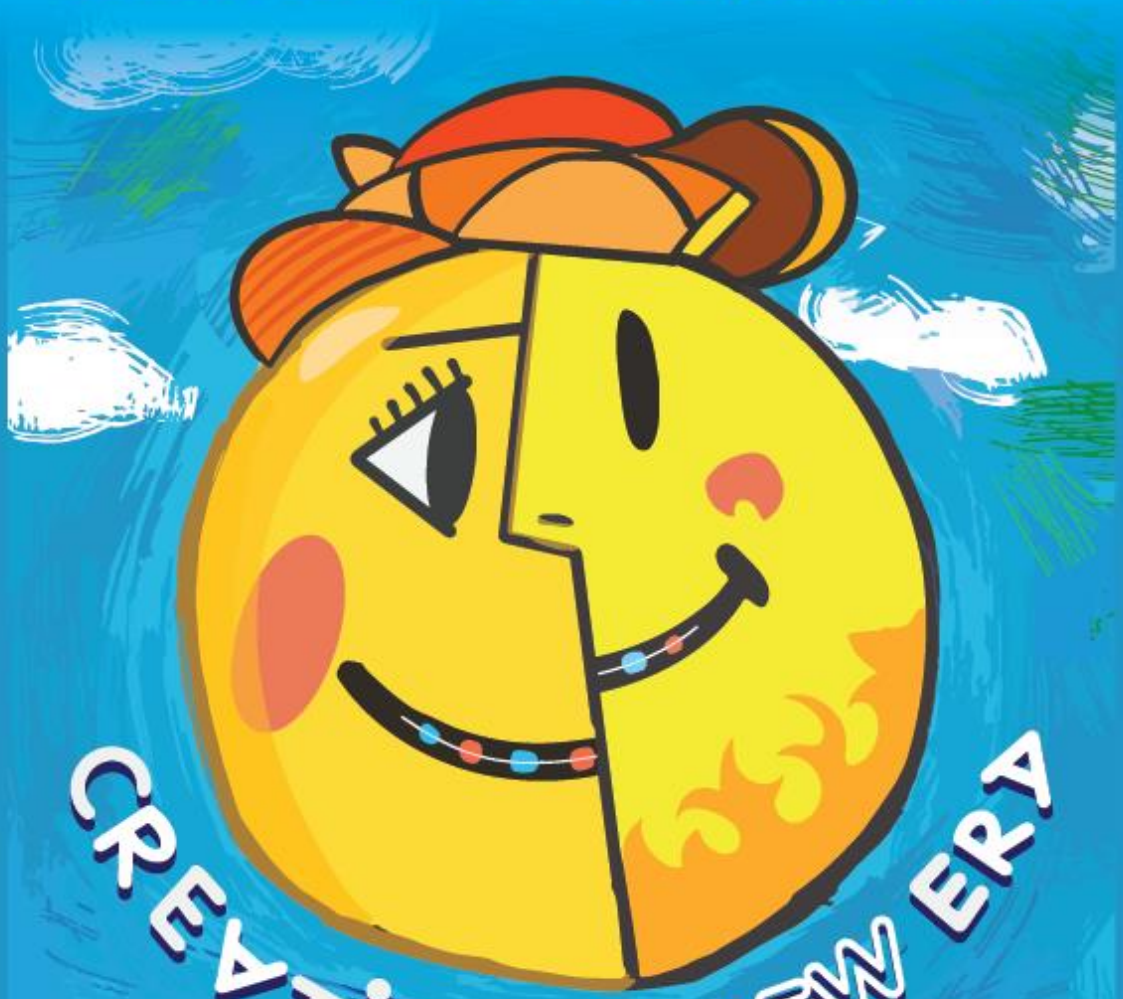
2022 KAO APOC Seoul

October 28-30, 2022 COEX, Seoul, Korea

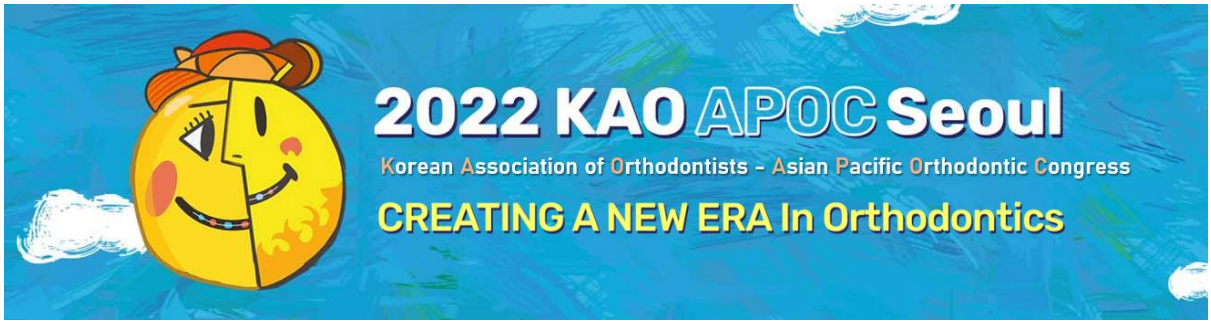


CREATING A NEW ERA

In Orthodontics

The 13th Asian Pacific Orthodontic Conference
The 55th Annual Scientific Congress of the Korean Association of Orthodontists

APOS
ASIAN PACIFIC ORTHODONTIC SOCIETY



<Pre-Congress>

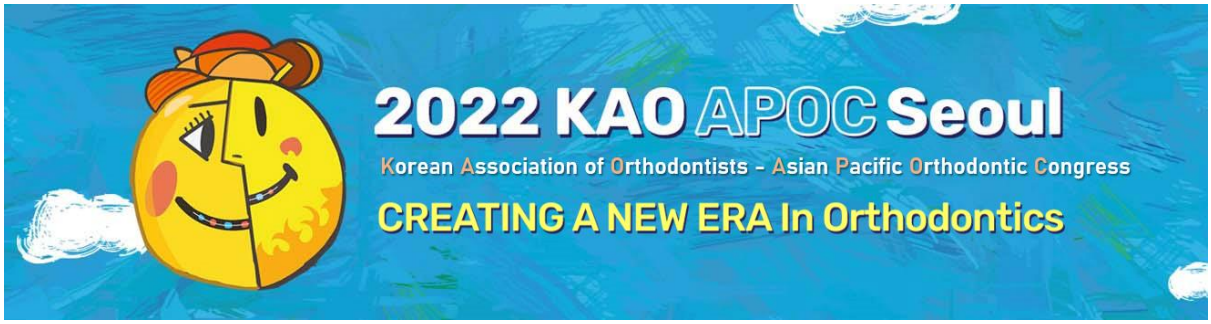
Uprighting Impacted Mandibular Second Molars with a Cantilever System Using orthodontic mini-implants

Sang-Jin Sung

When the first molar is missing in a dental arch, the second molar tips mesially. For ideal prosthetic treatment of the missing first molar, the second molar should be uprighted. Further, to maintain the existing occlusion, second molar extrusion must be prevented.

The second molar may be tipped mesially and be impacted due to an abnormal eruption process. In such cases, both uprighting and extrusion of the molar must be performed using an appropriate treatment strategy.

The traditional use of tip-back cantilever springs to upright the second molar is simple and efficient; however, in case of impaction, the use of orthodontic mini-implants (OMI) instead of splinting of the teeth for anchorage can help correct an impacted second molar without burden on the tooth anchorage. In particular, if the OMI head design is capable of engaging a cantilever spring, a severely impacted second molar can be easily corrected with an orthodontic appliance consisting of only a tube on the second molar, a 017×025 TMA cantilever spring, and one OMI.



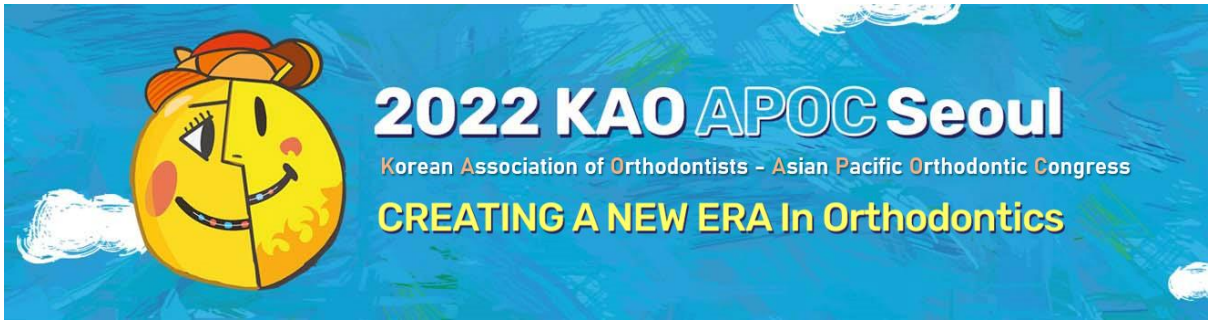
Radiographic Evaluation of Installation Site for Mini-Implant

Il-Hyung Yang

Orthodontic Mini-Implant (OMI) has been prevailing in our profession. Since its debut in orthodontics, we put our efforts to increase the success rate of OMIs and to predict the longevity of them. In such context, several succedent of industrial and academic efforts in the field of dental implant was also applied to OMI: (1) various designs of OMI itself including pitch, screw tip, neck, head, and so on; (2) surface treatment including machining, grit-blasting, sandblasting and acid-etching, nano particles, and so on; (3) various histomorphometric and immunohistomorphometric studies; (4) various clinical studies regarding the survival rate of OMIs.

It is quite common finding the articles using artificial intelligence in many orthodontic topics. Artificial intelligence combined with large amount of data can offer the information which has been unseen in the previous researches. It is always useful if we can get to a conclusion, accurate or somewhat inaccurate, in a simple way and with simple material easily found in our clinics.

This preliminary research report aims to suggest the way of predicting the success rate of OMI depending on its installation site mainly based on panoramic radiograms and the other images.

