Arthrogenous disorders of the TMJ

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Which of the following represents an arthrogenous disorder?

- Pain in the masseter muscle
- An electric shock-like pain around tooth #30
- A throbbing pain around the left eye
- Crepitus and pain around the left TMJ

75 yo female presents with pain on the left side

Review of Systems and Health HX:
- Frequent urination
- Poor digestion
- Stomach gas
- Heartburn problems
- Insomnia
- Low energy
- Chronically tired
- Osteoarthritis
- Poor circulation
- Wears glasses
- Cancer (skin cancer; both legs)
- Overweight
Arthritic disorders

1. Arthralgia/Capsulitis
2. Localized osteoarthritis
3. Polyarthritis
4. Synovial chondromatosis
5. Chronic pain associated with TMJ dysfunction and joint arthrosis
6. Idiopathic condylar resorption

Arthralgia

- Painful joint without osseous changes
- Presence of joint tenderness to palpation
- Other terms: capsulitis, synovitis, retrodiscitis, joint effusion

Localized osteoarthritis

- Clinical features: arthralgia, crepitus
- Often presents unilaterally
- Imaging findings: degenerative joint changes
- Decreased joint space
- Flattening of the articulating surfaces
- Bony spurs
- Sclerosis
- Erosive bony lesions
- High suspicion in patients >50 years
Case: Musculoskeletal Exam

Muscles

<table>
<thead>
<tr>
<th></th>
<th>R</th>
<th>L</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anterior temporalis</td>
<td>3</td>
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<tr>
<td>Posterior temporalis</td>
<td>0</td>
<td>0</td>
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<tr>
<td>SCM</td>
<td>3</td>
<td>3</td>
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<tr>
<td>Scalene</td>
<td>3</td>
<td>3</td>
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<tr>
<td>Occipital nerve</td>
<td>3</td>
<td>3</td>
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<td>Splenius capitus</td>
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<td>3</td>
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<tr>
<td>Rectus capitus</td>
<td>3</td>
<td>3</td>
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<tr>
<td>Upper trap</td>
<td>3</td>
<td>3</td>
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<tr>
<td>Lateral capsule</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Dorsal capsule</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Temporalis Tendon</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>

Case: Exam Findings

Range of Motion:
- Comfort Opening: 23 + 5 mm
- Passive Opening: 30mm (w/pain on L TMJ)
- Opening Path: straight
- RT lateral: 8mm (w/pain on L TMJ)
- LFT Laterotrusive: 10mm (w/pain on L TMJ)
- TMJ Noise Dysfunction: Crepitus on the left

Generalized osteoarthritis

- Primary vs. Secondary
  - Primary: idiopathic, genetic
  - Secondary: osteoarthritic changes caused by other disorders
- Heberdon's nodes
Osseous Component (CT/CBCT):
What do we look for?

Condylar features

- Articular surface flattening
- Subcortical sclerosis
- Subcortical cyst
- Osteophyte
- Deviation in form
- Condylar hypoplasia

Condylar position

- Concentric position with normal joint space
- Concentric position with decreased joint space
- Anterior position
- Posterior position

Fossa/eminence features

- Articular surface flattening
- Subcortical sclerosis
- Surface erosion


No Osteoarthritis

<table>
<thead>
<tr>
<th>Indeterminate for Osteoarthritis</th>
<th>Osteoarthritis</th>
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</thead>
<tbody>
<tr>
<td>Normal size of condylar head PLUS</td>
<td>No subcortical sclerosis or articular surface flattening PLUS</td>
</tr>
<tr>
<td>Subcortical sclerosis with or without articular surface flattening OR</td>
<td>Articular surface flattening with or without subcortical sclerosis PLUS</td>
</tr>
<tr>
<td>No deformation from subcortical cyst, surface erosion, osteophyte, or generalized sclerosis</td>
<td>No deformation from subcortical cyst, surface erosion, osteophyte, or generalized sclerosis</td>
</tr>
</tbody>
</table>
Case: Imaging Findings

49 yo female with left-sided pain

HPI:
- 14-year history of left-sided TMJ pain
- Prior treatments: multiple steroid joint injections, TMJ surgery
- Persistent pain
- Was told she had “arthritis” in the TMJ
- Hurts to even brush her hair on that side

Physical exam
- Range of motion:
  - Comfort: 22 mm
  - Passive: 39 mm, pain on left TMJ, soft-end feel
  - Lateral movements: R: 7 mm, L: 9 mm
  - Straight opening path
- Intraoral exam:
  - Generalized moderate dental attrition
- Occlusal exam:
  - Heavier contacts on the left posterior teeth
- Joint noises
  - Crepitus, L TMJ
  - Allodynia L TMJ area
  - All palpations were severe
Intraoral Light touch: L V2 and V3: reduced sensation
Pin Prick: L V2 and V3: reduced sensation

Extraoral Light touch: L V1 reduced sensation
Pin prick: L V1: reduced sensation
L V2: Hyperalgesia

Radiographic Exam

Diagnoses
- Arthralgia
- Degenerative joint disease
- Myofascial Pain
- Possible neuropathic component

Any underlying etiology?
Polyjoint arthritis

- Manifests as swelling and disability in multiple body joints
- Various types: rheumatoid, osteoarthritis, psoriatic, lupus, gout, and pseudogout
- May have clear hematologic markers
- Polyjoint osteoarthritis is the most common of the rheumatic diseases

Rheumatoid arthritis (RA)

- Chronic, systemic, autoimmune and inflammatory disorder
- Joint inflammation, erosive properties, symmetric joint involvement
- Can affect other organ systems
- Serologic markers:
  - Rheumatoid factor
  - Erythrocyte sedimentation rate
  - Anti-CCP antibodies
- Genetic component

Rheumatoid arthritis and the TMJs

- The TMJ is one of the last joints affected by RA (generally)
- Affected in >50% of adults and children with RA
- Symptoms:
  - Dull, aching pain with function
  - Joint edema
  - Limited mandibular range of motion
  - Anterior open bite
  - Stiffness
Synovial Chondromatosis

- Affects synovium
- 3 stages: a) early, b) transitional, c) late
- Usually affects one joint
- Tx: remove loose bodies, partial or complete synovectomy
53 yo female presents with left-sided ear and TMJ pain

Pain History:
Onset: 2+ years ago
Location: left ear and TMJ area
Quality: sharp, stabbing, accompanied by “ear stuffiness”
Frequency: a few times per week, 10-20 episodes per day
Attack duration: a few seconds
Severity of Pain: 7/10
Ameliorating factors: ibuprofen
Factors that made pain worse: lying down
Associated symptoms: “crunchy sounds” in the left TMJ area
Surgical procedure: Left TMJ arthroplasty with removal of benign tumor by the oral and maxillofacial surgeon. Post-operative healing was excellent. Photo taken 3 months post-op.

70 yo female with pain on the left

<table>
<thead>
<tr>
<th>Onset</th>
<th>4-5 years ago</th>
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<tbody>
<tr>
<td>Location</td>
<td>Left joint</td>
</tr>
<tr>
<td>Quality</td>
<td>Throbbing</td>
</tr>
<tr>
<td>Frequency</td>
<td>Daily</td>
</tr>
<tr>
<td>Attack duration</td>
<td>Almost all day</td>
</tr>
<tr>
<td>Severity</td>
<td>5/10</td>
</tr>
<tr>
<td>Remedializing factors</td>
<td>None</td>
</tr>
<tr>
<td>Associated symptoms</td>
<td>Headaches, neck pain, ear pain, jaw popping</td>
</tr>
</tbody>
</table>
Chronic pain associated with TMJ dysfunction and joint arthrosis

Peripheral and central sensitization of afferent nerves

Increased sensitivity to tactile and pin-prick stimuli

Lower pressure thresholds on the TMJ

Idiopathic condylar resorption

- Localized condition affecting the jaw joints
- Commonly found in teenage girls
- Biology is poorly understood
- Need to rule out local and systemic etiologies
- Causes mandibular condylar resorption
  - Loss of vertical dimension of the condyle
  - Anterior open bite/occlusal dysfunction
  - TMJ pain and dysfunction
Idiopathic condylar resorption

Right 13.5 MM ON RT
Left 9.3 MM ON LEFT

15 yo girl referred by ortho for occlusal change

- 1 year ago, developed a bite change
- Ortho was completed at age 12

<table>
<thead>
<tr>
<th>Onset</th>
<th>3 years ago</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location</td>
<td>Right side</td>
</tr>
<tr>
<td>Quality</td>
<td>Achy</td>
</tr>
<tr>
<td>Frequency</td>
<td>Varies from weekly to daily</td>
</tr>
<tr>
<td>Attack duration</td>
<td>Hours</td>
</tr>
<tr>
<td>Severity</td>
<td>2-3/10</td>
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<tr>
<td>Ameliorating factors</td>
<td>Not moving her jaw</td>
</tr>
<tr>
<td>Exacerbating factors</td>
<td>Cheering, yawning, talking</td>
</tr>
<tr>
<td>Associated symptoms</td>
<td>Headaches, neck pain, bite change, jaw popping, locking</td>
</tr>
</tbody>
</table>
Exam

Tenderness to palpation: severe on dorsal aspect of condyles

Range of Motion:
- Comfort Opening: 62 + 3 mm
- Passive Opening: 63mm no pain
- RT Laterotrusive: No Pain 12mm
- LFT Laterotrusive: No Pain 12mm
- Midline: WNL mm
- Opening Path: straight

TMJ Noise Dysfunction: right side early opening

Photos courtesy of Dr. Jennifer Mirabelli, Phoenix, Arizona

Imaging
Treatment

- NO RCTs identifying treatments for ICR
- Multifactorial treatments (depends on symptom severity)
  - Orthotics
  - Arthrocentesis, Arthroscopy
  - Condylar replacement: costochondral graft
  - Orthognathic surgery

Questions?
My Jaw Hurts! What do I do?
An Overview of Diagnostic Techniques, Examination, and Management Strategies in Orofacial Pain

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DIPLOMATE, AMERICAN BOARD OF ORAL MEDICINE
DIPLOMATE, AMERICAN BOARD OF OROFACIAL PAIN

1. Pain mechanisms

Muscles of mastication

1. Masseter
2. Temporalis
3. Medial pterygoid
4. Lateral pterygoid
5. Digastric

Jaw closers
Jaw opening

Protrusion, mediolusive movement
Diagnostic categories

1. Internal derangements
2. Arthrogenous
3. Myogenous

1. Internal Derangements

1. Arthralgia/Capsulitis
2. Localized osteoarthritis
3. Polyarthritis
4. Synovial chondromatosis
5. Chronic pain associated with TMJ dysfunction and joint arthropathy
6. Idiopathic condylar resorption
3. Myogenous Disorders

A. Localized myalgia
B. Myofascial pain
C. Myofascial pain with referral
D. Tendonitis
E. Myositis
F. Spasm
G. Contracture
H. Hypertrophy
I. Neoplasm
J. Movement disorders
K. Masticatory muscle pain attributed to systemic/central pain disorders


History and clinical examination

The Medical Interview

Chief Complaint
History of Present Illness
Medical and Dental Hx
Psychosocial History
Review of Systems
History of present illness: TMJ/Facial Pain

Key Questions
- Onset
- Location
- Quality
- Pain behavior
- Intensity
- Frequency
- Duration
- Modifying factors: ameliorating?
- Exacerbating?
- Associated symptoms?
- Prior treatments? Imaging?

