

Imaging of the temporomandibular joint

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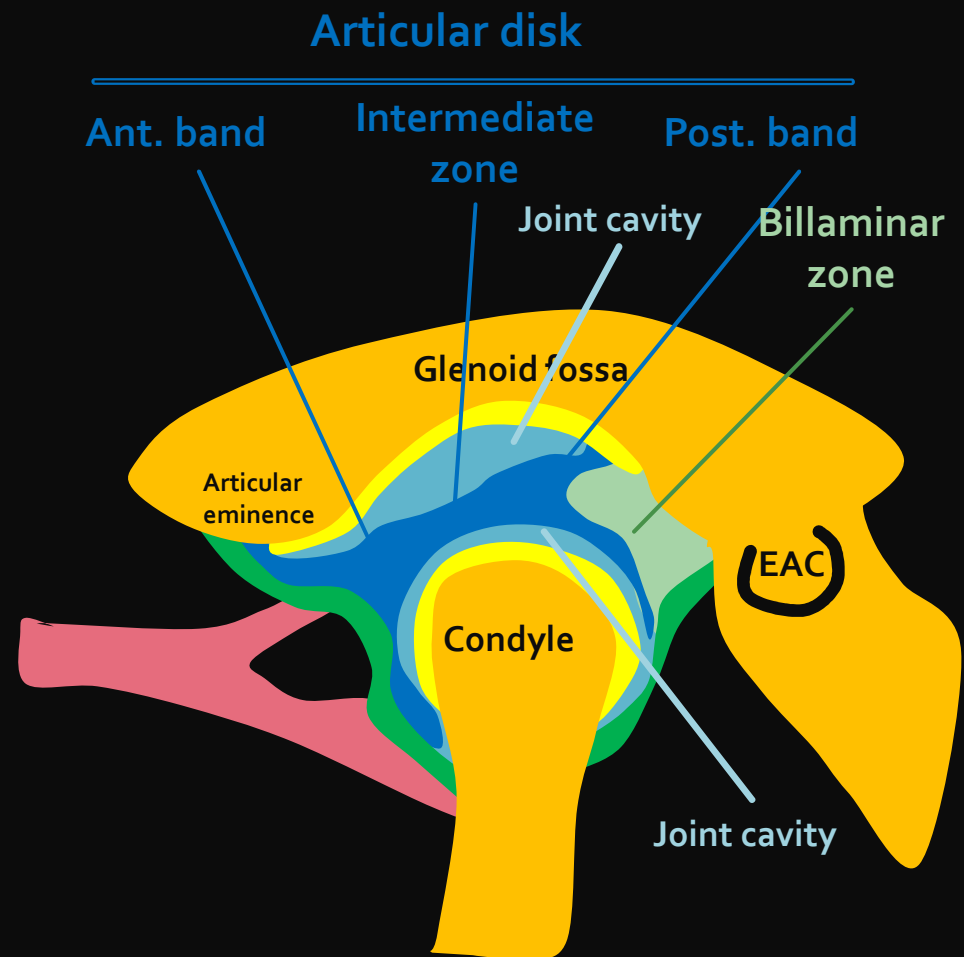
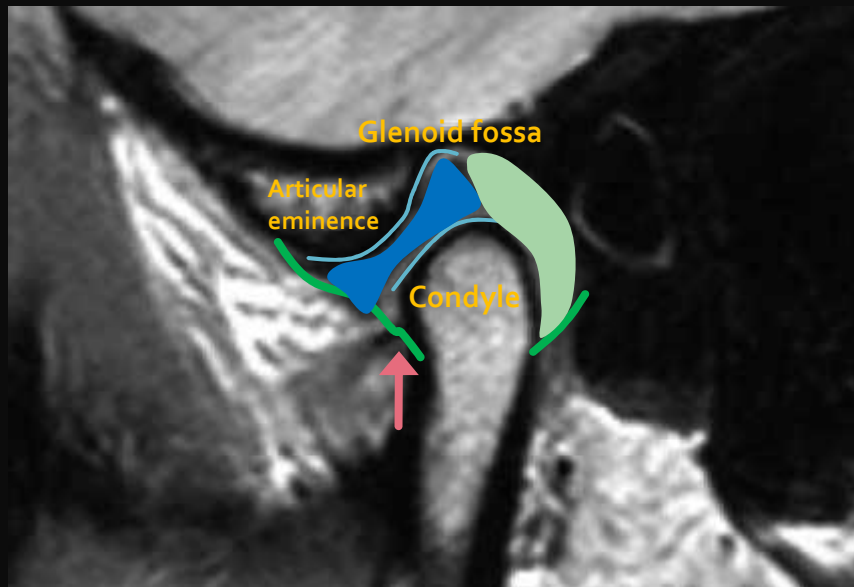
Department of Medical Imaging
General Hospital of Sitia, Crete/Greece

