

ABSTRACTS

The posters are available for viewing in the general session room, Ballroom A, from Friday, June 4 through Sunday, June 6, 2010. The poster number listed below corresponds with the poster numbers located on the top corners of the poster boards. Authors will be present at their poster boards on Saturday, June 5 during either the 10:00am or 3:00pm refreshment breaks to field questions or comments about their posters. Please see the schedule on pages 19-21.

POSTER #001

VIDEOENDOSCOPIC DIAGNOSIS FOR PREDICTING RESPONSE TO ORAL APPLIANCE THERAPY IN OBSTRUCTIVE SLEEP APNEA

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Introduction: Oral appliance (OA) therapy is one of the treatments for patients with obstructive sleep apnea (OSA). OA therapy is indicated for use in patients with mild to moderate OSA on the basis of the apnea-hypopnea index (AHI). However, it has been reported that some patients with severe OSA also successfully respond to OA. Such findings suggest that patients should not be selected for OA therapy based on AHI alone. Practice parameters are therefore needed to predict OA treatment outcome. We previously reported that nasendoscopy during waking might be helpful for the prediction of treatment success with OA therapy. We report herein additional data and findings for predicting OA treatment outcome using nasendoscopy.

Methods: Twenty-one severe OSA patients (AHI>30) comprising 18 men and 3 women diagnosed by overnight polysomnography were selected as subjects. Subjects ranged in age from 35 to 78 years (mean, 56 (SD 12)) and body mass index ranged from 16.9 to 31.6 kg/m² (mean, 24.5 (SD 3.2)). Patients were instructed to lay supine in a dental chair. A flexible endoscope was inserted through the nasal cavity and the tip of the scope was placed at the level of the velopharynx and oro-/hypopharynx. Changes in the width of the velopharynx and oro-/hypopharynx when advancing the mandible from the centric occlusal position during waking were observed, and the direction of any widening was noted. All subjects then underwent overnight polysomnography with OA after confirming that they could wear the OA comfortably. AHI reduction rates following OA therapy were calculated and compared between patients with and without pharyngeal widening. The calculated AHI rates were also compared among the different widening directions.

Results: All subjects showed improved AHI following OA therapy. All subjects also showed oro-/hypopharyngeal widening when advancing the mandible. Sixteen subjects showed velopharyngeal widening and the remaining 5 did not. The AHI reduction rate for patients with velopharyngeal

widening was 79.1% (SD 14.1%), while that for patients without velopharyngeal widening was 45.0% (SD 26.4%). The difference between the two groups was significant. Two types of velopharyngeal widening were observed: an 'all-round type' and a 'lateral dominant type'. The AHI reduction rate of the all-round type was 80.7% (SD 16.7%) and that of the lateral dominant type was 77.5% (SD 12.0%). The difference between the two types was not significant.

Conclusion: The results of the present study can be interpreted as follows. 1. Nasendoscopic findings for the velopharynx were more helpful than those for the oro-/hypopharynx for the prediction of OA treatment outcome. 2. Patients who showed velopharyngeal widening when advancing the mandible on nasoendoscopy responded more effectively to OA therapy than those without velopharyngeal widening. 3. Patient response to OA therapy was independent of the direction of velopharyngeal widening. These findings suggest that velopharyngeal widening observed when advancing the mandible from the centric occlusal position is associated with better response to OA therapy.

POSTER #002

CROSSOVER STUDY COMPARING TWO ORAL APPLIANCE DESIGNS FOR TREATMENT OF OBSTRUCTIVE SLEEP APNEA

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Introduction: Oral appliance therapy is recognized as an effective treatment modality for patients with mild to moderate Obstructive Sleep Apnea (OSA) and for patients with severe OSA who fail treatment attempts with continuous positive airway pressure (CPAP). The purpose of this study was to determine whether or not treatment outcomes vary according to oral appliance design. Two widely used titratable oral appliances were compared (TAP3 and Klearway). The designs differ in advancement hardware and configuration of acrylic both in bulk and interocclusal contact.

Methods: The primary treatment outcome was the Respiratory Disturbance Index (RDI). Other outcomes that were compared included Sleep Apnea Quality of Live Index (SAQLI), Epworth Sleepiness Scale (ESS), oxygen saturation (SaO₂) and patient questionnaires. Following IRB approval (Protocol# HSC20070681H), twenty-five patients were recruited from consecutive referrals to the Veteran Affairs San Antonio Dental Clinic for Oral Appliance (OA) therapy following diagnosis of OSA by polysomnography (PSG). Patients meeting inclusion criteria were randomly assigned to a treatment arm in an AB/BA crossover study. Each patient answered questionnaires and underwent an initial study with a type III unattended sleep monitor (Remmers Sleep Recorder) to

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establish pretreatment baseline data. Patients were then treated with one of the two oral appliances by random assignment. They were treated to a patient-titrated endpoint of mandibular protrusion. Patients then underwent a second sleep study with the type III home monitor. After a two-week washout period, patients received the second oral appliance and the self-titration treatment protocol was repeated. At completion of treatment with each appliance, patients answered questionnaires and received a home sleep study.

Results: The outcome data for each appliance were compared using the student's T-test (ESS, SAQLI, RDI, and SaO₂) There was no significant difference ($p < 0.05$) in treatment outcomes based on appliance design. Conversely, the subjective data from questionnaires demonstrated a statistically significant ($p < 0.05$) preference for an oral appliance design with minimal coverage of teeth and palate.

Conclusions: Oral appliances for treatment of OSA should permit simple titration to accommodate individual requirements for mandibular protrusion. Oral appliance selection should favor titratable, unobtrusive designs with appropriate construction to promote acceptance and adherence to OA therapy.

POSTER #003

TEETH CLENCHING AND SLEEP BRUXISM IN 7-17 YEARS OLD POPULATION: RISK FACTORS FOR TEMPOROMANDIBULAR, SLEEP AND BREATHING DISORDERS

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Introduction: Tooth clenching and grinding are pafunctional habits frequently reported in children. Clenching is predominantly a daytime habit while grinding is reported during sleep and is known as a sleep motor disorder called sleep bruxism (SB). Both clenching and SB have been associated with tooth wear, temporomandibular disorders (TMD), pain, headache, snoring, sleep apnea, and attention-deficit/hyperactivity behavior.

We assessed the risk factors for signs and symptoms of TMDs, sleep disorders and behavioral problems in clenchers and sleep bruxers in a large-scale questionnaire-based study conducted at a university orthodontic clinic.

