The Occurrence of Sleep Disordered Breathing in Patients With Temporal Mandibular Joint Dysfunction (TMJ)

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Introduction: We previously characterized the occurrence of nocturnal bruxism in patients diagnosed with obstructive respirations during sleep. We also reported how nocturnal bruxism functions as a protective mechanism, in attempt to prevent obstruction of the upper airway, during sleep. The previous unanswered question was the frequency of which patients presenting with Temporal Mandibular Joint Dysfunction (TMJD) also have obstructive respirations during sleep. This study attempts to determine what percent of patients presenting with TMJD have the etiology stemming from a tendency towards obstruction of the upper airway.

Methods: All patients presenting to a facial pain clinic (Center for Facial Pain and Dental Sleep Medicine, PC) during the year of 2009 were included in the assessment. Histories and physical evaluations were conducted in the same fashion on all patients, by a boarded Facial Pain dentist also boarded in Dental Sleep Medicine. Intake information included a detailed enquiry assessing for signs and symptoms of disturbed sleep and particularly obstructive respirations during sleep. Notation was taken with regards to the circadian pattern of bruxing symptoms, with particular attention to those patients who had a preferential peak of symptoms in the morning after awakening, these included jaw tightness and pain. When this occurred preferentially during sleep or upon awakening, it was deemed a feature suggestive of a sleep-related breathing disturbance. When there were signs or symptoms suggestive of sleep-related breathing disturbance a referral for a NPSG study was initiated. When TMJD symptoms were severe on initial presentation it was deemed necessary to implement dental splint therapy in conjunction with the evaluation of a sleep related breathing disorder. Follow-up was performed and treatments were pursued based on the clinical findings. As such, split therapy was utilized, as needed, on most of these patients.

Results: A total of 429 patients were referred for evaluation of TMJD during 2009. Of the 429 patients, 323 (75%) had signs or symptoms suggestive of a sleep-related breathing disturbance. All of these patients were referred for NPSG testing to objectively establish a diagnosis of OSA or UARS. Only 136 of the 323 were compliant with the recommendation and underwent NPSG testing. Lack of compliance, in the other 187 patients, resulted from a variety of reasons ranging from insurance restrictions to lack of support from their Primary Care Provider (physician) in whom they would seek an opinion following their dental evaluation / recommendation when questioning the need for the testing. Of the 136 patients that had NPSG studies performed, 100% were found to have a significant degree of obstructive respirations ranging from mild-to-severe. The majority of the studies were performed using esophageal pressure monitoring (Pes) and many had a full array of EMG monitoring the external muscles of mastication. The Pes was used in order reliably identify respiratory-effort-related-arousals (RERA's) such not to miss the diagnosis of the UARS and also to demonstrate the protective nature of the bruxing phenomena—not reliably quantifiable with nasal pressure cannula methods.

Of the 429 patients, splint therapy was utilized in 403 (94%) as would be considered typical treatment for TMD patients.

Conclusion: Our study demonstrates that 75% of patients presenting with TMJD have clinical findings to suggest the presence of a sleep-related breathing disturbance. Of those who had NPSG testing, we found 100% had abnormal studies with variable degrees of obstructive respirations. This supports two points: First: Clinical evaluation by a trained dentist can identify patients with sleep disordered breathing and Second: There is a high correlation between sleep disordered breathing and TMJD. It is recognized that our patients were able to be assessed with NPSG's that included Pes monitoring, which increased the sensitively of the testing process.

Previously, we identified that the bruxing process functions as a protective mechanism of the upper airway. We demonstrated a lower-degree-of-negative pressure within the upper airway during periods of tonic bruxism, measured by a grid of EMG electrodes monitoring the external muscles of mastication. When EMG activity dropped—equivalent to the disappearance of bruxing—there was a resultant increase in the negative pressure within the upper airway as a result of increased airway obstruction. Prior studies also demonstrated that treatment of the patients' obstructive airway with CPAP resulted in improvement in the patients' bruxism. Other groups have previously claimed that the arousals from the obstructive respiratory events were associated with clenching / bruxism as part of the arousal response. Although this does occur, we recognize such events as phasic bruxism, which only constitutes one type of the bruxing phenomena. Our previous studies have demonstrated that tonic bruxism is a phenomenon that occurs as a protective mechanism of the airway and in many patients may constitute the main bruxing process that causes disturbing symptoms.

