

Predicting Airway Changes Using a Diagnostic Intra-Oral Appliance by Analyzing CBCT Images for Obstructive Sleep Apnea/Hypopnea

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Purpose: To compare linear and volumetric upper airway dimensions of sleep apnea/hypopnea subjects (SAH) with a mandibular advancement device (MAD) in inactivated position and using a predictive diagnostic intraoral appliance to replicate MAD activation.

Methods: With IRB approval, individuals treated with the SomnoDent[®] MAD were recruited and cone beam CT scans were made on each while performing the Müller's maneuver, (1) mouth closed (C), (2) inactivated MAD in place (MAD), and (3) with a George Gauge[™] replicating MAD activation (GG). Subject apnea/hypopnea Index (AHI), body mass index (BMI), age and sex were recorded. Three-dimensional image renderings with hollow models of the airway were examined. Airway volume and minimal cross-sectional area were measured at the retropalatal and retroglossal levels. Friedman's test was used to evaluate differences between groups ($p \leq 0.05$) with *post hoc* Wilcoxon test with Bonferroni correction. Spearman's rank correlation was used to test the association between C, GG and MAD measurements.

Results: The subjects (2 male and 5 female, mean age; 61.0 ± 10.4 yrs) had a mean BMI = 30.3 ± 5.5 kg/m². Mean AHI post-treatment (6.3 ± 7.5 h⁻¹) was significantly lower than pre-treatment (15.8 ± 5.1 h⁻¹) ($t=2.18$, $p=0.016$). There were no significant differences proven in indices between appliances or in the mouth closed position excepting retroglossal cross-sectional area ($\chi^2=6.0$, $p=0.05$) where there were significant differences between C (115.8 ± 86.8 mm²) and GG (63.4 ± 25.1 mm²) ($p < 0.02$). Diagnostic and treatment volume indices were not found to correlate.

Conclusion: The predictive and therapeutic devices used for SAH do not reliably increase upper airway dimensions when examined with the subject seated and in a conscious state. Specific airway changes cannot be predicted using a George Gauge[™] diagnostic device with the subject conscious and seated.