Ins and Outs of the TMJ

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• Anatomy
• Function
• Pathology
  – Internal derangement
  – Synovial inflammatory disease
• TMJ is a ginglymoarthroidal synovial joint
• Intra-articular disk is a bowtie shaped fibrocartilaginous structure lying above the condyle
• Separates joint into superior and inferior synovial compartments

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• TMJ is a ginglymoarthroidal synovial joint
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Disk Attachments

- Anterior band attached to anterior aspect of condyle, belly of lateral pterygoid muscle and joint capsule
- Posterior band attaches to posterior condyle and temporal bone by ligaments termed the bilaminar zone

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Function

• Closed mouth position
  – Condyle is seated in the condylar fossa
  – Condyle lies immediately below posterior band (3); the intermediate zone (2) is at the 10 O’clock position
  – Bilaminar zone is seen posteriorly (4)

Vilanova et al, Seminar Ultrasound CT MR 2007 June 28(3)
• Open mouth position
  – Condyle translates anteriorly to lie below articular eminence
  – Condyle lies immediately intermediate band which translates anteriorly as well

Vilanova et al, Seminar Ultrasound CT MR 2007 June 28(3)
Imaging

- Best to use two coupled surface coils
- Dedicated TMJ coils, Carotid coils at 1.5T
- Quadrature head coil at 3T
- For open mouth views a bite plate may be helpful

Vilanova et al, Seminar Ultrasound CT MR 2007 June 28(3)
Protocol

- Coronal T1
- Sagittal T1 open and closed
- Sagittal T2 FS open and closed
- Sagittal cartilage sensitive open and closed
- Post contrast Sagittal T1 fat sat closed mouth (only in cases of JIA)
- Note in my experience patient movement and inconsistent imaging is a major factor. Hence multiple sequences
There are three general possibilities

- Normal
- Anterior displacement with capture (reduction)
- Anterior displacement without capture (reduction)
- Note that the disk may also be displaced medially or laterally
Anterior Displacement With Capture

- Disk is anteriorly displaced in closed mouth position
- With jaw opening the condyle regains the normal position relative to the disk

Can Dent Assoc 2010;76:a3
Anterior Displacement Without Capture

- Disk is anteriorly displaced in closed mouth position
- With jaw opening the condyle does not regain normal position with respect to disk. Disk remains pushed anteriorly
- Jaw opening is typically restricted

Can Dent Assoc 2010;76:a3
Medial or Lateral Displacement

- Disk may also be displaced medially or laterally so important to check coronal images
- Clue is that the disk is not seen well on standard sagittal images
Osseous Changes in DJD

- As in any other joint with degenerative disease comes a range of osseous changes
Synovial Inflammatory Disorders

- While in adults most TMJ disease is degenerative, in kids disease is more based in JIA.
- Like other joints, Synovial inflammation causes a range of joint derangements and growth modulation changes.
Normal synovium enhances faint or none

But where is it?

The disc separates the joint into upper and lower synovial compartments so that is where the synovium is
Where Oh Where is Synovium

- The disk separates the joint into upper and lower synovial compartments
- Synovium lines these compartments in all areas where there is no articular cartilage

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Where Oh Where is it  Not

- Posterior to the joint is rich fibrofatty tissue
- It enhances and will always enhance but it is not synovium (black arrowheads)
Normal Synovium

- Normal Synovium enhances faint or none
- Subjective
- We prefer timed bolus injections
- Abnormal synovium enhances very quickly
Abnormal Synovial Enhancement

- Here the synovium is enhancing anteriorly (arrow). Mandibular condyle is flattened

Meyers AB, Laor T; Ped Radiol 12 2013
Condylar Erosive Changes

• Due to synovial inflammation an array of osseous changes scour mostly typified by erosive disease

• Shape of condyle is distorted (dashed arrow) with abnormal T2 signal (arrow)

Meyers AB, Laor T; Ped Radiol 12 2013
• Mandibular condyle is very special
• Retains both articular fibrocartilage and growth potential in the subchondral zone
• Uniquely vulnerable to changes in growth due to synovial changes in the joint

Mizoguchi et al, Japan Dental Science Rev, 11 2013
The antegonial notch refers to the concavity of the lower border of the mandible anterior to the gonion (angle of the mandible).
Mandibular Hypoplasia

- Normal vs. Congenital vs. Inflammatory

Becker et al, Radiology 10 1976
• In the normal case the notch is fairly flat. Minor concavity is fine
• In acquired forms the notch is pulled up and back
• In congenital forms the notch is more smoothly concave
Conclusion

- The TMJ is not so scary
- Anatomy is not very complex
- It’s a small joint!
- It is made scary due to problems with good image acquisition
- The better the images the easier your job