A Review of TMJ (Temporomandibular Joint) MRI

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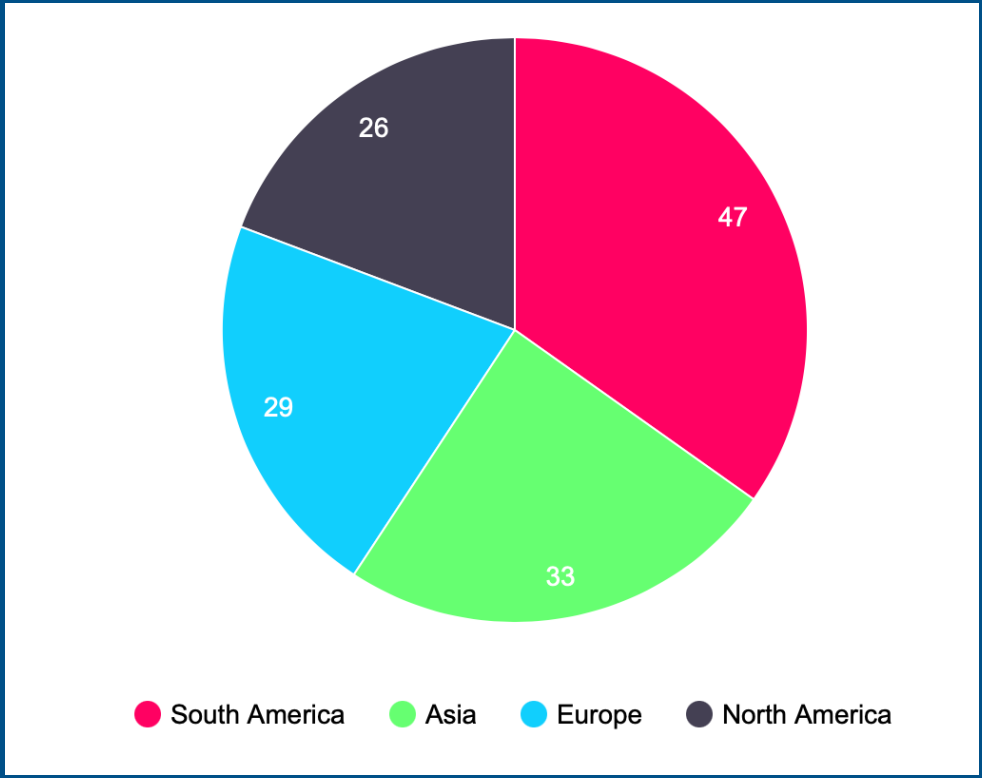
Overview

- Epidemiology
- Clinical Presentation
- Review of TMJ Anatomy & Normal MRI Appearance
- Most Common Pathologies and their Appearance

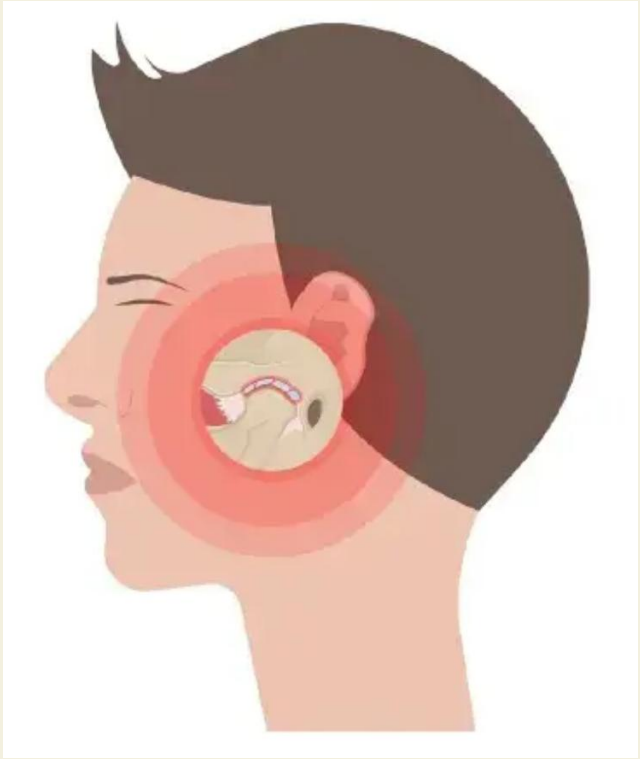
Epidemiology

- Worldwide incidence of approximately 34%
- Geography has been shown to play a role as prevalence is higher in South America (47%), compared to Asia (33%), Europe (29%), and North America (26%)
- Slightly higher incidence in females compared to males
- Incidence has been shown to be highest in an age range of 18-60 y/o



