Imaging the Temporomandibular Joint in Pediatric Patients

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TMJ Pathology in Pediatrics

• Juvenile Idiopathic Arthritis (JIA)
  – ~55% TMJ pathology on clinical exam
  – ~85% TMJ pathology detected on MRI
  – Importance of early detection

• Other causes:
  – Injury
    • Facial Trauma, iatrogenic Injury
  – Infection
  – Rarely affect the TMJ:
    • Synovial (osteochondromatosis
    • Pigmented villonodular synovitis (PVNS)

• The end stage of TMJ pathology will look similar in JIA, trauma, infection.
MRI Technique

• Coil selection
  – Dual surface coils
  – Multichannel Head Coil at 3T

• Scan planes / sequences
  – Axial localizer
  – Sagittal Oblique
  – Bilateral Coronal
  – Combination of T1, T2, PD, GRE
  – Open Mouth – to assess motion
  – Post Contrast Images to assess synovitis
Planning the Sagittal Oblique Plane
Planning the Sagittal Oblique Plane
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Normal Anatomy of the TMJ

- Osseous Anatomy
  - Condyle
  - Fossa
  - Temporal Tubercle
Normal Anatomy of the TMJ

- Osseous Anatomy
  - Mandibular Condyle
  - Mandibular Fossa
  - Articular Tubercle
Normal Anatomy of the TMJ

- **Osseous Anatomy**
  - Mandibular Condyle
  - Mandibular Fossa
  - Articular Tubercle

Closed Mouth
Normal Anatomy of the TMJ

- Osseous Anatomy
  - Mandibular Condyle
  - Mandibular Fossa
  - Articular Tubercle
Normal Anatomy of the TMJ

• Soft Tissue Anatomy
  – Disc
    • Posterior Band
    • Anterior Band
    • Central Intermediate Zone
    • Attachments
      – Posterior bilaminar zone
  • Normal Position
  – Normal Fibrofatty Tissue
  – Synovium

Closed Mouth
Normal Anatomy of the TMJ

- **Soft Tissue Anatomy**
  - Disc
    - Posterior Band
    - Anterior Band
    - Central Intermediate Zone
    - Attachments
      - Posterior bilaminar zone
  - Normal Position
  - Normal Fibrofatty Tissue
  - Synovium

**Closed Mouth**
Normal Anatomy of the TMJ

- Soft Tissue Anatomy
  - Disc
    - Posterior Band
    - Anterior Band
    - Central Intermediate Zone
    - Attachments
      - Posterior bilaminar zone
  - Normal Position
  - Normal Fibrofatty Tissue
  - Synovium

Closed Mouth
Normal Anatomy of the TMJ

- Soft Tissue Anatomy
  - Disc
    - Posterior Band
    - Anterior Band
    - Central Intermediate Zone
  - Attachments
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  - Normal Position
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Closed Mouth
Normal Anatomy of the TMJ

- Soft Tissue Anatomy
  - Disc
    - Posterior Band
    - Anterior Band
    - Central Intermediate Zone
    - Attachments
      - Posterior bilaminar zone
  - Normal Position
  - Normal Fibrofatty Tissue
  - Synovium

Closed Mouth
Normal Anatomy of the TMJ

- Soft Tissue Anatomy
  - Disc
    - Posterior Band
    - Anterior Band
    - Central Intermediate Zone
    - Attachments
      - Posterior bilaminar zone
  - Normal Position
    - CLOSED MOUTH
      - Posterior Band/Bilaminar at 12 o’clock
  - Normal Fibrofatty Tissue
  - Synovium

Closed Mouth
Posterior Band-Bilaminar zone junction

- 12 o’clock = Normal position
- 10° - 30° = Borderline – partial anterior displacement
- >30° = Anteriorly displaced
Normal Motion of the TMJ

Closed Mouth

Open Mouth
Normal Motion of the TMJ

Closed Mouth

Open Mouth

Condyle, Mandibular fossa, Articular Tubercle
Normal Motion of the TMJ

Closed Mouth

Open Mouth
Normal Motion of the TMJ

Closed Mouth

Open Mouth

Posterior Band, Anterior Band, Central Intermediate Zone
Normal Anatomy of the TMJ

• Soft Tissues
  – Disc
    • Normal Position
    • Attachments
      – Posterior bilaminar zone
  – Normal Fibro-fatty Tissue
  – Synovium

Open Mouth
Normal Anatomy of the TMJ

• Soft Tissues
  – Disc
    • Normal Position
    • Attachments
      – Posterior bilaminar zone
  – Normal Fibro-fatty Tissue
    • Normal enhancement
  – Synovium

Open Mouth
Normal Anatomy of the TMJ

- Soft Tissues
  - Disc
    - Normal Position
    - Attachments
      - Posterior bilaminar zone
  - Normal Fibrofatty Tissue
  - Synovium
    - Normal thin enhancement

Open Mouth
Normal Anatomy of the TMJ
Normal Anatomy of the TMJ

Mandibular fossa
Disk
Condyle
Normal Anatomy of the TMJ

Synovium

- Normal thin enhancement
TMJ Pathology

• Synovitis
• Condyle
  – Bone marrow edema
  – Erosions
  – Flattening
  – Decreased anterior translation
• Disc
  – Disc Attenuation
  – Disc displacement
    • Subluxation / Dislocation
    • +/- Relocation
12-year-old girl with JIA

Right

Left

Coronal Post-contrast
12-year-old girl with JIA

Synovial thickening and hyper-enhancement

Normal synovial enhancement
12-year-old girl with JIA

Hyper-enhancement in the bone marrow corresponding to edema-like signal on T2 FS images

Normal Marrow Signal
12-year-old girl with JIA

Right

Normal disc position

Medially subluxation of the disc

Left
Erosions

12-year-old girl with JIA

Sagittal Oblique GRE

17-year-old girl with JIA

Coronal GRE
Erosions

17-year-old girl with JIA
Anterior Disc Subluxation

16-year-old boy with JIA
Anterior Disc Subluxation

16-year-old boy with JIA
Anterior Disc Subluxation

16-year-old boy with JIA
Anterior Disc Subluxation with Recapture
Anterior Disc Dislocation

17-year-old girl with JIA
Anterior Disc Dislocation

17-year-old girl with JIA
Anterior Disc Dislocation

17-year-old girl with JIA
Anterior disc dislocation – without recapture
Decreased anterior translation of the condyle
Anterior disc dislocation – without recapture
Decreased anterior translation of the condyle
Tearing of the bilaminar zone
Summary

• Indications
  – JIA (Traumatic/iatrogenic injury, infection)

• Technique
  – Sagittal oblique and Coronal
  – Post contrast

• Normal Anatomy and Motion
  – Posterior band-bilaminar zone junction at 12 o’clock
    • >10° borderline, >30° subluxation

• Pathology
  – Synovitis
  – Erosions
  – Disc
    • Attenuation
    • Subluxation/Dislocation +/- Recapture
References


