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Korean Academy of Dental Sleep Medicine

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□ Recent Publications in Dental Sleep Medicine

- Effects of treatment with oral appliance on 24-h blood pressure in patients with obstructive sleep apnea and hypertension: a randomized clinical trial. Andrén A, Hedberg P, Walker-Engström ML, Wahlén P, Tegelberg A. Sleep Breath. 2012 Jul 21.

BACKGROUND: Continuous positive airway pressure treatment has been shown to lower blood pressure (BP) in patients with obstructive sleep apnea (OSA). The aims of the present pilot study were to evaluate the potential effects of oral appliance (OA) therapy on BP, to assess various outcome BP measures, and to inform sample size calculation.

METHODS: Seventy-two patients with OSA and hypertension were randomly assigned to intervention with either an OA with mandibular advancement (active group) or an OA without advancement (control group). Before and after 3 months of treatment, the patients underwent nocturnal somnographic registration and 24-h ambulatory BP monitoring.

RESULTS: Among the various BP measures, the largest trend toward effect of OA treatment was seen in 24-h mean systolic BP with a 1.8 mmHg stronger BP reduction in the active group compared with controls. A stronger trend toward effect was seen in a subgroup with baseline ambulatory daytime mean systolic BP >135/85 mmHg where the mean systolic BP fell, on average, 2.6 mmHg. Additional exclusion of patients with baseline apnea hypopnea index (AHI) ≤ 15 gave a significant reduction in mean systolic BP of 4.4 mmHg ($P=0.044$) in the active group compared with controls.

CONCLUSIONS: In patients with OSA and hypertension, OA treatment had a modest

trend toward effect on reducing BP. A stronger trend toward treatment effect was seen after excluding patients with normal baseline ambulatory BP. Additional exclusion of patients with baseline AHI ≤ 15 showed a significant treatment effect. Data to inform sample size for an adequately powered randomized study are provided.

- Impact of CPAP interface and mandibular advancement device on upper airway mechanical properties assessed with phrenic nerve stimulation in sleep apnea patients. Borel JC, Gakwaya S, Masse JF, Melo-Silva CA, Sériès F. *Respir Physiol Neurobiol*. 2012 Jul 3;183(2):170-176.

Oronasal mask (ONM) can be used when mouth leaks impair nasal-CPAP effectiveness. However, ONM's constraint on the chin and straps' traction may alter upper airway (UA) mechanical properties. In contrast, mandibular advancement device associated with nasal-CPAP (NM+MAD) may reduce UA resistance. The aim of this exploratory study was to compare the effects of ONM, NM, and NM+MAD on UA mechanical properties. The three interface modalities were assessed in 11 OSAS patients at 6, 8, 10 cmH₂O CPAP using a phrenic nerve magnetic stimulation (PNMS) protocol. PNMS-twitches' related flow, pharyngeal pressures (nasopharynx, velopharynx, oropharynx) and UA resistances were determined. Regardless of CPAP level, twitch-induced maximum flow was higher with NM+MAD than with ONM. Velopharyngeal resistance was higher with ONM than with NM+MAD. Oropharyngeal resistance was higher with ONM than with NM. In conclusion, NM+MAD reduced velopharyngeal resistance compared to those measured with ONM and NM alone. We hypothesize that this strategy may help reducing the effective pressure level and thus further limit the risk for mouth leaks.

- A combination appliance for obstructive sleep apnea: the effectiveness of mandibular advancement and tongue retention. Dort L, Remmers J. *J Clin Sleep Med*. 2012 Jun 15;8(3):265-9.

STUDY OBJECTIVES: The purpose of this study was to determine if subjects with moderate-to-severe obstructive sleep apnea would experience increasing treatment effect when a tongue retention component was added to a mandibular repositioning appliance.

DESIGN: Cohort study.

SETTING: Sleep clinic.

PATIENTS: Forty-four sequentially recruited patients with moderate-to-severe

obstructive sleep apnea.

INTERVENTIONS: Subjects were sleep tested at 4 treatment stages of oral appliance therapy. The 4 stages were: 6-mm mandibular protrusion, 8-mm protrusion, 6-mm protrusion with a tongue retention bulb, and 8-mm protrusion with a tongue retention bulb.