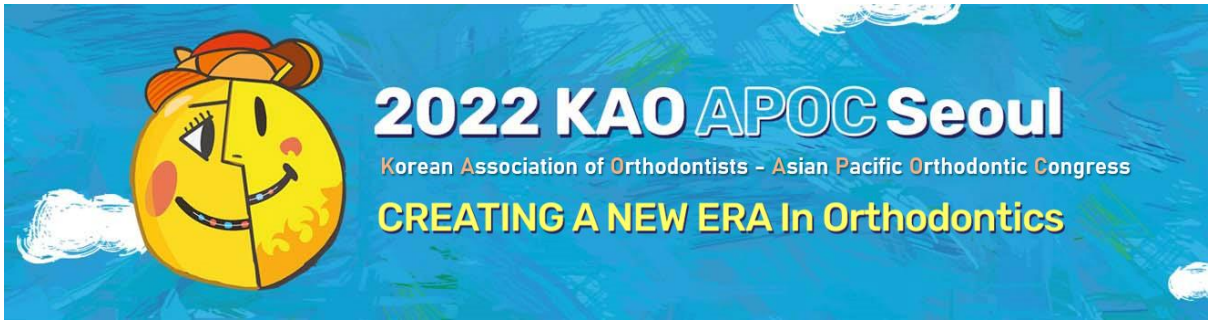


Biocreative Innovations in Transverse Problem Correction

Seong-Hun Kim

Rapid Maxillary Expansion (RME) is a cornerstone of orthodontic treatment, established for decades as a useful adjunct. Since the introduction of CBCT, many reports have shown that tooth-borne RME has the undesired effects, such as loss of buccal bone after the expansion, and significant buccal flaring of the dentition. Bone-borne RPE has been reported, with mixed results; the amount of skeletal expansion and the tipping effects are controversial between bone-borne and tooth-borne RME. Among these, Micro-Implant Assisted Maxillary Skeletal Expander (MSE), known as a tooth bone borne type hybrid expander, has several advantages. Guide holes in the expander provide beginners the solution on where to place the miniscrews. It is commercialized and easy to obtain ready-made products. And also, the treatment results are fairly consistent. These merits allowed the popularity of the appliance all over the world. Many clinicians favor the MSE because it can overcome the disadvantages; so therefore, there are explosion of clinical studies on this appliance. But, could this hybrid expander empower "Targeted transverse correction in accordance with different type of maxillary deficiency?"

A new treatment system called ‘Biocreative Orthodontic Strategy, BOS’ developed by Dr Kyu-Rhim Chung to implement independent target teeth/bone/soft tissue movement while avoiding extending unnecessary orthodontic appliances to non-target segments during the orthodontic treatment period. Since January 2004, the speaker has been continuing to apply different types of bone borne expander to clinical practice: Modified Haas Type bone borne expander or Tissue bone borne expander, Biocreative C-Expander (C-Expander). The Haas type expander is bonded with composite to four to six mini-implants. There is no contact with dentition. The device produces very effective skeletal expansion with minor tipping of the maxillary processes, and without additional buccal flaring of the posterior teeth. This essentially eliminates the undesired side effects of tooth-borne RME or hybrid type expander. An additional benefit is that after expansion, the skeletally supported expander can be connected to individual teeth to act as an anchor unit for target tooth movement. This treatment protocol fits the BOS precisely. Through this presentation, the speaker wants to compare treatment effects and periodontal changes among conventional hyrax expander, MSE, and palatal side C-expander with scientific evidences and related clinical case reports.



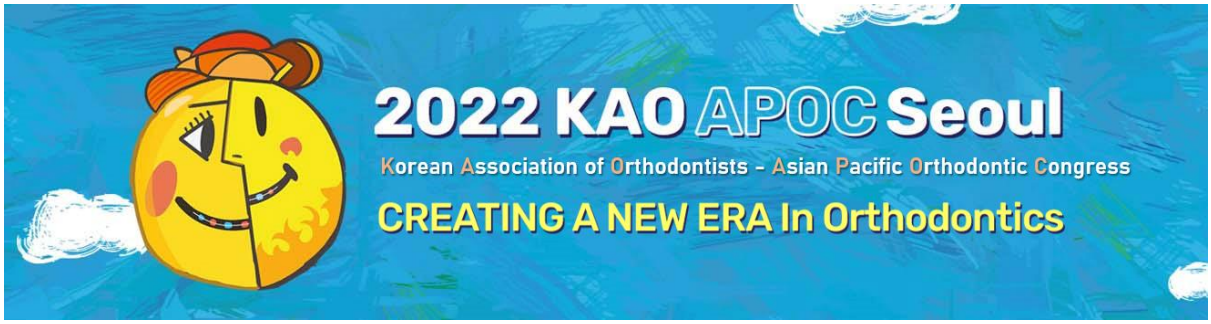
Vertical Problem Correction Using Mini-screws

Jung-Min Heo

Many patients with anterior open bite and gummy smile have overerupted molars or excessive vertical growth of maxillae, so mandibles are rotated downward and backward.

Since extrusion of the incisors to close the bite is not only unaesthetic but also unstable, it is necessary to intrude the posterior teeth or the entire teeth for the ideal treatment result. Although intrusion through the surgery can ideally treat the vertical skeletal problem, many successful treatment results have been reported with orthodontic intrusion using skeletal anchorage.

In this presentation, orthodontic intrusion using mini-screws to treat anterior open bite and gummy smile will be discussed.



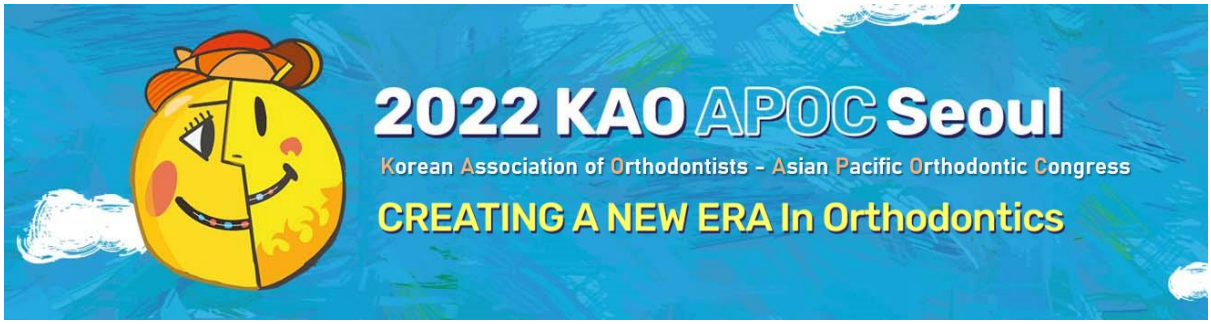
<Young Investigator Award 2022>

Various Applications of CBCT in Orthodontic Treatment: From Treatment Planning to Treatment Evaluation

Min-Hee Oh

Orthodontic treatment is applied to a wide area of oral maxillofacial areas to correct dental malocclusion and skeletal discrepancy. Therefore, for precise orthodontic diagnosis, it is necessary to accurate evaluation of deformity of skeletal structures as well as malocclusion of the teeth. In order to evaluate orthodontic treatment, it is necessary to evaluate the teeth including the root, and in the case of orthognathic surgery patients, it is also necessary to evaluate the temporomandibular joint. Cone-beam computed tomography (CBCT) has been used to overcome limitations of two-dimensional radiographs including distortion, magnification, and overlap of anatomical structures.

This presentation reports the results of a study using CBCT to evaluate whether the three-dimensional morphology of the mandibular condyle, glenoid fossa, and mandible correlated with menton deviation in facial asymmetry. In addition, it is showed that the methods of evaluating dental movement after orthodontic treatment using composite tooth model composed of an intraoral-scanned crown and a CBCT-scanned root and evaluating condylar displacement after orthognathic surgery using CBCT-generated cephalograms.



<APOS Oration>

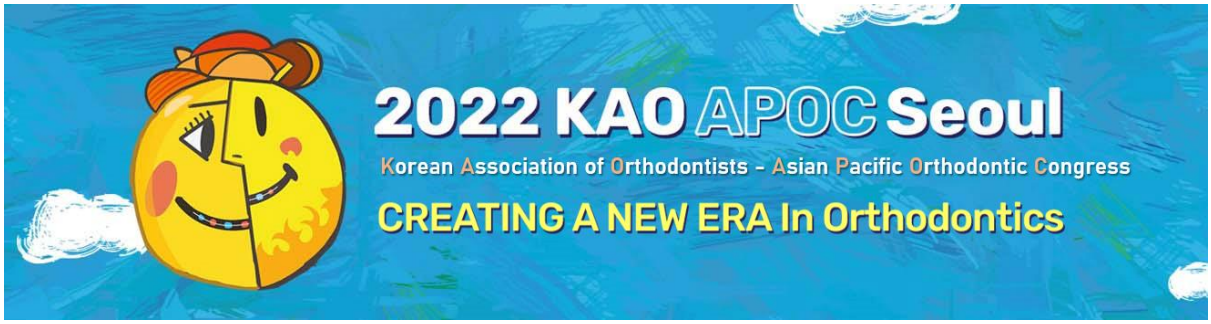
If Pinocchio was an orthodontic salesman

Nikhilesh Ramesh Vaid

Orthodontic Appliances are no longer just brackets and wires. Technology has ushered in an era of integrated appliance systems,on both vestibular & lingual surfaces as well as removable aligners,that are slowly gaining global acceptance. Integrated systems however, are marketed by corporations that have financial considerations that sometimes take precedence over science and clinical commonsense. This presentation will present a comparative analysis and an experimental clinical audit of contemporary appliance systems and adjuncts from an independent evidence based perspective.

Learning Objectives

- Peruse marketing and advertising claims made by various appliance & adjunct manufacturers.
- Analyze data from experimental designs evaluating appliance performance on efficacy & efficiency parameters.
- Compare different appliance systems evaluated based on standard clinical excellence standpoints.
- Analyze the web presence of Orthodontic information, the role of orthodontic organizations and how we can affect orthodontic care protocols

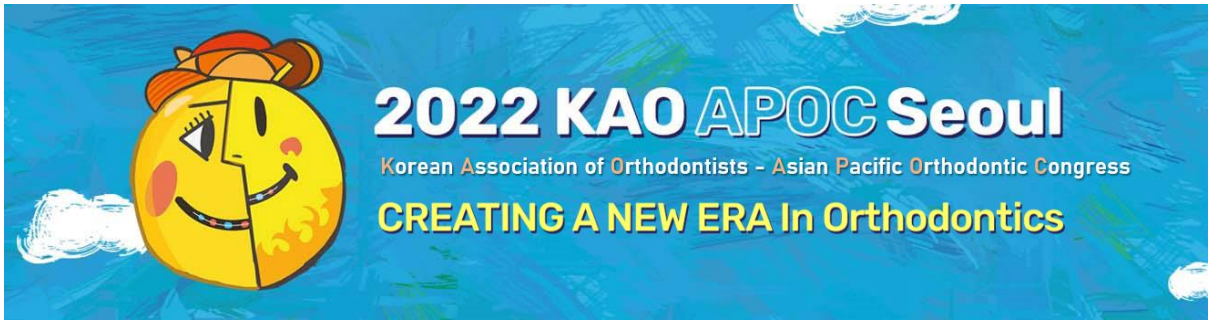


<Special lecture I>

Deep Learning for Medical Image Analysis

Young-Gon Kim

Deep learning has led to many breakthroughs in many fields of computer science. Especially, computer vision with deep learning is one of the remarkable tasks such as classification or detection for outstanding performance compared to the existing methods. Medical image can be also analyzed with deep learning by extracting meaningful features for diagnosis (classification or detection of disease) or prognosis (prediction). Applications of CNN (Convolutional neural network) to medicine have improved the performance of computer aided diagnosis. In this program, I would like to introduce to researches related with deep learning-based medical image analysis.