History of present illness: Headaches

Key Questions
- History of aura?
- Presence of photophobia and/or photophobia?
- Presence of nausea or vomiting?
- Unilateral? Bilateral?
- Pulsating? Non-pulsating?
- Aggravated by physical activity?
- Any autonomic features?
- Red flags?

Snoop4 red flags

- S: systemic/secondary factors
- N: neurological signs/symptoms
- O: onset
- O: older age of onset (>50 years)
- P: prior headache history
- New or different headache?
1. Systemic symptoms/signs
   - Is there any history of fever, chills, night sweats, myalgias, weight loss?
   - Possible secondary causes of this: giant cell arteritis, infection, malignancy.

1. Systemic Disease
   - Does the patient have any of the following in their medical history? malignancy, immunocompromised state, HIV
   - Possible secondary causes: metastatic disease, opportunistic CNS infection

2. Neurological symptoms/signs
   - Is the patient experiencing: focal or global neurological symptoms or signs including changes in behavioral or personality?
   - Possible secondary causes of this: Neoplastic, inflammatory, infectious, vascular CNS disease

3. Onset (sudden)
   - "How quickly did you pain for from 0/10 to 10/10?"
   - Possible secondary causes of this: Vascular crises (stroke, subarachnoid hemorrhage, cerebral venous sinus thrombosis, reversible cerebral vasoconstriction syndrome, arterial dissection)

4. Onset (after age 50)
   - Possible secondary causes: Neoplastic, inflammatory, infectious CNS disease, giant cell arteritis
Snoop4 red flags

5. Pattern change
- Progressive headache
- Precipitated by valsava maneuver
- Postural aggravation
- Papilledema

The Medical Interview

Chief Complaint
History of Present Illness
Medical and Dental Hx
Psychosocial History
Review of Systems

Family History
Social History
Work
Stress level
Emotional stability
Sleep quality
Habits
Disability/Litigation
Prior diagnostic tests

Review of Systems

- Constitutional Symptoms (e.g. Fever, Weight loss)
- 1) Head, Eyes, Ear, Nose, And Throat (HEENT)
- 2) Stomatognathic, 3) Cardiovascular
- 4) Gastrointestinal, 5) Genitourinary
- 6) Musculoskeletal, 7) Integumentary (Skin)
- 8) Neurologic/Psychiatric, 9) Endocrine
- 10) Respiratory, 11) Immunologic, 12) Hematologic
58 yo male presents with severe pain in the right ear
Onset: 3 months ago

CC: "I have severe pain in the area I had an extraction in 2 months ago...

Ocular pain
Photosensitivity...
61 yo male presents with sharp, shooting, burning pain

- Pain began after a dental extraction
- Lower left

Set up

- General appearance
  - Alert? Oriented? In any distress?
- Communication ability
- Extraoral exam of head and neck soft tissues
  - Any asymmetry?
- Exam of jaw/facial/cervical glands:
  - Lymph node examination
  - Salivary gland examination
  - Thyroid gland examination
Physical Exam

- Exam of neck
- Cervical range of motion
- Altered hand/arm sensations
- Crepitation
- Exam of digits/wrist/nails

Physical Exam

- Palpation of the TMJs:
  - Lateral pole
  - Dorsal pole
  - 2.2 lbs/1kg of pressure

Physical Exam

- Palpation of masticatory and cervical muscles:
  - 4.4 lbs/2 kg of pressure, hold for 1-2 seconds
  - Check for tenderness and taut bands
  - Evaluate for trigger points
  - Hold for 3-5 seconds to check for referral
Physical Exam

- Muscle palpations:
  - Superficial masseter
  - Deep masseter
  - Anterior temporalis
  - Posterior temporalis
  - Temporalis Tendon
  - Sternocleidomastoid
  - Trapezius
  - Medial Pterygoid
  - Lateral Pterygoid
  - Digastric muscle

Musculoskeletal examination

- Anterior and Posterior Digastric Muscles
- 4 lbs of pressure

Physical Exam

- Exam TMJ for joint sounds
  - Palpation
  - Auscultation

Typical joint sounds: clicking, crepitus
Physical Exam

- Inspection of teeth, alveolar bone
- Inspection of oral and pharyngeal tissues
- Lesion description:
  - Location, color, appearance, border
  - Palpation, relationship to adjacent structures

Physical Exam: Range of Motion

- Pain-free opening
- Active opening
- Passive opening: 1 kg of pressure, only perform if active opening ≤ 40 mm
- Normal range of motion: 40-60 mm
- Lateral movements normal range is 5-10 mm
- Protrusion
  - Note any deviations, deflections

Physical Exam

- Occlusal exam
  - Dental symmetry
  - Fremitus
  - Attrition
    - 0=no wear, 1=enamel wear only, 2=enamel wear with dentin exposure (<1/3 of clinical crown lost), 3=enamel wear with dentin exposure (>1/3 of clinical crown lost)
  - Erosion/abrasion/abrasion
  - Posterior tooth contact
  - Overbite/overjet
Physical Exam

- Clenching signs
- Scalloped tongue
- Indentations in buccal mucosa
- Major malocclusion

Cranial Nerves

I: Olfactory
- Smell
- Little information obtained from testing sense of smell
- Often omitted

II: Optic
- Vision, pupil reactivity to light and vision
- Near visual acuity, peripheral vision

III: Oculomotor
- Eyelid elevation, pupil size and reactivity

IV: Trochlear
- Downward and lateral movement of the eye

V: Trigeminal
- Sensory and motor, 3 branches

VI: Abducens
- Lateral movement of the eye
Cranial Nerve Exam

- VII: Facial
  - Facial expression, eyelid and lip closure
  - Corneal reflex
  - Taste
- VIII: Vestibulocochlear
  - Hearing and equilibrium
  - Gustatory (taste)
- IX: Glossopharyngeal
  - Gagging, swallowing
  - Taste
- X: Vagus
  - Gagging, swallowing
  - Phonation
- XI: Spinal accessory
  - Shoulder movement
  - Head rotation
- Hypoglossal
  - Tongue movement
  - Speech

Diagnostic Tests in Orofacial Pain

- Thorough history
- Physical examination
- Radiographic examination
  - MRI (soft tissue)
  - Panoramic, Cone Beam CT (hard tissue)
- Nerve blocks
- Medications
- Trigger point injections
- Laboratory examination
Limited opening of the jaw

Muscle vs. Joint

1) Passive stretch test
   - Apply ice or ethyl chloride spray
2) Stretch localization

3) Joint anesthesia mobilization
   - Must have image of the joint
   - Use 2% xylocaine without epinephrine
   - Mobilization is only successful if the limited opening is acute

Imaging Modalities: Hard tissue

1) Periapical films
2) Panoramic film
3) Cone beam CT
Imaging Modalities: Soft Tissue

- MRI
  - Closed lock
  - Soft tissue pathology
  - Salivary glands

Hypermobility

- Beighton’s hypermobility score: total of 9
- Threshold ranges from 4-6
- Benign joint hypermobility syndrome: 4 or greater + arthralgia >3 months in 4 or more joints

Referred pain

- Spray and stretch
- Trigger point injection
Diagnostic Anesthesia

- Nerve blocks
  - Trigeminal
  - Supraorbital
  - Infraorbital
  - Greater occipital
- May apply topical anesthetic to an intraoral trigger zone

Topical anesthetic testing

- 3 applications (at 1-2 min intervals), pain goes from 2-3/10 to 0/10

Local nerve block test

- IA/L nerve block with 2% lidocaine, 1:100,000 epi
Laboratory Testing

- CBC with differential and platelet count
- Comprehensive metabolic panel
- Renal function
- Liver function
- Rheumatologic markers
  - Antinuclear antibodies
  - Rheumatoid factor
  - Erythrocyte sedimentation rate
  - C-reactive protein
  - Anti-SS-A and Anti-SS-B

Questions?
11 yo girl presents with painful clicking and locking

<table>
<thead>
<tr>
<th>Trait</th>
<th>3 months ago</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location</td>
<td>Left joint</td>
</tr>
<tr>
<td>Quality</td>
<td>Sharp initially, then a dull ache</td>
</tr>
<tr>
<td>Frequency</td>
<td>Daily</td>
</tr>
<tr>
<td>Attack duration</td>
<td>5 minutes</td>
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<tr>
<td>Severity</td>
<td>5/10</td>
</tr>
<tr>
<td>Ameliorating factors</td>
<td>Keeping the mouth closed</td>
</tr>
<tr>
<td>Exacerbating factors</td>
<td>Chewing</td>
</tr>
<tr>
<td>Associated symptoms</td>
<td>Symptoms are worse in the mornings, associated with intermittent locking</td>
</tr>
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</table>

