E-Posters

P-1

The proximity of the root of the maxillary anterior teeth to the lingual anatomic structure

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Objectives : The aim of this study was to investigate the proximity of the root of the maxillary anterior teeth to the lingual anatomic structure.
Material and Methods : The sample of this retrospective study comprised 100 cone-beam computed tomography images taken for the diagnostic purpose before treatment. The exclusion criteria were as follow; maxillary anterior teeth with incomplete apical closure, a history of orthodontic treatment, a missing or impacted tooth in the maxilla, a pathologic lesion in the maxillary area, cleft palate, systemic disease. The distances from the root of the right maxillary central incisors, lateral incisors and canines to the incisive canals, the palatal cortical plates, or the maxillary sinus were measured on the horizontal reference planes. Teeth were divided into 4 groups according to their proximity to the lingual cortical plates, maxillary sinus or the incisive canals: Group 1(distance < 2mm), Group 2 (2 distance < 4mm), Group 3 (4 distance < 6mm), Group 4 (6 mm distance). Relationship between the proximity of the root of the anterior teeth to the anatomic structure and age, gender, cephalometric variables, position or angle of the anterior teeth were assessed.
Results : Group 1 and 2 (less than 4 mm) were 39% in the maxillary central incisors, 6% in the maxillary lateral incisors, and 40% in the maxillary canines. FMA showed negative correlation, tooth angle showed positive correlation with the proximity of roots. Vertical and horizontal tooth position also showed correlations with the proximity of roots.
Conclusion : The proximities of the maxillary anterior teeth to the lingual anatomic structure were considerable and correlated with the gender, cephalometric variables, tooth position and angle.

P-2

An approach for the evaluation of soft tissue asymmetry in relation to hard tissue asymmetry

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Objectives : The purposes of this study were to identify the differences between soft and hard tissue asymmetries and establish a new midsagittal plane (MSP) for evaluating soft tissue.
Material and Methods : The subjects consisted of 31 skeletal Class III patients (16 men, 15 women) with menton deviation greater than 3.0mm based on the hard tissue midsagittal plane (hMSP). The differences between soft and hard tissue asymmetries were analyzed based on the hMSP perpendicular to the FH plane passing through nasion and basion. For soft tissue evaluation, the horizontal reference plane was defined as the FH plane, the modified frontal plane (mFRP) was established as a plane perpendicular to the FH plane passing through right and left orbitale, and the soft tissue MSP (sMSP) was constructed to pass through the soft tissue nasion, perpendicular to the FH plane and the mFRP.
Results : When measuring the asymmetries of soft and hard tissues based on the hMSP, the asymmetries of soft tissue were significantly smaller than those of corresponding hard tissue on anteroinferior reference points such as pogonion and menton ($P < 0.001$). In comparison of the soft tissue asymmetries between the sMSP and hMSP, they were significantly smaller on the sMSP than those on the hMSP ($P < 0.001$). However, there were no significant differences between the soft and hard tissue asymmetries based on the hMSP and between the soft tissue asymmetries to the sMSP and hMSP not only ANS located on the midface but the posterior part such as gonion and ramal inclination ($P > 0.05$).
Conclusion : Skeletal Class III patients with facial asymmetry showed differences between the soft and hard tissue asymmetries, therefore the new sMSP was established based on the anterior reference points to compensate these differences. On the pogonion and menton, there were significant differences between soft tissue asymmetries in the sMSP and hMSP.

P-3

Assessment of maxillary sinus floor level according to facial skeletal pattern

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Objectives : The aim of this study was to evaluate maxillary sinus floor level in different vertical and anteroposterior skeletal pattern using CBCT.
Material and Methods : Samples of 59 adults were divided into low, normal, high angle group according to SN-GoGn, and the same samples were also divided into skeletal Class I, II, III according to ANB angles.
The distance from maxillary sinus floor to root apex (RA disatnce) and the distance from maxillary sinus floor to alveolar crest (AC distance) were measured using CBCT and Invivo5 software.
Results : Intraexaminer reliability was evaluated with intraclass correlation coefficients(ICCs). ICCs of all measurement were above 0.942, indicating high reliability.
Comparing the low, normal, high angle groups, RA distances of MB, DB root of the maxillary first molar and DB root of the maxillary second molar were significantly smaller in high angle group than normal angle group. All AC distances were smallest in high angle group and greatest in normal angle group, but there were no significant differences.
Comparing the skeletal Class I, II, III groups, all RA distances of skeletal Class II group were significantly smaller than those of skeletal Class I group except for DB and P root of the maxillary second molar. And RA distances of B root of the maxillary second premolar and DB root of the maxillary first molar were significantly smaller than those of skeletal class I group. All AC distances of skeletal Class II were significantly smaller than those of skeletal Class I.
Conclusion : In some measurement, maxillary sinus floor level was significantly different according to vertical and anteroposterior skeletal pattern. Especially, for skeletal Class II patients and high angle patients, tooth movement such as total arch distalization and total arch intrusion, which are commonly used in these patients, can be challenged due to pneumatized maxillary sinus.

P-4

Histopathological analysis of masseter muscle tissue damage and contributing factors in skeletal Class III patients

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Objectives : Skeletal Class III malocclusion patients have various dysfunctions such as occlusal interference and imbalance of bilateral masticatory muscles during masticatory movement due to skeletal discrepancy and dental malocclusion. There has been controversy over the relationship between tissue damage of masticatory muscles and these dysfunctions. The purpose of this study was (1) to analyze the histopathologic tissue damage of masseter muscle in patients with skeletal Class III malocclusion and (2) to investigate the contributing factors.
Material and Methods : The biopsy samples of masseter muscles from eighteen patients who received orthognathic surgery for mandibular prognathism were collected. The samples were stained with haematoxylin and eosin (H&E), then the severity of inflammation was graded by two blinded pathologists with grade 0 (none), 1 (mild), 2 (moderate), and 3 (severe). The patients with grade 0 and 1 were classified as Group 1, and grade 2 and 3 were classified as Group 2. Sagittal, vertical, and horizontal skeletal discrepancies, severity of dental malocclusion (PAR index), functional shift during occlusion, and imbalanced activity of masticatory muscles were compared between Group 1 and Group 2.
Results : In 14 of 18 patients (77.8%), inflammations were observed in the masseter muscle. The skeletal discrepancies, severity of malocclusion, and functional shift did not differ between both groups. However, Group 2 showed significantly higher muscle imbalances than those of Group 1.
Conclusion : The patients with skeletal Class III malocclusion had a chronic inflammation of the masseter muscle at a high rate. The results of this study suggest that the severity of inflammation of the masseter muscle may related with the muscle imbalance.

P-5

Three-dimensional evaluation of condylar position and angulation in skeletal Class III patients with/without asymmetries

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Objectives : The purposes of this study were to compare the condylar position and angulation in skeletal Class III patients with and without facial asymmetry with those of skeletal Class I patients and to investigate their relationships with sagittal and transverse skeletal discrepancies.

Material and Methods : Sixty-five skeletal Class III adult patients were divided into 2 groups according to the degree of menton deviation : a symmetry group with deviation less than 2mm (n=32), and an asymmetry group with deviation greater than 4mm(n=33). The control group was comprised of 33 skeletal Class I patients. The reconstructed 3D images from cone beam CT images were reoriented by reference plane. Joint spaces (anterior, superior, posterior joint space, and medial, lateral joint space) and angulations (axial, sagittal, and coronal condylar angle) were compared among the 3 groups.

Results : Overall, the joint spaces were larger in the skeletal Class I group than in the skeletal Class III symmetry group. The anterior joint space was smaller in skeletal Class III symmetry group than in skeletal Class III asymmetry group. The posterior joint space was smaller in the deviated side of skeletal Class III asymmetry group than in skeletal Class III symmetry group. The medial and lateral joint spaces showed no difference between skeletal Class III symmetry and asymmetry groups. The axial and sagittal condylar angles were larger in the deviated side than in the nondeviated side of skeletal Class III asymmetry group.

Conclusion : The joint spaces and angulations were different according to sagittal and transverse skeletal discrepancy in skeletal Class III patients.

P-6

Three-dimensional evaluation of dentofacial transverse widths in adults with different sagittal facial patterns

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Objectives : The aim of this study was to evaluate dentofacial transverse dimensions of subjects with different sagittal facial patterns using 3-dimensional cone beam computed tomography images.

Material and Methods : 63 males and 80 females were divided into skeletal Class I, II and III groups. Skeletal and dental evaluations were made on frontal view and coronal cross-sections of the images. Independent two sample t-tests, one-way ANOVA followed by post-hoc Tukey tests were used for gender and group differences. Linear regression analysis was used to identify factors related to change in ANB angle.

Results : Class II subjects did not show differences in maxillomandibular width difference and in maxillary widths compared to Class I subjects however, maxillary molars were lingually tipped. Class III subjects showed greater maxillomandibular width difference, smaller maxillary width and maxillary buccolingual alveolar width at mid-root level compared to Class I subjects. The maxillary molars were buccally inclined while mandibular molars were lingually compensated in Class III subjects.

Conclusion : The ANB angle showed positive correlations with jugal process width maxillary width and maxillary bucco lingual alveolar width at mid-root level as well as mandibular molar buccal inclination; negative correlations were found in maxillomandibular width difference, mandibular width at mid root level and maxillary molar buccal inclination.

P-7

Three-dimensional evaluation of dentofacial transverse widths of adults with various vertical facial patterns

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Objectives : The purpose of this study was to investigate maxillomandibular transverse width and molar inclinations of adult subjects with hypodivergent, normodivergent, hyperdivergent facial patterns using cone beam computed tomography.

Material and Methods : This study evaluated Class I subjects (55 male, 66 female) that were divided into hypodivergent (< 27Σ , normodivergent (28σ to 37Σ hyperdivergent (>38Σ groups by mandibular plane angle. Frontal and coronal views of CBCT images were analyzed. Gender difference, vertical facial pattern difference and related factors were assessed with independent two sample t-tests, one-way ANOVA followed by post-hoc Tukey tests, and Pearson correlation analysis.

Results : The hypodivergent group had greater maxillary alveolar widths 7mm apical from the alveolar crest. The intermolar widths and molar inclinations showed no significant difference among the groups. As mandibular plane angle increased, interjugular width and transverse mandibular width and bucco lingual maxillary alveolar width at mid-root level decreased while the maxillo mandibular width difference and palatal height increased for both genders.

Conclusion : An increase in mandibular plane angle is associated with a tendency of narrow mandibular arches, thinner maxillary alveolar bones at mid-root level and higher palatal arches for both genders. The intermolar width and molar inclinations were not significantly affected by vertical facial patterns.

P-8

Correlation between airway parameters and polysomnography variables in patients with obstructive sleep apnea

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Objectives : The purpose of this study was to investigate the correlation between airway parameters and polysomnography(PSG) variables in patients with obstructive sleep apnea(OSA).
Material and Methods : Among the OSA patients referred to the department of Orthodontics for the fabrication of mandibular advancement device from the department of Otorhinolaryngology in Asan Medical Center, 18 subjects who had their PSG data and computed tomography(CT) images were included. CT scans were taken in the supine position to reproduce the respiratory airway during sleep. Using InVivo 3D dental imaging software, subjects oropharyngeal airway volume and minimum cross-sectional area were measured. ANB, SNB, mandibular body length were measured from the subjects lateral cephalogram.
Pearson correlation coefficients were calculated to analyze the relationships between the airway parameters and PSG variables in OSA patients.
Results : The oropharyngeal airway volume showed a significant negative correlation with apnea-hypopnea index(AHI), an index used to indicate the severity of sleep apnea ($r=-0.616$, $p<0.01$). A non-significant negative relationship between the minimum cross-sectional area and AHI ($r=-0.324$, $p=0.189$) was identified.
There was a significant negative correlation between mandibular body length and AHI ($r=-0.697$, $p<0.01$), but the negative correlation between SNB and AHI was not statistically significant ($r=-0.422$, $p=0.081$).
In subjects with longer mandibular body length, the oropharyngeal airway volume was significantly larger($r=0.518$, $p<0.05$).
Conclusion : The study suggests that patients with short mandible and decreased oropharyngeal airway volume are more likely to be suffered from more frequent apnea and hypopnea events during sleep. In screening and referral of OSA patient, careful interpretation of CT scans and lateral cephalogram would be helpful.

P-9

Associations of tongue position and volume on pharyngeal airway space with different types of malocclusions

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Objectives : The purpose of this study was to the relationship between the volume of the pharyngeal airway and the volume of the tongue according to the location of the mandible using cone beam computed tomography.
Material and Methods : Diagnostic cone beam computed tomography (CBCT) images of 52 adults at the Korea University Anam Hospital from March 2014 to February 2017 were used. The influence of airway volume, minimum cross-sectional area, and vertical distance and volume of tongue were evaluated using multivariate linear regression. The lateral cephalometric images derived from CBCT were considered for lateral cephalometric analysis. Spearmans correlation analysis was performed to identify the lateral cephalometric variables closely related to the tongue and mandible and the tongue volume.
Results : The tongue volume had a significant effect on the airway volume. The vertical distance of the tongue tip (Tongue tipy) had a significant effect on the airway volume and minimum Cross-Sectional Area. Both the tongue volume and Tongue tipy showed a positive correlation with the results.
Conclusion : 1. The tongue volume and the vertical position of the tongue tip have a positive correlation with the volume of the airway and the minimum cross-sectional area.
2. As the tongue volume increases and the position of the tongue decreases, the volume of the airway space tends to increase.

P-10

Morphometric analysis for incisal guidance angle, occlusal plane angle, and functional temporomandibular joint shape variation

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Objectives : The correlations between morphology of the temporomandibular joint structure, the anterior guidance angle, and occlusal plane were investigated.
Material and Methods : A cone beam computed tomography analysis was performed in 158 patients (86 women and 72 men). 3D software was employed to obtain the coordinates of the shape of the incisal guidance angle, occlusal guidance angle, articular fossa, and mandibular condyle. Generalized Procrustes analysis including principal components analysis (PCA) were performed and produced principal components (PCs) scores of each shape and their centroid size (CS).
Results : A significant Pearson correlation coefficient of 0.3451 ($p<.001$) was observed between the incisal guidance angle and occlusal plane. The CS also showed a correlation with the incisal guidance angle, but not with the occlusal plane angle. The PCA results revealed that there were no significant correlations between the temporomandibular joint structure (TMJ) shape (fossa and condyle) and the incisal guidance angle.
Conclusion : Incisor guidance angle and occlusal plane angle were correlated. And there were weak correlations between CS and incisal guidance angle. It can be concluded that the size is more related to the incisor guidance angle than the morphological factors of the constituent components of the TMJ. It could be concluded that the shape variation of the fossa and condyle was not related to the occlusal plane angle and incisal guidance angle.

P-11

The effects of Sandblasting of Zirconia with surface conditions on Shearing bonding of Orthodontic bracket

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Objectives : The purpose of this study is to investigate the effect of sandblasting and zirconia primer treatment with or without thermocycling process on the Naked zirconia, Glazed zirconia, and Pocelain veneered zirconia.
Material and Methods : Experimental group was zirconia based ceramic, which is a restoration of zirconia. 40 pieces of Naked zirconia, Glazed zirconia and Porcelain veneered zirconia were prepared respectively. And we divided them by sandblasting and thermocycling process. The shear bond strength was measured using a universal testing machine. The surface of each specimen was observed by scanning electron microscopy (SEM), energy dispersive spectroscopy (EDS) and X - ray photoelectron spectroscopy (XPS) before and after sandblasting and after shear bond strength measurement. The data were analyzed by One-way ANOVA to compare the shear bond strength between the groups.
Results : The following results were obtained. The shear bond strength of all experimental groups, regardless of thermocycling and primer treatment, was statistically higher when sandblast was applied than the group without sandblasting. Shear bond strength decreased in all specimens during thermocycling. However, in the case of specimens treated only with zirconia primers on Naked zirconia, there was no statistically significant decrease of the shear bond strength, but all other specimens were significantly decreased.
Conclusion : This suggests that proper surface treatment is necessary for the specific type of zirconia restoration and that sandblasting treatment under all conditions will help to increase the shear bond strength.

P-12

The Effects of Primers on the Shear Bond Strength of Orthodontic Bracket to Zirconia Restorations

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Objectives : This study was conducted to investigate the effect of primers on the shear bond strength of orthodontic metal brackets to varied types of zirconia restorations.
Material and Methods : Three types of zirconia based ceramics were used in this study: naked zirconia, glazed zirconia, and porcelain veneered zirconia. Total 240 specimens were prepared and sandblasted at constant pressure and distance, and then pretreated with zirconia primer (Z-Prime™ Plus), multi-use primer (Assure Plus) and silane primer (Porcelain Conditioner) for each 80 specimens, respectively. Two brackets were bonded using two adhesive resins, Transbond™ XT and Light Bond™. Non-thermocycling group was stored in distilled water at 37℃ for 24 hours and thermocycling group was thermocylced for 3000 cycles. Shear bond strength was measured and the results were obtained as follows.
Results : In non-thermocycling group, all groups showed clinically applicable shear bond strength except naked zirconia in Porcelain Conditioner group. Thermocycling group showed statistically significant lower shear bond strength compared to non-thermocycling group. However, application of Z-Prime™ Plus and Assure Plus for naked zirconia, Assure Plus and Porcelain Conditioner for glazed zirconia, and Porcelain Conditioner for porcelain veneered zirconia showed statistically significant higher values for clinical use.
Conclusion : These results indicate that the use of appropriate primers should be considered depending on the type of zirconia restorations.

P-13

In vitro Evaluation of Cytotoxicity and Corrosion of Niobium-Titanium-Tantalum-Zirconium

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Objectives : This study aimed to evaluate cytotoxicity and surface corrosion of Nb-Ti-Ta-Zr archwires in different acidities and immersion periods
Material and Methods : (1) Stainless Steel (2) Nickel-Titanium (3) Titanium-Molybdenum (4) Nb-Ti-Ta-Zr are used . Artifical saliva with no test wire and copper wire served as negative and positive controls, respectively. Each test wire was immersed in artificial saliva at different pH levels and was evaluated for 7 and 30 days. The cytotoxic effects of archwire corrosion products on L929 Mouse Fibroblast cell culture was assessed through cell metabolism and proliferation using the XTT assay following ISO Standards. The 96-well cultured plate was evaluated using an ELISA reader to measure spectrophotometrical absorbance and calculate optical density. Surface roughness and surface analysis of test specimens prior to and after 30-day immersion was measured using a Surface Roughness Tester and Field-emission Scanning electron microscope.
Results : Nb-Ti-Ta-Zr showed highest viability at pH 6.25, closest to the negative control. However, combined means regardless of conditions show no statistical difference with Nb-Ti-Ta-Zr and the other tested wires. Combined means show SS having significantly higher viability than NiTi and TMA but not significant when compared to Nb-Ti-Ta-Zr. Furthermore, the exposure extracts of all wires immersed in pH 3.75 resulted in a significant reduction of cell viability percentage except that of SS wire at day 30 which was not significant. Cell viability percentage of the extracts of all tested wires at pH 3.75 at 7-day immersion were significantly lower than 30-day immersion, except for TMA, which was not statistically significant. Nb-Ti-Ta-Zr had the highest surface roughness while SS showed a relative smooth surface. Increased corrosion pattern was observed in an acidic environment.
Conclusion : Due to low cellular viability of NiTi, from a biological standpoint, Nb-Ti-Ta-Zr and SS may be viable treatment alternative in the initial stages of treatment.

P-14

In vivo optical assessment of rhodium-coated orthodontic archwires

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Objectives : The objective of this in vivo study was to investigate the optical properties of rhodium-coated archwires compared to conventional archwires and their influence on visual perception according to the Commission Internationale delEclairage (CIE) L*a*b* color space system.
Material and Methods : 30 new patients seeking orthodontic treatment were randomly allocated to three groups for each brand of ceramic brackets: Clippy-C, Damon Clear and Clarity. Brackets were placed on tooth surfaces and color measurements were performed using a spectrophotometer at three stages: (1) after bracket bonding without any archwires inserted (no wire, NW), (2) after ligating a conventional
wire, and (3) after ligating a rhodium-coated wire. Colorimetric parameters were recorded according to the CIE Lab system and color change was evaluated using National Bureau of Standards (NBS) units.
Results : All colorimetric parameters and color changes were not influenced by the type of archwire ($p > 0.05$), and the results converted into NBS units indicated insignificant difference between the two types of archwires. Among bracket types, Clarity showed lower L* values compared to Damon Clear and Clippy-C ($p < 0.001$), while Clippy-C showed lower b* and ą* values compared to the other two types of brackets ($p < 0.05$).
Conclusion : There was no statistically significant difference between ą*CW and ą*RW values, which indicated no difference in colorimetric parameters of conventional wires and rhodium-coated wires. Direct comparison by ą*SP values showed invisible color difference to human eyes in 68.1 percent of the measurements.

P-15

A prospective, split-mouth, clinical study of orthodontic titanium miniscsrews with machined and acid-etched surfaces

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Objectives : The aim of this study was to determine whether the success rate and primary stability of surface-treated miniscrews differed significantly from those of non-treated miniscrews.
Material and Methods : Patients who required one or more miniscrews for the same reason in each quadrant were recruited into a single-blinded, split-mouth, randomized, controlled trial with a 1:1 allocation ratio. Self-drilling miniscrews with two surface types were used; with no surface treatment and with an acid-etched surface treatment. The cumulative success rate and primary stability of each type of miniscrew was examined, and factors potentially affecting the success and failure of miniscrews were investigated.
Results : Forty patients were included in the study, with a total of 98 orthodontic miniscrews.
1. The overall success rate was 88.8 %, and the respective success rates for acid-etched and machined surface miniscrews were 91.8 % and 85.7 %.
2. The respective mean insertion torques were 13.62 5.95 Ncm for acid-etched miniscrews and 13.38 4 Ncm for machined surface miniscrews. Periotest values measured immediately after insertion were -0.50 2.77 for acid-etched miniscrews and -0.28 3.36 for machined surface miniscrews. There were no statistically significant differences between the two types of miniscrews
3. There was no significant difference in the mean insertion torques and periotest values according to surface treatment and jaw.
4. In the analysis of risk factors that affect the stability of orthodontic miniscrews, the success rate of miniscrews was low in cases of distalization and open bite group, which was statistically significant.
Conclusion : Neither the success rate nor the primary stability of acid-etched surface miniscrews and machined surface miniscrews differed significantly. There is a high possibility that miniscrews will fall out in patients who have an open bite or require total distalization.

P-16

Ultraviolet light treatment of SLA miniscrews followed by wet storage enhances bioactivity during shelf storage

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Objectives : The aim of this study was to evaluate whether combining two treatments to avoid biological aging of the surface of titanium and zirconia implants; i.e., storage in an aqueous solution after ultraviolet light (UV) or non-thermal atmospheric pressure plasma (NTP) treatment, yielded surface biological activity comparable to that following post-15-min UV or NTP treatment storage under air or immediately after UV or NTP treatment.
Material and Methods : Grade IV titanium discs modified by large grit sand-blasting and acid-etching (SLA) and smooth zirconia discs were irradiated with UV or NTP and their surface properties were evaluated immediately and after storage for 8 weeks in distilled H2O (dH2O) and a sealed container under air.
Results : Approximately 15–30 nm-sized nano-protrusions were formed only on SLA surfaces in dH2O immediately after UV or NTP treatment. Immediate dH2O storage after UV or NTP treatment prevented hydrocarbon contamination and maintained elevated amounts of Ti and Zr. After 8 weeks, unlike zirconia, protein adsorption, cellular adhesion, and cytoskeletal development of MC3T3-E1 cells on SLA surfaces stored in dH2O immediately after UV treatment were further exceeding those immediately after UV or NTP treatments.
Conclusion : UV treatment of SLA implants followed by wet storage can not only maintain but also strengthen biological activity during shelf storage.

P-17

Novel anti-biofouling light-curable fluoride varnish containing 2-methacryloyloxyethyl phosphorylcholine to prevent enamel demineralization

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Objectives : We evaluated the efficacy of light-curable fluoride varnish (LCFV) that contains 2-methacryloyloxyethyl phosphorylcholine (MPC) in terms of anti-biofouling properties and prevention
of tooth enamel demineralization.
Material and Methods : MPC was mixed with and incorporated into LCFV at 0 (control), 1.5, 3.0, 5.0, 10.0, 20.0, and 40.0 weight percentage (wt%).
Results : Addition of high wt% of MPC resulted in increased film thickness and decreased the degree of conversion, indicating loss of the advantageous properties of LCFV. Addition of 1.5, 3, or 5 wt% MPC significantly reduced the amount of bovine serum albumin adsorbed from a solution and proteins adsorbed from brain heart infusion medium compared to the control ($P < 0.001$). A similar pattern was observed for bacterial adhesion: significantly less Streptococcus mutans cells adhered on the surface of LCFV with 1.5, 3, or 5 wt% MPC ($P < 0.001$) than on the control. Finally, bacterial adhesion and surface microhardness loss were substantially lower on bovine tooth enamel surface coated with LCFV containing 3 wt% of MPC than in the control treatment (0 wt% MPC).
Conclusion : Therefore, this novel LCFV containing a low concentration of MPC (e.g., 3 wt%) would be effective in anti-biofouling while maintaining the important advantageous features of light-curable fluoride in preventing demineralization.

P-18

A comparison of micro-Implant placement characteristics and fracture strength between the Ti6Al4V and Ti6Al7Nb materials

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Objectives : The purpose of this paper is to measure and compare placement characteristics and fracture torque, and verify whether the MI made of the Ti6Al7Nb material has enough dynamic strength as be used instead of the conventional Ti6Al4V ELI MI.
Material and Methods : The experimental group consisted of 25 MIs, made using the Ti6Al7Nb material with diameter of 1.4mm and placement depth of 6.5mm. The control group consisted of 25 MIs, made using the Ti6Al4V ELI material. A bone flap with density of 50 PCF(pounds per cubic feet) was used for the cortical bone layer, and a 30 PCF was used for the cancellous bone layer. An implant placement engine was used to perpendicularly place the MIs on the artificial bone specimens to 6mm depth, at a rate of 10 rpm and under normal force of 1 Kg. Torque was recorded once in every one-eighth of a second and maximum torque values were compared.
Results : Whereas torque increased rapidly during the first 40-second section during which the MIs penetrated through the cortical bone, torque increased at a relatively gentle rate after penetrating through the cortical bone plate. Torque of the experimental group was slightly low compared to the control group. There were no differences in maximum placement torque and fracture torque between the experimental group and control group.
Conclusion : Based on the comparison of MI placement characteristics and fracture strength between the Ti6Al7Nb alloy material and conventional Ti6Al4V ELI material, there were no significant differences between the two materials at the significance level of 0.05. The null hypothesis that there are no differences in MI placement characteristics and fracture torque between the Ti6Al4V ELI and Ti6Al7Nb materials can be accepted.

P-19

Biomechanical analysis for total distalization of the maxillary dentition: A finite element study

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Objectives : The aim of this study was to mechanically evaluate displacement of maxillary whole dentition after distalization using variant MCPP modalities through finite element analysis.
Material and Methods : Twelve FE models have been constructed by banded tooth (1st premolar (U4), 2nd premolar (U5), and 1st molar (U6)) connected by Palatal Retraction Archwire (PRA) and by the vertical position of PRA hook (PRA-H) (0mm, 4mm, 7mm, and 10mm) in each modality. With each model was applied 300g-retraction force per side on hook from MCPP arms. The planes of the 3D coordinate system can be identified as follows: X-plane = sagittal plane, Y-plane = transverse plane, Z-plane = Vertical plane. Positive values indicate forward, right side, and upward displacements in the X, Y, and Z planes, respectively.
Results : In the sagittal plane, U6 with PRA-H0mm model showed total arch distalization of the maxillary dentition. Transversely, U5 with PRA-H10mm showed greatest buccal tipping movement of the 2nd premolar. Vertically, U5 with PRA-H0mm model resulted in the greatest amount of intrusion of the 2nd premolar. Whereas, U5 with PRA-H10mm model showed the greatest extrusion of the 2nd premolar.
Conclusion : U6 with PRA-H0mm was the most effective model for distalization of the maxillary dentition using MCPP. It can be suggested as a useful guidance for the application of MCPP.

P-20

Clinical significance of increase in vertical dimension of the stabilization splint

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Introduction : For a patient who has TMD symptoms and instable occlusion, a stabilization splint is recommended to use before orthodontic treatment. With the use of the splint, clinicians often witness that condyles move anterosuperiorly and posterior teeth become fulcrum, resulting in clockwise rotation of mandible and open bite with Class II relation. Beside the alteration of these occlusal condition and change of the mandibular position, the splint temporarily increase the patients vertical dimension. It has been demonstrated that an increase in vertical dimension can temporarily decrease muscle activity and may be responsible for the symptom reduction. The mechanism of the pain reduction around temporomandibular structures, however, has not been indentified yet.

Discussion : When the splint is applied and vertical dimension is increased, muscle spindles in the masseter muscle are stretched and activated to contract masseter muscle to its original length. This is called "stretch reflex". However, if stretch in the muscle persists for more than 7 to 10 seconds, the activity of Golgi tendon organs overrides the impulse of the spindle and responds by inhibiting contraction (reflex inhibition) and the muscles start to be relaxed as a result of "Golgi tendon reflex". As a consequence of the above mechanism, increased vertical dimension leads to muscle relaxation and reduced pain around temporomandibular structures.

