ABSTRACTS

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POSTER #001

Patients' and Bed Partners' Quality of Life Assessment of Oral Appliance Therapy in Obstructive Sleep Apnea

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Introduction: It is reported that Continuous Positive Airway Pressure (CPAP), often considered as a first choice therapy for OSA, could affect improvements in the QOL of bed partners (Kiely JL, 1997). In Oral Appliance (OA) studies, some reports suggest effectiveness in patient's QOL variables (Phillips CL, 2013). Although a previous study reported improvements of patients' and bed partner's QOL retrospectively (Tegelberg A, 2012), there is no comparative study to estimate the effect of bed partner's QOL. The aim of this study was to examine the effects on the QOL of both parties after the patients were treated with an OA.

Methods: This study consists of a simple questionnaire survey administered by asking the patient and bed partner to complete it at his/her home before and after OA therapy. The questionnaire consists of the Short Form 36 (SF-36), the Epworth sleepiness scale (ESS) and general questions requesting information such as snoring habits and sharing the bedroom details. The protocol had the prior approval of the clinical research ethics board, UBC Office of Research Services. Wilcoxon Signed Ranks test and Spearman test were used for statistical analysis. A $P < 0.05$ was considered as significant.

Results: A total of twenty patients (65% male, age 52.9 ± 9.9 years, BMI 26.3 ± 4.8 kg/m^2, baseline ESS 7.1 ± 3.1) and ten partners (10% male, age 49.9 ± 9.7 years, BMI 25.1 ± 8.6 kg/m^2, baseline ESS 4.4 ± 3.0) completed the data collection. Eighty five percent of patients had bed partner after OA therapy, and seventy five percent of patients and bed partners slept in the same room. In addition to significant improvements in patients ESS (median 6.5 to 5.5, $p = 0.04$) and bed partner's physical function (median 92.5 to 97.5, $P = 0.039$), a higher adherence (frequency of wearing an OA nights/week) correlated with an improvement in patients QOL variables (role physical $r = 0.512$, vitality $r = 0.465$, role emotional $r = 0.488$, and mental health $r = 0.485$, $p < 0.05$). The greater the snoring reduction correlated with an improvement in bed partners ESS score ($r = -0.744$, $p < 0.05$) and QOL variables (role physical $r = 0.632$, mental health $r = 0.848$, physical health $r = 0.848$ and total SF36 score $r = 0.780$, $p < 0.05$).

Conclusion: OSA patients with better adherence to OA therapy experienced an improvement in their own QOL. Bed partners who reported a greater reduction in patient's snoring exhibited an improvement in their own sleepiness and QOL. An assessment of changes in sleepiness and QOL variables in bed partners based on a larger sample size is warranted to further evaluate the potential changes that occur.

POSTER #002

Fabrication of an Oral Sleep Appliance without Dental Impressions

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Introduction: The fabrication of custom oral sleep appliance has historically required dental impressions. This procedure in general is one that patients do not look forward to and may even forgo a dental appliance just to avoid it. Recently, intra oral scanners have proliferated giving the patient the option of digital impressions without any type of impression material in their mouth. A series of scans are taken of the patient's dental arch and through software, stitched together to create a digital dental model. Manufactures also claim that appliances made from these models are more accurate than conventional dental impressions. The purpose of this study was to use digital scans of the dental arches and a therapeutic bite which were then electronically submitted to a dental lab for fabrication of a dental sleep appliance. In addition, the sleep appliance effectiveness was evaluated with a home sleep test.

Methods: An initial home sleep test was given to the subject to verify the diagnosis of mild sleep apnea and to gather baseline data for comparison of the effectiveness of the oral appliance. The subject's upper and lower arches were scanned. For the construction bite the subject was fitted with a jig to determine the greatest vertical opening which was comfortable and didn't cause a chin strain. From there the subject was ask to move the lower jaw forward into the jig while making snoring sounds until diminished with the jaw in a comfortable position where the lips could still seal. With the subject biting on the jig, the right and left buccal segments were scanned to record the construction bite. The STL files were then exported to the Dental Lab for fabrication of a Sleep Herbst appliance. At appliance delivery it was subjectively tested for fit and ability to make snoring sounds. A home sleep test was then given once the subject was comfortable with the appliance and reported improvement of symptoms. Before and after indexes were objectively compared.

