  - if there is obvious bone contact, as manifested by crepitus and a radiographic bone wedge, nonoperative treatment should be considered.
  - open reduction and internal fixation.
    - depends on the size of the lateral fragment and on the position and integrity of the coracoclavicular ligaments relative to the fragments
  - encircling wires, pins, sutures binding the proximal fragment to the coracoid process

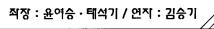
- open intramedullary fixation utilizing the Knowles pin

type III: - extension of type II injury into the joint

- treated as a type II injury
- if they lead to symptomatic late degeneration of the acromioclavicular joint,
- the 2 cm of clavicle may be excised with little morbidity and excellent results
- if treated surgically, the distal fragment should be retained because of its attachment to the coracoclavicular surface or severe comminution

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