<Special lecture II>

A New Era in Personalized Orthodontics

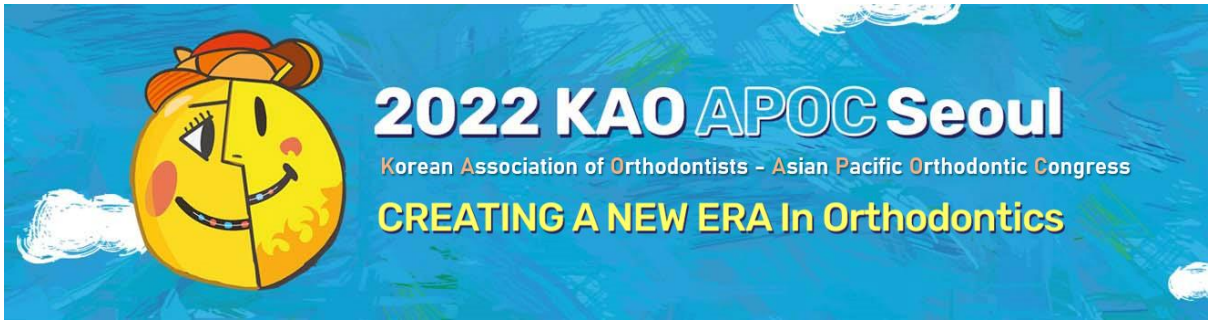
Alfred Griffin

Objective: The objective of this presentation is to 1) discuss the theoretical value of a fully custom fixed orthodontic appliance, and 2) evaluate the limited retrospective data collected to date, specifically the efficiency of LightForce 3D printed orthodontic brackets versus Stock orthodontic brackets as a function of duration of treatment and number of appointments to completion.

Methods: Records of cases utilizing LightForce Custom brackets and cases treated with stock brackets were evaluated from one orthodontic practice. All cases were treated by the same orthodontist. LightForce cases were all those completed up to 3/4/2022 (n=60). Stock bracket cases were all those completed between 1/1/2021 - 12/31/2021 (n=110). Only those cases with upper and lower 1st molar to 1st molar teeth erupted were included (LF 59, Stk 93). Partially erupted canines and premolars were accepted if at least 10% of the crown had erupted. Pre-treatment records of all treated cases were evaluated by a calibrated (PAR, ICON, IOTN) orthodontist and scored on an objective severity scale from 1-5. The investigator had full access to the treatment charts of all treated patients. All cases were evaluated for total treatment time, number of appointments, number of emergency appointments, and type of finishing archwire used.

Results: LightForce case data suggests 30-40% fewer scheduled and total appointments compared to stock bracket cases treated by the same orthodontist during the same time period. When matched for case severity and patient age, LightForce cases took 41% less time to finish than stock brackets. In addition, 70% of the LightForce cases were finished with Cu NiTi archwires versus 70% of stock brackets being finished in TMA or stainless-steel finishing wires.

Conclusions: In a retrospective evaluation of one orthodontic practice, LightForce brackets tended to show improvement in practice efficiency as evaluated by number of appointments to complete the case and duration of treatment time. The increased use of Cu NiTi finishing archwires in LightForce cases compared to stock brackets may indicate a decreased need for finishing bends with the LightForce bracket system. As this technology evolves, the specialty should continue to investigate how the theoretical benefits compare to what is actually realized in clinical practice.

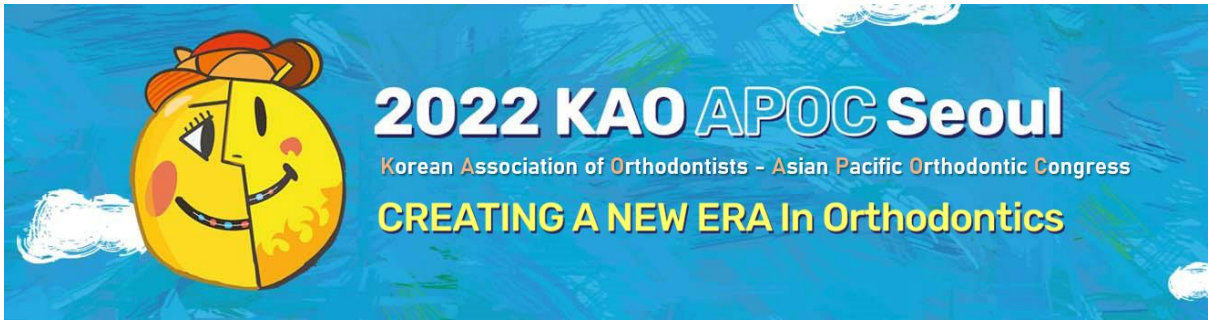


<Special lecture III>

Virtual Collaborative Interdisciplinary Treatment Planning

Sunil Kapila

In the current era that necessitates minimizing direct contact with patients and colleagues, virtual treatment planning and consultations are becoming increasingly important in health care delivery. In his presentation, Dr. Kapila will discuss the use of 3D segmented models derived from CBCT in virtual planning orthodontic and interdisciplinary treatments involving restorative, implant, surgical, tooth retrieval and other complex procedures across disciplines. The software platform utilized lends itself to concurrent virtual treatment planning with other providers and virtual consultations with patients- an approach that is highly pertinent in the era of COVID-19. Further, the use of this virtual interdisciplinary platform not only enhances the precision and customization of care but contributes to increased efficiency and outcomes of treatment. These reasons make the 3D virtual interdisciplinary treatment planning approach an important and an increasingly integral part of individualized therapy in complex orthodontic and interdisciplinary care.

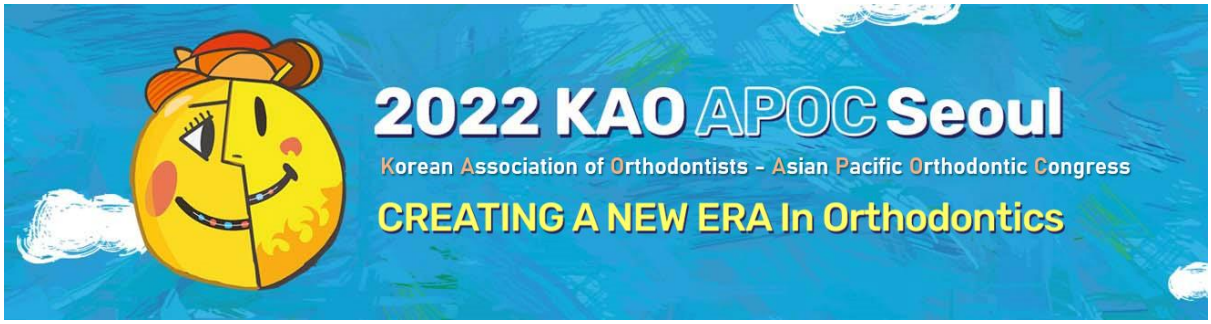


<Special lecture IV>

3D Printing of Polymeric and Metallic Orthodontic Appliances: Where's the evidence

Theodore Eliades

3D printing of a variety of apparatuses and appliances with the use of a wide array of printing modes and materials extending from polymers, to ceramic and metal/alloys. Whilst the application of 3D printing has become almost an integral part of orthodontic routine in many parts of the world, there is a notable lack of the performance of 3D printed appliances, their ageing pattern, release of compounds in the oral cavity, biological reactivity as well as fundamental mechanical and physical properties. This lecture reviews the scare evidence on the topic and highlights also various issues arising from the lack of regulatory monitoring of the process of fabricating appliances in the environment of a private orthodontic office, quality control issues as well as precautions, and required safety measures.



<Special Session I>

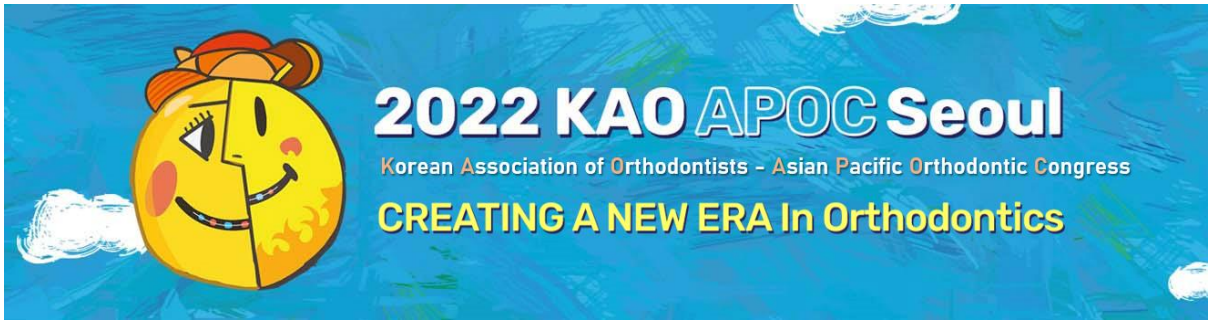
Current evidence on localized surgical injury for acceleration of orthodontic tooth movement: clinical and basic science evidence

Flavio Andres Uribe

In the last decade, acceleration of tooth movement has taken front and center interest among clinical and basic science research. Primarily, the local surgical injury of dentoalveolar complex has been the major target of modulation of this speed. Invasive and minimally-invasive approaches that consist of corticotomies with and without flaps that involve different surgical instruments to induce this localized injury have been evaluated. Although numerous studies have been conducted with contrasting results, overall, the evidence tends to support that a temporary acceleration may be obtained. The impact of these acceleratory effects on the reduction of the overall treatment duration are still unclear.