Results: Subjectively the appliance fit very well and position of mandible with the appliance in was accurate to the construction bite. Subject reports he was comfortable with the appliance at delivery. The before/after pRDI 11.68/9.24, pAHI 8.57/1.78 and ODI 6.85/1.13 were compared. The comparison of before/after total events for the three indexes were; pRDI 75/57, pAHI 55/11 and ODI 44/7. Both the after AHI and ODI were reduced into

the normal range. The after RDI, although not in the normal range, was also reduced.

Conclusion: Although this study had only one subject, this practitioners' experience with digital scans for fabrication of orthodontic appliances has been very successful and this study indicates it will also be true for impression less fabrication of dental sleep appliances. The fabrication of oral sleep appliances without dental impressions are as effective and more patient friendly than traditional methods and may become the new standard of care.

POSTER #003

ORCADES, a Prospective Multicenter Cohort Study of Obstructive Sleep Apnea (OSA) Patients Treated with a Custom-Made Mandibular Repositioning Device (MRD)

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Introduction: Use of an MRD is an alternative therapy for OSA in patients noncompliant with continuous positive airway pressure (CPAP). ORCADES is a French, prospective, multicenter, long-term, observational cohort study in 360 OSA patients who refused or did not tolerate CPAP and then were treated with a custom-made MRD. Results for the first patients treated are shown.

Methods: OSA patients screened by sleep physicians were referred to a dental specialist who fitted a custom-made MRD (CadCam; Narval) in eligible patients and did gradual mandibular advancement (MA) titration. Objective sleep data, clinical symptoms, quality of life, side effects and compliance were evaluated. Treatment success was defined as a ≥ 50% decrease from baseline in the apnea-hypopnea index (AHI).

Results: Interim analysis was performed on the first 232 patients fitted with an MRD (71% male, age 53.2 ± 11.9 years, mean AHI 29 ± 15/h, body mass index 27 ± 4 kg/m^2, 50.2% who refused CPAP and 49.8% previously treated with CPAP). Baseline AHI was 5-15/h (14% of patients), 15-30/h (44%) or > 30/h (42%); 42% of patients had severe snoring. Mean final MA was 7 ± 2 mm (75% of maximum MA; 2 ± 1 titrations). Among the 143 patients who have undergone a 3-month assessment, treatment success rate was 84% regardless of OSA severity. AHI was < 10/h in 63% of patients. Epworth Sleepiness Scale score decreased from 12 ± 5 to 8 ± 5, and loud snoring disappeared in 90% of patients affected. Nocturnal polyuria and sexual dysfunction resolved completely in > 50% of patients. Quality of life and fatigue score improved significantly from baseline. Compliance was high, with MRD use of mean 6.7 h/night on mean 6.6 days/wk. During the first 9 months of treatment, 61 patients (27%) have reported side effects. These included gum irritation or pain (9.5%, n = 22), dental or periodontal pain (8%, n = 19), temporomandibular joint pain or stiffness (7%, n = 16), cheek or tongue irritation (3%, n = 8), excessive salivation (2.5%, n = 6), dry mouth (2.5%, n = 6). To date, the rate of occlusion change or dental mobility was low (< 2%). Only 10 patients (4%) stopped treatment early as a result of side effects.

Conclusion: A custom-made MRD is an effective therapy for OSA that can be used successfully in patients who refuse, or are noncompliant with, CPAP.

POSTER #004

Oral Appliance Therapy Versus Nasal CPAP in Obstructive Sleep Apnea: a Randomised, Placebo-Controlled Trial on Psychological Distress

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Introduction: Obstructive sleep apnea is associated with a high prevalence of psychological distress symptoms, including depression and somatisation. The aim of the present study was to compare the effects of a mandibular advancement device (MAD) with those of nasal Continuous Positive Airway Pressure (nCPAP) on psychological outcomes.