MEASUREMENTS AND RESULTS: Forty-one of 44 subjects completed the protocol. There was a decrease in mean respiratory disturbance index from 33.5 events/h at baseline to 18.1 events/h at stage 4 ($p = 0.001$). Mean Epworth Sleepiness Scale (ESS) decreased from 12.3 at baseline to 9.0 at stage 4 ($p = 0.0001$).

CONCLUSIONS: A combined approach utilizing both mandibular protrusion and tongue retention can provide effective treatment for moderate-to-severe obstructive sleep apnea. The addition of a tongue bulb may provide further treatment effect when mandibular protrusion is limited. Appliance designs that allow for convenient combination therapy need to be developed for this purpose.

- The effectiveness of oral appliances in elderly patients with obstructive sleep apnoea treated with lorazepam - a pilot study. Tihacek-Sojic L, Andjelkovic M, Milic-Lemic A, Milosevic B. J Oral Rehabil. 2012 Jun 5.

Obstructive sleep apnoea (OSA) is one of the most common sleep disorders in elderly and represents a special problem for elderly patients. Elderly patients use a large number of drugs that might have an influence on the upper airway structure, anxiolytics or benzodiazepines being the most common. The aim of this study was to examine the effectiveness of mild or moderate OSA treatment with mandibular advance oral appliance in older lorazepam users compared with the age-matched lorazepam-free patients. A total of 40 functionally independent patients with the age of 65-74 were enrolled in the study. All included patients were found to suffer from at least two of the existing OSA symptoms (snoring, sleep fragmentation, daytime sleepiness) and were diagnosed with mild or moderate OSA after nocturnal polysomnography. Patients were divided into two groups. The experimental group consisted of 20 patients who used lorazepam in their daily therapy, and a control group consisted of 20 patients who did not take lorazepam. A mandibular advance appliance was made individually for each patient. Patients involved in the study were not overweight and were suggested to practise sleeping on the side and reduce alcohol consumption during the study. The study has shown that mandibular advance oral appliances were responsible for complete control of the OSA in over 37% of cases (15 patients). Patients have also reported substantial improvement in

the symptoms; 80% of them reported that they had snored less, slept better (94%) and have not experienced daytime sleepiness (100%).

- Relationship between oral health, diabetes management and sleep apnea. Cinar AB, Oktay I, Schou L. Clin Oral Investig. 2012 May 31.

OBJECTIVES: The aim of this study was to assess the relationship between tooth loss, toothbrushing behaviour, diabetes type 2 (DM2), obesity and sleep apnea among diabetics.

MATERIAL AND METHODS: DM2 patients (n = 165) in Istanbul, Turkey, were randomly selected from the outpatient clinics of two hospitals. Baseline clinical measurements (HbA1c, fasting blood glucose, high-density lipoprotein (HDL), low-density lipoprotein (LDL), body mass index (BMI), body-fat proportion, tooth loss) and self-administered questionnaires (toothbrushing, gingival bleeding, sleep apnea) provided data for factor and principal component analysis with Varimax rotation. Univariate statistics and chi-square tests were derived.

RESULTS: Mean maxillary tooth loss (4.49 ± 3.69 teeth) was higher than in the mandible (3.43 ± 3.12 teeth, $p < 0.001$). Favourable HDL was measured among most patients (77%); other favourable clinical measures occurred only in a minority of participants (HbA1c, 28%; fasting blood glucose, 17%; LDL, 30%). Twice daily toothbrushing was reported by 33% (17%) for healthy BMI; 37% when healthy body-fat proportions. There was risk of sleep apnea in 37%. The higher number of lost teeth in the maxilla was linked with obesity and sleep apnea. Non-daily toothbrushers were more likely to have high LDL and low HDL cholesterol and a higher risk of sleep apnea. When "at least occasionally" bleeding on toothbrushing occurred, higher HbA1c levels and sleep apnea were more likely.

CONCLUSION: Oral care with early diagnosis and monitoring of glycaemic level can help prevent complications of DM2.

CLINICAL RELEVANCE: Dentists may play a key role in better managing and diagnosing sleep apnea early by referring the patients with severe tooth loss and periodontal disease for general medical examination.

- Bed partners' and patients' experiences after treatment of obstructive sleep apnoea with an oral appliance. Tegelberg A, Nohlert E, Bergman LE, Andrén A. Swed Dent J. 2012;36(1):35-44.

