TMD and Craniofacial Pain Made Easy

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TMD and Craniofacial Pain Made Easy
(we’ll see about that)

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**Head and Neck Anatomy Review**

**Embryology (Where it all began)**
- Ectoderm
  - Derived from Epiblast layer
  - Nervous system
  - Sensory epithelium of eye, ear, nose
  - Epidermis, hair, nails
  - Mammary and cutaneous glands
  - Epithelium of sinuses, oral and nasal cavities, intraoral glands
  - Tooth enamel

**Embryology (con’t)**
- Mesoderm
  - Derived from Epiblast layer
  - Muscles
  - CT derivatives: bone cartilage, blood, dentin, pulp, cementum, PDL

**Branchial Arches**

**Mandibular (1st) Arch**
- Forms
  - Trigeminal nerve
  - Muscles of mastication
  - Mylohyoid
  - Ant. belly of digastric
  - Tensor tympani
  - Tensor veli palatini
Mandibular (1st) Arch
- Forms (con't)
  - Malleus and incus
  - Ant. ligament of malleus
  - Sphenomandibular ligament
  - Portions of the sphenoid bone
  - Lower lip, lower face and mandible
  - Associated with Meckel’s cartilage

Second (hyoid) Arch
- Forms
  - Facial nerve
  - Stapedius muscle
  - Muscles of facial expression
  - Posterior belly of digastric
  - Stylohyoid

Third Arch
- Forms
  - Glossopharyngeal nerve
  - Stylopharyngeal muscle
  - Greater cornu of hyoid
  - Lower portion of body of hyoid

Fourth through Sixth
- Forms
  - Sup. laryngeal branch and recurrent laryngeal branch of vagus nerve
  - Levator veli palatini
  - Pharyngeal constrictors
  - Intrinsic muscles of the larynx
  - Laryngeal cartilages

Osteology Review
- Bones of the cranium and facial skeleton

Second (hyoid) Arch
- Forms (con't)
  - Stapes and portions of malleus and incus
  - Stylohyoid ligament
  - Styloid process of temporal bone
  - Lesser cornu of the hyoid bone
  - Upper portion of body of the hyoid
  - Associated with Reichert’s cartilage
Cranial Bones
- Occipital bone
- Frontal bone
- Parietal bones
- Temporal bones
- Sphenoid bone
- Ethmoid bone

Facial Bones
- Vomer
- Lacrimal bones
- Nasal bones
- Inferior nasal conchae
- Zygomatic bones
- Maxillary bones
- Mandible
Bony Openings in the Skull
- Foramen cecum: emissary v.
- Cribiform plate: olfactory nerves
- Optic canal: optic n.,
- Sup. Orbital fissure: occulomotor nerve (III), trochlear nerve (IV), Ophthalmic division of Trigeminal nerve (V1), Abducens nerve (VI)
- Foramen rotundum: Maxillary division of Trigeminal nerve (V2)
- Foramen ovale: Mandibular division of Trigeminal nerve (V3).

- Foramen spinosum: Meningeal branch of V3
- Foramen lacerum: greater petrosal nerve
- Carotid canal: int. carotid artery
- Internal acoustic meatus: Facial nerve (VII), Vestibulocochlear nerve (VIII)
- Jugular foramen: Glossopharyngeal nerve (IX), Vagus nerve (X), Accessory nerve (XI)
- Hypoglossal canal: Hypoglossal nerve (XII)
The sphenoid bone is full of holes, and most have something to do directly with branches of the trigeminal nerve.

**Ophthalmic Division - Trigeminal Nerve**
- superior orbital fissure
- supraorbital notch/foramen

**Maxillary Division - Trigeminal Nerve**
- foramen rotundum
- infraorbital foramen
Muscles of Facial Expression
- Epicranial: Frontal and occipital bellies
- Orbicularis oculi
- Corrugator supercili
- Orbicularis oris
- Buccinator
- Risorius
- Levator labii superioris

Muscles of the Head and Face
- Epicranial: Frontal and occipital bellies
- Orbicularis oculi
- Corrugator supercili
- Orbicularis oris
- Buccinator
- Risorius
- Levator labii superioris

Muscles: Rules of Innervation
- The muscles of facial expression are all innervated by the facial nerve, which also supplies the stapedius, stylohyoid and the posterior belly of the digastric.
Muscles: Rules of Innervation

- The muscles of mastication are all innervated by the trigeminal nerve, which also supplies the tensor veli palatini, tensor veli tympani, the mylohyoid and the anterior belly of the digastric.

