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Impact of Prosthodontic Intervention on Speech Performance for Persons with Surgically Acquired Palatal Defects. M. SULLIVAN, D. BEUKELMAN, C. GAEBLER, J. MARSHALL*, G. MAHANNA (UNMC Meyer Rehabilitation Institute, Omaha, NE, UNL Barkley Center of Speech-Language Pathology, UNMC College of Dentistry, Lincoln, NE, UNMC College of Medicine, Omaha, NE).

To determine the impact of prosthodontic intervention on speech performance, 33 subjects with surgically acquired defects of the hard and/or soft palate were assessed with and without the use of an obturator or speech aid prosthesis. Using a repeated measures design, each subject was tested for speech intelligibility, speaking rate and nasality. Audio recordings were taken of each subject speaking sentences randomly generated from the *Sentence Intelligibility Test (Yorkston, Beukelman and Tice, 1996)* computer software program. Sentences were transcribed independently by three listeners who were unfamiliar with the passages and the speech intelligibility calculated as the percentage of words correctly transcribed. The three scores for speech intelligibility were averaged for each subjects' condition. Speaking rate was calculated as the number of intelligible and unintelligible words per minute. Three speech-language pathologists independently judged the nasality of speech for each subject using a 15 point interval scale. A score of -7 indicated extreme denasality, +7 extreme hypernasality and 0 balanced nasality. Scores of the three judges were averaged for each subjects' condition. Group means were used for the comparing the speech outcome with and without the use of a prosthesis and analyzed using a repeated measures ANOVA. A modified Communication Effectiveness Index-CETI (Lomas 1989) provided an assessment of the patient's perception of their speech disability using the prosthesis as compared to their speech prior to having a surgically acquired palatal defect. Without the prosthesis, mean speech intelligibility score was 61% (± 24.9) and was improved to 94% (± 10.6) when the prosthesis was inserted ($p<.0001$). Mean speaking rate was 138 wpm (± 32.5) without the prosthesis. Improvement with the use of a prosthesis to 164 wpm (± 32.5) was significant ($p<.001$) but was less than the normal speaking rate of 190 wpm for this test. Group mean nasality rating without the prosthesis was + 5.8 ± 1.3 indicating notable hypernasality. With the use of a prosthesis there was a significant decrease ($p<.001$) in hypernasality to +1.6 ± 1.9. Under the conditions of this study, obturator and speech aid prosthesis improved speech performance of persons with soft and/or hard palate defects, however mean speech intelligibility, speaking rate and nasality remained slightly less than normal when using a prosthesis. Nebraska State Dept. Of Health, Grant # 96-0813.

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Mechanical food properties responsible for food breakdown in human mouth. K.R. AGRAWAL* (Department of Anatomy, The University of Hong Kong, Hong Kong).

The breakage of food particles by 5 human dentate subjects has been measured after a single bite on 28 types of 'bagged' foods. The change in surface area measured by image analysis produced by biting was divided by the volume of the original food particle. The toughness and Young's modulus of each food was obtained on cylindrical or cuboidal specimens in wedge/scissor and compression tests by using a universal testing machine. Statistical analysis showed that the square root of the specific surface was inversely related to the square root of the toughness of foods divided by the square root of their Young's moduli ($r=-0.88; p<0.00001$). A second experiment involved recording the EMG of the anterior temporalis muscle bilaterally, jaw movements and signals from swallow sensors. Ten subjects were tested chewing 15 varieties of food. The area of a single EMG burst, averaged for all chews, was related to food properties in the same way as above ($r=-0.66$ to -0.91; $p<0.01$ for all subjects). Hence we conclude that a relationship between the fragmentation of food particles by the teeth and their materials properties has been demonstrated —with considerable implications for human masticatory studies, for the analysis of dentition and diet in mammals and for texture studies in food science. This study was supported by the CRCG of University of Hong Kong.