Methods: Consecutive subjects (604) seeking for orthodontic treatments were examined at the University of Montreal by an orthodontist. Parents or guardians present at the clinical examination were asked to complete a four-part questionnaire on behalf of their children, including medical and dental history, bruxism and TMD habits, sleep quality and daytime behavior.

Results: 16.3% of the population reported tooth clenching (while awake or asleep) and 13.5% SB. Compared to control subjects (466 subjects who did not report clenching nor grinding habits), clenchers showed higher risk for TMDs, such as temporomandibular joint clicking (OR 3.7, $p = 0.02$), locking (OR 3.5, $p = 0.04$), jaw muscle fatigue (OR 4.2, $p = 0.001$), masticatory and yawning problems (OR 2 and 4.2, $p = 0.03$ and 0.001 respectively). They also had higher incidence of other orofacial parafunctions, such as lip and nail biting (OR 2.2, $p = 0.001$). They complained of pain during sleep (OR 2.3, $p = 0.04$), frequent awakenings (OR 1.6, $p = 0.03$), waking up unrefreshed (OR 3.1, $p < 0.0001$) and sleepiness (OR 2.6, $p = 0.009$). They had higher risk factors for several behavioral variables, such as problems in listening, organizing difficult tasks, maintaining enthusiasm throughout a task and fidgets (all OR ≈ 1.8 , $p \leq 0.04$).

The group of SB subjects reported higher incidence of jaw muscle fatigue (OR 3.7, $p = 0.005$) temporomandibular joint pain (OR 5.8, $p = 0.04$), and other oral parafunctions (OR < 2 , $p < 0.05$) compared to controls. They also reported a longer sleep onset time (more than 30 min; OR 1.9, $p = 0.01$) and that they felt unrefreshed upon awakening. (OR 1.8, $p = 0.04$). No difference in behavior complaints was noted. Interestingly, the majority of SB subjects (59.8%) were a dental class II ($p = 0.009$).

Both clenchers and SB subjects showed a higher frequency of tooth wear (OR 3.2 and 3.8, $p < 0.05$) and a lower incidence of crossbite (both OR 0.5, $p = 0.03$) compared to controls. Headache was reported by 8.2% of clenchers and 9.8 % of children with SB vs. 5.2 % of controls. Snoring was reported in approximately 25 % of subjects in all groups. However, headache and snoring frequencies were not significantly different between clenchers or SB subjects and controls.

Conclusion: Clinicians should investigate in depth children with clenching or SB habits, considering their frequent association with TMDs, sleep and behavioral problems. However, findings should be extrapolated with caution since external validity is not established yet.

Support: CIHR. CC is a FRSQ Oral Health Network fellow.

POSTER #004

A CORRELATION BETWEEN TWO PEDIATRIC SLEEP DISORDERED BREATHING QUESTIONNAIRES AND CRANIOFACIAL MORPHOLOGY IN CHILDREN

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Introduction: Craniofacial abnormalities are considered to be a common cause of SDB in children, after potential contributions from adenoid and tonsil hypertrophy and obesity. (Ozdemir, 2004 and Schiffman, 2004) Rosen et al (1992) reported that children are probably under-diagnosed for SDB more often than adults because they tend to have distinct signs and symptoms that are less widely recognized.

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The aim of this study was to evaluate two types of SDB questionnaires in children undergoing orthodontic treatment in an undergraduate orthodontic clinic and to assess the possible relationship between questionnaire results and craniofacial morphology in children.

Methods: Parents were asked to complete two types of SDB questionnaires (OSA 18, Franco, 2000 and PSQ, Chervin, 2000) at the commencement of orthodontic therapy. The OSA 18 was scored on a graded scale as “none, hardly any, a little, some, a good bit, most of or all the time”. Higher scores (greater than 60) indicate a greater probability of SDB and/or a reduced quality of life. The questions were divided into five domains: sleep disturbance, physical symptoms, emotional symptoms, daytime functions and caregiver concerns. The PSQ questionnaire had 22 questions and was answered with “yes, no or don’t know”. If the number of “yes” responses was more than eight, it indicated a high risk of SDB. The UBC cephalometric analysis, which is routine examination for orthodontic treatment, included upper, lower and total face height, hyoid position, soft palate length, mandibular length, vertical airway length, overjet and overbite. Statistical analyses were performed (SPSS 10.0) with significance defined as a 2-tailed P value less than 0.05. Spearman rank correlations were applied between the two questionnaire scores and cephalometric measurements. Kruskal-Wallis tests compared gender and continuous variables.

Results: A total of 189 children (male 48.2%, mean age 9.9±1.7 years) completed both the questionnaires and cephalometric analysis. For the entire pool of patients, the OSA 18 suggested that 2 children (1.1%) and the PSQ suggested that 11 children (5.8%) had a greater probability of SDB. The mean score from the OSA 18 was 28.4±10.0 and the mean and median number of “yes” responses in the PSQ questionnaire was 2.7±2.8 and 2.0. The total score of OSA18 significantly correlated with the PSQ score (R=0.672, P<0.001). Male identified higher PSQ score than female (3.2±3.2 vs 2.2±2.3, p<0.05). No differences for Mallampati score, tonsil size or Angle classification could be identified for either questionnaire. Only BMI and total PSQ scores revealed a positive correlation (R=0.219 p<0.05). No significant correlation was identified between both of the questionnaire scores and cephalometric variables.

Conclusions: In an orthodontic setting, the PSQ questionnaire identified a larger proportion of children who may exhibit SDB. However, a significant correlation between both questionnaire scores and cephalometric variables could not be identified. The PSQ questionnaire may be a useful clinical tool to identify children with sleep disordered breathing in a large population of children with craniofacial anomalies.

Support: MITACS Accelerate BC Internship.

POSTER #005

SOFT PALATE MODELING FROM MAGNETIC RESONANCE IMAGING

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Introduction: As one part of the modeling the Oral, Pharyngeal, and Laryngeal (OPAL) complex project for simulating physiopathologic mechanisms in oral and upper respiratory tract regions, the objectives of this study were to extract a computational three-dimensional (3D) soft palate model from a set of Magnetic Resonance Imaging (MRI) data and discover an approach that generates a patient-specific modeling demonstration in a computerized visual platform.

Methods: Multiple MRI slices of the head and neck region of a young non-overweight Caucasian male volunteer were taken in the supine position with a passive oral appliance in place. The DICOM MRI slices were transcoded into Analyze7.5 format and registered into a high-resolution volumetric data set using Amira® software package. A surface mesh was then generated from the final segmentation and further edited to create a volume mesh. For biomechanical dynamic simulation, the volume mesh format and multiple landmarks of each muscle were imported into Artisynth, a 3D biomechanical modeling toolkit, for physical simulation of the anatomical structures.