With the current study we have identified that a high number of patients presenting with TMJD have features suggesting a problem with airway obstruction during sleep. In summary, with these results and our previously reported results we postulate that the driving mechanism behind bruxing-and-clenching—during sleep—is the protective nature that the bruxing provides on the airway, and those patients who brux during sleep are those who have airways with a propensity to collapse. This protective phenomenon over time leads to TMJD in many patients.

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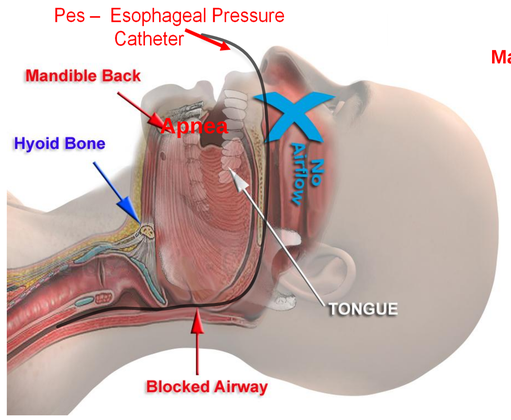
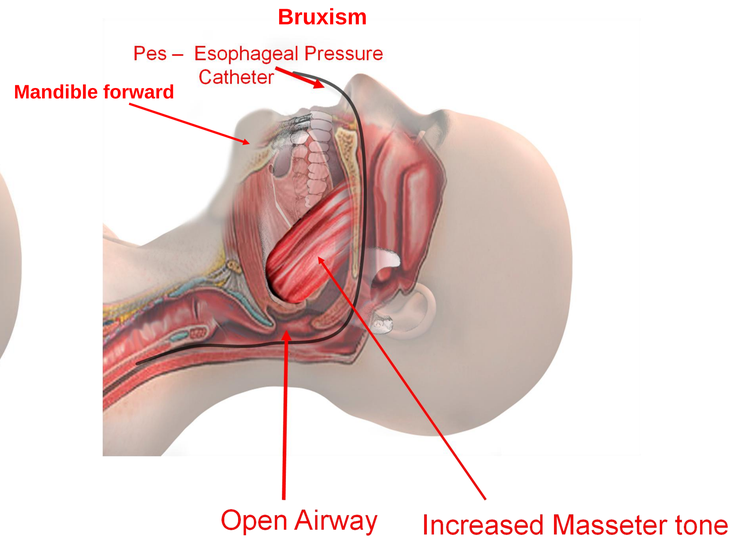
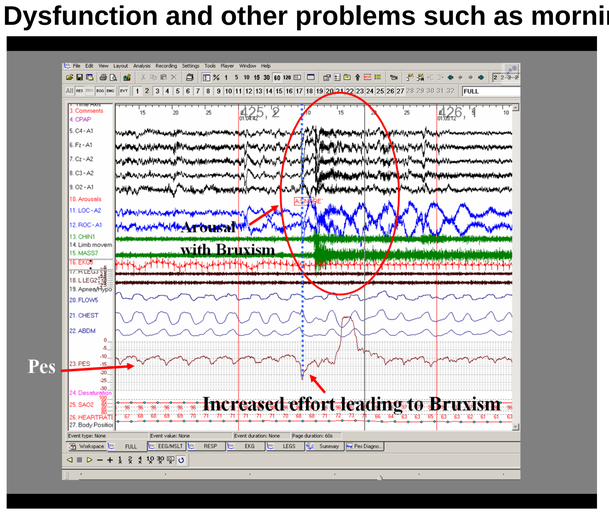
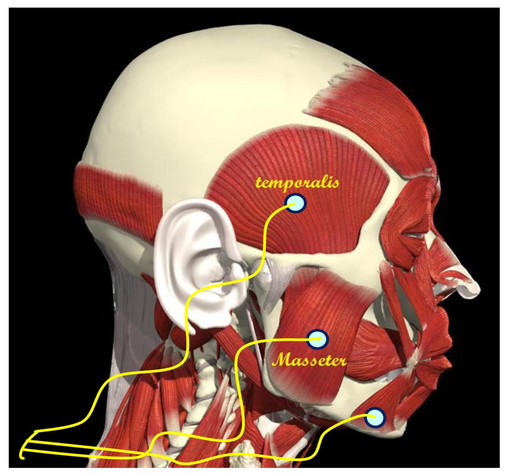