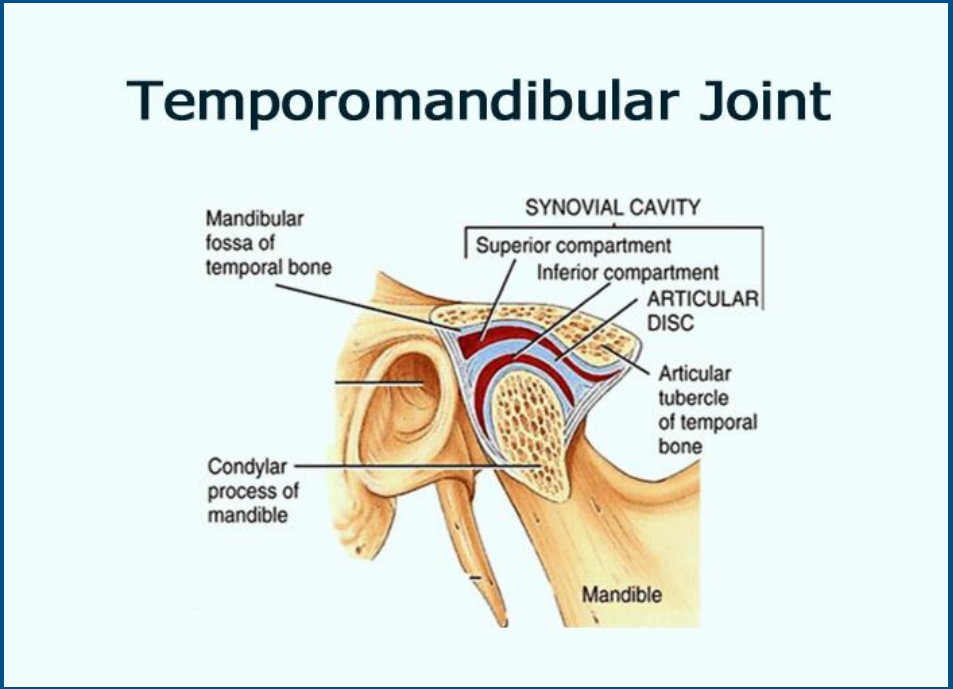
Clinical Presentation

- Face and/or neck pain
- Ear discomfort
- Difficulty with mastication
- Clicking sensation



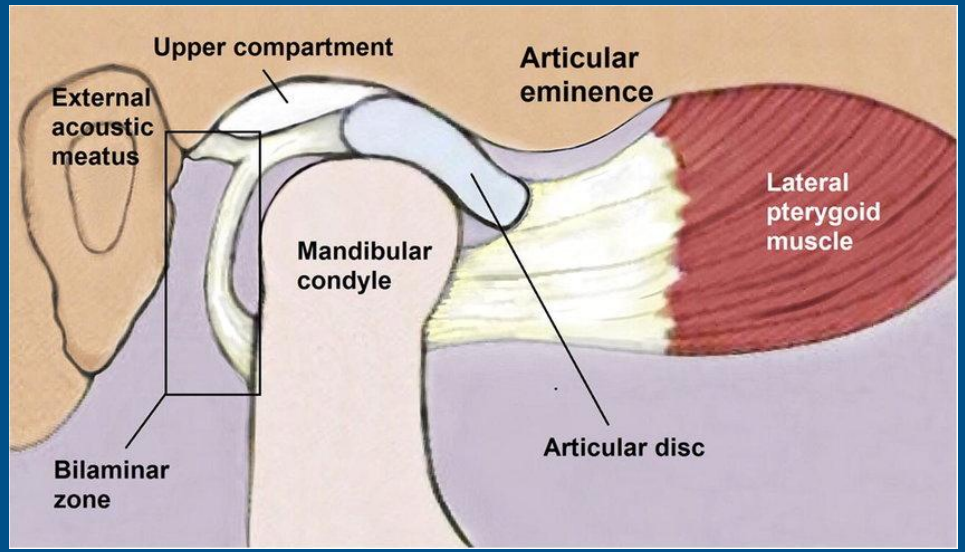
TMJ Anatomy

- The temporomandibular joint is formed by the mandibular fossa, the articular tubercle/eminence of the temporal bone, and the condylar process of the mandible
- There is an articular disc between the mandibular fossa and the condylar process, which separates the joint into two synovial cavities



