

Articles of the Month – November 2022

MAD

J Oral Rehabil. 2022 Nov 10.

doi: 10.1111/joor.13392. Online ahead of print.

Link: [J of Oral Rehabilitation - 2022 - Uniken Venema - Do dental parameters predict severity of obstructive sleep apnea and.pdf](#)

Do dental parameters predict severity of obstructive sleep apnea and mandibular advancement device therapy outcomes? A pilot study

[J A M Uniken Venema](#), [P F N Bosschieter](#), [A Hoekema](#), [J M Plooij](#), [F Lobbezoo](#), [N de Vries](#)

Background: Mandibular Advancement Devices (MAD's) are oral appliances commonly used in treatment of Obstructive Sleep Apnea (OSA). OSA severity and certain other factors, such as BMI and neck circumference, correlate with MAD therapy success. So far, the predictive value of dental parameters, such as dental profile, molar-classification, overjet, overbite, maximal retrusion, maximal protrusion, and protrusive range, has not been fully investigated.

Objectives: We aimed to investigate whether dental parameters influence OSA severity and MAD therapy outcome and could therefore be helpful in phenotyping OSA patients. Furthermore, we studied the predictive power of dental parameters for OSA severity and successful MAD therapy. We hypothesize that specific dental parameters correlate with more severe OSA and with more successful MAD treatment.

Methods: We performed a cohort study, including OSA patients diagnosed by polysomnography (PSG). Dental parameters were collected. Objective treatment outcome was collected by performing a PSG with MAD after three months of therapy. Differences between OSA severity groups and MAD treatment outcomes were analyzed and dental parameters were correlated between groups.

Results: The relation between dental parameters and OSA severity was analyzed in 143 patients, fifty patients had a PSG with MAD in situ after a 3-month therapy. The median baseline Apnea Hypopnea Index (AHI) significantly reduced from 17.6 (8.7-29.3) to 11.1 (5.5-17.5). Overbite and maximal retrusion differed significantly between mild, moderate, and severe OSA. Other dental parameters did not differ significantly between the groups, nor correlated with OSA severity or MAD treatment outcome.

Conclusion: In this study, no correlation between dental parameters and OSA severity or MAD treatment outcomes was found. Therefore, screening patients for OSA and MAD treatment outcome based on dental parameters is currently not possible.

EADSM comment: Interesting to know, although negative results, that prediction of success with MAD based on dental variables are probably impossible or too powerless.

Sleep Breath. 2022 Nov 14.
doi: 10.1007/s11325-022-02744-6. Online ahead of print.

Link: <https://link.springer.com/content/pdf/10.1007/s11325-022-02744-6.pdf>

Comparative efficacy of mandibular advancement devices in obstructive sleep apnea: a network meta-analysis

[Imran H Iftikhar](#)^{1,2}, [Peter A Cistulli](#)^{3,4}, [Haitham Jahrami](#)^{5,6}, [Khalid A Alamoud](#)^{7,8}, [Maarij Saeed](#)⁹, [Andrew P Soulimiotis](#)¹⁰, [Ahmed S BaHammam](#)^{11,12}

Purpose: To analyze relative efficacies of mandibular advancement devices (MAD) in sleep apnea treatment.

Methods: From eligible randomized controlled trials (RCT), MADs were classified based on their mechanistic designs. Data on apnea-hypopnea index (AHI), Epworth sleepiness scale (ESS), nadir oxygen saturation (minSaO₂), and sleep efficiency (SE%) from RCTs were then analyzed in network meta-analyses, and relative ranking of different MADs was computed based on P scores (a method of ranking similar to SUCRA). Similar analyses were conducted based on the different brands of MADs.

Results: There were no statistically significant differences between MADs in any of the outcomes analyzed. However, the P-scores, based on the point estimates and standard errors of the network estimates, ranked some MADs higher than others in some of the outcomes. Of the different mechanistic designs, the highest P scores were achieved for attached midline traction (P score = 0.84) and unattached bilateral interlocking (P score = 0.78) devices for AHI reduction, attached bilateral traction (P score = 0.78) and unattached bilateral interlocking (P score = 0.76) for ESS, monobloc (P score = 0.91) and unattached bilateral interlocking (P score = 0.64) for minSaO₂, and unattached bilateral interlocking (P score = 0.82) and attached bilateral traction (P score = 0.77) for SE%. Notable findings in the network meta-analyses based on MAD brands, of the limited number of studies that specified them were the effects of SomnoDent Flex™, TAP™, and IST® in their effects on AHI reduction, with P scores of 0.94, 0.83, and 0.82, respectively. Monobloc decreased supine-AHI the most (- 44.46 [- 62.55; - 26.36], P score = 0.99), and unattached bilateral interlocking had the greatest effect on REM-AHI (- 11.10 [- 17.10; - 5.10], P score = 0.87).

