

## Articles of the Month – February 2022

### PAP

Chest. 2022 Feb 14;S0012-3692(22)00263-X.

doi: 10.1016/j.chest.2022.02.013. Online ahead of print.Link:

<https://www.sciencedirect.com/science/article/pii/S001236922200263X?via%3Dihub>

### Relationship between CPAP termination and all-cause mortality: a French nationwide database analysis

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**Background:** Randomized controlled trials have failed to demonstrate an effect of continuous positive airway pressure (CPAP) therapy on mortality. However, these studies have a number of important limitations, including low CPAP adherence, patient selection and a small number of mortality events.

**Research question:** What are the effects of CPAP therapy termination in the first year on all-cause mortality in obstructive sleep apnea (OSA) patients from the nationwide CLAIMS data lake for sleep Apnoea (ALASKA) study?

**Study design and methods:** Data from the French national health insurance reimbursement system database (SNDS) for all new CPAP users aged  $\geq 18$  years were analyzed. The SNDS contains comprehensive, individualized and anonymized data on health spending reimbursements for >99% of all individuals living in France. OSA diagnosis was based on specific disease codes, while CPAP prescription was identified using specific treatment modality codes. CPAP therapy termination was defined as the cessation of CPAP reimbursements triggered by the respiratory physician or sleep specialist in charge of follow-up. Patients who terminated therapy in the first year were propensity score matched with those who continued to use CPAP. The primary outcome was all-cause mortality. Three-year survival was visualized using Kaplan-Meier curves. Contributors to mortality were also determined.

**Results:** Data from two matched groups each including 88,007 patients were included (mean age 60 years, 64% male). Continuation of CPAP therapy was associated with a significantly lower risk of all-cause death compared with CPAP therapy termination (hazard ratio 0.61, 95% confidence interval 0.57-0.65; Log-rank  $p < 0.01$ ). Incident heart failure was also less common in patients who continued versus terminated CPAP therapy (hazard ratio 0.77, 95% confidence interval 0.71-0.82;  $p < 0.01$ ).

**Interpretation:** These real-world data from a comprehensive, unbiased database highlight the potential for ongoing usage of CPAP treatment to reduce all-cause mortality in patients with OSA.

**EADSM comment:** Real-world study of a large sample strengthens the benefits of CPAP treatment, in terms of reduced mortality. Results that might be difficult to obtain using RCT study designs.

Cureus. 2022 Jan 30;14(1):e21729.

doi: 10.7759/cureus.21729. eCollection 2022 Jan.

Link:

<https://www.cureus.com/articles/82348-changes-in-exercise-capacity-of-patients-with-obstructive-sleep-apnea-following-treatment-with-continuous-positive-airway-pressure>

## Changes in Exercise Capacity of Patients With Obstructive Sleep Apnea Following Treatment With Continuous Positive Airway Pressure

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**Introduction:** Patients with obstructive sleep apnea (OSA) frequently complain of fatigue during exercise. Treatment with continuous positive airway pressure (CPAP) ameliorates OSA-related symptoms and may reduce the burden of OSA on coexistent diseases. However, the role of CPAP on exercise capacity in OSA has not been fully investigated.

**Aim:** The aim of this study is to assess exercise capacity in a group of newly diagnosed OSA patients, without known comorbidities, following treatment with CPAP.

**Methods:** Consecutively diagnosed OSA patients by polysomnography completed the International Physical Activity Questionnaire (IPAQ) and underwent cardiopulmonary exercise testing (CPET) and pulmonary function testing at baseline of OSA diagnosis three months after adherence to CPAP treatment.

**Results:** A total of 40 OSA patients (Apnea-Hypopnea Index (AHI)>15 events/hour) of whom 29 (72.5%) males with an average age of 42±2.5 years were enrolled in the study. OSA patients had a mean peak oxygen uptake ( $\text{VO}_2$ ) value of 40.3 ±8.4 ml/kg/min (77.7±15%), which was improved after three months on CPAP treatment, 47.6±7.9 ml/kg/min (92.9±10.5%). ( $p=0.002$ ). In addition, patients' mean work (W) value increased significantly from baseline to three months of treatment with CPAP (101.5±30 watts vs 78.6±18.5 watts.  $p=0.015$ , respectively). There were no significant differences in terms of physical activity, as noted in IPAQ, before and after OSA therapy ( $p=0.075$ ).

**Conclusions:** In the present study, OSA is associated with impaired exercise capacity, which seems to be improved after short-term treatment with PAP. Further evidence is warranted to elucidate whether CPET could be routinely used to monitor treatment responses of OSA with CPAP.

**EADSM comment:** Interesting finding that oxygen uptake increases with CPAP treatment, without any changes in physical activity.

