**Temporomandibular Joint Anatomy, Kinematics/Pathology**

Julie DeVahl, PT, MS  
Assistant Professor  
Department of Physical Therapy

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**Terminology**

- TMJ  
  TemporoMandibular Joint  
- TMD  
  TemporoMandibular joint Disorders

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**Learner Objectives:**

- Describe the anatomy of the TMJ  
- Describe osteo and arthrokinematics of the TMJ  
- Define muscle function of the TMJ  
- Recognize deviations from normal function  
- Identify the classification of TMD and components of each disorder

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**Anatomy**

- Osteology  
- Musculature  
- Articular Disc  
- Ligaments  
- Innervation

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**Anatomy.TV Interactive Head and Neck Primal Pictures, Ltd.**
Function of the Pterygoids

- Lateral
- Medial

Osteokinemetics

- TMJ is a true synovial ginglymoarthorial joint.

Orthokinemetics/Arthrokinematics

- Mandibular Depression: opening the mouth in the sagittal plane
- Normal range ≥40 mm
  - >38 mm can eat normally
  - 30-38 mm can use fork
  - 20-30 mm eat pieces
  - <20 mm must push food in
  - <10 mm drinking only


Orthokinemetics/Arthrokinematics

- Mandibular elevation: closing the mouth.
- Normal: teeth to teeth occlusion in proper alignment

Orthokinemetics/Arthrokinematics

- Protrusion: anterior movement in the horizontal plane
- Normal movement is at least alignment of the central incisors, but common to see 4-6 mm.
Orthokinematics/Arthrokinematics

- Lateral deviation: side to side movement in the horizontal plane.
- Normal range: 10 mm.

Manual Therapy Considerations for the TMJ

- Two close-pack positions:
  1. Anterior close-pack = maximum opening
  2. Posterior close-pack = maximum retraction
- Open pack position = rest position
  1. Teeth slightly parted
  2. Tongue tip touching palate
  3. Lips closed

Manual Therapy Considerations for the TMJ

- Capsular pattern:
  - Limited mouth opening
  - Ipsilateral lateral deviation if one joint is more involved than the other

Summary of Combination Muscle Functions:

- Mouth opening: bilateral action of the lateral pterygoid and digastric muscles.
- Mouth closing: bilateral action of the temporalis, masseter, and medial pterygoid muscles.

Mandibular Depression and Elevation

Summary of Combination Muscle Functions:

- Lateral deviation: action of the ipsilateral masseter, and contralateral medial and lateral pterygoid muscles.
- Protrusion: bilateral action of the lateral pterygoid, medial pterygoid, and anterior fibers of the temporalis muscles.
Summary of Combination Muscle Functions:

- Retrusion: bilateral action of the posterior fibers of the temporalis muscle, the digastric, stylohyoid, geniohyoid, and mylohyoid muscles.

What is TMD?

- “TMD refers to a collection of medical and dental conditions affecting the TMJ and/or muscles of mastication, as well as contiguous tissue compromise.”
  
  John Zuniga, DMD, PhD

TMD Signs & Symptoms

- Classic Triad (Laskin 1969)
  - Pain in the muscles of mastication, the pretragal area, and/or TMJ
  - Limited and/or asymmetric mandibular movement with opening and closing
  - Joint sounds: clicking, popping, crepitus

- Associated Symptoms
  - Headache (muscular)
  - Earaches/ringing
  - Dizziness
  - Muscle hypertrophy
  - Malocclusion

Prior to a Dx of TMD consider...

- Jaw muscles
- Bone and cartilage joint structures
- Facial structures
- Soft tissue joint structures, including the articular disc and synovium
- Jaw and joint function
- Cervical and upper thoracic spine function
- Posture and dysfunction
- Systemic disease
- Psychosocial issues

What is the Prevalence of TMD?

- 60-70% of the population have at least 1 sign/symptom.
- 25% are aware of and report the sign/symptom
- 5% of these will seek intervention

What is the Prevalence of TMD?

- 15-45 years old (mean of 33 years)
- Female to male ratio ≥4:1
- Declining incidence with age
TMD Classification

- Capsulitis/Synovitis
  - Inflammatory condition of the articular capsule and soft tissues surrounding the TMJ
- Causes
  - Microtrauma from parafunctional habits
  - Macrotroama from a blow to the jaw or post-op TMJ

S&S of Capsulitis/Synovitis

- Pain at rest
- Pain with palpation: lateral and/or posterior joint
- Pain with loading: chewing and biting on contralateral side
- Pain with accessory motion testing
- Effusion on MRI

TMD Classification

- Capsular Fibrosis
  - Hypomobility due to adhesions
- Causes
  - Chronic inflammation
  - Trauma
  - Immobilization
  - Anterior disc displacement without reduction