Conclusions: Findings from this study show clinically (but not statistically) significant differences between MADs in terms of their relative efficacy when analyzed for different sleep apnea treatment outcomes and sleep apnea phenotypes.

EADSM comment: Very interesting and needed comparison of the efficacy between various MAD designs. It might, however, be questioned whether the chosen subdivisions of appliances really reflect what is investigated. For instance, the use of elastics is not covered.

Mandibular Torus as a New Index of Success for Mandibular Advancement Devices

[Teresa Diaz de Teran](#)¹, [Pedro Muñoz](#)², [Felix de Carlos](#)³, [Emilio Macias](#)³, [Marta Cabello](#)¹, [Olga Cantalejo](#)¹, [Paolo Banfi](#)⁴, [Antonello Nicolini](#)⁴, [Paolo Solidoro](#)⁵, [Monica Gonzalez](#)^{1,6}

Background: In obstructive sleep apnoea (OSA), treatment with mandibular advancement devices (MADs) reduces patients' Apnoea-Hypopnoea index (AHI) scores and improves their sleepiness and quality of life. MADs are non-invasive alternatives for patients who cannot tolerate traditional continuous positive airway pressure (CPAP) therapy. The variability of responses to these devices makes it necessary to search for predictors of success. The aim of our study was to evaluate the presence of mandibular torus as a predictor of MAD efficacy in OSA and to identify other potential cephalometric factors that could influence the response to treatment.

Methods: This was a retrospective cohort study. The study included 103 patients diagnosed of OSA who met the criteria for initiation of treatment with MAD. Structural variables were collected (cephalometric and the presence or absence of mandibular torus). Statistical analysis was performed to evaluate the existence of predictive factors for the efficacy of MADs.

Results: A total of 103 patients who were consecutively referred for treatment with MAD were included (89.3% men); the mean age of the participants was 46.3 years, and the mean AHI before MAD was 31.4 (SD 16.2) and post- MAD 11.3 (SD 9.2). Thirty-three percent of patients had mandibular torus. Torus was associated with a better response (odds ratio (OR) = 2.854 ($p = 0.035$)) after adjustment for sex, age, body mass index (BMI; kg/m²), the angle formed by the occlusal plane to the sella-nasion plane (OCC plane to SN), overinjection, and smoking. No cephalometric predictors of efficacy were found that were predictive of MAD treatment success.

Conclusions: The presence of a mandibular torus practically triples the probability of MAD success. This is the simplest examination with the greatest benefits in terms of the efficacy of MAD treatment for OSA.

EADSM comment: Mandibular tori have been related to more severe OSA, both total-AHI and supine-AHI. (Ahn, S.H., Ha, J.G., et al. 2019) The above findings support previous single ones regarding an easily detected predictor of success for MAD. (Palm, E., Franklin, K.A., et al. 2014) Maybe these patients have no other causes to their OSA and the mandibular advancement device helps to keep the airway open by just advancing the jaw and reduce the influence of tori on the tongue position?

Non-CPAP therapies

Breathe (Sheff). 2022 Sep;18(3):220164.doi: 10.1183/20734735.0164-2022. Epub 2022 Oct 11.

Link: [Non-CPAP therapy for obstructive sleep apnoea \(nih.gov\)](https://pubs.rsos.royalsocietypublishing.org/doi/10.1098/rsos.220164)

Non-CPAP therapy for obstructive sleep apnoea

[Johan Verbraecken](#)^{1,2}, [Marijke Dieltjens](#)^{3,4,5}, [Sara Op de Beeck](#)³, [Anneclaire Vroegop](#)^{2,3,4}, [Marc Braem](#)^{3,5}, [Olivier Vanderveken](#)^{2,3,4}, [Winfried Randerath](#)⁵

