

## Articles of the Month – July-August 2022

### MAD

Sleep Breath. 2022 Aug 9;1-7.

doi: 10.1007/s11325-022-02689-w. Online ahead of print.

Link: <https://link.springer.com/article/10.1007/s11325-022-02689-w>

#### **An interim oral appliance as a screening tool during drug-induced sleep endoscopy to predict treatment success with a mandibular advancement device for obstructive sleep apnea**

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**Purpose:** Previous studies have shown a wide range of efficacy (29 to 71%) of a mandibular advancement device (MAD) in the treatment of obstructive sleep apnea (OSA). Currently, the ability to preselect suitable patients for MAD therapy based on individual characteristics related to upper airway collapsibility is limited. We investigated if the use of non-custom interim MAD during drug-induced sleep endoscopy (DISE) could be a valuable screening tool to predict MAD treatment outcome.

**Methods:** In a single-center prospective study including a consecutive series of patients with OSA, we compared DISE outcomes with a MAD in situ with polysomnography results after 3 months of using the same MAD that was used during DISE.

**Results:** Of 41 patients who completed the study, the median apnea-hypopnea index (AHI) was 16.0 events/h [IQR 7.4-23.4]. Respiratory outcomes on polysomnography, including apnea index (AI), total AHI, AHI in supine position, and oxygen desaturation index, all significantly improved after 3 months of MAD treatment. With complete improvement of the upper airway obstruction with the MAD in situ during DISE in supine position, patients were 6.3 times more likely to be a responder to MAD treatment compared to patients with a persisting complete obstruction, although not statistically significant (OR 6.3; 95%CI 0.9-42.7;  $p = 0.060$ ).

**Conclusion:** The potential predictive value with regard to MAD therapy outcomes of the use of an interim MAD during DISE would be an important finding, since the prediction of MAD therapy outcome is of great clinical and scientific interest. A study with a larger cohort should be performed to further investigate our findings.

**EADSM comment:** Developed prefabricated MADs might be used for prediction purposes according to this recent study.

Sleep Breath. 2022 Aug 10.

doi: 10.1007/s11325-022-02694-z. Online ahead of print.Link:

Link: <https://link.springer.com/article/10.1007/s11325-022-02694-z>

## **Effect of CPAP vs. mandibular advancement device for excessive daytime sleepiness, fatigue, mood, sustained attention, and quality of life in patients with mild OSA**

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**Objective:** This study's objective was to compare the best long-term treatment, mandibular advancement device (MAD) or continuous positive airway pressure (CPAP), for patients with mild obstructive sleep apnea (OSA) in improving excessive daytime sleepiness, fatigue, mood, sustained attention, and quality of life.

**Methods:** This study was a single-blind, parallel, randomized clinical trial with controls. The sample was composed of individuals between 18 and 65 years of age with a body mass index of < 35 kg/m<sup>2</sup> and apnea/hypopnea index above five and less than 15. Participants were submitted to physical examination, polysomnography, and the following questionnaires: Pittsburgh Sleep Quality Index, Berlin Questionnaire, Epworth Sleepiness Scale, Stanford Sleepiness Scale, Karolinska Sleepiness Scale, Modified Fatigue Impact Scale, Functional Outcomes of Sleep Questionnaire, Beck Anxiety Inventory, and Beck Depression Inventory. They were also presented with the following tests: maintenance of wakefulness test and psychomotor vigilance task.

**Results:** Of 79 patients, 25 were in the MAD group, 31 in the CPAP group, and 23 in the control group. Polysomnographic parameters were best normalized with CPAP compared with MAD. Fatigue was improved in the MAD and CPAP groups, with no difference between these treatments. Quality of life was also improved with both treatments, but CPAP was superior to MAD. Daytime sleepiness, mood, and sustained attention showed no difference with the interventions. Greater adherence was obtained with MAD patients than with CPAP measured by hours of use.

**Conclusions:** Treatment with CPAP was better at normalizing polysomnographic parameters and improving quality of life in patients with mild OSA. Both treatments improved fatigue with no difference between the two treatments. Neither treatment improved daytime sleepiness, mood or sustained attention.

**EADSM comment:** In accordance with previous research, the effect on daytime sleepiness in patients with milder OSA is uncertain. Fatigue might be a better measure for symptomatic improvements. Despite that, CPAP has its overall benefits.