This lecture will:

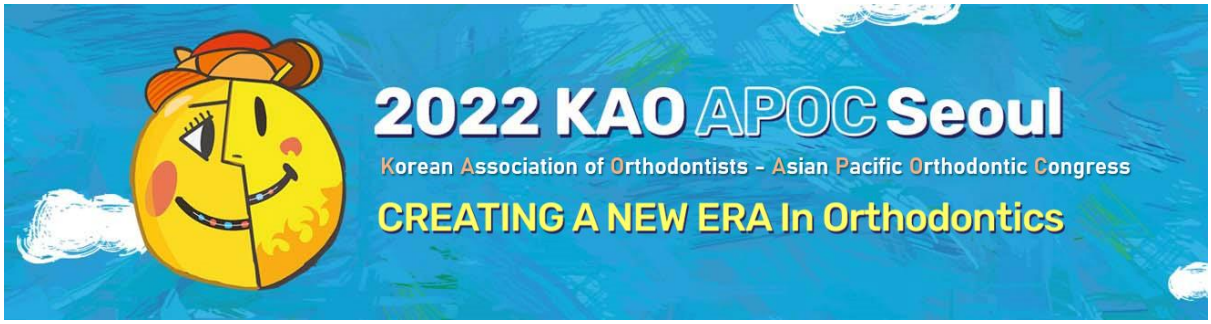
- Highlight the current evidence in both clinical and basic science regarding the acceleratory effects of the different invasive and minimally invasive procedures to accelerate the speed of orthodontic tooth movement
- Describe the future potential research fronts involving omics research, such as genomics, proteomics and metabolomics that could give us clues to achieve this acceleration
- Present the results of a basic science project evaluating the effect of piezocision in rats with RNA sequencing



Clinical Management of Orthodontic Root Resorption

Glenn T. Sameshima

This lecture will present the latest findings and information about external apical root resorption (EARR) caused uniquely by orthodontic tooth movement. Despite years of research and clinical experience, EARR remains an enigma but our current state of knowledge positions us to better manage EARR in our practices. Key questions that will be answered in this presentation: What is our present understanding of the etiology of EARR? Who are the patients most at risk? Should you start treatment for a patient who already has short roots? How does the clinician manage EARR found at progress? How does the clinician manage EARR found at the end of treatment? What is the long-term prognosis for teeth with short roots? The content of this lecture should be of great interest to clinicians, academics, and students.

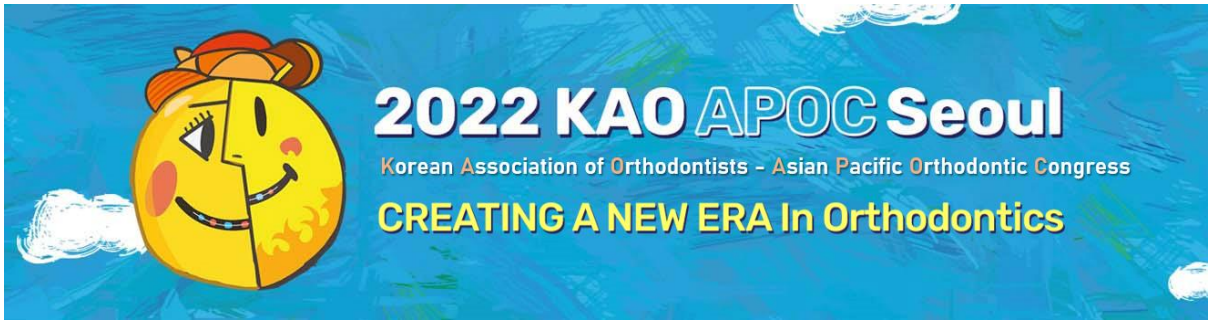


Orthodontic Treatment Planning and Management of the Periodontally Compromised Patient

Martin Antonio V. Reyes

Over the past few decades our efforts to educate our patients in the realm of dentistry has bared good fruits by the fact that more and more adult patients are seeking treatment not just for healthy teeth but also for an improved occlusion and a healthy smile. Relatively new advances the wonderful world of orthodontics particularly in self-ligating braces, clear aligners, TADS, traditional mechanics, and orthognathic surgery to name a few, are just some of the factors that have led to an increased curiosity and need to improve one's occlusion in the post adolescent years.

One particular problem that occurs when our patient's age is the occurrence of wear and tear of the dentition bringing about a host of problems such as unfavorable tooth movement, poor contacts and loss of bone support which will be the focus of this lecture. This 30-minute presentation will share some multi-disciplinary guidelines in diagnosing and planning orthodontic treatment for patients with history of localized and generalized alveolar bone loss. It will also present some evidence-based guidelines on the management of periodontally compromised dentition applying specific periodontal and orthodontic mechano therapy principles on a few clinical cases.



<Special Session II>

Orthodontic treatment for micrognathia with progressive condylar resorption

Shintaro Okashita

The patient was found to have a Micrognathism (mandibular retraction disorder) and was suspected to have progressive mandibular resorption (PCR), in which the mandibular head is resorbed and no joint exists. In this report, we describe two cases of patients with PCR who underwent orthognathic treatment using a combination of anterior mandibular advancement and genioplasty.

Case 1: 16-year-old female. Her chief complaint was maxillary prognathism and inability to bite with her front teeth. She had a severe mandibular retraction with ANB 13.0°, FMA 45.7°, and Pog to MacNamara -25.5.

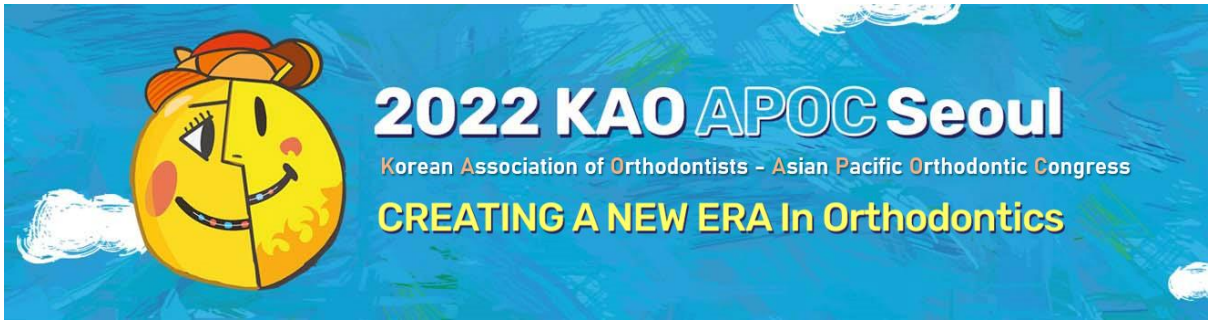
Case 2: 20-year-old man at the initial examination. His chief complaint was that he could not close his lips. 9.8° ANB, 39.4° FMA, -13.5 Pog to MacNamara, and a severe mandibular retraction.

Treatment results

After preoperative orthodontic correction, Le Fort type I osteotomy was performed on the maxilla, and mandibular branch sagittal segmentation and genio-plasty were performed on the mandible. To flatten the advanced occlusal plane of the mandible, the surgical plan included maxillary decompression and counter-clockwise rotation of the mandible. Postoperative orthodontic treatment was performed to obtain a normal occlusion and improve their profile. Both cases have maintained a relatively stable occlusion for more than 2 years after surgery.

Discussion and Conclusion

In both cases, the patients had protruding anterior teeth, open bite, and severe plexus. Despite these conditions, the patient was able to eat as well as a normal person despite some inconvenience, suggesting that the mandibular head is not an essential organ for masticatory movement. PCR is classified as an intractable disease in Japan, but instead of diagnosing mandibular head resorption itself as a disease, we should focus on masticatory dysfunction caused by this disease or its cause.

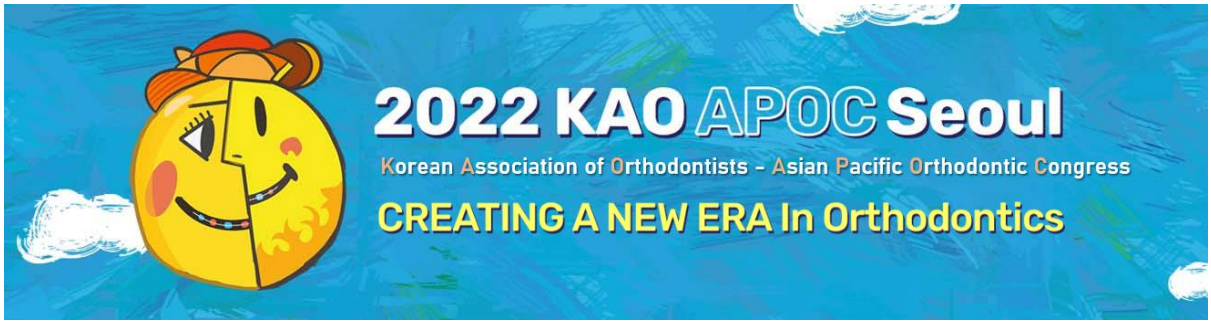


Orthodontic management of anterior open bite combined with TMD

Yoon Jeong Choi

There have been controversies regarding the relation between malocclusion and temporomandibular disorder (TMD). Previous studies reported that specific malocclusion does not seem to cause TMD. However, Class II malocclusion with anterior open bite is frequently observed in TMD patients, which implies TMD may cause clockwise rotation of the mandible and subsequent changes. Therefore, orthodontists must be cautious about the possibility of hidden TMD patients when treating Class II malocclusion with anterior open bite.

For correction of anterior open bite combined with TMD, this talk will present diagnosis of the malocclusion, orthodontic strategy for treatment, monitoring of the changes, and consideration of the muscular factors. A decision on a surgical or non-surgical approach should be made based on an accurate diagnosis, and each method needs a different orthodontic strategy. During orthodontic treatment, orthodontists should detect early favorable or unfavorable changes and the relevance of TMD. Furthermore, it is required for orthodontists to consider muscular factors to obtain predictable and stable outcomes.



Towards an Optimal Therapy Strategy, Pharmacologic Treatment for Temporomandibular Disorders

Ji-Woon Park

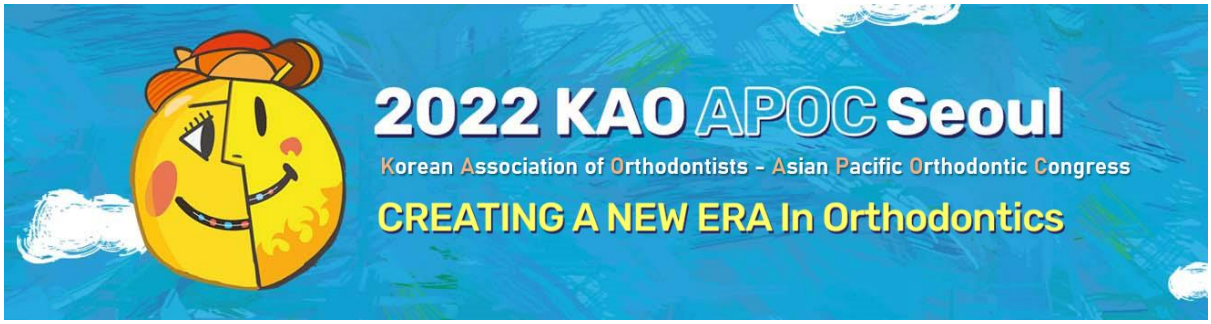
Temporomandibular disorders (TMD) is a common form of orofacial pain which involves the temporomandibular joints, masticatory muscles, and associated structures. It is known to affect approximately 33% of the adult population when considering at least one related symptom as the criteria, while 3.6-7% seek treatment due the severity of their TMD symptoms. It is generally more common in women with a peak prevalence around the age of 20-40 years which somewhat overlaps with the major patient group seeking orthodontic treatment. It is second only to toothache as the cause of orofacial pain. While symptoms are mild and self-limiting in most patients, a chronic type of TMD with persistent pain and a higher level of comorbidities such as psychological, autonomic, and sleep disturbances may develop. The etiology of TMD is known to be multifactorial including biologic, behavioral, and psychological factors however, the underlying mechanism is yet to be fully elucidated. Due to the lack of full understanding involving its pathophysiology the current diagnostic and treatment process for TMD is centered on verifying symptoms through patient interviews, palpation of surrounding muscle and joint, and imaging of associated structures leading to symptomatic treatment rather than pathophysiology-driven therapy. Conventional treatment includes controlling of contributing factors based on cognitive behavioral therapy, physical therapy such as thermal, electric, and laser stimulation, and also oral appliance therapy. Invasive treatment should not be considered as first line approaches in most cases since non-invasive treatment results in sufficient symptom relief in the majority of patients in the long-term experiencing improvement in both pain and function.