Treatment of obstructive sleep apnoea in adults is evolving, from a "one treatment fits all" to a more individualised approach. The spectrum of treatment options is broad and heterogeneous, including conservative, technological and pharmaceutical modalities. This raises the questions of which patients these modalities might be useful for, and if there are specific criteria for single or combined treatment. The most commonly used non-CPAP treatment is a mandibular advancement device. Furthermore, it appears from the available evidence that upper airway surgery, bariatric surgery, and maxillomandibular advancement can be effective in particular patient groups and should be indicated more readily in clinical practice. Technically, a tracheotomy is the most effective surgical treatment, but is not socially acceptable and is associated with major side-effects. Other treatment options are emerging, like positional therapy, hypoglossal nerve stimulation, and myofunctional exercises. Drug therapy is also promising when pathophysiological traits are considered. The range of currently available treatment options will be discussed in this review, with emphasis on the selection of appropriate patients, therapeutic efficacy and compliance, and reference to recent guidelines. In the selection process, routine application of drug-induced sleep endoscopy to assess the site(s) of collapse during sleep can increase the success rate of both surgical interventions and oral appliance therapy.

Educational aims: To outline recommendations concerning the proper management of obstructive sleep apnoea (OSA) patients that cannot be treated adequately with continuous positive airway pressure (CPAP) due to intolerance, poor adherence or compliance, or CPAP refusal. To provide information about the selection of appropriate patients for alternative non-CPAP treatment options. To better understand the different aspects of OSA treatment with noninvasive approaches, such as oral appliances, positional therapy, drug treatment and myofunctional therapy, including indications, contraindications, and expected short- and long-term results. To discuss the different surgical options for the treatment of OSA and to provide information on the important issue of proper patient selection for surgery, as most OSA surgical outcomes are associated with the pre-operative assessment of the level(s) of upper airway collapse.

EADSM comment: Exemplary, comprehensive open-access overview of non-CPAP therapies.

MYOFUNCTIONAL THERAPY

Sleep Sci. 2022 Oct-Dec;15(4):421-428.

doi: 10.5935/1984-0063.20220073.

Link: [ssci-15-04-0421.pdf \(nih.gov\)](#)

Effect of myofunctional therapy on snoring in obese patients: a randomized trial

[Thiare Sperger](#)¹, [Allan Cezar Faria Araujo](#)², [Carolina Ferraz de Paula Soares](#)³

Objective: To analyze the effectiveness of myofunctional therapy (MT) in the treatment of habitual snoring in obese patients.

Material and methods: This randomized clinical trial consisted of an experimental group (n=14) that underwent MT and a control group (n=26) that performed nonspecific exercises for the treatment of snoring. The Epworth sleepiness scale (ESS), Pittsburgh sleep quality index (PSQI), and short-form health survey (SF-36) were applied before and after treatment. Snoring was assessed subjectively by asking the partner about improvement after treatment. The SnoreLab app was used for objective assessment.

Results: There was no significant effect of MT on any of the SnoreLab variables analyzed when groups, time points or covariates (adherence, age, body mass index [BMI], neck circumference, and sex) were compared. Neck circumference (cm) and the Pittsburgh sleep quality index score were significantly higher after treatment. There was no change in the Epworth sleepiness scale score after treatment. A correlation was found between BMI and the Pittsburgh sleep quality index and between BMI and the functional capacity component of the SF-36. Patient adherence was similar between groups.

Discussion: Apps for recording snoring are a useful tool to be explored. MT exerted no significant effect on habitual snoring in obese patients despite the reduction of the snore score in the experimental group. Therapy applied without exclusion criteria based on the severity of sleep breathing disorders and pharyngeal characteristics fails to achieve the results necessary to treat habitual snoring in obese patients.

EADSM comment: Still more research is needed about myofunctional therapy. The lack of effect on snoring in obese patients, inspires to more studies of effects in relation to OSA phenotype.

SURGERY

J Clin Med. 2022 Nov 15;11(22):6749.

doi: 10.3390/jcm11226749.