Muscles of Mastication

- **Lateral Pterygoid: Inf. Belly**
  - Origin: Lateral surface of the lateral pterygoid plate
  - Insertion: Condylar neck; joint capsule; articular disc
  - Innervation: Lateral pterygoid n.
  - Action: Depresses mandible (translation)

- **Lateral Pterygoid: Sup. Belly**
  - Origin: Inf. Surface of the greater wing of the sphenoid
  - Insertion: Articular disc; condylar head and joint capsule
  - Innervation: Lateral pterygoid n.
  - Actions: Maintains articular disc position during condylar rest and movement

- **Medial Pterygoid**
  - Origin: Zygomatic Arch
  - Insertion: Angle and Ramus
  - Innervation: Masseteric n.
  - Actions: Elevates the Mandible

- **Medial Pterygoid**
  - Origin: Medial surface of the lateral pterygoid plate
  - Insertion: Medial surface of the mandible
  - Innervation: Medial pterygoid n.
  - Actions: Protrudes the mandible, elevates the mandible
**Muscles of Mastication**

- **Temporalis**
- **Masseter**
- **Lateral Pterygoid**
- **Medial Pterygoid**

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**Masseter**

- Elevates mandible in the direction of its fibers
- Seats condyle anteriorly-superiorly
- One neuron innervates 600 fibrils
- Strongest masticatory muscle of the Herbivores

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**Medial and Lateral Pterygoid**

- **Medial Pterygoid**
  - Originates on the medial side of the pterygoid plate
  - Opposite side is most efficient during function...
  - Functions with the masseter to provide the "working" movement.
  - The actual movement is very slight

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**LATERAL PTERYGOID**

- **Superior Head**: Becomes the disc. Tenses during closure, stabilizing disk
- **Inferior Head**: Attaches to neck of condyle. Pulls antero-medially, translating condyle for advancement and opening

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**Masseter**

- Orientation provides for mastication in "working" movement
- "Working" movement aligns Masseter for most efficiency
- Masseters are for mastication (when food is between the teeth)
Look closely at the orientation of the Lateral Pterygoid’s fibers. The Lateral Pterygoid, like any muscle, can only "get shorter" and by doing so, pulls the attachment closer to the origin. When the condyle is pulled anterior/medially, the eminance immediately provides translation of the condyle.

**Temporals**

- Posterior Segment is thinnest: retrudes mandible
- One neuron recruits 900 fibrils: 50% more efficient than masseter
- Temporals closes the jaw to approximate the teeth

**Muscles of mastication are innervated by the TRIGEMINAL NERVE**

- Ophthalmic (V1) Sensory
- Maxillary (V2) Sensory, Autonomic
- Mandibular (V3) Motor, Sensory, Proprioceptive, Parasympathetic

**The Trigeminal Nerve**
The Temporomandibular Joint

- An "arthroginglymoidal" joint
- Rotation occurs in the upper joint compartment (arthrodial)
- Translation occurs in the lower compartment (ginglymoid)

Cutaneous Nerves of the Head and Neck

Innervation:
- Auricular branch of the auriculotemporal nerve (75%)
- Posterior deep temporal nerves
- Masseteric nerve
the disc is attached to the head of the condyle medially and laterally, but not to the capsule medially and laterally

the disc is attached to the articular capsule anteriorly and posteriorly
Posterior temporal attachment or “superior lamina”

Posterior mandibular attachment or “inferior lamina”

“RETRODISCAL PAD”

Pinto’s ligament — malleomandibular ligament

Fibers of the superior head of the lateral pterygoid muscle attach to the disc.

TMJ Innervation:
Mandibular division of the Trigeminal nerve (V)
auriculotemporal
deep temporal
masseteric
Craniofacial Pain Examination

Initial Evaluation / Screening
- Panoramic Radiograph
- Health History
- History of TMD
- Maximum opening
- Palpation for joint noises
- Spray and stretch procedure
- Initial diagnosis and TX plan

Initial Examination
- Panoramic Radiograph
  - To rule out dental pathology, fracture, etc
  - To evaluate overall periodontal support
  - To get a vague idea of TMJ morphology
  - To evaluate the condylar and coronoid processes
  - To evaluate signs of parafunction

Proper diagnosis is the key to proper treatment.
Initial Examination

- Health history: what to look for
  - Current use of SSRI antidepressants
  - Trauma
  - Rheumatoid Arthritis/inflammatory diseases
  - Migraine headaches: temporalis headaches
  - Previous treatment

- Palpation of TM joints
  - RDD
  - Crepitus
  - Normal
  - Unilateral or bilateral
  - Able to capture with anterior positioning (RDD)
  - Patient perceives noise on the same side you detect it
  - Unable to detect noise the patient hears

- Maximum opening
  - Normal 48 to 52 mm without pain

Initial Examination

- Spray and Stretch Procedure
  - Ethyl chloride or Fluori-Methane
  - Spray over painful joint or muscle on stretch
  - Have the patient open and close a few times, measure their MO, and then have them relax
  - Ask the patient “does that make the discomfort worse, better or no change?”

