

AC Joint: Injury and disease

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- No conflicts of interest to disclose

Learning objectives

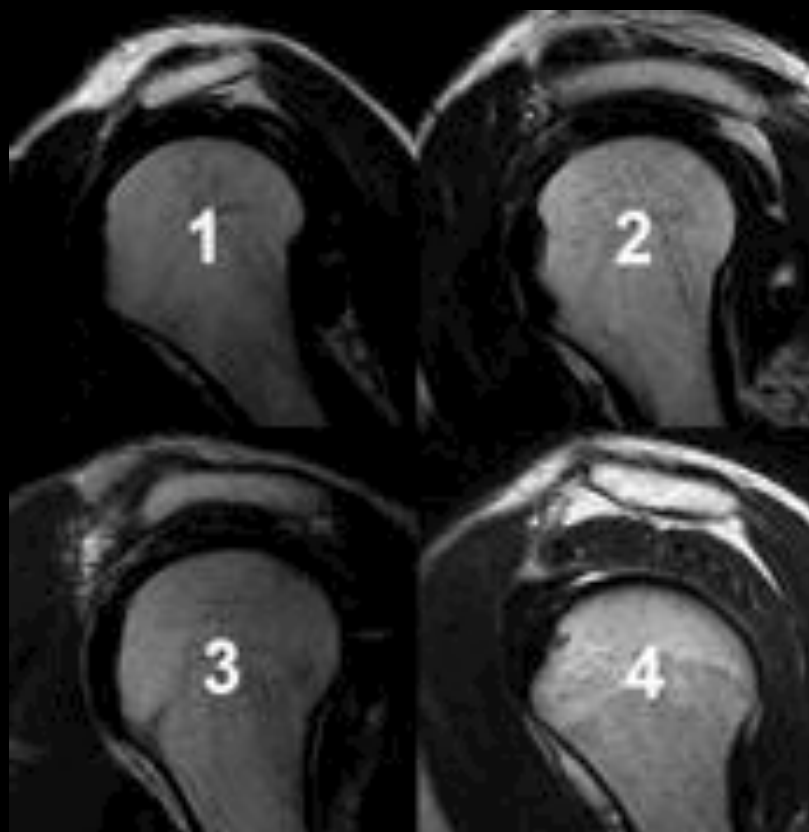
- Review normal imaging anatomy of AC joint
- Identify imaging findings in **AC joint trauma and its sequelae**, as well as indicate how imaging changes management
- Describe the **systemic diseases** that manifest at the AC joint, and recognize imaging findings utilizing various modalities

Normal Anatomy

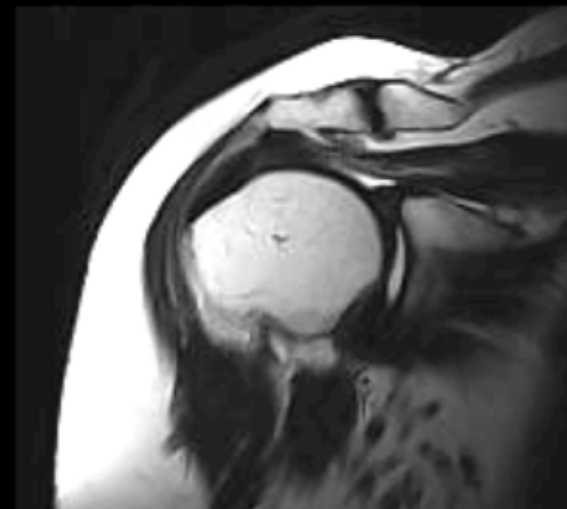
- Synovial, diarthrodial joint
- Intra-articular disk
- Normal measurements
 - AC Joint space <5 mm
 - Right and left AC differ by no more than 2-3 mm
 - Coracoclavicular distance usually $<11-13$ mm
 - Right and left should differ by < 5 mm



