Articles of the Month – October 2022

MAD

Adherence and efficacy of mandibular advancement splint treatment of sleep-disordered breathing during pregnancy: a pilot study

Nelly Huynh [1], Léa Drouin-Gagné [2], Camille Gilbert [2], Jean-Patrick Arcache [2], Pierre Rompré [2], Anne-Maude Morency [3], Robert Gagnon [3], John Kimoff [3], Sushmita Pamidi [3]

Purpose: Sleep-disordered breathing (SDB) is common in pregnancy and is associated with adverse health consequences for both mother and child. Mandibular advancement splints (MAS) have been shown to improve sleep quality, daytime sleepiness and snoring in non-pregnant women. The effectiveness of MAS for treating SDB in pregnancy is unknown. This pilot study aimed to evaluate the efficacy and adherence to MAS in pregnant women with SDB.

Methods: Women with mild-moderate SDB (apnea-hypopnea index (AHI) 10-29/h) on level 2 polysomnography (PSG) performed at 22.0 ± 5.5 weeks' gestation were treated with a MAS during pregnancy to 6 months postpartum. An embedded micro-recorder measured adherence. PSG was repeated while on titrated treatment, and off treatment in the postpartum period.

Results: Among 17 women completing the study, MAS was worn ≥ 4 h/night for 57.5 ± 36.7% of nights during the antepartum period. While using MAS, nightly snoring time decreased from 25.9 ± 24.5% at baseline to 6.4 ± 7.8% when treated during pregnancy (p = .003). AHI decreased from 17.6 ± 5.1 to 12.9 ± 6.3 (p = .02) and fell by ≥ 30% and below 15/h in 60% of participants. During the postpartum period, MAS was used for ≥ 4 h/night on 24.8 ± 27.9% of nights. Moreover, the mean AHI off MAS was 17.9 ± 13.1; 88% of women had persistent SDB (AHI ≥ 10).

Conclusions: In this cohort, treatment efficacy and objective adherence were variable. Device use was less frequent in the postpartum period even though a substantial number of women had persistent SDB after delivery.

EADSM comment: A somewhat neglected group of important OSA patients, the pregnant women, not only for MAD therapy, but also in general.(Dominguez, J.E. and Habib, A.S. 2022) This study really inspires to more research in this area.

Mandibular Advancement Device Therapy in Japanese Rugby Athletes with Poor Sleep Quality and Obstructive Sleep Apnea

Hiroshi Suzuki [1], Toshiyuki Nakayama [1], Arisa Sawa [1], Tatsuo Yagi [2], Yoshihiro Iwata [1], Hiroki Takeuchi [1], Miho Motoyoshi [1], Chin-Moi Chow [3][4], Osamu Komiyama [1]

Obstructive sleep apnea (OSA) may contribute to poor sleep quality. This study assessed subjective sleep quality, the Respiratory Event Index (REI), reaction times, and the therapeutic effects of a custom-made mandibular advancement device (MAD) in male Japanese elite rugby athletes. The Pittsburgh Sleep Quality Index (PSQI), Epworth Sleepiness Scale (ESS), and level III sleep test (REI and minimum oxygen saturation [SpO_2&nbsp;$_{min}$]) were used to evaluate sleep quality. MAD therapy was used daily for 3 weeks. A telephone-based reaction time test of kinetic vision (the ability to identify moving objects) was recorded within 15 min of waking and over 5 days of pre- and post-MAD therapy. Differences in variables were evaluated using paired t-tests. Of the 42 players (mean age, 26.3 ± 3.7 years; mean body mass index, 28.7 ± 3.2 kg/m^2) included in this study, 29 (69.0%) had poor sleep quality (PSQI > 5.5), and 27 were diagnosed with OSA (64.3%) (mild = 16/moderate = 9/severe = 2). Six were treated with MAD therapy, which significantly improved the REI (p < 0.01), SpO_2&nbsp;$_{min}$ (p < 0.001), ESS score (p < 0.001), reaction times (p < 0.01), and sleep quality. A significant reduction in reaction times suggests that OSA treatment can improve kinetic vision. Future studies should systematically evaluate the impact of sleep-disordered breathing on kinetic vision in athletes.

EADSM comment: Interesting new aspect of possible treatment effects from MAD; to improve athletes´ sports performance. (Maybe even more world records with improved nightly breathing?)

Low Arousal Threshold Estimation Predicts Failure of Mandibular Advancement Devices in Obstructive Sleep Apnea Syndrome

Caterina Antonaglia [1], Gabriele Vidoni [2], Luca Contardo [2], Fabiola Giudici [3], Francesco Salton [1 4], Barbara Ruaro [1 4], Marco Confalonieri [1 4], Martina Caneva [2]

Introduction: The treatment of choice for obstructive sleep apnea syndrome (OSAS) is continuous positive airway pressure (CPAP). However, CPAP is usually poorly tolerated and mandibular advancement devices (MADs) are an alternative innovative therapeutic approach. Uncertainty still remains as to the most suitable candidates for MAD. Herein, it is hypothesized that the presence of low arousal threshold (low ArTH) could be predictive of MAD treatment failure.