Ethyl Chloride
Initial Examination

- Initial Diagnosis and Tx Plan
  - Refer for Physical Therapy
  - Refer to another healthcare provider
  - Obtain further records
    - Study models
    - Radiographs
    - MRI
    - Electronic Diagnostics

- Spray and Stretch Procedure
  - Typical pain referral patterns
  - Trigger points

- Initial Diagnosis and Tx Plan
  - No Tx indicated
  - Initial trial of anti-inflammatories, home PT, and Aqualizer
    - 600 mg ibuprofen q6h for 6 days
    - Ice 10 minutes with gentle stretching followed by 10 minutes moist heat
    - Aqualizer as much as possible and definitely at night

Imaging Records

- Complex Motion Tomography
- Computer Aided Tomography
- Magnetic Resonance Imaging

- Tomograms
  - Corrected (with SMV)
  - Allows evaluation of condylar position, and arthritic changes
  - Sagittal or coronal images possible
  - Slices may be taken in intervals across the joint
  - Less expensive and less radiation than CT scans
Imaging Records

- Computed Aided Tomography
  - Excellent for evaluation of condylar position and arthritic changes
  - Due to the number of slices, may pick up something not shown on Tomos
  - Allow computerized 3D reconstruction-useful in surgery
  - Less expensive than MRI

Imaging Records

- Magnetic Resonance Imaging
  - The Gold Standard for soft tissue evaluation
  - Not bad for hard tissue
  - Good for evaluation of disc position
  - Allows evaluation of inflammation, cysts, tumors, etc.
  - Relatively expensive
  - Magnetic field rather than X-Rays

The Comprehensive Exam

- Thorough history review
- Palpation of all palpable muscles of the head and neck, TMJ, ligaments, etc.
- ROM measurements
- Cervical ROM
- Basic Neurological Exam
- Dental / Occlusal Exam
- Possible Diagnostic Injections
TMD: Basic Differential Diagnosis

- Or...Everyday, Normal Dental Office, Craniofacial Pain Disorders

Capsulitis

- Treatment
  - Anti-inflammatory
  - Physical Therapy
  - Aqualizer or soft splint
  - Hard splint if necessary

Capsulitis, Trismus or Non-Reducing Disc Displacement?

Capsulitis

- Diagnosis
  - History of Trauma
  - Continuous TMJ Pain
  - Tenderness to Palpation
  - ROM not necessarily reduced
  - Acute malocclusion on injured side
  - Pain with Clenching
  - No pain with clenching on a tongue depressor

Capsulitis Treatment

- Anti-inflammatory
  - 600 mg Ibuprofen q6h for 4-7 days
  - Medrol dose pack (methylprednisolone)

Capsulitis Treatment

- Iontophoresis
  - A non-invasive method of pushing medication transdermally using a charged pad.
- Phonophoresis
  - A non-invasive method of pushing medication transdermally using ultrasound.
Capsulitis Treatment

- Iontophoresis
  - 0.4% Dexamethasone in a liquid (negative current)
  - 40, 60 or 80 milliamps

- Phonophoresis
  - 0.4% Dexamethasone in a gel form (ultrasound carries the medication)
  - 3 megahertz. 50-100%, constant movement of the head

Capsulitis Treatment

- Splint therapy
  - Any splint for acute capsulitis should be temporary—for use until the inflammation is resolved.
  - The perfect splint for a capsulitis case would self adjust as the inflammation reduces…

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Capsulitis Treatment

- Splint therapy
  - Once the initial capsulitis has resolved, a nightguard or daysplint (or both) may be indicated to reduce adverse joint loading.