Iraklion, 24 June 2022

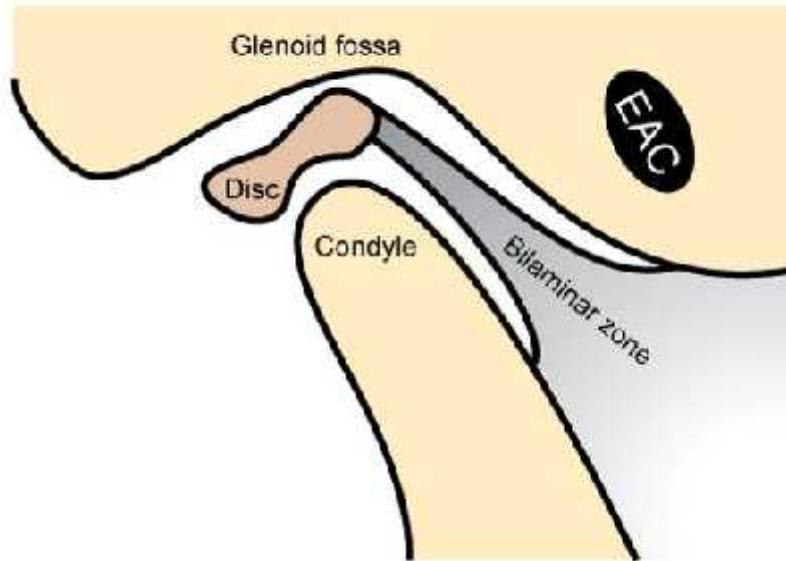
Anatomy

Synovial diarthrodial joint

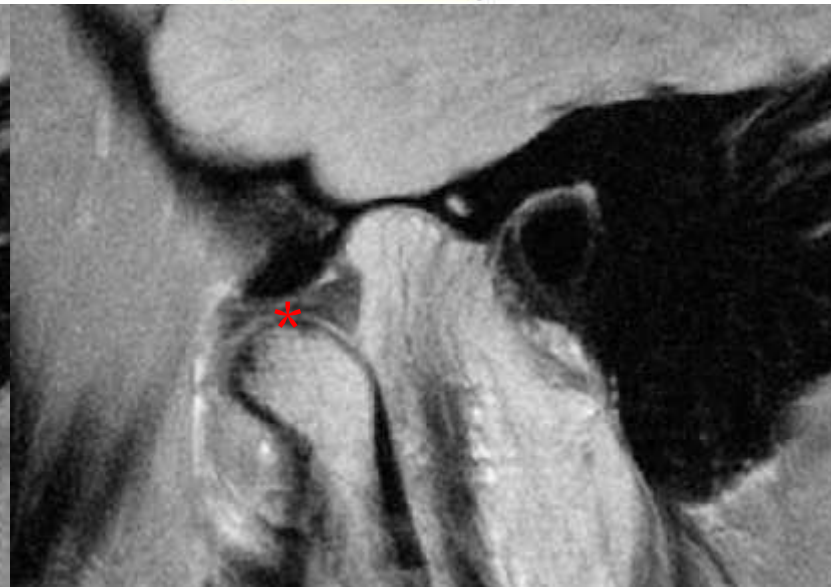
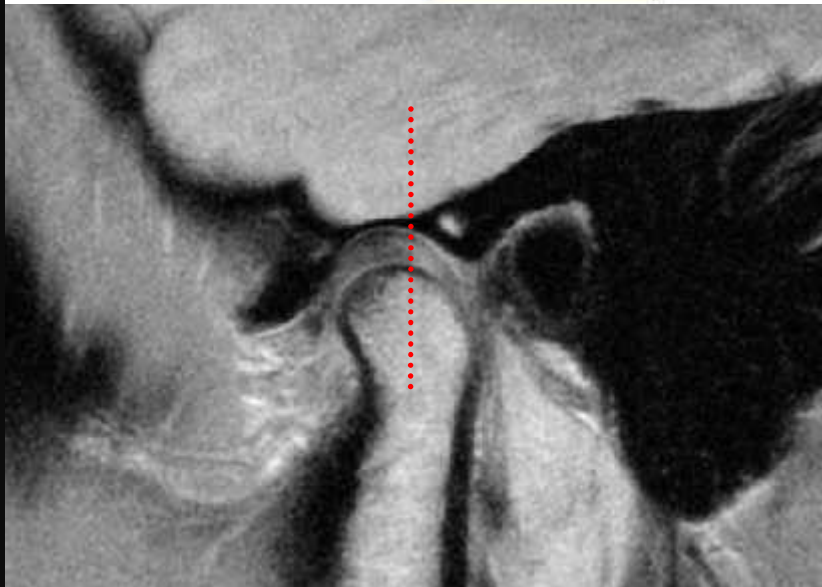
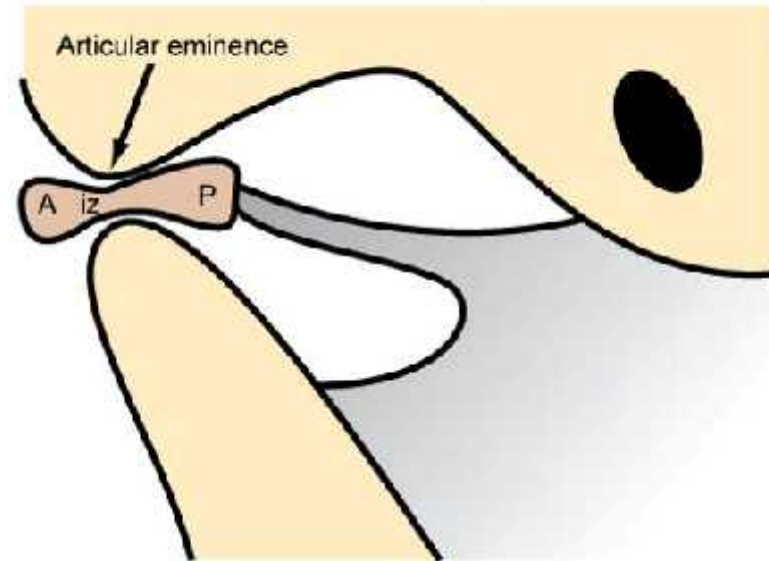
- ✓ glenoid fossa
- ✓ mandibular condyle
- ✓ articular eminence
- ✓ joint capsule/cavity
- ✓ articular disc
- ✓ retrodiscal tissue (bifaminal zone)
- ✓ lateral pterygoid muscle



Mouth Closed



Mouth Open



Imaging

MR imaging

Internal derangement

TMJ arthritis (synovitis)

Tumors

- ✓ joint space
- ✓ articular disc
- ✓ synovial membrane
- ✓ muscles

Aiken A, et al. Magn Reson Imaging Clin N Am 2012

CT

Degenerative changes

Congenital anomalies

Tumors

Trauma

- ✓ osseous structures

CBCT

isotropic voxels, spacial resolution (0.15 mm), lower patient dose

Vilanova JC, et al. Semin Ultrasound CT MR 2007

XR

Degenerative changes (advanced)

- superimposition of osseous structures
- joint space width relies on positional factors

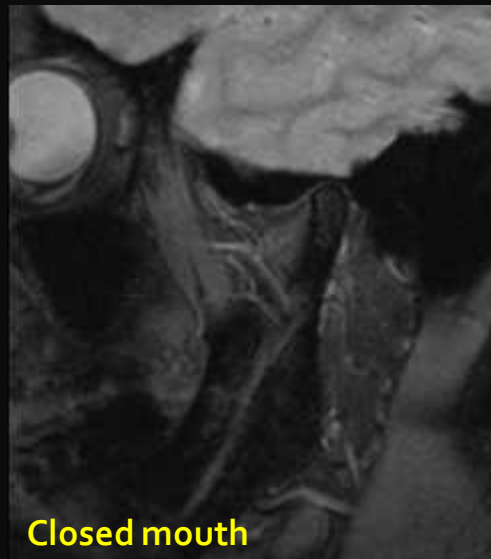
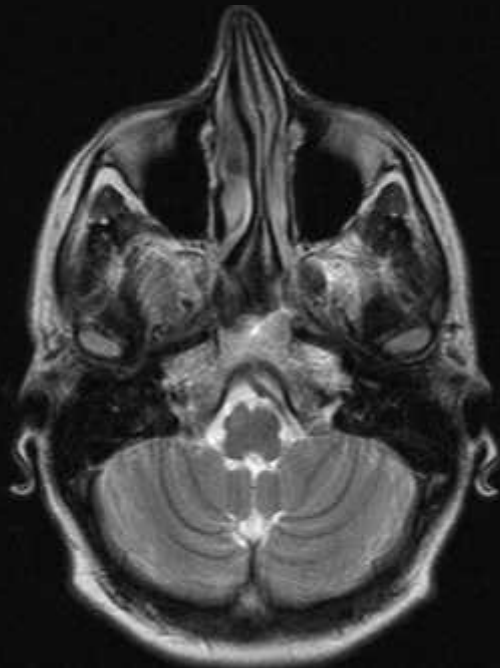
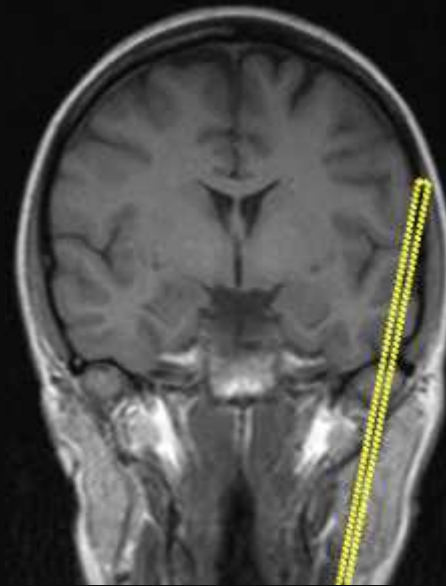
Arthorgraphy