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Maxillomandibular Relationship in TMD Patients Before and After Short Term Bite Plate Therapy. A. FU*, N. MEHTA, A. FORGIONE, E. CLARK, C. HAYES, G. KUGEL AND E. ABDALLAH. (Tufts Univ. School of Dental Medicine, Boston, MA, USA)

The purpose of this study was to assess the maxillomandibular relationship in temporomandibular disorder (TMD) patients, before and after short term flat bite plate therapy, to determine whether there is transverse shift of the mandible toward the frenal midline. Twenty subjects, 17 females and 3 males (mean age= 38 years ± 12.2) from the patient population attending the Gelb Craniomandibular and Orofacial Pain Center at Tufts University School of Dental Medicine were selected based on the Research Diagnostic Criteria for TMD. Thirteen subjects had a diagnosis of myofascial pain (RDC I.a), while 7 subjects had at least one diagnosis of disc displacement with reduction (RDC II.a). Impressions were taken, and diagnostic casts were fabricated for all subjects. A Vinyl Polysiloxane Plaster bite registration material (Regisil PB™ Cartilage System) was used to record the maxillomandibular relationship, both in full bite as well as in first contact. The casts were then mounted on a Denar condylar tracing articulator, using the bite registration material, and the maxillomandibular relationship evaluated using the Centric Check System. The frenal attachment to the upper and lower gingiva was used as a reference to evaluate mandibular shift. At the initial visit, all subjects showed a mandibular shift, with 9 subjects shifting to the left side and 11 shifting to the right. Symptom questionnaires were used to assess associated pain and discomfort. Bite plate therapy was provided to the patients for 4 weeks, after which a second set of bite registrations were taken and symptom questionnaires provided. A Binominal test was performed to evaluate the rate of occurrence of mandibular shift. All subjects shifted to the frenal midline position, following short term bite plate therapy, regardless of the original position right or left (Binominal $p<0.001$). The results of this study indicate that the mandible will shift toward the frenal midline position after short term bite plate therapy.

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Effects of Occlusion Type and Wear on Cervical Lesion Frequency. LR MARION*, SC BAYNE, DA SHUGARS, JD BADER, AD GUCKES, MS SCURRIA, HO HEYMANN. (UNC School of Dentistry, Chapel Hill NC).

The etiology of non-carious cervical lesions continues to be debated, but there is growing evidence that it may be related to the type of patient occlusion and the effects of tooth flexure. The objective of this study was to examine the association between occlusion (canine-guided[CG] vs group function[GF]) and/or occlusal wear with the presence or absence of cervical lesions.

146 dental casts representing a subset of patients from a case control study (Bader *et al., Comm Dent Oral Epid* 1996; 24: 286-291) were examined for (a) presence or absence of lesions, (b) type of occlusion (CG vs GF), and (c) amount of occlusal/incisal wear for each tooth. Wear (w) was rated from 1 to 8 (most) on a visual scale for extent of faceting (Marion, *J Dent Res* 1993; 72: 341). All identifications of lesions were cross-checked with photographic records and records of intraoral exams from the case-control study. Frequency, occlusion type, and wear were statistically analyzed by patient and by tooth.

Frequency of lesions by patient was 58/86 or 67% for GF and 8/60 or 13% for CG occlusion. Frequency of lesions by tooth was 507/2341 or 22% for GF and 38/1636 or 2% for CG occlusion. Wald Chi-Square ($p\leq0.001$) indicated that the risk for lesions was 12.33 times more likely in teeth of GF versus CG group. For patients with GF, teeth with lesions had slightly lower wear ratings ($w = 3.00 \pm 1.38$) versus teeth without lesions ($w = 3.68 \pm 1.41$). Logistic regression ($p\leq0.05$) of occlusal wear scores for GF patients demonstrated that premolar and molar teeth with $w\leq2$ had a 40% risk of having a lesion while if $w>4$ the risk was only 16%. These results seem to suggest CG patients were at much lower risk for cervical lesion development. They also suggest that teeth that underwent occlusal wear were less prone to cervical flexure, and therefore, were less susceptible to cervical lesion formation.

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ADA Controlled Clinical Trial of a 10% Carbamide Peroxide Solution. R.H. LEONARD*, C. BENTLEY, C. PHILLIPS, J.C. EAGLE, G.E. GARLAND, G.J. GARI, V.B. HAYWOOD (UNC, Chapel Hill, NC, Medical College of Georgia, Augusta, GA,).