TMD

Myogenous disorders

Joint disorders

Internal derangements
Joint Disorders

Internal Derangements

Subluxation/Luxation

Arthrogenous

Disc displacement with reduction

Disc displacement with reduction, with intermittent locking

Disc displacement without reduction, with limited opening

Disc displacement without reduction, without limited opening

Arthralgia

Localized osteoarthritis

Systemic arthritides

Diagnostic criteria: Disc displacement with reduction

1) History: + for at least 1 of the following:
   - In the last 30 days, any TMJ noise(s) present with jaw movement or function OR
   - Patient report of any noise present during the exam

2) Exam:
   - Clicking, popping, snapping noise during both opening and closing movements detected with palpation during one of or 2 repetitions of jaw opening and closing
   - Clicking, popping, snapping noise detected with palpation during one of 3 repetitions of jaw opening and closing AND clicking, popping, snapping noise detected with palpation during one of 3 repetitions of right or left lateral, or protrusive movement(s)

Validity (without imaging): sensitivity 0.34 and specificity: 0.92

Imaging is the reference standard for this diagnosis


Disc displacement with reduction

Types of disc displacement:

A. Anterior
B. Antero-medial
C. Antero-distal
D. Lateral
E. Medial
F. Posterior
Examination: Disc displacement with reduction

- Palpation (light pressure)
  - Note the timing of the joint movement interference relative to mouth opening
    - During opening or closing motion
    - Early, middle late

- Auscultation

- Opening path


11 yo girl: Exam findings

<table>
<thead>
<tr>
<th>Palpations</th>
<th></th>
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<tbody>
<tr>
<td>Lateral capsule R</td>
<td>2</td>
</tr>
<tr>
<td>Lateral capsule L</td>
<td>3</td>
</tr>
<tr>
<td>Dorsal capsule R</td>
<td>2</td>
</tr>
<tr>
<td>Dorsal capsule L</td>
<td>3</td>
</tr>
<tr>
<td>Superficial masseter R</td>
<td>1</td>
</tr>
<tr>
<td>Superficial masseter L</td>
<td>1</td>
</tr>
</tbody>
</table>

Pain on the left with right lateral movement

ROM:
- Comfort and passive: 45 mm
- Lateral: 7 mm bilaterally
- Deviates to the left on opening

TMJ dysfunction: early opening click on the left

Diagnostic criteria: Disc displacement with reduction with intermittent locking

1. History: positive for both of the following:
   - In the last 30 days, any joint noise(s) present with TMJ movement or function OR
   - Patient report of any noise present during the exam; AND
   - In the last 30 days, the jaw locks with limited mouth opening, even for a moment, and then unlocks

AND

2. Exam: positive for at least ONE of the following:
   - Clicking, popping, snapping noise during both opening and closing movements detected during opening and closing OR
   - Clicking, popping, snapping noise detected during opening and closing AND
   - Clicking, popping, snapping noise detected during right or left lateral, or protrusive movement(s)

Validity (without imaging): sensitivity: 0.38 and specificity: 0.98

11 yo girl presents with painful clicking and locking

**Diagnosis:** disc displacement with reduction with intermittent locking

Onset: 3 months ago
Location: Left joint
Quality: Dull ache
Frequency: Daily
Attack duration: 5 minutes
Severity: 5/10
Ameliorating factors: Keeping the mouth closed
Exacerbating factors: Chewing
Associated symptoms: Symptoms are worse in the mornings. Associated with intermittent locking

**Diagnostic criteria: Disc displacement without reduction with limited opening**

1. History: positive for both of the following:
   1. Jaw locked so that the mouth would not open all the way AND
   2. Limitation in jaw opening severe enough to limit jaw opening and interfere with inability to eat

2. Exam: positive for the following:
   1. Maximum assisted opening (passive stretch) including vertical incisal overlap <40mm

Validity (without imaging): sensitivity: 0.80 and specificity: 0.97


**Examination: Disc displacement without reduction with limited opening**

1. Maximum assisted opening (passive stretch) including vertical incisal overlap <40mm
2. Deflection to the locked side upon opening
3. Lateral movement will be reduced to contralateral side
4. Palpate the condyles to check for translation
Other causes of joint-related limited opening

- Disc perforation
- Condyle or disc deformation
- Disc-articular surface adhesion

Diagnostic criteria: Disc displacement without reduction without limited opening

1. History: positive for both of the following:
   1. Jaw locked so that the mouth would not open all the way AND
   2. Limitation in jaw opening is not severe enough to limit jaw opening and interfere with ability to eat

AND

2. Exam: positive for the following:
   1. Maximum assisted opening (passive stretch) including vertical incisal overlap ≥40mm

Validity (without imaging): sensitivity: 0.54 and specificity: 0.79

Diagnostic criteria: subluxation/luxation

1. History: positive for both of the following:
   1. In the last 30 days, jaw locking or catching in a wide open mouth position even for a moment, resulting in an inability to close from the wide-open position AND
   2. Inability to close the mouth from a wide-open position without a self-maneuver

2. Exam: not required but...
   1. There is an inability to return to a normal closed mouth position without the patient performing a manipulative maneuver

Validity (without imaging, based on hx only; for subluxation only): sensitivity: 0.98 and specificity: 1.00


Subluxation

- Other terminology:
  - Condyle dislocation
  - True dislocation is rare
  - Condyle undergoes excessive translation
- Needs manual manipulation to reduce the jaw to its normal position
- Causation: trauma (intubation), usually occurs in frail elderly

56 yo patient locks during the dental visit

The patient is referred to you for evaluation of an open lock that occurred 15 minutes ago in the dental chair, during a restorative procedure.

The patient is NOT in pain.
There is NO prior history of TMJ clicking.

The patient is thin, frail, has a comfort opening >60 mm
Open locking

- More common than a true dislocation
- Usually able to self-reduce

Causation:
- Disc “jamming” anterior to the crest of the articular eminence due to jaw-closing muscle tetanus
- Jaw opening for an extended period of time (yawning, long dental procedure)

Posterior disc displacement

- Partial open locking
  - Inability to close their jaws after opening but the condyle is NOT anterior to the articular eminence
  - “I can’t close my teeth together”

Imaging for disc displacements: MRI

<table>
<thead>
<tr>
<th>Normal Disc Position</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sagittal plane:</strong> between 11:30 and 12:30 clock positions</td>
</tr>
<tr>
<td>Sagittal plane: intermediate zone is between anterior-superior aspect of condyle and posterior-inferior aspect of the eminence</td>
</tr>
<tr>
<td>Oblique coronal plane: disc is centered between the condyle and the eminence in the medial, central, and lateral aspects</td>
</tr>
</tbody>
</table>

Ahmad et al. 2009
Imaging for disc displacements: MRI

Disc Displacement
Sagittal plane: disc is positioned anterior to the 11:30 position PLUS
Sagittal plane: intermediate zone of the disc is positioned anterior to the condyle OR
Coronal plane: disc is not centered between the condyle and eminence in either the medial or lateral part.

Ahmad et al, 2009

Imaging for disc displacements: MRI


Etiology of internal derangements
- 1. Elongated lateral collateral ligament,
- 2. Hypermobility/Joint laxity
- 3. Articular surface abnormality
- 4. Disc-articular surface adherence
- 5. Disc perforation
- Macrotrauma
  - Sudden force resulting in structural alterations
- Microtrauma
  - Small force that is repeatedly applied to the structures over a long period of time.
Evolution of internal derangements

- Disc displacement
- Disc perforation
- Degenerative joint disease

Do asymptomatic joint sounds progress?

1) Greene CS et al. 1982: 100 patients with clicking, 5.2 years
   - Tx: conservative therapy for masticatory muscle disorders
   - 38% no longer had joint sounds, 1 had increased joint pain
2) Bush and Carter 1983: 35 dental students had joint sounds, 65 didn't
   - 11/35 still had them 3.2 years later; 43/65 developed joint sounds

3) Magnusson et al. 1986: 72 joint sounds in a 15-ya population (35 subjects; 38 subjects without joint sounds
   - No tx: 16/28 no longer had them at age 20
   - 19/38 developed joint noises by age 20
   - Joint sounds come and go and usually unrelated to major masticatory symptoms
4) Kononen et al. 1996: 128 young adults, observed over 9 years (ages 14, 16, 18, and 22)
   - Increase in clicking with age (11% to 34%)
   - No predictable pattern
   - No relationship between clicking and progression to locking
Do asymptomatic joint sounds progress?

- de Leeuw et al. 1994: 30 years after nonsurgical management of intracapsular disorder
  - 54% had persistent joint sounds
  - None had discomfort or dysfunction from the joint condition
- 7-9% of joint sounds progress
- Studies evaluating treatment of joint sounds have shown that many return over time
- Conclusion: TMJ naturally adapts over time; an asymptomatic click does not require treatment

Do asymptomatic joint sounds progress?


1) In most patients, a disc displacement with reduction is a stable joint condition.

2) In those with intermittent locking, there is a higher risk of the disc losing its ability to reduce

3) The lack of disc reduction is only rarely associated with typical signs and symptoms of a closed lock.

4) In patients with symptomatic disc displacement without reduction, the signs and symptoms have a tendency to disappear despite the persistence of a non-reducing disc.
Patient adaptability

- Biological: Diet, hormones, emotional stress, sleep, physical conditioning
- Demographic: Gender, demographics, age

Associated symptoms

- Joint Pain: Arthralgia or Capsulitis
  - Periarticular tissues contain nociceptors: discal ligaments, capsular ligaments, and retrodiscal tissues
  - Stimulation of these nociceptors creates inhibitory action in the muscles that move the mandible (protective co-contraction)
- Dysfunction:
  - Clicking
  - Closed lock
  - Dislocation
- Protective muscle co-contraction

Thank you
My Jaw Hurts! What do I do? An Overview of Orofacial Pain and Temporomandibular Joint Disorders, Pain Mechanisms, and Diagnosis

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What types of conditions are orofacial pain disorders?

**Odontogenic pain**
- Pulpitis
- Dental abscess
- Cellulitis
- Periodontitis

**Musculoskeletal Pain**
- Joint disorder
- Muscular disorder

**Neuropathic Pain**
- Trigeminal Neuralgias
- Painful post-traumatic trigeminal neuropathy

**Neurovascular Pain**
- Migraine

---

Course objectives

1) How to recognize and screen patients with orofacial pain and dysfunction, including temporomandibular joint disorders.
2) The underlying pain mechanisms and dysfunction of the orofacial structures.
3) How to make common orofacial pain diagnoses.
4) The relationships between orofacial pain disorders, headaches, and cervical pain.
Course Outline

1) Terminology and pain mechanisms
2) Internal derangements
3) Arthrogenous Disorders
4) Myogenous Disorders

What is oral health?