Internal derangement
Degenerative changes

- ✓ joint space
- ✓ articular disk
- invasive, radiation, infection

MR imaging

- T2-w axial
- T1-w coronal
- GRE/PD/T2-w oblique sagittal
- ✓ Bilateral
- ✓ Closed/open mouth
- ✓ ST: 3mm
- ✓ Small FOV (288 X384)



Closed mouth



Open mouth

Pathology

Congenital

- ✓ Bifid condyle
- ✓ Condylar hypoplasia/hyperplasia
- ✓ Idiopathic condylar resorption

Internal derangement of TMJ

- ✓ Disk displacement
 - with/out reduction

Trauma

- ✓ TMJ fractures
- ✓ TMJ dislocation

TMJ arthritis

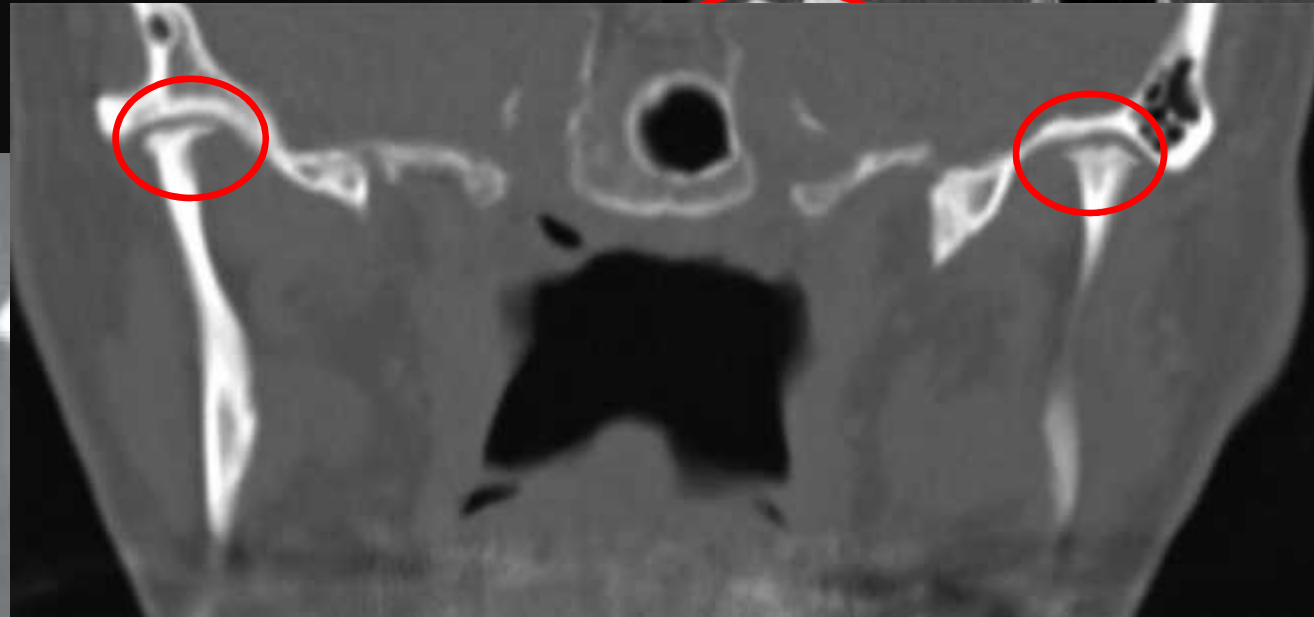
- ✓ RA
- ✓ JIA
- ✓ OA
- ✓ CPPD
- ✓ Infectious arthritis

Tumors/tumor-like conditions

- ✓ Synovial chondromatosis
- ✓ Benign neoplasms
- ✓ Malignant neoplasms

Pathology

Congenital



Idiopathic condylar resorption

- teenage girls
- progressive condylar erosion, joint space widening
- hormonal influence/AVN

Condylar hyperp

- increased volume of mandibular body
- hormonal influence/trauma
- facial asymmetry

- +/- neck elongation
- congenital/acquired
- TMJ ankylosis
- facial asymmetry

Pathology

Tumor/tumor-like conditions

Bening neoplasms

Osteochondroma
Chondroblastoma
Osteoid osteoma

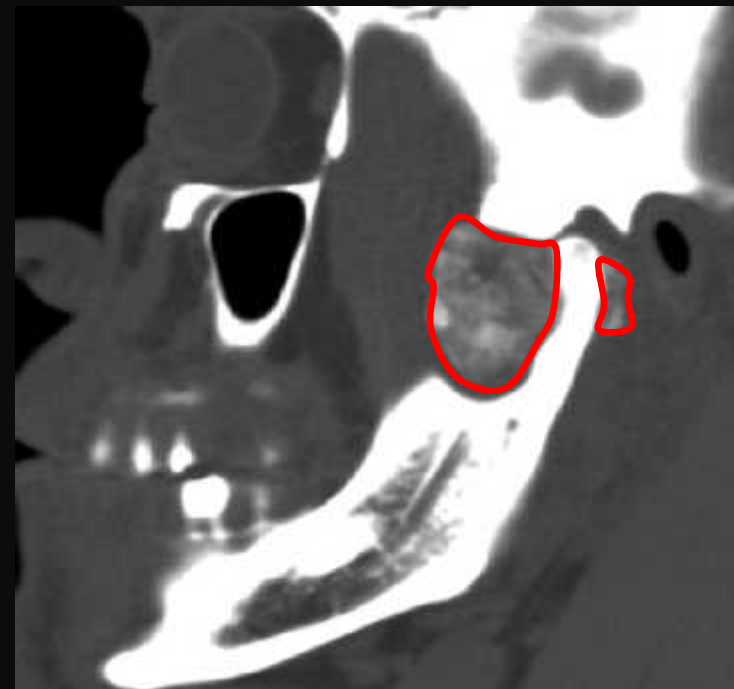
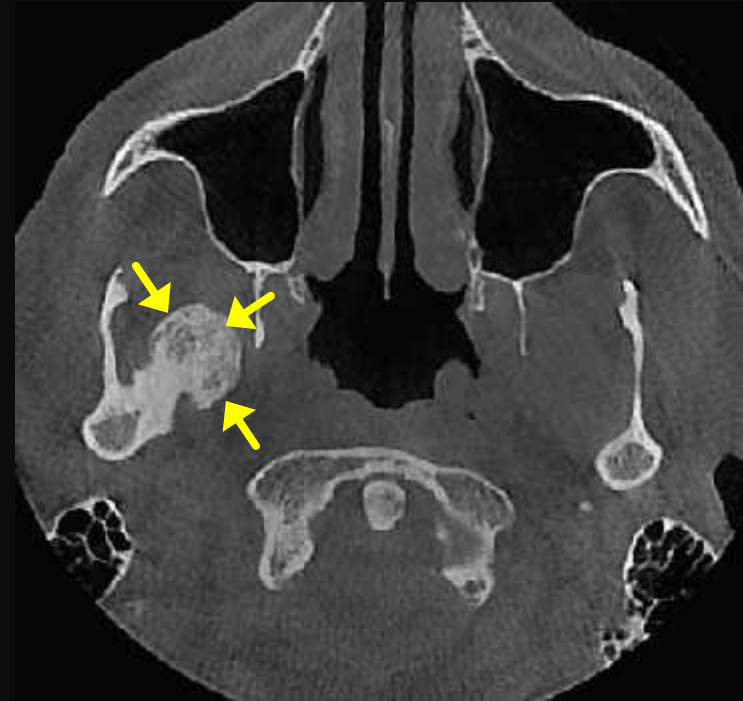
Malignant neoplasms