Trismus Defined

- **trismus** (triz mus)
  - Persistent contraction of the masseter muscles due to failure of central inhibition; often the initial manifestation of generalized tetanus. Syn: *ankylosis*, *lockjaw*, *lock-jaw*

  [L. fr. G. *trismos*, a creaking, rasping]

  - Steadman’s Medical Dictionary

Trismus

- **Trismus**
  - **Potential Causes**
    - Trauma to the muscles of mastication
    - Trauma to the TM joints
    - Surgery
    - Radiation therapy
    - TMJ problems in general
    - Muscle damage
    - Joint damage
    - Rapid growth of connective tissue (i.e. scarring)

Trismus

- **Limitations in Range of Motion** resulting from factors external to the joint include:
  - Neoplasms
  - Acute infection
  - Myositis
  - Systemic diseases (lupus, scleroderma, and others)
  - Pseudoankylosis
  - Burn injuries or other trauma to the musculature surrounding the joint
Limitations in Range of Motion resulting from factors internal to the joint include:
- Bony ankylosis
- Fibrous ankylosis
- Arthritis
- Infections
- Gross trauma
- Micro-trauma (bruxism)

Limitation in Range of Motion due to Central Nervous System disorders:
- Tetanus
- Lesions that affect the trigeminal nerve
- Drug toxicity

Iatrogenic causes of Trismus
- Third molar extraction (during which the muscles of mastication may be torn, or the joint hyperextended)
- Direct trauma from injection into the medial pterygoid (MOST COMMON)
- Hematomas secondary to dental injection
- Post maxillo-mandibular fixation after mandibular fracture or other trauma.

Trismus
- Diagnosis
  - Extreme limitation of Range of Motion—usually under 20mm
  - History of trauma or recent IA nerve block
  - Spray and Stretch Procedure
    - Over the masseter and TMJ
    - ROM will increase significantly
  - Patient may or may not report feeling better
**Trismus**

- **Treatment**
  - Early and Often
  - Passive stretching (tongue blade exercises)
  - Anti-inflammatories
  - Physical therapy (manual therapy, moist heat, modalities)

**Internal Derangements**

What is that CLICKING?

**Internal Derangements**

- A (Very) Simplistic Overview
  - Reducing Disc Displacement
  - Non-Reducing Disc Displacement
The Normal TM Joint

A brief discussion of...

Centric Relation

Discal Dislocation with Reduction

JPT 5th Edition 1987

“the maxillomandibular relationship in which the condyles articulate with the thinnest avascular portion of their respective disks with the complex in the anterior-superior position against the shapes of the articular eminencies.”

(GPT-5)
centric relation (as defined by Shun Trik): 1) the maxillomandibular relationship in which the condyles articulate with the buccal aspect of the respective disks with the complex in the anterior-superior position against the anteroinferior osteocartilaginous surface and hence against the articular eminence. This position is clinically discernible when the mandible is in its anatomically most retruded position in the glenoid fossa. This position may not be able to be recorded in the presence of dysplasia of the masticatory system 7. A clinically determined position of the mandible placing both condyles into their anterior-uppermost position. This can be determined in patients without pain or derangement in the TMJ (Ramford)

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Centric relation (see fig. 1 to 7): the maxillomandibular relationship in which the condyles articulate with the thinnest avascular portion of their respective disks. It is the most retruded physiologic relation of the mandible to the maxillae to and from which the individual can make lateral movements. It is a position that can exist at any degree of jaw separation. It occurs around the terminal hinge axis (GPT-3). The most retruded physiologic relation of the mandible to the maxillae when the condyles are in the most posterior unstrained position in the glenoid fossae from which lateral movements can be made at any given degree of jaw separation (GPT-4). The most posterior relation of the lower jaw from which lateral movements can be made at a given vertical dimension (Boucher). A maxilla to mandible relationship in which the condyles and disks are thought to be in the midmost, uppermost position. The position has been difficult to define anatomically but is determined clinically by assessing when the jaw can hinge on a fixed terminal axis (up to 25 mm). It is a clinically determined position of the mandible placing both condyles into their anterior uppermost position. This can be determined in patients without pain or derangement in the TMJ (Ramsfjord).
Macro Trauma

Micro Trauma

1.2mm Airway!!!

The cause of bruxism???
**Discal Dislocation without Reduction**

- **Acute**
  - Sudden onset with pain and swelling
  - Pain with forced maximum intercuspation
  - Deflection to the affected side on opening
  - Maximum opening is usually around 26mm

- **Chronic**
  - History of joint clicking
  - History of reduced range of motion
  - Usually no pain

**Diagnostic Imaging**

- **MRI**
  - Needed to absolutely confirm DDw/oR.
  - Critical to have the MRI taken correctly.
  - Contraindications include pace maker, metal fragments in the eye, ferro-magnetic aneurism clips, significant metal in the area of interest, etc.
  - Write the prescription for closed and wide open views.
  - Provide a bite block for the open view.
  - Read the film yourself and discuss with the radiologist if you disagree with the interpretation.
Discal Dislocation without Reduction

Reduction (“unlocking”) Technique

Prior to the Unlocking Procedure

- Confirm tentative diagnosis with spray and stretch technique to help determine if the reduced ROM is muscular.
- Moist heat?
- Other modalities?