Pharmacological treatment is a well-accepted approach for TMD patients that has been applied for many years. Commonly used and also effective agents include analgesics, non-steroidal anti-inflammatory drugs (NSAIDs), antidepressants, anticonvulsants, muscle relaxants, benzodiazepine, and corticosteroids. Such medication influences TMD symptoms by directly reducing pain and in some cases by controlling comorbid symptoms such as mood disorders and sleep disturbance. Recently, chronic systemic inflammation has been proposed as the underlying mechanism of pain chronicity in several pain conditions and a few studies have also suggested the possibility of immune disturbance in TMD patients. The control of systemic inflammation could be another mechanism in affecting TMD

symptoms through medication.

TMD is a complex disorder accompanied by various comorbidities and multiple factors may influence its long-term prognosis and treatment response. Based on such characteristics, individual aspects of the disease should be considered when selecting pharmacologic treatment for TMD which will lead to personalized treatment with increased efficiency. Orthodontic treatment related issues could be one of such factors to be included in the treatment planning process for TMD patients.

Therefore, in this lecture general points to consider in the pharmacologic treatment of TMD patients will be handled in a comprehensive manner, later moving on to more detailed description on individual factors to consider when selecting specific agents and also special thoughts on issues related to orthodontic treatment.



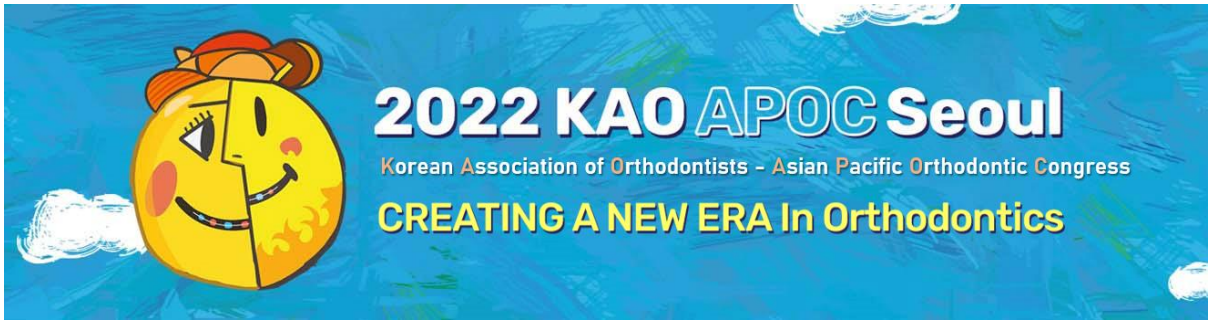
<Special Session III>

Staying ahead of the curve with in-office clear aligners

Geraldine Lee

With the increase in demand for aesthetic removable orthodontic solutions, intraoral scanners and digital workflows have been gaining popularity in clinics everywhere. Clinicians are now able to increase their clinic offering with in-house clear aligners and differentiate themselves from the rest.

Dr Geraldine will take you through the process of planning, designing, and fabricating clear aligners for simple cases within your dental clinic. She will discuss the importance of proper case selection, how to take digital impressions and create instant treatment simulations, and fabrication of the clear aligners in-house. The biomechanics of moving teeth will be discussed, as well as what to look out for when planning a treatment strategy using clear aligners.



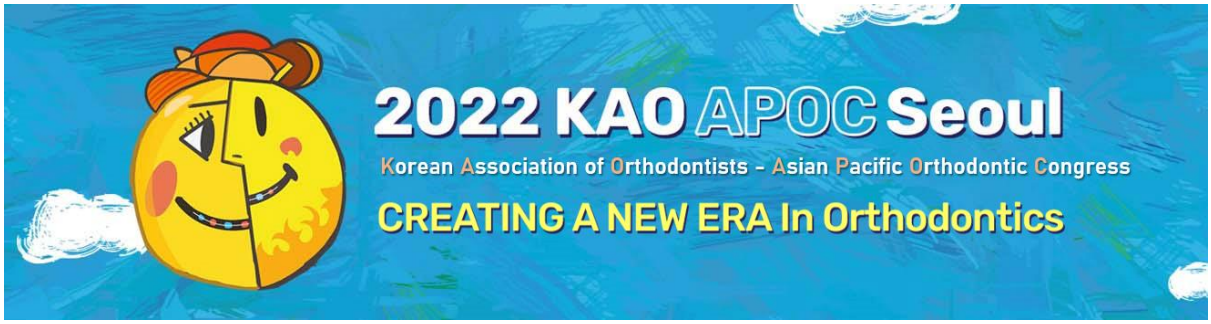
Diagnosis and Treatment Planning in the Digital Era

Ashley Trevor Smith

This lecture outlines the advantages of using digital systems for the diagnosis and treatment planning in Orthodontics. The main improvement in the field of Orthodontics in recent years is the incorporation of the Cone Beam CT (CBCT) Each patient has an optimum arch shape and crown torque.

CBCT shows us the design limits for each patient yet there are many common features to all patients. Digital orthodontics allows the astute Orthodontist to diagnose and digitally design the best orthodontic result for each patient (taking into consideration optimum tooth position, function and aesthetics with full knowledge of the boney limits).

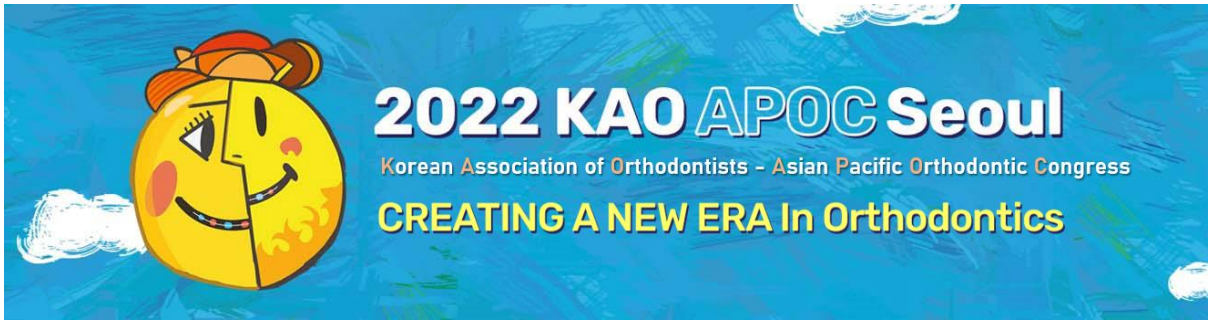
At my practice (Toowoomba Orthodontists) we treat all final phase cases with either fully customized braces (Insignia) or aligners (Spark). We have treated over 5000 Insignia cases and 1000 Spark cases. Both these systems have the advantage of using either library or actual CBCT roots.



Disclusion for mandibular asymmetry correction

Chairat Charoemratrote

Most of the facial asymmetry usually presented with mandibular asymmetry. Mandibular asymmetry is mostly related to maxillary deficiency. Malposition of the maxillary teeth could be a cause of premature contact and lead to anterior or posterior cross bite with mandibular asymmetry. Loss of permanent maxillary teeth could cause arch collapsing with subsequently limited function of the affected side with asymmetry appearance. The presentation will focus on the cause of mandibular asymmetry from occlusal interference with malposition of the maxillary teeth. Disclusion by means of bite plane in appropriate location with orthodontic tooth movement to improve the mandibular asymmetry will be presented.

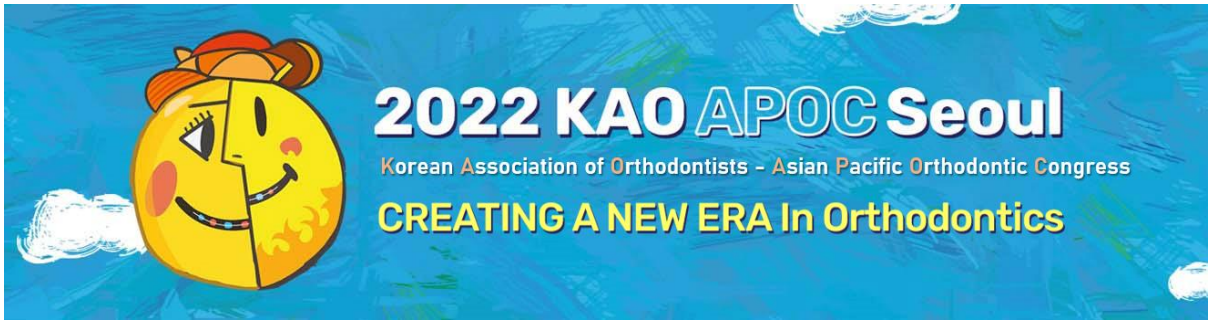


<Special Session IV>

How Can ENT Doctors Collaborate with Orthodontists about Pediatric OSA?