Results: The segmented soft palate complex consisted of five groups of muscles: levator veli palatini, tensor veli palatini, palatoglossus, palatopharyngeus and musculus uvulae. The palatine tonsil between the pharyngopalatine and glossopalatine arches was included into the segmentation. The levator and tensor veli palatinis were less identifiable due to the overlapping soft tissue structures in the nasopharyngeal airway area.

Conclusions: The same procedure was used to build-up a generic reference model of dentition, tongue, mandible and airway from a mixture of medical records of the same subject. This manual segmentation method eliminated the common errors that occur from an automatic segmentation. This remains a fundamental process for analyzing the dynamic interaction between the anatomical components for patients with sleep disordered breathing.

Support: Natural Sciences and Engineering Research Council of Canada (NSERC) and Vancouver Coastal Health Research Institute (VCHRI).

POSTER #006

ONE-STAGE SURGICAL TREATMENT OF OBSTRUCTIVE SLEEP APNEA

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Introduction: Obstructive sleep apnea is a potentially life-threatening disease that has a number of surgical and nonsurgical treatment options. This paper will present ten

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years of accumulated experience in the treatment of 120 patients with moderate to severe obstructive sleep apnea with a one-stage surgical procedure.

Methods: Patients referred for surgical correction of obstructive sleep apnea had all been placed on CPAP and had been offered nonsurgical therapies, such as mandibular repositioning devices and weight loss programs. All patients were offered a staged surgical procedure versus a one-stage surgical procedure.

The surgical procedure performed on all these patients was the same. This included a maxillary Le Fort I osteotomy with advancement, a bilateral mandibular osteotomy, and genioglossus advancement by a horizontal osteotomy of the chin. An uvulopalatal pharyngoplasty as well as reduction of the lateral pharyngeal walls was done if indicated.

Results: A surgical cure was defined as an RDI below 15 and a nadir desaturation of 90. Results of this retrospective review indicate that 98% of patients had a cure with 2% of the patient population needing further soft tissue surgery to cure their obstructive sleep apnea.

Conclusions: We conclude that a one-stage surgical approach is safe and effective in providing patients with a cure of their obstructive sleep apnea.

POSTER #007

WILL NOT BE PRESENTED

POSTER #008

PREVALENCE OF SLEEP DISORDERS IN PEDIATRIC ORTHODONTIC PATIENTS

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Introduction: The impact of sleep-related disordered breathing (SRDB) has been widely studied in adults for over two decades, but much needs to be learned about its influence on the health of pediatric patients. Early diagnosis of pediatric SRBD is critical because signs and symptoms often lead to misdiagnosis of SRDB as other clinical conditions. Prevalence, signs, symptoms and risk factors for sleep disorders in children are less well characterized than in adults.

The primary aim of this study was to estimate the prevalence and severity of SRBD in a university-based pediatric orthodontic patient population, using the Pediatric Sleep Questionnaire (PSQ) (Chervin et al., *Sleep Medicine* 2000, 1:21-32), a previously validated survey to identify children at risk for SRBD. The SRBD scale has a sensitivity of 81% and a specificity of 87%. A score of 0.33 suggests the risk of SRBD, with higher values favoring a diagnosis.

The secondary aim of this study was to examine the association between risk for pediatric SRBD and 1)

craniofacial findings using routine lateral cephalograms and 2) demographic characteristics of the sample.

Methods: This study had institutional IRB approval. 100 consecutive university-based orthodontic patients, ages 7-17 years, on whom diagnostic orthodontic records had been obtained, including a routine lateral cephalometric radiograph, comprised the study sample. Prior to initiation of orthodontic treatment, the parent/guardian completed the PSQ for their child, and risk of SRDB was calculated. Association between risk or no risk of SRDB and gender, race, age, BMI Z-score and cephalometric angular and linear measurements was estimated using unpaired t-tests and logistic regression analysis. The level of significance was set at 0.05.

Results: The sample mean age was 13.4±2.02 (SD) years, 57% were female, and ethnic background was comprised of 73% Caucasian, 10% Hispanic, 9% African American, 5% Asian, and 2% American Indian. 18 subjects (18%) scored >0.33 on the PSQ (95% CI 10%,26%), suggesting that these subjects were at risk for SRBD. The rest (n=82) were considered not at risk based on their PSQ scores. Using unpaired t-tests, the average values for age, BMI-z score, and the linear and angular cephalometric measures were not statistically significantly different between the at-risk and not-at-risk children. A logistic regression was used to assess whether the combined effect of the demographic variables, age, gender, ethnicity (Caucasian vs. non-Caucasian), and BMI-Z score would be predictive. The overall model was not statistically significant (P = 0.051).

Conclusion: Using the Pediatric Sleep Questionnaire, we estimated that 18% of our sample of orthodontic patients 7-17 years old was at risk for SRBD. No significant associations were detected between risk of SRDB and either demographic or cephalometric angular or linear variables analyzed. These findings suggest that further research is warranted to identify risk factors for pediatric SRDB.

Support: Southern Association of Orthodontists.

POSTER #009

TREATMENT OF SLEEP RESPIRATORY BREATHING WITH RAPID MAXILLARY EXPANDER IN CHILDREN WITH TONSIL HYPERTROPHY – A NON INVASIVE OPTION TO ADENOTONSILLECTOMY

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Introduction: Adenotonsillectomy (AT) has long been the treatment of choice for obstructive sleep disordered breathing (SDB) in children and the literature shows about 75-80% of cure within children with sleep respiratory breathing (SRB). This sleep disorder lead to a poor growth has a negative impact on neurocognitive system and causes serious mood alteration and hyperactivity. Beside this, pediatric studies

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revealed associations of SRB with inflammation, metabolic dysfunction, and elevated blood pressure. Although the AT is the first line of treatment for most children with SRD, recent studies have shown that rapid maxillary expansion (RME) is a non invasive therapy option to treat snore and sleep obstructive apnea in children.

The aim of this study is to evaluate the RME approach to treat snore in children with SRB who were referred to AT, as well to evaluate the improvement in the subjective symptoms, using a sleep diary.