Chondrosarcoma
Osteosarcoma

Tumor-like conditions

Synovial (osteo)chondromatosis

- ✓ chondrometaplasia of synovial membrane
 - calcified nodules
 - condylar degenerative changes
 - joint effusion
 - synovial proliferation



Pathology

Internal derangement of TMJ

Mechanical defect that interferes with the normal function of the joint
abnormal relationship between the disk and adjacent articular surfaces

Symptomatic: 20-30% of patients

F:M 8:1

Characteristic: disk displacement

- ✓ any direction (anterior, most common)
- ✓ with/out reduction

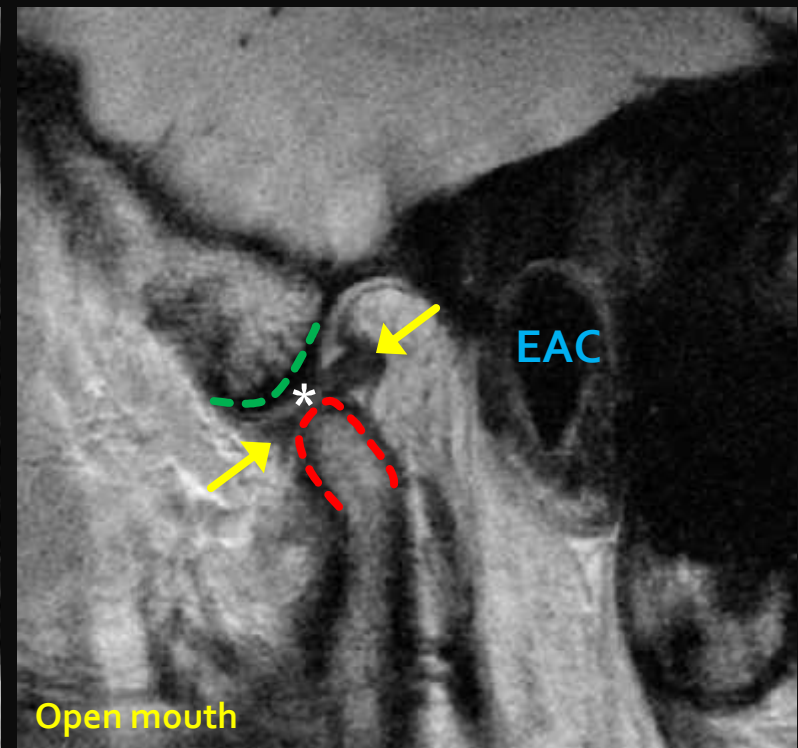
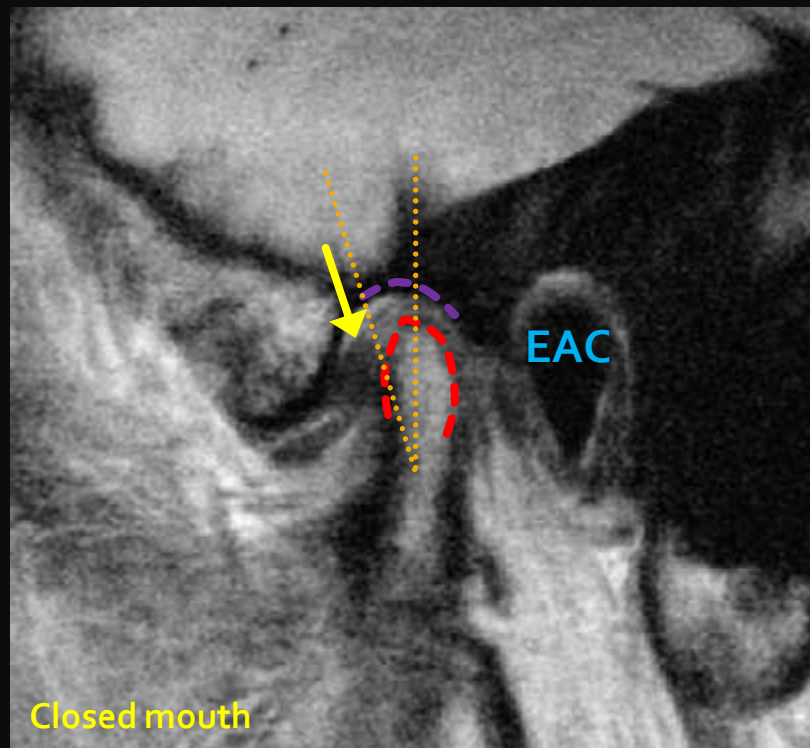
Disk thickening => rounded disk => SI changes => disk perforation

Pathology

Internal derangement of TMJ

anterior displacement with reduction (ADR)

Anterior disc displacement ($>10^\circ$) in closed mouth that reduces in open mouth
Disk abnormal morphology/SI
Degenerative changes