## Short-term positive effects of a mandibular advancement device in a selected phenotype of patients with moderate obstructive sleep apnea: a prospective study

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**Study objectives:** To evaluate (determinants of) treatment success of mandibular advancement device (MAD) application in a selected phenotype of patients with obstructive sleep apnea (OSA).

**Methods:** 90 non-obese patients with moderate OSA (obstructive apnea-hypopnea index (OAH)  $\geq 15$  and  $< 30$ /h) without comorbidities were prospectively included. Polysomnography (PSG) was performed at baseline and with MAD. A drug-induced sleep endoscopy (DISE) with jaw thrust was performed in 83%.

**Results:** OAH reduction  $\geq 50\%$  was observed in 73%, OAH reduction  $\geq 50\%$  with OAH  $< 10$ /h in 70%, complete OSA resolution (OAH  $< 5$ /h) in 40%. Patients with non-positional OSA showed a significantly higher rate of complete OSA resolution: post-test probability increased to 67%. In patients with total disappearance of collapse at velum level and at all levels during DISE with jaw thrust, the drop in OAH was impressive with an infinitively high positive likelihood ratio. However, the proportion of patients having non-positional OSA or the DISE-characteristics as described above was  $< 20\%$ . The change in snoring disturbance based on a Visual Analogue Scale was 76% (IQR 40-89%,  $p < 0.001$ ) and a statistically significant amelioration in Epworth Sleepiness Scale (especially in somnolent subjects) was observed. High adherence was reported.

**Conclusions:** In this pre-defined OSA phenotype, MAD was effective in reduction of OAH and in amelioration of symptoms. Stratification by non-positional OSA and findings on DISE with jaw thrust increased treatment success defined as reduction in OAH. However, the clinical relevance can be questioned because only a small number of patients demonstrated these characteristics.

**EADSM comment:** In contrast to several other studies, this study showed benefit from non-positional OSA in order to receive treatment success with MAD. However, the proportion of patients with non-positional POSA was small, and a lot of other characteristics can influence such a relationship, e.g. type of device, sex, non-anatomical traits and age.

Mil Med. 2022 Aug 20;usac248.  
doi: 10.1093/milmed/usac248. Online ahead of print.

Link:

<https://academic.oup.com/milmed/advance-article/doi/10.1093/milmed/usac248/6672661?login=true>

## The Success of Oral Appliance Therapy Based on Symptom-Driven Titration

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**Study objective:** Obstructive sleep apnea (OSA) is a chronic condition that could lead to debilitating and sometimes life-threatening consequences. Oral appliance therapy (OAT) is effective in providing a conservative, nonsurgical treatment option for patients diagnosed with mild-to-moderate OSA. The primary goal of this study is to describe a symptom-based titration protocol and determine if the patients can be effectively managed with oral appliances (OAs).

**Method:** A retrospective chart review of patients who were treated with OAs was analyzed for the management of OSA. Patients were self-titrated for symptomatic improvement before posttreatment titration sleep studies were conducted.

**Results:** Our study has found that 87.5% of the test population was successfully managed with OAs after overnight titration. Seventy-five percentage of the patients were titrated to Apnea-Hypopnea Index (AHI) < 5 with an average of 79.6% reduction from the baseline. Statistical studies showed that patients' body mass index and age at baseline polysomnogram studies significantly influenced the reduction in AHI achieved, whereas the baseline AHI did not show any significant correlation.

**Conclusion:** Oral appliance therapy (OAT) can be a reliable treatment modality to treat OSA, and performing a separate overnight posttreatment titration study further ensures its effectiveness. Furthermore, OAT can be an effective treatment modality even for moderate-to-severe OSA with posttreatment titration.

**EADSM comment:** Study that highlights the importance of titration.

Clin Exp Dent Res. 2022 Aug 23.  
doi: 10.1002/cre2.650. Online ahead of print.

Link: [The comparison of two different mandibular positions for oral appliance therapy in patients with obstructive sleep apnea - Makihara - Clinical and Experimental Dental Research - Wiley Online Library](#)

## The comparison of two different mandibular positions for oral appliance therapy in patients with obstructive sleep apnea

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**Background:** An oral appliance (OA) can alleviate upper airway obstruction by pulling the mandible forward during sleep. While a large mandibular advancement with an OA decreases the number of apnea and hypopnea events, long-term use may cause side effects, such as toothache, stiffness, and pain in the temporomandibular joint.

