“Management considerations for Temporomandibular Disorders”

by
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Classification of Temporomandibular Disorders

I. Masticatory Muscle Disorders
1. Protective Contraction
2. Local Muscle Soreness
3. Myofascial Pain
4. Myospasm
5. Chronic Centrally Mediated Myalgia

II. Temporomandibular Joint Disorders
1. Derangements of the Condyle-Disc Complex
   a. Disc Displacement with Reduction
   b. Disc Displacement without Reduction
2. Structural Incompatibilities
   a. Adhesions / Adherences
   b. Deviation in Form
   c. Subluxation
   d. Spontaneous Dislocation
3. Inflammatory Disorders
   a. Synovitis
   b. Capsulitis
   c. Retrodiscitis
   d. Arthritides

III. Chronic Mandibular Hypomobility
1. Ankylosis
2. Muscle Contracture
3. Coronoid Impedance

IV. Growth Disorders
1. Congenital / Developmental Bone Disorders
   a. Agenesis
   b. Hypoplasia
   c. Hyperplasia
   d. Neoplasia
2. Congenital / Developmental Muscle Disorders

Muscle Pain

Muscle pain is the most common type of pain humans experience.

Chronic muscle pain affects between 11–24% of the world’s population
Cimmino et al. 2011

In the U.S. chronic pain are estimated to incur an economic burden of $500 billion dollars annually.
Miranda et al. 2010

Malocclusion Incorrect joint position
Muscle Pain

Or ...we think about muscle pain as it relates to parafunction (bruxism, clenching, tooth wear).

Sleep Related Bruxing  Awake Time Clenching

We dentists have developed many concepts regarding the etiology of muscle pain.

How valid are the data?
The data have been classically based on patient report and clinical observations.

Current data is based on real time activity in a sleep lab.

Common beliefs regarding bruxism, tooth wear, EMG and pain - Facts or Fiction ? -

What are some common beliefs?

1. TMD patients report more bruxing activity than controls. **TRUE**

   Self-report of bruxism:
   55% of TMD patients report they brux
   only 15% of controls report they brux

Common beliefs regarding bruxism, tooth wear, EMG and pain - Facts or Fiction?

1. TMD patients report more bruxing activity than controls.  **TRUE**
2. TMD patients actually brux more than controls.  **FALSE**

Results of 2 nights in sleep studies:
9.7% of TMD patients showed bruxism
10.9% of the controls showed bruxism
(RMMA index of 1.7 events per 1.5 hours)
- no statically significant difference -

Raphael et al. Sleep bruxism and myofascial pain TMD.

3. There is a correlation between the magnitude of tooth wear and bruxing activity.  **FALSE**
4. There is a strong correlation between tooth wear and RMMA (rhythmic masticatory muscle activity).  **FALSE**

There is no correlation between tooth wear and RMMA observed in a sleep lab.


5. There is a strong correlation between bruxing activity and pain.  **FALSE**

6. Patients who have pain have higher resting EMG activity.  **FALSE**

Studies demonstrate that there are no differences in EMG activity between masticatory muscle pain patients and controls.

Yermann 1985
Maszewska 1984
Carlson, 1993
Mailou, 1997
Sevensson, 2004

7. Patients who brux more, have more pain.  **FALSE**

Self-reported bruxers (cut off 4 episodes of RMMA an hour)
Low frequency bruxers had more pain than the high frequency bruxers.

1. TMD patients report more bruxing activity than controls. **TRUE**
2. TMD patients actually brux more than controls. **FALSE**
3. There is a correlation between the magnitude of tooth wear and bruxing activity. **FALSE**
4. There is a strong correlation between tooth wear and RMMA (rhythmic masticatory muscle activity). **FALSE**
5. There is a strong correlation between bruxing activity and pain. **FALSE**
6. Patients who have pain have higher resting EMG activity. **FALSE**
7. Patients who brux more, have more pain. **FALSE**

Perhaps we need to begin to rethink muscle pain.