Acromial Shape - Bigliani Classification



**Subacromial Enthesophyte
“Keeled Acromion”**

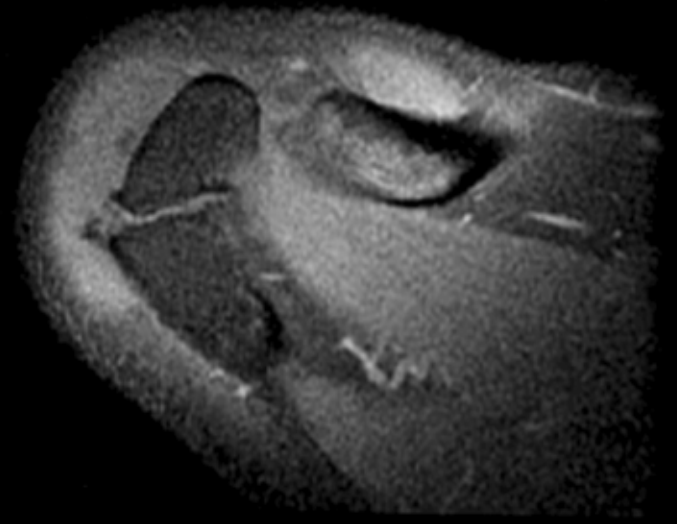


**Spur might be a risk factor
for full-thickness rotator
cuff tears (Tucker, 2004)**

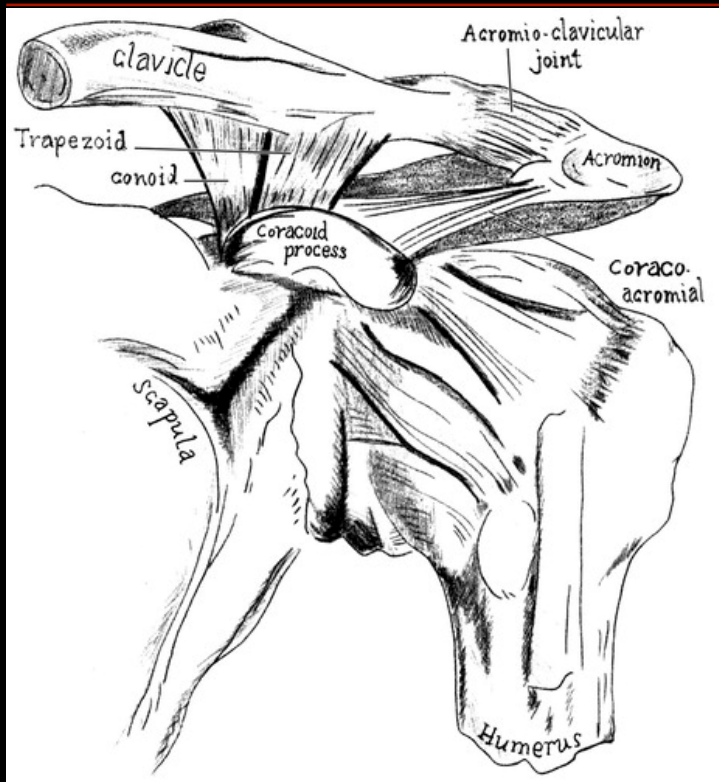
Getz et al. 1996

Vanarthos et al. 1995

Os acromiale



AC Separation



Alyas et al. 2008

- 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

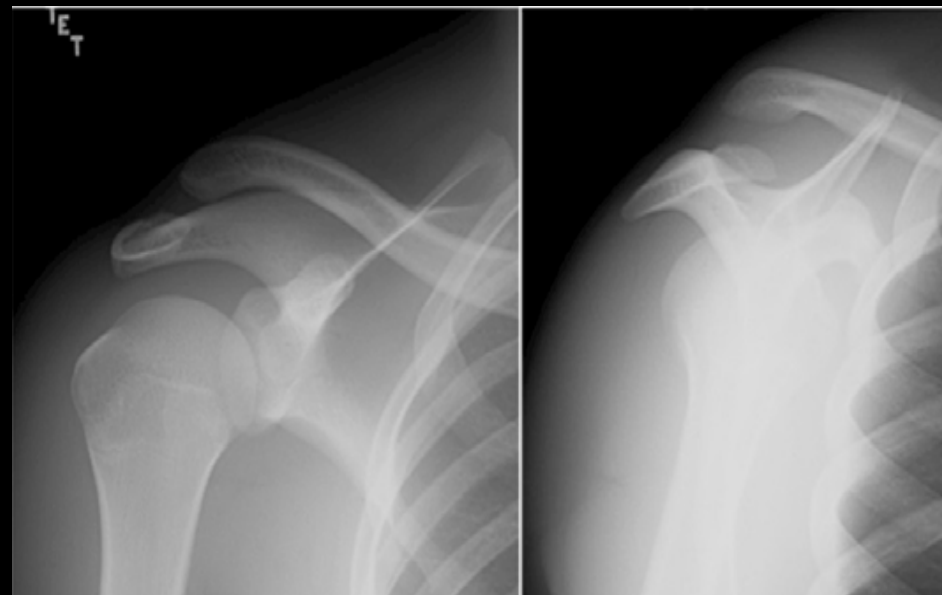
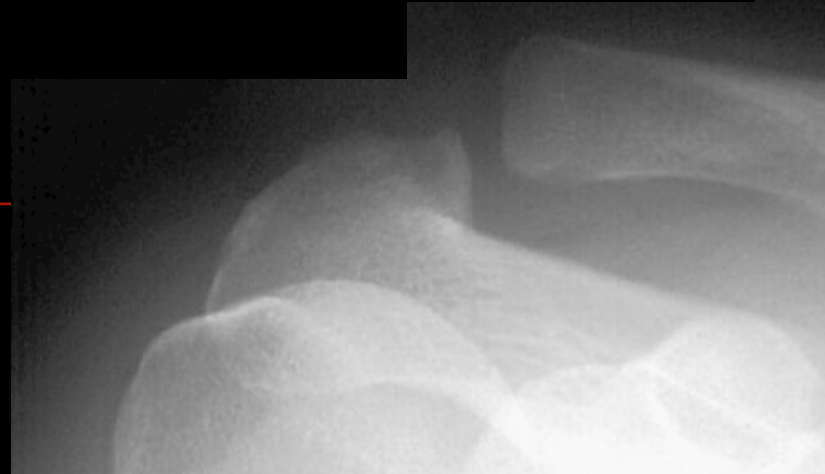
Rockwood Classification (1996)