Discal Dislocation without Reduction

- Treatment
  - Acute
    - Attempt to Reduce (yourself or give the patient exercises)
    - Treat with splint, PT and meds
  - Chronic
    - Attempt to Reduce?
    - No treatment
    - Palliative (meds, home PT, splint)
Educate the patient as to what is going on (TMJ Tutor or “Joint videos”)

- Give the patient a chance to unlock on their own
  - Place on 600mg Ibuprofen q6h
  - Give ice and moist heat instructions
  - Educate the patient as to what to do if they unlock

Unlocking Protocol

- Informed consent. If possible, obtain this at least 24 hours before the procedure is performed.
- Prepare the tissue for posterior/superior TM joint capsule injection.
- Perform injection of 1.8cc short acting anesthetic.
- Ask the patient if their occlusion feels different. They should not be able to occlude on the side of the injection. If they can, you missed the joint capsule, but you will likely still have anesthesia of the auriculotemporal nerve.
- Allow the patient to attempt to “unlock” on their own. At this point I will leave the room and prepare the thermal plastic material.

Unlocking Protocol (Cont)

- Perform manipulation of the joint if the patient is unable to reduce the disc displacement on their own.
- Proceed to fabrication of the temporary splint, whether obvious reduction occurs or not.
- If obvious reduction occurs, spend an appropriate amount of time to thoroughly educate the patient regarding their disc displacement. It is imperative that they can determine when they are “locked” and when they are “unlocked.”
- If reduction was successful, have the patient check every 3 to 5 minutes to confirm that they are still unlocked.
- If indicated, instruct the patient to take 600mg Ibuprofen every 6 hours for the next 4 days. A pain reliever may also be prescribed, such as Ultram, Darvocet, Vicodin or Norco.
After the Injection(s)

- Ask the patient if their bite feels different (it should!).
- Ask the patient to move their jaw side to side and gently open wide (while you leave the room?).
- Approximately 50-70% of acute NRDD’s will reduce at this point.
If Not . . .

- Gentle Manipulation Techniques
  - Classic “dental school” technique
  - Tongue blade/dowel technique
  - Assisted opening / Assisted lateral motion
Real Answers

- Sometimes, they don’t unlock
- Sometimes, they aren’t locked in the first place

Next Step

- Give the patient some time and try again?
- MRI?
- Arthrocentesis?

Dental School Answers:

- Because you suck as a dentist
- . . .and your margin is open


Evaluation of the position, mobility, and morphology of the disc by MRI before and after four different treatments for temporomandibular joint disorders.


METHODS: Eighty-five joints (85 patients) with unilateral internal derangement or osteoarthritis that were successfully treated were included in this study. The patients were divided into four groups as follows: splint therapy group, pumping manipulation group, arthrocentesis group, and arthroscopic surgery group. Changes in the disc position, mobility, and morphology before and after treatment were compared among the four groups using MRI.
Evaluation of the position, mobility, and morphology of the disc by MRI before and after four different treatments for temporomandibular joint disorders.

RESULTS: All discs showed anterior disc displacement (ADD) without reduction before treatment. Only 10% of the joints became ADD with reduction after treatment, and the other joints remained ADD without reduction in spite of treatment. Discs treated by arthroscopic surgery were located more anteriorly compared with pre-treatment. The disc deformity advanced after arthrocentesis and arthroscopic surgery.

Study design: The study comprised 28 patients with a clinical unilateral TMJ disorder of internal derangement type III and capsulitis/synovitis. Bilateral MRI was immediately performed preoperatively and at a 2-month follow-up.

Comparison of the pretreatment MRI findings with the 2-month follow-up data showed for the TMJ internal derangement type III and capsulitis/synovitis side a slight decrease in the diagnoses of internal derangement from 28 (100%) preoperatively to 23 (89.3%) postoperatively, and a slight increase in those of OA from 25 (89.3%) to 28 (100%).