**Muscle Pain**

In order to successfully treat muscle pain we need to understand normal muscle function and what factors lead to pain.

We need to think physiologically….….not dentally.

**Masticatory Muscle Pain**

*What is it?*  
*What causes it?*

**Spasm**

An involuntary, CNS induced tonic contraction, often associated with local metabolic conditions.

**Cramp**

Yet studies demonstrate that there are no differences in EMG activity between masticatory muscle pain patients and controls.

Yemm 1985
Majewski 1984
Carlson, 1993
Maillou, 1997
Sevensson, 2004

**A Clinical Masticatory Muscle Model**

Okeson 2012
Local Muscle Soreness

- Description -
A primary, non-inflammatory, myogenous pain condition.
(muscle fatigue / over use)

- Etiology -
1. Protracted co-contraction produces changes in the muscle tissue, such as fatigue, ischemia, resulting in the production of algogenic substances.
2. Deep pain input (may lead to "cyclic muscle pain")
3. Local tissue trauma
   a. local injury (e.g. injections, strain)
   b. unaccustomed muscle use (e.g. bruxism, chewing gum) (Delayed onset local muscle soreness)
4. Increased levels of emotional stress

- History -
1. The pain began several hours or days following an event associated with protective co-contraction (e.g. altered sensory input, high crown)
2. Tissue injury (injections, opening wide, or unaccustomed muscle use - pain may be delayed)
3. Secondary to another source of the pain
4. Associated with an increased level of the emotional stress
Local Muscle Soreness

- Clinical Characteristics -

1. Structural dysfunction: a decrease in the velocity and range of mandibular movement. The full range of movement cannot be achieved by the patient. Passive stretching by the examiner can often achieve a more normal range of movement (soft end feel).
2. Minimal pain at rest.
3. Increased pain with function.
4. Local tenderness to palpation.

- Treatment -

The general goal of therapy is to reduce sensory input that can lead to cyclic muscle pain by:
1. Eliminate any ongoing altered sensory or proprioceptive input.
2. Education patient and encourage physical self regulation.
   a. decrease jaw use to within painless limits.
   b. stimulate proprioceptors with normal muscle use.
   c. promote emotional stress awareness / reduction.
   d. encourage reduction of non-functional tooth contacts (cognitive awareness).
3. Occlusal appliance therapy.
4. Considered the use of mild analgesics. (ibuprofen 400mg tid)

Local Muscle Soreness

Occlusal Appliance Therapy

- Type
- Indications
- Fabrication
- Clinical Protocol

The Stabilization Appliance

Occlusal Appliance Therapy

- Type
- Indications
- Fabrication
- Clinical Protocol
The Stabilization Appliance

- Indications -

Local Muscle Soreness
Chronic Centrally Mediated Myalgia
Bruxism

Occlusal Appliance Therapy

- Type
- Indications
- Fabrication
- Clinical Protocol

Final Criteria for the Stabilization Appliance

1. The appliance is stable and retentive.
2. All the teeth contact evenly on flat surfaces in the musculoskeletally stable position.
3. Eccentric contacts are on the anterior teeth.
4. In the upright position, posterior teeth contact heavier than the anterior teeth.
5. The appliances smooth and polished.

The final mandibular stabilization appliance

What about mandibular appliances?
Occlusal Appliance Therapy

- Type
- Indications
- Fabrication
- Clinical Protocol

When an occlusal appliance reduces the patient’s symptoms...

....what do you do next?

Reasons that could explain why your occlusal appliance reduced the muscle pain.

So why did the patient respond?