The purposes of this double-blind whitening study were to determine the clinical efficacy and duration of efficacy of active 10% carbamide peroxide (CP) vs. a placebo. The design of the study was consistent with the ADA Council on Dental Therapeutics, Guidelines for Acceptance of Peroxide-Containing Oral Hygiene Products. A maxillary polyvinylsiloxane impression was taken of each patient, poured in dental stone, and a whitening tray fabricated according to the manufacturer's instructions. The study teeth were the four maxillary incisors (Vita shade A3 or darker). Forty-nine subjects were randomized to either a placebo (n=25) or active agent (n=24). Enamel shade for teeth #7, 8, 9, and 10 was determined by Vita shade tabs arranged in order of value according to the manufacturer and ranked numerically (B1=1, A1=2...C4=16). Intra-oral color slides were taken to record enamel shade with the appropriate Vita shade tab. Each examiner completed shade determination exercises prior to the study. Subjects were seen after fourteen treatment days (guard and solution worn for 8-10 hours per day) to evaluate enamel shade change (efficacy). Forty-seven subjects were seen at 3 months post-treatment to evaluate duration of efficacy. There were no statistically significant differences between the two groups in the baseline shade values for teeth 7, 8, 9, and 10 (Wilcoxon Test: P=0.96, 0.43, 0.48, 0.22 respectively). The change in enamel shade scores from baseline to day 14 was significantly different for the two groups ($P=0.0001$). The active group on average experienced a significant decrease of median shade score (getting lighter) of at least 8 Vita units while the placebo group on average experienced no change. The average enamel shade change for both groups from day 14 to 3 month post-treatment was zero Vita units. On average, the active group was 7 Vita unit shades lighter at 3 months than at baseline. The active 10% CP whitening solution was effective in lightening teeth, and this effect was sustained at 3 months post-treatment. Supported by Discus Dental.

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Safety Issues Of 10% Carbamide Peroxide In Clinical Usage. M.C. KNIGHT*, R.H. LEONARD, C. BENTLEY, C. PHILLIPS, J.C. EAGLE, G.E. GARLAND, G.J. GARI, V.B. HAYWOOD (UNC, Chapel Hill, NC, Medical College of Georgia, Augusta, GA, USA).

The purpose of this double-blind nightguard vital bleaching (NGVB) study was to compare safety issues when using an active 10% carbamide peroxide(CP) whitening solution vs. a placebo. Safety issues evaluated were changes in; the plaque index (PI), the gingival index(GI), attached gingiva (AG), intra-oral soft tissue or mucosal, tooth vitality(TV), and occurrence of tooth sensitivity(TS) and gingival irritation (GI). All subjects participating in the study completed and signed an approved informed consent form. An impression of the maxillary arch was taken and a whitening tray fabricated according to manufacturer's instructions. A stratified blocked randomization approach was used to assign subjects to an active whitening agent or placebo in which the stratification factors were age and gender. Each subject received an oral prophylaxis at least two weeks prior to beginning the study. Using the oral hygiene instructions and the floss and toothbrush given to them, subjects were asked to brush and floss daily, after breakfast and before bedtime. Each patient was given a diary to record TS and GI. Forty-nine subjects (25placebo, 24active) started the NGVB process for 14 daily treatment applications of 8-10 hours each. Patients were seen at baseline, after 14 days treatment time, and 3 months after treatment completion. 60% of the active group experienced TS while only 29% of the placebo group experienced TS. GI was reported by 45% the active group and by 13% of the placebo group. At the 3-month post-treatment appointment, no one in either group experienced TS or GI that they felt was whitening related. With respect to PI, GI, AG, intra-oral mucosal changes and TV, there were no statistically significant differences between the placebo and active whitening group at baseline or in change from baseline to 14 days or from baseline to 3 months (savage test, $p> 0.10$). In conclusion, when evaluating the above mentioned safety issues, there were no statistically significant adverse effects between an active 10% CP whitening solution and a placebo when used as described in this study. Supported by Discus Dental, Inc.