Methods: This study is part of a randomized placebo-controlled trial, in which different treatment effects of a titrated MAD are compared with those of nCPAP and an intra-oral placebo appliance in a parallel design. Sixty-four mild/moderate OSA patients (52.0 ± 9.6 years) were randomly assigned to these three parallel groups. All patients filled out twice the Dutch version of the Symptom Checklist-90-Revised (SCL-90-R): one before treatment and one after six months of treatment. The SCL-90-R is a multidimensional symptom inventory designed to measure symptomatic psychological distress over the past week (e.g., depression and somatisation). Linear mixed model analyses were performed to study differences between the groups for the different dimensions of the SCL-90-R over time.

Results: The three groups showed higher average values of psychological distress at baseline than the reported normal values for the Dutch population (P = 0.001). The baseline values of the different dimensions of the SCL-90-R questionnaire did not differ significantly between the three groups (P = 0.305–0.987). The changes in the different dimensions from baseline to therapy evaluation were not significantly different between the three groups (P = 0.175–0.950), while the pooled data of the three groups showed significant improvements in the dimensions "somatisation," "Insufficiency of thinking and acting," "agoraphobia," "anxiety," "depression," and "sleeping problems," over time (F = 4.14–16.73, P = 0.048–0.0002).

Conclusion: Within the limits of this study, it can be concluded that there is no significant difference between MAD and nCPAP in the effects on psychological outcomes. Moreover, placebo effects probably play an important role in the significant improvements of psychological distress symptoms with these therapies.

POSTER #005

Dental Side-Effects Following Mandibular Advancement Therapy: Assessment of Changes in Overjet as a Function of the Type of Occlusion

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Introduction: Oral appliance (OA) therapy with mandibular advancement devices (OAm) is a lifelong treatment. Therefore, the prevalence of possible side effects as well as their nature need to be evaluated for each patient. The present study describes the prevalence of changes in overjet (OJ) as a function of the type of occlusion.

Methods: A retrospective study was conducted on 93 patients (baseline: apnea/hypopnea index (AHI) 20.0 (13.7) /hr; body mass index (BMI) 26.8 (4.2) kg/m^2; male/female ratio 77.4%; age 47.2 (9.1) years) treated for 1 year with a custom-made titratable OAm without labial protection at the incisors (treatment: AHI 7.5 (8.5) /hr; BMI 26.8 (4.2) kg/m^2; Δprotrusion 8.8 (2.6) mm; subjective use 47 (10.2) h/week). Patients titrated until maximum comfortable protrusion or resolution of the subjective symptoms.

Patients were excluded after one year because of (a) missing data (n = 1), (b) irregular OAm use (n = 4), (c) dental prosthetics or orthodontic wires (n = 14) on incisors and/or canines which could inhibit teeth movement. Finally 78 patients were subdivided in six groups based on the measured OJ and overbite: normal bite (NB; n = 21), deep bite (DB; n = 16), large OJ (LOJ; n = 21), LOJ plus DB (LOJDB; n = 13), small overjet (SOJ; n = 4), edge-to-edge (ETE; n = 2), and open bite (OPB; n = 1). SOJ, ETE and OPB were excluded due to a small sample size.

The effects of age, BMI, ΔAHI, Δprotrusion and number of supporting teeth were studied in R (ANOVA or Kruskal-Wallis analysis; level of significance $p < 0.05$; normal distribution verified using Shapiro-Wilk). The effect of the type of occlusion on ΔOJ after one year of treatment was calculated with a multiple linear regression model and a step-down Bonferroni analysis, corrected for both the amount of protrusion and the degree of subjective use of the OAm.

Results: One year of OAm treatment caused in 79.5% of all patients a change in OJ. No significant difference was found between the number of patients with a changed OJ per subgroup. However, only 60% of patients starting with a DB demonstrated changes in OJ as opposed to 90%, 81% and 85% of patients with a LOJ, NB and LOJDB, respectively. Multiple regression analysis revealed a significant difference in changes in OJ between the NB and DB subgroup ($p = 0.027$) and the LOJ and DB subgroup ($p = 0.012$).