1. A change in the occlusal condition
2. A change in the condylar position
3. A change in the vertical dimension
4. A change in cognitive awareness
5. Altered sensory input to the CNS (bruxism)
6. Natural musculoskeletal recovery
7. Placebo effect
8. Regression to the mean

Managing the patient with Local Muscle Soreness

<table>
<thead>
<tr>
<th>Week</th>
<th>VAS</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>6/10</td>
<td>education, physical self regulation reduce use to painless limits reduce non-functional tooth contacts introduce the stabilization appliance, night time use</td>
</tr>
<tr>
<td>1</td>
<td>3/10</td>
<td>reinforce physical self regulation reevaluate the stabilization appliance, adjust PRN</td>
</tr>
<tr>
<td>2</td>
<td>1/10</td>
<td>reinforce physical self regulation reevaluate the stabilization appliance, adjust PRN</td>
</tr>
<tr>
<td>3</td>
<td>0/10</td>
<td>reinforce physical self regulation reevaluate the stabilization appliance, adjust PRN</td>
</tr>
<tr>
<td>4</td>
<td>0/10</td>
<td>What do you do next?</td>
</tr>
</tbody>
</table>

Reasons that could explain why your occlusal appliance reduced the muscle pain.

So why did the patient respond?

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So why did the patient respond?

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Reasons that could explain why your occlusal appliance reduced the muscle pain.

Time to change our discussion to a different disorder.
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What about the use of an “Anterior Positioning Appliance”? 

- Think orthopedically -

A painful disc displacement

- Think orthopedically -

Anterior therapeutic position, pain reduction
- an interesting question -

When an “Anterior Positioning Appliance” reduces the patient symptoms…..
…..what do you do next?

The problem was there were no data.

Which philosophy is correct?

The Re-builders

The Re-capturers

The Repairers

What is the short-term success of anterior positioning appliances?

<table>
<thead>
<tr>
<th>author</th>
<th># of pat</th>
<th>type of tx</th>
<th>duration</th>
<th>reported success</th>
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</thead>
<tbody>
<tr>
<td>Anderson et al 1985</td>
<td>10</td>
<td>APA - 24 hrs/day</td>
<td>3 months</td>
<td>sign. improvement</td>
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<tr>
<td>Lundh et al 1985</td>
<td>24</td>
<td>APA - 24 hrs/day</td>
<td>6 weeks</td>
<td>much better</td>
</tr>
<tr>
<td></td>
<td>23</td>
<td>SA - 24 hrs/day</td>
<td>6 weeks</td>
<td>slightly better</td>
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<tr>
<td></td>
<td>23</td>
<td>Control</td>
<td>6 weeks</td>
<td>no change</td>
</tr>
<tr>
<td>Okeeson 1986</td>
<td>40</td>
<td>APA - 24 hrs/day</td>
<td>2 months</td>
<td>80%</td>
</tr>
<tr>
<td>Simmons et al 1995</td>
<td>7</td>
<td>APA - 24 hrs/day</td>
<td>9 months</td>
<td>95%</td>
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<tr>
<td>Davies et al 1997</td>
<td>40</td>
<td>APA - 24 hrs/day</td>
<td>2 months</td>
<td>88%</td>
</tr>
<tr>
<td></td>
<td>25</td>
<td>APA - only HS</td>
<td>2 months</td>
<td>65%</td>
</tr>
<tr>
<td></td>
<td>20</td>
<td>APA - only day</td>
<td>2 months</td>
<td>52%</td>
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What is the long-term success of anterior positioning appliances for pain and dysfunction?

<table>
<thead>
<tr>
<th>author</th>
<th># of pat</th>
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<th>success/pain &amp; dysfunction</th>
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<td>241</td>
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<td>36% 50% 43%</td>
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<tr>
<td>Okeeson, 1988</td>
<td>40</td>
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<tr>
<td>Butterworth et al, 1992</td>
<td>151</td>
<td>APA &amp; orthodontics</td>
<td>1.75 yrs</td>
<td>51%</td>
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<tr>
<td>Davies et al 1997</td>
<td>48</td>
<td>no occlusal changes</td>
<td>3 yrs</td>
<td>70%</td>
</tr>
<tr>
<td>Vichokachitoong et al, 1993</td>
<td>17</td>
<td>no occlusal changes</td>
<td>4.2 yrs</td>
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<tr>
<td>Summers et al 1997</td>
<td>75</td>
<td>APA &amp; Cr / Bridge</td>
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<td>Tallents et al 1990</td>
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What is the long-term success of anterior positioning appliances when pain and dysfunction are evaluated separately?