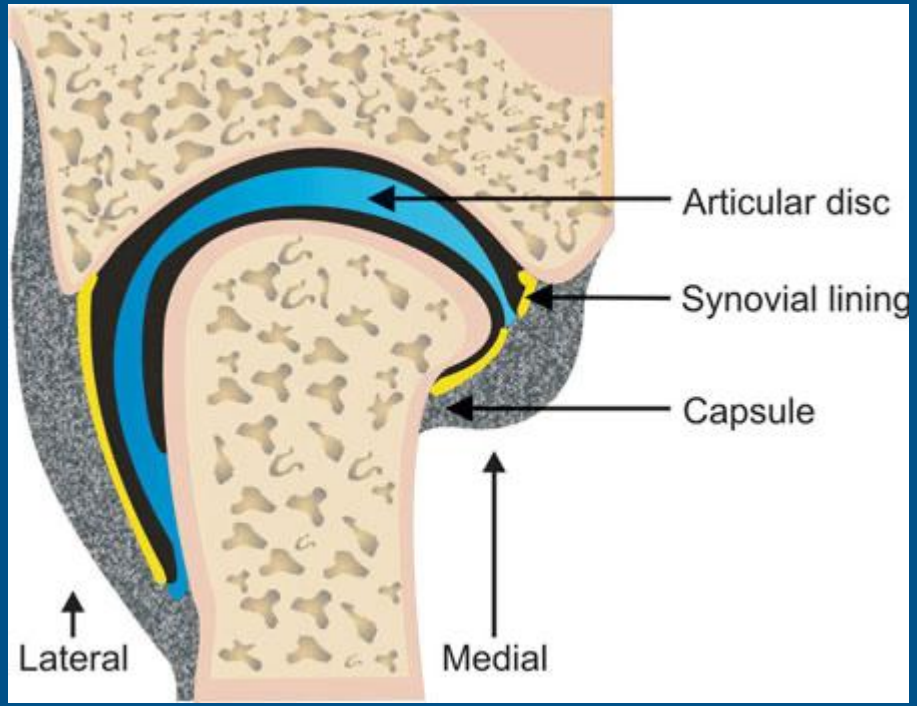
TMJ Anatomy

- The two joint cavities of the TMJ are called the upper and lower compartments, and each has their own mechanism of movement
- The disk is connected anteriorly to the joint capsule, and posteriorly it splits to become the Bilaminar zone
- One branch of the Bilaminar zone connects to the temporal bone and the other connects to the mandibular condyle



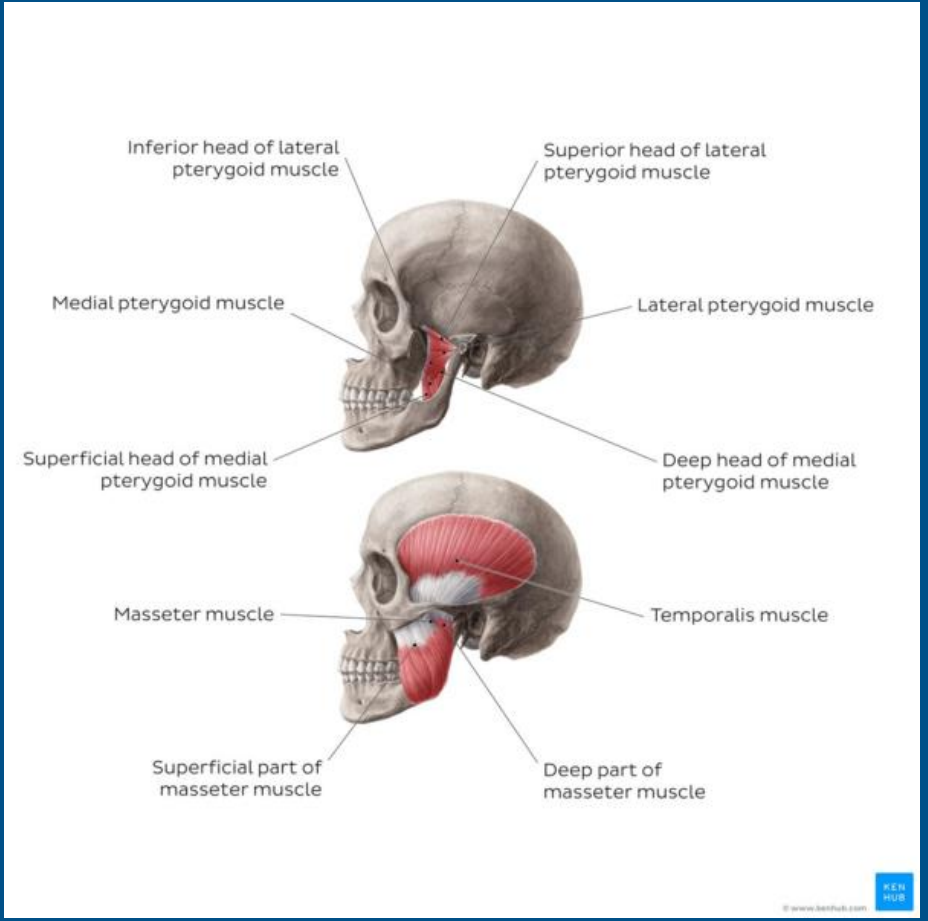
TMJ Anatomy

- The TMJ is a synovial joint
- A fibrous capsule surrounds the joint and it is lined internally by a synovial membrane
- The articular surfaces are lined with fibrocartilage, as opposed to the hyaline cartilage as in most synovial joints