Type 1 – Often just swelling



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

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)

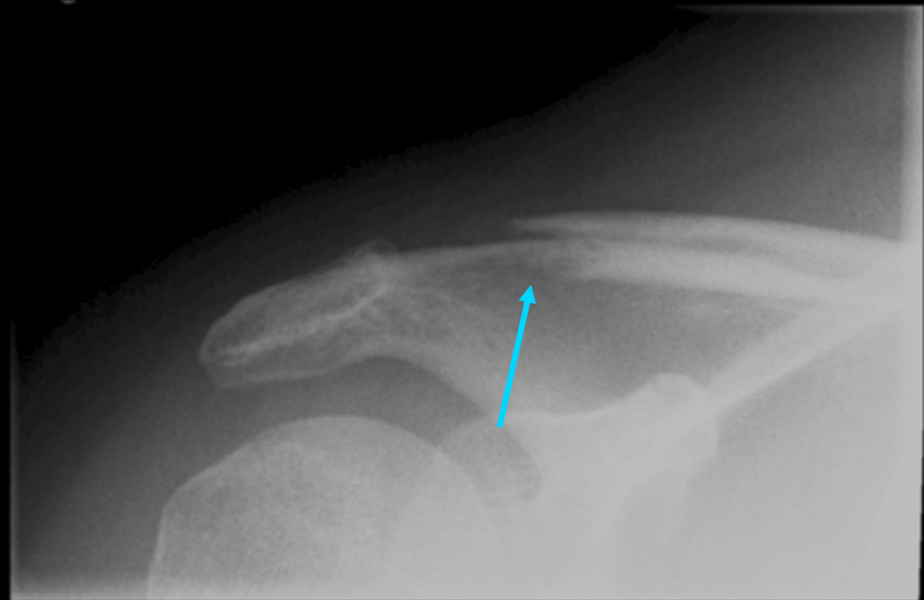
Imaging of AC separations

- When necessary, is used mainly for **prognosis**
 - Surgery no longer advocated for Grade III¹
 - 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