Magnetic resonance imaging findings of internal derangement, osteoarthrosis, effusion, and bone marrow edema before and after performance of arthrocentesis and hydraulic distension of the temporomandibular joint

Temporary Splint

- Made out of a thermal plastic material (Dupont-Tone polymer 767)
- Splint is made immediately, usually in an “end to end” dental relationship
- Position is tested to confirm stable reduction of the disc displacement
- Temporary splint is worn full time for 4 days.
Patient Education

- It is **EXTREMELY** important to educate the patient to help them feel and know when they are locked and when they are unlocked.

Follow Up

- The patient is to call the next morning
- The patient returns in one week for follow up
- The patient is educated as to the importance of nightguard therapy or daysplint therapy to stabilize the proper disc position (CR)
Thermal Plastic Temporary Splint Fabrication

Mandibular Splint Fabrication
Warning

Sales Pitch Coming.....

The Silent Sleep
Customizable pre-fabricated oral appliance

1. Non custom (less expensive)
2. Easily fit with VPS (denture relin material)
3. No boiling
4. Easy to alter position
5. May be relined as many times as needed
6. Excellent trial or temporary appliance
7. May be used in youth or children
8. May fit directly in the sleep lab
9. Dental/TMJ uses as well

Questions?

NRDD Keys to Success

- Accurate Diagnosis
- Good Technique
- A Reducible Disc (i.e. patient hasn’t been locked for 20 years)
- Immediate treatment to stabilize the reduced disc after a successful procedure
- Follow up with appropriate long term care

In Conclusion

- Capsulitis:
  - Tongue Blade Test
  - Aqualizer and Advil
- Trismus
  - Severely reduced range of motion after IA block
  - Medrol dose pack and Physical Therapy
- Non-Reducing Disc Displacement
  - 26mm of range of motion, without clicking, with a history of recent clicking
  - Unlocking procedure (or refer ASAP)
Always and never are two words you should always remember never to use

Parafinction or Protective Function: Bruxism and Sleep Apnea

Parafunction

• Physical behavior that is without functional purpose and may be potentially harmful.
Protective Function
• Physical behavior that is intended, whether conscious or subconscious, to improve survival.

Pharyngeal Patency
• While awake, the pharynx is always held open except during swallowing.
• This is accomplished by reflexes controlling the activity of pharyngeal muscles.
• During sleep, reflex control of the pharyngeal muscles is lost.
• During sleep, the pharyngeal airway can narrow severely or close completely.

The Oropharynx
Conduit for Completely Different Functions
• SWALLOWING
• RESPIRATION

Anatomy Review
Normal vs. Obstructed Airway

**Normal Airway**

- Air passes through the nose and flexible structures in the back of the throat (soft palate, uvula and tongue).
- During sleep the muscles relax but, normally, the airway stays open.

**Obstructed Airway**

- OSA is a situation in which the entire upper airway is blocked causing air flow to stop.
- Snoring is the vibration of the pharyngeal soft tissues as air passes through.

Nocturnal Bruxism

**Proposed Mechanisms**

- Recent publications suggest that sleep bruxism is secondary to sleep-related micro-arousals.

- BACKGROUND: Sleep bruxism (SB) is a stereotyped movement disorder that is characterized by rhythmic masticatory muscle activity (RMMA) and tooth grinding.
- METHODS: Polygraphic sleep recordings of 20 SB subjects without any sleep-related breathing disorders were analyzed for changes in respiration.
- RESULTS: A positive and significant correlation was found between the frequencies of RMMA episodes and the amplitude of breath ($R^2 = 0.26; p = 0.02$). The amplitude of respiratory changes was 11 times higher when arousal was associated with RMMA in comparison to arousal alone.
- CONCLUSIONS: To our knowledge, this is the first report showing that RMMA-SB muscle activity is associated with a rise in respiration within arousal.

- We showed that RMMA are secondary to a sequence of events in relation to sleep micro-arousals: the heart (increase in autonomic sympathetic activity) and brain are activated in the minutes and seconds, respectively, before the onset of activity in suprhyoid muscles and finally by RMMA in jaw closing masseter or temporalis muscles.

- The above results suggest that the onset of RMMA and SB episodes during sleep are under the influences of brief and transient activity of the brainstem arousal reticular ascending system contributing to the increase of activity in autonomic-cardiac and motor modulatory networks.
• PARTICIPANTS: Nine patients with sleep bruxism and 7 normal subjects were matched for age and sex.

• In sleep bruxism patients, although sleeping time did not differ between the 2 sleeping body positions, 74% of rhythmic masticatory muscle activity and swallowing events were scored in the supine position compared to 23% in the lateral decubitus position.

