AC Joint: Injury and disease

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Learning objectives

- Review normal imaging anatomy of AC joint

- Identify imaging findings in AC joint trauma and its sequelae, as well as indicate how imaging changes management

- Describe the systemic diseases that manifest at the AC joint, and recognize imaging findings utilizing various modalities
Normal Anatomy

- Synovial, diarthrodial joint
- Intra-articular disk
- Normal measurements
  - AC Joint space <5 mm
  - Right and left AC differ by no more than 2-3 mm
  - Coracoclavicular distance usually <11-13 mm
  - Right and left should differ by < 5 mm

Alyas et al, Radiographics2008
Acromial Shape - Bigliani Classification

Subacromial Enthesophyte “Keeled Acromion”

Spur might be a risk factor for full-thickness rotator cuff tears (Tucker, 2004)

Getz et al. 1996
Vanarthos et al. 1995
Os acromiale
AC Separation

- Very common: 9% of all injuries to shoulder girdle
- Mechanism is fall on adducted shoulder
- Plain radiographs useful if pain/deformity severe and fracture concern

Alyas et al. 2008
Rockwood Classification (1996)

Types 1 – Often just swelling

Type 2 - Inferior border of clavicle not elevated beyond the superior border of the acromion

Type 3 - Inferior border of the clavicle is elevated beyond the superior margin of the acromion, but coracoclavicular distance is not greatly increased (less than twice normal)

Types 4 – 6 (not shown) require surgical intervention, but account for <5% of all AC separations
Imaging of AC separations

- When necessary, is used mainly for **prognosis**
  - Surgery no longer advocated for Grade III\(^1\)
  - Often will see deformity with Gr II and III, but not I
  - Return to sport takes **6-12 weeks Gr III vs 2-3 wks Gr II**
- Usually perform AP views both AC jts **w/o wts**
  - AC jt space <5 mm
  - CC distance <12 mm: distinguishes Gr II from III
  - Inferior cortex of distal clavicle should be aligned with inferior border of acromion; if full offset, Gr III
  - Stress views **not needed** as grade 1 and 2 treatment same

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1: Clarke HD  Orthop Clin NA 2000; 31: 177
AC Separation: Sequelae

- Can be associated with distal clavicular #'s
- **Osteolysis** of distal clavicle
  - Usually **unilateral**
  - May be post-traumatic or atraumatic (RA, HPTH)
  - NMBS/MRI show uptake/increased signal early
  - Cortical resorption/AC joint widening occur late on xray
- **Osteoarthritis**
  - More common radiographically than clinically
  - Degenerative changes seen 25-60% asx pts
  - Joint space narrowing up to 50% is part of normal aging¹

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Distal Clavicular Osteolysis (DCO)

XR demonstrating widening of the AC joint with irregular cortical margins
Distal Clavicular Osteolysis -- *MRI*

Select Coronal MR Sequences showing increased T2 signal in the AC subchondral marrow (a,b), as well as periarticular inflammation (c)
Osteoarthritis

- Commonly seen on US
  - AC joint OA seen in 33/51 (65%) normal subjects\(^1\)

- 3T MRI\(^2\): osteophytes, marrow edema, subchondral cysts, ACJ fluid, capsular thickening all equally seen in sx and asx pts.
  - Superior capsular distension >2.1 mm may discriminate

- US-guided injection may be diagnostic
  - More accurate than clinical guidance\(^3\)

1: Girish G et al. AJR 2011; 197: W713-9
3: Gilliland CA et al. Phys Sportsmed 2011; 39: 121-131
XR showing AC joint osteophytes/hypertrophy with corresponding thickening of the articular capsule on US, as well as periarticular soft tissue inflammation on MRI

AC Joint Cysts

- Acromioclavicular (AC) joint cyst
  - “superior pseudotumor of the shoulder”
  - fluid from the glenohumeral joint extends through the full thickness rotator cuff tear into a degenerated AC joint
    - Can progress to large ‘geyser’
  - to prevent cyst recurrence distal clavicular resection is required in combination with acromioplasty at the time of rotator cuff repair
XR showing supraclavicular soft tissue mass with corresponding cystic lesion on US. Confirmed on MR to be a large AC joint cyst, shown here in axial plane.
Septic Arthritis

- Unless recent trauma or instrumentation, haematogenous seeding is the likely etiology
  - *S. aureus* is the most commonly isolated agent

- Risk factors
  - Bacteraemia
  - Advanced age
  - Intra-articular injections and prosthetic joint
  - Immunocompromised state
  - Rheumatoid Arthritis

- Possible irreversible joint damage within 48 hours of onset
  - Secondary to proteolytic enzymes of WBC within the infected synovial space
  - Up to 90% of patients will recover with appropriate antibiotic treatment
  - Timely diagnosis and treatment are critical
Septic Arthritis

- **XR**
  - Destructive changes involving subchondral bone on both sides of joint
  - Juxtaarticular osteoporosis

- **MR**
  - Sensitive for early cartilaginous damage
  - Synovial inflammation and perisynovial edema
Systemic disease: Hyperparathyroidism

- **Hyperparathyroidism** is the effect of excess parathyroid hormone in the body

- **Subtypes**
  - **primary** - Parathyroid adenoma is the most common cause ~ 80%
  - **secondary** - Adenomatous hyperplasia and renal osteodystrophy
  - **tertiary** - Autonomous parathyroid adenoma from chronic overstimulation of hyperplastic glands in renal insufficiency

XR findings of distal clavicular osteolysis (blue arrow) and Rugger jersey spine in patient with HPTH
Systemic disease: *Neoplasm*

Destructive distal clavicular process seen on XR with corresponding aggressive expansile mass on CT
Systemic disease: **RA**

- ‘pencil pointing’ of distal clavicle
  - Sharply tapered erosions of distal clavicle seen in RA
  - Often **bilateral**
  - In active RA, joint space > 7mm

- **Ddx** = HPTH, scleroderma, cleidocranial dysostosis, pyknodysostosis (rarely)

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1: Lehtinen JT et al  Rheumatology 1999; 38: 1104-7
ACJ one of the sites for chondrocalcinosis in CPPD, HPTH, hemochromatosis
- Symphysis, menisci, TFCC
- Prevalence of 1.1% in 1920 CXR’s, most of which had dx of CPPD
  - average age of 75
- If young → metabolic disorder
Conclusion

- ACJ injury one of most common injuries in athletics
- Imaging plays a role in prognosis
  - Sequelae include OA and less commonly osteolysis
  - OA may be asx, therefore US-guided injection can play a role in Dx/Rx
- As a synovial joint, ACJ subject to typical pathologies (infection, inflammation, neoplasm), but also may serve as a window to systemic disease
References