When most patients exhibit obstructive respirations during sleep the mandible falls back and brings the back of the tongue with it. This triggers a series-of-events that, in some people, results in a reflexive attempt to open up the airway by increasing masseter tone (Tonic Bruxing). This brings the mandible forward and in many patients improves respirations. Unfortunately, over time this can lead to symptoms of pain in the TMJ Dysfunction and other problems such as morning headaches.





The above example demonstrates a discrete event of a respiratory-effort-related arousal, associated with increased masseter muscle activity (Phasic Bruxing that in this case transitions into Tonic Bruxing). Without the Pes; demonstrating the increased respiratory effort preceding the increase in masseter muscle activity, this event would not have been recognized as being associated with obstructive respirations.

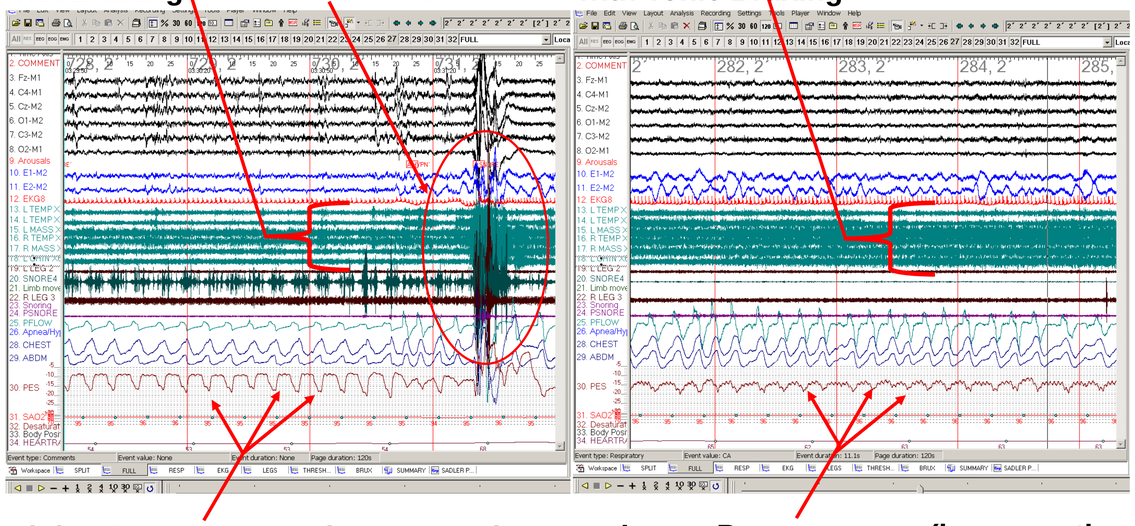
To better characterize the muscle activity of the mandible and obtain assessment of an association between upper airway muscle tone with airway obstruction, additional EMG electrodes have been utilized. Below are two samples: Left with low muscle activity associated with large airway pressures and Right with more muscle activity associated with less airway pressures.

Muscle Tone Inversely Related to Upper Airway Obstruction

Decreased Muscle Tone when not Bruxing

Phasic Bruxing Event

Increased Muscle Tone Associated with Tonic Bruxing



Higher Pes pressures (more negative Pressure from greater airway obstruction)

Lower Pes pressures (less negative Pressure from less airway obstruction)

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