The Effects of Barbed Repositioning Pharyngoplasty in Positional and Non-Positional OSA Patients: A Retrospective Analysis

[Giovanni Cammaroto](#)^{1,2}, [Claudio Moretti](#)³, [Giuseppe Di Prinzio](#)³, [Isotta Campomagnani](#)³, [Giannicola Iannella](#)^{2,4}, [Angelo Cannavici](#)¹, [Giuseppe Meccariello](#)¹, [Andrea De Vito](#)⁵, [Antonino Maniaci](#)⁶, [Jerome Renè Lechien](#)^{2,7}, [Carlos Chiesa-Estomba](#)^{2,8}, [Christian Calvo-Henriquez](#)^{2,9}, [Paula Martinez Ruiz de Apodaca](#)^{2,10}, [Marina Carrasco Llatas](#)¹⁰, [Ahmed Yassin Bahgat](#)¹¹, [Guillermo Plaza](#)¹², [Carlos O'Connor-Reina](#)¹³, [Luca Cerritelli](#)³, [Virginia Corazzi](#)³, [Chiara Bianchini](#)³, [Andrea Ciorba](#)³, [Stefano Pelucchi](#)³, [Claudio Vicini](#)^{1,3}

Purpose: The aim of our retrospective study is evaluating the effectiveness of barbed repositioning pharyngoplasty (BRP) in a consecutive cohort of patients and assessing its impact on positional indexes in order to potentially identify specific obstructive sleep apnea (OSA) phenotypes for patients who might benefit more significantly from this intervention.

Methods: A single-center retrospective study with baseline and follow-up type III sleep tests evaluating the Apnea Hypopnea Index (AHI), supine AHI, non-supine AHI, oxygen desaturation index (ODI), mean SaO₂, percentage of time spent at SaO₂ below 90% (CT90), and lowest oxygen saturation (LOS) were performed. The patients were then divided into groups according to Sher's criteria and Amsterdam Positional OSA Classification (APOC). Parametric and non-parametric tests and univariate and multivariate analyses were conducted.

Results: The study finally included 47 patients. The statistical analysis showed significant improvement in AHI, supine AHI, non-supine AHI, and ODI after surgery. The linear regression showed that high values of baseline AHI, AHI supine, and AHI non supine predict more significant postoperative reductions in AHI, AHI supine, and AHI non supine, respectively. Therapeutic success was achieved in 22 patients out of 47. The logistic regression did not find any independent risk factors for success. The most significant reduction in AHI, supine AHI, and non-supine AHI was observed in the APOC 3 group while the APOC 1 patients experience a substantially lower improvement.

Conclusions: BRP appears to be an effective surgical procedure for the treatment of OSA. The non-positional patients might benefit more from BRP in comparison with positional patients. Moreover, OSA severity should not be considered an absolute contra-indication for this surgical procedure.

EADSM comment: Study showing the importance of using more specific criteria to define positional OSA, when evaluating treatment outcomes of non-CPAP therapies. The APOC criteria are useful for this purpose (Frank, M.H., Ravesloot, M.J., et al. 2015)

OSA

J Sleep Res. 2022 Dec;31(6):e13690.

doi: 10.1111/jsr.13690. Epub 2022 Jul 22.

Link: [Correlates of excessive daytime sleepiness in obstructive sleep apnea: Results from the nationwide SESAR cohort including 34,684 patients \(wiley.com\)](#)

Correlates of excessive daytime sleepiness in obstructive sleep apnea: Results from the nationwide SESAR cohort including 34,684 patients

[Martin Ulander](#)^{1,2}, [Jan Hedner](#)^{3,4}, [Göran Stillberg](#)⁵, [Ola Sunnergren](#)⁶, [Ludger Grote](#)^{3,4}

Excessive daytime sleepiness (EDS) is a hallmark symptom in obstructive sleep apnea (OSA). It is commonly eliminated by obstructive sleep apnea therapy and constitutes a major treatment indication. This study aimed to identify determinants of excessive daytime sleepiness by the Epworth Sleepiness Scale (ESS) scores in the large, representative national obstructive sleep apnea patient cohort of the Swedish Sleep Apnea Registry (SESAR, www.sesar.se). Data from 34,684 patients with obstructive sleep apnea recruited at 23 sites (33% females, mean age 55.7 ± 13.7 years, BMI 30.2 ± 6.3 kg/m², AHI 29.1 ± 22.3 , and ODI 24.9 ± 21.4 events/h) had a mean ESS score in the mild to moderate excessive daytime sleepiness range (9.7 ± 4.9). The proportion of patients with excessive daytime sleepiness was 41.4% in men and 44.6% in women. Independent predictors of excessive daytime sleepiness included gender, age, and hypoxic markers (high ODI and low mean saturation). Univariate and multivariate analyses were used to identify significant predictors for the ESS score and for excessive daytime sleepiness (ESS ≥ 10) amongst anthropometric factors, sleep apnea frequency (apnea-hypopnea index (AHI)), markers of intermittent hypoxia (oxygen desaturation index (ODI), mean saturation (mSaO₂)), as well as prevalent comorbidities. Depression was associated with higher ESS scores and hypertension/atrial fibrillation with lower scores. The oxygen desaturation index provided a stronger predictor of excessive daytime sleepiness than the apnea-hypopnea index. The severity of obstructive sleep apnea, captured as the apnea-hypopnea index, was only weakly associated with daytime sleepiness in this representative obstructive sleep apnea patient cohort. Age had different effects in men and women. The impact of obstructive sleep apnea in a wider patient related perspective needs to be determined after the inclusion of factors other than the apnea-hypopnea index.