Conclusion: The present results confirm a high prevalence of changes in overjet (OJ). Further, the presence of a deep bite will result in smaller changes in OJ after one year compared to a normal bite or a large OJ. This protective deep bite effect applies only to those patients starting with a normal or small OJ.

POSTER #006

Comparison of Mandibular Repositioning Device Outcomes for the Treatment of Obstructive Sleep Apnea Using Alternative Approaches for Determining the Optimal Jaw-Forward Position

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Introduction: Successful outcomes from oral appliance therapy require an optimized positioning of the jaw in both the vertical and protrusive planes. This study provides a comparison of mandibular repositioning device outcomes (MRD) using two methods for defining the optimal jaw position.

Methods: Method A (N = 28) results were derived from a retrospective analysis of patient charts from those who had a dental sleep medicine office. The George Gauge was used to define protrusion of 60%. Patients were instructed then to advance the MRD until snoring stopped and/or they felt less tired. If the patient had not advanced the MRD or subjective reports indicated additional titration was required, additional office visits were scheduled for adjustments. Method B (N = 23) patients were evaluated prospectively. The Apnea Guard device (AG) was used to determine correct jaw position based on 70% protrusion, and a predictive algorithm for vertical separation (VDO) based on gender and tongue size. AG outcomes were measured at 30 days with no additional adjustments to the MRD.

Results: Improvement in sleep parameters: The mean pre and post-treatment AHI for Method A were 24 ± 10.7 and 8 ± 6.8. The comparative change in AHI for Method B was 22 ± 10.2 to 6 ± 4.1. Additionally, for those in Method A Group, 64.3% (18) achieved an AHI < 10 and an overall reduction of 50%. In Method B, 78.3% of patients achieved the goal of < 10AHI and a 50% reduction. 14.3% and 4.3% of patients respectively failed to reach treatment goals using Method A versus Method B. No statistically significant differences in outcomes were observed between the two methods based on the Chi-Squared statistic. One of the two patients who failed the endpoint with Method B appeared to be a non-responder to oral appliance therapy (rather than a failure of the protocol). Improved time to successful treatment: Group A displayed a mean time to successful treatment of 136 ± 53.1 while Group B displayed an improved time to successful treatment outcome of 33 ± 15 days. The average time to achieve an efficacious outcome with Method B (i.e., 34 days) excluded delays resulting from patient rescheduling.

Conclusion: Methods A and B both achieved clinically important treatment endpoints for the vast majority of patients, while Method B provided fewer treatment failures. A jaw-forward

position that optimizes treatment outcomes with the MRD was predicted with the AG. Method B allowed therapy to be initiated immediately, reduced the treatment time by an average of 100 days, and decreased the cost for delivery and repeat visits. A cost analysis showed that Method B reduced the treatment time by an average of 100 days, and decreased the cost for delivery of an efficacious outcome by an average of $300 per patient in this setting.

POSTER #007

Effects of Response Criteria on the Success Rate of Oral Appliance Treatment for Obstructive Sleep Apnea

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Introduction: One clinical issue in oral appliance therapy for obstructive sleep apnea (OSA) is that treatment success is defined rather arbitrarily. Although a given treatment may be regarded as "successful" under the liberal definition of a response, an increase in residual respiratory events after treatment could possibly lead to adverse health outcomes including OSA-related hypoxemia. We hypothesized that the success rate of treatment with an oral appliance would vary considerably with the selection of the response criteria. We further sought to identify clinically-relevant criteria for treatment success with oral appliances by focusing on oxygenation in addition to Apnea Hypopnea Index (AHI).

Methods: The study protocol was approved by the ethics committee of the Neuropsychiatric Research Institute, Japan. The effects of an oral appliance on AHI and nadir percutaneous oxygen (SpO_2) were investigated in 224 Japanese OSA subjects (47 ± 12 years, 25 ± 4 kg/m^2). Treatment success was defined as a reduction in AHI to < 5/h with a > 50% reduction in baseline AHI (criterion 1), a > 50% reduction in baseline AHI alone (criterion 2), or a > 50% reduction in baseline AHI with the nadir SpO_2 above 90% (criterion 3). Paired t-tests were used to compare the differences between the baseline and follow-up AHI. 2×4 χ^2 tests followed by residual analyses were also used to evaluate the responder-nonresponder distributions.