Pathology

Internal derangement of TMJ

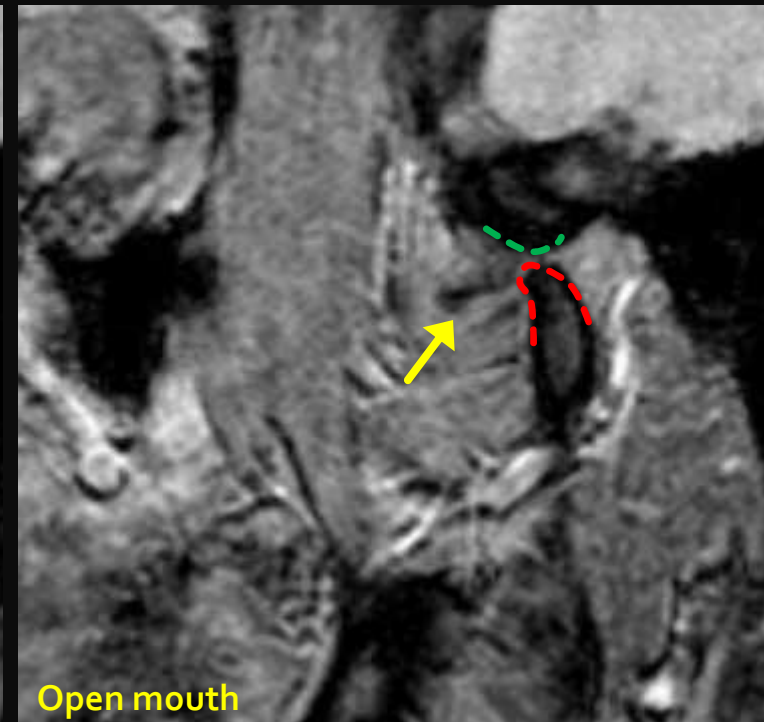
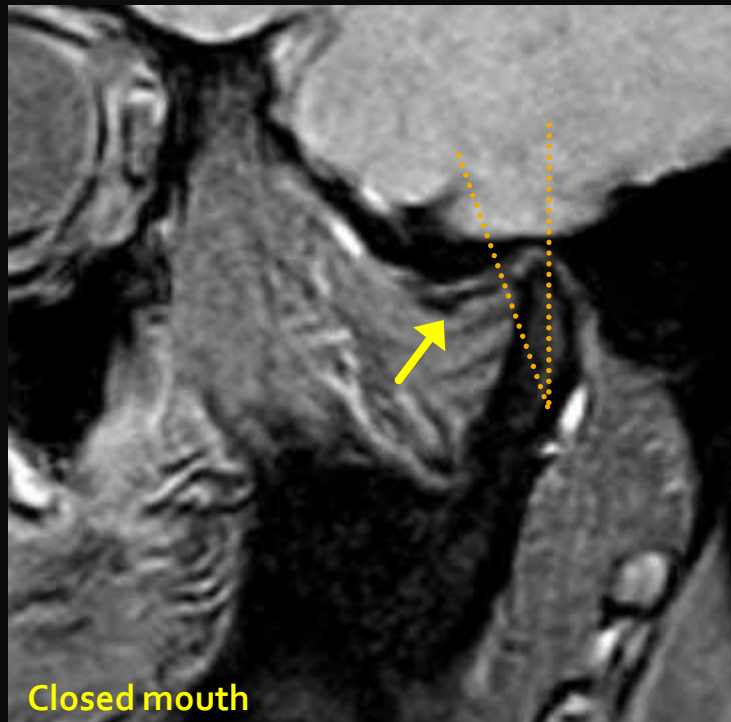
anterior displacement with no reduction (ADNR)

Anterior disc displacement in closed mouth that does not reduce in open mouth

Disk abnormal morphology/SI

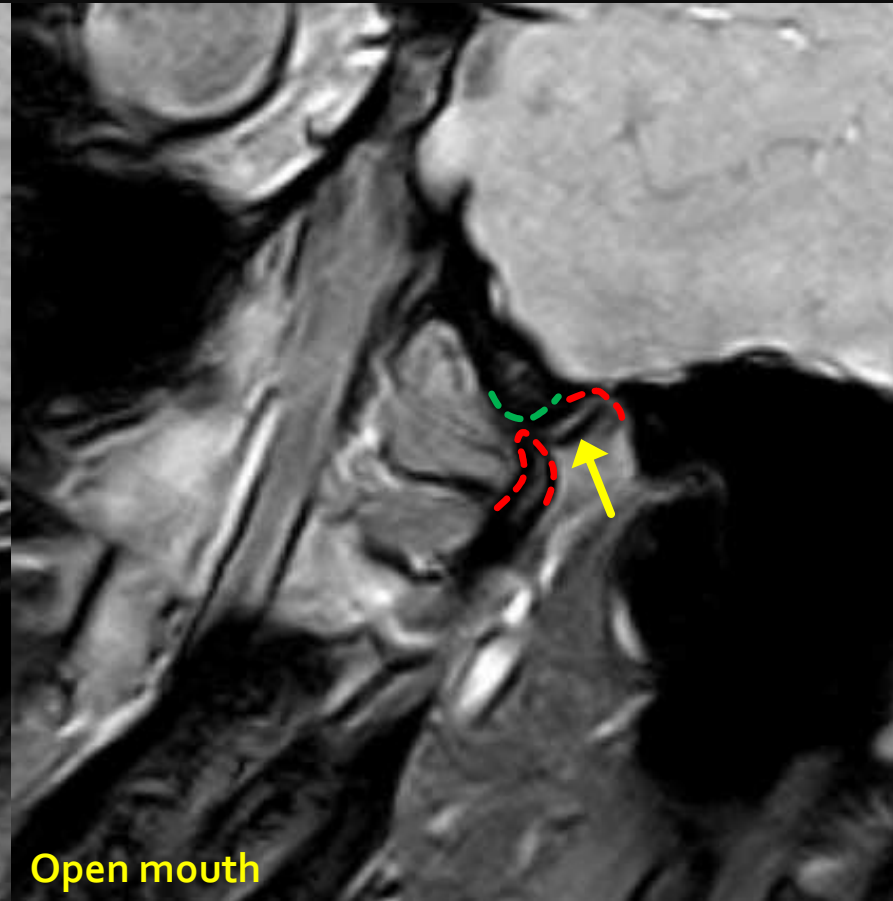
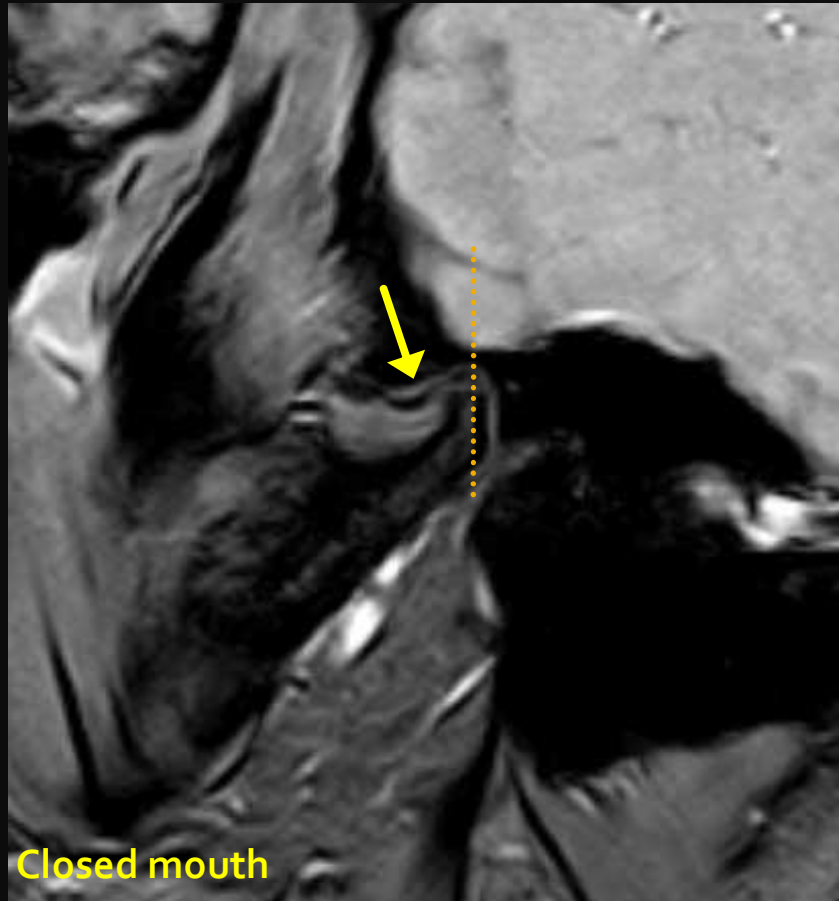
Degenerative changes