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Nightguard Vital Bleaching and Its Effect On Tooth Morphology. K.P. MATTHEWS*, A.L. RUDD, J.C. EAGLE, G.E. GARLAND, C. BENTLEY, R.H. LEONARD, C. PHILLIPS (UNC, Chapel Hill, NC)

The purpose of this study was to evaluate the effect of a 10% carbamide peroxide whitening solution on tooth enamel morphology as viewed under the scanning electron microscope (SEM). Ten patients participating in a Nightguard Vital Bleaching (NGVB) study were randomly selected for this project. Each subject wore a guard filled with the whitening solution for 8-10 hours per day for 14 treatment days. At baseline, and on the fourteenth day of treatment, the teeth were cleaned, an impression taken (Reprosil®) rinsed, disinfected, dried, filled with Polybed epoxy resin and cured overnight at 65°C. The epoxy cast was removed from the impression, mounted on a specimen stub, and sputter coated with gold-palladium (Polaron 5200 sputter coater), and examined under the SEM. Scanning electron microscopic photographs at baseline and after 14 treatment days were obtained for each patient at X200 and X2000. To evaluate changes in enamel surface morphology, 6 examiners were asked whether a discernible difference existed between the baseline/14 day photograph of each patient. Examiners did not know which photograph was baseline or 14 day. Sixty percent of the comparisons were determined to be similar with no visual distinguishable changes to the enamel morphology. Still masked, the examiners also compared each patient's baseline/14 day photographs with photographs of a known standard. The knowns ranked as: untreated tooth (0), pumiced tooth with prophy paste (1), and teeth acid etched for either 5(3), 10(4)..., or 60(9) seconds. The Wilcoxon matched-pairs signed-ranks test was used to determine if a significant change occurred in enamel morphology. Ninety percent of the comparisons with a known standard were ranked by the examiners as being similar to either the control tooth, or tooth pumiced with prophy paste. The average control photograph selected for both baseline/14 days was the pumiced tooth which was expected at baseline since all patients received a prophy before the trial. The average change in rank was similar for X200 and X2000 at ($x=0.27$ and 0.24) but the shift was significant at X200($p>.05$) but not at X2000. In conclusion, a 14 day regimen of NGVB using a 10% carbamide peroxide whitening solution has minimal effects on the surface morphology of teeth. Supported by Discus Dental, Inc.

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Computer Assessment of Whitening Effects of 10% Carbamide Peroxide. C. BENTLEY*, R.H.LEONARD, J.C.EAGLE, G.E.GARLAND and G.J.GARI (UNC, Chapel Hill, NC).

We have previously demonstrated the utility of a brightness index (BI), derived by computer processing of digitized photographic images, for monitoring changes in tooth brightness after nightguard vital bleaching (NGVB). Our objective in the present study was to compare the sensitivity of computer-based shade determination with the conventional method of visual shade guide comparison. We performed computer analyses of photographic images from an ADA double-blind whitening study, comparing an active 10% carbamide peroxide (CP) product with a placebo in 16 subjects. Examinations were performed at baseline, after 7 days and 14 days of bleaching, and at 3 months post-treatment. Enamel shade for maxillary incisors was determined using Vita shade tabs, arranged in manufacturer's brightness order, and agreed upon by 2 examiners. At each examination, photographs were taken on 35 mm Kodachrome film with appropriate Vita shade tabs for reference, using electronic flash illumination. These were later digitized and the BI determined using commercial software (Adobe Photoshop™) as previously described. While visual shade guide comparison revealed statistically significant lightening at 14 days, the data at 7 days were inconclusive and no significant differences were observed between 14 day and 3 month data. Mean values of the computer-derived brightness index for the placebo group at baseline, 7 days, 14 days and 3 months were 0.24, 0.32, 0.29 and 0.18 respectively, with no significant differences among the time points by 1-way ANOVA. Equivalent values for the active group were 0.38, 0.58, 0.78 and 0.61 and the differences among the time-points were highly significant by ANOVA ($P<0.01$). A paired T-test was performed to investigate the apparent darkening of the teeth that occured between the end of the bleaching phase and the 3 month post treatment examination. This change was also found to be highly significant ($p<0.01$). We conclude that computer analysis generates more sensitive shade indicators for studies of NGVB than visual shade guide comparison, providing a more reliable and more objective method for the monitoring of this process. Supported by Discus Dental, Inc.