Methods: Twelve patients were enrolled in this study, ranging in age from 4 to 10. All groups were first referred to the AT and then were referred to our sleep lab to undertake a non invasive treatment before surgery. All parents answered an adapted version of a sleep diary before treatment and after 1 month RME has concluded. At clinical examination all patients presented cross bite, long face pattern and some degree of hypertrophic tonsils. The adapted version of sleep diary used in this study asked about the presence or not, of tiredness, mood at wake up, snore, sleep bruxism, nightmare, movement during sleep, closed lips during sleep. Casts models were requested and sent to a unique laboratory to construct the appliance. The McNamara device was chosen to expand the maxillary arch. The devices were permanently fixed to the upper teeth and the activation was 0,5mm per day, mean of a total activation was 7mm (range 6-9mm) in a mean period of 15 days.

Results: The results showed that at pre treatment 6 patients presented tonsil grade III and 4 presented tonsil grade IV. Regarding to Angle class molar, 9 patients were CI II, 2 were CI III and one was CI I. After 30 days of RME conclusion, none patient presented tiredness and bad mood at wake up time as well the nightmare events; one patient still presented sleep movement; only 2 patients still presented sleep bruxism and all 12 patients have the snore totally eliminated.

Conclusion: We conclude that the RME was effective to treat snore and subjective symptoms in children with tonsil hypertrophy, and it is a safe therapy option before adenotonsilectomy.

POSTER #010

RELEASE TIME OF TMD, CERVICAL AND OTOLOGICAL SIGN AND SYMPTOMS IN PATIENTS WITH SLEEP BRUXISM AND TREATED WITH OCCLUSAL SPLINT – A LONG TERM FOLLOW-UP

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Introduction: Sleep bruxism (SB) is characterized by tooth clenching or grinding during sleep and is classified as sleep disorder. Besides, the periodic pressure caused by SB may affect the temporomandibular joint (TMJ) structures resulting in an alteration on ligaments and on articular disc, leading to

temporomandibular dysfunction (TMD). The literature shows that occlusal splints (OS) are effective to treat the SB and TMD, and some studies have reached good results after a treatment in a period of 180 days of OS usage. Otherwise, there are works that have showed improvement only in the first months during the same period.

The aim of this study is evaluate the release of DTM sign and symptoms in patients relating SB during a period of 240 days of OS usage.

Methods: Thirty-patients (26women and 4 men) ranging in age from 22 to 43,were enrolled in this study. The inclusion criteria were presence of otological and TMD signs and symptoms ; presence of sleep-related bruxism, based on an oral history (frequent grinding sounds reported by a bed partner); never have been treated with occlusal splint; absence of any kind of drugs usage that can interfere with sleep or motor function; absence of neurological disease. Patients who have previously used OS were excluded. All patients underwent the anamnesis and clinical evaluation with an expertise professional, to detect SB and TMD signs and symptoms. All items evaluated were scored according to intensity such as, 0=never, 1=rare, 2=some time and 3=often. All group used a flat and rigid occlusal splint made of acrylic resin, 24h per day, except during meals, unless there is constant pain during masticatory function. The total time of this protocol was approximately 240 days. The adjustments were taken once a month to achieve functional/ neuromuscular stability and evaluate how long will occur the release of the symptoms and if the release will remain.

Results: The results showed that after 3 months of OS usage the improvement in the better sleep perception occurred on 84% in the group. Within otological symptoms, plugged ears and ear acute pain have released in all patients after the second month and rare tinnitus remained in 1 patient. Headache was eliminated in 90% of patients after 2 months, nausea and vertigo were disappeared after 2 months in 90% of patients and the other 3 patients have these symptoms eliminated on the 3 third month. Cervical, TMJ, masseter and temporalis pain were eliminated after 3 months in 27 patients and rare same symptoms persisted in 3 patients.

Conclusion: We conclude that the use of OS is very efficacy to treat signs and symptoms of TMD and SB once the pain relief allows healthy sleep. Even OS mechanism of action is unclear; it seems to be the best therapy option to rescue the life span of these patients.

POSTER #011

FOLLOW-UP STUDY OF TWO MANDIBULAR ADVANCEMENT APPLIANCES: PRELIMINARY RESULTS

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Introduction: Mandibular advancement appliances (MAA) are used to treat mild-to-moderate obstructive sleep apnea syndrome (OSAS). The aim of this study was to assess the efficacy of two MAA over time from a previous comparative study (PCS).

Methods: Subjects had participated in a PCS that tested two Canadian oral appliances in a randomized cross-over design. At the end of the PCS, 15 of the 16 subjects wore their appliance at the follow-up interview and 14 participated in an overnight sleep study to assess the efficacy of the oral appliance that they selected at the end of the PCS. The mean follow-up time is 40.9 ± 2.1 months (mean \pm SEM) and follow-up time varies from 31 to 53 months (7 subjects from 31 to 40 months). Four women and 10 men aged 51.9 ± 1.7 y.o. participated in the follow-up assessment. Three polysomnographic evaluations (PSGE) were used: baseline from the PCS, a night with the appliance they selected at the end of the PCS, and a follow-up night. Subjects completed the Epworth Sleepiness Scale (ESS), the fatigue severity scale (FSS), and a quality of life questionnaire (FOSQ) after each PSGE. Statistical ANOVA tests were performed.

Results: The respiratory disturbance index (RDI) was significantly reduced from baseline (10.4 ± 1.3) to the night at the end of the PCS (5.7 ± 1.1 , $p=0.004$) and remained low at follow-up (4.5 ± 0.7 , $p<0.001$ compared to baseline). In addition, questionnaire results revealed that the ESS, FSS, and FOSQ were all significantly improved from baseline to the night at the end of the PCS ($p<0.02$) and remained improved at follow-up ($p<0.02$ compared to baseline), with a high self-report compliance of 7.1 hr/night and 6.4 nights/week. We also observed that 12 of the 16 subjects who completed the protocol suffered from positional sleep apnea at the baseline night. This number was reduced to 9 at the end of the PCS and 6 at the follow-up. We then decided to assess positional RDI. RDI in supine position was reduced from the baseline night (17.2 ± 3.0) to the night at the end of the PCS (9.7 ± 2.6 , $p=0.054$) and remained low at follow-up (6.4 ± 1.3 , $p=0.006$ compared to baseline). A second arm was added to fit a dorsal harness in an attempt to eliminate positional apnea. Five subjects agreed to wear the harness. It was effective for four subjects, but only one agreed to wear it after a 1-month trial.

Conclusion: MAA efficacy persists over a wearing period of between 31 to 53 months. The addition of a dorsal harness was effective, although compliance was poor. Subjective daytime sleepiness, fatigue severity, and quality of life remained improved at follow-up. (Supported by FODQ-FRSQ & CIHR. Appliances provided by Klearway and Silencer, Canada and the harness by Amrein, Switzerland).

