

A Three-dimensional Airway Assessment for the Treatment of Snoring and/or Sleep Apnea with Jaw Repositioning Intraoral Appliances: A Case Study

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ABSTRACT: The purpose of this snoring/sleep apnea study was to assess the role of 3-D magnetic resonance imaging (MRI) of the airway correlated to jaw repositioning/intraoral appliance design. A clinical case is presented utilizing this technology, integrating a diagnostic baseline and follow-up sleep study/polysomnograph. The baseline polysomnography, prior to jaw repositioning appliance design, indicated a respiratory disturbance index (RDI) of 21.5 hypopnea/apneas per hour. The follow-up sleep study, with use of an intraoral repositioning appliance, showed a 3.9 per hour RDI, an 82% RDI reduction/improvement. Magnetic resonance TMJ and airway images were done. The MRI enhanced airway assessment computer software program analyzed the 3-dimensional volume and cross sectional area changes from hard/soft palate junction to epiglottis. Imaged were the oropharynx nasopharynx and hypopharynx regional anatomy. The baseline, without mandibular positioning device, showed a total airway volume of 5,801.31 cubic mm, whereas with the mandibular positioning device in place, the total airway volume was increased to 8,657.22 cubic mm or a total increased volume of 32%. The largest improvement site in the airway was the mid-soft palatal uvula/nasopharynx region, with base of tongue moving forward. Along with traditional polysomnography, 3-dimensional MRI airway imaging should be considered as a diagnostic procedure in assessing sleep apnea patients. The necessity of a combined medical/dental team approach is emphasized.

0886-9634/1404-332\$03.00/0, THE JOURNAL OF CRANIOMANDIBULAR PRACTICE, Copyright © 1996 by CHROMA, Inc.

Manuscript received March 19, 1996; revised manuscript received April 2, 1996; accepted July 3, 1996

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Sleep apnea is a serious respiratory disorder with a high potential for morbidity.¹ Statistics have indicated that this disorder is a major public health problem which affects a significant portion of the population.² It has been associated with sudden infant death syndrome (SIDS).³ Snoring, or noisy breathing during sleep, is one of the major signs of potential upper airway obstructions. Conservative estimates are that one out of every four males snore. Snoring has a direct relation to sleep apnea with increased risk of hypertension.⁴⁻⁶ Estimates of its prevalence run from a low of 9% to a high of 40% of the male population between the ages of 40 to 60, and 4-25% of the female population in the same age group.⁷ Snoring has largely been ignored as a potential health hazard, unless a full profile of obstructive sleep apnea events is quite obvious during examination and history taking.⁸ The consequences and complications of sleep apnea and associated snoring have widespread effects and often go undiagnosed or misdiagnosed. Sleep deprivation leads to daytime somnolence, causing many fatal motor vehicle accidents.^{9,10} Fatigue at work and falling asleep at the job have serious medical and financial loss considerations.^{11,12} The yearly costs directly