Results: The baseline AHI was reduced with an oral appliance in place, compared with the follow-up value (23 ± 11 to 8.5 ± 8.7 /h, $p < 0.05$) in all of the patients. There were fewer responders under criterion 1 (41%, $|R_{adjusted}| = 1.8$, $p < 0.01$) while more responders under criterion 2 (72%, $|R_{adjusted}| = 0.8$, $p < 0.01$). Based on criterion 2, there were 161 responders, in whom the baseline AHI decreased from 23 ± 12 /h to 5 ± 4 /h ($p < 0.01$). However, 43% and 6% of these responders did not satisfy criteria 1 and 3, respectively. In every OSA subgroup, the success rate under criterion 2 [75% (mild), 71% (moderate), and 70% (severe)] was greater than that under criterion 1 (53%, 40%, and 24%, respectively). Nevertheless, responders under criterion 2 in the severe OSA subgroup were still hypoxemic with a nadir SpO_2 of 87 ± 8% even after treatment. This situation was improved by the use of criterion 3, where a satisfactory improvement in AHI (from 38 ± 11 to 1 ± 1 /h, $p < 0.01$) was associated with a sufficient increase in the nadir SpO_2 (from 75 ± 8 to 93 ± 2%, $p < 0.01$).

Conclusion: This is the first study to demonstrate that the success rate of OSA treatment with oral appliance can vary remarkably with selection of the response criteria. We propose that, to avoid adverse health outcomes, an adjunct definition of treatment success using SpO_2 may be effective for patients who have more severe OSA.

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POSTER #008

Postural Movements of the Mandible Associated with Inspiratory Effort during Sleep in Obstructive Sleep Apnea Patients

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Introduction: Mandibular posture in patients with obstructive sleep apnea (OSA) has received greater interest with the increased use of oral appliances that alter the posture of the mandible. However, postural movements of the mandible associated with respiratory effort during sleep remains poorly understood. The aim of this study was to characterize the relationship of the postural movements of the mandible with inspiratory effort during sleep in patients with various levels of OSA severity.

Methods: Forty-three patients (11 non-OSA patients, 18 mild and moderate, and 14 severe OSA) were studied in a hospital sleep laboratory using standard video-polysomnography. The posture of the mandible was monitored with a magnetic resonance field transducer placed over the forehead and chin (JAWSENS, Nomics, Belgium). Inspiratory effort was monitored with an inductance plethysmograph on the ribcage and abdomen. The jaw-closing or jaw-opening movement synchronized with inspiratory effort was visually scored in each epoch (30 seconds). A synchronized movement was considered to be positive when it lasted more than a half of the epoch and when the amplitude of the jaw movement was greater than 1.0 millimeter. The percentage of the positive epochs per total sleep epochs was calculated and P values of < 0.05 were considered significant.

Results: Two types of postural movement of the mandible were synchronized with inspiratory effort; type A) jaw-closuring movement during inspiratory effort, and type B) jaw-opening movement during inspiratory effort. There was no significant difference in the percentage of epochs that contained type A movement (non-OSA: 1.1 ± 2.3%; mild and moderate OSA: 5.7 ± 14.7%; severe OSA: 3.3 ± 7.5%). In contrast, the percentage of epochs that contained type B movement (synchronized

jaw-opening during inspiratory effort) was significantly higher in the severe OSA patients compared to non-OSA patients (non-OSA: 3.1 ± 6.7%; mild and moderate OSA: 9.3 ± 19.9%; severe OSA: 23.6 ± 27.2%). The increase in the percentage of type B movements was positively correlated with an increase in the Apnea Hypopnea Index ($P < 0.05$).