POSTER #012

MANDIBULAR PROTRUSIVE CHARACTERISTICS IN PATIENTS USING A DUOBLOC ADJUSTABLE MANDIBULAR REPOSITIONING APPLIANCE: PRELIMINARY RESULTS

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Introduction: The efficacy of mandibular repositioning appliances (MRA) in the treatment of snoring and/or apnea, can be expected to rely on patients protrusive characteristics. Generally, therapy starts at a given percentage of the maximal protrusion (MP) and is gradually increased in adjustable appliances, up to the maximal effective protrusion (MEP). It is the aim of the present study to check on the validity of a maximal comfortable protrusive position (MCP) as a predictor for MRA treatment success.

Methods: Prior to therapy, the MP was measured in each patient three times and averaged, using a splint with 6mm interincisal distance representing the thickness of the MRA. Next, each patient was asked to protrude as far as comfortably possible (MCP) for 3 consecutive times and the results were averaged. Doing so, 14 patients (age, 45 ± 6 y; Male/Female, 10/3; AHI, 19 ± 14 events/h; BMI, 28.5 ± 4.6 kg/m²) were selected for treatment with a titratable, duobloc appliance (RespiDent Butterfly MRA, Orthoclinics, Belgium). Treatment was initiated with the MRA positioned at 50% MP. During the month following the fitting of the MRA, patients started the titration by tightening the screw of the MRA, yielding 0.5mm protrusion on each 360° turn. They proceeded either until the partner reported a pronounced decrease in snoring or until physical limits were met. Snoring was evaluated at each recall using a visual analogue scale (VAS) ranging from '0' to '10' with '0' equalling no snoring and '10' causing the bedpartner to sleep separately. After 1 month, the patients completed a VAS and the amount of titration was measured on each MRA by the dentist.

Results: At the baseline, the mean MP ranged between 5.4mm and 15.5mm (mean $11.4 \text{mm} \pm 2.9 \text{mm}$). The mean MCP ranged between 4.3mm and 11.8mm (mean $8.4 \text{mm} \pm 2.6 \text{mm}$), equalling $74\% \pm 14\%$ of the MP. The average VAS score prior to treatment was 7 ± 3 . After 1 month of titration, patients had advanced the lower jaw with $2 \text{mm} \pm 2 \text{mm}$, ending up in a MEP at an average of $68\% \pm 14\%$ of the MP. In all patients, VAS scores on snoring had significantly dropped ($p < 0,0000097$) to 3 or below (mean 2 ± 1).

Conclusion: All patients showed a beneficial effect of mandibular advancement on snoring, reducing the amount of snoring towards or below a level of 3 which can be considered an important reduction. The average MEP turned out to be somewhat lower than the average MCP, although not statistically different ($p = 0.50$) at the 0.05 level. The present

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results indicate that the determination of the MCP is a useful tool in the pre-treatment screening of patients selected for MRA treatment.

POSTER #013

A RETROSPECTIVE COMPARISON OF CUSTOM-MADE ORAL APPLIANCES IN THE THERAPY OF ADULT SLEEP-DISORDERED BREATHING: A MONOBLOC DESIGN VERSUS A DUOBLOC MANDIBULAR ADVANCEMENT DEVICE

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Introduction: There is growing interest in the use of oral appliances, such as mandibular advancement devices (MADs) which are worn intraorally at night to mechanically protrude the mandible, to treat snoring and sleep apnea. These devices have either a one-piece (monobloc) or two-piece (duobloc) design. The aim of this study was to compare retrospectively the results obtained by a custom-made duobloc oral appliance with a previous group of patients treated with a custom-made monobloc.

Methods: We compared 48 patients (age, 48 ± 8 y [mean \pm SD]; Male/Female, 37/11; AHI, 16 ± 15 events/h; Body Mass Index [BMI], 26.83 ± 4.86 kg/m²) that received monobloc MAD therapy for snoring and/or obstructive sleep apnea with 25 patients (age, 48 ± 8 y; Male/Female, 19/6; AHI, 19 ± 12 events/h; BMI, 28.39 ± 3.67 kg/m²) treated with a titratable, duobloc MAD for similar pathologies. All patients received a baseline polysomnography (PSG) without MAD, and a follow-up PSG with MAD. Treatment outcomes were analyzed and compared. Complete response was defined as an important reduction of snoring (i.e. to a snoring index of ≤ 3) plus a decrease in AHI to fewer than 5 events/hour. Partial response was defined as a satisfactory decrease of snoring (i.e. a decrease of the snoring index of at least 3 points) plus a 50% or greater reduction in AHI. Total treatment success is achieved when there is either complete or partial response. Alternatively, treatment was also analyzed using a decrease in terms of AHI <10 /h as a criterion, as widely used in other studies. Treatment failure was defined as ongoing clinical symptoms and/or a less than 50% reduction in AHI. Compliance failure was defined as an inability of the patient to continue treatment.

Results: Treatment with monobloc MAD resulted in a complete response in 18 out of 48 patients (37.5%), whereas with the duobloc MAD a complete response was noted in 14 out of 25 patients (56.0%). The monobloc MAD resulted in a total treatment success in 23 out of 48 patients (47.9%), whereas 18 out of 25 patients (72.0%) achieved a total treatment success with duobloc MAD. No compliance failures were noted in the patients using duobloc MAD, whereas 4 out of 48 (8.3%) patients failed to continue treatment with monobloc MAD.

Conclusion: Oral appliance therapy with an adjustable, duobloc MAD results in a higher complete response rate (AHI < 5 /h), a higher total treatment success rate and a lower compliance failure rate compared to a classical monobloc MAD. Using the alternative definition of treatment success, being AHI < 10 /h, the duobloc MAD provides a treatment success rate comparable to that of the monobloc MAD.

POSTER #014

TEACHING OF DENTAL SLEEP MEDICINE IN U.S. DENTAL SCHOOLS

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Introduction: The interest of Medicine in diagnosing and treating sleep related breathing disorders (SRBD) has increased as recognition and consequences of these disorders are documented. However studies indicate that only about 10% of patients with SRBD are being diagnosed and likely less have ongoing adequate treatment. Medical school surveys of curriculum hours in all sleep disorders reveals an increase from less than 1 hour in 1980 to 2.11 hours in 1998 over the 4 year MD programs. Our research study surveys curriculum hours currently offered in U.S. dental schools in Sleep Medicine and Dental Sleep Medicine.

Methods: In 2009 the deans of the 58 U.S. dental schools were sent an 8-question survey to be forwarded to the appropriate department and faculty member. Responses were categorized as to hours taught in Dental Sleep Medicine in each academic year for 2008/2009, which sleep topics were addressed, which treatments were covered, and which department(s) were responsible for its teaching.

