

961 Facial profile in Japanese adults using proportional analysis.
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Lundstrom et al. reported standard reference of Swedish young adults with normal occlusion by using soft tissue analysis with natural head position. The purpose of this study is to know the value of the Japanese young adults with normal occlusion using the same analysis as Lundstrom. The examiner obtained the value of 11 indices (8 horizontal, 2 vertical and 1 horizontal/vertical) from facial profile photographs of dental school students who had no orthodontic treatment (21 males, 18 females, average age: 23.4 years). The gender and racial difference between the Japanese value and the Swedish value derived from Lundstrom's report were tested by t-test in each index. Comparison with American female derived from Peck and Peck's value in some indices was also tested. Gender difference in 5 indices was recognized (index No.1, 2, 3, 6 and 7). All these 5 indices values of male were 2-10 point higher than those of female. Racial difference of male in 6 indices was recognized (index No.2, 3, 6, 7, 8 and 11). These 6 indices values of Japanese male except index No.6 and 11 were 3-6 point higher than those of Swedish male. Racial difference of female in 5 indices was recognized (index No.1, 2, 3, 6 and 7). All these 5 indices values of Japanese female were 4-10 point lower than those of Swedish female. Therefore, Japanese male have more prominent nose, upper and lower jaws, chin and more eminent chin than female. There was no common Japanese-Swedish characteristic difference between the two of the comparison in male and female. Japanese female has less prominent nose and less eminent chin than Swedish and American races. The severity scale of soft tissue profile should be ranged over these gender and racial difference for the estimate of malocclusion.

963 Tongue volume in human adults with mandibular prognathism.
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We examined whether the tongue volume in subjects with mandibular prognathism was larger than that in those with good occlusion and whether the tongue volume was accounted for by the morphological characteristics of dento-skeletal structure. Ten female adults with good occlusion (control group) and 16 with mandibular prognathism (test group) were selected. Coronal and sagittal views of magnetic resonance image were taken. Intrinsic muscle of the tongue, genioglossus, styloglossus, and hyoglossus muscles were defined as the muscles that constituted the tongue. Airway was defined as the oropharyngeal space between the line parallel to the Frankfort horizontal at PNS and that at the most antero-inferior point of the fourth cervical vertebra on the mid-sagittal MR image. Each film was scanned and the areas of the tongue and airway on each slice were measured. The tongue volume and the airway space were calculated by multiplying the area of each slice by 5mm thick plus multiplying the arithmetic mean of the areas of two adjacent slices by 2.5mm thick of gap. Lateral cephalograms were recorded for the test subjects. Mean tongue volume, airway space, and tongue/oral cavity ratio were $64.6 \pm 11.2 \text{ cm}^3 (\text{S.D.})$, $19.7 \pm 6.7 \text{ cm}^3 (\text{S.D.})$, and $76.6 \pm 6.6\% (\text{S.D.})$ for the control group, and $65.7 \pm 7.6 \text{ cm}^3 (\text{S.D.})$, $20.1 \pm 7.3 \text{ cm}^3 (\text{S.D.})$, and $76.6 \pm 7.3\% (\text{S.D.})$ for the test group, respectively. No statistical differences were found between two groups. The tongue volume correlated with the distances Nasion-Menton ($R=0.63$, $P<0.01$), Palatal plane-Menton ($R=0.65$, $P<0.01$), Palatal plane-Upper first molar ($R=0.60$, $P<0.05$), and Mandibular plane-Lower first molar ($R=0.56$, $P<0.05$). These results suggest that the tongue volume is accounted for by the anterior face height and the posterior tooth height, but do not support the conventional clinical surmise that large tongue volume is inherent in those with mandibular prognathism.