• We conclude that there is an association between obstructive sleep apnea and parafunctional activity, that sleep position affects the incidence of both sleep disordered breathing and parafunctional activity, and that analysis of apneas and hypopneas in both supine and lateral decubitus sleeping positions may be helpful.

Nocturnal Bruxism
• Relationship to Sleep Apnea

• Because sleep apnea leads to sleep arousals, and because sleep arousals are thought to result in increased parafunctional activity, we undertook the present study to determine the relationship between sleep apnea and parafunctional activity.

• 24 patients

• Nocturnal clenching was slightly higher in patients with sleep apnea than those without (12.2 vs 7.6 clenches/hr, p = 0.18), and there was a correlation between the clench index (CI) and apnea plus hypopnea index (A + H)

• There were significant falls in both the A + H (64.4 +/- 28.8 vs 36.5 +/- 36.7, p = 0.02) and CI (12.5 +/- 12.1 vs 7.0 +/- 8.6, p = 0.04) in the lateral decubitus vs supine sleeping positions.
Bruxism and Sleep Apnea in Children

Bruxism (Teeth Grinding or Clenching)

- Twenty-seven OSA children.
- Apnea index (AI) of 5 or more on polysomnographs.
- Their clinical history was obtained from their mothers, and oral findings were also evaluated. The patient consisted of 15 males (56%) and 12 females (44%).
- Snoring was the most frequently observed finding (100%).
- In terms of dentistry, oral breathing was the most frequently observed finding.

**References**
- Kawashima S, Niikuni N, Lo CH, Kohno M, Nakajima I, Akasaka M. Department of Pediatric Dentistry, Nihon University School of Dentistry, Tokyo, Japan.

- Sahin U, Ozturk O, Ozturk M, Songur N, Bircan A, Akkaya A. 1,605 children (819 boys and 786 girls) aged 7-13 years from 9 randomly selected primary schools located within the city limits of Isparta, Turkey.


- DiFrancesco RC, Junqueira PA, Trezza PM, de Faria ME, Frizzarini R, Zerati FE. Division of Otolaryngology, São Paulo University Medical School.

**Results**

- Evaluated 38 children consecutively referred to the sleep laboratory with suspicion of OSAHS.
- Severe cases of apnea were most common among children under the age of six.
- In children with OSAHS, the most common symptoms were snoring and nasal obstruction.
- Excessive sleepiness and bruxism were seen in 29.4 and 34.3%.
- All of the children diagnosed with severe OSAHS also presented snoring and bruxism.

**Conclusions**

- Before surgery all the 69 children presented sleep apnea and 45.6% presented bruxism. Malocclusion could be found in 60.7%. Three months after surgery none of the children presented breathing problems and only 11.8% presented bruxism. There was no difference in malocclusion.

- CONCLUSIONS: This study suggests that there is a positive correlation between sleep-disordered breathing and bruxism. There was an important improvement of bruxism after T & A surgery.
140 children aged between 4 and 12 years with obstructive symptoms due to adenotonsilar hypertrophy were evaluated.

With a questionnaire existence of bruxism was evaluated before and after adenotonsillectomy and the results were compared with each other.

RESULTS: The prevalence of bruxism was 25.7% before surgery and 7.1% after it.

CONCLUSION: This study suggests that adenotonsillectomy could improve bruxism significantly in children who have obstructive symptoms due to adenotonsilar hypertrophy.

During the CPAP titration night most breathing abnormalities were eliminated and a complete eradication of the tooth grinding events was observed. The results of this study suggest that when sleep bruxism is related to apnea/hypopneas, the successful treatment of these breathing abnormalities may eliminate bruxism during sleep.
Nocturnal Bruxism

• Effective Treatment
• Bite Splints


Aggravation of respiratory disturbances by the use of an occlusal splint in apneic patients: a pilot study.

Gagnon Y, Mayer P, Morisson F, Rompré PH, Lavigne GJ.

Faculty of Dental Medicine, University of Montreal, Canada.

• RESULTS: No statistically significant difference in AHI was noted between baseline and splint nights.

• However, four patients experienced an aggravation in apnea diagnosis category on the night they used the splint. The AHI was increased by more than 50% in 5 of the 10 patients. The RDI showed a 30% increase from baseline to splint nights. The percentage of sleeping time with snoring also increased by 40% with the splint.