**Objectives:** This study aimed to evaluate the effectiveness of different mandibular positions for obstructive sleep apnea (OSA) and determine the optimal therapeutic mandibular position.

**Methods:** Thirty-two patients (17 males and 15 females) with mild to moderate OSA participated in this prospective study. All patients were randomly allocated to receive a 50% mandibular advancement or a 75% mandibular advancement with an OA. The pre- and posttreatment apnea-hypopnea index (AHI), apnea index (AI), and Epworth Sleepiness Scale (ESS) were compared. Treatment effectiveness and treatment success were compared between groups.

**Results:** AHI improved significantly in both groups, and AI improved significantly in the group with 50% mandibular advancement. No significant improvements in the ESS were observed in either group. There was no significant difference in treatment effectiveness between groups. In the proportion of females and males whose treatment was effective in the two groups, females were significantly greater than males.

**Conclusions:** For patients with mild to moderate OSA, 50% mandibular advancement is recommended as the initial therapeutic mandibular position. It was suggested that gender differences also affect treatment effectiveness.

**EADSM comment:** Interesting result of similar outcome between 50% and 75% initial advancement in patients with mild to moderate OSA.

## OSA

J Glaucoma. 2022 Aug 17.

doi: 10.1097/IJG.0000000000002105. Online ahead of print.

Link: [https://journals.lww.com/glaucomajournal/Abstract/9900/Association\\_between\\_Risk\\_of\\_Obstructive\\_Sleep.87.aspx](https://journals.lww.com/glaucomajournal/Abstract/9900/Association_between_Risk_of_Obstructive_Sleep.87.aspx)

### Association between Risk of Obstructive Sleep Apnea and Glaucoma: The Singapore Epidemiology of Eye Disease Study

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**Precis:** In this population-based, cross-sectional study of Indian and Malay adults in Singapore aged  $\geq 40$  years, intermediate or high risk of obstructive sleep apnea was associated with 50% higher odds of having glaucoma.

**Background/aims:** The relationship between obstructive sleep apnea (OSA) and glaucoma is unclear. We assessed the association between the risk of OSA and glaucoma in an Asian population.

**Methods:** In this population-based, cross-sectional study, we included Indian and Malay adults aged  $\geq 40$  years recruited between 2011-2015. Glaucoma was assessed by trained ophthalmologists and classified into primary open angle glaucoma (POAG) and primary angle closure glaucoma (PACG). OSA risk was assessed with the Snoring, Tiredness, Observed apnea, High blood pressure, Body mass index, Age, Neck circumference, and male Gender (STOP-Bang) questionnaire and categorized as low risk ( $< 3$ ) or intermediate/higher risk ( $\geq 3$ ). We used multivariable logistic regression models to evaluate the relationship between risk of OSA and glaucoma adjusted for key variables, and further stratified for subtype and ethnicity.

**Results:** Of the 3,126 participants (mean age:  $63.1 \pm 9.6$  y; 52.5% female), 134 (4.3%) had glaucoma, comprising 86 (2.8%) POAG, 22 (0.7%) PACG and 26 (0.8%) secondary glaucomas, and 1,182 (37.8%) had an intermediate/higher risk of OSA. Compared to individuals with a low risk of OSA, individuals with intermediate/higher risk had 50% greater odds of having glaucoma (odds ratio: OR 1.55, 95% Confidence Interval: CI 1.03-2.33;  $P=0.035$ ). We observed a non-significant increase in likelihood of having POAG in those with intermediate/higher risk of OSA compared to those with low risk. The OSA-glaucoma relationship was modified by ethnicity, with Malays with intermediate/higher risk of OSA having a 2-fold risk of having any glaucoma (OR 2.01, 95% CI [confidence interval]: 1.12, 3.59  $P=0.019$ ); while the same elevated risk was not observed for Indians.

**Conclusions:** Intermediate or high risk of OSA is associated with 50% higher odds of having glaucoma in our Singaporean population, with a 2-fold higher risk of glaucoma observed in Malays (but not Indians); however a confirmational sleep study is needed.

**EADSM comment:** Not so well-known and investigated association.

Medicine (Baltimore). 2022 Jul 29;101(30):e29443.

doi: 10.1097/MD.00000000000029443.