Methods: A total of 32 consecutive patients, with OSAS of any severity, who preferred an alternate therapy to CPAP, were treated with a tailored MAD aimed at obtaining 50% of their maximal mandibular advancement. Treatment response after 6 months of therapy was defined as AHI < 5 events per hour or a reduction of AHI ≥ 50% from baseline. Low ArTH was predicted based on the following polysomnography features, as previously shown by Edwards et al.: an AHI of 82.5% and a hypopnea fraction of total respiratory events of >58.3%.

Results: There were 25 (78.1%) responders (p-value < 0.01) at 6 months. Thirteen patients (40.6%) in the non-severe group reached AHI lower than 5 events per hour. MAD treatment significantly reduced the median AHI in all patients from a median value of 22.5 to 6.5 (74.7% of reduction, p-value < 0.001). The mandibular advancement device reduced AHI, whatever the disease severity. A significant higher reduction of Delta AHI, after 6 months of treatment, was found for patients without low ArTH.

Conclusions: Low ArTH at baseline was associated with a poorer response to MAD treatment and a lower AHI reduction at 6 months. A non-invasive assessment of Low ArTH can be performed through the Edwards' score, which could help to identify an endotype with a lower predicted response to oral appliances in a clinical setting.

EADSM comment: A very welcome study of more success predictors for MAD therapy based on endotype. According to the text in this article, patients with a low arousal threshold terminate their respiratory events earlier, meaning that the ventilatory drive has insufficient time to build up and restore pharyngeal patency without arousal. The study found that MAD produced less decrease in AHI in patients with a low arousal threshold, because in these patients this feature contributes to the occurrence of obstructive events regardless of the severity of the syndrome and the anatomical alteration corrected by MAD.

OTHER NON-CPAP THERAPIES

Link: JCM | Free Full-Text | Head-Of-Bed Elevation (HOBE) for Improving Positional Obstructive Sleep Apnea (POSA): An Experimental Study (mdpi.com)

Head-Of-Bed Elevation (HOBE) for Improving Positional Obstructive Sleep Apnea (POSA): An Experimental Study

Giannicola Iannella [1], Giovanni Cammaroto [2], Giuseppe Meccariello [2], Angelo Cannavicci [2], Riccardo Gobbi [2], Jerome Rene Lechien [3], Christian Calvo-Henríquez [4], Ahmed Bahgat [5], Giuseppe Di Prinzio [6], Luca Cerritelli [6], Antonino Maniaci [7], Salvatore Cocuzza [7], Antonella Polimeni [8], Giuseppe Magliulo [1], Antonio Greco [1], Marco de Vincentiis [1], Massimo Ralli [1], Annalisa Pace [1], Roberta Polimeni [1], Federica Lo Re [1], Laura Morciano [1], Antonio Moffa [9], Manuele Casale [9], Claudio Vicini [2][6]

Purpose: Evaluate the effectiveness of the head-of-bed elevation position (HOBE) with a 30° elevation of the head and trunk, in improving obstruction of the upper airways in obstructive sleep apnea (OSA) patients. A prospective trial simultaneously performing drug-induced sleep endoscopy (DISE) and polysomnography (PSG) tests was performed.
Methods: Forty-five patients were included in the prospective study protocol. All patients enrolled in the study and underwent the following evaluations: (1) a drug-induced sleep endoscopy, with an evaluation of obstructions and collapse of the upper airways at 0° and in a HOBE position, with head and trunk elevation of 30°; (2) an overnight PSG assessment in the hospital with head and trunk elevation from 0° to 30° during the night; (3) a questionnaire to evaluate the feedback of patients to sleeping with head-of-bed elevation.
Results: Velum (V) and oropharynx lateral wall (O) collapses were reduced in the 30° up position. There were no statistical differences that emerged in the obstruction of the tongue base and epiglottis between the 0° position and the 30° up position ($p > 0.05$). The average AHI score changed from 23.8 ± 13.3 (0° supine position) to 17.7 ± 12.4 (HOBE position), with a statistical difference ($p = 0.03$); the same statistical difference emerged in the percentage of apneas that decreased from 55 ± 28.1 to 44 ± 25.8 ($p = 0.05$).
Conclusions: By adopting the HOBE position with 30° elevation of the head and trunk, it is possible to obtain a reduction of upper airways collapses and an improvement of apnea/hypopnea events and nightly respiratory outcomes.