Conclusion: Our findings suggest that there is an increase in synchronized jaw-opening associated with inspiratory effort that increases with OSA severity. The observed unstable mandibular posture with increased OSA severity could represent a reduced response of the jaw-closing muscles to airflow stimuli in the pharynx. The observed postural movement may contribute to our understanding of the mode of action of oral appliance therapy.

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POSTER #009

Risk Factors Associated with Obstructive Sleep Apnea: A Case-Control Study

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Introduction: Obstructive sleep apnea (OSA) is a type of breathing disorders which is related to snoring and repeated obstruction at the pharyngeal area. The consequences of OSA impact quality of life and are associated with systemic diseases such as hypertension, diabetes mellitus and cardiovascular disease. OSA is a complex disease with multifactor etiology. However, the association between oral manifestration and etiology of OSA is still not clear.

Methods: We conducted a case-control study to investigate the association between physiologic (age, gender, BMI and neck circumference), systemic (diabetes and hypertension) and oral anatomic factors (tongue size, torus mandibularis, Mallampati's score, palatal vault and presence of lateral pharyngeal wall) with OSA. A total of 154 subjects including 78 OSA diagnosed patients (43 males, 35 females) and 78 general non-OSA patients (37 males, 41 females) were enrolled in the case and control groups, respectively. History-taking together with physical and oral examinations were thoroughly conducted according to the criteria of each factor classification.

Results: Descriptive statistic together with inferential statistic for bivariate analysis using chi square and multiple logistic regression revealed that there are three factors significantly associated with OSA. First, patients with Mallampati's score level 3 and 4 had risk for OSA 29.470 times higher than patients with lower level of Mallampati's score (OR = 29.470 95% CI 5.217–33.741). Second, patients with neck circumference > 40 cm had risk for OSA 10.861 times higher than patients with smaller neck circumference (OR = 10.861 95% CI 2.032–16.280). Third, patients with larger tongue had risk for OSA 5.34 times higher than patients with smaller tongue (OR = 5.341 95% CI 1.187–8.052). However, there is no statistical significant correlation between OSA and palatal width and depth, torus mandibularis size and presence of lateral pharyngeal wall.

Conclusion: Collaboration between physicians and dentists is crucial for management of OSA. As larger neck circumference and oral manifestation (high Mallampati's and larger tongue) can be found during physical and oral examination by dental practitioners, dentists should be able to aware, identify, give advice or refer patients who have history of snoring to get further examination, diagnosis and proper management if they have OSA from physician.

Support: Neuroscience Research and Development group (NRD), Faculty of Dentistry, Khon Kaen University, Thailand

POSTER #010

Practice Management Implications of Leading Custom Mandibular Advancement Devices

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Introduction: Mandibular Advancement Device (MAD) selection may impact patient outcomes and the business economics of a dental practice. Midwest Dental Sleep Center (MDSC) began recording the type of MAD selected by all dentists in the practice for treatment of OSA. Results of the patient/dentist reported problems and dental economic implications are reported for 309 consecutive patients treated by 4 dentists.

Methods: Patients were previously diagnosed by a sleep physician and subsequently referred to MDSC for a custom MAD. The dentists completed new patient consultations to determine candidacy for treatment and selected a custom MAD based on the overall clinical assessment. All findings were recorded in the patient's medical record allowing for data retrieval and analysis. Any unplanned patient visits due to patient reported problems, broken MADs and appointments for redelivery of repaired or replaced MAD's were tracked from 15–198 days.

Results: Across 309 cases, six different custom MADs were provided that met the inclusion criteria of 5 or more patients). There was no correlation of AHI severity or gender in the appliances selected. Patients call the practice with problems and when it cannot be resolved with phone consultation, appointments are scheduled. During the 198 day period, 21 percent (66/309) required a problem appointment. The rate of patient reported problem appointments ranged from 15% to 57% (of new patient deliveries) reported by MAD type. On average these are 30 minute appointments that are not reimbursed and represent a $200.00 loss in production per appointment. Therefore, during the 198 day period, patient reported problem appointments cost the practice $13,200.00, ranging from $1,600.00 to $4,000.00 depending on MAD type. Thirteen percent (41/309) of all cases required a lab repair or remake. The combined repair/remake rate by MAD type ranged from 0% to 22%. On average repairs/remakes take 3 weeks, which is

significant in lost therapy nights. Appointments for redeliveries are 45 minutes and represent a $300.00 loss in production per appointment. Excluding the lab fee for the remake or warranty coverage, redeliveries cost the practice $12,300.00 ranging from $600.00 to $4,800.00 depending on MAD type.