Link: [Association between obstructive sleep apnea \(OSA\) and atrial fibrillation \(AF\): A dose-response meta-analysis - PMC \(nih.gov\)](#)

## Association between obstructive sleep apnea (OSA) and atrial fibrillation (AF): A dose-response meta-analysis

[Dong Zhang](#)<sup>1</sup>, [Yibo Ma](#), [Jian Xu](#), [Fu Yi](#)

**Background:** Refractory hypoxemia episodes are characteristic of obstructive sleep apnea (OSA). Patients with OSA suffer from oxidative stress in all systems. Atrial fibrillation (AF) is a type of arrhythmia that may be induced by OSA. In this study, we explored the dose-response relationship between OSA and AF. Our research provides the basis for a novel approach to AF prevention.

**Methods:** We screened four databases (PubMed, Embase, the Cochrane Library, and Web of Science) for observational studies on OSA and AF. Studies were collected from database establishment to November 2020. We performed a traditional subgroup meta-analysis. Linear and spline dose-response models were applied to assess the association between the apnea-hypopnea index, an indicator of OSA severity, and the risk of AF. Review Manager version 5.3 software and Stata 16.0 were used for the analysis.

**Results:** Sixteen observational studies were included in the study. We excluded a study from the conventional meta-analysis. In the subgroup analysis, the odds ratios for new onset AF for no obvious reason, new onset AF after surgical operations, such as coronary artery bypass grafting, and AF after ablation treatment were 1.71 (95% CI 1.37-2.13,  $P < .05$ ), 2.65 (95% CI 2.32-3.01,  $P < .05$ ), and 2.93 (95% CI 2.47-3.49,  $P < .05$ ), respectively. Linear dose-response meta-analysis results revealed that the risk of AF increased with increasing apnea-hypopnea index value.

**Conclusion:** Through dose-response meta-analysis, we found a potential dose-response relationship between OSA severity and the risk of AF. This relationship should be considered in interventions aimed at AF prevention in the future.

**EADSM comment:** Interesting relationship between OSA and atrial fibrillation will be important for clinicians.

J Sleep Res. 2022 Jul 22;e13690.  
doi: 10.1111/jsr.13690. Online ahead of print.

Link: [Correlates of excessive daytime sleepiness in obstructive sleep apnea: Results from the nationwide SESAR cohort including 34,684 patients - Ulander - Journal of Sleep Research - Wiley Online Library](#)

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

[Martin Ulander](#)<sup>1,2</sup>, [Jan Hedner](#)<sup>3,4</sup>, [Göran Stillberg](#)<sup>5</sup>, [Ola Sunnergren](#)<sup>6</sup>, [Ludger Grote](#)<sup>3,4</sup>

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](http://www.sesar.se)). Data from 34,684 patients with obstructive sleep apnea recruited at 23 sites (33% females, mean age  $55.7 \pm 13.7$  years, BMI  $30.2 \pm 6.3$  kg/m<sup>2</sup>, AHI  $29.1 \pm 22.3$ , and ODI  $24.9 \pm 21.4$  events/h) had a mean ESS score in the mild to moderate excessive daytime sleepiness range ( $9.7 \pm 4.9$ ). 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  $\geq 10$ ) amongst anthropometric factors, sleep apnea frequency (apnea-hypopnea index (AHI)), markers of intermittent hypoxia (oxygen desaturation index (ODI), mean saturation (mSaO<sub>2</sub>)), 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 big cohort of OSA patients further elucidate the mysterious relationships between OSA and daytime sleepiness.

## SURGERY

Int J Oral Maxillofac Surg. 2022 Aug 20;S0901-5027(22)00327-7.  
doi: 10.1016/j.ijom.2022.08.012. Online ahead of print.

Link: [Effects of maxillomandibular advancement on respiratory function and facial aesthetics in obstructive sleep apnoea patients with versus without maxillomandibular deficiency - ScienceDirect](#)

### **Effects of maxillomandibular advancement on respiratory function and facial aesthetics in obstructive sleep apnoea patients with versus without maxillomandibular deficiency**