The purpose of the study was to evaluate bed-partners' and patients' self-reports of general well-being, physical strength and mental energy after treatment for

obstructive sleep apnoea (OSA) with a mandibular advancement oral appliance (OA). Patients (N = 134) referred from medical physicians diagnosed with true OSA, i.e. an apnoea-hypopnoea index of > 10, were treated with an OA for more than one year. The somnographic evaluations were undertaken in a patient's home before the start of, and six months after, treatment. An individually designed monobloc OA was manufactured by a dental technician for nightly use. After one year of treatment, a follow-up questionnaire was sent to patients whose sleep disorder was reduced > 50% from baseline values and to their bed partners. The questionnaire consisted of 15 questions or statements with multi-answer alternatives concerning well-being, physical strength, mental energy, sleep, day and night symptoms, and the Epworth Sleepiness Scale (ESS: eight questions). The questionnaire was answered by 82% (110/134) of the patients and 85 bed partners. Both patients and bed partners reported improvement in general well-being, physical strength and mental energy, between 70-80% for patients and 55-68% for bed partners sharing the same bed-room. Similar results were found for concentration ability, joyfulness and strength of effort in social intercourse, as well as decreased daytime sleepiness, improvement in the feeling of getting enough sleep and reduced nocturia. Conclusions: In all dimensions, the treatment effect had a great influence, not only on patients but on bed partners as well.

- Treatment of obstructive sleep apnea using a custom-made titratable duobloc oral appliance: a prospective clinical study. Dieltjens M, Vanderveken OM, Hamans E, et al. *Sleep Breath*. 2012 May 13.

PURPOSE: This prospective clinical study investigates the efficacy of a specific custom-made titratable mandibular advancement device (MAD) for the treatment of obstructive sleep apnea (OSA). This MAD has attachments in the frontal teeth area that allow for progressive titration of the mandible.

METHODS: Sixty-one adult OSA patients were included (age, 46.7 ± 9.0 years; male/female ratio, 45/16; apnea-hypopnea index (AHI), 23.2 ± 15.4 events/h sleep; body mass index, 27.9 ± 4.1 kg/m²). After an adaptation period, titration started based on a protocol of symptomatic benefit or upon reaching the physiological limits of protrusion. As a primary outcome, treatment response was defined as an objective reduction in AHI following MAD treatment of ≥ 50 % compared to baseline, and treatment success as a reduction in AHI with MAD to less than 5 and 10 events/h sleep. Compliance failure was defined as an inability to continue treatment.

RESULTS: A statistically significant decrease was observed in AHI, from 23.4 ± 15.7 at baseline to 8.9 ± 8.6 events/h with MAD ($p < 0.01$). Treatment response was achieved in 42 out of 61 patients (68.8 %), whereas 42.6 % met criteria of AHI < 5 and 63.9 % achieved an AHI < 10 events/h sleep, respectively. Four patients (6.6 %) were considered as "compliance failures."

CONCLUSIONS: The present study has evaluated the efficacy of a specific custom-made titratable MAD in terms of sleep apnea reduction.

- Microimplant-based mandibular advancement therapy for the treatment of snoring and obstructive sleep apnea: a prospective study. Ngiam J, Kyung HM. Angle Orthod. 2012 May 10. [Epub ahead of print]

OBJECTIVE: To investigate the efficacy of orthodontic microimplant-based mandibular advancement therapies for the treatment of snoring and obstructive sleep apnea (OSA) in adult patients.

MATERIALS AND METHODS: Ten adult OSA patients (seven men, three women; mean age 60.00 ± 9.25 years) were each treated with two mandibular orthodontic microimplants attached to a customized reverse face mask for mandibular advancement. Pretreatment and posttreatment outcome measures of microimplant mobility, apnea-hypopnea index, snoring, respiratory movement, and Epworth sleepiness scores were evaluated after 6 months.

RESULTS: Highly significant reductions in the apnea-hypopnea index, snoring, and sleep variables were observed. Sixteen of the 20 (80%) microimplants were stable and showed no mobility, and four (20%) demonstrated grade 1 or 2 mobility and required removal and reinsertion of a new microimplant.

CONCLUSIONS: Favorable reductions in sleep variables highlight the potential of microimplant-based mandibular advancement therapy as an alternative treatment modality for OSA patients who cannot tolerate continuous positive airway pressure and oral appliance therapy.