Conclusion : The treatment objectives of orthodontic treatment are not limited to pain reduction of temporomandibular joint but to make stable occlusion in a musculoskeletally stable position. Establishing orthopedic stability in the masticatory structures should be a routine part of the orthodontic treatment. Achievement of these treatment objectives will reduce the patient's risk factors for developing TMD and increase the stability of orthodontic outcomes.

P-21

Prediction of optimal bending angles of a running loop to achieve bodily protraction

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Objectives : The purpose of this study was to predict the optimal bending angles of a running loop for bodily protraction of the mandibular first molars and to clarify the mechanics of molar tipping and rotation, using the finite element method.
Material and Methods : A three-dimensional finite element model was developed for predicting the orthodontic tooth movement on the basis of computed tomography images of a dental study model. A mechanical model based on the beam theory was constructed for clarifying the force systems.
Results : When a running loop without bends was used, the molar tipped mesially by 9.6 degrees and rotated counterclockwise by 5.4 degrees. These angles were almost similar to those predicted by the beam theory. When the amount of tip-back and toe-in angles were 11.5 and 9.9 degrees, respectively, bodily movement of the molar was achieved. When the bend angles were increased to 14.2 and 18.7 degrees, the molar tipped distally 4.9 degrees and rotated clockwise 1.5 degrees.
Conclusion : Bodily movement of a mandibular first molar was achieved during protraction by controlling the tip-back and toe-in angles with the use of a running loop. The beam theory was effective for understanding the mechanics of molar tipping and rotation, as well as for predicting the optimal bending angles.

P-22

Maxillofacial complex displacement during maxillary protraction using palatal plates: Finite element analysis

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Objectives : The purpose of this study was to analyze initial displacement of the maxillofacial complex during dentoskeletal maxillary protraction with various appliance designs placed on the palatal region by using three-dimensional finite element analysis.

Material and Methods : Six models of maxillary protraction were developed: conventional facemask (Type A), facemask with dentoskeletal hybrid anchorage (Type B), facemask with a palatal plate (Type C), intraoral traction using a Class III palatal plate (Type D), facemask with a palatal plate combined with rapid maxillary expansion (RME; Type E), and Class III palatal plate intraoral traction with RME (Type F). In Types A, B, C, and D, maxillary protraction alone was performed, whereas in Types E and F, transverse expansion was performed simultaneously with maxillary protraction.

Results : Type C displayed the greatest amount of anterior dentoskeletal displacement in the sagittal plane. Types A and B resulted in similar amounts of anterior displacement of all the maxillofacial landmarks. Type D showed little movement while Type E displayed a larger range of movement of the maxillofacial landmarks in all directions.

Conclusion : The palatal plate served as an effective skeletal anchor for use with the facemask in maxillary protraction. In contrast, the intraoral use of Class III palatal plates showed minimal skeletal and dental effects in maxillary protraction. In addition, palatal expansion with the protraction force showed minimal effect on the forward movement of the maxillary complex.

P-23

The 3-dimensional zone of the center of resistance of the mandibular posterior teeth segment

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Objectives : The center of resistance in 3-dimensional (3D) space is not a point but a small volume and is influenced by tooth morphology and direction of application of force. The aim of this study was to localize the 3D zone of the center of resistance (ZCR) of mandibular posterior teeth groups (Group 1: first molar; Group 2: both molars; Group 3: both molars, and second premolar; Group 4: both molars, and both premolars) using 3D-finite-element analysis.

Material and Methods : 3D-finite-element models comprised the mandibular posterior teeth, periodontal ligament, and alveolar bone. In the symmetric bilateral model, a 100-g midline force was applied on a median sagittal plane at 0.1-mm intervals, to determine the AP and vertical positions of the ZCR (where the applied force induced translation). The most reliable BL position of the ZCR was then determined in the unilateral model. The combination of the AP, vertical, and BL positions was defined as the ZCR.

Results : The ZCRs of Group 1/Group 2/Group 3/Group 4 were 0.48, 0.46, 0.5, and 0.53 of the mandibular first molar root length from the alveolar crest level, and located slightly distobuccally, at AP ratios of 2:3, 2:2.3, 2:2.4, and 2:2.5 to each sectional arch length and at BL ratios of 2:1.5, 2:1.1, 2:1.6, and 2:2.4 to the first molars BL width, respectively.

Conclusion : Clinically, the ZCR may be simplified to a point of the 3D-CR as the 3D CR volume is very small, and it can be a useful reference for 3D-movement planning of mandibular posterior teeth or segments.

P-24

Local ointment application of Reveromycin A prevents alveolar bone loss from periodontal disease

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Purpose : Inhibiting the progress of periodontal disease is important for long-term orthodontic treatment. We aimed to identify the effects of local ointment application of the osteoclast-specific inhibitor Reveromycin A (RMA) in periodontal tissue by using an experimental model analyzing mice with periodontitis caused by food impaction.

Materials and methods : Eight-week-old male wild type mice were ligated with wire around the contact point between the left maxillary first molar (M1) and second molar (M2). The areas were locally applied with RMA ointment for eight weeks. The remaining alveolar bones between M1 and M2 were measured using micro CT image analysis software and then were performed histological analysis.

Results : At eight weeks after ligation, the remaining alveolar bone mass in the RMA ointment group (RMA+) was higher than in the non RMA ointment group (RMA-). Histologic findings in representative hematoxylin-eosin staine in the periodontal tissue indicated that the attachment loss was lower in the RMA+ group than RMA– group. Also osteoclast counts of the RMA+ group were lower than in the RMA– group. Immunohistochemical findings in the periodontal tissue, the scores of TNF-ח and IL-1⁚f inflammatory cytokines were lower in the RMA+ group than RMA– group.

Conclusions : These results suggested that local ointment application of Reveromycin A inhibits the activity of osteoclasts and prevents alveolar bone loss from periodontal disease.

P-25

α2-adrenergic receptors-mediated signaling negatively regulates osteoclastogenesis

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Objectives : It is important to minimize the tooth movement of anchor tooth during orthodontic treatment. In order to do that, it is necessary to suppress the resorption of alveolar bone arround the anchor tooth. The sympathetic nerve system is known to be involved in osteoclast differentiation. However, little is known about the role of the α2 adrenergic receptors (α2-ARs) during the development of osteoclasts. Therefore, in this study, we examined whether α2-ARs-mediated signaling would regulate osteoclast differentiation.

Material and Methods : We employed RAW264.7 pre-osteoclast and primary bone marrow cells to evaluate osteoclastogenesis. In the presence and absence of α2-AR agonists (Guanabenz, clonidine and xylazine) and α2-AR antagonists (yohimbine and idazoxan), these cells were cultured in osteoclast differentiation medium. We evaluated the mRNA levels of nuclear factor of activated T-cells, cytoplasmic 1 (NFATc1), cathepsin K, and tartrate-resistant acid phosphatase (TRAP) using quantitative real time PCR. Furthermore, TRAP staining was also conducted to assess the effects of α2-AR agonists on osteoclastogenesis.

Results : The RANKL-induced expression of NFATc1, TRAP and cathepsin K mRNA was reduced by administration of 5-20 μM guanabenz, 20 μM clonidine and 20 μM xylazine. Furthermore, the reductions in these mRNA levels in response 10 μM guanabenz and 20 μM clonidine were attenuated by 20 μM yohimbine or idazoxan. The number of TRAP-positive multinucleated osteoclasts were significantly reduced by 5-20 μM guanabenz and 10-20 μM clonidine.

Conclusion : This study demonstrates that α2-ARs may be involved in the regulation of osteoclastogenesis. α2-AR agonists may be considered as potential therapeutic agents for suppression of the movement of the anchor tooth during orthodontic treatment.

P-26

Effects of β-blocker on osteocyte during tooth movement

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Objectives : The regulation of bone metabolism by the sympathetic nervous system has become clearer recently. We showed that the selective β2 adrenaline receptor (β2-AR) blocker (butoxamine) reduced tooth movement and restored decreased maxillary alveolar bone volume in spontaneously hypertensive rats (SHR) with sympathicotonia. Recent studies shows that osteocytes, and not osteoblasts, is the major source of receptor activator of nuclear factor kappa-B ligand (RANKL), which was a key factor for osteoclast differentiation and activation. The influence that β-AR blocker causes to osteocyte on tooth movement is not clear. In this study, we compared the effects of β-AR blockers, such as atenolol (β1-AR blocker), butoxamine (β2-AR blocker), and propranolol (non-selective β-AR blocker) on osteocyte during tooth movement in SHR.

Material and Methods : Atenolol, butoxamine, and propranolol were administered daily to each SHR group. A closed-coil nickel-titanium spring was connected between the maxillary first molar and maxillary central incisor teeth. After four weeks, we calculated the distance of tooth movement, trabecular microarchitecture and histomorphometry analysis.

Results : Atenolol, butoxamine and propranolol treatment inhibited the amount of tooth movement and increased maxillary alveolar bone volume. Meanwhile, atenolol, butoxamine and propranolol treatment decreased osteoclast number and surface, and increased mineral apposition rate (MAR) in the compression side. Furthermore, immunohistochemical analysis revealed osteocytes expressed β1-AR and β2-AR and osteoblasts expressed only β2-AR. Also atenolol, butoxamine and propranolol treatment reduced sclerostin (SOST) and RANKL positive osteocytes in the compression side.

Conclusion : we found that a β-AR blocker reduced tooth movement and restored bone volume in SHR, and also that a β-AR blocker regulated bone metabolism of alveolar bone by a new pathway, which reduced production of SOST and RANKL from osteocytes.

P-27

The increase of nasal inspiratory airway by maxillary skeletal expansion

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Objectives : The aim of this study was to evaluate the change of nasal inspiratory airway, nasal and zygomatic width induced by MSE(maxillary skeletal expansion) utilizing cone beam computed tomography in the coronal plane.
Material and Methods : The sample consisted of 42 patients (11 men, 31 women) in the permanent dentition who were diagnosed as maxillary transverse deficiency by the Yonsei Transverse Index(YTI). Patients received a simple respiratory test before and after maxillary skeletal expansion. 23 patients were younger than 20 and 19 patients were older than 20. The types of devices were MARPE(7 patients), MAPE(25 patients), Hybrid RPE(10 patients). The screw of MSE devices was turned by clinician a quarter of screw twice a week for two to three months, and then turned twice a month thereafter.
The respiratory flow was also measured through the Peak nasal inspiratory flow measurement device. Computed tomograms were taken before expansion and after maxillary skeletal expansion. The tomograms were analyzed by invivo5 software to reconstruct 3-dimensional images and to calculate the width of the nasal, zygomatic cavities before and after expansion.
Results : A significant difference was found in mouth respiratory flow($P<0.001$), nasal respiratory flow($P<0.001$), nasal cavity width($P<0.001$), inter-first molar width($P<0.001$). between before expansion and after active expansion in paired t-test.
Moreover, width enlargement of nasal cavity showed a significant positive correlation with nasal respiratory flow as well as inter-first molar width by correlation analysis.
Conclusion : Based on the results indicated, MSE(maxillary skeletal expansion) significantly increases nasal cavity and decreases resistance in nasal cavity. Therefore, clinical application of MSE to resolve maxillary transverse deficiency with narrow nasal airway is recommendable to enhance physiologic treatment outcomes.

P-28

Development of Dental Pulp Stem Cell-derived Micro Bone Tissue

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Objectives : This study demonstrated the feasibility of integrated bioprocess using dental pulp stem cell (DPSC), microwell-mediated cell spheroids and a High Aspect Ratio Vessel (HARV) bioreactor to develop in vitro cell-based bone tissue for bone tissue engineering.

Material and Methods : Polyethylene glycol microwell-mediated DPSC spheroids were cultured in a High Aspect Ratio Vessel (HARV) bioreactor in the presence of osteogenic supplements for differentiation of dental pulp stem cell (DPSC) to osteoblasts. In the integrated bioprocess, Polyethylene glycol microwells were applied to generate cell spheroids for 3D cell and tissue growth, and a High Aspect Ratio Vessel (HARV) bioreactor was used to facilitate the mass transport of nutrients and osteogenic supplements into the formed 3D tissue. 3D Dynamic culture using cell spheroids and a rotating bioreactor enhanced the survival and osteogenic differentiation of DPSCs in vitro, and finally highly mineralized tissues were generated.

Results : Integrated bioprocess described here would provide an efficient method to develop 3D cell-based bone tissue in the context of macroscopic bone formation. Especially, through the expression of osteocalcin and type I collagen in 3D osteogenic culture system, it was confirmed that the integrated bioprocess demonstrated the correlation between mineralized bone nodule formation and osteogenic gene expression.

Conclusion : The dynamic culture system in this study has shown potential as an alternative strategy for bone repair and bone tissue engineering.

P-29

Alveolar bone remodeling during upper incisors intrusion and retraction

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Objectives : To identify factors related to upper incisors alveolar bone remodeling during intrusion and retraction.

Material and Methods : 34 Korean orthodontic patients (34 females; mean age 25.8 years, from 14 to 49 years) who underwent extraction treatment accompanied with upper incisors intrusion and retraction were examined. Lateral cephalometric radiographs were taken and total 25 linear, angular and ratio variables of facial structures which could affect the alveolar bone remodeling of upper incisors were measured. The levels of alveolar bone were categorized as T1, T2, and T3 according to 3, 6, 9 mm distance from the alveolar crest. Pearsons correlation coefficients were measured to identify variables related to alveolar bone remodeling ($P< 0.05$).

Results : The initial angulation between labial surface and corresponding alveolar bone of upper incisors are correlated with the amount of the angulation change. The amount of T1 change, T2 change and T3 change are correlated with the initial palatal plane to upper incisor angle, the initial palatal plane to upper incisor labial bone angle. The changes in T1, T2, and T3 are also correlated. The initial ratio of T2 to T1 is correlated with the change in the ratio of T2 to T1. The amount of palatal bone resorption is correlated with the initial interincisal angle, FH to functional occlusal plane angle, the amount of alveolar bone bending, and the initial and final mandibular plane angle.

Conclusion : The suggested factors related to alveolar bone remodeling in this study would enhance the predictability of alveolar bone response in patients with upper incisors intrusion and retraction, which provides an insight into safe and reliable orthodontic treatment.

P-30

RANKL transiently facilitates tooth eruption and osteoclastogenesis

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Objectives : To investigate the expression of exogenous injected local receptor activator of nuclear factor-kappa ligand (RANKL) inducing osteoclastogenesis during tooth germ eruption and alveolar bone development in a mouse.
Material and Methods : Forty fetal mice were born from pregnant mice on day 16-17 of gestation, on day 3 of fetal mice were randomly divided into control and experiment groups. In experiment groups, subcutaneous injection of RANKL (0.4 mg/kg) into inferior mandible areas of mice daily until day 11. On day 7, 9, 11 and 13 of 10 mice (control 5 animals and experimental 5 animals) were sacrificed, respectively. Micro-CT reconstructed images of the lower incisors and molars were used to survey the tooth eruption. Longitudinal sections of the mandibles were prepared for H & E and TRAP staining to perform the TRAP-positive cell counting. Statistical comparisons were carried out using Students t-tests (P .01).
Results : The incisal edge of incisors from the bone ridges on mice day 11 and 13 in RANKL group appeared significantly more exposure than in PBS groups. RANKL groups showed the significantly large number of multinuclear TRAP-positive osteoclasts on day 7, 9 and 11(P .01). The molar tooth eruption in the RANKL group was slightly faster than those identified in PBS groups on day 9 and 11.
Conclusion : The facilitating effect on tooth eruption and alveolar bone development probably be mediated by exogenous RANKL. However, this effect expressed in transient time of tooth eruption process. Short-term local administration of RANKL may be a method by which to induce the tooth eruption in patients with ankylosed teeth or impacted teeth.

P-31

An auto-transplantation case with root resorption: 6-year follow up

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Introduction : Treatment of children with multiple congenitally missing teeth is challenging. The treatment options include retaining the space by maintain deciduous teeth or using space maintainer until the age of final prosthesis delivery, or close the space by orthodontic force in early age. On the other hand, auto-transplantation is an alternative treatment for these patients during mixed dentition.
Summary : A 9-year-old female patient with multiple congenital missing mandibular premolars (#35, #44 and #45) is presented. She had convex profile, perioral protrusion and skeletal class I malocclusion. The treatment combined auto-transplantation of the maxillary left first premolar to the mandibular right second premolar region and orthodontic treatment with a 6-year follow-up.
Even we follow the protocol of auto-transplantation; the transplanted tooth had internal root resorption after orthodontic force was applied for three months. Thus, root canal treatment was arranged, and the orthodontic force was stopped until pulp and periapical status was stable. After 5 months endodontic dressing, the root resorption of the transplanted tooth was under controlled and the periodontal status was stable, also the teeth could provide normal occlusal function after orthodontic treatment.
Conclusions : In a patient with multiple congenitally missing premolars, auto-transplantation in proper timing with cautious clinical management could be an alternative treatment option.

P-32

A traction case of the causative impacted tooth with ameloblastic fibroma

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Introduction : Treatment of the causative impacted teeth in pediatric patients with ameloblastic fibromas usually involves resection of the ameloblastic fibromas and extraction of the causative impacted teeth. However, in our case, we used the dredging method. Dredging is a treatment method that eradicates the tumor and restores the normal form and function of the jaw in order to overcome these disadvantages. Fenestration and traction of the impacted teeth were performed. There is no ameloblastic fibromas recurrence. The impacted teeth erupted to occlusal plane.

Summary : We report the case of a 11-year-old boy who had an impacted left mandibular first molar with ameloblastic fibromas. He had deep bite and slight crowding. Lower mid line was right shift. We treated the ameloblastic fibromas by the dredging method in 2012. Then, the causative impacted first molar was treated by fenestration and traction. The lingual arch was set in mandible for anchorage. This tooth erupted to occlusal plane during 5 years. The amount of movement of this tooth was about 20 mm. There has been no sigh of recurrence in the 6 years after operation. We are performing follow-up observation with orthopantomography and CT. Now we started treatment with multi brackets appliance.

Conclusions : It was possible to erupt by the traction the causative impacted first molar from a patient with ameloblastic fibromas treated by the dredging method.

P-33

Orthodontic guided eruption of impacted maxillary canine

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Introduction : Maxillary canines are the second most frequently impacted teeth in the dental arch. In some cases, simply extracting deciduous canine leads to normal eruption of permanent canine. In other cases, rather invasive surgical intervention and orthodontic traction are required.
Case Summary : In this case report, an 11-year old girl with an impacted maxillary canine visited our clinic. The canine cusp was placed between the root tips of central and lateral incisors, and the resorption of lateral incisor root had already taken place. No treatment would result in transposition of lateral incisor and canine. The extraction of deciduous canine alone could not bring out any significant change. In such circumstances, one way to correct the canine erupting path would be the combination of window opening-button bonding – orthodontic traction. However, the girl and the parents strongly refused to have any surgical intervention due to the girls trauma.
The treatment of this girl involved deciduous canine extraction, direct bonding orthodontic fixed appliance (2x4), and applying lingual torque and mesial tipping force to the adjacent lateral incisor root on 019x025 TMA wire. During bracket bonding, the lateral incisor bracket was place strategically so that the lateral incisor root would not interfere with the impacted canine cusp.
Conclusion : Despite the unfavorable location of the impacted canine cusp, the impacted canine successfully found the correct erupting path. We are now expecting the normal eruption of impacted canine.

P-34

Can we control arch form by using light wire?

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Introduction : Recently, tube-type appliance is drawing clinicians attention due to minimal pain and discomfort. Tube-type appliance is especially popular to treat elderly patients because light wire enables alignment without abruptly changing posterior occlusion. However, traditional edgewise appliance has been used instead of tube-type appliance when arch form needs to be changed. This led to increased patient discomfort and treatment time due to unnecessary tooth movement. To avoid use of conventional brackets, clear aligners have to be fabricated in addition to tube-type appliance.

Case Summary :

Nowadays, biomechanically sound treatment techniques also have advanced as use of tube-type appliance has been increased. Arch form change such as expansion or constriction of intercanine width is possible with light force. Moreover, unilateral expansion or constriction of intercanine width can also be carried out.

Mesiodistal position of the terminal tube is a key to control arch width. If the terminal tube is intentionally positioned distally on both right and left sides, intercanine width is increased bilaterally. On the contrary, bilateral mesial positioning of the terminal tube constricts arch form bilaterally. Complex cases including unilateral crossbite in canine region can also be corrected easily with this technique. If the terminal tube is positioned distally on one side, arch form expands unilaterally. Similarly, mesial positioning of the terminal tube on one side constricts arch form unilaterally.

Interproximal stripping is often required on mesial and distal surface of teeth that are planned to move labially or lingually depending on the expansion or constriction of the arch form.

Conclusion : This presentation introduced a treatment protocol to control arch form using light wire. Arch form can be easily controlled with mini-tube appliance by controlling mesiodistal position of the terminal tube.

P-35

Treatment of Class II malocclusion with maxillary second molar extraction

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Introduction : In nongrowing patients with Class II malocculsion, premolar extraction, second molar extraction or distalization can be used as treatment option. Second molar extraction corrects Class II malocclusion by distal movement of upper dental arch thus Class I molar relationship can be achieved. Second molar extraction facilitates the distal movement of first molars for Class II correction and reduces duration of treatment. This case report presents a Class II malocclusion patient with upper incisor protrusion who were treated with maxillary second molar extraction and distalization of maxillary dentition using TAD.
Case Summary : A 14-year-old female demonstrating Skeletal Class II, Angles Class II molar relationship and mild crowding on maxillary dentition had a chief complaint of upper incisor protrusion. Overbite and overjet were 6.5 mm and 5.0 mm respectively. To achieve Class I molar relationship, the amount of distalization were 2.6 mm on right side and 3.4 mm on the left side. Third molars were present and the feature were appropriate in size and shape to replace seocond molars. The crown of third molar was fully developed with little or no root formation. Which was the right time to carry out second molar extraction. maxillary second molars were extracted and patient was treated with full fixed appliance. Anterior bite plate on maxillary dentition and intrusion arch on lower anterior teeth were applied to treat deep bite. With TAD on midpalate Maxillary dentition was distalized for 9 month and Class I molar relationship was achieved. The total duration of treatment was 17 months.
Conclusion : Maxillary second molar extraction is an alternative treatment choice for dentoalveolar compensation of Class II cases. This rigorous treatment is not a routine. But when individual case meets the criteria, it is a very effective and efficient approach for the dentoalveolar correction of certain Class II malocclusions.

P-36

The strategy of middle-aged adult orthodontic patients using anterior lingual brackets

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Introduction : One of the major factor of decision for starting orthodontic treatment is aesthetic appreciation. Minimally invasive dentistry by brace of only anterior teeth reduce the cost, period of treatment and discomfort.
So minimum treatment with lingual appliances may be increasing demand for orthodontic treatment to patients avoiding getting into.
Case Summary : Considering patients clinical factors, and environmental factors, lingual 2D bracket system can be used for orthodontic treatment.
Because lingual 2D bracket system can only achieve alignment and leveling, presence of skeletal and dental problems and perfection of posterior occlusion and root parallelism and size of anterior teeth are important things for consideration.
Using conventional brace therapy results in increasing cost and period of treatment, considering the disadvantages, if Lingual 2D bracket system therapy with interproximal reduction(IPR) for decrowding achieve the esthetic and functional purpose of treatment, it could be a practicable alternative.
Rapid alignment was obtained with the light Ni-Ti wire and light TMA wire bending and interproximal reduction and additional appliances, it was possible with minimum loss.
Conclusion : For treatment of mild to moderate anterior crowding of middle-aged adult with normal root parallelism and good anterior Bolton ratio, lingual 2D bracket system can be the best choice for orthodontic treatment. It is believed that more adult patients can be involved by comfortable and minimal orthodontic treatment.

P-37

Three treatment options of mandibular second molar impaction

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Introduction : Mandibular second molar is crucial to normal occlusion. Mandibular second molar impaction is observed rarely (0.2%). But it seems to deepen to mandibular arch crowding in the anterior and posterior region. Etiology of the second molar impaction are as follows; space insufficiency, follicle collision, ankylosis and unknown origin.

Summary : The first case has a severe tilted second mandibular molar. This case was treated with mini-bracket and super-elastic wire. Second patients mandibular second molar was located in a deep mandibular body. Surgical exposure and pulling by a temporary anchorage device (TAD) were performed. The third case shows staggered appearance in the panoramic view. First choice was surgical extraction and transplantation.

Case 1
Name; YB Hwang, Age; 18, Sex; Female,
CC; Crowding
Dx; Severely tilting of right mandibular second molar
Appliance; 022*028 SWA and Tiggle bracket on #37
Second molar up-righting ; .012 and .014 super-elastic NITI archwire

Case 2
Name; HY Kim, Age; 20, Sex; Female,
CC; Mouth protrusion, Bruxism
Dx; Class II crowding, mandibular asymmetry, molar impaction on #47
Appliance; 022*028 SWA and molar tube on #47
Wire used .016*.022 copper NITI for second molar up-righting.
TAD used twice for pulling of second molar posteriorly and anteriorly
Facial asymmetry was corrected by two jaw surgery.

Case 3
Name; AR Jo, Age; 19, Sex; Female,
CC; Missing mandibular molar and mouth protrusion
Dx; Class II crowding, molar impaction on #37, #47, It has malformed root and may be akylosed.
Appliance; 022*028 SWA
Second molars was extracted surgically and third molars was transplanted.
After twelve month, wires are used on the transplant.

Conclusions : All cases attained functional normal occlusion and facial beauty. Fixed orthodontic appliance, temporary anchorage device, transplantation used to correct mandibular second molar impaction. These approach will be good option in similar situation.

P-38

Nonsurgical orthodontic approach for ankylosed single permanent incisor with vertical bone defect

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Introduction : Tooth ankylosis in growing patients can cause bone level discrepancy which could be led to tooth level discrepancy. Since affected tooth loses bone remodeling ability due to lack of periodontal ligament, relocation with orthodontic traction can be difficult even with subluxation. Treatment goal in such cases should be removal of bone and tooth level discrepancy.
Case Summary : We report two cases with ankylosed single permanent incisor with vertical bone defect. Both cases had a skeletal Class I malocclusion, anterior open bite, lip incompetency and a single ankylosed maxillary permanent central incisor. Total arch intrusion based on level of ankylosed tooth was performed to remove tooth level discrepancy and vertical bone defect. Establishment of occlusal plane as ankylosed tooth level led to open bite correction and lip incompetency removal in parallel. Pre-treatment, post-treatment photographs demonstrate effective, esthetically-pleasing treatment results.
Conclusion : Leaving single infraoccluded ankylosed tooth as it is can result in many pathologic conditions such as dental caries, periodontitis or even extraction. Especially, if it comes to anterior teeth area, esthetical point of view should be considered as well. Therefore, comprehensive treatment approach with proper treatment objectives including perspective on removal of vertical bone defect can improve longevity and favorable prognosis of treatment results.

P-39

Considerations in orthodontic treatment of the patients with anterior tooth size discrepancy

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Introduction : The size and shape of anterior teeth is very important factor in orthodontic treatment, because it could affect function and esthetics, both. When patients have peg-shaped teeth or congenital missing of lower incisors, orthodontists have to consider varies factors to achieve good results. In these cases, interdisciplinary collaboration between dentists, orthodontists, and periodontists would be essential.
In this presentation, Ill discuss the considering factors in the patients with anterior tooth size discrepancy, and will show some cases.

Case Summary :

case 1.
33Y 6M / Male
Class III anterior crossbite with #12 missing and #22 peg-shaped tooth
treated by 4 non-extraction, #12-22 prosthodontic treatment

case 2.
16Y 0M / Female
Class I with #32, #42 congenital missing and lower spacing
treated by non-extraction and #32, 42 prosthodontic treatment

case 3.
27Y 9M / Female
Calss III with lower mandibular 3 incisors
treated by 4 premolars extraction

case 4.
Class III with #12, 22 peg-shaped tooth
Treated by non-extraction and lower anterior stripping

Conclusion : Orthodontists have to make a proper treatment plan considering tooth shape and proportionality in the patients with anterior tooth size discrepancy. In these cases, proper space consolidation is very important. Also, it is necessary for us to collaborate with other specialties for good treatment results.

P-40

Anterior space closure with partial fixed appliance in patient with fibrotic gingival hyperplasia: Case report

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Introduction : Anterior spacing can be due to a variety of reasons, and gingival hyperplasia has been reported as a factor that can change the dentition. Assessment of anterior overbite, Bolton tooth ratio, soft tissue and oral habits is very important for space closure.

Case Summary : A 25 years old male patient has been treated periodic gingivectomy, gingivoplasty and periodontal treatment with recurrent fibrotic gingival hyperplasia. The chief complaint of the patient was confined to the anterior part, and posterior alignment and occlusion were not bad. Also, because he did not want to improve lip protrusion, I decided to close the space by 2X6 fixed appliance. Since the anterior overbite was deep, bite opening was planned for space closure. Maxillary and mandibular 6 Anterior teeth and first molar were leveled with fixed orthodontic appliances, and an intrusional and retractional TMA utility arch wire was used to move the 6 anterior teeth upward and backward, closing the space. Then the lingual fixed retainer was attached to the 6 anterior teeth and finished. Since then, he regularly receives maintenance checks at periodontal and orthodontic clinics.