965 Soft Tissue Comparisons of Chinese and Caucasian Surgical Class III Patients.
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The purpose of this study was to compare the soft tissue morphology of Chinese and Caucasian Class III patients who were treatment planned for orthognathic surgery. Lateral cephalometric radiographs of 30 Chinese and 30 Caucasian patients were included in the study to analyze for race and sex differences. Thirteen soft tissue measurements were evaluated. Two sample t-test was used for group comparisons. The results show that in Chinese sample, the maxilla and mandible were more prognathic than the Caucasian sample ($5.4 \pm 4.3 \text{ mm}$ and $12.5 \pm 10.6 \text{ mm}$ vs. $2.7 \pm 4.8 \text{ mm}$ and $5.6 \pm 7.1 \text{ mm}$, respectively, $p<0.05$). Maxillary and mandibular lip protrusion were also found to be significantly different between the two groups ($6.5 \pm 2.7 \text{ mm}$ and $8.9 \pm 3.3 \text{ mm}$ vs. $2.0 \pm 2.2 \text{ mm}$ and $3.8 \pm 2.4 \text{ mm}$, respectively, $p<0.05$). Nasolabial angle and lower face throat angle was found to be more acute in the Chinese sample. No significant difference was found in vertical height ratio, lower vertical height-depth ratio, or mentolabial sulcus depth. Vertical lip-chin ratio was found to be significantly smaller in the Caucasian as compared to the Chinese sample ($37.2 \pm 4.5\%$ vs. $44.3 \pm 7.0\%$, $p<0.05$). These results suggest that there are morphological differences between these two ethnic groups which may require different approach in treatment planning for orthognathic surgery. This study was supported by The University of Hong Kong, Faculty of Dentistry.

967 Expected Values of Outcomes for Age Related Orthodontic Decisions.
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Decision analysis may be employed to calculate the expected values of outcomes when clinical decisions are taken under conditions of uncertainty and when probabilities of alternative pathways lead to specified endpoints. Our aim was to compare the values and probabilities of payoffs, or utilities, to be expected comparing treatments begun prior to and after the ages of 15 years. **METHODS:** Retrospective data of 995 patients [399 Cl. I, 568 Cl. II, and 28 Cl. III] provided the prior estimates of probabilities for (i) Extraction frequency, (ii) Duration of Treatment, and (iii) Improvement according to %PAR score reduction. Separate probabilities were computed for 758 case treated under 15 years and 237 treated older than 15 years. Utility scaling of these three variables enabled assignment of 'payoffs' in a decision analytical mode. **RESULTS:** Decision Analysis revealed that (i) expected values for earlier treatment were greater than for later [218 : 208]; (ii) in both age groups the non-extraction decision has a higher expected value than the extraction choice [253:191 for young, 234:191 for older patients] (iii) The probability distributions for payoffs indicate that overall greater utility is to be expected for earlier rather than later treatment. **CONCLUSIONS:** 1. Decision analysis can be applied to compare alternative orthodontic treatment options with respect to specified attributes of outcomes. 2. Such analyses can optimize outcomes based on estimates of probabilities, and may be used to formulate policies with the highest yield of tangible benefits to patients. 3. Validation of the model is necessary for application to patient populations with different clinical characteristics and/or utilities. [NIH/NIDR Grant DE 09883]

962 Craniofacial Growth of Mandibular Prognathism during the Pubertal Growth Period.
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The purpose of this study was to investigate whether or not patients with mandibular prognathism would show a specific manner of craniofacial growth in comparison to that of normal patients during the pubertal growth period. The materials used in this study consisted of Class I (n=20) and Class III (n=16) groups of serial lateral cephalometric head films of Japanese boys from 10 to 15 years of age over a period of five years. All subjects in the Class III group were selected from a file of patients waiting for orthognathic surgery and had no orthodontic treatment during the observation period. The Class I group which served as a control group in this study, underwent orthodontic treatment, but did not have any growth-related orthopedic therapy. The cephalometric measurements of each group were statistically analyzed using the Student t test. The results of the cephalometric measurements about the maxillary and the mandibular growth changes showed that Class III was fairly similar to Class I during the pubertal growth period. However, there was significant difference ($p<0.001$) in the total changes of A-B on the occlusal plane (Wits appraisal) between the two groups. The present findings suggest that, although the principal skeletal frame of those with mandibular prognathism is established before the pubertal growth period and maintained thereafter, dentoalveolar disharmony is aggravated, becoming more severe during this period.

964 Craniofacial morphology in Korean patients with Class III malocclusion.
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There is little information concerning differences in the cranial base in Class III malocclusion in different ethnic groups, particularly those found in S.E. Asia. Therefore, the aim of this study is to determine whether a consistent cranial base morphology is evident in patients with Class III malocclusion across divergent ethnic groups. Lateral cephalographs of approximately 70 Korean children aged between 5-11 years with Class III malocclusion were compared with approximately the same number of their counterparts of European-American descent at the University of Michigan. The cephalographs were traced, checked and discretized into seven age- and sex-matched groups. Thirteen points on the cranial base and midface were identified and digitized, employing a software program (Acquire) and a digitizing tablet. The datasets were scaled to an equivalent size and, using a Procrustes routine, the mean cranial base morphology for each age group was computed. Comparisons of variance undertaken for each age group indicated that glabella, the tip of the nasal bone, Bolton point and inferior pterygo-maxillare were the landmarks most affected. Indeed, F values from statistical tables for the average cranial base morphologies indicated a highly significant difference at all age groups tested ($p < 0.001$). The differences in cranial base morphology evident for Korean and European-American children, predominantly localized in the region of the frontal and nasal bones, and to a lesser extent the foramen magnum, may contribute to the appearance of a Class III malocclusion. This study was supported by HSURC grant: 7-75266 (GDS) and MRC grant: MT-10269 (SL).