DD. Stuck disk (remains in the same position in both closed- and open mouth, adhesions)



Stuck disk

DD. Stuck disk (remains in the same position in both closed- and open mouth, adhesions)



Pathology

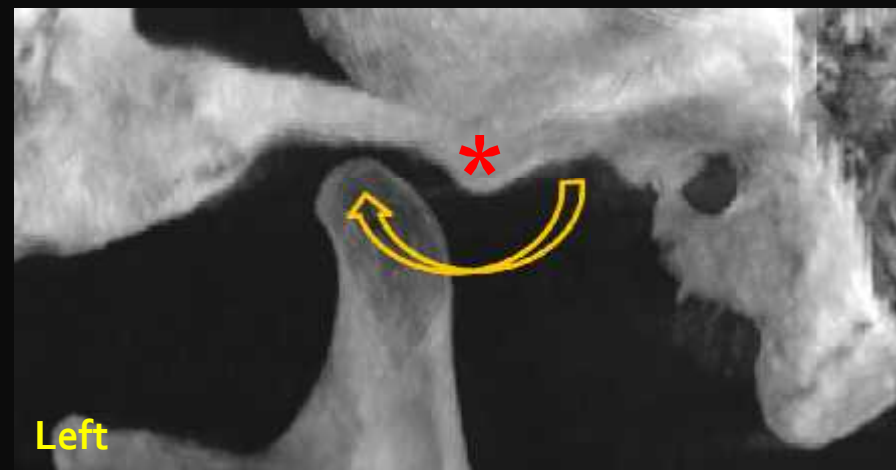
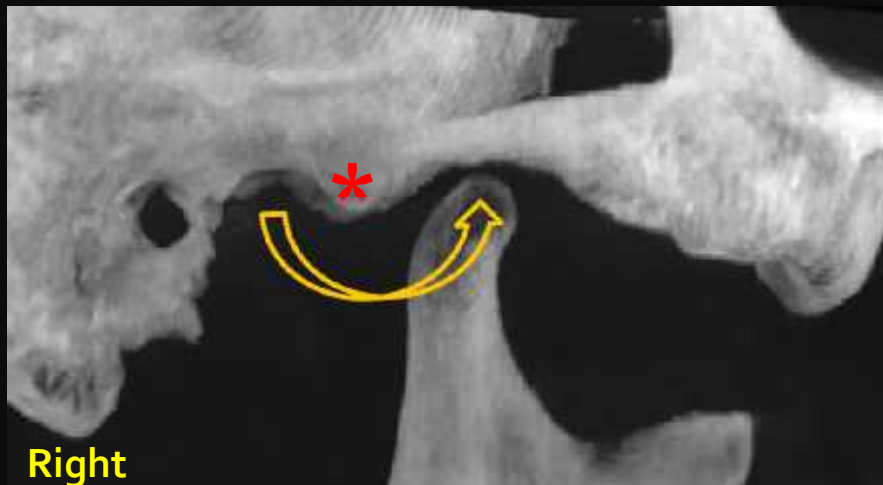
Trauma

Condylar fractures

- ✓ 25% of mandibular fractures
- ✓ additional mandibular fractures
- ✓ XR, CT (large FOV)

TMJ dislocation

- ✓ displacement of the mandibular condyle anterosuperior to the articular eminence
- ✓ clinical correlation!