Conclusion : Fibrous gingival hyperplasia may be considered as a cause of spacing and it is very important to cooperate with periodontal clinic.

P-41

Vertical control of Skeletal Class II malocclusion with deep bite

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Introduction : Deepbite can be treated by intrusion or flaring of the incisors, or extrusion of the buccal segments, or a combination of these. The choice of treatment depends on several factors.

Case Summary : Diagnosis and etiology

The patient, a 29-year-old woman, had a chief complaint of inconvenience in chewing and anterior teeth chipping. The patient had an excessive overbite of 10 mm and retroclined maxillary incisors with the mandibular incisors impinging on the palatal gingiva due to an excessive curve of Spee. Dental Class molar and canine relationship, missing of maxillary right first premolar and prolonged retention of primary canine were observed. The cephalometric analysis showed Class skeletal pattern with extremely hypodivergent pattern.

Treatment objectives

Treatment objectives were to (1) obtain Class I canine and molar relationships, (2) correct the deepbite with intrusion of anterior teeth and extrusion of posterior teeth, (3) obtain proper inclination and position of the anterior teeth, (4) make space for restoration of the maxillary canine, (5) achieve good retention.

Treatment progress

The treatment began with the placement of fixed anterior bite plane to enable lower anterior bracket bonding and to encourage the extrusion of the posterior teeth. For intrusion and flaring of the incisors, miniscrews were placed in between maxillary lateral incisor and canine, and C-tube orthodontic microplates (Jin Biomed Co, Bucheon, Korea) was placed in between mandibular central incisors.

Treatment results

Class I canine and molar relationships were achieved. The mandibular incisors were intruded approximately 4mm and minor extrusion of molars was observed. The cephalometric measurements showed that the U1 to FH had increased from 86.2Ơto 97.7T and IMPA had increased from 82.4Ơto 116.5Ţ

Conclusion : The intrusion of the anterior teeth could be effectively achieved by miniscrew-aided mechanics and anterior bite plane enabled extrusion of the molar.

P-42

Autotransplantation of maxillary premolars to replace missing mandibular premolars In a Class II maocclusion

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Introduction : The most common orthodontic treatment plan for skeletal CLII patients with full CLII molar relationship is maxillary premolar extraction. Autotransplantation of the maxillary premolar to missing mandibular premolar area provides several advantages over a prosthetic restoration or an osseointegrated implant.

Case Summary : This is the case of a 23-year-old woman who had a skeletal Class II malocclusion, severe deep bite, and congenital missing of second premolars in the mandible. Extraction of the maxillary first premolars was planned to improve facial esthetics and to solve Class II malocclusion. The retained deciduous second molars with poor prognosis were extracted, and the maxillary first premolars were transplanted to replace the missing mandibular second premolars on both sides after leveling and alignment. Preapplication of orthodontic force to the donor teeth minimize PDL damage of the donor tooth and increase PDL cell proliferation. After the initial healing period, a bracket was bonded to the transplant and included in the alignment with 0.016-in nickel-titanium and 0.016X0.022 nickel-titanium wires. After the leveling and alignment phase, upper anterior teeth were retracted, and esthetic facial profile and Class II molar relationship were obtained without any significant root resorption or sign of ankylosis.

Conclusion : Autotransplantation of teeth with complete root development is known to be less successful than immature teeth. However, this case demonstrates the possibility of successful orthodontic treatment with autotransplantation in adult patients as well.

P-43

Retreatment of skeletal Class II malocclusion patient with dental midline deviation and improper occlusion

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Introduction : Facial asymmetry and dental midline deviation are inevitably encountered by all orthodontists. If the treatment plan includes an extraction in mild skeletal asymmetry patient, careful treatment plan is required to ensure that iatrogenic asymmetry may not occur. Besides, making a treatment plan on patients who already had orthodontic treatment is more challenging. Therefore accurate evaluation of present illness and proper biomechanics should be applied during retreatment to prevent same problem from occurring.
Case Summary : This case report is for a 21-years-old woman with skeletal Class II malocclusion, facial asymmetry and dental midline deviation. She had a orthodontic treatment history with extraction of both maxillary first premolars and right mandibular first premolar in local clinic 5 years ago. Unilateral extraction of mandibular first premolar results in midline deviation toward the extraction site. But her chin top was deviated slightly to the left side, which made her asymmetry worsened. Also, mandibular incisors are all tipped to extraction site and open bite was on right maxillary canine area. During retreatment, maxillary molars were tipped back and distalized by TADs. Remaining left mandibular first premolar was extracted and the space was closed to left side for midline correction. Axis of mandibular incisors and openbite of right maxillary canine was corrected by proper bracket positioning and intermaxillary elastics.
Conclusion : It is important to consider both facial and dental midline when establishing a treatment plan of patient who has dental midline deviation. Inaccurate diagnosis results in iatrogenic asymmetry in final treatment results. And improper treatment mechanics result in unfavorable results such as bowing of dental arch and unparalled roots during orthodontic space closure. Therefore, aesthetic and functionally satisfactory results can be obtained by accurate diagnosis and proper treatment mechanics.

P-44

Effect of cervical or high-pull headgear on the Class II Division 1 growing patients

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Introduction : We introduce two cases of skeletal Class II malocclusion patients who have achieved good occlusion and profile through long term use of the class II orthopedics without additional fixed appliance.

Case Summary : The first case is a 7 year old female patient who has high angle skeletal Class II malocclusion and severe lip protrusion. She had mild class II molar relationship, deep bite and excessive overjet and hyper activity of mentalis muscle. This patient underwent a periodic growth check after long term use of the CII activator and High Pull Headgear to improve the profile and occlusion for about 5 years from SMI stage 0 to stage 7, and no additional fixed appliance was required. We have achieved good occlusion and profile. The patient and her parents were satisfied with these results.

The second case is an 8 year old male patient who has low angle skeletal Class II malocclusion and lip protrusion. He had class II molar relationship, deep bite and moderate crowding on upper anterior dentition. This patient long term use of the CII activator and Cervical Headgear for 4.5 years from SMI stage 0 to stage 4 without fixed appliance, and now periodic growth check is in progress. CI molar relationship and good occlusion was acquired without 2nd phase treatment.

Conclusion : In patients who have convex profile and Class II malocclusion, we usually consider the orthodontic treatment with premolars extraction or orthognathic surgery for the first choice. This is an unavoidable choice for adults. However, for some growing patients, orthopedic treatment can be better choice to preserve teeth and improve the profile and occlusion.

P-45

Camouflage treatment of skeletal Class III malocclusion with distalization of mandibular dentition utilizing TAD

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Introduction : There are several options when treating skeletal Class III malocclusion depending on the severity. Combination of orthognathic surgery and orthodontic treatment may require in severe cases. However in mild skeletal Class III, camouflage treatment can be enough to achieve esthetically and functionally satisfying result. Appropriate molar relationship can be obtained from protraction of maxillary dentition and/or distalization of mandibular dentition without surgery. Recently, these movement of whole dentition became possible by utilizing TAD.
Case Summary : A 21-year-old male patient with mild skeletal Class III had a chief complaint of irregularity in dentition. Edge-to-edge bite, crossbite in both anterior and posterior region and Class III molar relationship were observed. Arch length discrepancy of maxillary and mandibular dentition were 9.2 and 2.4mm, respectively. With small upper incisal angle and arch length discrepancy in mandible, expansion of the maxillary arch and distalization of mandibular arch were chosen as a treatment plan. Distalization of mandibular dentition was assisted by TAD. With the use of sliding jigs, the mandibular dentition was successfully distalized resulting Class I molar relationship with appropriate overjet and overbite.
Conclusion : In treating skeletal Class III patients, the orthodontists often face to make a decision between orthognathic surgery and camouflage treatment based on considering the arch length discrepancy, incisal angle, severity of malocclusion and soft tissue profile. With the help of TAD, the entire dentition can be moved anteriorly or posteriorly with minimal effect on opposing dentition, so that the orthodontist can treat mild skeletal Class III without orthognathic surgery.

P-46

Consideration of extraction options in mandibular 3-incisor cases with protruded lips

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Introduction : Congenital absence of teeth is a common dental anomaly. Congenital absence of mandibular incisors has exhibited racial ethnicity toward Korean, Chinese, Japanese population. Also, heredity or a familial distribution of congenital absence of lower incisors is suggested by some investigators. It is hard to establish proper occlusion in mandibular 3-incisor cases, because of tooth-size discrepancy. Clinicians might feel hard to make a decision which tooth to extract if they need additional extraction.

Case Summary : Two cases are noted, and there are brother and sister. Brother was a 16-year-old boy with lower left lateral incisor missing and Angles Class I malocclusion. He wanted to retrude his lips and his had high upper incisor angle, so both upper first premolars and lower right first premolar were extracted and space was closed using TAD into Class I molar relationship, and dental midline wasnt well fitted. Sister was a 14-year-old girl with lower right lateral incisor missing and Angles Class III malocclusion. She also wanted to retrude her lips and she had normal upper incisor angle, scissor bite on right upper second premolar, so both upper second premolars and lower left central incisor were extracted and space was closed with using TAD. However it was finished into end-to-end molar relationship because of tooth size discrepancy.

Conclusion : Mandibular 3-incisor case is hard to make a proper occlusion unless making a space for additional incisor. In this case, patients wanted to retrude their lips, so they needed extraction. Clinicians should think about carefully which tooth to extract considerating satisfactory occlusion for the patients.

P-47

Occlusal stabilization of functional occlusal rehabilitation with orthodontic treatment in temporomandibular disorder

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Introduction : Establishing an orthopedically stable relationship between the occlusal position of the teeth and the joint position is important for proper masticatory function throughout the patient's lifetime. The musculoskeletally stable position of the condyles coincides with the maximum intercuspal positions of the teeth, which represents orthodontic treatment goals for all patients. Unstable occlusion is end result of temporomandibular joints dysfunctional remodeling from diminished host adaptive capacity and/or biomechanical stress.
Without occlusal stabilization the condyle continues to modify and change the occlusion.
This case report presents the advanced occlusal stabilization in patients of temporomandibular disorder with orthodontic treatment.
Case Summary : The patient having signs & symtoms of systemic illness(congenital syphilis, renal failure, hypertention, hyperlipidemia), Hutchinsons incisor, collapsed occlusal plane, retained deciduous teeth and malformed or congenital missing and impaction of permanant teeth and masticatory dysfunction was orthodontically rehabilitated of functional occlusion by posterior occlusal bite block, interalvolar elastics and orthodontic miniscrew.
The other patient having mouth opening limitation history, traumatic functional occlusion in anterior teeth, cervical abfractions and cracks accompanying occlusal and incisal wears of multiple anterior and posterior teeth and parafunction(clenching, bruxism) was acquired optimum orthopedic stability in the masicatory system with orthodondic treatment.
Conclusion : The maximum intercuspal positions of the teeth obtained by orthodondic treatment would be expected to show the musculoskeletally stable position of the condyles and optimum orthopedic stability in the masicatory system.

P-48

Orthodontic closure of maxillary first molar extraction space by maxillary molar protraction in various ages

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Introduction : It is often to deal with patients who lost permanent molars or had hopeless permanent molars requiring orthodontic treatment. Orthodontic space closure by protracting posterior teeth can be an excellent treatment option without dental implants. Because of the anatomic and biologic challenges such as pneumatized maxillary sinus, alveolar bone atrophy and wide extraction space of first molar, a carefully selected force system should be applied.
Case Summary : Case 1) We report the case of a 52–year-old adult female with root rest of right maxillary first molar. We decided to extract the residual root and protract right maxillary second and third molar. The indirect anchorage with temporary anchorage device(TAD) and lingual splint with stainless steel wire were used for anchorage control. And we protracted posterior teeth in straight wire at buccal and lingual sides. The space closure took about 26 months.
Case 2) We report the case of a 20-year-old adult female with chronic apical abscess on left maxillary first molar. After extraction of the first molar, we used indirect anchorage on left upper second premolar with TAD and splint with stainless steel wire to enhance anchorage. Then, we protracted posterior teeth at both buccal and lingual sides.
Case 3) We report the case of a 13-year-old adolescent female with impacted molars on upper right sides. After the orthodontic traction, right upper second molar erupted but first molar was extracted because of its anatomic limitation, dilacerated roots. So we decided to protract second molar at both buccal and lingual sides in straight wire. The space closure took about 21 months.
Conclusion : Orthodontic closure of maxillary first molar extraction space by maxillary molar protraction was done with skeletal anchorage and carefully selected force system. Careful evaluation of occlusion and periodontal health should be considered.

P-49

Non-surgical treatment of severe skeletal Class II adult with upper lip protrusion

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Introduction : Treatment of severe skeletal Class II adult patient often requires repositioning of both the maxilla and mandible through a surgical correction. If the patient doesnt wish to undergo surgical treatment, non-surgical treatment can be performed in a similar way. Although there is a limitation, we can improve malocclusion and achieve proper facial profile with non-surgical treatment.
Case Summary : We report the case of a 23-year-old woman who had a skeletal Class II malocclusion, severe mandibular retrognathism, anterior open bite, and temporomandibular joint(TMJ) symptoms of click sound on both sides and previous TMJ pain history. Previously, the patient had orthodontic treatment including extraction therapy of upper second premolars. To correct the vertical excess of maxilla and convex profile, we extracted lower second premolars additionally. We totally intruded upper arch for the correction of gummy smile and lip protrusion and prevent extrusion of lower molars with miniscrew in order to rotate the mandible in a counterclockwise direction. After treatment, we could establish proper occlusion and anterior teeth relationship. Also, facial profile was improved.
Conclusion : Non-surgical treatment of skeletal Class II adult patient with mandibular retrognathism was performed to correct the patient's malocclusion and gummy smile and improve facial esthetics. The regular evaluation of temporomandibular joint symptoms should be done after treatment. If patient wants further improvement of facial profile and accepts surgical procedure, advancement genioplasty could be considered.

P-50

Camouflage orthodontic treatment of severe skeletal Class III adult with anterior openbite

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Introduction : Orthognathic surgery is thought to be the most effective treatment option for Skeletal Class III patient with anterior openbite, because it can solve anterioposterior, vertical, transverse problems by repositioning both the maxilla and mandible. However, with the introduction of temporary anchorage device(TAD) and advancement in orthodontic techniques, the range of camouflage treatment has expanded.
Case Summary : We report the case of a 32-year-old woman who had a skeletal Class III malocclusion with anterior openbite, maxillary transverse deficiency, tongue thrust habit and multiple dental caries. We decided non-surgical treatment because of her medical(psychiatric) problems. Before orthodontic treatment, the root rests were extracted and caries treatment was done. Also, myofunctional therapy, improving the swallowing reflex, speech and chewing, was performed every check-up. At first, we expanded maxillary arch with miniscrew-assisted rapid maxillary expansion. To correct vertical and anterioposterior problems as well as dental crowding, we extracted right mandibular second premolar and left mandibular first premolar and retracted lower anterior teeth with TADs. Functional occlusion and adequate anterior overjet and overbite was achieved.
Conclusion : Extraction of lower premolars for camouflage treatment of skeletal Class III adult patient with anterior open bite was effective to correct the patients malocclusion. In addition, myofunctional therapy was done for preventing relapse.

P-51

Non-extraction, non-surgical treatment of skeletal Class III long face adult with anterior and posterior openbite

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Introduction : Skeletal Class III patients with open bite usually have not only anterioposterior problem but also vertical problem. Various treatment modalities including orthognathic surgery can be considered according to their severity. In case of non-surgical treatment, treatment options include various mechanics such as extrusion of anterior teeth, intrusion of posterior teeth, extraction therapy, multi-loop edgewise archwire(MEAW) and so on.
Case Summary : We report the case of a 24-year-old man who had a skeletal Class III malocclusion, anterior and posterior open bite, maxillary transverse deficiency and facial asymmetry. In order to correct maxillary tranverse deficiency, we expanded maxillay arch with miniscrew-assisted rapid maxillary expansion. And for the purpose of correction of anterioposterior and vertical problem, we intruded upper molars and intrusively distalized lower arch with miniscrew. At the finishing stage, we used MEAW on lower arch to upright and intrude molars and bicuspids while extruding anterior teeth. After the orthodontic treatment, Class I canine and molar relationship on both sides and proper anterior teeth relationship was achieved.
Conclusion : Non-surgical treatment of skeletal Class III long face adult with anterior and posterior open bite was done to correct the patient's malocclusion and improve facial esthetics and occlusal function. In addition, periodic follow-up should be done for retention check.

P-52

The limitation and consideration for skeletal Class II camouflage treatment

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Introduction : Orthognathic surgery and camouflage are the main treatment options for the patient having skeletal Class II problems. Although the orthognathic surgery improves esthetic and functional disharmony by changing skeletal pattern surgically, non-invasiveness is the most advantageous aspect of camouflage treatment. This case report re-ensures the limitation and consideration of camouflage treatment for the Class II patients who are indication of orthognathic surgery.

Case Summary :

Case I summary

A 19 year-old female patient with Angle's Class II molar relationship, skeletal Class II malocclusion, hyperdivergent face and large overjet had a chief complaint of protruded maxillary anterior teeth. Maxillary teeth distalization with skeletal anchorage on mid-palate was implemented. As a result, while skeletal disharmony was less improved, maxillary incisor angle was decreased and inter-incisor angle was increased.

Case II summary

Class II camouflage treatment with extraction of maxillary first premolars was implemented to a 20 year-old female, with similar skeletal pattern and chief complaint with Case I. After the finishing, no significant changes on skeletal pattern were present. However maxillary incisor angle decreased.

Conclusion : There are limitations for the Class II camouflage treatment when compared with orthognathic surgery. In camouflage treatment, maxillary incisor angle was decreased by being retracted. Whereas decreasing of incisor angle was minimized by maxillary setback in orthognathic surgery. Skeletal disharmony can not be improved properly through camouflage treatment. Therefore, orthodontist should recognize the limitation of camouflage treatment for the patient having skeletal Class II problems. Additional active measure such as maxillary impaction using skeletal anchorage could be helpful in camouflage treatment.

P-53

Early treatment for patients with multiple congenital missing teeth on maxilla

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Introduction : Orthodontic treatment for prosthetics is necessary for oligodontia patients with widespread spacing. Especially, patients who have oligodontia on maxilla show lack of development in maxillary alveolar process, which is crucial for building adequate occlusal relationship. As a result, they show distinct malocclusion such as anterior and posterior crossbite. However patients usually start treatment at their late adolescents when the formation of alveolar process finalized. We present two cases, to compare and discuss about advantages of early management for oligodontia patients.

Case Summary : A 15-year-old woman started treatment, who had phase I treatment of maxillary expansion, space maintenance and chin-cup treatment. The patient was diagnosed with 7 congenital missing of her upper and lower premolars when she was 9 years old. Along with large interincisal angle, her upper incisors were lingually inclined. We managed to create a space for one dental implant on each quadrants. After 24 months of treatment, she is at maintenance stage for her prosthetics.

Second case is a 22-year-old woman who came for treatment with a chief complaint of edge bite. She had congenital missing of her both canines, premolars and first molars in maxillary dentition. We decided to use skeletal RPE to actively resolve posterior crossbite in beginning of treatment stage. Lower dentition was distalized to make positive overjet. After 50 months of treatment, we made space for six dental implants with adequate occlusal relationship.

Conclusion : Oligodontia patients show distinct malocclusion such as decreased anterior and buccal overjet, large interincisal angle and short lower facial height. Proper phase I treatment such as maxillary expansion, inhibition of crossbite and space maintenance can alleviate future malocclusion. Early diagnosis and management of oligodontia with radiographic method can bring satisfying results for both clinicians and patients by decreasing treatment period.

P-54

Gingival recession during face mask therapy in mixed dentition.

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Introduction : Gingival recession is a manifestation of periodontal breakdown. Plaque microorganisms are the primary etiologic factor, but other secondary conditions are also associated with its presence like malpositioned teeth or teeth tipped off basal bone.

Case Summary : A 8-year-old patient exhibited gingival recession of tooth #42, gingival fenestration of tooth #31,41 after 6 months of face mask therapy. There were severe plaque accumulation around them. The periodontal problem improved slightly after appropriate oral hygiene instruction, and enough positive overjet. More improvement began when the vertical chin pad extension was reduced to avoid pressure on the affected area. After 1 years of face mask treatment, the affected region was almost corrected except #31,42. After 7 months follow-up, gingival condition was better.

Another 8-year-old patient showed gingival recession of tooth #31,41 after 6 months of face mask therapy. He is now on treatment, so he is focused on tooth brushing instruction and proper positive overjet.

Both patients showed lingually inclined mandibular incisors more than 6 degree after anterior crossbite correction, compared with that they had normal mandibular incisor inclination before orthopedic treatment.

Conclusion : When we correct the mixed dentition patient of anterior crossbite by orthopedic face mask, we need to concentrate the periodontal side effects like gingival recession and fenestration.

P-55

Case report of open-bite with TMD in middle aged woman

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Introduction : As the lifespan of a human is extended, the needs of orthodontic treatment in middle-aged adults increase, because of restoration, function, esthetics and so on; They have several complex problems like as multiple missing teeth, poor periodontal status, prosthetic restoration(implant, crown and bridge), TMD with malocclusion. If a patient have several posterior implants with anterior open-bite, it is difficult to control the occlusal plane.
Case Summary : We report the case of a 52-year-old woman who had a skeletal Class I malocclusion, severe anterior open bite, vertical maxillary elongation, occlusal cant and implants on her right upper and lower 1st molar with TMD symptoms and signs. There was missing teeth on upper and lower 2nd molar in her right side, poor periodontal status and crowding on her anterior teeth. At first, we evaluated the TMD problems and treated the TMD symptoms. Thereafter, the labial fixed appliances, elastics and temporary anchorage devices were applied to treat her skeletal and dental problems, and dental implants helped restore her masticatory function. Pre-treatment, post-treatment photographs of this patient demonstrate effective, esthetically-pleasing, and stable treatment results.
Conclusion : Fixed orthodontic treatment with invisible lingual appliance and double jaw surgery was performed to correct the patient's malocclusion and improve facial esthetics.

P-56

Nonsurgical treatment strategy for children with hyperdivergent skeletal Class III focusing on lateral facial profile

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Introduction : Children with hyperdivergent skeletal Class III tend to display relatively straight lateral facial profile which is contrasted by severe Class III denture relationship. Treatment time is often extended due to the latent vertical growth which jeopardizes the facial profile and denture relation. Therefore a step-by-step strategy is crucial for the success of treatment over a long term.

Case Summary :

1. Establishment of treatment goal: Correction of denture relationship may produce a convex profile with retrusive mandible. Hence radical orthognathic surgery for mandibular setback may have to be avoided. A well-controlled camouflage may be an alternative.
2. Phase I treatment: Long faces tend to show or develop lip incompetency which worsens the convex profile. Use of facemasks may therefore have to be minimized due to its extrusive nature.
3. Phase II treatment: Conventional orthodontic mechanics such as intermaxillary elastics produce extrusive forces which can be detrimental for long face. Hence a well-controlled total arch intrusion using interradicular miniscrews may be indicated near the end of growth.
4. Incisor position: Due to the steep SN and/or mandibular plane angle, normal incisor angles relative to the mandibular plane may make the incisor look very protrusive. A radical lingual translation or root movement is indicated.

We present three cases to demonstrate a strategy for hyperdivergent Class III patients, including the modest phase I treatment followed by active total arch intrusion as phase II treatment mainly focusing on the maintenance or improvement of facial profile.

Conclusion : The orthodontic treatment for children with hyperdivergent skeletal Class III is highly challenging. Timely application of total arch intrusion and controlled incisor movement may be a solution.

P-57

Short-term treatment by Mini-tube appliance with a removable appliance in mixed dentition.

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Introduction : Adjunctive treatment with Mini-tube appliance(MTA) in adult patients is useful and convenient. Malocclusion with anterior crossbite, tooth interference, crooked teeth in mixed dentition patients makes teeth abrasion or gingival problems such as a recession. In that case, orthodontists can solve the major problems with removable appliances, but cannot obtain precise teeth alignment. For precise and rapid teeth alignment, after removable appliance, adjunctive orthodontic treatment with MTA is used in mixed dentition.
Case Summary : Case1. A 10-year-old patient has a crossbite with lingual positioned lateral incisors. His dental problems are anterior teeth crowding, diastema, deficiency of alignment space in upper anterior segment, Skeletal problem is not. If there is no treatment, Patient will get incisal abrasion due to the interference of teeth in the future. To get more space, I used a removable palatal expander with finger spring. And I made a good alignment by using MTA in 4 upper incisors. After that, MTA in incisors was served as a retainer. The active treatment period was 6 months. Case 2. An 8-year-old patient has a crossbite with lingual positioned central incisor. His two major dental problems are anterior crowding and gingival recession on #41 due to traumatic occlusion. To remove the interference, I used a removable appliance with three finger springs and posterior bite plate. And I arranged the teeth by MTA. The active treatment period was 5 months.
Conclusion : In mixed dentition patients with anterior crowding and tooth interference, MTA with a removable appliance is useful to arrange teeth and remove the interference in a short time. And after treatment, MTA can be served as a retainer.

P-58

A case report of undiagnosed lower incisor ankylosis management during extraction orthodontic treatment

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Introduction : Tooth ankylosis is the pathological fusion of cementum or dentin of a tooth root to the alveolar bone. Most of ankylosed permanent tooth can be diagnosed because of infraocclusuion or dental history. But orthodontist can meet some ankylosed permanent teeth undiagnosed, because they have no clinical signs. Excepting infraocclusion, Radiographic and percussion signs of ankylosed tooth cannot be detected easily.
Case Summary : She was 26years old female. She was a nurse in university hospital. Orthodontic chief complaint is tooth alignment. First orthodontic tx. plan is non-extraction. After 1st alignment. she concerned about slight protrusion. So #14 24 34 44 extraction was performed. After levelling, space closing was attempted. But for a long time, space closing wasnt conducted. For 2 years variable attempts were conducted: loop mechanic, sliding mechanic, mini implants. Finally #32 ankylosis was diagnosed. For an excuse, no obvious clinical signs were examined. But late diagnosis of an ankylosis is a kind of mistake. To overcome ankylosis, various tx. options were considered.: 1)block bone osteotomy contained ankylosed tooth, 2)extraction of ankylosed tooth and prosthodontic tx., 3)surgical luxation, 4)molar protraction and #32 compromised crown. Finally, I decided #32 compromised crown after molar protraction. MIAs and #32 ankylosed tooth itself were used as absolute anchor for molar protraction and slight ant. Teeth retraction. Fotunately, extracted space was closed and #32 esthetic was tolerable. But, the prognosis of #32 must be followed.
Conclusion : Permanent tooth ankylosis can be detected during orthodontic treatment. So careful diagnosis must be conducted. Ability and knowledge to overcome unexpected problems during orthodontic treatment must be prepared. Good relationship with Pt. was also necessary.

P-59

Strategic approach to retreatment of relapsed anterior openbite with shortened incisor rooots and posttreatment stability

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Introduction : An anterior open bite is a status showing lack of an optimal vertical overlap and occlusal contacts on incisors. The etiological factors of the anterior open bite involve functional problems, e.g. abnormal habit , as well as skeletal and dental problems. Thus, control of the abnormal habits or the poorly positioned musculatures is critical to correct the anterior open bite and to maintain a proper occlusion.
The following case is regarding the retreatment of a patient with relapsed anterior open bite and shortened incisor roots and the effective modalities for a satisfactory maintenance.

Case Summary : A 21-year-old man had finished treatment for crowding and anterior open bite five years ago. He revisited the clinic for retreatment of relapsed anterior open bite. Poor cooperation in wearing the retainer was one of the reasons of retention failure. In addition, it was required to consider the root resorption of incisors in treatment plan. Treatment for relapsed anterior openbite involves the tongue posture training using an acrylic button on transpalatal-arch. Selective force application and planning strategic sequences were practical to avoid excessive force on the incisors with shortened root. At 40 months of treatment, an adequate vertical overlap on the incisors was achieved and the treatment was finished. In retention period, the training for a stable tongue posture was continued and the orthodontic elastics on retainer to microimplants was utilized to maintain the treatment result effectively.

Conclusion : The treatment of an open bite is quite complicated to obtain a satisfactory result and the maintenance of an optimal occlusion in retention period is harder than the treatment. Therefore, the strategic approach considering a specific status of the patient with openbite is important to improve the malocclusion and maintain the obtained occlusion. The abnormal habit and poor tongue posture also should be corrected during the treatment and retention period.