==EADSM comment:== Not a dramatic influence of an increase in bed elevation at the location of the head. But, maybe good for combination with other OSA-treatments. Otherwise, a neck collar might be better. In a very small study that evaluated the effect of a neck collar + MAD compared with only MAD, AHI was half as high in the combination therapy group. Delijaj et al., J Sleep Disord Ther 2016, 5:5

MUSCLE TRAINING

Inspiratory muscle training as adjuvant therapy in obstructive sleep apnea: a randomized controlled trial

L M de Azeredo [1], L C de Souza [2], B L S Guimarães [1][3], F P Puga [3], N S C S Behrens [3], J R Lugon [4]

The aim of this randomized controlled trial was to analyze the effects of an inspiratory muscle training (IMT) program on apnea and hypopnea index (AHI), inspiratory muscle strength, sleep quality, and daytime sleepiness in individuals with obstructive sleep apnea (OSA), whether or not they used continuous positive airway pressure (CPAP (+/-) therapy. The intervention group underwent IMT with a progressive resistive load of 40-70% of the maximum inspiratory pressure (PImax) for 30 breaths once a day for 12 weeks. The control group was submitted to a similar protocol, but with at a minimum load of 10 cmH2O. Changes in the AHI were the primary outcome. PImax was measured with a digital vacuometer, daytime somnolence was measured by the Epworth sleepiness scale (ESS), and the quality of sleep by the Pittsburgh Sleep Quality Index (PSQI). CPAP use was treated as a confounder and controlled by stratification resulting in 4 subgroups: IMT-/CPAP-, IMT-/CPAP+, IMT+/CPAP-, and IMT+/CPAP+. Sixty-five individuals were included in the final analysis. Significant variations were found in the 4 parameters measured throughout the study after the intervention in both CPAP- and CPAP+ participants: PImax was increased and AHI was reduced, whereas improvements were seen in both ESS and PSQI. The twelve-week IMT program increased inspiratory muscle strength, substantially reduced AHI, and had a positive impact on sleep quality and daytime sleepiness, whether or not participants were using CPAP. Our findings reinforce the role of an IMT program as an adjunct resource in OSA treatment.

EADSM comment: Inspiratory muscle training might be a future adjunctive therapy for OSA patients, although not a monotherapy. The study showed a decrease to only one third of the baseline AHI value in patients with severe disease. The results should, however, be interpreted with caution, since there were only 8 patients in that group. But, to reduce the severity of OSA, particularly in these patients with a severe disease, with a non-invasive method seems attractive.

CPAP

Link: Reduction in fall risk markers following CPAP treatment of obstructive sleep apnoea in people over 65 years | Elsevier Enhanced Reader

Reduction in fall risk markers following CPAP treatment of obstructive sleep apnoea in people over 65 years

David Stevens [1], Chris Barr [2], Katherine Bassett [3], Aaron Oh [3], Stephen R Lord [4], Maria Crotty [5], Kelsey Bickley [6], Sutapa Mukherjee [7], Andrew Vakulin [8]

Objectives: Falls in older people can lead to serious injury and significant societal health and financial burden. Obstructive sleep apnoea (OSA) is associated with impaired gait/balance and may increase fall risk, yet few studies examined whether treating OSA reduces fall risk. This study examined the effect of continuous positive airway pressure (CPAP) on fall risk markers in people over 65yrs diagnosed with OSA.

Design: Single arm intervention study.

Setting: University and tertiary care CPAP clinic.

Participants: Individuals over 65 years diagnosed with OSA and recommended CPAP.

Intervention: 3-6 months CPAP therapy.

Measurements: 28 participants had a physiological profile assessment (PPA) at baseline and following 3-6 months of CPAP. The PPA examines visual contrast sensitivity, lower limb proprioception, knee extension strength, reaction time and postural sway to generate a fall risk score (FRS). t-tests were used to determine difference between pre- and post-treatment FRS. Regression was used to examine the associations between CPAP use and daytime sleepiness with FRS.

Results: CPAP significantly reduced the FRS ([Mean ± SD] 0.59 ± 1.0 vs 0.04 ± 1.1, p = 0.016), contrast sensitivity and lower limb proprioception (P < 0.05). Increased CPAP use was associated with improvement in FRS in unadjusted analysis (β = -0.213, 95%CI -0.371 to -0.056, p = 0.01). Reduction in Epworth sleepiness score was associated with a reduction in FRS in unadjusted (p = 0.023) and adjusted analysis (adjusted for AHI p = 0.027 or O2Nadir p = 0.015).

Conclusions: CPAP may reduce fall risk in people over 65yrs, possibly related to better CPAP adherence and reduced daytime sleepiness. Future controlled trials and mechanistic studies are needed to elucidate how CPAP may reduce fall risk.