Conclusion: There are material differences in custom Mandibular Advancement Device rates of patient reported problems, repair and remake rates and the subsequent financial impacts on the operation of the dental practice. These have not previously been known and quantified.

POSTER #011

Feasibility Pilot Evaluating the Use of Pre-Fabricated Titratable Mandibular Advancement Device for Management of Obstructive Sleep Apnea

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Introduction: The effectiveness of oral appliance therapy (OA) for OSA is variable, but ability to predict response based on baseline characteristics is limited. This is a feasibility pilot evaluating the use of a prefabricated titratable mandibular advancement device of PFMAD (ApneaRX, Apnea Sciences). If successfully used in a clinical setting, we can anticipate evaluating its utility as a possible predictive mechanism.

Methods: PFMAD used is a "one size fits all" boil-and-bite device with ability to incrementally adjust mandibular position (1 mm is typical neutral position and able to advance to 10 mm). Appropriate candidates for OA therapy at Kaiser Permanente Sleep Center (Fontana) were created a PFMAD by a respiratory therapist. Patients were instructed to start at 3 mm and advanced nightly by 1 mm as tolerated. At maximum tolerable advancement, repeat polysomnography (post-PSG with portable monitor) was performed. We assessed device fit, maximum tolerable advancement, efficacy, and acceptance of therapy.

Results: 76 patients attended OA Class. 73 patients were fit for PFMAD; 3 opted out due to being poor dental candidates. 52 patients returned for post-PSG while 21 declined further PFMAD trial (15 for discomfort, 3 failed to follow up, 2 re-tried CPAP, 1 no symptomatic benefit). Of the 52 that returned for post-PSG, 69% were "responders" (AHI4% improvement and post-AHI < 15). Response rate based on OSA severity: mild 63% (17/27); moderate 65% (13/20); severe 100% (5/5). Overall, AHI improved from 17.9 ± 12.7 to 7.1 ± 8.4 ($p < 0.01$) with median mandibular advancement of 6 mm (range 4-9 mm). In responders, there was essential normalization of AHI from 19.4 ± 14.3 to 2.9 ± 2.4 ($p < 0.01$). There were no significant differences in baseline characteristics between responders and non-responders. 24 patients were referred for custom oral appliance; comparison of efficacy with PFMAD is pending.

Conclusion: PFMAD can be feasibly created by non-dental sleep center providers, able to be worn by most patients, and able to be titrated by patients at home. We anticipate studying its utility in predicting efficacy and acceptance of customized OA.

POSTER #012

Sleep Medicine in Dental Hygiene Education

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Introduction: According to the National Sleep Foundation, 70 million Americans chronically suffer from over 80 medically recognized sleep disorders. Many of these individuals remain undiagnosed. In order to effectively address this issue, health care professionals must collaboratively work to educate, identify, and treat patients with sleep disorders. However, medical and dental clinicians do not receive adequate education in sleep medicine. On the frontline regarding prevention and counseling, dental hygienists can play an important role in patient education, screening, and management of sleep disorders. The purpose of this study was to assess the amount of sleep medicine content in dental hygiene education programs across the US, to determine if the institutional setting or geographic region had an effect on the amount of sleep medicine content taught, and to solicit opinions from dental hygiene faculty on the importance of sleep medicine content in the dental hygiene curriculum.

Methods: An electronic survey was emailed via Qualtrics to all 332 accredited dental hygiene programs in the US. The 18-question survey assessed the sleep medicine content presented during the 2012/2013 academic year. Follow-up emails and phone calls were made to non-responding programs. Email addresses and phone numbers were obtained from the American Dental Hygienists' Association (ADHA) website.