# MAD

## Case Reports

Sleep Sci. Jul-Sep 2021;14(3):291-295.

doi: 10.5935/1984-0063.20200077.

Link: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8848527/>

## Resolution of fibromyalgia by controlling obstructive sleep apnea with a mandibular advancement device

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Fibromyalgia (FM) is a chronic, often disabling disorder characterized by multisite pain along with sleep problems and fatigue. Pain and sleep exhibit a reciprocal relationship. When FM and obstructive sleep apnea/hypopnea (OSA) co-exist, treatment options include continuous positive airway pressure or mandibular advancement device. We present a patient experiencing fibromyalgia and OSA whose symptoms vanished wearing a Mandibular Advancement Device (MAD) during sleep. To our knowledge, this is the first documented case of FM symptom resolution by MAD treatment.

**EADSM comment:** New aspect of beneficial symptomatic effects from MAD treatment.

Sleep. 2022 Feb 26;zsac044.

doi: 10.1093/sleep/zsac044. Online ahead of print.

Link: <https://academic.oup.com/sleep/advance-article/doi/10.1093/sleep/zsac044/6537599>

## The Relationship Between Mandibular Advancement, Tongue Movement, and Treatment Outcome in Obstructive Sleep Apnea

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**Study objectives:** To characterize how mandibular advancement enlarges the upper airway via posterior tongue advancement in people with obstructive sleep apnoea (OSA) and whether this is associated with mandibular advancement splint (MAS) treatment outcome.

**Methods:** 101 untreated people with OSA underwent a 3T magnetic resonance (MRI) scan. Dynamic mid-sagittal posterior tongue and mandible movements during passive jaw advancement were measured with tagged MRI. Upper airway cross-sectional areas were measured with the mandible in a neutral position and advanced to 70% of maximum advancement. Treatment outcome was determined after a minimum of 9 weeks of therapy.

**Results:** 71 participants completed the study: 33 were responders (AHI<5 or AHI≤10 events/hr with >50% AHI reduction), 11 were partial responders (>50% AHI reduction but AHI>10 events/hr), and 27 non-responders (AHI reduction<50% and AHI≥10 events/hr). Responders had the greatest naso- and oropharyngeal tongue anterior movement (0.40±0.08 and 0.47±0.13mm, respectively) and oropharyngeal cross-sectional area enlargement (6.41±2.12%) per millimetre of mandibular advancement. A multivariate model that included tongue movement and percentage of airway enlargement per millimetre of mandibular advancement along with baseline AHI correctly classified 69.2% (5-fold cross-validated 62.5%, n=39) of participants in response categories when the jaw was advanced in the range that would usually be regarded as sufficient for clinical efficacy (> 4 mm). In comparison, a model using only baseline AHI correctly classified 50.0% of patients (5-fold cross-validated 52.5%, n=40).

**Conclusions:** Tongue advancement and upper airway enlargement with mandibular advancement in conjunction with baseline AHI improve treatment response categorization to a satisfactory level (69.2%, 5-fold cross-validated 62.5%).

**EADSM comment:** Prediction studies for MAD therapy are welcome. This method using MRI is, probably however, more suitable for research purposes, that evaluate the mechanisms behind MAD response, than to be used in everyday clinical practice.

## Pediatric OSA

Sleep Med. 2022 Jan 13;90:135-141.

doi: 10.1016/j.sleep.2022.01.007. Online ahead of print.

Link: <https://www.sciencedirect.com/science/article/pii/S1389945722000089?via%3Dihub>

### Management of the pediatric OSAS: what about simultaneously expand the maxilla and advance the mandible? A retrospective non-randomized controlled cohort study

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**Objective/background:** This retrospective non-randomized controlled cohort study aimed to evaluate the efficiency of simultaneous maxillary expansion and mandibular advancement for the management of pediatric OSAS.

**Patients/methods:** The sample was composed of 94 children treated with an innovative orthopedic device to correct a Class II malocclusion associated with an OSAS. Polysomnographic recordings were performed before and after the treatment. We also included a group of 113 age-matched control patients who had the same pathologies, but who did not receive the orthopedic treatment at the time they undergone polysomnographic exams. Statistical tests evaluated the significance of the evolution of these data, both in treated and untreated control patients.

**Results:** After nine months ( $\pm 3$  months) of treatment, respiratory OSAS symptoms significantly improved: the AHI significantly decreased as it became inferior to the pathological threshold ( $< 1$ ) for 53% of the treated patients' sample, with a greater proportion within the youngest age group (63%). Only two patients still presented a moderate OSAS after treatment, with an AHI slightly superior to 5. This positive evolution of OSAS respiratory symptoms was not observed within the control group, highlighting the real impact of the orthopedic treatment over the children's natural growth. However, sleep remained fragmented following the treatment.