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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>average 83%</td>
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What is the long-term success for Joint Sounds?

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Summary of Studies on Anterior Positioning Appliance Therapy

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<tr>
<th></th>
<th>Pain</th>
<th>Clicking</th>
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<tbody>
<tr>
<td>Short-term effects</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Long-term effects</td>
<td>Yes</td>
<td>No</td>
</tr>
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Long-term Treatment of Disc Displacement with reduction (phase II)

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<tr>
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Long-term Success for Joint Sounds

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Treatment Considerations

Has the Disc been “recaptured”?
Painful loading of the retrodiscal tissues.  

Position the mandible forward off the retrodiscal tissues.  
(pain reduction)

The retrodiscal tissues adapt. 

The condyle can now function in the musculoskeletally stable position painlessly.  
(two may still be clicking)

Studies that support the fibrotic adaptation of the retrodiscal tissues: 
Scapino RP, 1983 
Hall MB, et al, 1984 
Solberg WK, et al, 1985 
Arkerman S, et al, 1986 
Blaustein DI & Scapino RP, 1986 
Solberg WK, et al, 1986 
Luder HU, et al, 1993 
Pereira FJ, et al, 1996a 
Pereira FJ, et al, 1996b

Long-term Outcome of Disc Displacement with reduction  
- conclusions from results of long-term studies -

Our goal should be to help the patient adapt the retrodiscal tissues by reducing loading forces. 
1. Educating the patient to the problem 
2. Reduce heavy chewing 
3. Reduce non-functional tooth contacts 
4. Appliance therapy 
Anterior positioning appliances may be helpful but only on a part time basis.
Final Anterior Positioning Appliance

A temporary therapeutic position not a final treatment position.

How should anterior positioning appliances be used in patients with anterior disc displacement with reduction?

Management of disc displacement with reduction

Stabilization Appliance (always at night and when needed during the day)

- No pain → Time, re-evaluate → Reduce use of the appliance and assess for orthopedic stability
- Continued pain

Anterior Positioning Appliance (always at night and when needed during day)

- No pain
- No further treatment indicated (consider bruxism)
- Decrease use of the appliance
- Return of pain → Time, re-evaluate

Patient

Clinical evaluation

- Reduces pain
- No change in pain

Orthopedic stability

- No dental therapy indicated
- Assess for orthopedic stability
- Orthopedic instability
- Evaluate for appropriate dental therapy

- No pain
- Pain reduction, allow more time
- Convert the APA to a SA
- Pain returns

Return to the APA
Clinical evaluation

Stabilization Appliance
(always at night and when needed during the day)

Patient
Continued pain

No pain

Time, re-evaluate

Reduce use of the appliance and assess for orthopedic stability

Anterior Positioning Appliance
(always at night and when needed during day)

No change in pain

Reduce pain

Begin 24 hour use

Reduction of pain

Re-evaluate pain, consider surgical evaluation

- A closing philosophical thought -

Do not ever lose sight of the fact that we are healthcare providers.
We have been granted the privilege of treating our fellow men/women.
Treatment plan your patients as if they were family members.
When you do this, you will have a happy and grateful patient.

Long-term Outcome of Disc Displacement with reduction

- conclusions from results of long-term studies -

Our goal should be to help the patient adapt the retrodiscal tissues by reducing loading forces.

1. Educating the patient to the problem
2. Reduce heavy chewing
3. Reduce non-functional tooth contacts
4. Appliance therapy

Anterior positioning appliances may be helpful but only on a part-time basis. Permanent occlusal changes are seldom indicated.