Sung Wan Kim

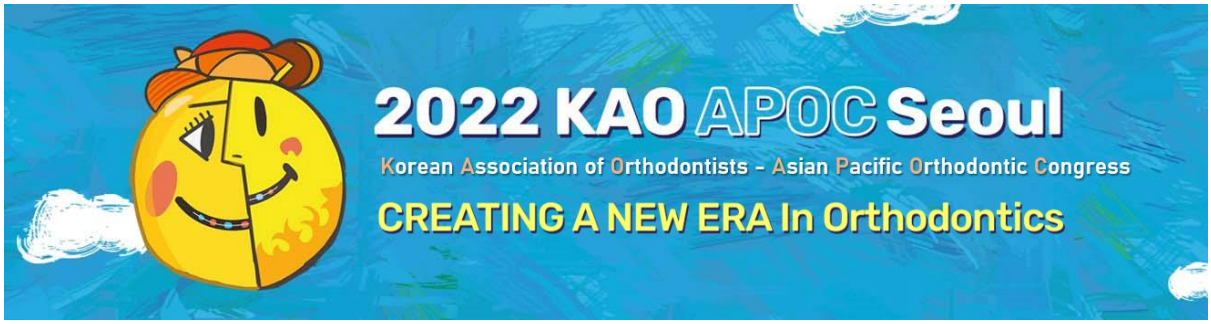
Pediatric OSA is a kind of sleep-disordered breathing caused by upper airway obstruction, but is totally different from adult OSA in terms of the cause, clinical presentation and treatment. The most common cause of pediatric OSA is adenotonsillar hypertrophy. In most cases, symptoms related to pediatric OSA could be resolved by adenotonsillectomy, but incomplete results are often noted after surgery. This is because the underlying causes of pediatric OSA are complex. Such factors as obesity, anatomical and neuromuscular factors, and hypotonic neuromuscular disease are also involved. Especially, anatomical and craniofacial features assessed during orthodontic exams such as macroglossia, midface hypoplasia, mandibular and maxillary retrognathia, maxillary constriction, short cranial base length, increased total and lower anterior facial heights, and a more anterior and inferior position of the hyoid bone are often associated with persistent symptoms of pediatric OSA after adenotonsillectomy. If small maxilla and/or mandible predisposed children with persistent symptoms, ENT doctors can refer those patients to orthodontists for dental or orthodontic approaches such as maxillomandibular advancement, rapid maxillary expansion, and distraction osteogenesis. On the other way, as dentists often look into children's mouths, they can play an active role in screening potential pediatric OSA and identifying those with enlarged tonsils and referring them to ENT for sleep assessment and soft tissue surgeries. And nasal obstruction can be found in many pediatric SDB patients which is the most frequent cause of mouth breathing resulted in airway obstruction and also the cause of failure in orthodontic treatment after adenotonsillectomy. The causes of nasal obstruction are variable such as allergic rhinitis, nasal polyposis, and septal deviation etc. ENT doctors are able to define and deal with the cause of nasal obstruction. Orthodontist can help the patients with high palatal arch with expansion technique resulted in relief of nasal obstruction. Therefore, both ENT doctors and orthodontist have beautiful collaboration in the pediatric patients with OSA. During the overall screening and treatment process for pediatric OSA, ENT doctors and orthodontists should collaborate as a transdisciplinary team for successful management of pediatric OSA.



How Much Can Orthodontic Treatment Influence the Obstructive Sleep Apnea?

Ali Darendeliler

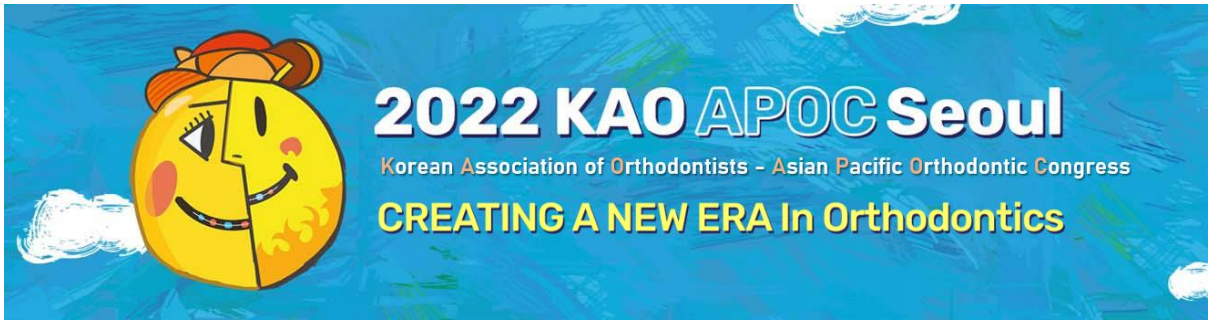
In recent years, increasing interest has developed in sleep related breathing disorders such as snoring and obstructive sleep apnoea (OSA). Nasal Continuous Positive Airway Pressure (CPAP) is sometimes the treatment of choice, but its cumbersome nature makes tolerance and compliance less than optimal. This gives rise to the need for other alternatives such as oral appliances that may be equally effective, but more tolerable. Mandibular Advancement Splints (MAS) were found successful in 63% of OSA patients. Tongue Stabilizing Device (TSD) has also showed promising results in the management of OSA. However preventing and intercepting OSA in children and adults would be the ideal approach and may potentially avoid lifelong management of sleep related issues. Dr Darendeliler will discuss different types of orthodontic and orthopedic treatment approaches, their effectiveness, their short and long term effects and clinical management.



Consideration of Upper Airway Obstruction in Orthodontic Diagnosis and Treatment for Pediatric Patients

Hong He

Mouth breathing is one of the most common clinical manifestations of pediatric SDB. Children whose mouth breathing remains untreated may develop long, narrow faces, high palatal vaults, dental malocclusion, gummy smiles etc. because of orofacial muscle imbalance. SDB in children has been associated with a variety of comorbidities, including failure to thrive, hypertension, attention deficit disorder, enuresis etc. Orthodontists who have the knowledge of SDB can play an important role in the early diagnosis and treatment of pediatric SDB. It is recommended that the orthodontist perform a clinical risk assessment for SDB. Orthodontists may be involved in the treatment of pediatric SDB by correcting the underlying dental and skeletal deformities. When making the orthodontic treatment plan, orthodontists should account for children's upper airway condition.

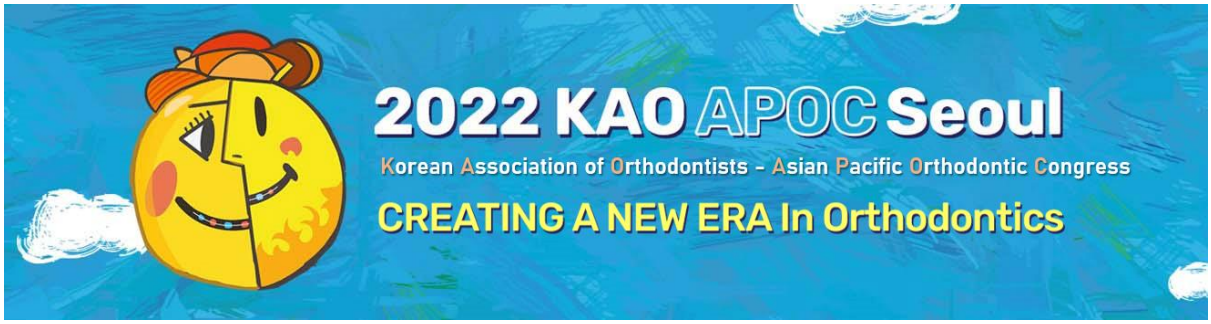


<Special Session V>

Surgery First with Clear Aligner Technique

Sandra Khong Tai

In this presentation, Sandra Khong Tai will discuss how to treat orthognathic surgery cases with clear aligners. Case selection criteria for a surgery first approach by using a surgical simulation in the digital treatment planning software will be discussed, together with appointment sequencing, post-surgery fixation and a comprehensive surgical protocol. Collaboration with the oral surgeon for orthognathic surgical planning for surgery first cases will be outlined in a step by step detailed protocol.



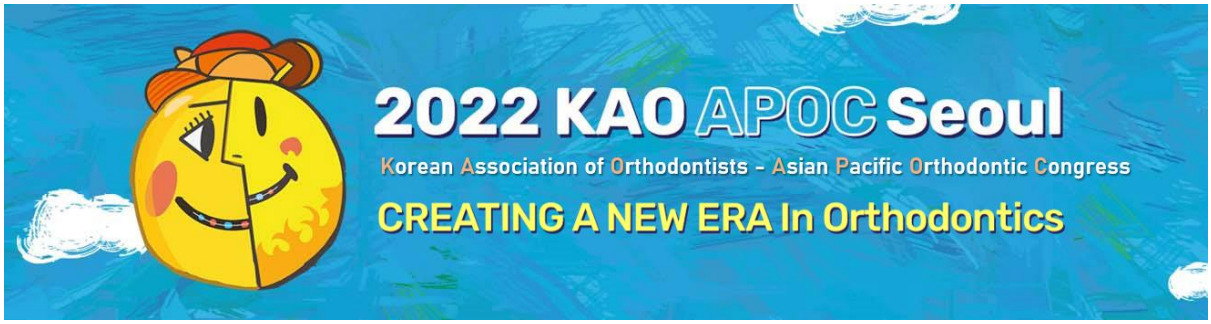
Artificial Intelligence-based Craniofacial diagnosis of Obstructive Sleep Apnea

Hwi-Dong Jung

Obstructive sleep apnea syndrome (OSAS), the number of which has increased, is diagnosed by several methods including polysomnography. To address time and cost issues from the existing tools, computational fluid dynamics (CFD) has been used for the upper airway geometry obtained from computed tomography (CT) data. A patient with sleep apnea suffers from considerable pressure drop owing to the narrow shape of the airway, which is the main indicator of OSAS. To address the time and cost issues exhibited by the existing diagnosis methods, this study presents computational fluid dynamics (CFD) and machine learning approaches that are derived from the upper airway morphology with automatic segmentation by deep learning.

Our team develops CFD models of the upper airway to increase the quantity of airway model data and simulates them to obtain the aerodynamic features to predict the severity of sleep apnea. In order to overcome the high computational time costs, this study uses a machine-learning algorithm. We use multivariate Gaussian process regression to enable fast predictions of aerodynamic features of unknown patients. Unlike existing regression methods, multivariate Gaussian regression considers the correlation between outputs, and the algorithm can reduce the computational costs of CFD. Additionally, we use the support vector machine algorithm to classify the patients as normal or moderate OSAS.

Recently we developed an advanced OSAS diagnosis method, which was based on upper airway morphology with automatic segmentation using deep learning was developed using CFD and machine learning approaches. By auto segmentation algorithm, we can remove excessive labor and spent time to extract the morphological factors of the upper airway. Furthermore, using regression and classification models, we could obtain immediate flow characteristics and subsequent patient diagnosis results. These processes are fully automatic. Therefore, this will help clinicians by making real-time diagnosis convenient and possible.