“Oral health is multi-faceted and includes the ability to speak, smile, smell, taste, touch, chew, swallow and convey a range of emotions through facial expressions with confidence and without pain, discomfort and disease of the craniofacial complex.”


Framework for the definition of oral health
Orofacial pain

Musculoskeletal

Neuropathic

Neurovascular

UNDERSTAND FIRST, TREAT SECOND

Definitions...

True or False:
Temporomandibular Disorder (TMD) is an appropriate diagnosis.

What are the common symptoms associated with "TMD"?

Common complaints: jaw pain, ear ache, headache, facial pain, bruxism

1) 57 yo female: “My ears hurt and feel full”

1) Ear pain
2) Ear ringing
3) Headaches
4) Jaw pain
5) Ear fullness
6) Facial pain

Prior consultations:
ENT, Dentist, Endodontist, PCP
2) 80 yo female with a persistent toothache

- #31 aching pain since the last 6 months
- Sharp when biting down
- 2) Headache
- 3) Neck pain
- 4) Ear fullness and ringing
- 5) Facial pain
- 6) Tingling of the tip of the tongue

Prior consultations: Dentist, Endodontist, Periodontist, PCP

3) 65 yo female with severe pain on the upper right and lower right teeth

- Pain began 6 months prior to initial visit
- Poorly localized pain on the right side
- Feels sharp and achy
- Has severe pain on the TMJs and masticatory muscles

General symptoms of “TMD”
So what does this all mean?

- 1 in 6 patients visiting a general dentist experienced orofacial pain
- Dentoalveolar and musculoligamentous were the most prevalent types of pain


Costen syndrome

- Suggested changes in the dental condition caused ear symptoms
- His theories have now been disproved
- Initiated the dental community’s interest in understanding the orofacial system

Terminology and classification

1934: Costen Syndrome
1959: Temporomandibular dysfunction syndrome (Shore)
1969: Myofascial pain dysfunction syndrome (Laskin)
1971: Functional temporomandibular joint disturbances (Ramfjord and Ash)
1982: Temporomandibular disorders (Bell)
1988: IHS-11th category: headache of facial pain attributed to disorder of cranial, neck, eyes, ears, nose, sinuses, teeth, mouth, or other facial or cranial structures
1992: Research diagnostic criteria for TMD (Dworkin & LeResche)
1996: AAOP provided diagnostic criteria and subcategories

Photo credit: Dr. Gaetano Meli TMJ Pain and Neuropathic Pain in Patients with Temporomandibular Joint Disorder (http://slideplayer.com/slide/9173647/)

Photo credit: Dr. Gustafson (TMJ Pain and Neuropathic Pain in Patients with Temporomandibular Joint Disorder (http://slideplayer.com/slide/9173647/)}
According to the RDC/TMD, temporomandibular disorders are classified into 3 categories: muscle disorders, disc displacements, and arthralgia/arthritis/arthrosis.


2014: Diagnostic Criteria for TMD

- 12 common diagnoses identified:
  - Arthralgia
  - Myalgia, local myalgia, myofascial pain, myofascial pain with referral
  - 4 disc displacement disorders
  - Degenerative joint disease
  - Subluxation
  - Headache attributed to TMD


Classification

- ICD-10: Medical classification list developed by the WHO
- Diagnostic classification standard
- http://www.icd10data.com/
- SNOMED-CT: Systematized Nomenclature of Medicine - Clinical Terms.
"Initially the dentist should select the least invasive and most reversible therapy that may ameliorate the patient’s pain and/or functional impairment."

"Before restorative and/or occlusal therapy is performed, the dentist should attempt to reduce, through the use of reversible modalities, the neuromuscular, myofascial and temporomandibular joint symptoms."


---

**TMD-PAIN Screener**

1. In the last 30 days, how long did any pain last in your jaw or temple area on either side?
   a. No pain
   b. Pain comes and goes
   c. Pain is always present

2. In the last 30 days, have you had pain or stiffness in your jaw on awakening?
   a. No
   b. Yes

---

**TMD PAIN Screener**

3. In the last 30 days, did the following activities change any pain (that is, make it better or make it worse) in your jaw or temple area on either side?

   A. Chewing hard or tough food: a. No, b. Yes

   B. Opening your mouth or moving your jaw forward or to the side: a. No, b. Yes

   C. Jaw habits such as holding teeth together, clenching, grinding, or chewing gum: a. No, b. Yes

   D. Other jaw activities such as talking, kissing or yawning: a. No, b. Yes
Screening Form

Part A:
- Current jaw muscle or joint pain, painful jaw popping, locking?
- Current persistent tooth pain after having multiple dental treatments?
- Current burning tongue/mouth syndrome, trigeminal neuralgia, trigeminal neuropathy?
- Clenching/grinding of the teeth
- TMJ crepitation (grating noise) or popping
- Frequent unexplained headaches, migraines, and/or neck pain
- Ear pain, ear ringing, stuffiness in the ear

Part B:
- Recent (within two years) history of pain in the jaw muscles and/or TMJs
- Any history of treatment for TMD (TMJ)

Part C:
- Palpate the masseter and anterior temporalis muscles.
- Palpate the lateral and dorsal condyles of the TMJs.
- Range of Motion in mm (inter-incisal)
  1) Comfortable opening ___ mm
  2) Maximum passive stretch (Doctor stretches the patient) ___ mm

Anatomy
Temporomandibular joint

- Formed by the mandibular condyle and the mandibular fossa of the temporal bone
- Ginglymoarthrodial joint
- Articular disc
  - Dense fibrous connective tissue

Temporomandibular Joint

- Retrodiscal tissue
- Superior and inferior cavities
- Synovial fluid
  - Metabolic requirements to tissue
  - Lubricates the joint

Ligaments

- 1. Collateral ligaments
- 2. Capsular ligaments
- 3. Temporomandibular ligament
- 4. Sphenomandibular ligament (accessory)
- 5. Stylomandibular ligament (accessory)
Innervation and vascularization:

- Trigeminal nerve, V3
- Auriculotemporal nerve
- Deep temporal nerve
- Masseteric nerve
- Superficial temporal artery (posterior aspect)
- Middle meningeal artery (anterior aspect)
- Internal maxillary artery (inferior aspect)
- Inferior alveolar artery (condyle)
Muscles of Mastication
- Masseter
- Temporalis
- Medial Pterygoid
- Lateral Pterygoid
- Digastric

**Masseter**
- Superficial and deep portions
  - Elevation of mandible
  - Superficial portion aids in protrusion

**Temporalis**
- Anterior, middle, and posterior
  - Anterior: elevation of mandible
  - Middle: elevation and retraction of mandible
  - Posterior: elevation and slight retraction of mandible
Temporalis: anterior, middle, and posterior
- Anterior: elevation of mandible
- Middle: elevation and retrusion of mandible
- Posterior: elevation and slight retrusion of mandible

Medial Pterygoid
- Elevation and protrusion
- Mediotrusive movement with unilateral contraction
Medial Pterygoid

Medial pterygoid
• Elevation and protrusion
• Mediotrusive movement with unilateral contraction

Lateral Pterygoid

Lateral pterygoid: inferior and superior bellies
• Inferior lateral pterygoid: opening and protrusion (simultaneous contraction); mediotrusive movement (unilateral contraction)
• Superior lateral pterygoid: elevation of mandible; stabilizes the condyle and disc during mandibular loading (unilateral chewing)

Digastric: Anterior and Posterior

Digastric: anterior and posterior bellies
• Depression of mandible
• Elevation of hyoid bone
Pain mechanisms

Terminology
- **Afferent nerve fibers**
  - A-beta
  - A-delta
  - C fibers
  - Silent nociceptors
- Nociception
- Pain
- Suffering
- Pain behavior

Nociceptive Pain
Nociception

Perception

Pain terminology continued

1. PERIPHERAL SENSITIZATION
2. CENTRAL SENSITIZATION

Peripheral Sensitization

Allodynia
Hypalgesia
Thank you!
My Jaw Hurts! What do I do?
An Overview of Diagnostic Techniques, Examination, and Management Strategies in Orofacial Pain

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DIPLOMATE, AMERICAN BOARD OF OROFACIAL PAIN

What are the types of management strategies in orofacial pain?

- Education and Self-Management
- Cognitive Behavioral Intervention
- Pharmacologic Therapy
- Physical Therapy
- Orthopedic Appliance Therapy

Goals for management of TMDs

- Reduce pain
- Reduce adverse loading
- Restore function
- Resume normal daily activities
Treatment approaches

- Apply conservative therapies first
  - Self-management
  - Behavioral modification
  - Physical therapy
  - Medications
  - Orthopedic appliances

- Avoid the early use of aggressive, irreversible and complex treatments
  - Complex occlusal therapy
  - Surgery

Treatment approaches

- "Initially the dentist should select the least invasive and most reversible therapy that may ameliorate the patient's pain and/or functional impairment."

- "Before restorative and/or occlusal therapy is performed, the dentist should attempt to reduce, through the use of reversible modalities, the neuromuscular, myofascial and temporomandibular joint symptoms."


Conservative therapy

- Apfelberg DB et al. 1979: 90 patients with TMD followed over 10 years.
  - 90% had symptom relief.