Results: Two new dental schools with interim accreditation had not graduated a class, and were not included. Of the 56 remaining dental schools, responses were received from 48 (85.7% response rate). For those schools where specific departments were identified as teaching sleep disorders the distribution was Oral Surgery (OS)16, TMJ/Orofacial Pain (OFP)16, Oral Medicine (OM)11, Prosthodontics (P)8 and Orthodontics (O)5. The DDS curriculum hours ranged from 0-17 hours, with 14 schools spending 0 hours, 24 schools 1-3 hours, 5 schools 4-6 hours, 2 school 7-9 hours, 2 schools 10-12 hours and 1 school > 12 hours. The average number of hours for all responding schools was 2.65 (127/48). The most frequently described topics covered included sleep bruxism (30) schools, and sleep related breathing disorders (30). The most frequent diagnoses included obstructive sleep apnea (31), sleep bruxism (28), primary snoring (21) and UARS (19). The most frequent therapies covered were oral appliance therapy (32), CPAP (29), maxillofacial surgeries (24), ENT surgeries (22). Ambulatory sleep testing devices were covered by 8 schools showing at least a 16.7% interest in this topic.

Conclusion: The survey revealed an average of 2.65 hours spent teaching dental students about Sleep Medicine and

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Dental Sleep Medicine with OS>OFP >OM>P >O identified as the departments involved in teaching. The authors find these numbers compatible to the number of hours reported taught in all Sleep Medicine in pre-doctoral medical curricula, although in Dentistry are also split with bruxism issues. It is evident that SRBD is being introduced in many US dental school curriculums. However the authors believe the total hours taught are still inadequate given the epidemic proportions of society affected by sleep disorders, the financial and societal impact, and medical consequences of non treatment. The authors believe that public health requires better training of all dentists, at minimum establishing competency in screening for SRBD, rather than limiting training to a handful of graduate students.

POSTER #015

TREATMENT OF SLEEP-DISORDERED BREATHING WITH A NOVEL, CUSTOM-MADE, ADJUSTABLE MANDIBULAR REPOSITIONING APPLIANCE: A PROSPECTIVE PILOT STUDY

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Introduction: Mandibular repositioning appliance (MRA) therapy is a treatment option for patients with snoring and/or obstructive sleep apnea (OSA). This paper reports on the results of MRA therapy using a novel, custom-made titratable MRA for the treatment of snoring and OSA.

Methods: The MRA used in this prospective pilot study was a custom-made, titratable, duobloc MRA, with attachments for adjustment of mandibular protrusion in the frontal teeth area (RespiDent Butterfly MRA, Orthodontic Clinics NV, Antwerp, Belgium). The study sample included 25 consecutive patients with snoring and/or OSA (age, 48 ± 8 years; Male/Female ratio, 19/6; AHI, 19 ± 12 events/hour sleep; BMI, 28 ± 4 kg/m²). The titration protocol of mandibular protrusion was based on the improvement of clinical symptoms. Clinical outcomes included the partner rating of snoring using a visual analogue scale (VAS), and the apnea/hypopnea-index (AHI). A decrease of at least 3 points on VAS for snoring, during treatment with MRA compared to baseline, was considered satisfactory. To be considered as an important reduction, snoring had to be reduced to a snoring index of <3. Treatment success was defined as a satisfactory decrease of snoring plus an AHI < 5/h and/or a 50% or greater reduction in AHI.

Results: After the titration period, a statistically significant improvement was observed concerning AHI, from 19 ± 12/h at baseline to 8 ± 8/h with MRA (P < .001). At polysomnography with MRA, 52 % of patients had an AHI < or = 10 associated with at least a 50% reduction in AHI. In 18

out of 25 patients (72 %) a treatment success was noted. A significant (P < .0001) decrease in VAS snoring was observed with MRA (2.4 ± 2.1) compared to baseline (7.1 ± 2.3). A satisfactory decrease in snoring was noted in 94% of patients; while 84% of participants reported an important reduction in snoring with MRA.

Conclusion: The results of this prospective pilot study indicate that treatment with a novel, custom-made, adjustable MRA is effective in reducing the severity of snoring and obstructive sleep apnea. It was determined that 72 percent of patients were treated successfully.

POSTER #016

EVALUATION OF OBSTRUCTIVE SLEEP APNEA PATIENTS' ORAL APPLIANCE TITRATION PROTOCOLS

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Introduction: Mandibular Repositioning Devices (MRDs) are an accepted Obstructive Sleep Apnea (OSA) treatment for patients with mild to moderate disease severity, and for those with severe sleep apnea who cannot or will not wear nasal Continuous Positive Airway Pressure (CPAP). Home sleep monitoring systems such as the Remmers Sleep Recorder (RSR) can be used by dentists to guide the titration of a MRD and to document treatment efficacy.

The study population was 32 subjects, diagnosed by means of polysomnography (PSG) with moderate to severe OSA, who had failed or refused nasal CPAP. The aims of the study were to establish a titration protocol for a MRD, the Thornton Adjustable Positioner 3 (TAP 3) and to evaluate the efficacy of this MRD in treating these patients.

Methods: A baseline RSR study was performed and a MRD appliance fabricated for each subject. The subjects were instructed to increase the mandibular protrusion of the appliance until they felt a subjective improvement in their symptoms. This position was described as Self Titrated Position (STP).

A RSR study (1) was performed with the MRD at STP. The subjects were instructed to increase mandibular protrusion 1mm from STP and a second RSR study (2) was performed. A further RSR study (3) with the MRD at 2.0 mm forward of STP was next performed. The subjects were finally instructed to decrease mandibular protrusion to 1.0 mm behind STP and a final RSR study (4) was performed.

The RSR data that was analyzed included the Apnea-Hypopnea Index (RSR-AHI), the percentage of the night that the oxygen saturation was below 90% (% time < 90% O₂) and the lowest oxygen saturation recorded (Lowest O₂ %).

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Results: The results indicate the position which most effectively treated these patients was 2.0 mm advanced past the subject's STP. This position produced the lowest RSR-AHI in 57% of the subjects.

Using RSR-AHI recordings, we found the MRD effective in treating 71% of the subjects. The mean Lowest O₂ % increased by 4.5% and the mean % time < 90% O₂ decreased by 64%. Results from pre- and post-treatment questionnaires confirm that wearing the appliance leads to a significant improvement in quality of life. Daytime sleepiness was also reduced in 90% of subjects.