AC Separation: *Sequela*

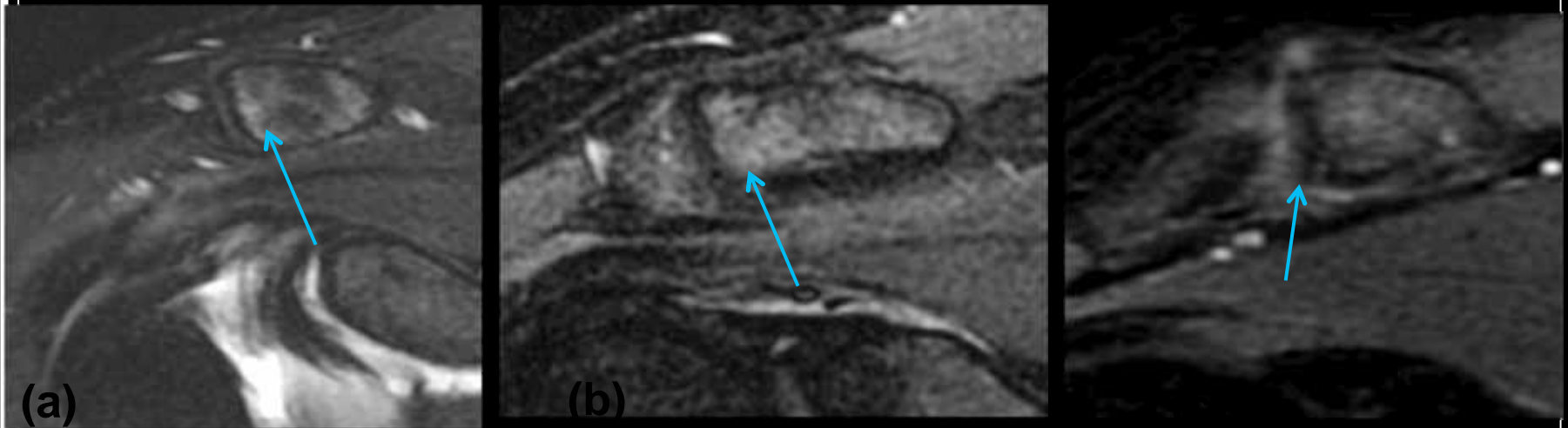
- Can be associated with distal clavicular #’s
- **Osteolysis** of distal clavicle
 - Usually **unilateral**
 - May be post-traumatic or atraumatic (RA, HPTH)
 - NMBS/MRI show uptake/increased signal early
 - Cortical resorption/AC joint widening occur late on xray
- **Osteoarthritis**
 - More common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

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 subjects¹
- 3T MRI²: 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 guidance³