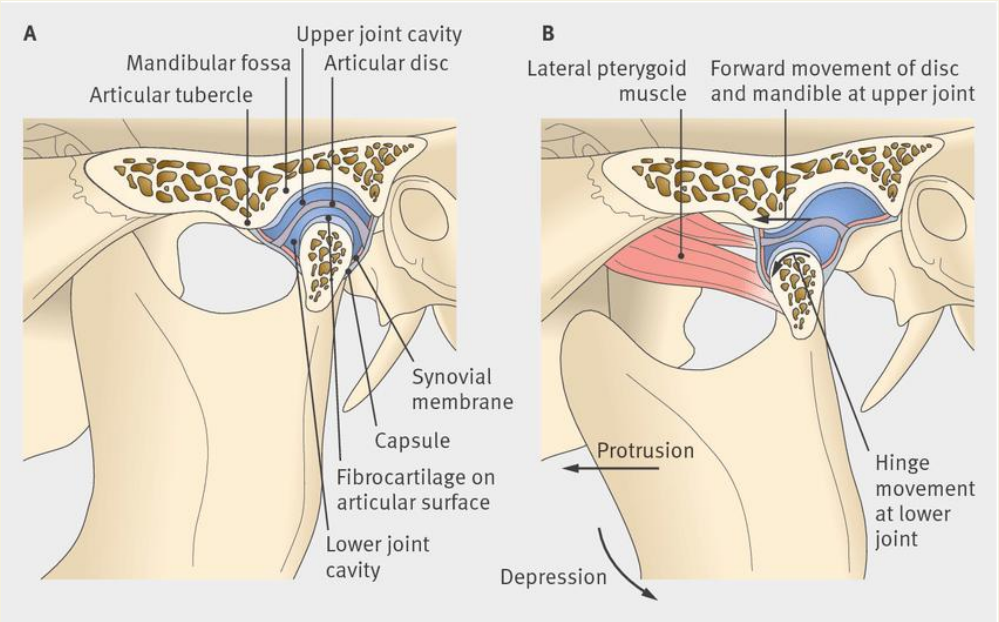
TMJ Anatomy

- The muscles involved in the joints movement are the muscles of mastication: temporalis, masseter, and medial/lateral pterygoid muscles
- There are multiple ligaments which stabilize the joint including the temporomandibular, stylomandibular, and sphenomandibular ligaments



TMJ Physiology

- The temporomandibular joint is a Ginglymoarthrodial joint, which means it involves an element of axial or hinge motion as well as a simple gliding motion
- The superior joint (between the articular disc and mandibular fossa), performs a gliding movement.
- The inferior joint (between the articular disc and condylar process of the mandible), performs a hinge movement

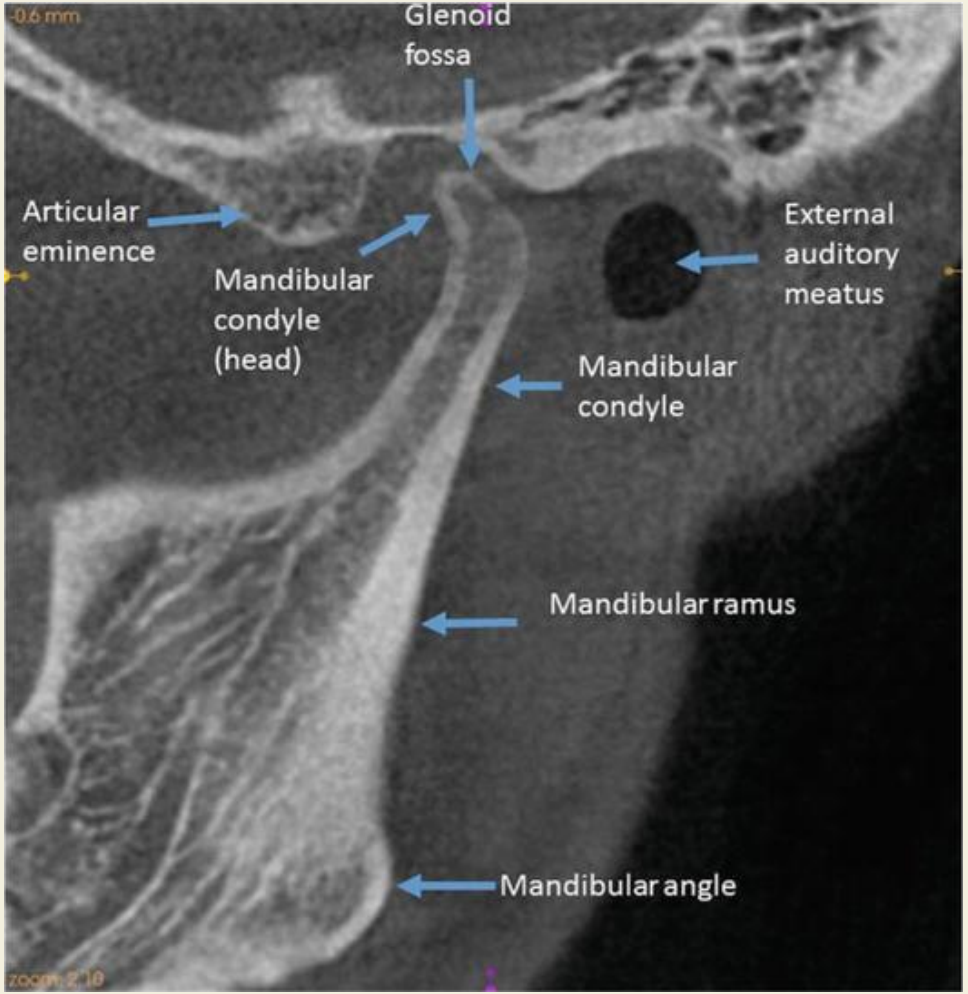


TMJ Imaging

- Conventional Radiographs
  - Can be used for basic evaluation of bony elements
  - Limited role due to lack of diagnostic evaluation of non-bony elements
- Ultrasound
  - Useful to assess for joint effusion
  - Can also provide visualization of the cartilage and disc displacement during open/closed mouth imaging
  - Provides opportunity for targeted therapy such as joint injections