966 Crown dimensions in ethnic Chinese normal occlusions versus Class I malocclusions.
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The analysis of malocclusions attributed to disharmony in tooth sizes has been reported by Bolton (*Angle Orthod* 28:113-130, 1958). Finishing an orthodontic case with Class I incisal and posterior occlusal interdigitation relies to a great extent on the relative harmony in mesio-distal widths between the maxillary and mandibular teeth. The aims of the present study were to determine a Bolton ratio for the Chinese racial group, and to compare mesio-distal crown dimensions of normal occlusions with Class I malocclusions in an ethnic Chinese community. Fifty-two plaster cast sets of untreated Class I malocclusions (26M/26F, ages from 15 to 24 years) and thirty-three plaster model sets of untreated orthodontically normal occlusions (17M/16F, ages from 14 to 28 years) were randomly selected from a potential pool of 500 patients' models for odontometric analysis. Models with fractured teeth, teeth with caries or restorations on mesial / distal surfaces, partially erupted teeth, missing teeth, or congenitally deformed teeth were excluded. Mesio-distal crown dimensions of each tooth from the permanent first molar to its antimeres were measured with a modified Boley gauge with 0.05 mm accuracy. Each crown measurement was performed twice, each time by a different investigator. Crown measurements were evaluated with Student's paired t-test. Inter-examiner and intra-examiner variability were not significant. The Overall Bolton Ratio derived from the sample of Chinese normal occlusions was $91.8 \pm 1.85\%$ (SD) and the Anterior Ratio was $79.4 \pm 1.73\%$ (SD). Crown measurements from the normal occlusion sample revealed statistically significant differences in both sexes for maxillary cuspids ($p < 0.01$) and mandibular canines ($p < 0.01$), while differences between antimeres were not significant. Comparing Class I malocclusions with normal occlusions, significant antimeric differences ($p < 0.01$) were seen in upper and lower right-sided first and second bicuspsids. Sex differences were marked with teeth sizes from the female Class I malocclusion sample showing the greatest variation from normal occlusion male and female samples ($p < 0.01$). The findings show that tooth size asymmetry localized at the right upper and lower premolar regions is a possible aetiological factor of occlusal disharmony in the Class I malocclusion sample.

968 Decision Analytical Comparison: One vs. Two-Stage Orthodontic Treatment Strategies.
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An estimate of 'payoffs', to patients accruing from orthodontic treatment, may be derived by subtracting from the value, or 'utility' of obtaining a reduced malocclusion severity (%PAR reduction), undesired outcomes such as treatment of long duration [D] and the loss of teeth [X] required for orthodontic treatment. These estimates of net gain, or benefits, can be incorporated in a Decision Analytical Model at the 'terminal nodes' of trees. Our aim was to compare the patient payoffs to be expected respectively from one-stage (N=183) and two-stage (N=67) treatment of 250 Class II div. 1 children between ages 11 and 14 years. **METHODS:** Decision Trees were constructed using "DATA IV 2.5 by TREE" software. Frequency distribution of variables (%PAR reduction, D and X) provided probability estimates at chance nodes. Payoffs were calculated by combining arbitrarily assigned utility scores to the 3 outcome variables. The tree was solved and tested for sensitivity. **RESULTS:** The one stage decision resulted in higher expected values for patient payoffs [277:259]. Non extraction treatment for both one and two stage strategies has higher expected values [277:259]. Sensitivity analysis indicated that the model was robust for a wide range of the arbitrary utility scales. **CONCLUSION:** 1. Tradeoffs exist between various attributes of outcomes. 2. This model tests the tradeoffs between duration of treatment and loss of teeth and the 'quality' of dental alignment result. 3. Under these conditions, the preferred strategy for 11-14 year old Class II div. 1 treatment is a one stage non-extraction. 4. Additional parameters of outcomes such as long term stability, costs, and psychometric variables related to satisfaction are necessary for a more complete evaluation of treatment options by decision analytical methods [Supported by NIH/NIDR Grant DE 09883]