**Conclusions:** This study confirmed that simultaneous maxillary expansion and mandibular advancement induced a modification of the maxilla-mandibular anatomy, helping in the significant improvement of the respiratory OSAS symptoms. Then, considering these preliminary results, pediatric OSAS can be managed with this new orthopedic strategy, especially if it is performed early.

**EADSM comment:** More studies of children with OSA, treated with orthodontic appliances are needed. Read more in next article.

Braz J Otorhinolaryngol. 2021 Mar 14;S1808-8694(21)00055-0.

doi: 10.1016/j.bjorl.2021.02.010. Online ahead of print.

Link: <https://www.sciencedirect.com/science/article/pii/S1808869421000550?via%3Dihub>

## Effectiveness of functional orthodontic appliances in obstructive sleep apnea treatment in children: literature review

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**Introduction:** Obstructive sleep apnea syndrome is a common condition in childhood and if left untreated can result in many health problems. An accurate diagnosis of the etiology is crucial for obstructive sleep apnea treatment success. Functional orthodontic appliances that stimulate mandibular growth by forward mandibular positioning are an alternative therapeutic option in growing patients.

**Objective:** To perform a literature review about the effects of functional orthodontic appliances used to correct the mandibular deficiency in obstructive sleep apnea treatment.

**Methods:** The literature search was conducted in June 2020 using Cochrane Library; PubMed, EBSCO (Dentistry & Oral Sciences Source), LILACS Ovid; SciELO Web of Science; EMBASE Bireme and BBO Bireme electronic databases. The search included papers published in English, until June 2020, whose methodology referred to the types and effects of functional orthopedic appliances on obstructive sleep apnea treatment in children.

**Results:** The search strategy identified thirteen articles; only four articles were randomized clinical studies. All studies using the oral appliances or functional orthopedic appliances for obstructive sleep apnea in children resulted in improvements in the apnea-hypopnea index score. The cephalometric (2D) and tomographic (3D) evaluations revealed enlargement of the upper airway and increase in the upper airspace, improving the respiratory function in the short term.

**Conclusion:** Functional appliances may be an alternative treatment for obstructive sleep apnea, but it cannot be concluded that they are effective in treating pediatric obstructive sleep apnea. There are significant deficiencies in the existing evidence, mainly due to absence of control groups, small sample sizes, lack of randomization and no long-term results.

**EADSM comment:** Review article that highlight the need for more research of pediatric OSA.

Sleep. 2021 Dec 31;zsab304.  
doi: 10.1093/sleep/zsab304. Online ahead of print.

Link:

<https://academic.oup.com/sleep/advance-article/doi/10.1093/sleep/zsab304/6491216?login=true>

## The effect of adenotonsillectomy and rapid maxillary expansion on the upper airway in pediatric obstructive sleep apnea: a randomized crossover-controlled trial

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**Study objectives:** We aimed to determine the effects of adenotonsillectomy (AT) and rapid maxillary expansion (RME) on the apnea-hypopnea index (AHI) and compare volumetric changes in the upper airway (UA) arising from AT and RME.

**Methods:** Thirty-nine children who presented with maxillary constriction and grade III/IV tonsillar hypertrophy were randomized into two groups. One group underwent AT as the first treatment, and the other group underwent RME. Polysomnography (PSG) and cone-beam computed tomography (CBCT) were conducted before (T0) and 6 months after the first treatment (T1). In a crossover design, individuals with AHI>1 received the second treatment. Six months later, they underwent PSG and CBCT (T2). The influence of age, sex, tonsil and adenoid hypertrophy, initial AHI severity, initial volume of the UA, first treatment, and maxillary expansion amount was evaluated using linear regression analysis. Intra- and inter-group comparisons for AHI and inter-group comparisons of volumetric changes in each region of the UA were performed using a paired t-test and Wilcoxon test.

**Results:** The initial AHI severity and therapeutic sequence in which AT was the first treatment explained for 95.6% of AHI improvement. AT caused significant improvements in the AHI and volumetric increases in the buccopharynx and total UA areas compared to RME.

**Conclusions:** The initial AHI severity and AT as the first treatment accounted for most of the AHI improvement. Most reductions in AHI were due to AT, which promoted more volumetric increases in UA areas than RME. RME may have a marginal effect on pediatric obstructive sleep apnea.

**EADSM comment:** Study highlighting the importance of identifying phenotypes, also in pediatric OSA. In this case children with the largest grades of tonsillar hypertrophy, who benefit most from surgery, not from RME. These findings also emphasize the importance of a strong collaboration between pediatricians and dentists.