TMJ Imaging

- CT
  - Can evaluate bony elements and the adjacent soft tissues
  - Ideal for evaluation of certain pathologies such as fractures and degenerative changes/erosions
  - Can be used to follow up MRI in cases where findings suggest bony pathology

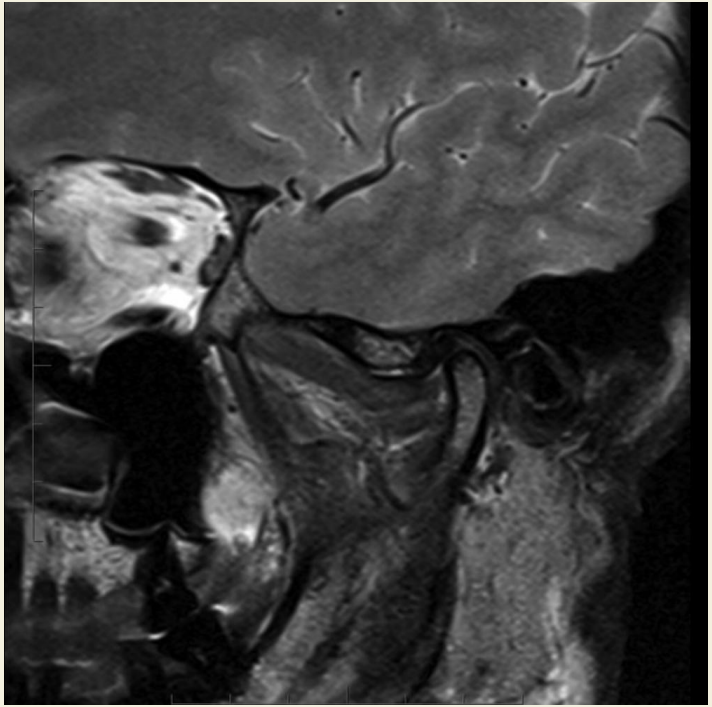


TMJ Imaging

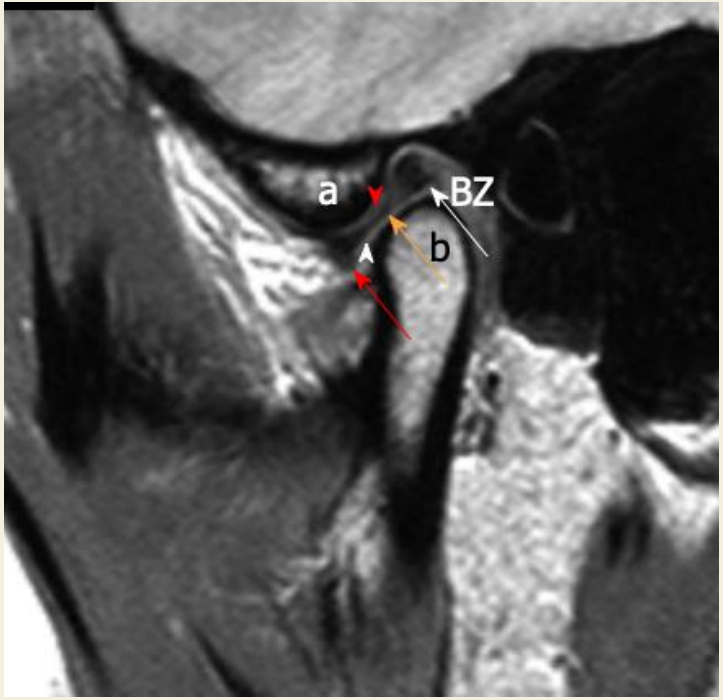
- MRI is the standard imaging for evaluation when an internal structural abnormality is suspected
- Northwell Health Imaging Protocol includes:
  - Closed mouth coronal T1 images
  - Closed and open mouth T2 and PD images taken in sagittal oblique views
  - Sagittal oblique dynamic PD cine images (SSFSE)
  - Additional contrast enhanced T1 FS views can be attained if clinically indicated

Series	Sequence	FOV	Slice/Gap
SAG PD OBL BILAT CLOSED	TSE	14-16	3 /0
SAG T2 FS OBL BILAT CLOSED	TSE	14-16	3 /0
COR T1 BILAT CLOSED	TSE	14-16	3 /0
SAG PD OBL DYNAMIC RT	SSFSE/HASTE	20-24	4 / 0
SAG PD OBL DYNAMIC LT	SSFSE/HASTE	20-24	4 /0
SAG PD OBL BILAT OPEN	TSE	14-16	3 /0
SAG T2 FS OBL BILAT OPEN	TSE	14-16	3 /0