Pathology

TMJ arthritis - RA

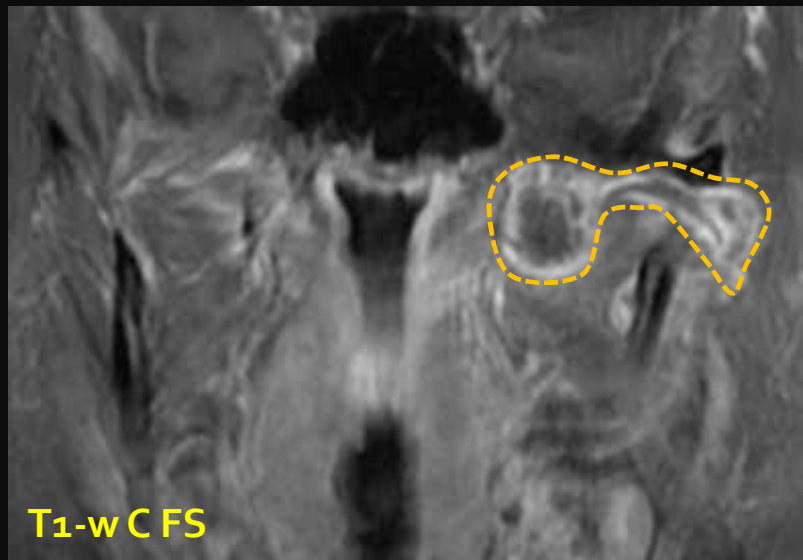
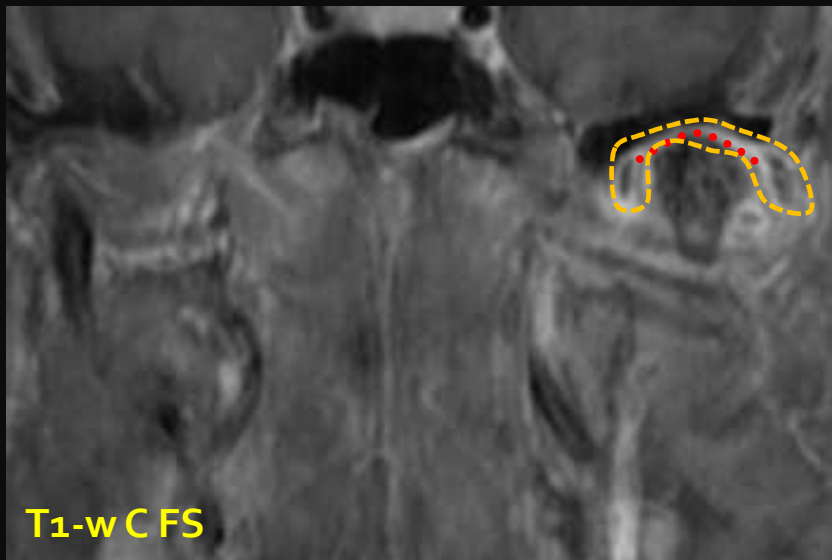
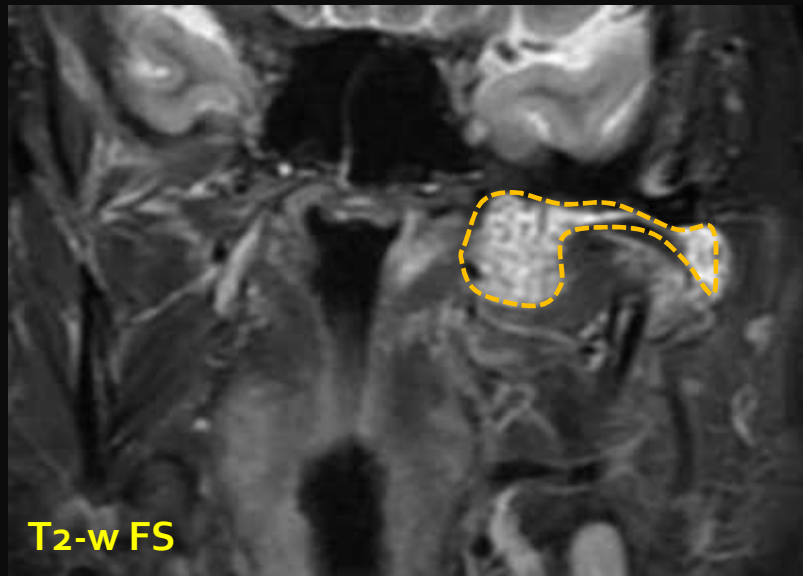
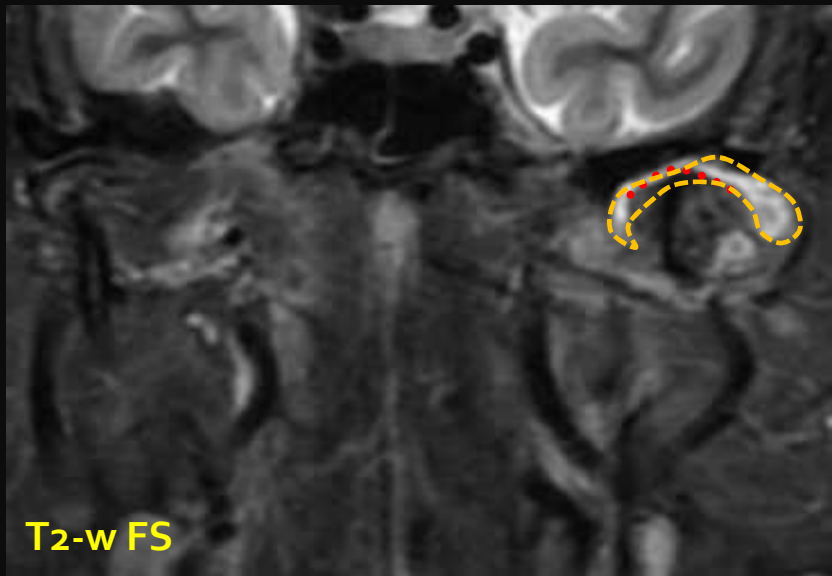
- clinical evidence of TMJ involvement > 50% of patients with RA
- TMJ: involved at later disease stage
- 3rd - 5th decade

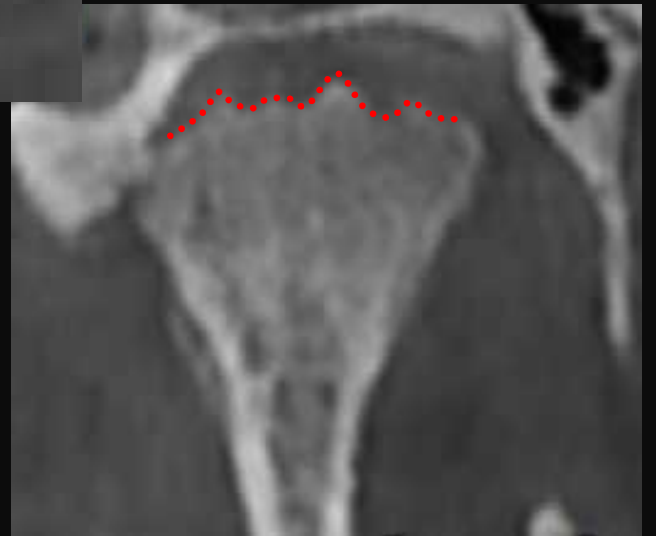
Mehra P, et al. J Oral Maxillofac Surg 2009

MRI:

- ✓ **synovitis**
- ✓ **joint effusion**
- ✓ erosions (condyle, articular eminence)
- ✓ condylar flattening/resorption

Salamon NM, et al. Semin Musculoskelet Radiol 2020





Pathology

TMJ arthritis - JIA

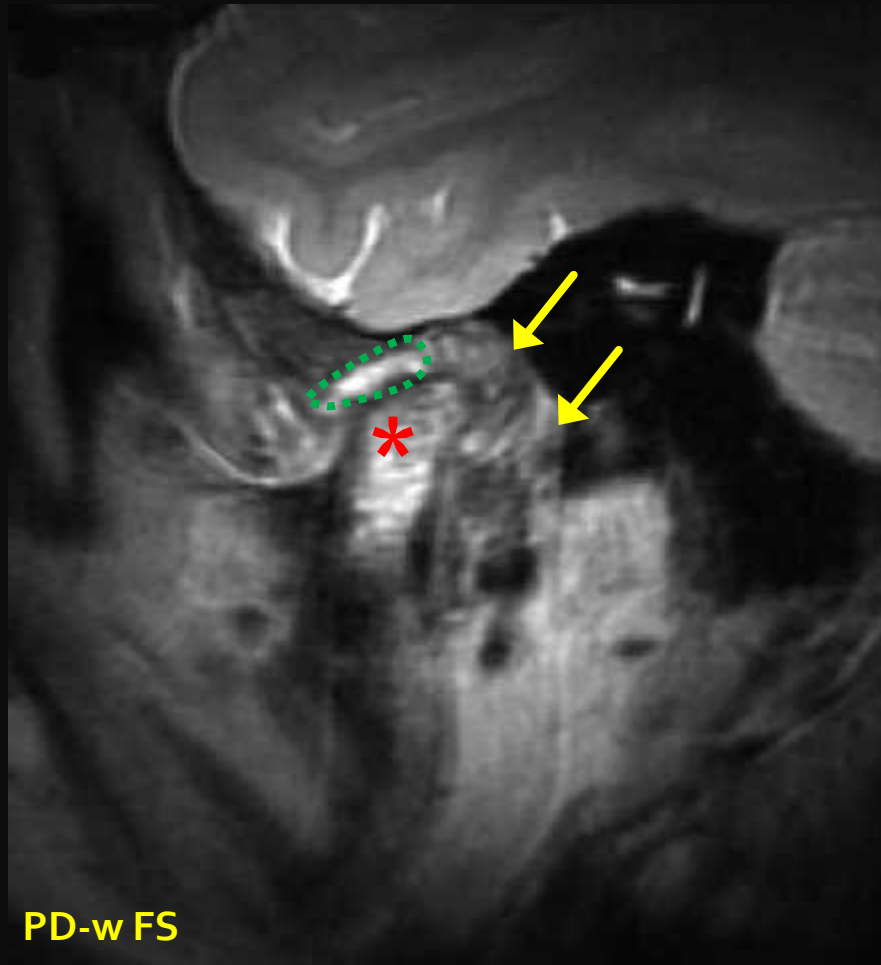
- oligo-/polyarticular arthritis ≥ 6 weeks, < 16 years
- TMJ involvement: up to 75% of children
 - ✓ more likely with the presence of systemic disease