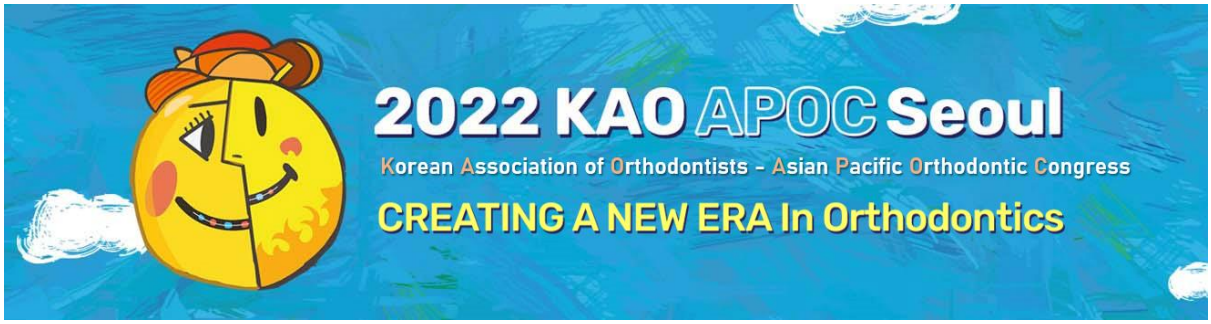
Artificial Intelligence for Digital Setup

Yoon-Ji Kim

Orthodontic diagnosis is a primary step to orthodontic treatment. After the acquisition of patients' anatomical and biological information, a problem list is generated and a treatment plan is established. After diagnosis, the patient's dental model may be used to simulate the orthodontic treatment by separating each tooth from the arch and rearranging them in the desired position, which will serve as a visual treatment objective. Traditionally, this task has been performed using plaster casts, dissecting each tooth from the plaster model and repositioning them using dental wax. Although this process provides the orthodontist insight into the possibilities and limitations of treatment, creating a diagnostic setup model from a dental plaster model is tedious and time-consuming.

Since the advent of intraoral scanners, instead of using the dental plaster model, intraoral scan data can be manipulated to perform digital tooth setup. After acquiring the full arch scan data of patients, teeth are segmented and repositioned to the desired position using the 3D CAD software. It is more efficient, as it eliminates the process of making plaster models, and it has been reported as effective and accurate as the conventional method. However, there is still much work required in the digital space to perform the virtual setup, such as tooth segmentation, setting the occlusal plane, and adjusting the tip, torque, and rotation of each tooth.

This presentation summarizes the latest artificial intelligence technologies introduced for the automation of digital setup procedures and provides a brief review of the automated setup softwares in the market.



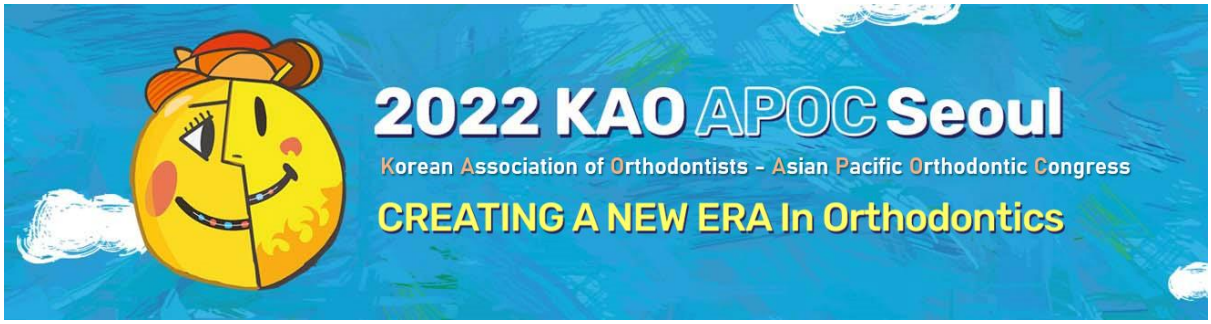
<Special Session VI>

Vertical Control for Enhancing Aesthetic Outcome

Nathamuni Rangarajan Krishnaswamy

In the past, the focus in orthodontics has been on correcting the anterior-posterior skeletal and dental relationships. Not surprisingly, the current and widely used system of Angle's classification focuses primarily on the sagittal with very little focus on transverse or vertical dimension problems. It took decades before pioneering orthodontists highlighted the importance of vertical facial dimension.
Distortions in vertical proportions has a greater negative impact on facial aesthetics as compared to sagittal and transverse dimension problems. The vertical facial pattern gets established early in life and needs therapeutic intervention.

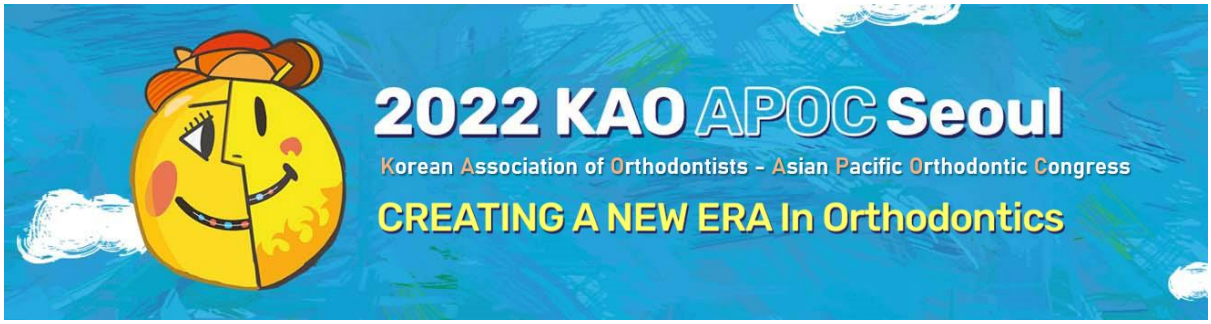
Although the vertical dimension lends itself to mechanical control alteration in vertical pattern itself is difficult and instability following treatment is a veracious issue. The various options for controlling vertical dimension for enhancing facial esthetics will be discussed in this presentation.



A stepwise approach to the correction of excessive gingival display

Eddie Hsiang-Hua Lai

Excessive gingival display is an aesthetic concern for patients and a challenge for clinicians. An accurate diagnosis is essential in order to provide effective treatment. The aim of the presentation is to fill a gap in the current literature by providing clinicians with an overview and a stepwise approach to assessing gingival excess, as well as reviewing possible treatment. An examination should be initiated extra-orally to distinguish contributing skeletal factors. The relationships of four aesthetic parameters (LIPG): lip length (L), incisal lines (I), tooth proportions (P), and gingival lines (G), should be examined individually to determine other possible causes of gingival excess. Contributing factors may include a short or hypermobile upper lip, dentoalveolar extrusion, or altered passive eruption. Further investigation to identify patients who might benefit from orthognathic surgery, orthodontic treatment alone, lip repositioning or botulinum injection, or aesthetic crown lengthening procedures, should be conducted to reconfirm a diagnosis and provide the optimal treatment. Clinicians can have a dental blueprint for anterior tooth reconstruction and are able to provide comprehensive treatment in co-operation with other disciplines. By understanding the principles of an aesthetic smile line, the aetiology of an excessive gingival display and treatment concepts, clinicians are able to provide alternative treatments to avoid extensive surgical procedures while achieving acceptable outcomes.



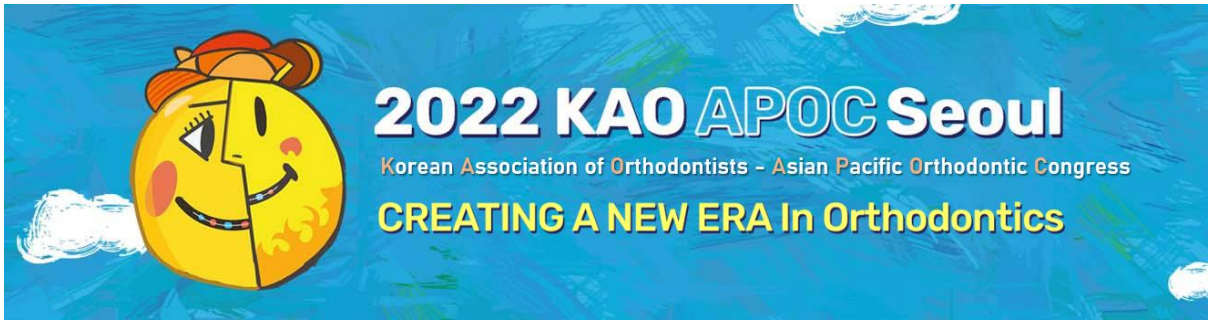
Three-Dimensional Management in Open Bite Treatment

Doan Quoc Huy

The open bite patterns I often encounter usually have horizontal and vertical abnormalities in the posterior teeth area, which may stem from the functional abnormalities of the facial neuromuscular system, cheek, tongue, lips, etc. Those differences lead to a series of erroneous deviations in teeth, alveolar, maxillary system from the posterior teeth area to the anterior teeth area.

Besides finding the cause and related factors, once the treatment of an open bite case starts, the posterior teeth area is always my first priority to examine and adjust. The direction of movement is always in the order of horizontal, vertical and then anteroposterior dimension.

Finally, the ultimate goals in orthodontic treatment I aim for are enhancing the facial aesthetic, maintaining the functional masticatory system, stabilizing the final result and a proper procedure for both dentists and patients.



<KAO Scientific Research>

The possibility of spontaneous correction of malocclusion through solving various social etiologic factors

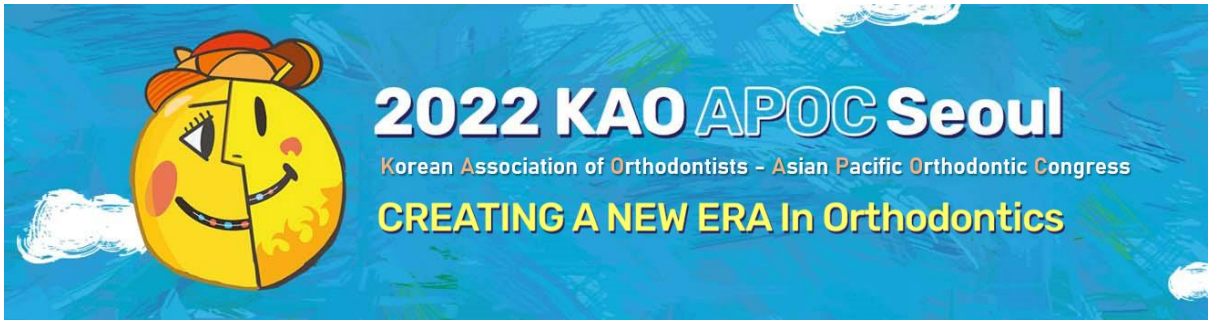
Jae Ho Baek

Introduction : The goal of this study is inducing spontaneous correction of malocclusion by solving social etiologic factors. Many causes of malocclusion including mouth breathing, nail biting, finger sucking, clenching and etc. are related to psychosocial problems. By clarifying the correlation between these factors and specific malocclusion, the malocclusion can be resolved spontaneously without any artificial appliances.