<table>
<thead>
<tr>
<th>Symptoms of TMD</th>
<th>Number of patients</th>
<th>Type of Tx</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pain</td>
<td>11</td>
<td>No tx</td>
</tr>
<tr>
<td>Trismus</td>
<td>64</td>
<td>Conservative Therapy</td>
</tr>
<tr>
<td>Noise</td>
<td>9</td>
<td>Occlusal equilibration</td>
</tr>
<tr>
<td>Combination of the above</td>
<td>2</td>
<td>Joint injection</td>
</tr>
<tr>
<td>Signs of TMD</td>
<td>Number of patients</td>
<td>Type of Tx</td>
</tr>
<tr>
<td>Trismus</td>
<td>64</td>
<td>Conservative Therapy</td>
</tr>
<tr>
<td>Subluxation</td>
<td>9</td>
<td>Occlusal equilibration</td>
</tr>
<tr>
<td>Deviation</td>
<td>2</td>
<td>Joint injection</td>
</tr>
<tr>
<td>Noise</td>
<td>4</td>
<td>Combination: conservative tx and dental adjustment</td>
</tr>
</tbody>
</table>
Conservative Therapy

- Okeson & Hayes 1986: 110 patients surveyed 2-8.5 years later, after receiving treatment for TMD.
  - Types of Treatment Received
    - Occlusal splint
    - Relaxation therapy
    - Diazepam before bedtime
    - Limited, selective grinding of the teeth
  - 85.5% reported complete pain relief or much less pain.
  - 79.2% reported tx received was completely or considerably helpful.

Conservative Therapy

- Oyetola EO et al. 2017: 55 patients presented to a University-based teaching hospital in Nigeria over 1 year
  - All patients experienced pain in the TMJ
    - Signs
      - Clicking
      - Jaw deviation
      - Attrition
      - Limited mouth opening
  - 6 weeks of conservative therapy was successful

Create a problem list

- Identify perpetuating contributing factors
  - Parafunctional habits
  - Trauma
  - Anatomic relationships
  - Pathophysiologic conditions
  - Psychosocial conditions
17 yo female presenting with jaw pain and clicking

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location</td>
<td>Right and left TMJs</td>
</tr>
<tr>
<td>Quality</td>
<td>Sharp pain</td>
</tr>
<tr>
<td>Frequency</td>
<td>Daily</td>
</tr>
<tr>
<td>Duration</td>
<td>5 minutes</td>
</tr>
<tr>
<td>Severity</td>
<td>6/10</td>
</tr>
<tr>
<td>Ameliorating</td>
<td>Keeping the mouth closed</td>
</tr>
<tr>
<td>Exacerbating</td>
<td>Chewing</td>
</tr>
<tr>
<td>Associated</td>
<td>Jaw muscles are also sore</td>
</tr>
</tbody>
</table>

Diagnosis: Internal derangement with reduction

What is her lifestyle like?

Am there any habits that aggravate the symptoms?

How is school?

General Treatment Protocols

- Function avoidance
- Parafunction avoidance “N-position”
- Poor head and neck posture avoidance
- Jaw joint clicking avoidance

“Myofascial Protocol”

- Identify and avoid harmful activities to the jaw
- Increase local blood flow in the painful muscles
- Stretch stiff and painful muscles
- Encourage a daily, non-impact exercise program

Function avoidance

Strict avoidance of clicking or crunching the jaw

Do NOT open the jaws wide while chewing and talking

Limit this to 2-3 times per day.

Parafunction avoidance

Teach the patient what appropriate posture is

Shoulders back and down

Stomach in

Posture

- Teach the patient what appropriate posture is
- Shoulders back and down
- Stomach in
Who do you think has the worst postural habits?

Why should appropriate neck posture be emphasized?

- 52 year-old woman with chronic neck pain, headaches, jaw pain, sinus pain, facial pain
- 1) Headaches: throbbing pain, once a month, associates with sinus infection
- 2) Neck pain: associated with headache and sinus infection
- 3) Ear pain, pressure, fullness

Relationship between the neck and masticatory muscles

- 1) Afferent input from cervical structures converges on trigeminal motor neurons in the trigeminal brainstem complex
- 2) Masticatory muscles contract when cervical muscles contract (co-contraction)
Other habit avoidance

“Belief is a critical element of such a change...”

General Treatment Protocol

- Thermal therapy
  - Increases blood flow, relaxes muscles
  - A) Hot bath/shower therapy: 3 times per week for 3 weeks
  - B) Local hot pack therapy: 20 minutes up to 3 times per day
  - C) Ice pack therapy

Myofascial stretching

A) "N-stretch", Passive jaw stretch
- Hold each stretch for 6 seconds, repeat 6 stretch 6 times, repeat all of this every 2 hours

B) "Chin-chest" stretch
- Hold each stretch for 6 seconds, repeat 6 stretch 6 times, repeat all of this every 2 hours

C) Exercise therapy

Myofascial stretching

Limitations

- Compliance
- Adherence
- Long-term follow-up

17 yo female presents with jaw pain and jaw clicking

1) Implement the myofascial protocol:
   - Demonstrate N-position
   - Demonstrate N-stretch
   - Guided opening exercise

2) Implement the avoidance protocol:
   - Avoidance of clicking
   - Soft-food diet

2 week follow-up: 90% resolution of the clicking noise and 100% resolution of the pain.

Myogenous Disorders

1. MYALGIA/MYOFASCIAL PAIN
2. TENDONITIS
3. MYOSITIS/TRISMUS

40 yo female presents with pain

1) Jaw pain
2) Neck pain
3) Headaches

<table>
<thead>
<tr>
<th>Onset</th>
<th>15 years ago</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location</td>
<td>Masseter, back of head, neck</td>
</tr>
<tr>
<td>Quality</td>
<td>Severe ache</td>
</tr>
<tr>
<td>Frequency</td>
<td>Daily</td>
</tr>
<tr>
<td>Attack duration</td>
<td>Constant</td>
</tr>
<tr>
<td>Severity</td>
<td>5/10</td>
</tr>
<tr>
<td>Ameliorating factors</td>
<td>Flexeril, acupuncture, sleep, rest</td>
</tr>
<tr>
<td>Exacerbating factors</td>
<td>Any jaw function</td>
</tr>
</tbody>
</table>
Exam

Palpations

<table>
<thead>
<tr>
<th>Structure</th>
<th>R</th>
<th>L</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upper trap</td>
<td>1</td>
<td>2 (refers upwards)</td>
</tr>
<tr>
<td>Lateral capsule</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Dorsal capsule</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Superficial m.</td>
<td>1</td>
<td>2 (refers around the area)</td>
</tr>
<tr>
<td>Temporalis tendon</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Range of Motion

- Pain-free Opening: 34 mm
- Passive Opening: 37 mm with no pain, soft-end feel
- RT Laterotrusive: 11 mm
- LFT Laterotrusive: 10 mm
- Opening Path: straight
- TMJ noise: none detected

1. Patient education and self-management

- A. Myofascial protocol
- B. Avoidance protocol
- C. Myofascial stretching
- D. Daily exercises
2. Physical therapy

- Relieve musculoskeletal pain and restore normal function
- Reduce inflammation
- Strengthen muscle activity
- Promote the repair and regeneration of tissues

The effectiveness of physiotherapy in the management of TMD: A systematic review and meta-analysis


Inclusion: RCTs assessing effects of physiotherapy regardless of blinding

Participants: Diagnosis of TMD

Types of Interventions: PT manual therapy, dry needling, exercise

Outcomes assessed: pain and/or mandibular function

Various pain scales used; pre- and post-tx scores assessed

Types of disorders:
1 study: disc displacement with and w/o limitations of mouth opening
4 studies: muscle disorders
1 study: disc displacement with reduction + muscle disorders

Treatment: ranged from 1 day to 6 weeks (mean: 5 weeks)
1 study: Dry needling only
PT sessions: 9-15 treatments
Manual therapy
The effectiveness of physiotherapy in the management of TMD: A systematic review and meta-analysis

Results:

1) Carmeli et al. 2001: mobilization exercises vs. soft flat plane splint; dx: anteriorly displaced discs; conclusions: exercises are more effective than splint

2) Craane et al. 2012: PT vs. control; ADD with reduction; conclusion: no differences between groups

3) Craane et al. 2012: PT vs. control; masticatory muscle pain; no significant differences between groups except elevated PPT for masseter and temporalis in treatment groups

4) Kalamir et al. 2012: myofascial therapy (IMT), IMT + self-care, vs. no treatment; chronic myogenous TMD; no differences in ROM; lower pain scores in both tx groups vs. control; IMT + self-care had more improvement by 1 year

5) Kalamir et al. 2013: short-term effects of self care vs. myofascial therapy; chronic myogenous TMD; differences pain scores were statistically significant but not clinically significant

6) Tuncer et al. 2013: manual therapy + home therapy vs. home therapy alone; TMD; combination therapy was more effective

7) Fernández-Carnero et al. 2010: Dry needling in the masseter; myofascial TMD; dry needling group showed improvement in pain and ROM compared to placebo

3. Office-based myofascial physical medicine procedures

- A) Vapocoolant assisted myofascial stretching
- B) Trigger-point injection assisted stretching

4. Occlusal appliances

- Primary indication:
  - Moderate levels of attrition
  - Cheek ridging
  - Moderate, bilateral tenderness upon palpation of the jaw closer muscles

Occlusal appliance: what?

- 1. Full coverage vs. partial coverage
- 2. Repositioning vs. non-repositioning
- 3. One arch vs. double arch
Occlusal appliances: what?

- Full arch, hard, acrylic stabilization splint
  - Maxillary arch
  - Mandibular arch
- Non-repositioning
- One arch

Serves as a behavioral changing device that makes the patient aware of any oral parafunction.

Full-arch Stabilization appliance

- Posterior teeth contact the splint evenly and simultaneously
- Anterior/canine guidance
- When upright, the posterior tooth contacts should be more prominent than the anterior tooth contacts


Occlusal appliances: what?

- Partial coverage devices
- Anterior bite plane devices
- Posterior coverage only
When should occlusal appliances be worn?

1. Night-time

vs.

2. Day-time

Occlusal appliances: WHEN?

1) Protect teeth from further attrition

2) Reduce pressure on sore teeth

3) Maybe change the patient’s parafunctional habits

4) Provide a stable occlusion for patients missing bilateral, posterior tooth contacts

5) Reduce clenching-induced ear ache

6) Reduce joint loading

7) Reduce painful clicking and/or episodic locking

Occlusal appliances: WHY?

Occlusal appliances: LIMITATIONS

Full arch stabilization splint:

- May clench more on the appliance
- Bite change
- Effect may be short-lived
- Some may lock in the setting of anterior disc displacement with reduction

Partial coverage device:

- Bite change
- May increase joint pain

Mandibular repositioning splint

- Bite change
29 yo male presents to office with CC of inability to bring his front teeth together. Symptoms began 1 year ago. Reports history of "grinding" his teeth. 1 year ago, he states receiving a splint from his dentist (partial coverage splint).