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The aim of this study was to compare the effects of maxillomandibular advancement (MMA) on respiratory function between obstructive sleep apnoea (OSA) patients with and without maxillomandibular deficiency, and to compare the changes in facial aesthetics after MMA between the two groups. MMA-treated patients who had both baseline and follow-up polysomnography (PSG) data and lateral cephalograms were enrolled in this retrospective study. In addition to PSG and cephalometric data, patient satisfaction with postoperative breathing and facial aesthetics, and overall satisfaction with the treatment were assessed. Twenty-one patients were classified as not having maxillomandibular deficiency (without-deficiency group) and 40 patients as having maxillomandibular deficiency (with-deficiency group). The improvements in respiratory parameters (e.g., apnoea-hypopnoea index) and patient satisfaction with postoperative breathing were comparable in the two groups ( $P = 0.094-0.713$ ). The changes in facial profile measurements (e.g., nasal prominence, nasolabial angle, and lip positions relative to the true vertical line) and patient satisfaction with postoperative facial aesthetics were also comparable in the two groups ( $P = 0.148-0.983$ ). In conclusion, no significant difference in the effects of MMA on respiratory function and facial aesthetics between OSA patients with and without maxillomandibular deficiency was observed.

**EADSM comment:** Interesting finding of similar effect from MMA in patients irrespective of a diagnosis of maxillomandibular deficiency.

## POSITIONAL THERAPY

Sleep Breath. 2019 Dec;23(4):1141-1149.  
doi: 10.1007/s11325-019-01792-9. Epub 2019 Feb 18.

Link: [Treatment of sleep-disordered breathing with positional therapy: long-term results \(springer.com\)](https://doi.org/10.1007/s11325-019-01792-9)

### Treatment of sleep-disordered breathing with positional therapy: long-term results

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**Purpose:** The aim of the present study was to assess the efficacy of a sleep position trainer (SPT) in patients with an established diagnosis of positional obstructive sleep apnea and to evaluate the adherence after 1-year follow-up.

**Methods:** Polysomnography (PSG) was performed at baseline and after 1 year of SPT use. Patients received questionnaires to assess treatment satisfaction and subjective adherence. Data on objective adherence and number of vibrations initiated by the SPT were collected from the SPT device.

**Results:** Nine out of 58 patients stopped using the SPT during the first year of treatment (16%). Thirty-four middle-aged and overweight patients underwent a PSG after 1 year of SPT use (male/female ratio, 28/6; overall apnea/hypopnea index (AHI), 16/h). A significant reduction in overall AHI to 6/h was observed using treatment ( $p < 0.001$ ). The median percentage of supine sleep decreased significantly to 1% with SPT ( $p < 0.001$ ). The mean objective SPT use in 28 patients was  $7.3 \pm 0.9$  h/night and  $69 \pm 26\%$  of the nights. Furthermore, 75% of the patients reported a better sleep quality since the start of SPT treatment.

**Conclusions:** Long-term treatment with the SPT was found to be effective in reducing overall AHI. Time spent sleeping in supine position was reduced to almost zero in the continuing users. Patient satisfaction was high when using the SPT.

**EADSM comment:** Interesting positive results from long-term positional therapy.

## PEDIATRIC

Evid Based Dent. 2022 Aug 19.

doi: 10.1038/s41432-022-0283-6. Online ahead of print.

Link: [Is maxillary expansion effective in treatment of obstructive sleep apnoea syndrome? A systematic review of systematic reviews | Evidence-Based Dentistry \(nature.com\)](#)

### **Is maxillary expansion effective in treatment of obstructive sleep apnoea syndrome? A systematic review of systematic reviews**

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**Background** Maxillary expansion (ME) might be beneficial in improving airway dimensions and obstructive sleep apnoea syndrome (OSAS) in patients with constricted maxillae. The aim of this overview is to present clinicians with a summary of the evidence. Data from systematic reviews and meta-analyses were evaluated to investigate the effect of ME on OSAS. **Methods** An electronic search was commenced in five databases, in addition to a manual search until July 2021. Screening of articles started with title and abstract followed by full-text assessment. Systematic reviews with/without meta-analyses were included. Critical appraisal was done using A Measurement Tool to Assess Systematic Reviews (AMSTAR) 2, Level of Research Design scoring and criteria of body of evidence scores. The search, study selection and critical appraisal were completed by three reviewers. **Results** In total, 14 systematic reviews with/without meta-analyses were included. The quality of available evidence ranged between low to high, based on the overall quality evaluation. **Conclusions** Based on the available evidence, maxillary expansion might be able to improve the nasal airway volume and OSAS in both growing and adult patients in the short term. ME can be considered as one of the treatment options in cases with OSAS.

**EADSM comment:** Review and meta-analysis that again highlights the need to treat more children for OSA.