Results: Thirty-six percent (36%) of the programs responded. The mean number of hours devoted to sleep medicine education was 1.55 hours (SD = 1.38). Seventy-four percent (74%) of the responding programs reported spending time on sleep bruxism (mean = 1.38 hours, SD = 0.85). However, only 39% of the responding programs reported spending time on other topics such as snoring and obstructive sleep apnea (mean = 1.39 hours, SD = 0.72). Other topics such as snoring and obstructive sleep apnea were more likely to be taught in university-based programs without a dental school than in those with a dental school or in community-based programs ($p < 0.05$). Seventy-one percent (71%) of respondents agreed that sleep medicine content should be incorporated into the dental hygiene curriculum. Eighty-five percent (85%) of respondents indicated an interest in learning more about sleep medicine.

Conclusion: Sleep medicine education is included in the majority of US dental hygiene programs, but this is largely limited to a superficial coverage of sleep bruxism and occlusal guards. Current training is inadequate to prepare dental hygienists for their potential role in patient education, screening, treatment and management of sleep-related breathing disorders. Dental hygiene faculty agree that sleep medicine is an important issue in health care and are interested in learning more about the subject.

POSTER #013

Physician Evaluation among Dental Patients who Screen High-Risk for Sleep Apnea

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Introduction: Obstructive sleep apnea (OSA) is increasing in prevalence, widely undiagnosed, a precursor of significant pathology and responsive to therapy. Collectively these features point to the salience of OSA screening. This study sought to investigate the utility and public acceptability of screening for OSA risk in a dental practice setting and to examine the response of patients to a recommendation for physician evaluation.

Methods: A convenience sample of 124 adults was recruited by dental hygienists at a community-based dental practice in Raleigh, NC, using flyers. OSA risk was assessed using two methods. (1) The 4-item STOP screening questionnaire classified high-risk as the presence of ≥ 2 of: loud snoring; daytime tiredness; witnessed apnea; hypertension. (2) Overnight pulse oximetry classified high-risk as the presence of either: oxyhemoglobin saturation below 90% for ≥ 1% cumulative recording time; or oxygen desaturation index ≥ 10 events/hour in which oxyhemoglobin saturation decreased ≥ 3% from baseline. Patients were notified of their OSA risk status according to each instrument in a mailed letter. Those classified as high-risk on one or both instruments were advised to seek physician evaluation within 3 months. Three months later, patients were asked by telephone if they had sought physician evaluation. Prevalence ratios (PR) with 95% confidence limits (95% CL) were estimated using a log-binomial regression model in which the binary dependent variable was physician evaluation. The independent variable was OSA risk classified as low-risk on both instruments or high-risk on: STOP only; pulse oximeter only; or both instruments. Covariates were age, sex, body mass index and daytime sleepiness.

Results: Among 124 patients, 48.4% was male, 23.9% was obese and the mean age was 51 years. Fifty percent screened high-risk on STOP questions and 31.5% screened high-risk on both instruments. Physician consultation information was obtained from 114 patients (91.9%). Of those patients who screened high-risk for OSA, 46.2% (n = 42) sought physician evaluation. Compared to patients screening low-risk on both instruments, those at high-risk on the STOP questions alone were nine times as likely to seek physician evaluation (adjusted PR = 9.2, CL: 1.1, 76.2); similar to patients screening high-risk by pulse oximetry alone (adjusted PR = 9.7, 95% CL: 1.2, 77.4). Patients high-risk on both instruments were 13 times as likely to seek physician evaluation as those at low-risk (adjusted PR = 13.0, 95% CL: 1.6, 103.4) but this was not significantly greater than that of patients at risk based on one instrument alone.

Conclusion: Patients who screened high-risk for OSA in a dental setting were receptive to advice to seek physician evaluation. Probability of care seeking was similar for patients at high-risk by simple questions or pulse oximetry when instruments were jointly administered. Findings, including the unexpectedly high percentage of patients screening high-risk for OSA based on published criteria, have implications for the establishment of recommendations for OSA screening in the dental office.