Overall, the data consistently suggest that occlusal appliances impact symptom level far more than "tincture of time." They have similar efficacy to other forms of pain relieving therapy. Studies measuring maseter activity during sleep suggest at least a short-term change in clenching/bruxism with oral appliance of any type. Data do not support one method over another for initial management.

The therapeutic value of the appliance is NOT dependent on whether it "stops" bruxism. 88% of patients wearing a stabilization appliance showed wear patterns on the appliance, but still had pain relief (over a 10-week period). No appliance will stop bruxism behavior.
Partial coverage appliances: evidence

- Very little clinical trial data on the efficacy of partial coverage devices
- Patients have improved more with a stabilization splint vs. an anterior bite plane device (small study)
- Is the NTI more effective than a stabilization splint?

5. Pharmacologic therapy

- It is critical to understand pain mechanisms in order to select the most appropriate medication for the condition you are treating.
- Ensure the diagnosis is correct.
- Let's review.
5. Pharmacologic therapy: Topical Medications

1) Voltaren gel 1%
2) Ketoprofen 20% in PLO or Lipoderm (compounded)
3) Lidocaine 5% patch

- Indications: acute TMJ capsulitis/synovitis, arthritis, myogenous pain
- Who would benefit?
- Do they work?


5. Pharmacologic Therapy: Systemic Medication

- Muscle relaxants
  - Indications: acute, masticatory muscle spasm
  - Cyclobenzaprine: 10-30 mg po before sleep
  - Baclofen 10 mg, 5 mg TID (up to 80 mg/day)
  - Metaxalone: 800 mg TID-QID (max 3200 mg/day)
  - Methocarbamol: 500-1000 mg QID
  - Tizanidine: 4 mg hs (max 24 mg/day)
  - Carisoprodol: 350 mg TID
  - Chlorzoxazone: 250-750 mg TID or QID

- Benzodiazepines
  - Indications: Acute pain due to bruxism (short-term only, 1-2 weeks), musculoskeletal pain
  - Contraindicated in patients with depression prior to therapy
  - Diazepam 2-10 mg tid to qid
  - Clonazepam Start 0.5 mg tid; increase slowly to maximum of 15 mg/day
  - Alprazolam 0.25 - 0.5 mg bid or tid; maximum is 4 mg/day
Adjuvant analgesics: Serotonin modulators (TCA’s, SNRI’s), anticonvulsants

Indications: chronic myofascial or neuropathic pain; chronic TMJ capsulitis/synovitis or arthritis that has not responded to previous medications and conservative therapy

- Amitriptyline, nortriptyline: 10-30 mg/day, taken hs; titrate up to 40 mg/day; NNT 4.9
- Desipramine: 10-25 mg hs, up to 50 mg/day
- Duloxetine: 30 mg/day; titrate up to 60 mg/day; NNT 10.0
- Venlafaxine: 37.5 mg/day up to 225 mg/day
- Pregabalin: 600 mg/day; NNT 13

5. Pharmacologic Therapy: Systemic Medication

6. Psychological therapy/pain counseling

A) Behavioral therapy
B) Cognitive-behavioral therapy
C) Relaxation therapy
D) Stress management program
Pain Diary/Exercises Program
- Increased Circulation Program
- Identify and Reduce Triggers
- Chronic Pain Self-Help Bk/CD
- Psychometric Assessment
- Pain Management/Rx Contracts
- Referral and Follow-up

**Behavioral therapy**

### Pain Diary/Exercises Program

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
<th>Pain Level</th>
<th>Mood Level</th>
<th>Medication</th>
</tr>
</thead>
<tbody>
<tr>
<td>8:00-9:00</td>
<td>Read</td>
<td>0-10</td>
<td>0-10</td>
<td>Read</td>
</tr>
<tr>
<td>9:00-10:00</td>
<td>Stretch</td>
<td>0-10</td>
<td>0-10</td>
<td>Stretch</td>
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<tr>
<td>10:00-11:00</td>
<td>Exercise</td>
<td>0-10</td>
<td>0-10</td>
<td>Exercise</td>
</tr>
<tr>
<td>11:00-12:00</td>
<td>Heat</td>
<td>0-10</td>
<td>0-10</td>
<td>Heat</td>
</tr>
<tr>
<td>12:00-1:00</td>
<td>Eat</td>
<td>0-10</td>
<td>0-10</td>
<td>Eat</td>
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<tr>
<td>1:00-2:00</td>
<td>Work</td>
<td>0-10</td>
<td>0-10</td>
<td>Work</td>
</tr>
<tr>
<td>2:00-3:00</td>
<td>Stretch</td>
<td>0-10</td>
<td>0-10</td>
<td>Stretch</td>
</tr>
<tr>
<td>3:00-4:00</td>
<td>Exercise</td>
<td>0-10</td>
<td>0-10</td>
<td>Exercise</td>
</tr>
<tr>
<td>4:00-5:00</td>
<td>Heat</td>
<td>0-10</td>
<td>0-10</td>
<td>Heat</td>
</tr>
<tr>
<td>5:00-6:00</td>
<td>Eat</td>
<td>0-10</td>
<td>0-10</td>
<td>Eat</td>
</tr>
<tr>
<td>6:00-7:00</td>
<td>Work</td>
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<td>7:00-8:00</td>
<td>Stretch</td>
<td>0-10</td>
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<td>Stretch</td>
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<tr>
<td>8:00-9:00</td>
<td>Exercise</td>
<td>0-10</td>
<td>0-10</td>
<td>Exercise</td>
</tr>
<tr>
<td>9:00-10:00</td>
<td>Heat</td>
<td>0-10</td>
<td>0-10</td>
<td>Heat</td>
</tr>
<tr>
<td>10:00-11:00</td>
<td>Eat</td>
<td>0-10</td>
<td>0-10</td>
<td>Eat</td>
</tr>
<tr>
<td>11:00-12:00</td>
<td>Work</td>
<td>0-10</td>
<td>0-10</td>
<td>Work</td>
</tr>
</tbody>
</table>

**DIAPHRAGMATIC BREATHING:**

1. Sit in a relaxed position, hands on stomach.
2. Breathe in through your nose, feel hands move out.
3. Breathe out twice as long through pursed lips, feel hands move in.
4. Perform 10 breaths (repeat hourly).
Create a list of goals

My specific goals are: (check appropriate boxes)

- To reduce pain intensity and frequency.
- To regain control over my pain.
- To eliminate my current medications.
- To control my headaches.
- To sleep better.
- To improve my posture.
- To decrease pain and improve function.
- To increase my neck mobility.
- To return to work.
- To increase my ability to experience the pleasures of life.

Case: Summary

1) Myofascial Protocol and Avoidance Protocol
2) Spray and Stretch
3) Physical Therapy
4) Trigger point injections
5) Occlusal stabilization splint
6) Pharmacotherapy: cyclobenzaprine 5 mg hs

Internal Derangements

1. DISC DISPLACEMENT WITH REDUCTION
2. DISC DISPLACEMENT WITH REDUCTION, WITH INTERMITTENT LOCKING
3. DISC DISPLACEMENT WITHOUT REDUCTION, WITH LIMITED OPENING
4. DISC DISPLACEMENT WITHOUT REDUCTION, WITHOUT LIMITED OPENING
15 yo girl presents with a painful click in the right jaw.

Jaw Pain

Jaw clicking

Onset 2 months ago
Location Right joint
Quality Sharp initially, then lingers to a dull ache
Frequency Daily
Attack duration Intermittent
Severity 8/10
Ameliorating factors Keeping the jaw at rest
Exacerbating factors Any jaw function

Exam

Palpations
- Upper trap R: 1
- Upper trap L: 1
- Lateral capsule R: 3
- Lateral capsule L: 1
- Dorsal capsule R: 3
- Dorsal capsule L: 1
- Superficial masseter R: 2
- Superficial masseter L: 1
- Temporalis Tendon R: 0
- Temporalis Tendon L: 0

Range of Motion

- Pain-free Opening: 25 mm
- Passive Opening: 40mm with pain on the right TMJ
- RT Laterotrusive: 12 mm
- UTL Laterotrusive: 13 mm
- Opening Path: deviates to the right upon opening
- TMJ noise: mid-opening click (able to reduce with anterior repositioning)
Disc Displacement with Reduction

1) Is it painful?
2) Is it avoidable?
Start with the avoidance and myofascial protocols.

1. Occlusal Appliance: Anterior Repositioning Splint

- Full arch, hard, acrylic stabilization splint
- Maxillary arch
- Mandibular arch
- Non-repositioning
- One arch

Serves as a behavioral changing device that makes the patient aware of any oral parafunction.
Occlusal appliances: WHY?

1) Protect teeth from further attrition
2) Reduce pressure on sore teeth
3) Maybe change the patient’s parafunctional habits
4) Provide a stable occlusion for patients missing bilateral, posterior tooth contacts
5) Reduce clenching-induced ear ache
6) Reduce joint loading
7) Reduce painful clicking and/or episodic locking

2. Pharmacologic Therapy: Topical Medication

1) Voltaren gel 1%
2) Ketoprofen 20% in PLO or Lipoderm (compounded)
3) Lidocaine 5% patch

**Indications: acute TMJ capsulitis/synovitis, arthritis, myogenous pain**

2. Pharmacologic Therapy: Systemic Medication

- NSAIDs non-selective vs. selective
- **Indications: acute TMJ capsulitis/synovitis, arthritis, myogenous pain**
- NNT: 1.6-3.0

- Etodolac: 200-300 mg tid (max of 1200 mg/day)
Mechanism of Action

- Analgesic
- Anti-pyretic
- CNS effects: reduce secondary hyperalgesia

Hersh EV, Lally ET, Moore PA. Update on cyclooxygenase inhibitors: has a third COX isoform entered the fray? Curr Med Res Opin 21:1217-1226, 2005

NSAIDs

- Analgesic
- Anti-pyretic
- CNS effects: reduce secondary hyperalgesia

COX-2 inhibitors
- Celebrex: 200 mg QD (max: 400 mg/day)
- *Meloxicam: 7.5 mg QD (max: 15 mg/day)
- *Etodolac: 300-500 mg BID (max: 1200 mg/day)

Acetaminophen
- Start 650 mg qid; increase to 4000 mg/day

Cox-2 inhibitors and cardiovascular events: Why?