Normal TMJ MRI: Closed Mouth

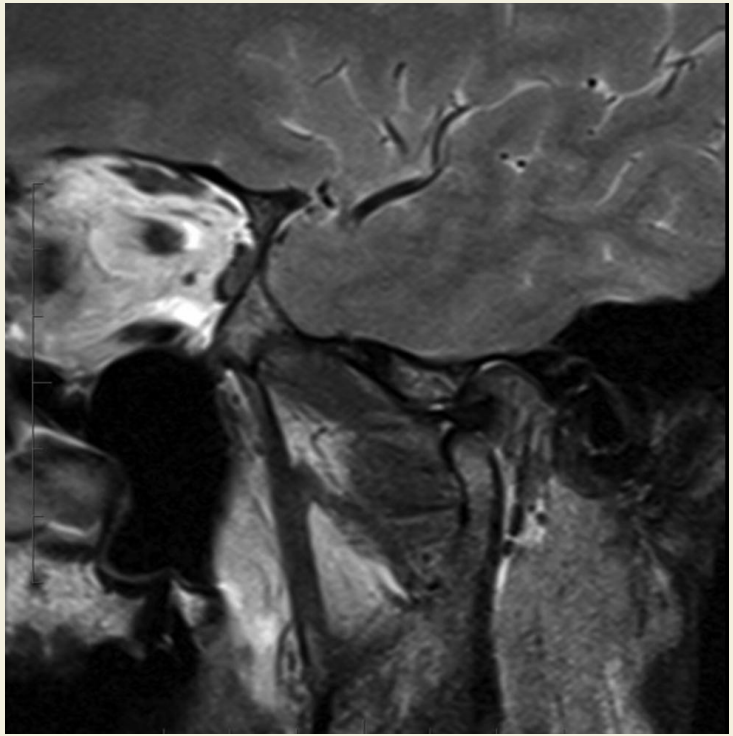


Mandibular condyle and disc are aligned and sitting in the fossa

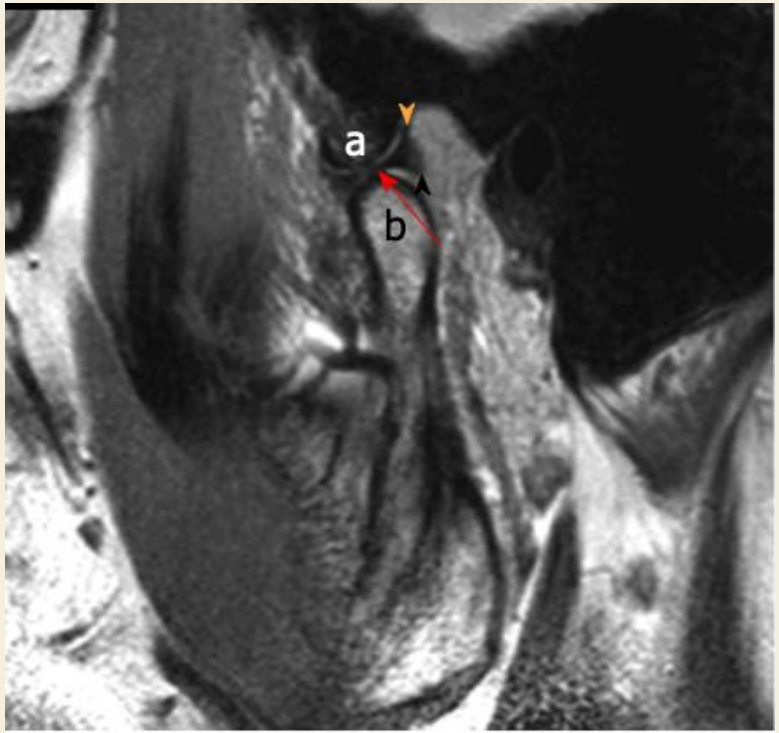


Disk is located posterior to the articular eminence “a.” There is a bow-tie shaped appearance of the disc with the thicker anterior/posterior bands (red and white arrows, respectively) and a thinner central zone (orange arrow). The bilaminar zone is also identified posteriorly.

Normal TMJ MRI: Open Mouth



Anterior translation of both the mandibular condyle and disc out of the fossa with hinge movement within the lower joint compartment



The central zone of the disk is situated between the articular eminence of the temporal bone “a” and the condylar head of the mandible “b”

TMJ Disorders

- 2 Main Categories

INTRA-ARTICULAR

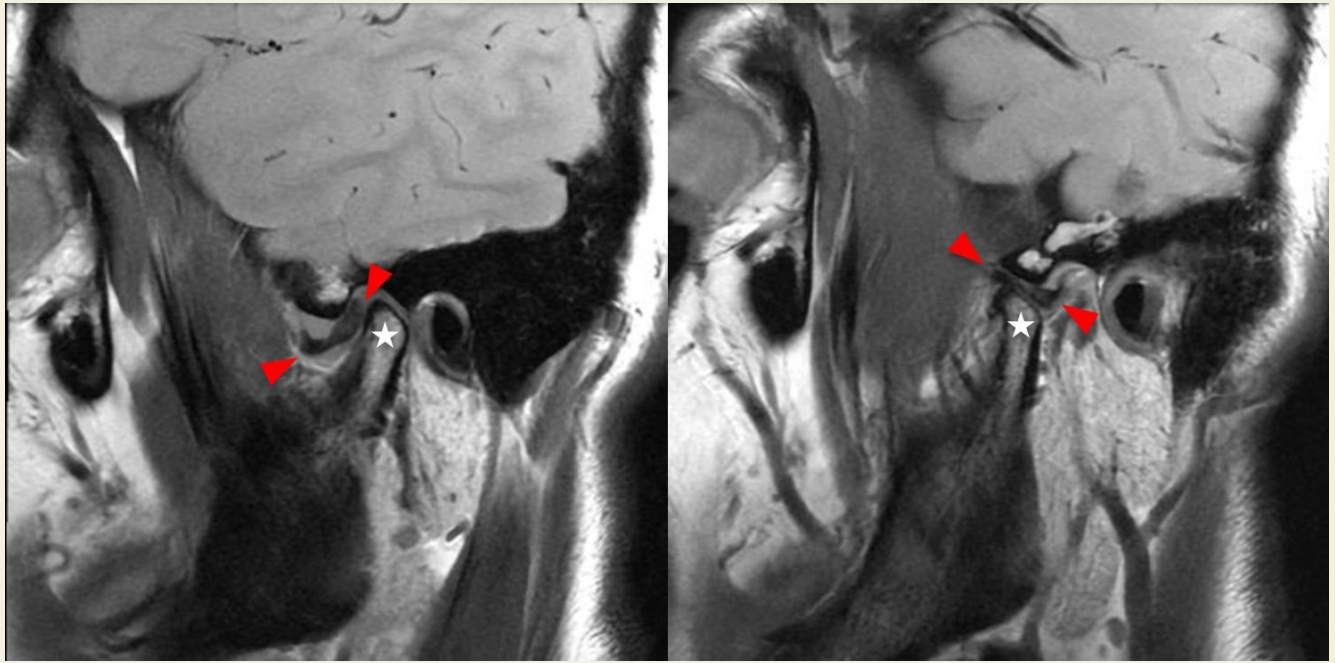
Directly involve the joint itself, and includes issues relating to inflammatory and/or mechanical factors