P-60

Orthodontic alignment of a transmigrated mandibular canine

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Introduction : Transmigration is an uncommon phenomenon of an impacted mandibular canine crossing the midline. When orthodontists encounter the transmigrated canine, a diagnostic decision must be made regarding an attempt to orthodontically bring a transmigrated tooth into dental arch or to plan treatment with surgical extraction or autotransplantation. Alignment of transmigrated mandibular canines is a challenging, but should be considered viable treatment alternative.
Case Summary : A girl, aged 12 years 2 months, came with a chief complaint of delayed eruption of right mandibular canine. A radiographic survey revealed that the canine was horizontally impacted with dentigerous cyst, and located on the lingual side of the incisors. Surgical exposure of the impacted canine was done through lingual side by raising a full-thickness mucoperiosteal flap and bonding a button for the traction. The modified lingual arch on the lower first molars used both a traction appliance as well as space maintenance in the developing dentition to prevent unnecessary loss of remaining leeway spaces. After 6 months of treatment, the bracket was bonded to correct the mesiodistal position of the canine. The total treatment took 25 months and both dentitions had good interdigitation with Class occlusion. The gingival tissue looked healthy with an adequate zone of attached keratinized gingiva.
Conclusion : Moving a transmigrated mandibular canine into its original place is complicated and rarely lead to an ideal outcome, but achievable. In this case, because the position of impacted canine was at the lingual side, it was able to acquire enough attached gingiva by pulling it toward the labial side. To get a successful result, position of the impacted tooth, eruption status of neighboring incisors, timing of the treatment and orthodontic mechanics have to be considered.

P-61

Orthodontic Treatment in an Adult Patient with Tooth Fracture and Crowding

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Introduction : In recent years, the demand for adult orthodontic treatment has grown rapidly; yet there is a paucity of information. Because of physiologic and psychologic differences between adolescent and adult patients, there may well be differences in the way malocclusions are corrected in these two groups. In this case report, a middle-aged woman with a fractured tooth was described. She had full-fixed orthodontic treatment with 4 first premolars extraction even though she did not want orthodontic treatment because of several reasons.
Case Summary : A 46-year-old female patient presented with chief complaints of the #14 tooth fracture. She also had the completely lingual-erupted #35 tooth, crowding and Angle Class III molar relationship. The following treatment alternatives were established for this patient: (1) #14 root rest extraction and dental implant and prosthetic treatment, (2) #14 forced eruption and prosthetic treatment, (3) full-fixed orthodontic treatment. She determined full-fixed orthodontic treatment even though she did not want at first because of long treatment period and orthodontic complications such as gingival recession, black triangle, root resorption and so on. Her 4 first premolars were extracted and temporary anchorage device(TAD) were placed to retract the left first molar. The orthodontic treatment took approximately 30 months and a functional occlusion was established without severe orthodontic complications.
Conclusion : The decision to undergo orthodontic treatment is complex and was influenced by various factors. As clinicians, it is important to ascertain these factors to understand the patient's motives, hence reducing the possibility of divergent thinking between patients and clinicians.

P-62

Strategic prosthetic implant for anchorage and maintenance of occlusal plane with multiple missing molars

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Introduction : Premolar extraction is often performed to relieve protrusion of anteriors.However, If multiple molars are missing in adult patients, it is difficult to obtain anchorage to retract anteriors. In addition, occlusal plane can be tilted due to the vertical component of retraction force.
Case Summary : The patient was 32 year-old female and exhibited skeletal Cl II malocclusion. Anteriors were protruded and multiple posterior teeth were missing. Maxillary left canine was completely impacted. Upper left 2nd molar and lower left 1st molar were missing. Opposing teeth were extruded and lower right posterior teeth were absent. Upper right and left 1st premolars were extracted to improve protrusion. Fixed appliance was bonded in the maxilla first. Orthodontic traction of impacted canine was conducted. In the maxilla, anteriors were retracted with orthodontic miniscrew. In the mandible, final position of the 1st molar was determined after evaluating diagnostic set-up and calculating the amount of anterior retraction. Prosthetic implant was placed in the calculated position of the first molar. Fixed appliance was bonded. The implant was used as an anchorage to retract anteriors and intrude super-erupted lower left 2nd molar.
Conclusion : Precise prediction of orthodontic tooth movement can enable strategic placement of prosthetic implant during the orthodontic treatment. This can contribute to success of orthodontic treatment by providing absolute anchorage and maintaining occlusal plane.

P-63

Retreatment by total arch mesialization in adult who had dished-in face after extraction orthodontic treatment

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Introduction : When planning 4 premolar extraction in a patient with chief complaint of lip protrusion, through explanation and discussion with patient is essential as well as appropriate treatment planning. If treatment planning is incorrect or improper mechanics are used, anterior teeth can be severely tipped or distalized lingually. This can lead to distal movement of anteriors more than desired. lips can be excessively retracted.

Currently, excessive anterior retraction is retreated by regaining premolar extraction space with open-coil spring. Thereafter, regained space is prosthetically restored. most patients do not want prosthetic replacement. It is also difficult to precisely predict facial changes.

The authors attempted to improve lip fullness in patients who had premolar extraction but was not satisfied with the treatment results in our clinic. Orthodontic miniscrews in buccal and lingual alveolar bone, intermaxillary elastics, and face mask were used to mesialize the entire dentition without making space in the premolar extraction area.

However, only anteriors were flared forward in most cases. Volume around the philtrum seemed to increase. Lips were not moved forward enough to meet patients expectation.

Case Summary : Retreatment was carried out in 5 adult female patients who underwent orthodontic treatment with premolar extraction in a private practice. Fixed appliances, orthodontic miniscrews in buccal and lingual alveolar bone, intermaxillary elastics, and face mask were used to mesialize the entire dentition. In three patients, both anterior teeth and lips were mildly moved forward but the amount was not sufficient. In the remaining two patients, only anterior teeth were moved forward and lips were rarely moved.

Conclusion : Retreatment with total arch mesialization could not improve facial esthetics of patients who had dished in face after orthodontic treatment with 4 premolar extraction. A proper diagnosis and thorough discussion with patient is required. Alternative approaches such as surgery or filler need to be considered.

P-64

Case report of adolescent skeletal Class II patient with unilateral posterior crossbite

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Introduction : Skeletal class II malocclusion is caused by overgrowth of maxilla, undergrowth of mandible or combination of both. In adolescent patients, functional appliance can be great treatment option. Several appliances have same treatment mechanism : accelerating mandibular growth and differential growth of condyle. In a differnet way, headgear is used for inhibiting overgrowth of maxilla. This case report discuss about the start timing of 2 phase treatment. It will show you the considerations about selecting functional appliances, timing of treatment start and end in skeletal class II patient.

Case Summary : 11-year-boy visit clinic for anterior crowding and protrusion. Clinical examinations show unilateral posterior crossbite with skeletal class II relationship. Skeletal age judged by hand-wrist and cervical vertebrae radiograph shows MP3 G and CVM 2 or 3 stage. For acheving Class I skeletal relationship and correcting unilateral crossbite, we planed to use activator and head-gear. Before comprehensive orthodontic treatment, dental relationship such as molar key and bolton ratio was analysed via 3D diagnostic model. Dental assymetry and midline is corrected with stripping and distalization.

Conclusion : It is important to understand the potential growth in treatment of skeletal Class II malocclusion. Various causes should be analyzed carefully when determining treatment plan. Proper diagnosis and patient's cooperation are key factors in the success or failure of treatment. In this case, functional treatment is carried in close to the peak puberty growth. As a result, mandibular forward growth and inhibition of maxillary growth are shown in a short period of time. The use of head-gear helps to reduce treatment duration by expanding maxillary arch and distalization of upper dentition simultaneously. Dental analysis using a 3D model helps us to correct midline deviation and construct Class I molar, canine key. After 2 years we can confirm stable maintenance of treatment result.

P-65

An unusual case of impacted canine related to a miniplate : A 10 year follow-up

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Introduction : In orthodontic practice, impaction of canines is a frequently encountered clinical problem.
A number of reasons may be responsible for canine impaction such as tooth size-arch length discrepancies, prolonged retention or early loss of the deciduous canine, abnormal position of the tooth bud, presence of an alveolar cleft, ankylosis, cystic or neoplastic formation, dilaceration of the root, iatrogenic origin, and idiopathic condition with no apparent cause.
In the present case report, an impacted mandibular canine was related to a miniplate in left mandibular body area. Total treatment time was 12 months, impacted lower canine was positioned in its proper space, and the treatment results had been stable during the retention period.
But, the 10 year follow-up of the patient revealed root resorption of the alined mandibular canine. The purpose of this case report is to provide the information of a treatment of impacted tooth and pediatric mandibular fracture.
Case Summary : A 10-year-old girl was referred from department of plastic surgery asking for missing tooth in mandibular dentition. She had a miniplate in left mandibular body area as a result of mandiular fracture by traffic accident, which was 3 years ago.
An ordinary surgical traction ended in a failure. However, good occlusion was established after removal of the miniplate.
Pre-treatment and post-treatment photographs of this patient demonstrated effective, esthetically-pleasing, and stable treatment results. The patient was scheduled to be followed during retention period. Root resorption of the exposured canine was shown in the radiographic view and oral examination after 10 years.
Conclusion : Root resorption is observed more frequently and its risk of development is higher in cases of severe trauma.
Using of miniplate in the case of pediatric mandibular fracture must be a very careful procedure because of the possible impairment of permanent tooth germ.

P-66

Facial profile changes through maxillary dentition posterosuperior displacement and mandibular rotation in class II malocclusion

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Introduction : The using of MIA has made it possible to treat difficult treatments in the past. Of these, total arch movement as non-extraction treatment is very valuable for the practice and the patient.
In class II malocclusion, the facial esthetics of patient is improved through maxillary dentition posterosuperior displacement and mandibular rotation.
Case Summary : The patient was 29 years 9 month female patient with the chief complaint of lip protrusion and crowding. . The Clinical examinations showed spacing of maxillary anterior teeth, peg-lateralis of #12,22, crowding of mandibular anterior teeth, lower lip protrusion and chin retrusion. And in radiographic examinations, she had a skeletal class II malocclusion with mandibular retrognathism and hyperdivergent pattern, and generalized alveolar bone resorption.
In advance, for leveling down periodontal pocket depth, I had referred to other clinic. After 5 months, her periodontal state was better. but because her alveolar bone level was low, the location of the center of resistance leveled low. So Avoiding tooth extrusion, total arch movement treatment was chosen. The treatment planed maxillary dentition moved proteriosuperior and mandibular dentition did posterior with MIA.
MIA inserted in maxillary buccal #4-5 and #6-7 regions, in between #6 and #7 midpalatal suture and in mandibular buccal #6-7 regions. And for the palatal side intrusion, had used double TPA with retraction hook. And Considering Bolton ratio and peg-lateralis, had carried out mandibular incisor stripping.
After 1 year 6 months, her profile changed through maxillary dentition posterosuperior displacement and mandibular counterclockwise rotation. So, she had the esthetic profile with her lip retrusion and chin protrusion.
Conclusion : This case shows non-extraction treatment using MIA insertion improved Class II profile through both jaw dentition distalization, maxillary dentition intrusion, mandibular counterclockwise rotation, both lip retrusion and chin protrusion.

P-67

Change of treatment plan due to compromised molars in orthodontic extraction case : case report

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Introduction : Many cases require premolar extraction, either for relief of crowding or for profile change. In patient presented with mutilated molars, however, orthodontists could decide to extract compromised molars rather than healthy premolars. Several clinical case are described in detail to discuss considerations of treatment planning when a patient has compromised molars.

Case Summary :

Case 1: A patient was treated with extraction of #14, #24, #36(severe caries) and #45(dens evaginatus) instead of first premolars extraction. Midline elastic was used to correct dental midline.

Case 2: A patient was presented with chief complaint of protrusion. Extraction of #15, #16, #26 was needed because of severe dental caries and #37 was mesially tilted due to missing of #36. We decided to extract #46 for balancing extraction and all extraction sites of first molars were closed. Implant was placed in the space of #15 and alignment of second and third molars was achieved.

Case 3: A patient had congenital missing on #15, #25 and compensating extraction of lower second premolars was needed to treat orthodontically. However, #36 was extracted instead of #35 due to poor prognosis. Miniscrew was used for protraction of lower left second molar.

Case 4: A patient had root rest of #16, #47, severe dental caries on #26 and missing of #36. The patient needed to correct protrusion and had all four third molars. We decided to treat with extraction of all mutilated teeth and closure of the space instead of implant placement.

Conclusion : There is several considerations on treatment planning when a patient has compromised molars; location and number of compromised teeth, periodontal condition, midline discrepancy, occlusal relationship, anchorage control, presence of third molar and amount of crowding and protrusion. In carefully selected case, extraction of compromised molars in conjunction with orthodontic treatment could provide significant advantages from the cost-benefit perspective.

P-68

An optimal esthetic treatment for traumatized incisors by single-tooth osteotomy and lingual orthodontics

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Introduction : Ankylosed anterior tooth by trauma has a limitation in orthodontic tooth movement. If it is difficult to move the tooth, extraction of the ankylosed tooth and implant placement can be considered. However, the alveolar bone around the extracted tooth does not undergo sufficient bone remodeling. Consequently, it may cause unfavorable position of the implant and non-esthetic restorations. For overcoming these problems, we planned single-tooth osteotomy(STO) through three-dimensional(3D) simulation to enable the movement of the tooth-alveolar bone complex in the patient who had external root resorption.
Case Summary : A 42-year-old female patient with chief complaint of lip protrusion had ankylosis with external root resorption of #21 tooth due to trauma and missing of #46 tooth. For improvement of lip protrusion, it was planned to extraction of #14, 24, 34 tooth and space closure of missing area of #46 tooth. The initial 3D model was set up to predict the tooth movement. After space closure was performed except #21 tooth, the set-up model and computed tomography data were superimposed to confirm the tooth position. Based on it, it was possible to move the tooth-alveolar bone complex to the accurate position by STO without damaging adjacent teeth through the surgical guide. There was good recovery of periodontal tissue after surgery and it was achieved improvement of lip protrusion and a stable occlusion.
Conclusion : STO would be an optimal treatment method to move the tooth with alveolar bone under difficult conditions of the orthodontic tooth movement. Also, 3D diagnosis and simulation help to establish an accurate surgical plan of the movement of the fragment.

P-69

Non-extraction treatment by total arch retraction using temporary anchorage devices

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Introduction : Total arch retraction using stable skeletal anchorage has been reported as an effective treatment method and can be accompanied with vertical control of the dentition. This case report shows the patient of hyperdivergent skeletal Class I malocclusion with lip protrusion treated by total arch retraction using temporary anchorage devices.

Case Summary : The 34-year-old female complained of lip protrusion. Facial analysis showed lip protrusion and incompetency. In panoramic radiograph, third molars in maxillary right side and on both sides of the mandible were fully erupted. The cephalometric analysis showed skeletal class I malocclusion and hyperdivergent facial profile.

In this case, total retraction of maxillary and mandibular dentition was performed using one midpalatal miniscrew on maxilla and two miniplates on mandible. After treatment, lip protrusion and incompetency was relieved, and resulted in improvement of facial esthetics.

Conclusion : Total arch retraction using temporary anchorage devices has advantages that can meet the needs of patients who do not want extraction treatment and that retraction procedure can be easily stopped when root resorption of anterior teeth or periodontal deterioration occurs. In terms of simplicity and stability, midpalatal miniscrew on maxilla and miniplates on mandible may be effective skeletal anchorage for total arch retraction. Using stable and predictable skeletal anchorage with acceptable treatment options and appropriate biomechanics will provide patients with esthetic and functional results and satisfaction.

P-70

Surgical-orthodontic treatment of long face class patient with vertical maxillary excess and transverse discrepancy

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Introduction : Skeletal class III malocclusion with hyperdivergent skeletal pattern, characterized by narrow and long face, is often associated with vertical maxillary excess, excessive lower facial height and gummy smile. Vertical maxillary excess is commonly involved with narrow palate. Maxillary width coordination is necessary for satisfactory skeletal relationship.
In case of long face Class III malocclusion, It is hard to satisfy esthetic and functional problems by camouflage treatment. When planning the repositioning of the maxilla by orthognathic surgery, consideration should be given to the vertical facial ratio, the maxillary incisor exposure, and the occlusal plane, which determine the vertical position of the maxilla in addition to anterior and posterior discrepancy.
Case Summary : We report the case of a 22-year-old man who had a skeletal class III malocclusion, long face with vertical maxillary excess, arch width discrepancy, and facial asymmetry. There were severe crowding in maxilla and mandible, with palatally erupted maxillary right second premolar and impacted left second premolar. Maxillary both second premolars were extracted to resolve crowding. Microscrew assisted rapid palatal expansion(MARPE) was performed to expand maxilla transversely. After orthodontic decompensation, maxillomandibular complex clockwise rotation surgery and BSSRO on mandible were performed to vertical improvement with less mandibular set back.
Conclusion : Favorable outcome can be obtained in patient with vertical maxillary excess and skeletal class III malocclusion by performing clockwise rotation surgery of maxillomandibular complex.

P-71

Hypersensitivity to metal brackets suspected nickel allergy: A case report

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Introduction : Nickel is an immunologic sensitizer and may induce a contact hypersensitivity reaction. Nickel is a component of the nickel-titanium arch wires representing 50% of the alloy, and also a component in stainless steel arch wires representing 8% of the alloy. The percentage of nickel in the appliances, auxiliaries, and utilities used in orthodontic treatment varies and may act as an allergen in patients.
Case Summary : We report the case of a 14-year-old female who request orthodontic treatment due to delayed eruption of lower left central incisor. She was previously healthy and did not report a history of allergy to nickel alloy. Metal brackets were bonded on upper and lower arches and 0.014 Ni-Ti arch wires placed and Ni-Ti open coil spring was inserted. However, the patient presented allergic reaction such as swelling and rashes around vermilion border. To resolve this problem, at first, the orthodontist prescribed a topical steroid ointment and an ice pack for first aid. Secondly, upper and lower metal brackets were replaced with ceramic brackets. In addition, Ni-Ti arch wire was replaced with stainless steel arch wire. After two months, the allergic reactions resolved and the symptom had not recur. Thirdly, to identify the affecting allergens, a couple of allergy tests were performed, and follow-up check was carried out by referral to the department of allergy and clinical immunology.
Conclusion : The orthodontists should be mindful of possible nickel allergy during the course of orthodontic treatment and have knowledge of alternatives to allergy-causing materials for management of patients in clinical practice.

P-72

Early premolar extraction in the mixed dentition with severe crowding : Case report

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Introduction : The ideal time for starting orthodontic treatment has always been a subject of controversy. The goal of early extraction in the mixed dentition is to create space for eruption of permanent teeth into more favorable positions over basal bone to prevent or reduce the complexity of future orthodontic treatment in the permanent dentition. In this report we present two severe crowding cases treated with early premolar extraction.

Case Summary : Case #1 The patient was a 8-year-old male with premature exfoliation of primary second molar on left maxilla and severe crowding caused by tooth size arch length discrepancies. Space regaining for primary second molar was made by distalization and upper first premolars were extracted for canines natural eruption. Treatment using fixed appliance was done to make space for second premolars eruption.

Case #2 The patient was a 9-year-old female having severe crowding caused by tooth size arch length discrepancies. Due to impacted canine, first premolar root resorption was found and upper first premolars were planned to be extracted. After eruption of second permanent molar, the patient showed lower arch crowding with Class II molar relation, which lead to treatment using fixed appliance with the extraction of mandibular second premolar.

Conclusion : Extractions of the first premolars provided space for permanent canines, whose roots were more than two third developed. In extremely severe crowding early extraction can reduce period of fixed appliance treatment and chance of alveolar bone and periodontal structure disturbances. Although early premolar extraction in orthodontics is not a common treatment option, excellent results can be achieved when diagnosis and early treatment are properly carried out.

P-73

A Case with mid-sagittal osteotomy and anterior segmental osteotomy in skeletal Class III malocclusion patient

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Introduction : Skeletal Class III malocclusion is usually accompanied by anterior and posterior discrepancies, as well as transverse discrepancy of the jaws. Orthodontic treatment with orthognathic surgery is necessary to improve the skeletal discrepancies, and to obtain the facial harmony and functional occlusion. However, because of the possibility of functional problems such as respiration due to changes in hard tissue and soft tissue structure caused by orthognathic surgery, additional considerations are needed to prevent these problems at the time of surgery.
Case Summary : This case was a 24-year-old man whose chief complaint was a mandibular protrusion. Additionally, he could not breathe in his nose when he slept. His case showed skeletal Class III malocclusion, anterior and posterior crossbite and facial asymmetry. Various factors affecting the stability of orthognathic surgery have been reported, among which respiration is an important one. Mandibular retraction in a skeletal Class III malocclusion can move the mandible backward and move the tongue backward at the same time, resulting in a decrease in airway space after surgery. Therefore, to reduce the amount of posterior movement of the mandible, anterior segmental osteotomy using extraction space of 1st premolars and BSSRO and genioplasty were performed in the mandible. In the maxilla, Le Fort I osteotomy with mid-sagittal osteotomy was performed to resolve transverse discrepancy.
Conclusion : In patients with skeletal Class III malocclusion who are at risk for sleep - related respiratory disturbances such as the above patient, mandibular surgery with anterior segmental osteotomy may reduce the posterior movement of the mandible. In addition, transverse expansion of the maxillary mid-sagittal osteotomy can be used to secure additional airway space. Therefore, in the case of skeletal Class III malocclusion with sleep - related respiratory disturbance, mandibular anterior segmental osteotomy and maxillary mid-sagittal osteotomy can be considered when making a treatment plan.

P-74

Three-year stability of non-surgical correction of severe anterior open-bite via molar intrusion: a case report

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Introduction : In cases of severe anterior open bite, orthognathic surgery is generally believed to be the treatment of the choice due to its effectiveness. However, more stable treatment results are notably likely to be achieved via step-by-step adaption of the soft-tissue responsible for the dysgnathia during orthodontic treatment, rather than adaption after the sudden dramatic change in skeletal configuration due to orthognathic surgery.

Case Summary : A 20-year-old man with a history of extensive surgery sought orthodontic treatment for a severe anterior open bite (overbite, -9.0 mm). Massive crowding in combination with malformations of several teeth had led to premolar extraction therapy whereby relief of the massive crowding attenuated the bite-closing effect of the extractions. Without any surgery, correction of transversal malocclusion by bucco-lingual inclination and molar intrusion via miniscrew anchorage resulting in considerable counterclockwise rotation of the mandible facilitated successful closing of the severe open bite. The satisfactory outcome, achieved via accurate diagnosis and appropriate treatment of bio-mechanics, remained stable 3 years after treatment. Macroglossia, which was one of the relevant etiologic factors, was not corrected surgically due to the patients request.

Conclusion : Severe anterior open bite can be corrected via non-surgical modality and remained stable for long time although macroglossia might be cause slight relapse during the retention period.

P-75

Orthodontic treatment combined with SARPE for skeletal class II patient with severe crowding.

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Introduction : The diagnosis and treatment plan of the transverse discrepancy can be differentiated depending on whether the cause is skeletal or dental origin. In many cases, good occlusion cannot be achieved unless the transverse discrepancy is sufficiently improved. When posterior crossbite is observed, although the bucco-lingual inclination of molar is within the normal range, it is diagnosed as the skeletal transverse discrepancy that requires an expansion of the midpalatine suture. However, after adolescence, there is an increasing chance with advancing age that bone spicules will have interlocked the suture.

Case Summary : A female patient with the age of 23 visited the clinic because of dental crowding. The maxillary arch was narrow and the palatal vault was high, which leads to the observation of bilateral posterior cross bite. The chin was retracted and the lip incompetency was observed.

In this case, the dental expansion should be minimized, while the maximum skeletal expansion is required, based on the molar inclination, the width of apical base, and the distance between the center of resistance of molars.

Therefore, SAPRE was performed considering the patient's age, the amount of expansion, and a number of teeth requiring extraction. The impacted teeth, four third molar, and lower first premolar were extracted under G/A.

Conclusion : The skeletal and dental discrepancies were improved and it showed an acceptable occlusion. There have been a number of methods to overcome transverse discrepancy. However the surgical techniques should be accompanied when the conventional methods are not appropriate. In particular, when there is a significant discrepancy and it is difficult to apply the MARPE (for example, the anatomic shape of the palate). As shown in this case, it would be important to consider surgical methods to gain enough skeletal expansion while minimizing the dental tipping.

P-76

Orthodontic treatment with extraction of upper central incisor

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Introduction : It is uncommon to extract upper central incisor for orthodontic treatment. There are several considerations when we decide to extract upper central incisor and substitute lateral incisor as central incisor. First, there is size difference between upper central and lateral incisor. It is about 1.5mm for this patient. Second, there is gingival height difference. It is about 2 mm. Third, canine is used as a lateral incisor which makes some other considerations too. The shape , size and the bucco-lingual thickness of canine are different from those of upper lateral incisor. With all these possible considerations we could treat this patient and make a good result with the aid of orthodontics, periodontics and prothodontics.

Case Summary : We report this case of a 14 years old woman who had hopeless tooth of upper left central incisor. She has convex profile, large overjet and monderate crowding on both arches. After extraction of upper right first premolar, upper left central incisor and lower right and left second premolars, fixed orthodontic treatment was done. We did gingivectomy on the upper left lateral incisor which is placed at the upper central incisor location to match the gingival line with upper right central incisor. After a few weeks later, we made all ceramic crown on the upper left lateral incisor .

Conclusion : We could make a good result of orthodontic patient who had hopeless tooth of upper left central incisor by fixed orthdontic treatment combined with gingivectomy and all ceramic crown.

P-77

Unusual extraction treatment in Class II div. 1 malocclusion with bimaxillary protrusion

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Introduction : If the extraction is required in orthodontic treatment, the extraction of the various teeth is selected depending on the goals that the patient intends to achieve. However, the extraction of the first molar has not been easily tried. In orthodontic treatment, the first molar, which corresponds to "key to occlusion" is rarely extracted from normal circumstances, and may, in certain cases, be able to be restrictively extracted. If the first molar has problems such as severe caries, wide restoration, root resorption, ectopic eruption, ankylosis, and enamel hypolpasia, then the first molar extraction is considered.
Case Summary : A 13-year-old woman diagnosed as a skeletal Class II div. 1 malocclusion came to our office with bimaxillary protrusion, maxillary second premolar impaction, maxillary first molar root resorption, gingival swelling and hyperplasia on anterior teeth. Maxillary second premolar, first molar and mandibular first premolar were extracted to treat her skeletal and dental problems, and temporary anchor device was used for anchor preparation. During the treatment, maxillary third molar erupted and was well aligned. After treatment, esthetic profile and improved occlusion was achieved.
Conclusion : If the treatment plan includes unusual extraction, such as the extraction of the first molar, the timing of the extraction and adjustment of the anchorage should be considered to facilitate the treatment process. Although the treatment method is somewhat complicated and requires more time, extraction of the first molar can show satisfying the result will be esthetic and functional result if the case is chosen properly and the timing of the extraction is determined correctly.

P-78

Treatment of Class II crowding case with cervical-pull headgear

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Introduction : Skeletal Class II case with hypodivergent growth pattern is difficult to extraction. Especially when there are dental crowdings are exist. If crowdings are severe, theres no hesitancy to extraction. But, if there are slight crowdings are exist, cervical-pull headgear is a kind of selection. There is sufficient evidence of the distal movement of maxillary teeth by cervical-pull headgear.1 The forward growth of the dental arch and alveolar process is inhibited in many cases.1 Also, there are different opinions about vertical dimension. One persist a mandibular plane angle is increased after cervical-pull headgear used.2 Another persist vice versa.
Case Summary : A case presented is 10 years old boy. His chief complaint is anterior crowding of teeth. He showed a straight profile. And he also showed deep mentolabial fold, short lower facial height and prominent chin. Intraorally, he showed upper anterior crowding. And he showed both 1/4 premolar width Class II molar relationship. In cephalometric analysis, it showed 25.3 degree Frankfort horizontal line - mandibular plane angle. We treated him with non-extraction multi-bracket bonding system. We indicated him put on cervical-pull headgear during night. We treated him in 21 months.
Conclusion : We completed him in Angle Class I molar relationship successfully. A distal movement of maxillary teeth by cervical-pull headgear is accomplished. As we predicted that increasements of vertical dimension are acquired some kind. The case showed flattening improvement of mentolabial fold.

P-79

Treatment of Class II bialveolar protrusion with extraction

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Introduction : The impaction of a mandibular second molar is a relatively rare occurrence with a prevalence of 1.36%. The crowding, and a higher angle of inclination of mandibular second molar characterize the mandibular second molar impaction. The impaction and mesial inclination of mandibular second molar is correlated with mandibular teeth dimension. In addition, it is associated with mandibular anterior crowding, and bialveolar protrusion.
Case Summary : 14 years old boy with lower anterior crowding, and mandibular right second molar impaction was came in. He showed convex profile and lip incompetency. In intraoral status, he showed both arch protruded anterior teeth, and lower dental midline deviated to left by 2.0mm. Also, he showed both Class I molar key, and lower anterior crowding. We diagnosed him as Class II bialveolar protrusion. And his right mandibular second molar is mesially impacted. We planned and treated him with four first premolar extraction orthodontic treatment. Especially, we uprighted mesially impacted right mandibular second molar with 016 Australian stainless steel segmented loop wire. The wire is consisted with two loops and connected with mandibular first molar.
Conclusion : 016 Australian stainless steel segmented loop wire is efficient to upright mesially impacted mandibular second molar. Treatment with four bicuspid premolar extraction is also effective in bialveolar protruded Class II case.

P-80

Treatment of Class III asymmetry patient with facial asymmetry with 3D technique

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Introduction : As surgery first approach improve skeletal discrepancy and profile in the early stage, patient satisfaction is high. Also it was reported that because of inflammation reaction by surgery, regional and systematic acceleratory phenomenon increase tooth movement speed so that total treatment period can be shortened. However, it is difficult to refer to tooth position to reflect on the orthognathic surgery plan due to insufficient dental decompensation, and the stability of the bone fragment can be reduced because of the unstable post surgical occlusion. In addition, the posterior downward rotation of the mandible due to occlusal interference makes it difficult to accurately predict the anterior and posterior positions of the maxilla and mandible at the end of treatment.