EADSM comment: Interesting findings, that CPAP treatment reduces fall risk markers in the elderly, who might also suffer from osteoporosis with a lot of suffering from such incidents. Would be interesting to study, whether such possible benefits, also exists from non-CPAP therapies.

OSA

All-Cause Mortality in People with Co-Occurring Insomnia Symptoms and Sleep Apnea: Analysis of the Wisconsin Sleep Cohort

Bastien Lechat[1], Kelly A Loffler[1], Douglas M Wallace[2,3], Amy Reynolds[1], Sarah L Appleton[1], Hannah Scott[1], Andrew Vakulin[1,4], Nicole Lovato[1,4], Robert Adams[1,4], Danny J Eckert[1], Peter G Catcheside[1], Alexander Sweetman[1,4]

Purpose: Insomnia symptoms and sleep apnea frequently co-occur and are associated with worse sleep, daytime function, mental health and quality of life, compared to either insomnia or obstructive sleep apnea (OSA) alone. This study aimed to investigate the association of symptoms of co-morbid insomnia and sleep apnea (COMISA) with all-cause mortality.

Patients and methods: Wisconsin Sleep Cohort data were analysed to assess potential associations between COMISA symptoms and all-cause mortality. Nocturnal insomnia symptoms were defined as difficulties initiating sleep, maintaining sleep, and/or early morning awakenings "often" or "almost always", and/or regular sedative-hypnotic medicine use. OSA was defined as an apnea-hypopnea index ≥5/hr sleep. Participants were classified as having neither insomnia symptoms nor OSA, insomnia symptoms alone, OSA alone, or COMISA symptoms. Associations between the four groups and all-cause mortality over 20 years of follow-up were examined via multivariable adjusted Cox regression models.

Results: Among 1115 adult participants (mean ± SD age 55 ± 8 years, 53% males), 19.1% had COMISA symptoms. After controlling for sociodemographic and behavioral factors, COMISA symptoms were associated with an increased risk of all-cause mortality compared to no insomnia symptoms or OSA (HR [95% CI]; 1.71 [1.00-2.93]). OSA alone (0.91 [0.53, 1.57]) and insomnia symptoms alone (1.04 [0.55, 1.97]) were not associated with increased mortality risk.

Conclusion: Co-morbid insomnia symptoms and sleep apnea is associated with increased all-cause mortality risk. Future research should investigate mechanisms underpinning COMISA and the effectiveness of different treatment approaches to reduce mortality risk for this common condition.

EADSM comment: Another piece in the intriguing puzzle of the relation of sleepiness for mortality risk in OSA patients. More knowledge about this relationship will be of help to decide about indications for treatment.

PEDIATRIC OSA

Link: [The effects of rapid maxillary expansion on persistent pediatric snoring post-tonsillectomy (springer.com)](springer.com)

The effects of rapid maxillary expansion on persistent pediatric snoring post-tonsillectomy

[Rita Catia Brás Bariani](#) [1], [Renato Bigliazzi](#) [2], [Thais de Moura Guimarães](#) [3], [Sergio Tufik](#) [3], [Gustavo Antônio Moreira](#) [4], [Reginaldo Raimundo Fujita](#) [1]

Purpose: To investigate the short-term effects of rapid maxillary expansion (RME) on the quality of life of children who had persistent snoring post-adenotonsillectomy (AT).

Methods: The study included children with maxillary constriction aged 5 to 12 years, two or more years after AT whose parents/guardians reported that they still snored ≥ 5 nights per week. We enrolled children with sleep-disordered breathing, including children with primary snoring and children with obstructive sleep apnea (OSA). All patients underwent laryngeal nasofibroscopy and complete polysomnography. Quality of Life (QOL) Questionnaire (OSA-18), the Pediatric Sleep Questionnaire (PSQ), Conners Abbreviated Scale (CAS), and the Epworth Sleepiness Scale (ESS) were administered before and after RME.

Results: Of 24 children enrolled, 13 had primary snoring and 11 had OSA. Overall OSA-18 scores were reduced in both groups (intragroup difference, $p < 0.001$). The PSQ total score, CAS, and ESS were significantly reduced in both groups ($p < 0.001$) In the evaluation of snoring, there was a reduction due to the treatment effect in both groups ($p < 0.001$). Daytime sleepiness and attention deficit hyperactivity disorders were also positively affected in both groups.

Conclusions: Our study demonstrated the potential benefit of RME in treating children with persistent snoring and transverse maxillary deficiency (TMD). RME can improve snoring and the QOL of children with refractory SDB after AT.

EADSM comment: Even more results confirming benefits for children from orthodontic methods to treat sleep disordered breathing.

REFERENCES

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