MYOFASCIAL

Do not directly involve the joint space itself, but includes other issues such as those relating to the muscles of mastication or pain/nerve disorders

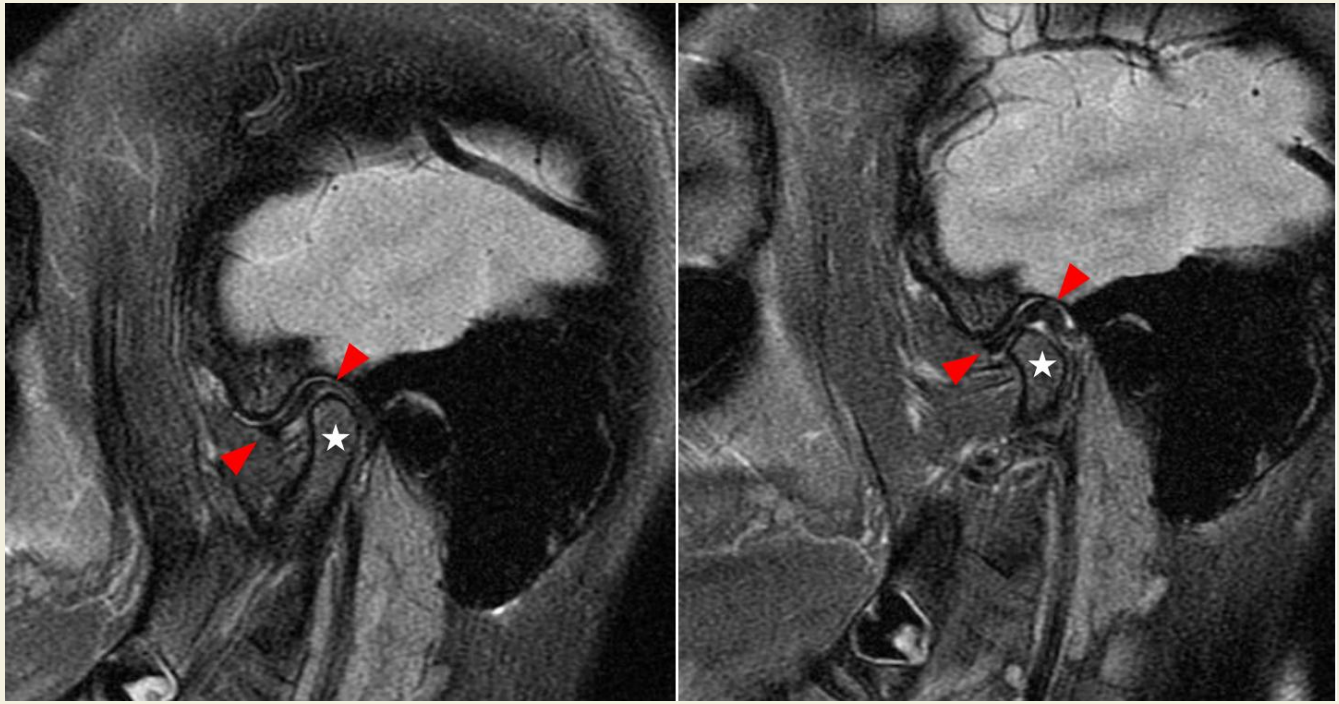
Common Intra-articular Causes of TMJD

Jaw Clicking



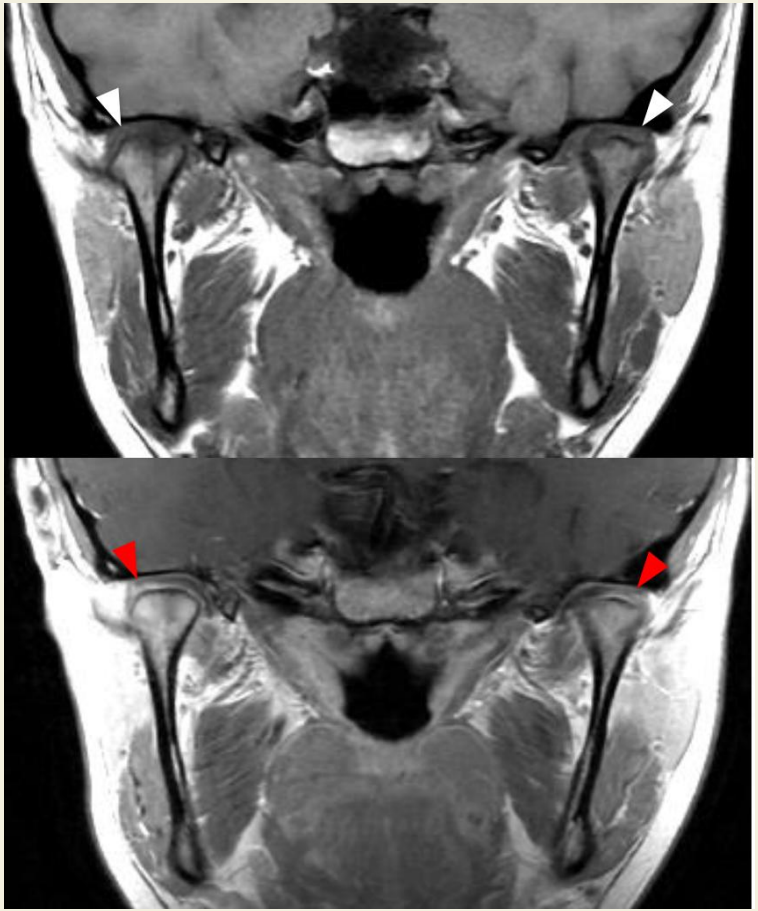
39 year old woman with clicking sensation during mouth opening. Sagittal PD sequence of the right TMJ in closed mouth (left) and open mouth (right) views. Anterior displacement of the disc (red arrowheads) is seen with respect to the mandibular condyle (star) on closed mouth view, with reduction on open mouth view. This reduction is often associated with a clicking or popping sensation.

Stuck Disc



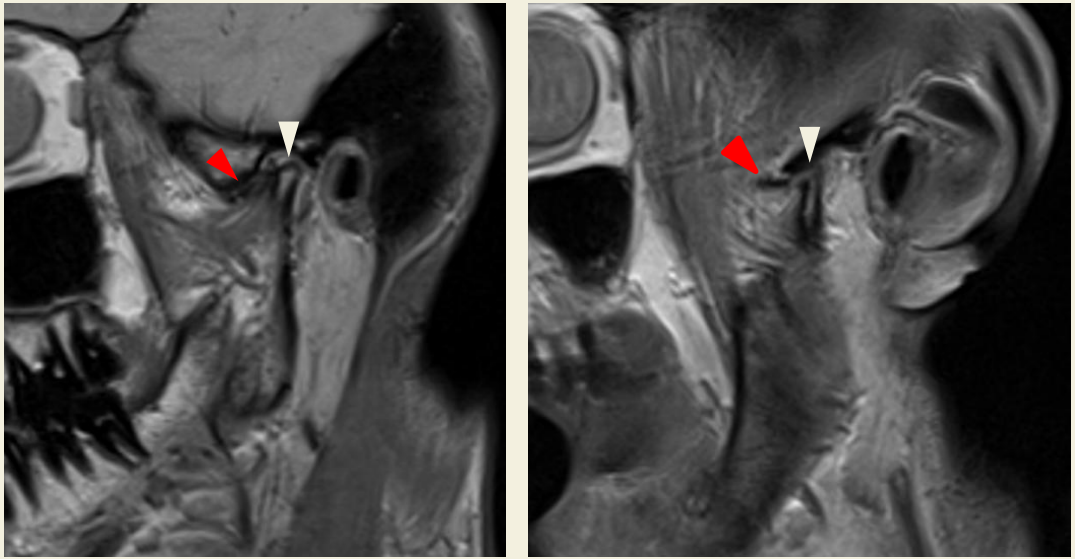
18 year old woman with limited mouth opening. Sagittal T2 fat saturated sequences in closed mouth (left) and open mouth (right) views. The mandibular condyle (star) demonstrates mild anterior translation with minimal to no anterior translation of the disc (red arrowheads), compatible with a stuck disc.

Synovitis



18 year old woman with juvenile idiopathic arthritis with TMJ pain. Coronal T1 pre-contrast (upper) and post-contrast (bottom) sequences are shown. Enhancement within the joint space is seen bilaterally (red arrowheads), compatible with active synovitis.

Advanced internal derangement with anteriorly dislocated meniscus without reduction



46 year old woman with severe biltaeral TMJ pain and limited mouth opening. Labwork for rheumatoid arthritis was negative. Sagittal oblique PD sequences of the right TMJ in closed (left) and open (right) mouth positions are shown. Note severe erosions of the condyle (white arrowheads) and persistent anterior dislocation of the meniscus (red arrowheads) due to idiopathic severe internal derangement.

Sources

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