Therefore, for successful surgery first approach, not only accurate diagnosis but also establishing surgical occlusion by predicting a final tooth position and change of skeletal relationship according to the change of occlusion is essential. With the recent development of digital technology using CAD / CAM (computer-aided design / computer-aided manufacturing) technology, more efficient and predictable orthodontic treatment is being implemented through 3D virtual surgery and digital setup.

Case Summary : In this case, we diagnosed patient as Skeletal Class III with facial asymmetry and maxillary skeletal deficiency. Therefore, maxillay skeletal expansion was done with MARPE(mini screw assisted rapid palatal expansion) and through digital set up and 3D virtual surgery, surgery first approach orthognathic surgery and orthodontic were performed to achieve satisfactory results.

Conclusion : To treat skeletal Class III adult with facial asymmetry and maxillary deficiency, accurate diagnosis of facial asymmetry and skeletal discrepancy, careful treatment plan with virtual set up and operation using digital technology, proper post-operative management and experience of clinician were able to achieve improvement of occlusion and facial appearance.

P-81

Natural teeth preservation orthodontics

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Introduction : In general, natural teeth preservation treatment refers that the maintenance of teeth through conservative/prosthodontic treatment with RCT or periodontic therapy in a situation where almost extraction is required. Orthodontic treatment is sometimes used as an adjunct for the improvement of periodontal condition or prosthodontic treatment. However, in many cases, several teeth are removed for orthodontic purpose rather than saving teeth.

Discussion : Natural teeth preservation orthodontics can be divided into three categories, as follows.

1. Non-extraction (distalization) orthodontics: If the space is insufficient only by the usual non-extraction method, moderate protrusion or crowding can be corrected by moving entire dentition distally with miniscrews and improving the torque of the anterior teeth.
2. Non-surgical orthodontics: Class III malocclusion or asymmetry without severe skeletal problem can be corrected with non-surgical orthodontic methods, if orthognathic surgery is difficult to choose, through the distal movement of entire lower dentition, anterior cross-bite and posterior occlusion can be improved. And also occlusal plane canting and midline deviation can be treated through selective intrusion and differential unilateral movement of the upper and lower dentition.
3. Non-prosthetic orthodontics: If a tooth is missing and an implant or bridge is needed, the defected area can be closed by moving the adjacent teeth with this method. If the permanent teeth are impacted or displaced severely, it can be repositioned correctly also. Non-prosthetic correction reduces the need for prosthesis, improves the use of natural teeth, and provides harmonious and stable teeth alignment.

Conclusion : Natural teeth preservation orthodontics cannot treat all malocclusions, and when considering esthetics and stability, premolar extraction, orthognathic surgery, and prosthodontic treatment are sometimes inevitable. However, if we move our vision and center of gravity to the direction of saving natural teeth when establishing diagnosis and treatment plan, orthodontic treatment will be able to escape the negative paradigm represented by the extraction.

P-82

Treatment of 55-year-old protrusion patient with periodontal disease

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Introduction : Recent researches showed that adult orthodontic patients are increasing. Some of the adult orthodontic patients have periodontal disease and pathologic tooth migration by the attachment loss. Because fixed appliance can worsen the oral hygiene and periodontal disease, orthodontic treatment of peridontitis patient can be very burdensome. Because pathologic tooth migration often causes premature contact and traumatic occlusion, orthodontic treatment, if it is successfully performed, seems to be very beneficial to the patient.

Case Summary : A 55-year-old patient came to my office for orthodontic consultation. His main concern was protrusive profile. There was a generalized spacing in the upper anterior region by pathologic tooth migration and deep pockets were also observed. I referred him to the local periodontist and after scaling and root planing, orthodontic treatment was initiated. Using orthodontic mini-implants and fixed appliances, anterior teeth were retracted and overjet was corrected. Protrusive profile and spacing was also successfully improved. After bonding the fixed retainers, brackets were removed after 19 months of treatment. After 49 months of retention, his occlusion was stable and all the teeth were maintained without extraction.

Conclusion : During treatment of peiodontitis patients, patients cooperation and periodontal management are essential. If the treatment is successfully finished, favorable occlusal load distribution, mutually protected occlusion and splinting of anterior teeth by fixed retainer will prolong the life of patients teeth.

P-83

Case report of skeletal Class II asymmetric anterior open-bite with a 3-dimensional problem

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Introduction : Open-bite is a condition where a space exists between the occlusal or incisal sufaces when the mandible is brought into habitual or centric occlusion. It is multifactorial phenomenon and no single factor can account for open-bite. The treatment method using mini-implant to intrude teeth can relieve anterior open-bite and skeletal Class II malocclusion by inducing mandibular autorotation without patients cooperation or hazard of surgery. In addition, it also can correct hyperdivergent and convex soft tissue profile. If asymmetrical intrusion force is applied differently in left-and-right side, occlusal canting and mandibular asymmetry can be corrected without surgery.

Case Summary : Therefore, in this presentation, clinical case of skeletal class II asymmetric open-bite patient which was treated by posterior intrusion using mini-screw anchorage will be introduced regarding 3-dimensional change before and after the treatment. Intrusion strategies are as follows. First, intrusion was planned only at the upper posterior arch because of required amount of planned intrusion in maxillary alveolar bone housing and relapse factor. Second, for canting correction asymmetric intrusion was planned in left-and-right side with 3D CBCT image. Third, to prevent third order effect, buccolingual intrusion was planned simultaneously. Finally, screw was placed at mandible in order to prevent lower posterior teeth extrusion for ample amount of autorotation. And mini-implant can perform as retainer without much discomfort after fixed appliance debonding. In turn, mini-implant was connected to intruded teeth as indirect anchorage to prevent relapse which occurs actively for 1 year after the treatment. Additionally, habit control such as tongue thrust was performed.

Conclusion : In conclusion, by asymmetric intrusion strategy, maxillary canting and mandibular asymmetric rotation can be corrected. For such results, precise diagnosis and careful treatment planning is inevitable.

P-84

Accelerated tooth movement followding Piezocision: A case report

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Introduction : Patients may elect to forego orthodontic treatment due to the cost of treatment, the duration of treatment or due to the appearance of orthodontic appliances. The followings are ways to speed up the movement of teeth and shorten the duration of the orthodontic treatment: Corticotomy, Modified corticotomy (PiezocisionTM), Vibration (ExcelDent®), Irradiation of light (Biolux®), Ultrasonic waves. The purpose of this presentation is to report a crowding case combined with PiezocisionTM and to evaluate patient discomfort.

Case Summary : The adult female patient visited our clinic to correct her uneven upper anterior teeth. We performed PiezocisionTM on interdental alveloar bone from upper right lateral incisor to upper left lateral incisor and then wire changed sequentially every two weeks. The outcome measures were recorded on study model at each clinical visit. Crowding was determined as a linear function between mesio-distal widths of the adjacent teeth (recorded in millimeters) according to the Irregularity Index first described by Little. All linear measurements were recorded manually with a digital vernier calipers. The rate of tooth movement was measured as the change in the displacement of teeth such that as alignment improved over time, there was also a quantitative reduction in the Little's Index score. A visual analog scale (VAS) was used as the assessment tool for orthodontic pain.

Conclusion : The rate of tooth movement after piezocisionTM was 0.483 mm per week or 1.9 mm per 28-day month. The rates of tooth movement were encouraging. The conventional wisdom regarding normal rates of tooth movement are about 1mm of movement per months. Pain was not significant in clinically.

P-85

3 tools for successful nonextraction orthodontic treatment

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Introduction : Flaring of anterior teeth in orthodontic treatment could induce inappropriate circumstances in terms of esthetics and functions. So, even in non-extraction orthodontic treatment, keeping the position of anterior teeth is very important and retracting anterior teeth might be required for better results. In order to achieve satisfied outcomes, we need to make spaces to align teeth backward or to retract teeth under non-extraction condition.
Discussion : Three non-extraction cases were successfully treated using combination of 3 tools (full arch retraction; FAR, arch expansion, interproximal reduction; IPR) without flaring anterior teeth regardless of gender, age and malocclusion type. Appropriate combination of 3 tools for each case was determined and used. Among 3 cases, 1 case was treated by combination of all 3 tools and other 2 cases were treated by combination of FAR and IPR. Especially, 27 years old female with mild skeletal class III with lower lip protrusion was treated successfully using combination of FAR and IPR.
Conclusion : Our results demonstrate that combination of 3 tools is an effective way to align teeth backward or to retract anterior teeth presenting good results in non-extraction orthodontic treatment. Orthodontist should keep in mind that an appropriate combination of 3 tools would be suitable for each case. And we suggest that one should consider availability of 3 tools from the first step in orthodontic treatment in making diagnosis, to determine extraction or nonextraction.

P-86

CBCT analysis on the position of temporomandibular joint in skeletal Class III malocclusion patients with facial asymmetry

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Objectives : The purpose of this study was to investigated the position of temporomandibular joint using CBCT in skeletal Class III patients with facial asymmetry and to evaluate factors that affect menton deviation.
Material and Methods : The asymmetry group included 30 skeletal Class III patients with menton deviation greater than 4.0 mm. The control group consisted of 30 skeletal Class I individuals who had menton deviation less than 2.0 mm. Linear and angular measurements for the position of temporomandibular fossa and condyle, the condyle-fossa relationship and morphological features of the mandible were measured using OnDemand3D software to evaluate the differences between the deviated and non-deviated sides in asymmetry group and control group. Correlation coefficients were calculated between measurements and menton deviation.
Results : In the asymmetry group, the mandibular condyle on the deviated side were significantly laterally position than on the non-deviated side in relation to middle sagittal reference plane ($P < 0.05$). With regard to the condyle-fossa relationship, the medial joint spaces on the deviated side were significantly larger than on the non-deviated side ($P < 0.05$). Differences of ramus length and frontal ramal inclination between the deviated side and non-deviated sides were correlated to menton deviation ($P < 0.05$).
Conclusion : Skeletal Class III patients with facial asymmetry showed morphological asymmetries of the mandible. The positions of the temporomandibular fossa did not differ between the deviated and non-deviated sides and the positions of the condyle on the deviated side were significantly more lateral position, however, the differences between the deviated and non-deviated sides were too small.

P-87

Clustering of dentoskeletal pattern in orthodontic patients with deep curve of Spee

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Objectives : The objective was to investigate whether orthodontic patients with deep curve of Spee (COS) could be classified according to dental and skeletal characteristics and to compare COS characteristics between the classified groups.
Material and Methods : 184 patients who have COS more than 3 mm were included to this study. 18 dental and skeletal variables were measured using lateral cephalograph, models. The measurements are overjet, overbite, interincisal angle, angle of lower incisors, canines and first molars based on MP and MnOP, relative height of lower incisors, canines based on MP, gonial angle, SNA, SNB, ANB, MP-FH, MnOP-FH in lateral cephalograph and COS, intercanine, interpremolar, intermolar width, arch length in models. Using the 18 correlated variables, principal component analysis (PCA) was performed and K-means cluster analysis based on PCA results was used to obtain distributed cluster groups. Comparison between clusters were done with analysis of variance followed by the Tukey post-hoc test.
Results : According to K-means cluster analysis, deep COS subjects were categorized into 3 clusters. Cluster 1 (n=52) showed skeletal Class III-normal angle subjects, linguoversion of incisor, canine distal tipping, uprighted or distally tipped first molar, wider intermolar and shorter arch length. Cluster 2 (n=57) presented skeletal Class I and II-low angle subjects predominantly, large overjet, the deepest overbite, labioversion of incisor, severe mesial tipping of canine and molar, a deeper COS and the smallest extrusion of incisor and canine. Cluster 3 (n=75) presented skeletal Class I and II-high angle subjects mainly, the largest overjet, decreased interincisal angle, mesial tipping of molar, the most extrusion of incisor and canine.
Conclusion : Based on the results, it is important to analyze the dentoskeletal factors contributing to the deep COS and then strategic treatment planning of COS leveling should perform in accordance with COS patterns.

P-88

Study on the clinical usefulness of the RP Model made by using intraoral scan images

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Objectives : To evaluate the possibility of replacing the plaster model (PM) with the RP model (RM) in the orthodontic clinic.

Material and Methods : 20 sets of plaster model and RP model were obtained from the 20 subjects. For evaluation of the validity, reliability, and reproducibility, two researchers (R1, R2) measured 20 items twice.

Results : Validity; In the case of R1, there was a significant difference ($p<0.05$) in 10 items between plaster model and RP model, and 7 items in R2. Reliability; In the case of R1, there was a significant difference ($p<0.05$) in the 7 items in plaster model and 11 items in the RP model, and 5 and 4 items in R2. Reproducibility; There were significant differences ($p<0.05$) between the two researchers in 9 items in plaster model and 8 items in RP model. There was no item which showed a difference of 0.5 mm or more between the researchers and between the first and the second measurements of the same researcher, except the difference in the measurements of the mandibular intermolar width in RP model between the researchers.

Conclusion : Even though there were statistically significant differences between plaster model and RP model, the RP model can be an alternative to the plaster model, clinically.

P-89

Evaluation of buccolingual inclination in Class II patients with and without advanced periodontitis

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Objectives : The aim of this study was to compare the buccolingual inclinations and transverse arch width of maxillary and mandibular first molars and second premolars between normal occlusion sample, Class II malocclusion patients, and periodontally compromised Class II malocclusion patients using cone-beam CT. The hypothesis was that the periodontally compromised patients had lingually tilted molars compared to periodontally healthy Class II patients.

Material and Methods : Group 1 comprised 40 Korean normal occlusion subjects. Group 2 and Group 3 were selected from patients diagnosed as Class II malocclusion and grouped according to the presence of moderate to advanced periodontitis with bone loss. 3D CBCT images were taken before treatment and measurements were made to compare the buccolingual inclination and transverse arch width at the first molars and second premolars. The transverse arch width was measured at three points. The percentage of maxillary arch width to mandibular arch width (Mx-Mn width ratio) was evaluated.

Results : The mean value of inclination at the maxillary(U6) and mandibular first molar(L6) in group 1 were 91.18 and 80.17 degrees respectively. At U6 and U5, Group 2 showed more buccal inclination ($P < .0001$), and Group 3 showed more lingual inclination ($P < .0001$), when compared with Group 1. At L6 and L5, Group 3 had more lingual inclination compared with Group 1 and Group 2. ($P < .0001$) The transverse arch width of U6, U5 measured at buccal bone and CEJ was significantly narrower in Group 2 and Group 3. The Mx-Mn width ratio at first molar was 105.68 (at buccal bone) and 103.88 (at CEJ). The Mx-Mn width ratio had no statistically significant difference between three groups.

Conclusion : In patients with moderate to advanced periodontitis, maxillary and mandibular posterior teeth tipped more lingually, while maintaining the Mx-Mn width ratio.

P-90

Comparison of bucco-lingual inclination between Class II with and without periodontitis and normal occlusion samples

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Conclusion : In patients with moderate to advanced periodontitis, maxillary and mandibular posterior teeth tipped more lingually, while maintaining the Mx-Mn width ratio.

P-91

Buccolingual inclination and transverse dimension between skeletal Class III,Class II patients and normal occlusion samples

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Objectives : The aim of this study was to find out the transverse characteristics of sagittal jaw relation by comparing the buccolingual inclinations and transverse arch width of maxillary and mandibular first molars and second premolars between normal occlusion, Class II malocclusion and skeletal Class III malocclusion patients. Assessments were performed by using 3-dimensional CBCT. The hypothesis was that there is a difference between them.

Material and Methods : Group 1 comprised 40 Korean normal occlusion subjects. Group 2 (30 patients) had Class II div. 1 malocclusion and Group 3 (40 patients) had skeletal class III malocclusion. 3D CBCT images were taken before treatment and measurements were made to compare the buccolingual inclination and transverse arch width at the first molars and second premolars. The transverse arch width was measured at three points; buccal alveolar bone, CEJ, and palatal alveolar bone. The percentage of maxillary arch width to mandibular arch width was evaluated.

Results : At U6 and U5, Group 2 and Group 3 showed more buccal inclination than Group 1. At L6 and L5, Group 1 and Group 2 had no statistically significant difference. However, Group 3 had more lingual inclination compared with Group 1 and Group 2. Group 3 had statistically smaller Mx-Mn width ratio compared to Group 1 and Group 2 at first molars at palatal bone and CEJ indicating maxillary width was narrower when compared to mandibular width in Group 3.

Conclusion : There was a difference in crown inclination and transverse width of the posterior tooth according to sagittal skeletal dysplasia, which was found to be particularly severe in skeletal Class III malocclusion patients. This suggests that the treatment of skeletal Class III malocclusion patients should be more focused on correcting transverse discrepancy of maxillary and mandibular arch width and posterior crown inclination

P-92

Comparison of intraoral scan images in an arch with and without orthodontic brackets.

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Objectives : This study aims to examine the reproducibility of an intraoral scan (IOS) image in the upper and lower arches and to evaluate the difference of IOS images with and without orthodontic brackets.
Material and Methods : Total 24 arches (Maxilla: 14, Mandible: 10) were scanned directly from sixteen patients using an intraoral scanner. Each arch was scanned twice with two weeks interval to examine reproducibility (IOS1 and IOS2, respectively). Reproducibility was calculated with the difference in three different regions of the arch (anterior, premolar, and molar area) using the 3-dimensional analysis software (Group1: IOS1 vs IOS2). To assess the effect of orthodontic brackets on the IOS images, 24 arches (Maxilla: 10, Mandible: 14) were scanned before (IOS) and after the orthodontic bracket bonding (ISO_B). The regions of interest were defined by the buccal surface above the bracket and the lingual surface of teeth (Group 2: IOS vs ISO_B). Kruskal Wallis and Mann whitney test were performed to evaluate the differences.
Results : The mean difference between repeated IOS images (IOS1 vs IOS2) was +0.066,-0.068mm respectively and the average maximum error was 1.038mm. The error tends to increase from the anterior to the post region; however there were no significant differences among the regions and between the arches. The IOS image with brackets showed more deviation of the image (IOS - ISO_B, mean deviation: +0.101,-0.116mm) with significant differences compared to that of group 1($P<0.001$) in all regions.
Conclusion : This study represents that the digital IOS provides reproducible images; however brackets may influence the IOS images.

P-93

Diagnosis and treatment outcome of facial asymmetry according to the occlusal cant and menton deviation

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Objectives : This study was performed to investigate morphological differences and to compare treatment outcomes between the ipsilateral type of facial asymmetry, whose frontal occlusal plane (FOP) inclined toward the same side of the menton deviation, and the contralateral type, whose FOP inclined toward the opposite direction, by using cone beam computed tomography (CBCT) images.

Material and Methods : This retrospective study included consecutive patients with skeletal Class III malocclusion and facial asymmetry, who had undergone bimaxillary orthognathic surgery and had taken serial CBCT before (T0), 1 month after (T1), and 1 year after (T2) surgery. The contralateral group (n =12) was selected first, then the ipsilateral group (n = 12) was selected by matching age, gender, and degree of FOP cant with those of the contralateral group. Using reconstructed CBCT images we measured linear distance, angle, volume, and area and analyzed them using independent t tests and paired t tests.

Results : The differences in mandibular body length which has an opposite tendency to FOP cant caused the atypical menton deviation in the contralateral group. The asymmetry was improved after surgery in both groups. However, in the contralateral group, the improvement of menton deviation was not statistically significant ($P < 0.05$) and the difference of hemi-lower facial area between deviated and non-deviated sides remained after the surgery.

Conclusion : Clinicians should pay attention to possibility of incomplete correction of asymmetry after surgery and consider the need of additional surgery when treating the contralateral type of asymmetry.

P-94

A study of physiologic drift of upper first molar and canine following maxillary premolars extraction

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Purpose : To explore the physiologic drift characteristics of untreated upper first molar and canine following the extraction of maxillary premolars .
Materials and methods : 62 Patients' series data were collected from Peking University Hospital of stomatology during 2012 to 2014 and divided into maxillary first or second premolar extraction group according to the extraction position. Propensity score matching was used to match the different extraction spaces of two groups by the ratio of one-to-one(total for 112 extraction space, 56 for each group). Pre- and post-extraction casts were taken and scanned by 3D scanning. The series models of one patient were superimposed on the regional palatal surface. The inclination, torque, linear movement of the cusp and the rotation of the first molars and canines were measured and compared between the two groups.
Results : The first molars in both groups expressed mesial movement of the cusp, the mesial inclination, palatal torque and mesial-palatal rotation of the crown. Compared between the first and second premolar extraction groups, the inclination variations of the first molars were 3.362.96T 6.572.9¤P0.05); The torque variations were -1.011.69T -1.061.83¤P
Conclusions : 1. After maxillary premolars extraction, The first molars in both groups expressed mesial movement of the cusp, the mesial inclination, palatal torque and mesial-palatal rotation of the crownand she canines expressed distal movement of the cusp, the distal inclination, palatal torque and distal-palatal rotation of the crown.
2. The inclination ,rotaion and the mesial movement of the cusp variations of maxillary first molars in second premolar extraction group are greater than the other group, but present no statistical differences for canines between the two groups.

P-95

The longitudinal cephalometric study for positional changes of maxillary and mandibular incisors using implants methods

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Objectives : The present study was conducted to assess the positional changes of human maxillary and mandibular incisors in childhood and adolescence at various stages.
Material and Methods : Lateral cephalographs including 10 subjects (7 males and 3 females) between 7-14 years old were used, which had been taken at University of California in San Francisco and kept at University of the Pacific. Four lateral cephalographs T1, age 7 to 8; T2, age 9 to 10; T3, age 11 to 12; T4, age 13 to 14 were chosen for each subject according to chronologic age and dental occlusion. Tracing on acetate paper of each cephalographs was used in order to mark the 10 landmarks (S, N, ANS, PNS, U1, L1, Me, Go, ptm, Imp) and superimposed between T1 and T2, T2 and T3, T3 and T4 according to structural method on cranial base, maxilla, and mandible, and best fit method on implants. The differences were evaluated.
Results : The following results were obtained: The vertical and anteroposterior positional change of maxillary incisors showed statistically significant growth changes at different stages according to different superimposition methods. The vertical and anteroposterior positional change of mandibular incisors showed statistically significant growth changes at only T3-T4 regardless of different superimposition methods.
Conclusion : The above results show that positional change of the upper and lower incisors was assessed together the growth of the facial bones when traditional superimposition method was used in growing children. This suggests that facial bone growth needs to be considered when assessing the positional change of upper and lower incisors.

P-96

Study on the accuracy of maxillary superimposition in growing patients using Cone-Beam Volumetric Images

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Objectives : This study compared the accuracy of 3D-Ceph image to that of 2D-Ceph image in maxillary superimposition to ascertain the advantages of 3D-Ceph, such as more accurate tracing landmarks and no double images. This study also examined the differences between stable structural superimposition and best fit superimposition in maxillary growth with the 3D-Ceph image generated by cutting the Cone-Beam Volumetric Image of the maxilla based on the center of the sagittal plane.
Material and Methods : The CBCT(cone-beam computed tomography) imaging data of patients who visited the Ewha Womans University Mok-dong dental hospital in their growth period was collected. Among these patients, those with CBCT taken more than two times and 2D-Ceph taken in the same time period between prepubertal and postpubertal growth period were selected. The Ondemand3D(Cybermed Inc, USA) was utilized to reconstruct the left side 3D-Ceph image of patients based on the sagittal plane of the CBCT images taken during two time intervals. For each patient, two 3D-Ceph images were extracted from each of the two CBCT images, followed by stable structural maxillary superimposition and best fit maxillary superimposition. Furthermore, 3D-Ceph was compared with 2D-Ceph, which was taken in the same time period as CBCT pertaining to the maxillary superimposition with stable structural superimposition.
Results : The findings indicated that 3D-Ceph provides more accurate results in maxillary superimposition than 2D-Ceph and that stable structural superimposition is more accurate than best fit superimposition. Additionally, the results showed that the best fit method underestimates the maxillary growth of patients in their growing stage.
Conclusion : Stable structural superimposition of the maxilla with 3D-Ceph generated from CBCT is an accurate and effective tool in evaluating maxillary growth.

P-97

Genetic Influence of Matrix and Intramatrix Rotation of Mandible : Korean Twin Study

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Objectives : To investigate the heritability of total rotation, matrix rotation, intramatrix rotation of mandible of Korean monozygotic (MZ) twins, dizygotic (DZ) twins, and their siblings.

Material and Methods : The samples consisted of 75 pairs of Korean twins (mean age, 39.7 years; MZ group, n = 36 pairs; DZ group, n = 13 pairs; Sibling group n = 26 pairs). Lateral cephalometric radiograms were taken and 13 variables related to internal, external rotation of mandible were measured. Three types of occlusal planes (bisected occlusal plane, functional occlusal plane, MM bisector occlusal plane) were used to evaluate genetic influence of occlusal plane. Heritability (h2) was calculated by using Intraclass Correlation Coefficient (ICC) and Falconers method.

Results : In regard of mandibular rotation, MZ showed significantly higher ICC values compared to DZ and siblings. ICC mean value of 13 cephalometric measurements were 0.85 (MZ), 0.62 (DZ), and 0.52 (Sibling). Heritability of total rotation (0.48) and matrix rotation (0.5) between MZ and DZ was higher than that of intramatrix rotation (-0.14). All of the three types of occlusal plane showed high heritability, and among the three types, functional occlusal plane showed the highest heritability (h2 =0.76).

Conclusion : Based on the findings of strong genetic effect of total rotation and matrix rotation, orthodontic treatment may not either change the inherited rotation pattern or maintain stable outcome, while lower border of mandible may be responsive to the treatment. Occlusal plane change, especially in regard of functional occlusal plane, may not be stable due to strong genetic influence.

P-98

Evaluation of skeletal maturity in cervical vertebrae and hand-wrist in relation to vertical facial types

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Objectives : In order to evaluate differences in skeletal maturity in relation to vertical facial types and to compare differences in skeletal maturity of the cervical vertebrae and hand-wrist in girls.

Material and Methods : This study involved 59 Korean girls, aged 7 to 9 years, with skeletal Class I malocclusion. The girls were categorized into 3 groups (low, normal, and high angle) according to the mandibular plane angle. Skeletal maturity was measured by skeletal maturity indicators (SMIs) and the Tanner-Whitehouse III (TW3) method on hand-wrist radiographs, and by cervical vertebrae maturation indicators (CVMIs) on lateral cephalometric radiographs.

Results : SMI and TW3 bone age were significantly higher in the high-angle than in the low-angle group ($P = 0.014$). There was no significant difference in CVMI among the three groups. A weak positive correlation was observed between the mandibular plane angle and skeletal maturity (SMI, TW3, CVMI; $r = 0.391$, 0.333 and, 0.259, respectively).

Conclusion : The skeletal maturity of the hand-wrist with a high mandibular plane angle was higher than that with a low angle. Taking an additional hand-wrist radiograph may aid in evaluating skeletal maturity when assessing the growth and development of girls. In high-angle patients, the time to commence orthodontic treatment may be earlier than in low-angle patients.

P-99

Heritability of the cephalometric facial hard, soft tissue parameters in Korean twins and their siblings

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Objectives : To investigate the heritability of the cephalometric facial hard and soft tissue parameters of Korean monozygotic (MZ) twins, dizygotic (DZ) twins, and their siblings.

Material and Methods : The samples consisted of Korean adult MZ and DZ twins and their siblings (mean age, 39.7 years; MZ group, n = 36 pairs; DZ group, n = 13 pairs; Sibling group, n = 26 pairs). Lateral cephalometric radiographs were taken and total 56 hard tissue and 24 soft tissue variables were measured to analyze linear, angular and ratio characteristics of facial structures. Intraclass correlation coefficient (ICC) of each group was extracted to compare the heritability among three groups. Fifteen factors were extracted by Principal Components Analysis (PCA), and the heritability of each factors was obtained (low heritability, $h2<0.2$; high heritability, $h2>0.8$).

Results : The average hard and soft tissue ICC of MZ was higher than that of DZ and siblings. The mean of the hard tissue ICC and the soft tissue ICC were similar in each group. 15 Factors were extracted from the eighty variables, which could explain about 89.85% of the total components. Among the 15 factors, Factor 3 related to facial divergency, Factor 8 related to the anterior facial height, and the factor 13 related to the soft tissue chin thickness showed high heritability.

Conclusion : The higher the genetic similarity, the greater the similarity of facial structures, and genetic factors affect the hard tissue and soft tissue to a similar extent. The genetic influence of vertical relationship of facial skeleton, anterior facial height and soft tissue chin thickness is larger than other factors.

P-100

Accuracy of Computer-Aided Surgical Simulation Planning Program for Orthognathic Surgery in Skeletal Class III Patients

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Purpose : Nowadays, the surgical prediction can be effectively done by using Computer Aided Surgical Simulation (CASS) planning program and transfers the surgical plan to operating room by three-dimension surgical splints. This study aimed to assess the accuracy of CASS planning program for conventional orthognathic surgery in skeletal type III relationship.