- Cox
- Thromboxane
- Thromboxane
- Prostacyclin
- Prostacyclin
- Ibex

Adverse effects

- NSAIDs
  - GI disturbances: dyspepsia, diarrhea, abdominal pain, ulceration, bleeding, perforation
  - May add sucralfate, cimetidine, ranitidine, misoprostol
  - Kidney dysfunction
  - May decrease effect of anti-hypertensives: diuretics, beta-blockers, adrenergic (take NSAID for 4 days or less)

- Acetaminophen:
  - Elevated bilirubin and alkaline phosphatase, liver toxicity, skin reaction, hypertension

Intra-articular Injection

- Hyaluronic acid injections
  - Synvisc
  - Hyalgan
  - 3-4 series of injections, one month apart for each
2. Disc displacement with reduction, with intermittent locking

- 1. Myofascial and avoidance protocols
- 2. Myofascial stretching: guided opening (rotation) exercises
- 3. Anterior repositioning splint
- 4. Pharmacotherapy: NSAIDs, acetaminophen
- 5. Intra-articular injection with hyaluronic acid

25 yo girl presents with a pain in the right jaw and limited opening

- Jaw pain

<table>
<thead>
<tr>
<th>Onset</th>
<th>1 month ago</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location</td>
<td>Left joint</td>
</tr>
<tr>
<td>Quality</td>
<td>Sharp with movement, otherwise a constant ache</td>
</tr>
<tr>
<td>Frequency</td>
<td>Daily</td>
</tr>
<tr>
<td>Attack duration</td>
<td>Constant</td>
</tr>
<tr>
<td>Severity</td>
<td>8/10 when opening wide or chewing; 3/10 at rest</td>
</tr>
<tr>
<td>Ameliorating factors</td>
<td>Keeping the jaw at rest</td>
</tr>
<tr>
<td>Exacerbating factors</td>
<td>Any jaw function</td>
</tr>
</tbody>
</table>

Exam

<table>
<thead>
<tr>
<th>Palpations</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Upper trap R</td>
<td>1</td>
</tr>
<tr>
<td>Upper trap L</td>
<td>1</td>
</tr>
<tr>
<td>Lateral capsule R</td>
<td>1</td>
</tr>
<tr>
<td>Lateral capsule L</td>
<td>3</td>
</tr>
<tr>
<td>Dorsal capsule R</td>
<td>1</td>
</tr>
<tr>
<td>Dorsal capsule L</td>
<td>3</td>
</tr>
<tr>
<td>Superficial masseter R</td>
<td>3</td>
</tr>
<tr>
<td>Superficial masseter L</td>
<td>1</td>
</tr>
<tr>
<td>Temporalis Tendon R</td>
<td>2</td>
</tr>
<tr>
<td>Temporalis Tendon L</td>
<td>0</td>
</tr>
</tbody>
</table>
Range of Motion

- Pain-free Opening: 20 mm
- Passive Opening: 42 mm with pain on the left TMJ, hard-end feel
- RT Laterotrusion: 10 mm
- LFT Laterotrusion: 4 mm
- Opening Path: deflects to the left
- TMJ noise: none

3. Internal Derangement Without Reduction, With Limited Opening

- 1. Self-applied physical therapy with medication
- 2. Joint injection with anesthetic and steroid followed by manual mobilization
- 3. Sedation plus arthrocentesis of the joint followed by manual mobilization
- 4. Arthroscopic surgical intervention for mobilization

Occlusal appliance?
Intra-articular injection and mobilization

- Hyaluronic acid injections
  - Synvisc
  - Hyalgan

4. Internal Derangement without reduction, without limited opening

- 1) Myofascial and avoidance protocols
- 2) Pharmacologic therapy: NSAIDs, acetaminophen
- 3) Occlusal stabilization splint
- 4) Physical therapy
- 5) Corticosteroid joint injection or Hyalgan injection (if needed)

Arthrogenous Disorders

LOCALIZED OSTEOARTHRITIS
60 yo female presents with jaw pain

- Onset: 1 month ago
- Location: Left joint and ear
- Quality: Throbbing, sharp and shooting
- Frequency: Daily
- Attack duration: Constant
- Severity: 7/10
- Ameliorating factors: Ibuprofen
- Exacerbating factors: Chewing

Exam

Palpations

<table>
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<tr>
<th></th>
<th>R 0</th>
<th>L 1</th>
<th>R 0</th>
<th>L 0</th>
<th>R 2</th>
<th>L 2</th>
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<td>Dorsal</td>
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</tr>
</tbody>
</table>

Range of Motion

- Pain-free Opening: 25 mm
- Passive Opening: 30 mm with pain on the left TMJ, soft-end feel
- Right Laterotrusion: 6 mm
- Left Laterotrusion: 12 mm
- Opening Path: straight
- TMJ noise: crepitus on left joint
Imaging

Osteoarthritis

1) Myofascial and avoidance protocols, Physical Therapy

2) Occlusal stabilization splint

3) Pharmacologic therapy

4) Intra-articular injections

Full arch, hard, acrylic stabilization splint

Maxillary arch

Mandibular arch

Non-repositioning

One arch
Occlusal appliances: WHY?

1) Protect teeth from further attrition
2) Reduce pressure on sore teeth
3) Maybe change the patient’s parafunctional habits
4) Provide a stable occlusion for patients missing bilateral, posterior tooth contacts
5) Reduce clenching-induced ear ache
6) Reduce joint loading
7) Reduce painful clicking and/or episodic locking

Pharmacologic therapy: Topical

1) Voltaren gel 1%
2) Ketoprofen 20% in PLO or Lipoderm (compounded)
3) Lidocaine 5% patch

Indications: acute TMJ capsulitis/synovitis, arthritis, myogenous pain

Pharmacologic Therapy: Systemic Medication

NSAIDs non-selective vs. selective

Indications: acute TMJ capsulitis/synovitis, arthritis, myogenous pain

Non-selective
- Ibuprofen: 600 mg QID (max: 3200 mg/day)
- Nabumetone: 500 mg BID (max: 2000 mg/day)
- Naproxen: 500 mg BID (max: 1500 mg/day)
-Diclofenac: 25-50 mg q 6-8 hours (max of 150 mg/day)
-Ketoprofen: 25-50 mg tid to qid (max is 300 mg/day)
-Etodolac: 200-300 mg tid (max of 1200 mg/day)
Pharmacologic Therapy: Systemic Medication

- COX-2 inhibitors
  - Celebrex: 200 mg QD (max: 400 mg/day)
  - Meloxicam: 7.5 mg QD (max: 15 mg/day)
  - Etodolac: 300-500 mg BID (max: 1200 mg/day)

- Acetaminophen
  - Start 650 mg qid; increase to 4000 mg/day


Pharmacologic therapy

- Corticosteroids: systemic vs. intra-articular
  - Indications: severe, unremitting TMJ capsulitis/synovitis, arthritis
    - Systemic: Prednisone taper, Medrol Dose Pack
    - Corticosteroid joint injections
      - 10-20 mg triamcinolone (0.5 cc)
      - 1.5 cc of 2% lidocaine without epi
      - Inject superior joint space
      - Do not repeat more than twice a year

Mechanism of action: corticosteroids

- Carbohydrate and protein metabolism
- Lipid metabolism
- Electrolyte and water balance
- Anti-inflammatory properties*
Other intra-articular injections

- Pharmacologic therapy (continued)
  - E) Hyaluronic acid injections
    - Synvisc
    - Hyalgan
    - 3-4 series of injections, one month apart for each
  - F) Platelet-rich plasma injections
  - G) Joint lavage/arthrocentesis
  - H) DMARDs

Indications: TMJ capsulitis/synovitis, arthritis that has not responded to previous medications and conservative therapy

What if conservative therapy doesn’t work

- Need to reassess the diagnosis
- Reassess contributing factors that may be unrecognized
- Patients with chronic conditions and multiple contributing factors may benefit from a pain management program
  - Need a team of providers

Occlusal therapy

- Irreversible therapy
  - Orthodontics
  - Selective grinding
  - Fixed prosthodontic procedures

  *Necessary for dental malocclusion, but NOT for the treatment or prevention of TMJ pain or masticatory myogenous pain

  Occlusal therapy is beneficial when managing changes to the occlusion as a RESULT of a joint problem (i.e. osteoarthritis and anterior open bite)
Questions?