Mehra P, et al. J Oral Maxillofac Surg 2009

MRI:

- ✓ **synovitis**, joint effusion
- ✓ osteitis, erosions (condyle)
- ✓ condylar flattening/resorption
- * growth deviations of the mandible

Weiss PF, et al. Arthritis Rheum 2008



Pathology

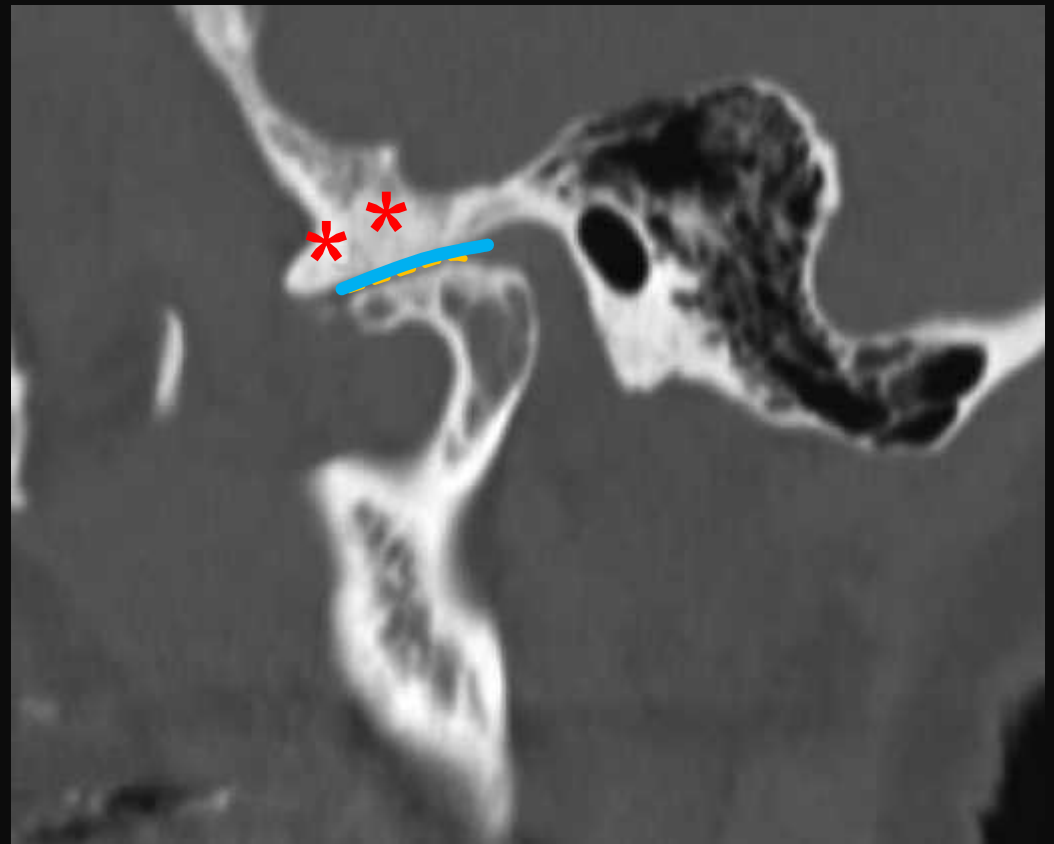
TMJ arthritis - OA

- The most common joint pathology affecting the TMJ

Tanaka E, et al. J Dent Res 2008

CT/MRI:

- ✓ condylar flattening
- ✓ cortical bone irregularity
- ✓ joint space narrowing
- ✓ subchondreal sclerosis
- ✓ osteophytes (advanced stage)



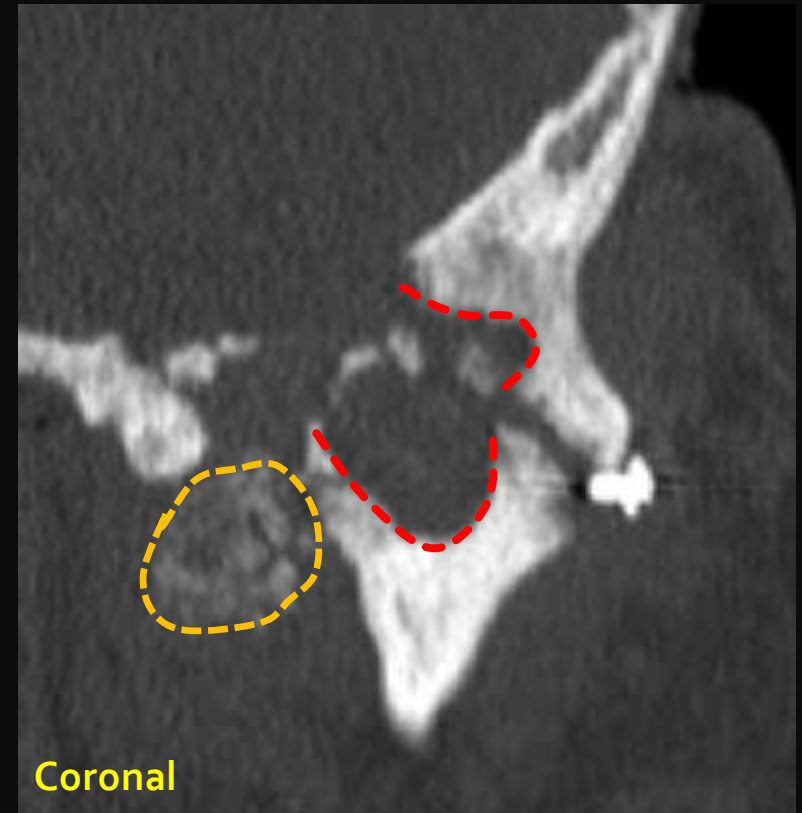
Pathology

TMJ arthritis - CPPD

- Deposition of calcium pyrophosphate dehydrate crystals
 - ✓ articular cartilage, fibrocartilage

CT/MRI:

- ✓ erosions (extensive)
- ✓ calcium deposition (disk, periarticular tissue)
- * other sites of chondrocalcinosis



Knowledge of the complex anatomy
Open/closed mouth

Imaging techniques/protocols
MRI: intraarticular structures, periarticular soft tissue
CT/CBCT: bony structures

Specific pathologies mainly including OA, internal derangement
and inflammatory arthritis

Thank you

Questions?

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