Materials and methods : Nineteen participants were diagnosed and treated by combined orthodontic-orthognathic surgery from the Faculty of Dentistry, Mahidol University. The first CBCT scans and 3D virtual model scans were recorded 2-4 weeks presurgically (TO). The simulation plans were generated by surgical prediction software, Simplant O&Otm, and were transferred to operating room by 3D surgical splints. The second CBCT scans were records postsurgically after splint-off period (T1). The differences of T0 and T1 were compared by linear measurements and angular measurements and statistically analyzed by one-sample t-test and Intraclass Correlation Coefficient (ICC)

Results : There was no statistically significant differences between repeated measurement of T0 and T1 and the ICC showed an excellent correlation. (0.787 – 0.998) Statistically significant differences were found in U6L to FHP, L6R to MSP, PP to FHP, MP to FHP, and MP to MFP with P-value less than 0.05. The overall mean linear difference was 0.57 mm and mean linear differences for maxilla and mandible were 0.59 and 0.54 mm, respectively. The overall mean angular difference was 0.93 degrees and mean angular differences for maxilla and mandible were 0.95 and 0.91 degrees, respectively.

Conclusions : Application of CASS for two-jaw orthognathic surgery in skeletal class III non-growing patients had acceptable accuracy which facilitated diagnosis, treatment planning, and surgical planning effectively.

P-101

Smile esthetics with differing gingival display in Japanese

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Purpose : The smile, one of the features composing facial architecture, plays a role of fundamental relevance in contributing to the esthetics and attractiveness of the face. Excessive gingival display, so-called gummy smile, can severely detract from an otherwise pleasing smile. The amount of gums considered most attractive, the threshold level, and judgment criteria are all unknown. The principal aim of this study was to quantitatively evaluate the influence of the amount of maxillary gingival display on the perception of smile attractiveness by dental professionals and dental students.
Materials and methods : Eleven female patients (mean age 23 years, 3 months) who had good occlusion were selected. Frontal extraoral photographs displaying three different smiles were obtained for each patient. The gingival display was divided into 7 groups, from 0 to 6 mm. The smile raters were 31 Japanese orthodontists and 128 Japanese third-year dental students. The students, who had not yet studied orthodontics, were chosen for similarity to laypersons. Determination of the subjective esthetic value of each smile was accomplished using a visual analogue scale.
Results : Both the dentists and dental students, the median esthetic value increased gradually from 0mm to 6mm. The threshold for determining gummy smile was lower in dentists than in dental students. The dentists judged that 3mm or less was ideal, while the students judged that 4mm or less was good.
Conclusions : A goal of around 3mm of gingival display is proposed in gummy smile case treatment for Japanese patients.

P-102

The influence of palatal bone thickness on the presence of torus palatinus in mid-palatal suture

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Purpose : The palatal bone is one of the most suitable places for orthodontic anchoring screw (OAS) placement because there are no anatomical structures, such as nerves, blood vessels or roots . The purpose of this study was to investigate index by measurements of palatal bone thickness that focused on the torus palatinus (TP) for OAS placement.

Materials and methods : Forty five female subjects who were characterized by maxillary protrusion, were divided into TP-present and TP-absent groups. The patients had undergone orthodontic treatment at Aichi-Gakuin University Dental Hospital. Bone thickness was measured mediolaterally and anteroposteriorly at 1mm interval along the midpalatal suture using CBCT. From the transverse basis lines, 20mm lines were drawn perpendicular to the sagittal plane through mesial contact points of the left and right maxillary first molars. In coronal image, bone thickness was measured at both sides of 3mm toward mediolateral. In each sagittal image, bone thickness were measured and compared every 5mm interval (0-4mm(G1), 5-10mm(G2), 11-15mm(G3), 16-20mm(G4)).

Results : Palatal bone thickness in TP-absent group was greatest 5.980.17mm at G1,G2 and decreased gradually toward the distal region. The TP-present group was thickest 8.210.26mm in G2, G3 in the presence of TP area, and showed significant difference between G2, G3 and G1,G4. Even the TP-absent area in TP-present group was significantly thicker than TP-absent group.

Conclusions : These results suggest that palatal bone in TP-present group is suitable places for OAS placement not only TP-present area but also TP-absent area.

P-103

Treatment effects of total distalization of mandibular dentition according to temporary anchorage devices

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Objectives : The aim of this study was to compare treatment effects after distalization of the mandibular dentition according to locations and types of temporary anchorage device (TADs) in Class III malocclusion
Material and Methods : The study sample consisted of 40 Class III malocclusion patients with buccal miniscrew treatment (age, 25.9 7.7 years) and ramal plate treatment (age, 25.1 6 years). Pre- and post-treatment cephalograms were analyzed with 23 linear and angular measurements. Multivariate analysis of variance was performed to evaluate the changes after treatment in each group and differences in treatment effects between the two groups.
Results : The mean amount of distalization at the crown and root levels of the mandibular first molars and the amount of distal tipping was 2.5 mm, 1.2 mm, and 5.2Ơin the buccal miniscrew group, and 3.9 mm, 1.7mm, and 9.0Ơin the ramal plate group, respectively. In addition, 1.3 mm intrusion was observed in the buccal miniscrew group. The distal movement of the lower lip was 0.7mm in the buccal miniscrew group and 2.7mm in the ramal plate group. In the ramal plate group, FMA increased by 1.0 ʈ
Conclusion : Ramal plate showed a greater amount of distalization and extrusion of the posterior teeth than the miniscrews.

P-104

Substitution of congenitally missing lower lateral incisors with canines : 5-year follow up

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Introduction : Management of patients with missing lateral incisors can be challenging. There are several treatment options for replacing missing lateral incisors such as canine substitution, a tooth-supported restoration, or a single-tooth implant. Space requirements, tooth size relationship, and size and shape of the canine should be taken into consideration to select the appropriate treatment plan. In this case report, we describe the successful treatment and 5-year follow up of substitution of congenitally missing lower lateral incisors with canines.
Case Summary : We report the case of a 9-year-old girl with skeletal Class I malocclusion, congenitally missing lower lateral incisors, midline discrepancy, crossbite on left anterior region and space deficiency of upper left canine. Phase I orthodontic treatment was initiated to correct space deficiency. Arch expansion with removable appliance was used and the upper left 1st premolar was extracted for retraction of left canine. Phase II treatment was resumed at 11 years old. Upper right 1st premolar was extracted and space was closed with absolute anchorage by using miniscrews. Lower lateral incisors were successfully substituted with canines using interproximal reduction and incisal edge reshaping. The final occlusion was favorable and an esthetic facial profile was achieved. The results have been stable throughout the 5-year follow up period.
Conclusion : A skeletal Class I patient with missing lower lateral incisors was treated successfully with canine substitution and the treatment results remained stable.

P-105

Long term retention after treatment by unilateral extraction of first premolars

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Introduction : Treatment of an adolescent patient with facial asymmetry starts with an orthopedic appliance when the patient is in the maximum growth period.
When we start treatment with fixed appliance after orthopedic treatment of facial asymmetry, it is important to make an accurate diagnosis and determine whether to include extractions.
In this case report, we describe the successful treatment of a skeletal Class I patient with facial asymmetry using a monoblock during growth and unilateral extraction of first premolars after growth completion.
Case Summary : A 11-year old skeletal Class I female patient had mandible asymmetry to the right side and a normodivergent facial pattern. She also had lower dental midline shift to the right side. She was in SMI stage 4 and a monoblock was used to improve facial asymmetry. Upper left first premolar was extracted after 11 months of treatment because there was no eruption space for the second premolar. After 23 months of treatment, she was in SMI stage 8 and after re-diagnosis, a decision was made to extract lower left first premolar for crowding relief and midline alignment. We retracted the lower left canine separately and closed the extraction space. In this process, we used MEAW in lower arch to improve Class III molar relationship and correct dental midline shift. At the end of treatment, she was in SMI stage 10. At the 7 years retention after treatment, the results of the treatment were well maintained.
Conclusion : Skeletal Class I patients with facial asymmetry could be successfully treated by orthopedic treatment during growth and by unilateral extraction of first premolar after growth completion. The results were stably maintained after 7 years.

P-106

20-year retention after treatment of a skeletal Class III with hypodivergent profile and unilateral crossbite

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Introduction : Skeletal Class III patients with narrow upper arch usually show a combination of crossbite in the anterior or posterior teeth. There are many options to resolve transverse discrepancy such as transpalatal arch, rapid palatal expansion appliance, removable appliance, and so on. We illustrate the successful treatment and stable retention after treatment of a skeletal Class III patient with hypodivergent profile combined with unilateral crossbite. Proper diagnosis and choice of appliance would allow successful treatment and retention.

Case Summary : A 27 year-old skeletal Class III female had a hypodivergent facial profile. She also had a crossbite on the right anterior side, dental midline deviation and spacing on the lower arch. We use a removable plate with fan type screw and posterior bite block for expansion of the upper anterior area. Transpalatal arch, lingual arch and canine expansion spring was applied to resolve transverse discrepancy. After orthodontic treatment, proper overjet, overbite and occlusion were achieved. The occlusion was stable even after 20 years with fixed retainers and removable circumferential retainers on both arches.

Conclusion : A skeletal Class III adult patient with hypodivergent facial profile, crossbite and transverse discrepancy was treated successfully by using removable appliance and canine expansion spring. The treatment results remained stable by following a proper treatment plan.

P-107

15-year long-term retention after maxillary canine substitution for lateral incisors

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Introduction : Dentists often encounter situations with missing upper lateral incisors. There are many treatment options for missing lateral incisors. It could be canine substitution, a single tooth implant, or a bridge restoration. Canine substitution could be the most conservative treatment option. Long-term studies have shown that canine substitution can lead to an acceptable functional relationship. Proper diagnosis and treatment plan for missing of lateral incisors is important for the result of treatment.

Case Summary : We reported that a 12 year-old female presented with skeletal Class I malocclusion, upper right canine, peg lateralis of both upper lateral incisors, and crowding on upper and lower arch. Both incisors. We decided to extract both upper lateral incisors for crowding relief on upper arch. Continuous reshaping of both upper canine for substitution was performed during treatment period. After orthodontic treatment, proper overjet, overbite and occlusion were achieved. The occlusion remained stable after 15 years with fixed retainers and removable circumferential retainers on both arches.

Conclusion : We achieved good esthetics and stable retention of occlusion with canine substitution. Crowding and smile esthetic was improved with extraction of lateral incisors and canine substitution. Proper diagnosis and treatment plan for missing of lateral incisors was important for esthetic and stable results.

P-108

Non-surgical/non-prosthetic camouflage treatment of Skeletal Class II openbite with bilaterally missing lower first molars

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Introduction : The successful camouflage treatment of skeletal Class II openbite malocclusion relies on the control of both A-P and the vertical problems. The treatment scheme increases in complexity when additional dental limitations such as premature loss of first molars or/and esthetic issues are combined with the skeletal problem. We illustrate the non-surgical and non-prosthetic camouflage treatment of skeletal Class II openbite malocclusion combined with missing bilateral mandibular first molars.

Case Summary : A 21-year-old woman indicated Skeletal class II (ANB 9.0° with retrognathic, hyperdivergent mandible (FMA 48.8°, lip protrusion, openbite malocclusion combined with the early loss of bilateral mandibular first molars. To manage the malocclusion along with the improvement of facial esthetics, anterior retraction (AP control) and full arch-intrusion (vertical control) to induce autorotation of the mandible was done in the maxilla. In the mandible, the second and third molars were uprighted and protracted substituting the missing first molars with the application of TADs. The treatment outcome and prognosis were also confirmed with CBCT imaging and 3-dimensional superimposition techniques along with long-term stability.

Conclusion : Non-surgical and non-prosthetic camouflage treatment of skeletal Class II openbite malocclusion with missing bilateral mandibular first molars was successfully treated by second molar protraction and maxillary full arch-intrusion with bodily retraction.

P-109

Classification of final restoration for the created alveolar space by maxillary anterior segmental distraction osteogenesis

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Objectives : Classification of the final restorations of the new alveolar bone after the DO, and the relationship between the site of the DO and the final restoration methods were analyzed.

Material and Methods :

1. Selection criteria

Unilateral and bilateral Cleft lip and palate Patient treated by alveolar DO from 2000 to 2010 at Yonsei university

13 Patients (11 male, 3 female) and 24 sites of space

2. Classification

1) Implant (with or without bone graft)

2) Conventional prosthesis

3) Space closure with orthodontic treatment

Results : Thirteen patients (mean age, 16 years 7 months) with unilateral cleft lip and palate were examined for skeletal dental changes in maxillary segmental DO. All patients were treated with intraoral appliance or rigid external distractor (RED). The created space by DO and skeletal measurement were obtained for Pre-DO, Post DO, and final restoration type and presence of bone graft in newly created alveolar bone were evaluated,

An average of 9.5 mm alveolar bone was created for 24 created alveolar spaces. For final restoration, implants were implanted in eight spaces (33%), and bone grafting was performed in three of them. Seven spaces (29%) were restored with a bridge and the remaining nine spaces (38%) were closed by orthodontic tooth movement.

Conclusion : Among the created alveolar spaces, implants were applied mainly to the premolar area and the conventional prostheses was mostly restored to the anterior or canine area.

In the case of implants, bone grafting was not necessary in the posterior dentition, but it was necessary to the anterior part of dentition.

Orthodontic closure after MASDO was achieved both in the premolars and in the anterior region effectively.

Distraction site in maxillary dentition should be decided based on final restoration goal, and retention strategies are needed for proper restoration.

P-110

3D analysis of the relationship between the anterior tooth retraction and arch dimensional changes

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Objectives : The purpose of this study were to evaluate the relationship between the amount of anterior teeth retraction and arch dimensional changes with extraction treatment through CBCT superimposition, and to compare the difference of arch dimensional changes between large retraction group and small retraction group.
Material and Methods : The sample consisted of 24 adults with maxillary protrusion and minimal crowding, treated by premolar extractions. CBCT images of before and after treatment were evaluated. The changes in the transverse arch measurement, the amount of maxillary incisor retractions was assessed, and the bucco-lingual inclination of maxillary canine was measured. Pearson correlation coefficients were calculated to analyze the relationships between the amount of anterior teeth retraction and dimensional changes in the arch width. Then, patients were divided into large retraction (more than 4mm) and small retraction (less than 4mm) groups and the transverse arch measurement changes was evaluated in each group. To exclude the effect of buccolingual inclination on maxillary intercanine width, the amount of lateral displacement by inclinational change was calculated.
Results : Pearson correlation coefficients indicated that retraction amount of anterior teeth was significantly correlated with the change of maxillary intercanine width. Maxillary intercanine width in large retraction group was significantly increased, but maxillary intercanine width in small retraction group was maintained. However, after excluding the effect of buccolingual inclination changes in the canine, maxillary intercanine width were significantly increased in both groups
Conclusion : The amount of anterior teeth retraction was significantly correlated with the change of maxillary intercanine width. In large retraction group, maxillary intercanine width was more significantly increased. Without buccolingual inclination change of canine, maxillary intercanine width may be also significantly increased in less small retraction group.

P-111

Maxillary protraction affects available space for maxillary second molars

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Objectives : This study was undertaken to determine whether maxillary protraction affected space available for second maxillary molars, utilizing lateral cephalometric readings of two groups (Class III and Class I patients).
Material and Methods : Fifty-six adolescents were included in this retrospective study and were divided into two groups. In the Class III group (17 boys and 14 girls; mean age: 11.17 years), skeletally anchored facemasks were applied. Pre- and post-maxillary protraction lateral cephalometric films were obtained. The Class I group (10 boys and 15 girls; mean age: 12.10 years) exhibited skeletal Class I malocclusions requiring no orthopedic treatment; this group provided chronological radiographs that were matched to those of the Class III group. Measurements were statistically evaluated with independent t-test.
Results : Minimum required sample size was not met for one linear and two angular measurements. Cronbach alpha reliability was acceptable or better for every variable. The Class III group demonstrated a significant increase in multiple linear and angular measurements, compared with the Class I group. The maxilla effectively advanced in the Class III group. Eruption of the second maxillary molar was not statistically different between Class III and Class I groups.
Conclusion : Space available for the second maxillary molar significantly increased after maxillary protraction with a skeletally anchored facemask. Growth of the maxillary tuberosity region after maxillary protraction may be a rationale for early Class III treatment to alleviate space deficiency. The second maxillary molar exhibited clinically favorable eruption.

P-112

Periodontal changes after orthodontic treatment in middle-aged adults are comparable to those in young adults

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Objectives : The goal of this study was to compare the outcomes and amount of change in periodontal health of anterior teeth in young vs middle-aged adults, who were treated to improve anterior alignment and occlusion.

Material and Methods : Pre and post treatment records including orthodontic casts, cephalograms, standardized periapical radiographs were retrospectively collected from young adult (19≤age<30, N=12) and middle-aged adults (age≥40, N=27). Discrepancy index (DI), Cast-Radiograph evaluation (CRE), treatment duration(TD), marginal bone loss (MBL), tooth length (TL) were measured and using periapical radiographs, changes in the level of marginal bone(△MBC) and the amount of root resorption(RR) following orthodontic treatment were calculated.

Results : DI, MBL, and TD were significantly higher in the middle-aged adults than in the young adults ($P < 0.05$). However, CRE and the △MBC following treatment were similar between the two groups ($P > 0.05$). The mean amount of RR following treatment was -0.6 ± 0.44 mm and -1.0 ± 0.61 mm in young and middle-aged adults, respectively. The degree of RR after compensating for treatment complexity and TD was similar between the two groups ($P > 0.05$).

Conclusion : Although the initial malocclusion and periodontal conditions were unfavorable for the middle-aged adults, the overall treatment and periodontal outcomes following orthodontic treatment of the anterior teeth were comparable to young adults. It appears that older adults tolerate orthodontics to improve the appearance of the anterior teeth as well as younger adults, with no additional burden because of their increased age.

P-113

Three-dimensional changes of the zygomaticomaxillary complex after mini-implant assisted rapid maxillary expansion (MARME)

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Objectives : The aim of this study was to investigate 3-dimensional (3D) changes of the zygomaticomaxillary complex (ZMC) after mini-implant assisted rapid maxillary expansion (MARME).
Material and Methods : A total of 15 pairs of cone-beam computed tomography (CBCT) 3D images taken before expansion (T0) and after expansion (T1) were analyzed by measuring changes in the coordinates of the landmarks of the ZMC.
Results : Changes in x coordinates of the landmarks showed significant expansion ($P < 0.01$) and greater expansion at the lower than upper portion of the ZMC ($P < 0.05$) in the transverse dimension. All y coordinates of the landmarks except jugal point (J) showed forward displacement ($P < 0.05$) and z coordinates of ANS, PNS, Alare, A, and Ectocanine showed downward displacement ($P < 0.01$) in the sagittal and vertical dimensions. And z coordinates of the landmarks that were closer to the midsagittal plane and in a more posterior portion of the ZMC displaced further downward ($P < 0.05$). SNA and ANB angles increased ($P < 0.05$, $P < 0.001$, respectively) and SNB angle decreased ($P < 0.01$). There was a significant correlation between changes in x coordinates of Ectomolare and Ectocanine and the amount of expansion measured from the center of resistance of the maxillary first molars ($P < 0.05$). There was no significant correlation between the amount of expansion and changes in y and z coordinates of the landmarks.
Conclusion : 3D changes of the ZMC after MARME showed expansion in a pyramidal shape from the coronal view, downward and forward displacement from the sagittal view and parallel palatal expansion from the axial view. These findings might be useful for understanding skeletal expansion patterns using maxillary skeletal expander (MSE).

P-114

Three dimensional changes of lip and perioral regions following debonding of brackets

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Objectives : Objectives: The purpose of this study was to evaluate 3 dimensional lip change of koreans following removal of brackets, so as to linear distance, curvature, and volume.
Material and Methods : Methods: In this retrospective study, 34 patients were included, who were treated with straight wire appliances whose whole face were scanned with white light scanner before and after debonding. Twelve soft tissue landmarks were registered manually within the software. Linear measurements between each corresponding point were performed. The curvature values were promptly calculated from the software, and volumetric measurements were aided by virtual planes to enclose the scanned shell data to act as walls.
Results : Results: Aside from point Sn. and Soft-tissue B point, all landmarks showed statistically significant differences regarding the distance of movement. The degree of displacement ranged from -0.275 mm to -0.812 mm (Mean = -0.53 mm). Four out of twelve landmarks were reported to have statistically significant curvature difference. The overall change of curvature values were minor (range = 0.032 ~ 0.073, mean = 0.0525). The difference of volumes averaged 1,508 mm, while the ratio of the difference volume relative to initial volume was 0.073(7.3%).
Conclusion : Conclusions: Significant positional changes were found at most of the peri-oral landmarks. No significant positional change with regard to Sn. and Soft-tissue B point was present. Some landmarks showed statistically significant flattening change in respect to curvature measurements. Volumes of peri-oral region showed statistically significant decrease in relation to the initial volume.

P-115

Risk factors associated with open gingival embrasures after orthodontic treatment

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Objectives : To investigate the incidence of and contributing factors to open gingival embrasures between the central incisors after orthodontic treatment.

Material and Methods : One hundred posttreatment patients (29 men and 71 women; mean age, 24.7 years) were divided retrospectively into occurrence and nonoccurrence groups based on intraoral photographs. Based on the severity, the occurrence group was further divided into mild, moderate, and severe groups. Parameters from periapical radiographs, superimposed lateral cephalograms, and study models were compared between the occurrence and the nonoccurrence groups by using independent t-tests and were also analyzed on the basis of severity via analysis of variance. Logistic regression analysis was performed to identify the contributing factors to open gingival embrasures.

Results : The incidence of open gingival embrasures between the central incisors was 22% and 36% in the maxilla and the mandible, respectively. Lingual movement of the incisors, distance from the contact point to the alveolar crest after treatment, antero-posterior overlap of the two central incisors before treatment in the maxilla, and distance from the contact point to the alveolar crest after treatment in the mandible were significantly associated with the occurrence of open gingival embrasures ($P<0.05$). In the mandible, the amount of intrusion was significantly related to severity ($P<0.05$).

Conclusion : The incidence of open gingival embrasures following orthodontic tooth movement is high. Therefore, attention should be paid to the contributing factors to prevent or reduce the occurrence of open gingival embrasures.

P-116

Changes in occlusal force after surgical/non-surgical orthodontic treatment in anterior open bite patients: 2-year follow-up

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Objectives : To compare changes in occlusal area and force in patients whose anterior open bite was treated through molar intrusion or orthognathic surgery, and to investigate the correlation between open bite relapse and occlusal force.

Material and Methods : Anterior open bite patients treated with a fixed appliance through molar intrusion (n=19), or orthognathic surgery (n=37) were classified as experimental groups, and non-open bite patients treated with a fixed appliance were classified as a control group (n=35). Bite pressure-sensitive films were used to analyze the occlusal contact area and force before treatment, immediately after treatment, and 2 years after treatment. The amount of molar intrusion during treatment and extrusion after treatment and anterior bite opening were measured on lateral cephalograms.

Results : In molar intrusion group and surgery group, the occlusal contact area and force decreased immediately after the treatment compared with those of Pre-Tx but increased 2 years after treatment. 2 years after treatment, the occlusal contact area and force of the 2 groups increased similar to those of the non-open bite group except the occlusal force of the molar intrusion group.

In the molar intrusion group, there was no correlation between open bite relapse and occlusal force.

Conclusion : After treatment of open bite through molar intrusion or surgery, occlusal area and force decreased immediately after treatment, but increased similar to those of the non-open bite group 2 years after treatment.

P-117

Changes in occlusal force and contact area after IVRO with/without extraction of premolars:2-year follow-up

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Objectives : To evaluate how extraction of maxillary premolars during presurgical orthodontic treatments influences the changes in the occlusal contact area and force on patients with mandibular prognathism.

Material and Methods : Skeletal Class III patients who underwent intraoral vertical ramus osteotomy (IVRO) were classified as follows: male non-extraction group (n=45), male group with two maxillary premolar extraction n=23), female non-extraction group (n=31) and female group with two maxillary premolar extraction (n=29). The occlusal contact area and force of before treatment (Pre-Tx), 1 month after orthognathic surgery (Post-Op), after orthodontic treatment (Post-Tx), and 2 years after treatment (2Y after Tx) were evaluated by using CCD camera.

Results : The occlusal contact area and force in both gender significantly reduced after the beginning of orthodontic treatment and the occlusal function was restored at the initial level 2 years after orthodontic treatment. Changes in occlusal contact area and force over time did not show statistically significant difference ($P>0.05$). There was no significant difference in the occlusal contact area and force in each period between groups in both gender ($P>0.05$), except for the Post-Tx period after orthognathic treatment in male patients. The occlusal contact area of male extraction was significantly larger than that of male non-ext at Post-Tx ($P<0.05$).

Conclusion : In patients with mandibular prognathism treated with IVRO, the maxillary premolar extraction during presurgical orthodontic treatment did not cause a significant difference in the change in occlusal contact area and force 2 years after orthodontic treatment.

P-118

Changes in the condylar position after orthodontic treatment: A CBCT study

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Objectives : The purpose of this study was to compare the condylar position according to the amount of incisor retraction during orthodontic treatment using cone beam computed tomography.
Material and Methods : Sixty-two patients who had finished orthodontic treatment were divided into 3 groups (minimum, moderate, and maximum retraction groups) according to the amount of retraction of the maxillary incisor. Pre-treatment (T0) and post-treatment (T1) CBCT images were superimposed based on the anterior cranial base. Four joint spaces (anterior, posterior, superior, and medial) were measured and compared between T0 and T1 in each group using paired t-tests and among 3 groups using ANOVA.
Results : In the minimum and moderate groups, there were no significant changes in the four joint spaces ($P > 0.05$). In the maximum group the posterior joint space decreased by 0.2 mm after treatment ($P < 0.05$), which was still in a physiologic range. There was no significant relationship between condylar position and maxillary incisor retraction in the minimal and moderate retraction groups ($p > 0.05$). However, the condyle moved backward statistically significantly, but clinically insignificantly in the maximum-retraction group ($p < 0.05$).
Conclusion : The orthodontic treatment does not significantly affect the condylar position. Although excessive retraction of maxillary incisors can affect the condylar position, the amount of backward movement of condyle is in a physiologic range.

P-119

Dental and skeletal treatment changes in patients with hypermentalis activity

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Objectives : The main purpose of this study is to evaluate the dental, skeletal and soft-tissue morphology on cephalometric measurements, compare the pre-treatment and post-treatment phase, analyze the treatment changes between hypermentalis and normal mentalis patients with Angle Class II malocclusion and deal with dentomaxillofacial changes related to mentalis activity.
Material and Methods : 67 adult female patients with Angle Class II malocclusion were separated into two groups, 36 subjects were regarded as hypermentalis muscle activity and 31 subjects were diagnosed as normal mentalis muscle activity. In each group, the subjects were divided into pre-treatment phase and post-treatment phase. The current study used cephalometric analysis to determine the improvements and changes in dental position, skeletal and soft-tissue morphology. Paired t-test was utilized to calculate the before and after treatment variables and the outcomes were regarded significant as P0.05. Pearson correlation and binary logic regression analyses were used to link dentomaxillofacial improvements with hypermentalis muscle activity and explore the reasons of the disappearance of hypermentalis muscle activity.
Results : The hypermentalis patients had more hyperdivergent facial types and skeletal Class II malocclusion with narrower and higher symphysis morphology than normal mentalis muscle group. Maxillary incisor retraction (U1/FH, U1/NA,U1 to N-per; $p<0.01$) and mandibular incisor retraction (LI/NB,IMPA; $p<0.05$) had significant correlation to hypermentalis muscle activity change. Compared with the normal mentalis group, the hypermantalis one showed greater decrease in incisor retraction and lip protrusion.
Conclusion : The hypermentalis group had greater improvement in the maxillary incisor retrusion and retraction, mandibular incisor retraction and intrusion after treatment. And maxillary and mandibular incisor retraction had considerable positive correlation to hypermentalis muscle activity.

P-120

Condyalr Head Remodeling compensation for Condylar Head Displacement by orthgnathic Surgery

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Objectives : The purpose of this study was to evaluate the association between the kind of condylar displacement due to orthognathic surgery and the subsequent adaptive condylar head remodeling.

Material and Methods : The sample in this retrospective cohort study consisted of 30 patients (12 female and 18 male; mean age 22.7y) with skeletal Class III malocclusion who underwent bilateral sagittal split ramus osteotomy (SSRO). Three-dimensional superimpositions of cone-beam computed tomography (CBCT) scan derived images from immediately after and 6 months after surgery were to reveal the type of remodeling, while images from before and immediately after surgery were to identify the subsequent type of condylar displacement.

Results : Laterally displaced condyles showed bone resorption on the lateral surfaces and deposition on the medial surfaces, whereas the contrary was found in medially displaced condyles. Anteriorly displaced condyles showed resorption on the anterior surfaces and deposition on the posterior surfaces, whereas the contrary was found in posteriorly displaced condyles. Superior surfaces of the condyles showed bone resorption regardless of displacement direction.

Conclusion : The results indicate that the condylar remodeling patterns (resorption/deposition) are determined by the direction of condylar displacement during surgery. However, condylar displacement by surgery is not completely compensated by condylar head remodeling, especially in case of downward displacement.

