Airway Protection: The Missing Link between Nocturnal Bruxism and Obstructive Sleep Apnea

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Introduction : In 2008 we presented that Nocturnal Bruxism, defined as either a grinding or clenching of the jaw during sleep, occurs in many patients as a response to protect the airway in situations where there is a vulnerability towards airway collapse. To our knowledge, we are the first to make this claim that would explain the link between Nocturnal Bruxism and Obstructive Sleep Apnea. We additionally presented that in many patients this protective mechanism minimizes the degree of obstructive respirations making the diagnosis difficult and frequently only possible by way of esophageal pressure monitoring. We present here additional data to support our claim and to shed light on the importance of enhanced diagnostic measurements during polysomnography and also expanding the pathologic impact of obstructive respirations during sleep.

Methods: We retrospectively reviewed 729 consecutive charts of patients diagnosed with clinically significant obstructive breathing during sleep (OSA or Upper Airway Resistance Syndrome (UARS)) and prescribed CPAP therapy at least six months prior to initiating our assessment (296 females, 433 males, average age 51 +/- 13.8). Bruxism was determined by either positive responses on a sleep questionnaire or from information obtained from the clinical history and exam. NPSG testing was performed on all patients whose charts were reviewed and the results of the NPSG demonstrated OSA (which included those with UARS). UARS was established by esophageal pressure monitoring (Pes) using a water catheter technique. Follow-up interview was performed to assess outcome in patients with Bruxism placed on CPAP as a treatment of their OSA.

Results :

183 demonstrated Bruxism by history (25.1% of the OSA population) 95 females and 88 males.
119 patients were successfully contacted for follow up questioning by phone. 17 of these patients were using a bite-guard as part of their treatment.

Statistical assessment was performed on the remaining 102 patients only treated with CPAP. 75 stated they were using CPAP to some degree. Of those 75 patient 60 reported nightly use (100% compliant or 7 nights per week) and 27 patients were not using CPAP at all.

Of the 60 patients using CPAP nightly, 33 demonstrated improvement (55%) 17 stated partial improvement and 16 stated complete improvement.

A multivariate analysis was performed to determine if there was a relationship between CPAP use and degree of improvement in Bruxism.

	No Improvement	Partial Improvement	Complete Improvement	F and P Values
Age	46.8 13.7	48.8 10.6	49.6 12.3	F(2,66)=0.43, p=0.67
AHI	23.6 23.5	21.5 15.6	22.4 31.3	F(2,66)=0.13, p=0.88
RDI	31.9 25.1	31.9 25.1	36.2 27.1	F(2,66)=0.16, p=0.85
CPAP (nights/wk)	4.4 3.1	6.4 1.2	6.0 2.1	F(2,66)=5.65, p=0.0054

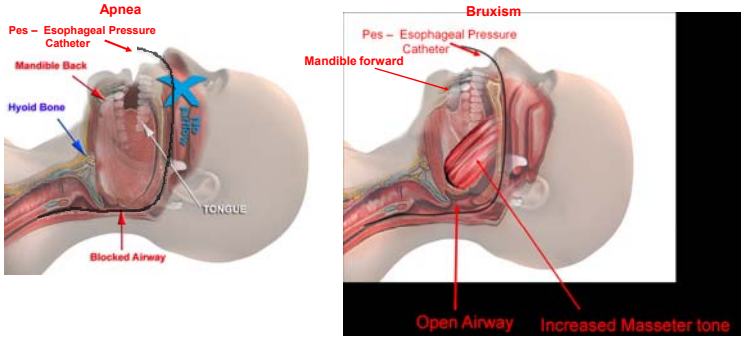
No significant differences were found between the groups with respect to Age, AHI, or RDI. There were significant differences with respect to CPAP use as measured by Nights of CPAP use per week and improvement in Bruxism with a p=.0054

Additional assessment of patients who were found to have UARS:

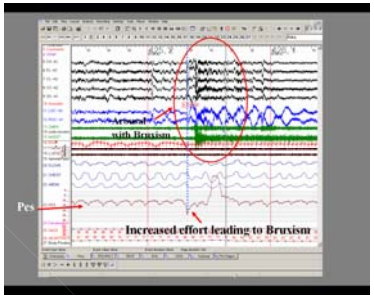
Of the 102 patients 25 had AHI < 6 but found to have the Upper Airway Resistance Syndrome with Effort related arousals identified by the Pes (pressure within the esophagus). 14 of the 25 used CPAP nightly of which 7 stated complete resolution of Bruxism and 5 stated partial improvement. Combined, this represented 85.7% of the Bruxism group. Therefore, Bruxism patients with The Upper Airway Resistance Syndrome who used CPAP nightly demonstrated improvement in Bruxism 85.7% of the time by treatment with CPAP alone.

Conclusion : Again, we are the first to postulate that nocturnal Bruxism is a compensatory mechanism of the upper airway to help overcome upper airway obstruction by activation of the clenching muscles which results in bringing the mandible, and therefore the tongue, forward. We recognize that this process may reduce the obstruction and therefore increasing the need for adding Pes (Pressure in the esophagus) monitoring to NPSG testing in order to properly establish a diagnosis in some patients. Cannula nasal pressure monitoring for flow limitation has not proven as successful in our experience and provides no assessment as to the magnitude of the airway obstruction when present. We have thus included patients with the UARS to our OSA group recognizing the subtle nature of the identifiable airway events and thus expanding our group of patients with Bruxism associated with airway obstruction. We have drawn our conclusion of Bruxism representing a protective mechanism of the airway after demonstrating that treating the airway with CPAP, thus protecting the airway, eliminates the need to invoke the Bruxism response and over time the Bruxism resolves. This study suggests such a compensatory mechanism is the etiological force behind nocturnal Bruxism in many patients.

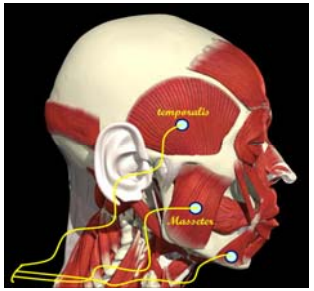
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When most patients exhibit obstructive respirations during sleep the mandible falls back bringing the back of the tongue with it. This triggers a series of events that in some people results in a reflexive attempt to open up the airway by increasing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



The above example demonstrates a discrete respiratory effort related arousal that triggers increased masseter muscle activity. Without the Pes demonstrating the increased respiratory effort just preceding the increase in masseter muscle activity, this event would not have been recognized as being associated with an obstructive respiratory event.



To better characterize the muscle activity of the mandible and obtain assessment of an association between upper airway muscle tone and airway obstruction, additional EMG electrodes have recently been utilized. Below are two samples from the same patient during the same night. The one to the left, with low muscle activity, is associated with large negative airway pressures (obstruction) and the one to the right, with more muscle activity, is associated with less