EADSM comment: Data from a large cohort describing the elusive associations between sleep disordered breathing and symptoms of daytime sleepiness. More knowledge is really needed in this area.

J Neurol. 2022 May;269(5):2460-2468.

doi: 10.1007/s00415-021-10824-y. Epub 2021 Oct 1.

Link: [Self-reported symptoms of sleep-disordered breathing and risk of cardiovascular diseases: Observational and Mendelian randomization findings \(wiley.com\)](#)

J Sleep Res. 2022 Dec;31(6):e13681.

doi: 10.1111/jsr.13681. Epub 2022 Jul 22.

Self-reported symptoms of sleep-disordered breathing and risk of cardiovascular diseases: Observational and Mendelian randomization findings

[Olga E Titova](#)¹, [Shuai Yuan](#)², [John A Baron](#)^{1,3,4}, [Eva Lindberg](#)⁵, [Karl Michaëlsson](#)¹, [Susanna C Larsson](#)^{1,2}

Sleep-disordered breathing may increase the risk of cardiovascular diseases, but observational findings are inconclusive. We investigated whether sleep-disordered breathing-related symptoms are associated with risk of several cardiovascular diseases using data from a cohort study and by performing Mendelian randomization analyses. The cohort study included 43,624 adults (56-94 years old) who completed questionnaires regarding symptoms of snoring and cessation of breathing, lifestyle habits and health characteristics. Participants were followed up for incident cardiovascular diseases and death over 8 years through linkage to the Swedish National Patient and Death Registers. The Mendelian randomization analyses were conducted using single-nucleotide polymorphisms robustly associated with sleep apnea in a recent genome-wide association study and summary-level data for major cardiovascular diseases from large-scale consortia. In the cohort study, an increased risk of atrial fibrillation was observed in participants who reported both snoring and cessation of breathing (hazard ratio [95% confidence interval] = 1.16 [1.03-1.30]) compared with those without sleep-disordered breathing symptoms. There was no association between sleep-disordered breathing symptoms and risk of myocardial infarction, heart failure, aortic valve stenosis or abdominal aortic aneurysm in multivariable analyses. Mendelian randomization analyses showed no association of genetic liability to sleep apnea with myocardial infarction, heart failure or atrial fibrillation, but revealed a suggestive association with coronary artery disease (odds ratio [95% confidence interval] = 1.24 [1.02-1.52]).

EADSM comment: Interesting to consider symptoms more when evaluating risks with untreated OSA. These were negative findings, but previously positive associations were found for e.g. stroke. (Titova, O.E., Yuan, S., et al. 2022)

REFERENCES

Ahn SH, Ha JG, Kim JW, Lee YW, Yoon JH, Kim CH, Cho HJ (2019) Torus mandibularis affects the severity and position-dependent sleep apnoea in non-obese patients. *Clinical Otolaryngology* 44: 279-285

Frank MH, Ravesloot MJ, van Maanen JP, Verhagen E, de Lange J, de Vries N (2015) Positional OSA part 1: Towards a clinical classification system for position-dependent obstructive sleep apnoea. *Sleep Breath* 19: 473-480

Palm E, Franklin KA, Marklund M (2014) Mandibular tori size is related to obstructive sleep apnea and treatment success with an oral appliance. *Sleep Breath* 18: 431-438

Titova OE, Yuan S, Baron JA, Lindberg E, Michaelsson K, Larsson SC (2022) Sleep-disordered breathing-related symptoms and risk of stroke: cohort study and Mendelian randomization analysis. *Journal of Neurology* 269: 2460-2468