Conclusion: A suggested treatment protocol for moderate/severe OSA patients treated with an adjustable MRD would be: after a period of self titration of the MRD to the point where the patient feels subjective improvement, a patient can be advised to advance the MRD further forward by 2.0 mm.

The results of this study add to the data showing that moderate OSA patients can be very effectively treated using MRDs. They also show that severe OSA patients can be treated effectively with MRDs but not as predictably.

POSTER #017

EFFECT OF VERTICAL DIMENSION OF COMPLETE DENTURES ON OBSTRUCTIVE SLEEP APNEA

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Introduction: Obstructive Sleep Apnea Syndrome (OSA) is a fairly common disorder in elderly population. The effect of losing teeth and having a decreased vertical dimension with an over closure of the mandible has not yet been fully investigated. The mechanism through which dentures might be effective in decreasing apneas could be related to an increase in vertical dimension (Erovigni F., 2005, Bucca C., 2006). Tongue retaining devices and nCPAP are the common treatment options for edentulous OSA patients, but poor compliance is often seen. It is important to understand the impact of vertical dimension changes on the airway of an edentulous patient to improve the design of dentures or develop a protocol for sleeping with or without dentures in OSA patients. Therefore, the aim of this study is to assess whether changes in vertical dimension of dentures affects obstructive sleep apnea events.

Methods: All edentulous patients who attended the Denture Clinic at University of Sao Paulo in the period of January to June 2009 seeking for new denture and who had concomitant OSA symptoms were included in this study. New maxillomandibular complete dentures were made for all patients following the traditional methods described previously (Tamaki, T., 1983). All patients were instructed to sleep two weeks without the denture, right after a baseline PSG without denture was done. After using their new standard complete dentures (Denture A) during the day and night for

another 2 weeks the patients underwent a second overnight polysomnography with denture A. A new upper denture, which had a 10 mm increase in the vertical dimension, (Denture B) was fabricated. The Denture B was given to the patients and they were instructed to use this only to sleep together with their regular lower denture. After adjustments and 2 weeks of nightly use, patients underwent a third overnight polysomnography with the standard lower denture and Denture B.

Results: In this preliminary study, 4 patients were included (3 women and one man) with a mean age of 75.7 (± 7.18) years. The BMI was 25.0 \pm 4.1 kg/m², 24.8 \pm 3.9 kg/m² and 25.4 \pm 3.6 kg/m² with no denture, denture A and B, respectively. The mean AHI and average mean oxygen saturation was; 1) PSG1-no denture 30.3 \pm 15.5/h and 93.3 \pm 1.0%, 2) PSG2-denture A 43.3 \pm 33.8/h and 94.5 \pm 0.6% and 3) PSG3-Denture B 32.7 \pm 24.2/h and 94.5 \pm 0.5%. Patient specific AHI with no denture/denture A/denture B was seen as follows; patient 1 41.1/82.7/42.4, patient 2 15.5/13.5/4, patient 3 46.1/60.4/60.4 and patient 4 18.6/16.8/23.9. Percentage REM sleep did increased in 3 patients with denture B compared to Denture A.

Conclusion: The increase of vertical dimension of denture B has shown to be beneficial in one patient, and to be similar as no denture but better than standard denture in another patient. Some changes might be related to the fluctuation in BMI throughout the study. We hypothesize that the improvements seen are very patient dependent, which is in agreement with the study from Arisaka (2009), where only some patients do show an improvement in their sleep if sleeping with denture instead of no dentures.

POSTER #018

COMPLETE DENTURE WEARS ON OSAS SYMPTOMS

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Introduction: Edentulism in elderly people can aggravate symptoms of the obstructive sleep apnea syndrome (OSAS), once it induces anatomical modifications in the face as well as functional alterations in the upper airway (Arisaka, 2009). The relationship between complete dentures wear and the OSAS symptoms has been verified and results evidence that wearing complete dentures during sleep increases upper airway space and alleviate OSAS symptoms (Bucca C, 2006; Endeshaw, 2004). Understanding its influence on OSAS symptoms during sleep is an important topic to be discussed, since utilization of complete dentures during sleep is not a consensus in the literature.

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Methods: Edentulous patients from the Prosthodontics Clinic of the University of Sao Paulo presenting OSAS symptoms were included in this study. Patients were given new complete dentures, made accordingly to the University of Sao Paulo - Dentistry School's protocol (Tamaki T., 1983), and were instructed to sleep with their dentures. After a two-week period patients underwent a baseline overnight polysomnography. Subsequently, subjects were instructed to wear their dentures only during daytime for at least two weeks and a second overnight polysomnography was performed. Data was analyzed by SPSS 10.0 and t-student test was applied for paired samples with significance level of 0.05.

Results: Fifteen edentulous patients with average age of 69.9 ± 6.5 years were included in this study. 66.7% of the subjects included were female. There were significant changes ($p \leq 0.05$) when comparing the polysomnography WITH / WITHOUT the complete dentures in the following measurements: % of stage 3/4 ($13.2 \pm 8.0\%$ / $18.1 \pm 8.7\%$) and Apnea/hypopnea Index ($30.5 \pm 22.6/\text{hour}$ / $20.0 \pm 13.0/\text{hour}$)

Conclusion: Within the limitations of this study, subjects showed a smaller AHI when they slept without their dentures, which is the opposite results presented in the literature, which report an improvement on edentulous patients AHI when wearing complete dentures during sleep (Arisaka, 2009; Bucca C, 2006). Results on this study might have suffered interference regarding the order of exams. A cross-over randomized trial, having the order of the polysomnography with and without dentures randomized might be necessary for more conclusive results.

POSTER #019

THE NEW TAP-PAP CUSTOM FACE MASK FOR CPAP COMPLIANCE AND SATISFACTION

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Introduction: Experience of all sleep healthcare providers and previous validated studies have established a well known fact that the mask on the CPAP is the major obstacle to CPAP compliance. Compliance nationwide has been shown to be 51%. The development of the Thornton Adjustable Positioner (TAP) to the TAP-PAP Custom Mask (CM) combines the intra-oral mandibular advancement appliance with a custom molded shield attached to the TAP, thereby eliminating the need for straps and stabilizing the mask from leakage by both taking an impression of the face for a perfect fit and by its connection to the skull base through the TAP appliance (no straps).

Methods: TAP-PAP Custom masks were fabricated (Chuck Lloyd at TMD Technologies) for 25 patients that were referred to our sleep center. The patients have been diagnosed and titrated for a CPAP with an off the shelf stock mask (SM). They all had a lack of symptomatic success and were about to abandon therapy. These patients were fitted for the CM

with a face impression and have complied with CPAP therapy. Telephone survey was accomplished to compare the CM and the SM satisfaction of the patient and bed partner (from 0-5 (5 being very dissatisfied)) and compliance comparing CM and SM with the number of hours worn per night.

