New method for analysis of facial growth in a pediatric reconstructed mandible

Chung How Kau, Sherif Galal Kamel, Jim Wilson, and Mark E. Wong. Am J Orthod Dentofacial Orthop 2011;139:e285-e290.

Introduction: The aim of this article was to present a new method of analysis for the assessment of facial growth and morphology after surgical resection of the mandible in a growing patient. **Methods:** This was a 2-year longitudinal study of facial growth in a child who had undergone segmental resection of the mandible with immediate reconstruction as a treatment for juvenile aggressive fibromatosis. Three-dimensional digital stereo-photogrammteric cameras were used for image acquisition at several follow-up intervals: immediate, 6 months, and 2 years postresection. After processing and superimposition, shell-to-shell deviation maps were used for the analysis of the facial growth pattern and its deviation from normal growth. The changes were seen as mean surface changes and color maps. An average constructed female face from a previous study was used as a reference for a normal growth pattern. **Results:** The patient showed significant growth during this period. Positive changes took place around the nose, lateral brow area, and lower lip and chin, whereas negative changes were evident at the lower lips and cheeks area. An increase in the vertical dimension of the face at the chin region was also seen prominently. **Conclusions:** Three-dimensional digital stereo-photogrammetry can be used as an objective, noninvasive method for quantifying and monitoring facial growth and its abnormalities.

Evaluation of well-balanced lip position by Japanese orthodontic patients

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Introduction: The purposes of this study were to assess and determine the range of a well-balanced anteroposterior lip position as evaluated by orthodontic patients from a series of varying lip positions in facial silhouettes, and whether the rater's sex and age were factors in the assessment. **Methods:** The average profiles were constructed from 30 Japanese male and female subjects with normal occlusion. A series of 13 profiles was developed for males and females, respectively. The lips were protruded or retruded by 1-mm increments from the average profile. One hundred fifty Japanese orthodontic patients were asked to choose the top 3 most-favored, well-balanced profiles for each sex. **Results:** The orthodontic patients tended to prefer a slightly retruded lip position than the average facial profile for both the male and female profiles. There was no significant difference between male and female raters in selecting the top 3 most-favored profiles. In the comparison of age groups, the over 30-year-old patients significantly preferred a more retruded lip position than did the 15- to 19-year-old and the 20- to 29-year-old patients for the female profile. **Conclusions:** These results suggest that, when we formulate a treatment plan, we should ask the patients about lip position before we start treatment.

Polymerization capacity of orthodontic composites analyzed by Fourier transform infrared spectroscopy

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Introduction: The aim of this in-vitro study was to analyze the polymerization capacity of 5 orthodontic composites by determining the degree of monomer conversion (DC). **Methods:** Fourier transform infrared spectroscopy was used to evaluate the DC of the orthodontic composites immediately after polymerization and after storage in artificial saliva at 37°C ± 1°C for 30 days. The resin-based adhesive composites investigated were Bisco Ortho (Bisco, Schaumburg, Ill), Heliosit Orthodontics (Ivoclar, Schaan, Liechtenstein), Kurasper F (Kuraray, Okayama, Japan), Light Bond (Reliance Orthodontic Products, Itasca, Ill), and Transbond XT (3M Unitek, Monrovia, Calif), cured with Elipar FreeLight 2 (3M ESPE, St Paul, Minn) for the testing of the DC values. Fifty cylindrical specimens were manufactured in molds. The data were analyzed by 2-factor analysis of variance (ANOVA) and Tukey HSD test. **Results:** According to 2-way ANOVA, the DC was significantly influenced by composite type ($P < 0.05$); after 30 days, there were no differences among the composite types for the DC. The interaction of

orthodontic composites and time played a statistically significant role in the DC ($P < 0.05$), but there was no statistically significant influence of time for the DC ($P > 0.05$). **Conclusions:** The DC was found to change according to composite materials used, and Bisco Ortho showed the most DC performance. The DC of orthodontic composites is a complex process that is affected not only by inorganic filler content of the composite but also the monomer type and many other factors. Sufficient DC values of 5 commercially available orthodontic composites can be achieved with a new-generation light-emitting diode curing light.

Masseter length determines muscle spindle reflex excitability during jaw-closing movements

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Introduction: The masticatory muscles are considered to be important determinants of facial form, but little is known of the muscle spindle reflex characteristics and their relationship, if any, to face height. The aim of this study was to determine whether spindle reflexes, evoked by mechanical stimulation of an incisor and recorded on the masseter muscle, correlated with different facial patterns. **Methods:** Twenty-eight adult volunteers (16 women; ages, 19-38 years) underwent 2-N tap stimuli to their maxillary left central incisor during simulated mastication. Reflexes were recorded during local anesthesia of the stimulated tooth to eliminate the contribution from periodontal mechanoreceptors. Surface electromyograms of the reflex responses of the jaw muscles to these taps were recorded via bipolar electrodes on the masseter muscle and interpreted by using spike-triggered averaging of the surface electromyograms. Lateral cephalometric analysis was carried out with software (version 10.5, Dolphin, Los Angeles, Calif; and Mona Lisa, Canberra, Australia). **Results:** Two-newton tooth taps produced principally excitatory reflex responses beginning at 17 ms poststimulus. Correlation analysis showed a significant relationship between these muscle spindle reflexes and facial heights: specifically, shorter face heights were associated with stronger spindle reflexes. This correlation was strongest between the derived measure of masseter length and the spindle reflex strength during jaw closure ($r = -0.49$, $P = 0.008$). **Conclusions:** These results suggest that a similar muscle spindle stimulus will generate a stronger reflex activation in the jaw muscles of patients with shorter faces compared with those with longer faces. This finding might help to explain the higher incidence of clenching or bruxism in those with short faces and also might, in the future, influence the design of orthodontic appliances and dental prostheses.

Subjective classification and objective analysis of the mandibular dental-arch form of orthodontic patients

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Introduction: Our objective was to evaluate the relationship between subjective classification of dental-arch shape, objective analyses via arch-width measurements, and the fitting with the fourth-order polynomial equation. **Methods:** Twenty-seven pretreatment mandibular dental casts (from 13 males and 14 females; ages, 12-31 years) were selected. Standardized photographs of the arches were serially organized from tapered to square by 10 examiners. The mean position in the ranking of each cast was calculated as a rank of each arch form. The dental casts were analyzed with a 3-dimensional laser scanning system. Dental-arch widths at the canines and molars were measured, and then a fourth-order polynomial equation was fit to each arch. Correlations between the rank of arch shape and the objective measurements were statistically tested. **Results:** The arch forms having the greatest variations among the examiners were those with an intermediate (ovoid) ranking. Statistically significant correlations were found between the ranks of arch shape, arch dimensions, and the polynomial equation analyses. **Conclusions:** Subjective clinical assessments were generally in agreement at the extremes of tapered and square arch forms; the exceptions were arches with an ovoid shape. There were statistically significant correlations between subjective dental-arch classifications and dental-arch dimensions, as well as the ratio determined from these variables and polynomial equation analyses. Therefore, fourth-order polynomial equations might be an important factor in the quantitative analysis of dental-arch form in orthodontic patients.