P-121

CBCT-generated cephalogram evaluation on short term changes on condylar position after SFA in mandibular prognathism

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Objectives : The purpose of this study was to compare the condylar displacement in surgery-first patients between the symmetry and asymmetry groups using CBCT-generated cephalogram.
Material and Methods : The subjects consisted of mandibular prognathism with and without facial asymmetry who underwent mandibular setback surgery using sagittal split ramus osteotomy and had CBCT taken before, about 1 week and 7 month after surgery. The condylar position was measured.
Results : As the results of comparison of the changes of condylar position before and 1 week and 7 months after surgery in each symmetry and asymmetry group, there was statistical significant changes at three time points in both groups. As the results of comparison of the condylar displacement between the lesser setback side and the greater setback side in each group, the condylar angle showed statistically significant change between the lesser and the greater setback sides in the asymmetric group. As the results of comparison of the condylar displacement according to the times, on the lesser setback side, there was a statistically significant change of condylar angle between the groups. The amount of condylar angle was larger in the asymmetry group than in the symmetry group. As the results of correlation analysis, only the LSS/GSS setback difference showed positive correlation with the surgical change and total change of condylar angle in the lesser setback side, whereas the ramus width and the ramus angle did not correlate with any condylar displacement.
Conclusion : In the surgery-first patients, the condylar position after mandibular setback surgery was statistically signigicant different in both groups and these condylar displacement remained at 7 months after surgery. However, the patterns of the condylar displacement were different between the symmetry and asymmetry groups.

P-122

Optimal surgical timing: Treatment result is our top priority

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Introduction : Recent increased sociocultural interest toward appearance has been prompted greater demands on orthognathic surgery. The fact that Surgery-First approach of the orthognathic surgery can avoid aggravation of the looks caused by dental decompensation or delays of improvement of looks, would be attractive to patients. For this reason, Surgery-First approach is now being introduced as a patient-friendly treatment. Some are even publicizing it as more reliable and safer treatment than Conventional approach of orthognathic surgery.
Discussion : It is the 'treatment objective' that gives criteria on deciding how to treat and the 'treatment objective' must be an evaluation criteria. In the daily clinic, we persue good aesthetics, function and prolonged retention as treatment objectives. It is the fundamental principles of dental treatment from the simple caries control to the orthognathic surgery. Therefore, if the Surgery-First approach is more favorable treatment, it should be evaluated by above treatment objectives.
Conclusion : This presentation will discuss the good aesthetics, function and prolonged retention as treatment objectives, especially the significance of the function, and will suggest the appropriate treatment process to achieve these treatment objecives. Also the comparison of Surgery-First approach and Conventional approach of orthognathic surgery will be presented to help determining which case has the advantage to achieveour treatment objectives.

P-123

Evaluation of facial soft tissue changes after 2-jaw surgery in skeletal classIII patients using stereophotogrammetry

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Objectives : This study is to evaluate changes in facial soft tissue after 2-jaw surgery in skeletal class III patients using 3-dimensional stereophotogrammetry.
Material and Methods : A retrospective study was performed with 18 skeletal class III patients who had undergone 2-jaw orthognathic surgery. Lateral cephalograms and 3D photographs were taken before (T0) and 6 months (T1) after surgery and were compared. A paired t test and Pearson correlation test were used to evaluate the hard and soft tissue changes and their correlations.
Results : After the surgery, significant maxillary differential impaction and mandibular setback were observed. Soft tissue measurements showed significant changes after the surgery except volume 1 (para-nasal) and 2 (upper lip). Nasal width was related with ANB and FH to PNS. Volume 2 showed relations with SNB, OJ, FH to PNS and Sper to B, while volume 3 (lower lip) was related with SNB, SN/GoMe, Bjork sum, U1 to SN and Sper to B. Lower facial height, nasal tip angle, nasolabial angle and volume 1 did not show relations with skeletal changes.
Conclusion : The results from this study suggest that the changes in facial soft tissue are closely related with the amount and the direction of the surgery in maxilla and mandible. The 3D stereophotogrammetry can be a useful tool to evaluate soft tissue changes after orthognathic surgery.

P-124

Long term retention after surgery-first orthodontic treatment of facial asymmetry with condylar hyperplasia

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Introduction : Condylar hyperplasia is divided into 3 categories: hemimandibular hyperplasia, hemimandibular elongation, and combination of the 2 entities and its etiology and pathogenesis remain uncertain. This condition can cause facial asymmetry, maxillary canting, chin deviation which requires surgical intervention with condylectomy for esthetic and functional correction. Surgery-first approach is one of the treatment option in cases of slight disharmony in arch coordination. In this case report, we describe the surgical-first orthodontic treatment with condylectomy for facial asymmetry caused by condylar hyperplasia and a 5-year follow-up.
Case Summary : We report the case of a 42-year-old woman with skeletal Class I malocclusion, facial asymmetry, condylar hyperplasia, maxillary canting and hypodivergent profile. Her chief complaint was discomfort due to facial asymmetry. Surgical treatment was planned to correct the skeletal discrepancy. Le Fort I osteotomy with repositioning of maxilla, IVRO on right side, and condylectomy on left side was done according to the surgical plan. Facial profile improved and functional occlusion was established by orthodontic treatment after orthognathic surgery. Post-op orthodontic treatment including arch coordination was done for 14 months. 5 years after orthodontic treatment and 6 years after surgery, occlusion and skeletal relationship remained stable.
Conclusion : Favorable occlusion and profile was established by orthognathic surgery as well as orthodontic treatment for a patient with facial asymmetry caused by condylar hyperplasia. The treatment results remained stable during the 5 year follow up period.

P-125

Treatment of the bimaxillary protrusion by anterior segmental osteotomy(ASO) : 10-year follow up

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Introduction : Bimaxillary protrusion is a commonly seen in orthodontic patients. When diagnosing and treatment planning for bimaxillary protrusion adults, clinicians should consider esthetic profile, treatment period, treatment difficulty of physiologic tooth movement, root resorption and periodontal problems. Usually, premolars extraction can be included with successful esthetic results, however surgical treatment is required to correct significant skeletal problems such as cases with a combination of transverse skeletal disharmony and maxillary excess. Anterior segmental osteotomy with extraction of premolars can relieve sagittal excess of the jaw. In this case report, we will show successful treatment of a case with bimaxillary protrusion treated by surgical procedures (anterior segmental osteotomy) and treatment results well maintained during the 10-year retention period.
Case Summary : We report the case of a 28-year-old skeletal Class I woman with bimaxillary protrusion and normodivergent profile. Surgical treatment (anterior segmental osteotomy) with premolar extraction on maxilla and mandible was planned to correct the skeletal discrepancy. Facial profile was improved and functional occlusion was established by orthodontic treatment after orthognathic surgery. Post-op orthodontic treatment was done for 11 months. 10 years after orthodontic treatment and 11 years after surgery, occlusion and skeletal relationship remained stable.
Conclusion : Favorable occlusion and profile was established for a bimaxillary protrusion patient after orthognathic surgery and orthodontic treatment. The treatment results remained stable throughout the long term retention period.

P-126

Early surgery after non-extraction presurgical orthodontic treatment in skeletal Class III hypodivergent patients

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Introduction : Skeletal Class III hypodivergent patients show a flat occlusal plane, small U1 (upper incisor) to UOP (upper occlusal plane) angle, short face and increased projection of the chin relative to the mandibular incisor. In these cases, large posterior impaction of the maxilla allows posterior setback of the mandible which leads to improvement in facial esthetics, normalization of the occlusal plane angle and decrease in incisor inclination. The purpose of our study was to investigate factors to consider when large maxillary posterior impaction is carried out in early bimaxillary orthognathic surgery in skeletal Class III hypodivergent patients, treated non-extraction.

Case Summary : Two patients with mandibular prognathism, flat occlusal plane angle and labioversion of the upper incisors are described. Although maxillary premolar extraction can be considered to normalize labioversion of the upper incisor, non-extraction was chosen to shorten the presurgical orthodontic treatment time. Through maxilla clockwise rotation, the jaw rotates backward and the mandibular plane angle and occlusal plane angle increases. U1 to FH (or SN) plane improved without any change in U1 to UOP angle. In rest and smile conditions, tooth and gingival exposure is improved. Esthetic facial profile and functional occlusion are achieved.

Conclusion : By rotating the maxilla clockwise in hypodivergent patients, occlusal plane, tooth and gingival exposure and upper incisor inclination can be improved. Even though U1 to UOP angle is constant, U1 to FH (or SN) plane and occlusal plane to FH plane are improved. Also, treatment results are functionally and aesthetically acceptable.

P-127

Muscle activity and jaw movement pattern after surgery in skeletal Class III asymmetry patients

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Objectives : The aim of this study was to evaluate changes of masticatory muscle activity and mandibular movement pattern after orthognathic surgery in skeletal Class III patients with facial asymmetry.
Material and Methods : The study samples consisted of 25 skeletal Class III patients treated with orthognathic surgery (OGS). They are divided into two groups. Study group: 15 patients (10 males and 5 females; 21.9 4.2 years, menton deviation >4mm) / Control group: 9 patients (4 males and 5 females; 22.3 2.8 years, menton deviation <1.6mm). The electromyography (EMG) activities of the bilateral anterior temporalis muscles (TA) and superficial masseter muscles (MM) were calculated at before OGS (T0) and 7-8 months after OGS (T1): resting, maximum clenching, anterior cotton roll biting and posterior cotton roll. The mandibular incisor movements were recorded with a magnetic incisor-point tracker (JT-3DTM, BioReserach Inc.) during a range of motion (ROM) test and unilateral gum chewing. The Average Chewing Pattern (ACP) was computed from gum chewing records.
Results : In EMG analysis, TA dominant pattern was changed to MM dominant during anterior cotton roll biting after OGS. In Jaw movement analysis, the amount of maximum opening, protrusive and lateral excursion to the non-deviated side decreased significantly at T1. During non-deviated side chewing, the maximum opening and closing velocities were significantly decreased. The turning point tended to be shorter in the vertical and horizontal views, and the maximum lateral width was significantly decreased.
Conclusion : Except anterior cotton biting, the TA-dominant EMG activity remained after the correction of the skeletal deformities. The correction of asymmetry caused the limitation of jaw movement on the non-deviated side in both ROM and ACP.

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Treatment of facial asymmetry patients using three-dimensional pre-surgical simulation, 3Dprinted surgical guide, and costomized plate

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Introduction : Facial asymmetry is influenced by not only the canting of the maxilla, but also mandibular discrepancy. In surgical correction of severe mandibular asymmetry, maintaining condyle position has limitation due to bony interferences between the proximal and distal segments because of yawing or shifting movements of the distal segments, which can lead to unintended condylar displacement. Nowadays improvement of CBCT imaging allows pre-surgical 3D simulation. 3D printed custom-made surgical guide and customized plate are also available. With 3D surgery simulations, an appropriate post-surgical condylar position of facial asymmetry patient can be determined before surgery, therefore better post-surgical stability can be obtained.

Case Summary : The first patient was a 23-year-old female with maxillary canting and mandible deviation to right. Both ramus of mandible were inclined to right side of patient and left ramus and body of mandible were longer than right side, in result of right condyle resorption. Surgery plan that changing inclination of proximal segment was established with 3D simulation. Surgery was performed with 3D printed surgical guide and customized plate. There were no TMD symptoms after surgery, and orthodontic result was stable.

The second patient was a 20-year-old male with maxillary canting and mandible deviation to left. Contrary to the first patient, both ramus of mandible were inclined left side of patient. Surgery plan was also established with 3D simulation and surgery was performed with 3D printed surgical guide and customized plate. There were no TMD symptoms after surgery, and result was stable.

Conclusion : In our cases, there was no significant difference between condylar position planned by 3D simulation before surgery and current condylar position. Neither occlusal change, nor TMD symptoms were observed. It is considered that using pre-surgical 3D simulation and 3D printed surgical guide and customized plate may be an effective method for patient who needs surgical correction of facial asymmetry.

P-129

Three-dimensional comparison of upper airway volume and configuration between supine position and upright position

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Objectives : When making a diagnosis and treatment plan in dentistry, cone beam computed tomography (CBCT) which is taken in an upright posture is usually used to analyze the dimensions of maxillofacial hard and soft tissue structures. However, the possibility of changes in the dimensions of the upper airway due to the effect of gravity should be taken into consideration as several of the oropharyngeal anatomical structures including the hyoid bone, tongue and the soft palate are movable.

The objective of this study is to compare the upper airway volume and configuration 3-dimensonally between the supine and upright positions.

Material and Methods : The sample consisted of 9 skeletal Class I female patients who had undergone angle reduction or zygomatic surgery which do not affect the upper airway dimensions. All patients underwent medical CT in a supine position before the surgery, and CBCT in an upright position 3-6 months after surgery. The width, length, and ratio between length and width (L/W), cross-sectional area, total volume, minimum axial area (MAA) and the position of was measured in both medical CT and CBCT .

Results : The cross-sectional area at C2, C3, MAA line and total volume were larger in the upright position than in the supine position ($p<0.05$). The L/W showed significant difference at only C2 line which means the cross-sectional morphology of the airway is more flat in the supine position than the upright position.

Conclusion : The cross-sectional area and total volume of the upper airway was narrower in a supine position than an upright position. This postural effect on the upper airway should be taken into account when assessing upper airway size with CBCT in an upright position. Especially when considering orthognathic surgery, the upper airway changes are important as snoring or obstructive sleep apnea occurs when lying down in a supine position.

P-130

Three-dimensional changes in the condylar position after intraoral vertical ramus osteotomy in facial asymmetry patients

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Objectives : The aims of the present study were to compare postoperative changes in condylar angulation and joint spaces between the deviated and non-deviated sides using computed tomography(CT) images in patients with facial asymmetry and skeletal Class III malocclusion who underwent intraoral vertical ramus osteotomy(IVRO).
Material and Methods : This retrospective study included 18 adult patients. The inclusion criteria were facial asymmetry with menton deviation of >3 mm and availability of CT images taken before (T0), immediately after (T1), and 12 months after (T2) orthognathic surgery. In order to investigate positional changes in and rotational movements of the condylar segments, four condylar segment measurements and five joint space measurements were performed.
Results : At T0, the axial condylar angle and coronal ramus angle showed significant differences between the deviated and non-deviated sides. At T2, the axial condylar angle was significantly different between the deviated and non-deviated sides, while the coronal ramus angle did not show significant differences. There were no significant differences in the five joint spaces between the deviated and non-deviated sides at T0 and T2. There were significant differences in the superior, medial and lateral joint spaces between the deviated and non-deviated sides at T1. At T2, the superior, anterior, and medial joint spaces returned to their preoperative state (T0-T2), whereas the posterior and lateral joint spaces remained significantly increased (T0-T2).
Conclusion : IVRO improves asymmetric structures and the facial appearance associated with the condylar segment. Physiological repositioning of the condyle gradually occurs during the postoperative follow-up period by 12 months after surgery.

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Surgery first orthognathic approach of skeletal Class III malocclusion with vertical and transverse discrepancy

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Introduction : Surgery first orthognathic approach (SFOA) has the advantage of rapid facial improvement and tooth movement after surgery, and a short treatment period. However, since preoperative orthodontic treatment is omitted, more precise evaluation and treatment is required and minimal preoperative orthodontic treatment may be performed to create a 3-point occlusal stop on surgical occlusion.
Case Summary : This case was a patient who was living in a foreign country and had difficulty in coming to the hospital, so we applied SFOA for rapid treatment and it was successful in a short period of time. A 35-year-old female Russian was presented with prognathic mandible, mid-facial deficiency, Class III molar relationship, molar transverse discrepancy with lower molar linguoversion, and super-eruption of Maxillary #7,8. SFOA with preoperative orthodontic treatment including #17,27 extraction, #18,28 protraction and buccal uprighting of lower molar was planned for rapid treatment progress. Including protraction of #18,28, total treatment duration was 13 months with only 7 visits and satisfactory occlusion and improved facial profile was obtained.
Conclusion : Although this case showed vertical and transverse discrepancy with skeletal Class III malocclusion, SFOA could be applied with minimal preoperative orthodontic treatment. The accurate diagnosis and minimal preoperative orthodontic treatment reduced the instability of the surgical occlusion and resulted in satisfactory treatment results with minimal treatment duration.

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A study on the changes of incisors in Class II orthognathic surgery patients

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Objectives : This study compared and analyzed T0(pretreatment), T1(before surgery), T2(at debond), and T3(retention period) in the 31 skeletal Class II patients(5 males, 26 females) who have undergone orthognathic surgery. The correlation of changes between periods and the retention, has been analyzed. At the same time, the study examined the changes in accordance with Genio OP, TMD, premolar extraction.

Material and Methods : This study included skeletal Class II patients who had undergone orthognathic surgery at the Department of Oral and Maxillofacial Surgery of Yonsei Dental Hospital.

After taking pictures by Cranex3+(soredex, Helsinki, Finland), this study used digital images with DICOM(Digital Imaging and Communication in Medicine) information in PACS (Picture Archiving Communication System).

All images are taken before the orthodontic treatment(T0), before the surgery(T1), after the orthodontic treatment(T2), in the retention period(T3).

Results : Premolar extraction from the mandible in T1-T0(N=22), significant lingual movement has been shown.

Pre-surgical orthodontic treatment without premolar extraction(N=9), because of crowding and the change of curve of Spee, significant anterior movement has been shown.

By the surgery, every measurements has changed into normal range.

In the retention period(T3-T2), in case with extraction has no significant IMPA increasing.

The extraction made no affection on the movement of the mandible

U1 to facial plane has increased in T1-T0 without premolar extraction.

With the Genio OP, the movement has shown retrusive movement.

U1 to facial plane has significantly shown retrusive movement in the retention period.

The extraction from the maxillary and the mandible does not affect to the retrusive movement in the retention period.

Conclusion : As a result, in the Class II orthognathic surgery, the skeletal relapse has shown, but the change from the treatment has maintained.

Therefore, the stability of the surgery will be the most important point of whole treatment. And the relapse can be used as a reference for future treatment and the surgery.

P-133

Surgical treatment of facial asymmetry patient with transverse maxillary deficiency

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Introduction : Facial asymmetry can be influenced by congenital, developmental, and acquired factors. Facial asymmetry is easily perceived and often patient come to the office with chief complaint. Transverse, anteroposterior, vertical dental decompensation is common in facial asymmetry. To acquire satisfying skeletal relationship after surgery, it is important to decompensate thoroughly in pre surgical orthodontic.
Case Summary : A 18-year-old woman was referred to the orthodontic department with the chief complaint of chin asymmetry and mandible prognathism. She was diagnosed as Class III malocclusion with facial asymmetry. Dental decompensation was observed and in the process of decompensation, transverse deficiency was expected. In preoperative orthodontic treatment, miniscrew-assisted rapid palatal expansion (MARPE) was used to improve transverse deficiency. Also to decompensate dental axis, criss-cross elastic was used. Then she underwent orthognathic surgery, and postoperative orthodontic treatment.
Conclusion : Facial asymmetry is easily perceived by the patient and often degrades life quality of patients. Treatment plan for facial asymmetry may include orthognathic surgery according to patient awareness of facial asymmetry, extent of occlusal deformity and sagittal or vertical jaw imbalance. If orthognathic surgery is planned, dental decompensation and arch coordination should be done before the surgery. Often transverse deficiency is found during the process so it should be considered thoroughly.

P-134

Surgico-Orthodontic case report of Class II, micromandible, gummy smile, open bite and TMD patient

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Introduction : To investigate key factors of surgico-orthodontic treatment of Class II, micromandible, open bite, gummy smile and TMD(Temporo Mandibular Disorder) patient.

Case Summary : 18 years old female wanted to correct protrusion and micromandible and anterior open bite. She had already been treated in the past using four bicuspid extraction. She also had DJD (Degenerative Joint Disease) and had been treated for 1 years in the TMD clinic. The main reason of openbite was DJD. This patient was already treated by camouflage orthodontics, therefore the lower anterior incisor was proclined. The key factor of pre surgical orthodontic treatment was retraction of lower anterior teeth. This will improve the amount of advancement of mandible. The orthognathic surgery was done by large amount of Le fort I impaction and set back, mandibular advancement and genio advancement. After post surgical orthodontic treatment, debonding was done. Her profile was greatly improved. Total treatment time was 1 year and 3 months.

Conclusion : To improve profile and skeletal problem in Class II patient, orthognathic surery is necessary. Large amount of maxiallry impaction was done to improve gummy smile and mandibular advancement was done for micromandible. Meticulous surgical technique and establishment of good occlusion is a key factor to achieve successful result.

P-135

A surgery-first approach in surgical-orthodontic treatment of mandibular prognathism

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Introduction : Compared to the conventional approach to orthognathic surgery, surgery-first approach could be advantageous in terms of reduced treatment time and immediate esthetic improvement. These factors may lead to high patient satisfaction rates from the early stages of treatment and improved cooperation during postoperative orthodontics. After the correction of the skeletal base discrepancy, the direction of postsurgical treatment coincides with the natural direction of spontaneous dental compensation and muscular force, thereby decreasing the time to full compensation. This approach demands more precise surgical planning and stronger collaboration between orthodontists and surgeons to accurately predict postsurgical tooth movement and surgical movement. This case report demonstrates successful surgical orthodontic treatment with a surgery-first approach in a patient with Class III skeletal jaw discrepancy.

Case Summary : I report the case of a 23-year-old man with chief complaint of mandibular prognathism. He had anterior crossbite and square face. Intraoral examination presented Angle's Class III molar relationship on both sides. Surgical-orthodontic treatment with a surgery-first approach was performed to correct his Class III skeletal jaw discrepancy and dental problem. Pre-treatment, post-treatment and retention photographs of this patient demonstrate effective, esthetically-pleasing, and stable treatment results.

Conclusion : This case report demonstrates that the surgery-first approach can be successfully used in correcting skeletal Class III malocclusion. In surgery-first approach, accurate prediction and simulation of the postoperative orthodontic treatment are crucial. With precise treatment planning, surgery-first approach has been acknowledged to reduce total treatment time significantly and to achieve high levels of patient and orthodontist satisfaction.

P-136

Measurement of facial line (cheek line-cheilion) changes after mandibular setback surgery

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Objectives : The lateral profile (facial line) is an important factor when evaluating attractiveness. A recent study has reported that the cheek line advances anteriorly by soft tissue redistribution of muscle and fat after mandibular setback surgery. In this study, we measured changes in the lateral profile (cheek line-cheilion) in Cone beam computed tomography images(CBCT) taken before and 6 months after mandibular setback surgery.

Material and Methods : Eighteen patients were selected among patients diagnosed with skeletal Class III malocclusion who underwent bilateral sagittal split ramus osteotomy(B point setback 8.29mm 1.47) at Chung-Ang University Hospital. CBCT images were obtained immediately before (T1) and 6 months after surgery (T2). Preoperative and postoperative soft tissue thickness measurements were obtained (a total of 14 points from cheek line to cheilion). The outcomes were compared using Wilcoxon Text and Pearson correlation analysis.

Results : The sample study showed that the most protruding point was the cheek point (intersecting point of lines connecting Ala-Tra and Ex-Ch) which showed an advancement of 0.58 mm on average after the surgery($P<0.01$). However below the cheek point, the soft tissue shows retrusion. The point on the cheek line where the soft tissue changes from advancement to retrusion varied among patients; cheek point to upper lip area (16.7%), upper lip (72.2%), in upper lip to lip commissure (5.6%), and lip commissure (5.6%), In the correlation analysis, lip commissure retrusion showed significant correlations with mandibular setback amount.

Conclusion : The sample study showed that cheek line has a tendency to advance above the upper lip after mandibular setback surgery. This is probably because after surgery, the related muscles return to their original position and excess soft tissue accumulates on the cheek. Below the cheek point, soft tissue tended to retreat in most subjects especially in the upper lip region.

P-137

Integration accuracy of intra-oral scans into cone-beam computed tomography images using various virtual planning software

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Objectives : The purpose of this study was to evaluate registration accuracy in the integration of intra-oral scans and cone-beam computed tomography images using three virtual planning software.
Material and Methods : The CBCT scan was obtained from the skull model made of bone-like materials. Before the CBCT scan, twenty fiducial markers were bonded on alveolar bone part of the skull model. Intra-oral scans and dental casts were taken from the same subject and dental casts were scanned with a 3D laser scanner. The cast scan models were registered into a CBCT model by fiducial markers using three-dimensional inspection software and the integrated model was used as control group. The intra-oral scan models were registered into a CBCT model using the three virtual planning software and the integrated models were used as experimental group. Shell-to-shell deviations and alignment errors between control group and experimental group were evaluated.
Results : The mean shell-to-shell deviations were 0.40 mm, 0.28 mm, 0.32 mm for each virtual planning software group, respectively. There was no significant difference between the groups (P >.05).
Conclusion : The integration of intra-oral scan models and CBCT images using virtual planning software showed accuracy applicable to clinical practice. This will enable us to secure the precision of the devices manufactured by the three-dimensional design and printer.

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Class II correction with twin block appliance in relation to hyperdivergent vertical jaw base

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Purpose : To compare skeletal and dentoalveolar changes in class II division 1 Thai patients treated with twin block appliance between hyperdivergent and normovergent patients.
Materials and methods : Pretreatment and posttreatment lateral cephalometric radiographs of 17 hyperdivergent [9 boys, 8 girls] and 26 normovergent [16 boys, 10 girls] Class II division 1 Thai subjects treated with twin block appliance were analysed. The subjects were divided into 2 different vertical growth patterns, hyperdivergent and normovergent groups, by SN-MP. Cephalometric analysis and Pancherz analysis were performed and compared the treatment effects between 2 groups.
Results : The mean age of the hyperdivergent and normovergent group at pretreatment time (T1) was 10.98 1.34 and 11.90 1.58 years old, respectively. The mean age of the hyperdivergent and normovergent group at posttreatment time (T2) was 12.80 1.03 and 13.19 1.15 years old, respectively. The average treatment time was 15.00 4.37 months for hyperdivergent group, and 14.19 5.26 months for normovergent group. Normovergent group had statistically significant increased SNB, and improved AF-BF (p
Conclusions : The effects of twin block appliance mainly due to dentoalveolar changes. Normovergent patients responded to the twin block appliance favourably. The treatment does not change the vertical dimension clinically in both vertical growth patterns. However, hyperdivergent patients have more vertical growth that affected the results of the treatment.

P-139

Color stability of various plastic and ceramic brackets: An in vitro study

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Objectives : Objectives : The aim of this study was to evaluate color stability of various plastic and ceramic brackets after immersing in food solutions.
Material and Methods : Material and Methods : Three plastic brackets and six ceramic brackets brands (three polycrystalline and three monocrystalline brackets) were selected. Ten brackets per brand were immersed in three dye solutions (red wine, coffee and curry). After immersing for one day, three days and seven days, color changes of the brackets were measured using a spectrophotometer (SpectrolinoTM). Color change, ą* was calculated based on the CIE L*, a* and b* system.
Results : Result : Plastic brackets, especially Silkon MTM showed the biggest color change in red wine, coffee and curry. 20/40TM bracket showed similar color change with plastic brackets despite that it is a polycrystalline bracket. Other polycrystalline brackets, ClarityTM advanced and VitrineTM, showed smaller color change than plastic but bigger than monocrystalline brackets. Monocrystalline brackets, RadianceTM and Inspire ICETM showed the smallest color change in all three solutions.
Conclusion : Conclusion : Significant color change of esthetic brackets can occur based on the bracket composition, dye solution type and immersion time.
- Plastic brackets, especially ceramic filler reinforced plastic bracket showed the biggest color change in red wine, coffee and curry.
- 20/40TM bracket showed similar color change with plastic brackets despite that it is a polycrystalline bracket.
- Other polycrystalline brackets, ClarityTM advanced and VitrineTM, showed smaller color change than plastic but bigger than monocrystalline brackets.
- Monocrystalline brackets, RadianceTM and Inspire ICETM, showed the smallest color change in all three solutions.

P-140

Frictional Properties of Surface Modified Nickel Titanium Orthodontic archwires

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Purpose : The purpose of this study was to investigate frictional properties of three types of surface modified nickel titanium archwires.

Materials and methods : 0.016 x 0.022-inch NiTi wires were deposited with DLC films and were implanted with CH4 and CF4 using Plasma-Based Ion Implantation and Deposition (PBIID) method. These archwires and upper canine brackets which had slot dimension of 0.022-inch were used in this study. Frictional resistance was determined using a Universal Testing Machine with a load cell of 50 N. The custom-fabricated friction-testing device was designed and bonded each bracket in an accurate position. A 5-cm segment of each wire was ligated to the bracket with an elastomeric ligature. The upper end of the wire was fixed in a grip that was attached to the load cell. Each wire was drawn at a cross-head speed of 10 mm/min for a distance of 5 mm. The static frictional force was determined from load-displacement curves.

Results : Static frictional resistance of four difference types of NiTi archwires showed that DLC-coated NiTi wires had the lowest mean of frictional force (86.13 5.26 gf) followed by CH4-PBII (87.30 9.83 gf), CF4-PBII (104.97 2.90 gf) and conventional NiTi wires (129.48 11.64 gf).

Conclusions : The three surface modified NiTi archwires reduce the frictional force between bracket and NiTi wire with 0.016 0.022 inch cross-section dimensions. Only DLC-coated NiTi wires exhibited significantly lower static friction than conventional NiTi wires. DLC coating is affecting tooth movement and shortening orthodontic treatment time.