"We combined all your medications into ONE convenient dose."
Myogenous Disorders

Seena Patel DMD, MPH
Assistant Professor, Associate Director of Oral Medicine
Arizona School of Dentistry & Oral Health, A.T. Still University, Mesa, AZ
Southwest Orofacial Group, Phoenix, AZ
Diplomate, American Board of Oral Medicine
Diplomate, American Board of Orofacial Pain

35 yo female presents with persistent pain on #10

• Describes a mild tenderness to #10
• Pain persists
• Extraction and implant

Case: Pain History

<table>
<thead>
<tr>
<th>Onset</th>
<th>18 years ago</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location</td>
<td>#10</td>
</tr>
<tr>
<td>Quality</td>
<td>Severe pressure</td>
</tr>
<tr>
<td>Frequency</td>
<td>Began episodically, now daily</td>
</tr>
<tr>
<td>Attack duration</td>
<td>Constant</td>
</tr>
<tr>
<td>Severity</td>
<td>9/10</td>
</tr>
<tr>
<td>Ameliorating factors</td>
<td>Ibuprofen</td>
</tr>
<tr>
<td>Exacerbating factors</td>
<td>Bruxism</td>
</tr>
<tr>
<td>Associated symptoms</td>
<td>Tmj clicking, day- and night-time parafunctional habits, Wakes with her jaw clenched</td>
</tr>
</tbody>
</table>
Myogenous Disorders

A. Localized myalgia
B. Myofascial pain
C. Myofascial pain with referral
D. Tendonitis
E. Myositis
F. Spasm
G. Contracture
H. Hypertrophy
I. Neoplasm
J. Movement disorders
K. Masticatory muscle pain attributed to systemic/central pain disorders


Diagnostic criteria: Myalgia

1) History: positive for both of the following
   - Pain in the jaw, temple, in the ear or in front of the ear AND
   - Pain modified with jaw movement, function, or parafunction

2) Exam: positive for both of the following
   - Confirmation of pain location in the temporalis or masseter AND
   - Report of familiar pain in the temporalis or masseter with at least one of the following provocation tests:
     - Palpation of the temporalis or masseter
     - Maximum unassisted or assisted opening movement(s)

Validity: sensitivity 0.90 and specificity: 0.99

Diagnostic criteria: myofascial pain with referral

1) History: positive for both of the following
   • Pain in the jaw, temple, in the ear or in front of the ear AND
   • Pain modified with jaw movement, function, or pain function

2) Exam: positive for both of the following
   • Confirmation of pain location in the temporalis or masseter
     AND
   • Report of familiar pain in the temporalis or masseter AND
   • Report of pain at a site beyond the boundary of the muscle being palpated

Validity: sensitivity 0.86 and specificity: 0.98


Muscle referral patterns:

- Anterior temporalis
- Masseter
- Cervical musculature

Muscle referral patterns: Masseter

Muscle referral patterns:

- Temporalis

Muscle referral patterns: medial pterygoid

Muscle referral patterns: lateral pterygoid
Muscle referral patterns:
- splenius cervicis
- sternocleidomastoid
- semispinalis capitis
Myofascial Pain: Clinical Features

- Spontaneous dull, aching pain and localized tenderness
- Muscle stiffness
- Sustained muscle function causes fatigue easily
- Upon palpation: hyperirritable spot within a taut band that exhibits referral
- Trigger point (TP): motor endplate with spontaneous firing
- Decreased ROM
- Weakness w/o atrophy or neurological deficit


Myofascial Pain: protective and risk factors

Myofascial Pain: contributing factors

Structural abnormalities
- Traumatic or whiplash injuries
- Sleep disturbances

Lifestyle
- Nutritional/metabolic
- Postural and repetitive strains
- Physical disorders

Emotions
- Traumatic or whiplash injuries
- Sleep disturbances

Support system
- Traumatic or whiplash injuries
- Sleep disturbances
- Physical disorders

Mind
- Traumatic or whiplash injuries
- Sleep disturbances
- Physical disorders

Environment
- Traumatic or whiplash injuries
- Sleep disturbances
- Physical disorders

Spirit
- Traumatic or whiplash injuries
- Sleep disturbances
- Physical disorders
Case: Exam Findings

<table>
<thead>
<tr>
<th></th>
<th>R</th>
<th>L</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lateral Condyle (TM)</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Dorsal Condyle</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Superficial Masseter</td>
<td>3</td>
<td>3 (referred down the jaw)</td>
</tr>
<tr>
<td>Anterior temporalis</td>
<td>3</td>
<td>3 (referred down the head, into her anterior teeth; replicated her CC)</td>
</tr>
<tr>
<td>SCM</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Upper trap</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Shoulder trap</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>

Case: Exam Findings

**Range of motion**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Pain-free</td>
<td>27 mm</td>
</tr>
<tr>
<td>Passive</td>
<td>40 mm, pain on left superficial masseter, soft-end feel</td>
</tr>
<tr>
<td>Protrusive</td>
<td>8 mm</td>
</tr>
<tr>
<td>R Lateral</td>
<td>11 mm</td>
</tr>
<tr>
<td>L Lateral</td>
<td>12 mm</td>
</tr>
</tbody>
</table>

Myogenous pain: causation

- Stress-induced hypoperfusion
- Direct muscle trauma
- Adverse effect of medication
- 2nd pathology induced trismus
- Parafunctions
- Peripheral and central sensitization
Pathophysiology

- Injury to Type I muscle fibers
- Metabolic distress at motor endplates
- Peripheral sensitization
  - Increase in muscle nociception
  - Muscle co-contraction
  - Central sensitization


Central sensitization

Radiation of Pain

Myofascial pain: pain mechanisms

[Image depicting radiation of pain]

[Image depicting myofascial pain mechanisms]
Diagnostic Tests: Spray and Stretch

Diagnostic Tests: Trigger Point Injection

18 yo female presents with jaw pain and headaches

- Jaw Pain: started a few years ago, has worsened over time and is very severe
- Location: bilateral TMJs and masseters
- Intensity is 5-10/10
- Described as throbbing
- Sound, stress, pressure aggravates pain
- Headaches:
  - Location: temples, sinus area, forehead, back of head, behind eyes
  - Described as throbbing
  - Sound, stress aggravates headache
- Neck Pain: started years ago
  - Described as throbbing
  - Stress aggravates neck pain
- Jaw Pain: started a few years ago, has worsened over time and is very severe
  - Location: bilateral TMJs and masseters
  - Intensity is 5-10/10
  - Described as achy
  - Occurs daily
  - Lasts until pain meds (ibuprofen) are taken
  - Chewing, laughing, yawning, talking, smiling, brushing teeth aggravates pain
  - Pain pills, heat sometimes help but often nothing relieves pain


Exam

<table>
<thead>
<tr>
<th>Palpations</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rectus capitus R</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rectus capitus L</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Upper trap R</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Upper trap L</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lateral capsule R</td>
<td></td>
<td></td>
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<tr>
<td>Lateral capsule L</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dorsal capsule R</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dorsal capsule L</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Superficial masseter R</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Superficial masseter L</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temporalis Tendon R</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temporalis Tendon L</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Comfort Opening: 25 + 4 mm
- Passive Opening: 30 mm Pain
- RT Laterotrusive: Pain R TMJ 10 mm
- LFT Laterotrusive: Pain L TMJ 11 mm
- Midline: WNL 1 mm
- Opening Path: left Deviation on opening
- TMJ Noise Dysfunction: left side late opening; left side mid closing

Diagnostic tests and treatment

- In-office spray and stretch: significant improvement
- Anterior repositioning splint: significant improvement
- 2 sessions of trigger point injections and nerve blocks
- 2 months later, all pain went from 9/10 to 2-3/10
Myositis

- Acute condition
- Inflammation of the muscle and connective tissue
- Associated with pain, edema, decreased range of motion

What do you think?

HPI:
RCT #31 3/29/17
Reports limited mouth opening, swelling and pain
Rx: Muscle relaxant
Then sent to ER and given IV antibiotics for cellulitis
Since, the swelling has looked the same
Referred for eval of TMJ’s
Mouth opening is progressively becoming more limited with time
Trismus

- Any restriction in mouth opening (muscle-related)
- Can result from trauma, surgery, radiation
- Other terms: involuntary bracing, muscle splinting, protective guarding
- What is the most common cause of trismus in dentistry?

http://anestesiabucal.blogspot.com/2010/04/tecnica-de-vaziran-y-akinosi.html

Differential diagnosis

- Infectious/inflammatory
- Neurologic
- Dental
- Radiation-induced
- Medication-induced
- Trauma
- Congenital
- Surgery

Pathophysiology

1. Limited jaw mobility
2. Inflammation
3. Pain
4. Protective reflex
5. Disuse/atrophy
Muscle spasm

- Continuous, involuntary contraction of the muscle
- "Even at rest"
- Painful if sustained
- Feels firm to palpation
- Causation: usually a normal protective reflex to the presence of regional pain (similar to trismus)

24 yo male presents with painful clicking in the left TMJ

- Clicking began 2 weeks ago
- Feels constant pain
- Cannot bring the back teeth together on the left side
- No structural abnormalities present

Masticatory muscle contracture

- Abnormal reduction in the extensibility of the jaw muscles
- Clinical exam findings:
  - Limited opening
  - Unyielding passive opening stretch
  - Lateral movements are normal

- Causation:
  - Trauma-induced scar
  - Slowly developing shortening of muscles without hypertrophy or enlargement
Masticatory muscle hypertrophy

- Jaw muscle enlargement
  - Masseters
  - Temporals

- Causation
  - Increased functional demand of the muscles

- Usually bilateral
- Rarely painful


Movement disorders

- Sleep Bruxism
  - 20% of max voluntary contraction of at least 2 seconds
  - Begins around ages 10-20
  - 85-90% of the population grind their teeth at some point in life
  - Most common in stage 2
  - Occurs during transition from deeper to lighter stages of sleep

Movement disorders

- Dykinesia
  - Spontaneous
    - 3-4% of elderly
  - Mild symptoms involves jaw and lips
- Tardive
  - High-dose antipsychotic use
  - Involuntary, repetitive perioral, tongue, or jaw movements
  - Grimacing, tongue protrusion, lip smacking
Movement disorders

- Orofacial Dystonia
  - Intermittent, involuntary
  - Momentarily, sustained contraction of the jaw/orofacial muscles
  - Movements disappear during sleep
  - Meige’s Syndrome

- Orofacial Tremor
- Orofacial Tics

80 yo female presents with a chronic ulcer on the tongue

- Reports severe pain on the tongue for a year
- Examination reveals fractured #28
- Ulceration on the tongue approximates this fracture
- The tongue uncontrollably moves over this site

70 yo male presents with inability to close his mouth

- Chief complaint is that he cannot close his mouth on his own
- Began a few months ago, spontaneously
- Denies weakness in any muscles, pain or joint noises
Centrally mediated myalgia

- Chronic, continuous muscle disorder
- 1. History of prolonged and continuous muscle pain
- 2. Regional dull, aching pain at rest
- 3. Pain is aggravated by function of the affected muscle
- 4. Pain is aggravated by palpation

Associated factors:
- Trigger points and pain referral on palpation
- Report of muscle stiffness, weakness, and/or fatigue
- Report of acute malocclusion not verified clinically
- Ear symptoms, tinnitus, vertigo, toothache, tension-type headache
- Limited range of motion
- Hypersensitivity

Pain mechanisms

- Tinnitus
- Dizziness
- Vertigo
- Earache
- Fullness

Prevalence of otologic symptoms in TMD is up to 85%

TMD treatment modalities may help symptoms
Questions?

It's Time For A Break