1: Girish G et al. AJR 2011; 197: W713-9

2: Choo HJ et al. Eur J Radiol 2013; 82: e184-191

3: Gilliland CA et al. Phys Sportsmed 2011; 39: 121-131

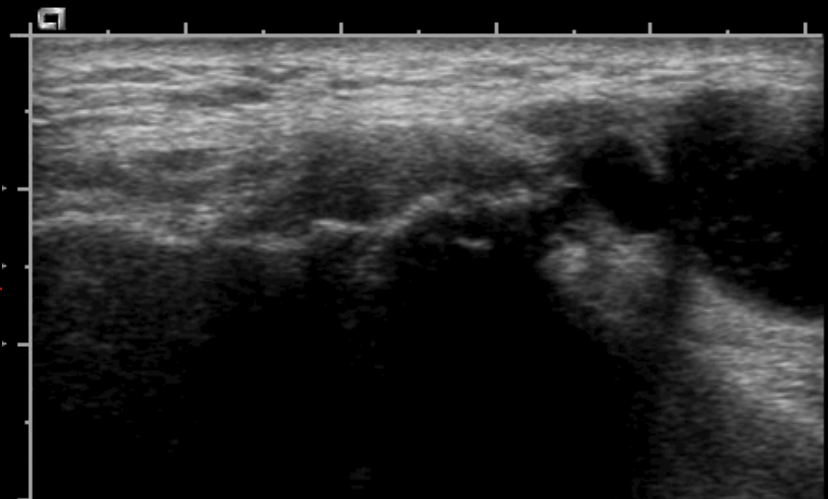
ACJ Osteoarthritis



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

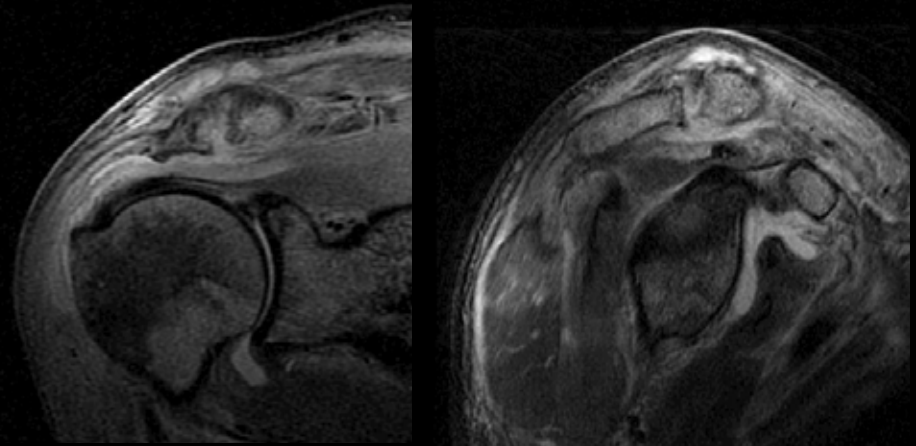
■ XR

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



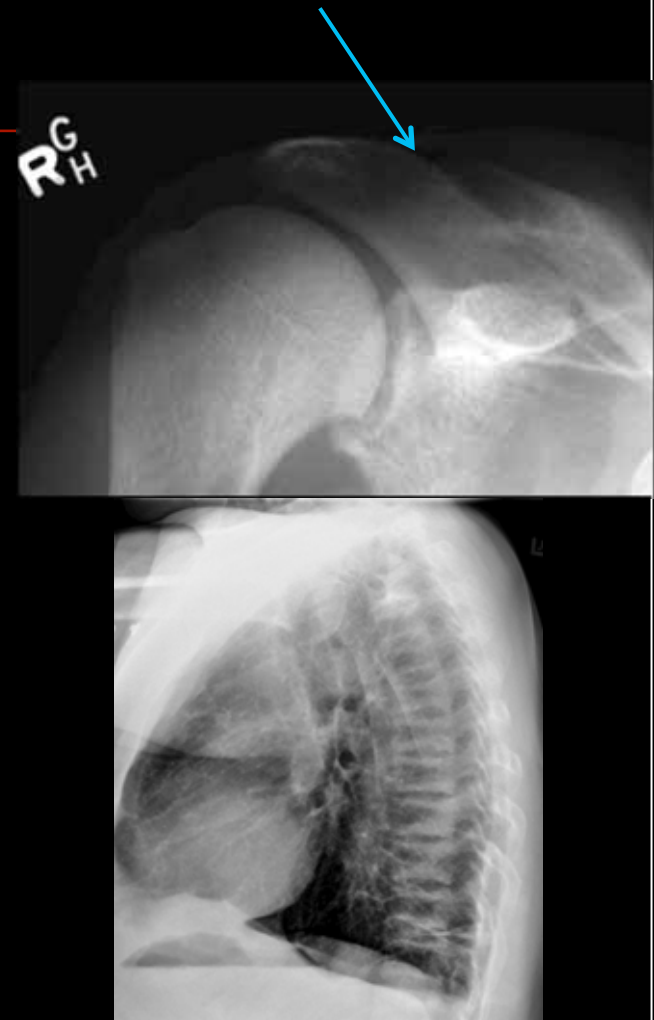
■ MR

- sensitive for early cartilaginous damage
- Synovial inflammation and perisynovial edema



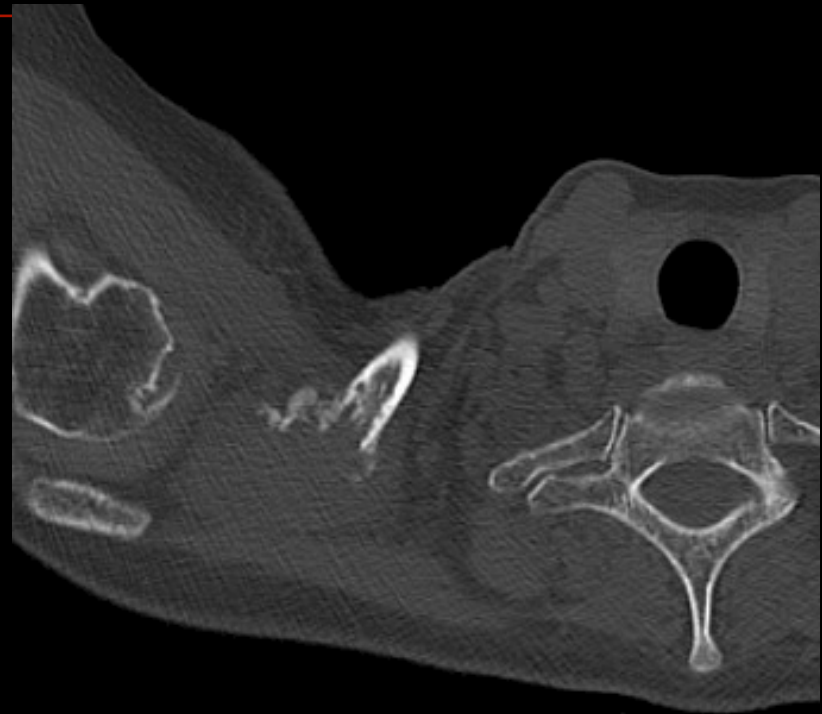
Systemic disease: *Hyperparathyroidism*

- **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 > 7mm¹**
 - Ddx = HPTH, scleroderma, cleidocranial dysostosis, pyknodysostosis (rarely)



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Systemic disease: *CPPD*

- 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 \rightarrow metabolic disorder



Parperis K et al. Clin Rheumatol 2013; 32: 1383-6

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**

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