S&S of Capsular Fibrosis

- Limited AROM
  - Mandibular depression <25 mm with deviation toward affected side
  - Protrusion toward affected side
  - Lateral deviation to opposite side limited
- Hypomobility on accessory motion testing
- No joint sounds, not painful if capsule is not stretched

TMD Classification

- Masticatory Muscle Disorders
  - Painful guarding of muscles of mastication
  - May progress to temporalis tendinitis
  - Referred pain patterns

S&S of Masticatory Muscle Disorders

- Pain with palpation of muscles
- Pain with biting on affected side
- Parafunctional oral behaviors
- Unable to control trajectory of mandible during opening/closing without joint sounds
TMD Classification

- **Hypermobility**
  - Mandibular depression >40 mm
  - End range opening click/thud
  - May not be symptomatic

- **Causes**
  - **Subluxation**: excessive opening when yawning, eating, or dental procedures

- **Hypermobility**
  - Mandibular depression >60 mm

- **Causes**
  - **Dislocation (open lock)**: trauma or recurrent and chronic

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S&S of Hypermobility

- Excessive mandibular depression
- Joint sound (click or thud) at end range of opening with deviation toward unaffected side
- Hypermobility noted with accessory motion testing

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TMD Classification

- **Anterior Disc Displacement with Reduction**
  - May be progression of hypermobile joint
  - Disc is displaced anteriorly at rest
  - Reciprocal click
  - Deviation toward involved side initially
  - Normal mandibular depression range

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S&S of Anterior Disc Displacement with Reduction

- Reciprocal joint sound with opening and closing
- Deviation (C curve) with opening
- Full AROM (unless associated with capsulitis, muscle guarding)
- Secondary muscle pain
TMD Classification

- Anterior Disc Displacement without Reduction (Closed Lock)
  - Progression of anterior disc displacement with reduction
  - History of clicking and popping, but no longer present
  - When acute, opening limited to 25mm because no translation is available

S&S of Anterior Disc Displacement Without Reduction (Closed Lock)

- Limited AROM
  - Mandibular depression <25 mm with deviation toward affected side
  - Protrusion toward affected side
  - Lateral deviation to opposite side limited
- History of joint sounds
- Hypomobility with accessory motion testing
- When the condition is chronic, posterior ligament and capsular tissues may be stretched to allow near normal movement.

S&S of Osteoarthritis

- Pain with palpation
- Limited opening
- Crepitus
- Radiographic evidence

TMD Classification

- Osteoarthritis
  - Non-inflammatory degeneration
    - Articular tissues
    - Subchondral bone
    - Osteophyte formation
  - Tends to be self-limiting

Other Conditions with TMJ Involvement

- Rheumatoid Arthritis
  - Juvenile RA
  - Infectious
  - Lymes disease
  - Psoriatic
- Bony Ankylosis
- Fibrous Ankylosis
Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD)

- http://www.rdc-tmdinternational.org/
- Lack of standardized diagnostic criteria for defining clinical subtypes of TMD
- Interdisciplinary, operational definitions, specific exam methods with reliability of measurements
- Dual axis system:
  1. Physical Diagnosis/Clinical TMD Conditions
  2. Psychological distress and dysfunction

RDC/TMD: Axis I

Group I: Muscle disorders
  I.a. Myofascial Pain
  I.b. Myofascial Pain With Limited Opening

RDC/TMD: Axis I

Group II: Disc Displacements
  II.a. Disc Displacement With Reduction
  II.b. Disc Displacement Without Reduction, With Limited Opening
  II.c. Disc Displacement Without Reduction, Without Limited Opening

RCD/TMD: Axis II

Group III: Arthralgia, Arthritis, Arthrosis
  III.a. Arthralgia
  III.b. Osteoarthritis of the TMJ
  III.c. Osteoarthrosis of the TMJ

Jaw Disability Checklist

What activities does your present jaw problem prevent or limit you from doing?

<table>
<thead>
<tr>
<th>Activity</th>
<th>No</th>
<th>Yes</th>
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<tbody>
<tr>
<td>Chewing</td>
<td></td>
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<tr>
<td>Drinking</td>
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<td>Exercising</td>
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<tr>
<td>Eating hard foods</td>
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<tr>
<td>Eating soft foods</td>
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<tr>
<td>Smiling/laughing</td>
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<tr>
<td>Sexual activity</td>
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<tr>
<td>Cleaning teeth or face</td>
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<tr>
<td>Yawning</td>
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<tr>
<td>Swallowing</td>
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<tr>
<td>Talking</td>
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<tr>
<td>Having your usual facial appearance</td>
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General Principles/Treatment Philosophy

- TMD cannot be "cured"
- TMD has a good long term prognosis
- Most patients improve in the first 6-8 weeks
- Patients who do not respond to treatment within 1 year have a poor short term prognosis

Summary

- Understanding of the unique anatomy of the TMJ
- Appreciate the multifactorial nature of the disorder
- Good prognosis for the majority of patients

References