P-141

Comparison of bone density measurement in Multi-Slice Computed Tomography and Cone Beam Computed Tomography

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Objectives : Cone-beam computed tomography(CBCT) has many advantages than multi-slice computed tomography(MSCT) in dentistry. CBCT enables low dosage of radiation exposure in patients, short measuring time, low cost and relatively high resolution of resulting images. But reliability of bone density measurement on CBCT has not been widely accepted. The purpose of this study was to compare and evaluate the bone density values obtained by using MSCT and CBCT.
Material and Methods : A dry mandible was scanned with MSCT(Hounsfield unit[HU]) and 3 types of CBCTs(voxel value[VV]) and bone densities(gray scales) were measured and compared in the scanned images using 3-dimensional software programs. The cortical, cancellous and total bone densities of alveolar bone between mandibular second premolar and first molar were measured on the axial slice at the height of 3,6 and 9mm apically from the alveolar crest.
Results : There was no statistical difference of bone density between right and left sides. The cortical bone density was significantly different between MSCT and CBCT ($p<0.05$), but there were no significant differences in cancellous and total bone densities between MSCT and CBCT ($p>0.05$). The bone density values showed linear relationships between MSCT and each CBCTs.
Conclusion : Bone density values were different but showed linear relationships between MSCT and CBCTs. Therefore, CBCT would be valuable for evaluating the bone density as relative values.

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Anchorage control between the Physiologic Anchorage Control Technique and MBT Technique: a randomized-controlled clinical trial

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Purpose : The purpose of this study was to explore the anchorage control ability of Physiologic Anchorage Spee-wire System (PASS) compared with MBT Straight Wire Technique.
Materials and methods : 60 subjects who required medium, maximum anchorage were selected from the patients who visited Peking University, school and hospital of stomatology during June 2012 to July 2014. All patients were randomized by minimization method into 2 treatment groupsPASS group (P group, n=31) and MBT group (M group, n=29). The anchorage control methods were decided according to the treatment plans by the orthodontists in charge. Dental casts of pretreatment and post-treatment were scanned by 3Shape R700 and imported into Rapidform 2006 in STL. format. The digital models were superimposed by palatal regional superimposition to measure the amount of teeth displacement, inclination variation, torque variation and arch width variation. Differences of the measurements were compared between P group and M group, and between adolescent group and adult group by Independent Sample T test.
Results : Compared between P group and M group, the variation of molar mesial displacement were 2.961.52mm and 2.701.66mm (P>0.05). The variation of incisor torque were -6.946.35º and -11.767.65ºP
Conclusions : Compared to MBT straight wire technique (including 12 TAD cases), PASS technique without additional anchorage appliance could attain identical molar anchorage control. PASS technique leads to lesser incisor retraction, which might result from its greater incisor torque expression.

P-143

Mesial movement of maxillary first molar in en masse orthodontic treatment with extraction of premolar

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Purpose : The orthodontic treatment with premolar extractions is given with headgears to decrease the mesial movement of molar in the distal movement of incisor and cuspid, and with wires complicatedly bended. I would like to introduce the comparison of the amount of mesial movement of maxillary first molar, between 15 cases by the en masse orthodontic treatment, simultaneous distal movement of central, lateral incisor, and cuspid, and 15 cases which were given distal movement of central and lateral incisor after distal movement of cuspid.
Materials and methods : Two groups were compared and examined with lateral roentgenographic cephalograms which were taken before and after their treatments. First group, which is called the enmasse group, is 15 cases with the extraction of maxillary first premolar and mandibular first premolar or second premolar by the enmasse orthodontic treatment. Second one, which is called the control group, is 15 cases with distal movement of central and lateral incisor after distal movement of cuspid.
Results : These comparisons and examinations resulted as follows. In all angle and distance measurement items, the statistical significance was not recognized in the changing positions of maxillary first molar.
Conclusions : This follows that no difference between the en masse group and the control one is recognized in the mesial movement of maxillary first molars, in the quantity of lingual slant of maxillary central incisors. It is thought that the strong power is necessary because the transseptal fibers between lateral incisor and cuspid are pulled in the distal movement of cuspid and therefore it causes the mesial movement of molars. It is considered that the simultaneous distal movement of central, lateral incisor, and cuspid is more effective with no necessary to pull the transseptal fibers and then with weak power. Therefore it is verified that the en masse orthodontic treatment is useful.

P-144

Comparison of fixed lingual retainer using .020 multistranded wire versus .012 NiTi wire and mini-tube

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Objectives : To compare the numbers of failures of fixed retainers using .020 multistranded wire and .012 thermoactive (TA) NiTi wire and mini-tube 2 years after placement.
Material and Methods : Sixty-six consecutive patients from the orthodontic clinic of the Chonnam National University Dental Hospital were randomly allocated to bonding of fixed lingual retainer using either a .020 multistranded wire or a .012 TA NiTi wire and mini-tube at the end of their orthodontic treatment. Eligibility criteria were the presence of the 4 maxillary and 4 mandibular incisors and the 2 mandibular canines, and no restorations, dental caries fractures, or periodontal disease of these teeth. The patients were randomized in blocks of 4 (using an online randomization service) with allocation concealment secured by contacting the sequence generator for assignment. The patients were recalled 1 month, 3 months, 6 months, 12 months, and 24 months after retainer bonding. During 2-year of follow-up period, any first-time failure of retainers was recorded. Blinding was applicable for outcome assessment only. The Kaplan-Meier survival analysis and the Log-Rank test were used to compare the survival rates of the two retainers.
Results : Eighteen patients dropped out at baseline, and 10 patients did not reach the recall. Bond failures occurred mainly during the first year. In 20 of 66 (30.3%) patients, the fixed retainer failed within 2 years: 14 of 34 (41.2%) in the multistranded wire group and 6 of 32 (18.7%) in the light NiTi wire and mini-tube group. There was a statistically significant difference in the risks of failure of the two retainers between multistranded wire and .012 TA NiTi wire and mini-tube (log-rank test, P = 0.046). The hazard ratio was 2.26 (95% confidence interval, 1.16-4.08; P = 0.027).
Conclusion : Fixed lingual retainers using .012 TA NiTi wire and mini-tube are effective in preventing the risk of failures.

P-145

Use of single midpalatal screw for distalizing maxillary arch

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Introduction : This report is about the use of single screw with extension arm in midpalatal area in order to distalize the whole maxillary arch. Maxillary arch distalizing is an effective method for correction of class 2 molar relationship and it also can provide excellent tools for relieving crowding or protrusion without extraction. There are several methods for distalizing maxillary molars, but they have some kinds of limitation including anchorage problem (ex : Pendulum appliance), or clinical difficulties (ex : palatal plate).
Single midpalatal screw with extension arm is simple and easy method for distalizing whole maxillary arch with less anchorage problem and clinical difficulties.
Discussion : Midpalatal suture area shows continuous bony apposition since the first appearance of bony bridges in the adolescent period. Therefore, if initial stabilizing is aquired, the inserted screws in the midpalate is quite stabe relative to other areas. Besides, bony nasal septum (including vomer) provides additional bone table in vertical dimension for the inserted screws, so longer screw cam be inserted in midpalate. When distalizing force is exerted between the midpalatal screw and TPA, biomechanical aspect should be considered because the direction of force applied on the midpalatal screw is beyond the center of resistance of molars. Therefore the molar would show root distalizing and crown mesializing movement. To minimize the side effect of this type, the extension arm should be used and also anti-tipping moment should be applied by the stiff continous arch wire.
This report will show single screw with extension arm in midpalatal area for distalizing the whole maxillary arch.
Conclusion : Single screw in midpalatal area can provide sufficient anchorage for distalizing the whole maxillary arch in adult patient. Further study is needed how to use the palatal screws in young patient whose suture is not fused yet.

P-146

Upper 2nd and 3rd molar forward movement to upper 1st molar extraction site

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Introduction : iIn adult patient, they have hopless upper 1st molar sometimes.
For patients, we decide crown and bridge treatment or implant for upper 1st molar extraction site.
But if they have sound upper 2nd and 3rd molar, we can move these teeth by orthodontic treatment for upper 1st molar extraction site.
Treatment time is relatively long. But they have natural and sound upper posterior teeth.
Discussion : For this treatment option, patient have relative good periodontal condition on upper posterior teeth area and sound 2nd and 3rd molar.
If these conditions are verified, we can try these treatment option with our patients.
We use palatal and buccal miniscrew for anchorage and long lever arm for moving poteiror teeth.
Tooth movement can be controlled by protraction force and lever arm length.
Palatal miniscrew position is between canine and 1st premolar palatal side and screw length is 7~9mm and 1.5mm diameter.
Buccal miniscrew position is between canine and 1st premolar buccal side and screw length is 7mm and 1.5mm diameter.
Usually, treatment is 1.5~2 years. But after orthodontic treatment, patient have good and healthy natural teeth.
Conclusion : When we meet hopless upper 1st molar in our office, we can use 2nd and 3rd molar orthodontic treatmentas good treatment option.

P-147

The Effect of Distraction Osteogenesis Maxillary Expansion (DOME) Using Micro-implants for Adult Obstructive Sleep Apnea

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Purpose : The aim of the study was to assess the objective and subjective effects of Distraction Osteogenesis Maxillary Expansion (DOME) for adult obstructive sleep apnea (OSA) patients with narrow and high-arched palates.
Materials and methods : This study was a retrospective study of 75 subjects with OSA confirmed by attended polysomnography from September 2014 to April 2018. Pre and Post-operative measurements were achieved at Stanford Sleep Medicine and Stanford Sleep Surgery Clinic. DOME was achieved with placement of customized maxillary expanders anchored by multiple micro-implants into the hard palate directly followed by minimally invasive osteotomies to re-created maxillary sutures at Stanford hospital. After maxillary expansions got achieved, orthodontic treatment was performed. Perioperative Apnea-hypopnea index (AHI), Epworth Sleepiness Scale (ESS), Nasal Obstruction Symptom Evaluation (NOSE), Oxygen Desaturation Index (ODI) and other polysomnography variables were obtained for 43, 72, 72, 34, and 10 subjects. Analysis was performed using Wilcoxon signed-rank test with significance set at p-value of < 0.05.
Results : Subjects had a mean age of 30.5 8.5 with 57 males and 18 females. The results show highly significant differences in pre and post-operative NOSE score (10.94 5.51 to 3.28 2.89, $p < 0.0001$) and mean ESS score (10.48 5.4 to 6.69 4.75, $p < 0.0001$). There was a significant reduction of AHI (17.65 19.30 to 8.17 8.47, $p < 0.0001$) and an improvement of percentage of REM sleep (14.4 8.3 % to 22.7 6.6 %, $p = 0.0014$).
Conclusions : DOME alleviated the severity of OSA, refractory nasal obstruction, sleepiness symptom, and changed the sleep architecture with increased percentage of time spent in REM sleep. DOME offered a new treatment alternative for a multi-disciplinary approach to adult obstructive sleep apnea syndrome with narrow and high arch palate.

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Differential craniofacial changes depending on the symmetrical pattern of maxillary skeletal expansion

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Objectives : This study aimed to evaluate three-dimensional (3D) craniofacial changes by maxillary skeletal expansion (MSE) according to the symmetrical pattern of expansion, and to investigate the predictor of asymmetric expansion.
Material and Methods : 66 patients (mean age; 19.35.7years) treated with maxillary skeletal expansion were divided into symmetric expansion group (Group S) and asymmetric expansion group (Group A). Pre- and post-expansion cone-beam computed tomography images were superimposed, where the common coordinated system was set. All landmarks were designated as coordinate pairs, and treatment changes were automatically calculated. Independent t-test was conducted for inter-group comparison of craniofacial changes, and logistic regression analysis was performed to find predictors of asymmetric expansion.
Results : The prevalence of symmetric versus asymmetric expansion was 7:3. No inter-group differences were seen in all averaged parameters. However, when Group S was subdivided into Group Ss with bilateral frontomaxillary suture split and Group Sn with no frontomaxillary suture split, Group Ss showed greater craniofacial changes than Group Sn. Group A with unilateral frontomaxillary suture split exhibited different nasomaxillary displacement between the halves. Among variables, chin deviation was associated with the asymmetric expansion.
Conclusion : Maxillary skeletal expansion had a risk of asymmetric expansion in patients with chin deviation inducing different pattern of craniofacial changes from symmetric expansion.

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Effects of a new type of clear overlay retainer on occlusal contacts

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Objectives : In this preliminary study, we evaluated the changes in the posterior occlusal contacts of patients who received Oral-treaper (OTP) as a retainer and investigated the effects of OTP as a post-orthodontic retainer.

Material and Methods : Three patients who completed active orthodontic treatment from the Department of Orthodontics, Kyung-Hee University Dental Hospital (Seoul, Korea), were included in the study. In every patient, after the removal of fixed appliances, lingual-bonded retainers were bonded on to the maxillary and mandibular anterior teeth. Two weeks later, they received OTP for the maxillary dentition. Each OTP was constructed with three layers. The innermost layer was the resin core, which did not exceed 1 mm and extended from the right first molar to the left first molar. The middle and outer layers extended to the most distal tooth. The total thickness of the OTP was less than 3 mm. Alginate impressions of the study models were taken immediately after the removal of fixed appliances (T1) and after 4 to 11 months of using the retainers (T2;mean duration, 7.5 months). We evaluated all cast models to compare the postorthodontic settling patterns during OTP use. The occlusal contacts in the digital models were expressed by different colors according to the depth of the occlusal contacts.

Results : The second molars in two of the adolescent girls were not fully seated at debonding, and the adult patients left mandibular molars were distally tipped, and hence, interdigitation of the molar teeth was not ideal at the completion of active treatment. However, at T2, the posterior molar occlusion demonstrated better interdigitation and increased occlusal contacts in all patients. The results of this study show the potential of improved settling when using the OTP thermoplastic retainer.

Conclusion : During the use of the three-layered COR named OTP, patients showed favorable settling of the occlusion of the second molars.

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Effect of photobiomodulation on rate of space closure according to application time and energy dose

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Objectives : The purpose of this study was evaluating the effect of photobiomodulation by the intraoral LED device on the rate of tooth movement during space closure stage according to the daily application time and energy dose.

Material and Methods : 42 orthodontic patients were allocated into 3 groups: Group A (3 min/day of application time and 10.8 J/cm2 of energy dose) and Group B (5 min/day and 18.0 J/cm2); Group C (without the application of LED irradiation) as the control group. Impression of the maxillary dentition was taken monthly, and the rate of space closure was calculated. On the day to start space closure (T0) and the day when the remaining extraction space was less than 0.5mm (T1), lateral cephalometric measurements were compared for calculating the anchorage variables and amount of dental tipping.

Results : The rate of space closure in A and B were faster compared to C. There was no statistical difference in the rate of space closure between A and B. The anchorage variables and dental tipping at the T0 and T1 stages did not show significant differences among the 3 groups.

Conclusion : LED photobiomodulation in the range of energy dose (10.8 – 18.0 J/cm2) belong to the optimal biostimulatory window and could acclelerate tooth movement when applied supplementally to orthodontic treatment. Since LED photobiomodulation can accelerate tooth movement during space closure stage, it is a meaningful step toward reducing orthodontic treatment duration and establishing a guideline for setup of clinical protocol for efficient use of LED photobiomodulation supplementally to orthodontic treatment.

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3-dimensional tooth control using closed type wire stop : simple & efficient method

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Introduction : Correct bracketing is important for successful orthodontic treatment. However, it is difficult for various reasons, it is very useful to align the teeth using mini-tubes and super elastic wires. Therefore, we would like to introduce a more efficient method to control the 3-dimensional position of the teeth using a simple, inexpensive, rectangular ready-made wire stop.

Discussion : Closed type wire stop is originally designed to prevent wire from slipping to other side, but it can be used as mini-tube because of its inner tube structure for 018 "or 022" slot. So, it would be act as an edgewise or ribbonwise tube depending on directions of the placement. It is easily bonded by adhesive resins. The outer surface of the stop is sandblasted to improve bond strength for better retention.

Due to its small size, it can be used for initial alignment, such as a crossbite, even in the case of severe crowding or anticipated occlusal interference of opposing teeth. It also could be used for additional control of the posterior teeth as a lingual appliance. Particularly, the torque can be applied with a rectangular structure, which is effective to correct posterior scissors bite

Despite the small bonding surface, the retention of sandblasted stop was enough in clinical uses, and the 3-dimensional position of the teeth including the torque was effectively controlled.

Especially, it has simple structure that is easy to manufacture and inexpensive. so, there is a big advantage in cost effective aspect.

Conclusion : The rectangular wire stop is very useful not only as the auxiliaries for improving tooth alignment but also as the temporary appliance for precise future bracket positioning. Furthermore, as It could be used cost-effectively in the control of teeth that is expected of extractions during therapeutic diagnosis, it may be widely used in daily orthodontic practices.

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Prospective randomized clinical trial to compare the effectiveness between tooth-borne RPE and MARPE using CBCT

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Objectives : This prospective study aimed to evaluate the effects of maxillary expansion according to age and method of expansion, tooth-borne rapid palatal expander(RPE) and miniscrew assisted rapid palatal expander(MARPE) using low-dose cone-beam computed tomography (CBCT) images.
Material and Methods : 48 patients randomly assigned to the tooth-borne RPE(n=20) and MARPE groups(n=28) and underwent low-dose CBCT before(T0), immediately after(T1) expansion, after 3 month after expansion(T2). We devided the subjects of each category into two groups depending on the patients CVMI (CVMI 1~5 group, CVMI 6 & adult group). And we measured the following measurements of the anchor-teeth at each time point: transverse measurements of nasal(NW), nasal floor(NFW), buccal alveolar crestal(ACW), interdental(IDW), and interapex(IAW) widths and maxillary width on the palatal plane(MW); dental(DI) and alveolar(AI) inclination; and periodontal measurements of buccal(BBPT) and palatal(PBPT) bone-plate thicknesses and buccal alveolar crestal level(BACL).
Results : Transverse measurements(NW, NFW, MW, ACW, IDW, IAW) of both groups exhibited significant increases at T1. Total expansion in the maxillary first molar included 43.6% and 52.5% of skeletal expansion and 56.4% and 47.5% of dento-alveolar expansion in the tooth-borne RPE and MARPE groups, respectively. However, the MARPE group exhibited a significantly smaller increase in DI(3.27Σ than the tooth-borne RPE group(4.80Σ and smaller decrease in BBPT of the anterior anchor teeth(0.37 mm) than the tooth-borne RPE group(0.73 mm) at T1. Also, There were significant differences between the RPE and MARPE at T2-T0 in changes of buccal inclination and BBPT, especially, in growing patient (CVMI 1~5 group)
Conclusion : MARPEs induce less buccal tipping and BBPT changes at the anchor teeth than tooth-borne RPEs, especially in growing patients. Miniscrews contribute towards minimizing alveolar bone damage of the anchor teeth without decreasing the amount of total expansion

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Longitudinal case reviews of wearing headgear in the growing Cl II patients during skeletal maturation.

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Private practice

Introduction : More than half a century ago, the late T.M. Graber said orthodontic philosophies and therapy, like philosophies and therapies in all other fields, swing with the pendulum. Those words hold still good in these days as much as those days.

According to a recent report, the use of headgear declines compared with couple of decades ago mainly due to many kinds of Cl II functional correctors including intraoral fixed appliances. However about 60% of orthodontists in that survey are still often using headgear.

The extraoral force should be distinguished from the intraoral force originated from skeletal and dental structures of which the reactive force still remains close to dentition and surrounding bones.

Discussion :

How much odds ratio is there in anticipating that the natural skeletal growth is likely to make early Cl II skeletal patterns become normal skeletal Cl occlusion without an extraoral engagement during the prepubertal and pubertal period expecting the catch-up forward growth of mandible compared to headgear treatment, and vice versa.

But it is generally accepted that the bad environments should interfere the normal skeletal growth and have to be controlled, which includes a deep overbite to prevent mandible from moving forward and a severe overjet to put a lower lip under upper incisors during the active growth period.

The early intervention to correct Cl II skeletal problems would bring with several benefits like restraint of maxillary growth, reduced severe overjet and incisor trauma, and control of bad habit, if considered about the pros and cons.

Such contrary opinions are suggested as patients compliance above all, a long treatment period, additional cost and relapse etc.

Conclusion : The purpose of this presentation is that the longitidinal case reviews have been presented to estimate the effects of wearing headgear in the growing Cl II patients with analyzed skeletal maturation stages.

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Visualization of Cone-beam CT using Open-Source Softwares

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Introduction : Treatment results or growth changes can be evaluated in three dimensions using softwares. ITK-SNAP and 3D Slicer are open-source softwares which can be used for superimposition and visualization of cone-beam CT (CBCT) images. For visualization, segmentation is done with ITK-SNAP, and then voxel-based superimposition of CBCT images can be performed using 3D Slicer. 3D Slicer has various visualization modules which are not equipped in popular commercial softwares. This report introduces how to visualize CBCT images using ITK-SNAP and 3D Slicer.

Discussion : Because these softwares are open-source, there are many functions and modules developed by various users. ITK-SNAP can be used efficiently for segmentation of region of interest, while 3D Slicer can be used to superimpose multiple CBCT images, and to visualize them with various visualization modules. However, these open-source softwares are not optimized well and difficult to learn, and require a lot of processing time. Through procedures using these softwares, hidden areas behind adjacent anatomical structures can be shown, and each viewing mode of multiple CBCT images which have been superimposed can be set respectively to visualize the changes during treatment or growth.

Conclusion : Although ITK-SNAP and 3D Slicer are more complex and time-consuming, they provide powerful visualization ability useful for evaluation of treatment or growth changes.

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The study on the structure, position and bifid of the mandibular canal

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Introduction : To study the structure, position and bifid of the mandibular canal by CBCT image.
Materials and Methods : Methods : CBCT data of 160 people were collected, and mandibular canal position in mandible, bifid from third molar to mental foramen, and three dimensional relation with the posterior teeth were analyzed.
Results : The average diameter of mandibular canal was 2.98mm from third molar to second premolar. Anterior loop appeared in 9.38% mandibular canal, and the average depth is 12.86mm. Mandibular canal contacted with 7.5% third molars, and the rate is higher when canal located lingually to the third molar. 28.44% mandibular canals have bifids.
Conclusion : CBCT image can help to observe the the structure, position and bifid of the mandibular canal, and avoid or reduce the nerve damage in treatment..

P-156

Corticotomy assisted treatment for complicated case correction: five case report

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Introduction : Todays orthodontic practice is not driven by proffesional clinical decisions only, it is also highly influenced by the patients different demands. Nowadays internet has enabled a direct access to information, thus enabling the patient to become more easily self-informed and determined in his/her requests. In this poster, presentation of possibilities of combining corticotomy and its RAP phenomenon, TADs and cortical plates, shall be based on real cases with what if? moments, when the patients posed different kinds of demand, such as: What if we try to save this tooth? What if I dont want to extract my premolars? What if we only help my GP to place implants and prosthetics by segmental orthodontics instead having braces on all teeth? What if we do it by shortening the treatment to 9 (or 3) months, because otherwise I cannot accept it?

Conclusions : Individualized and patient-oriented approach can end up with more then satisfying, very predictable and faster results, when using corticotomy assisted orthodontics, TADs and cortical plates.

Clinical experience of our team work (together with my surgeon) shows that when corticotomies are used together with aPRF (advanced platelet rich fibrin), in average there is 1 out of 10 patients, and even less, that are subjected to antibiotics prescription.

T-1

CBCT analysis of sella turcica bridging in patients with palatal canine impaction

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Introduction : Maxillary canine impaction is a dental anomaly found in 1-2% of population and the incidence of palatal impaction exceeds that of labial impaction. Common theories contributing to the etiology of palatal canine impaction are guidance theory and genetic theory. According to the genetic theory, palatal canine impactions are associated with other genetic abnormalities. Sella turcica bridging(STB) is the excessive ossification of the ligament between clinoid process. Some previous studies reported the association between STB and syndromes or skeletal/dental anomalies. However, there were few studies that investigate correlations between STB and palatal canine impaction. Moreover, most of them used 2D lateral cephalograms. The objective of this table clinic was to assess the association between STB and palatal canine impaction by using CBCT images.
Discussion : The sella turcica consists of a central hypophyseal fossa and two pairs of anterior and posterior clinoid process. The STB, one common morphologic variation of the sella turcica, is the true bony union of the anterior and posterior clinoid processes. There are some theories explaining the reason of the association between STB and palatal canine impaction. The sella turcica is the prime area for the migration of neural crest cells to maxillary, palatal, and frontonasal developmental fields. In addition, mutations in the homeobox negatively influence the development of the midface, teeth, and parts of sella turcica. According to these theories, the canines and sella turcica share a common embryology. Therefore, changes at the developmental level can cause a STB and it may related to palatal canine impaction.
Conclusion : Early detection and timely intervention of impacted canines can reduce the time, cost, and complexity of treatment. The STB can be used as a diagnostic marker to alert clinicians of the potential presence of palatal canine impaction.

T-2

Three-dimensional changes of the pharyngeal airway space and hyoid bone position after mandibular setback surgery

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Introduction : The mandibular setback surgery is a treatment option for patients with skeletal Class III dysplasia. The development of obstructive sleep apnea(OSA) following orthognathic surgery for mandibular prognathism has been discussed in recent years. The site of airway obstruction during apneic episodes in OSA is usually the oropharyngeal region, involving the soft palate, the dorsum of the tongue, and the posterior pharyngeal wall. Several studies have indicated that mandibular setback procedures caused a narrowing of the pharyngeal airway and hyoid bone displacement. Therefore, the aim of this table clinic was to assess the changes of the pharyngeal airway space and hyoid bone position after mandibular setback surgery only.

Discussion : Many studies have examined the change in respiratory space after mandibular setback surgery. As the mandible, base of the tongue and pharyngeal wall are directly connected to each other by muscles and ligaments, mandibular setback surgery causes posterior movement of the tongue and a reduction of the airway space. Several studies have shown that changes in hyoid bone position tend to be related to changes in mandibular position. After mandibular setback surgery, this surgical procedure causes posteroinferior displacement. The posterior shift of the tongue base creates an increase in contact length between the soft palate and the tongue base and can decrease the pharyngeal airway space.

Conclusion : After mandibular setback surgery, pharyngeal airway space and hyoid bone position can be changed. Therefore, the possibility of postoperative obstructive sleep apnea should be considered in patients who plan to undergo mandibular setback surgery.

T-3

The clinical application of Flat NiTi wire for space gaining through de-rotation of maxillary molars

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Introduction : In conventional orthodontic treatment method for space gaining and de-rotation of maxillary molars, various devices such as pendulum devices and open coil springs engaged with fixed appliances were used. However, these problems can be solved in a simple method due to the introduction of Flat NiTi wire, which is made by pressing round-shaped NiTi wires to be extremely flat and maximizes its superelasticity in one direction. The purpose of this table clinic is to present clinical cases that have successfully achieved space gaining through de-rotation of maxillary molars using Flat NiTi wire and to analyze the treatment results.
Discussion : Nitinol alloys(NiTi) exhibit shape memory effect and superelasticity. Flat NiTi wire is made by pressing round-shaped NiTi wire extremely flat, maximizing the superelasticity of the NiTi wire in one direction. Therefore, it is possible to move teeth with less force by using Flat NiTi wire. Since the volume of Flat NiTi wire is small, it is possible to attach Flat NiTi wire even in places where it is difficult to attach fixed appliances. The use of Flat NiTi wire also reduces gingival irritation and allows oral hygiene to be maintained relatively well. Three female children who had impaction or ectopic eruption of maxillary second premolars due to rotation and anchor loss of maxillary first molars achieved space gaining through de-rotation of maxillary first molars using flat NiTi and the treatment results were successful. The average treatment period was 7-9 months and they attained enough spaces for eruption or alignment of maxillary second premolars.
Conclusion : Using Flat NiTi wires make it easier to achieve space gaining through de-rotation of maxillary molars than conventional orthodontic methods.

T-4

Practical use of QR code for Patient care

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Introduction : QR code is one of the matrix barcode systems, which can be read by an imaging device such as a smartphone by the code input, and provides information easily and quickly. In an era using the smartphone has become common, we, Department of Orthodontics, Chonnam National University Dental Hospital, are going to introduce a new patient communication method utilizing QR code.
Discussion : Attaching a printed QR code to the orthodontic appliance or its case so the patient easily get the information when using the orthodontic appliance. This process can improve patient's understanding for better cooperation, which is very important especially in the orthodontic treatment with removable appliance since patient cooperation is the key to success. The items to be implemented are as follows: oral hygiene care, orthodontic appliance (RPE, Headgear, removable appliance, etc), retainers applied after debonding, and intermaxillary elastics. In addition, QR code connected to the website provides easy and convenient access to patients' treatment and reservations. Reducing waiting time at reception by providing doctors outpatient schedules on the website and making appointments is possible, and this enables fast and accurate reservation. Also, one-to-one consultation and reservation change service can be performed by using a general-purpose messenger. In several situation that patients are unavailable to make a phone call such as patients being abroad, it will help reducing the gap between dental staff and patients in communication.
Conclusion : Information and communication technologies are rapidly advancing to be used in various fields. Based on this trend, we intend to bring the QR code technology in orthodontic patient care to present a new way for effective patient management.