• CONCLUSION: This open study suggested that the use of an occlusal splint is associated with a risk of aggravation of respiratory disturbances. It may therefore be relevant for clinicians to question patients about snoring and sleep apnea when recommending an occlusal splint.
CPAP and OA Treatment

Cone Beam CT showing pre treatment and with TAP II in place

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Effect of an adjustable mandibular advancement appliance on sleep bruxism: a crossover sleep laboratory study.

Landry-Schönbeck A, de Grandmont P, Rompré PH, Lavigne GJ.
Department of Prosthodontics, Faculty of Dental Medicine, Université de Montréal, Canada.

Twelve subjects
5 nights in a sleep laboratory. After habituation and baseline nights, 3 more nights were spent with an MAA in either a slight (25%) or pronounced (75%) mandibular protrusion position or with an MOS (control).

CONCLUSION: Short-term use of an MAA is associated with a significant reduction in SB motor activity without any appliance breakage. A reinforced MAA design may be an alternative for patients with concomitant tooth grinding and snoring or apnea during sleep.

Reduction of sleep bruxism using a mandibular advancement device: an experimental controlled study.
Landry ML, Rompré PH, Manzini C, Guitard F, de Grandmont P, Lavigne GJ.
Faculté de Médecine Dentaire, Université Laval, Canada.

Thirteen intense and frequent bruxors
The MOS was used as the active control condition and the MAD was used as the experimental treatment condition.
 Designed to temporarily manage snoring and sleep apnea, the MAD was used in 3 different configurations.

CONCLUSIONS: Short-term use of a temporary custom-fit MAD is associated with a remarkable reduction in sleep bruxism motor activity.

Don’t Forget SSRI Induced Bruxism
BuPROPione as an Antidote to SSRI Induced Bruxism in 4 Cases
Bostwick, Jaffee

Screening Your Patients

Sleep Apnea Risk Factors
- Obesity
- Increasing Age
- Male Gender
- Anatomic Abnormalities of Upper Airway
- Family History
- Alcohol or Sedative Usage
- Smoking
- Hypertension

OSA Risk Factors
- BMI>30
- Neck circumference >16in
- High arched palate
- Micro/retrognathia
- Mallampati class III / IV airway
Results: The majority of the Far-East Asian men were found to be nonobese (mean BMI, 26.7 +/- 3.8) but had severe OSAS (mean RDI, 55.1 +/- 35.1). When controlled for age, RDI, and LSAT, the white men were substantially more obese (mean BMI, 29.7 +/- 5.8, P = .0055). When controlled for age and BMI, the white men had less severe illness (RDI, 34.1 +/- 17.9, P = .0001). Although the posterior airway space and the distance from the mandibular plane to hyoid bone were less abnormal in the Far-East Asian men, the cranial base dimensions were significantly decreased.
1.2 mm Airway!!!
Nacho
- Male
- 42 years old
- Chief Complaint: Tired, lack of energy
- Doctor asks, “Do you snore?”
- Patient says, “Yes.”
- Refer for Sleep Study

Christy
- Female
- 42 years old
- Chief Complaint: “Tired, lack of energy”
- Doctor asks, “Are you having trouble sleeping?”
- Patient says, “Yes.”

Case Studies

Becky
- 35yo,
- 5’5”, 125 lbs, BMI 20.8,
- Healthy
- square jawed
- large tori
- snoring
- anterior wear (bonding which she broke off)
- “jaw has always popped,”
- NG for 4 years
- Referred to me by dentist for chief complaints of temporal headaches, bilateral jaw pain
- Patient thought her pain might have been brought on by stress since her husband went to China and she has 3 small boys.

Linda
- 54yo woman
- 5’ 2”, 122lbs, BMI 22.3,
- AHI 11, supine AHI 21, REM AHI 36
- Chief complaints of extreme facial pain, jaw clicking, jaw pain, ear pain (2007 sleep study—CPAP intolerant, history of chronic TMD and facial pain among other problems, treated with anti-depressants)
Amy

- 39yo woman
- CC: Headaches, right sided jaw pain, pain when chewing
- Chronic jaw pain and dysfunction with history of prior splint therapy
- Pain worse in the past 6 months
- Bilateral severe reducing disc displacements
- MO 41mm
- Previous sleep study showed AHI of 5.4

Innocent Bystanders?
(or what you focus on isn’t always what you hit)

Airway?

TMJ / Muscles?

Innocent Bystanders?
(or what you focus on isn’t always what you hit)

Bunny

Deer

“All you need is love”

- The Beatles
“All I need is the air that I breathe, and to love you”

- The Hollies

Thank You!!

AACFP.ORG

CTISleep.com

JamisonRSpencer@gmail.com