Results: Of 25 CM patients, there were 2 that left therapy for other options, and three no contacts which leaves 20 contacted for the survey. The average PSG readings for the group were RDI 48, AHI 42, PSO_2 77% and ave. CPAP pressure was 15 cm H_2O . All had severe OSA. The unresolved chief sleep complaints most often stated were fatigue (14) and interrupted sleep (10). Top SM complaints were leakage (16) and strap discomfort (8). Most patients stated that they previously wore their SM over 7 hours per night (9) with the remaining evenly distributed between 0 and 6. This compared to the CM that was worn by most over 7 hours per night (11) and 4-6hr/night (5). The SM satisfaction by most was rated level 4 and 5 (very unsatisfactory) (14). The CM was rated very satisfactory by most (16) with none stating unsatisfactory. Bed partners were almost unanimous in their satisfaction (15/16) with one being somewhat satisfied.

Conclusion: Satisfaction and compliance of the TAP-PAP Custom Mask were far superior to the stock mask. Bed partner satisfaction was also established in this survey. Because the CM was successful in resolving sleep symptoms that the SM failed to resolve, the CM should be considered when severe OSA patients are going to abandon therapy. The results indicate the need for a more a comprehensive study that is underway by this author at this time. Reduced pressures also need validating. Both resolution of sleep pathology and verification of compliance will validate the results of this survey. The TAP-PAP Custom Mask has an important role in treating Sleep Disordered Breathing (SDB) and is a critical option to address the CPAP compliance issue in the treatment of SDB and OSA.

POSTER #020

A NEW SOFTWARE SYSTEM FOR QUANTIFYING THE UPPER AIRWAY IN PATIENTS WITH OBSTRUCTIVE SLEEP APNEA USING CONE BEAM COMPUTED TOMOGRAPHY

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Introduction: Obstructive sleep apnea (OSA) is characterized by a physical blockage of the upper airway/pharynx limiting airflow during sleep. Various treatments have been developed to ameliorate the negative effects of OSA with various degrees of success. A critical component of all corrective therapies is to assess its effectiveness in altering the size and shape of the pharynx to achieve increased airflow. Cone beam computed tomography (CBCT) provides a simple yet effective approach for visualizing altered upper airway/pharyngeal morphology. However, a rapid and reliable approach to quantify these changes remains elusive. The purpose of this study was to develop ease-of-use software capable of effectively modeling the upper airway/pharynx in patients

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with OSA, as well as normal control subjects, using CBCT technology.

Methods: CBCT dicom image scans were obtained from 10 males and females with and without OSA. New software was developed to implement the graphics kernel directly from an NVIDIA graphics card with CUDA architecture, including a GUI that facilitated ease-of-use operation. Mean peak signal-to-noise ratios (PSNR) were determined for the sample and were eliminated using a Gaussian filter. Principal Components Analysis (PCA) was performed to identify coordinate frames followed by automatic segmentation of pharyngeal boundaries. Surface extraction was performed using the rendered volume. The software routine was initially validated by comparing linear measurements derived from the computer models with physical measurements of the same individual. Upper airway/pharyngeal models from patients with OSA and normal subjects were compared, utilizing size and shape values derived from dense correspondence and finite element modeling.

Results: Upper airway/pharyngeal models could be generated with a high degree of precision and accuracy, while size and shape values successfully differentiated upper airway/pharyngeal models of patients with OSA from normal controls.

Conclusion: These initial results suggest that AccuCBCT software can be used effectively to assess OSA treatments aimed at altering the size and shape of the upper airway/pharynx in patients with OSA.

POSTER #021

INFLUENCE OF ORAL DIMENSIONS ON MANDIBULAR ADVANCEMENT SPLINT TREATMENT OUTCOME IN OBSTRUCTIVE SLEEP APNEA

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Introduction: Mandibular advancement splints (MAS) are a viable treatment for obstructive sleep apnea (OSA), however predicting efficacy in individual patients is problematic. Treatment outcome may be related to anatomical factors such as craniofacial size and upper airway soft tissue volume and/or anatomical balance between them. We aimed to assess whether craniofacial and oral cavity measurements are associated with MAS treatment outcome.

Methods: OSA patients were prospectively recruited from sleep disorders clinics for treatment with a customized two-piece MAS. Prior to MAS treatment, dental impressions and a lateral cephalometric radiograph were obtained for each patient. Inter-tooth distances and maxillary and mandibular palatal depths were obtained from plaster casts of the upper

and lower dental arches to assess oral cavity size. Standard cephalometric analysis was performed, with the addition of tongue cross-sectional area (CSA) and the bony oral enclosure CSA (defined as PNS-ANS-Go-Me). Treatment outcome was assessed by polysomnography after an acclimatization period.

Results: Of forty-nine patients, 24 were MAS treatment responders ($\geq 50\%$ reduction in apnea-hypopnea index [AHI]). Treatment responders did not differ in terms of age or BMI, although had a lower baseline AHI compared to non-responders (29.0 ± 13.3 vs. 37.2 ± 14.4 events/hour; $p < 0.05$). Oral cavity measurements from dental casts did not differ between treatment responders and non-responders. Cephalometric analyses revealed a shorter maxillary length (Cd-A) (83.8 ± 1.1 vs. 87.2 ± 4.6 mm; $p < 0.05$ and upper facial height (N-ANS) (51.1 ± 0.7 vs. 54.7 ± 0.7 mm; $p < 0.01$) in responders compared to non-responders. Tongue CSA was measured in a subset of 28 patients (12 responders, 16 non-responders). Responders had a larger tongue CSA than non-responders (39.7 ± 1.4 vs. 35.5 ± 1.1 mm²; $p < 0.05$) but there was no difference in the bony oral enclosure CSA. The ratio of tongue to bony enclosure CSA significantly differed between responders and non-responders (1.0 ± 0.02 vs. 0.9 ± 0.02 ; $p < 0.01$). Multiple regression analysis identified age and tongue/bony enclosure ratio as being significant predictors of percentage change in AHI with MAS treatment ($R^2 = 0.427$; $p = 0.001$).

Conclusion: This study suggests that oral cavity dimensions do not differ between MAS treatment responders and non-responders. However, responders appear to have a larger tongue volume for a given oral cavity size, suggesting that MAS help correct anatomical imbalance. Cephalometric assessment of the ratio between tongue and bony enclosure size may be useful in predicting response to oral appliance therapy.