Materials & Methods : Total 7,514 patients' data (Male : 2,897, Female :4,617) including questionnaire, radiography, photography, and diagnostic models were treated. All of patients have one of malocclusions that are open bite, deep bite (over 3mm), large overjet (over 3mm), and crossbite. The samples are subdivided by age, job, bad habits, whether mouth breathing, walking time, electric device usage time, the degree of language development, family relations, conversation time with family, and separation experience from parent. Then the correlation between these classified groups and their malocclusion was analyzed statistically. To resolve the factors with a significant correlation, continuous education for each patient was provided and the degree of spontaneous correction of malocclusion was evaluated.

Discussion : Recently, psychosocial factors that can cause various malocclusion, including an in the time spent using electric device, are increasing. According to this study, these factors were closely related to posture and breathing pattern. These changes, in particular, seem to have a severe effect on the growth and development of the maxilla. If we find out more factors related to this, and if we detect and resolve them in advance, many malocclusions can be improved spontaneously through education alone.

Conclusion : With continuous education to solve social etiologic factors without using any appliances, spontaneous malocclusion correction was found in about 74% of patients aged 6 to 10 years. Crossbite was improved in 67% of patients before the age of 6 years. After the age of 10, spontaneous improvement was difficult in open bite, and the improvement effect was shown only in about 3%. All of the patients showed improvement in space problems during education period. No significant difference was between male and female group.



<KAOF Scientific Research>

A Retrospective Study on the Prevalence of Orthodontic Problems in 6,7,8-year-old Korean Using Panoramic Radiograph

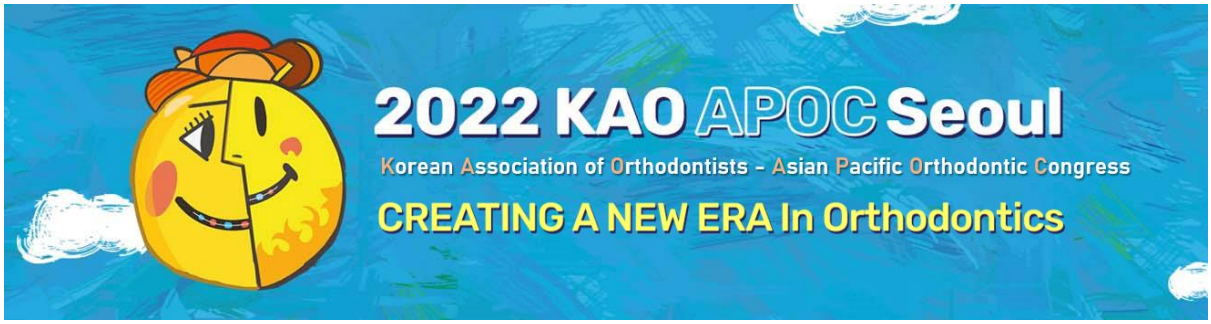
Jiyeon Lee

Objective: The purpose of this study is to retrospectively analyze the prevalence of orthodontic problems and the proportion of patients who underwent the examination for orthodontic diagnosis in the 6-year-old(n=300), 7-year-old(n=400), 8-year-old(n=400) children who took the panoramic radiographs.

Methods: 6,7,8-year-old children who took panoramic radiographs were divided into five groups; the department of conservative dentistry (COD), oral and maxillofacial surgery (OMS), orthodontics (ORD), periodontics (PDD), and prosthodontics (PRD) according to the patient's chief complaint. We investigated the patients' chief complaints and checked the eruption of the first molars, the lack of eruption space of the incisors, the frequency of patients with tooth eruption disorders, lack of space, impaction, a supernumerary tooth (SNT), missing tooth, and ectopic eruption. Among the four groups whose main complaint is not for the orthodontic department, we counted the number of patients with dental problems requiring orthodontic treatment. We studied the rate of the patients with orthodontic issues who received an orthodontic diagnosis or not.

Results: Dental trauma 44,34%, respectively) showed the most frequent chief complaints in 6 and 8-year-old patients, but SNT (26%) in 7-year-old patients. The coronal inclination of canines of all patient groups showed mesial inclination. Only 1.5%(6-year-old) and 23%(7,8-year-old) of patients with orthodontic problems who first visited OMS & COD underwent the examination for orthodontic diagnosis.

Conclusions: In this study, most canines showed mesial inclination in all age groups. The proportion of patients who had orthodontic problems increased along with age. However, only 1.5, 23, and 23% (6,7,8-year-old, respectively) of patients who required orthodontic treatment underwent the examination for orthodontic diagnosis. Even though the appropriate time for orthodontic treatment is different for each patient, an orthodontic diagnostic examination should be performed to establish an accurate treatment plan and solve the problem. Proper information should correct the misconception that it is appropriate to delay orthodontic examination until permanent dentition to patient caregivers**.**



<Ko Hwang Award>

Long-term stability of patients with transverse discrepancy by orthodontic treatment only

Seong-Min Bae

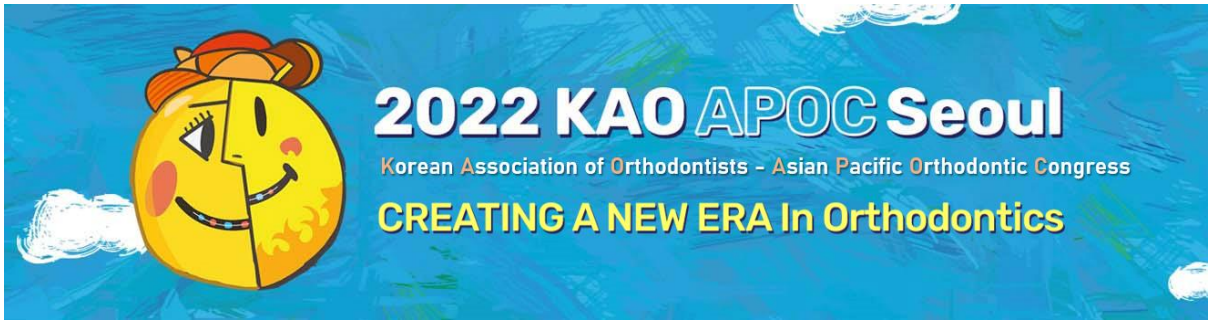
Problems in the transverse dimension can be challenging to manage, especially in adult patients. Several etiologic factors that cause adult transverse discrepancies are true excess or deficient maxillary or mandibular transverse growth, ectopic tooth eruption, soft tissue imbalance (example: prolonged digit sucking), asymmetric mandibular growth,etc.

Considering factors when formulating a diagnosis and treatment plan for adult patients with transverse discrepancies are magnitude of transverse discrepancy, facial symmetry or asymmetry with lateral CR-CO shift, whether the transverse discrepancy is absolute or relative transverse discrepancy due to AP discrepancy, magnitude of buccal corridors and magnitude of transverse dental compensations.

Treatment options for adult transverse discrepancies are multiple maxillary osteotomy, SARPE, MARPE and dental expansion. Dental expansion includes translating maxillary posterior teeth buccally with fixed appliance with or without Quadhelix or TPA is available in thick periodontal biotype patients for expansion of transverse maxillary first molar about 3~5mm.

Recently, as skeletal lateral expansion using orthodontic microscrews has been popularized, I have found that the curve of Wilson is removed or, in severe cases, reversed due to unnecessary skeletal expansion and often over-application. In addition, excessive maxillary expansion and compensatory mandibular excessive dental arch expansion are taking place. In addition, there was a question as to whether the old principle of orthodontic treatment to prevent orthodontic relapse, “maintenance of lower intermolar width”, is still effective.

Therefore, I would like to share the experience of long-term observation of treatment cases using dental expansion and molar distalization using MIA (Micro-Implant Anchorage) in cases with transverse discrepancy with or without dental crowding.

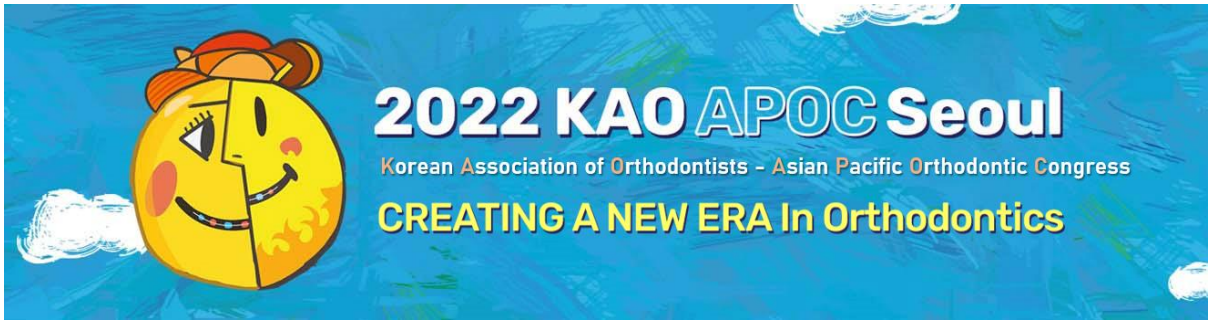


<Veteran's lecture>

Guideline for ortho - perio integrated approach

Hwang Chung Ju

The purpose of orthodontic treatment is to improve the functionality and aesthetics of teeth and jawbones by correcting malocclusion, and to maintain the treatment results in a stable condition with well-balanced surrounding muscles of the jawbones and temporomandibular joints. While aesthetic and functional improvements can be achieved by orthodontic treatment, undesired side effects may affect the dentition and supporting structures. Periodontal problems belong to such side effects, which need to be managed by both the the practitioner and patient. According to clinical reports orthodontic treatments cause some periodontal changes temporarily, but do not have any negative effects in the long-term. Furthermore, it has been reported the plaque score and the incidence of gingivitis are lower in patients who are in orthodontic treatment or patients with recent removal of orthodontic appliance than those who have not been treated orthodontically. The proportion of adult orthodontic patients is expanding. Especially, the number of middle-aged patients is increasing. Most middle-aged patients have periodontal problems. These patients show alveolar bone loss of various degrees, which leads to decreased bone support of the teeth and a decrease in the vertical dimension. In adult patients, not only aesthetic but also functional rehabilitation is required. A careful periodontal screening and periodontal treatments need to be performed prior to orthodontic treatment. Even if inflamed tissue is removed before orthodontic treatment, dental plaque may accumulate again within one to two months after the installation of orthodontic appliance and moderate to severe inflammation may occur. If orthodontic treatment is continued, the inflammation would be exacerbated. Usually, interdental and molar areas are more affected than the labial, lingual, and anterior areas. If undesired thinning-out of periodontal tissue occurs due to orthodontic force such as expansion and torque, a special attention should be paid to gingival recession, which may occur following orthodontic treatment as a result of mechanical irritation, periodontitis, and traumatic occlusion. For adequate and stable treatment results, it is important to establish a protocol for the management of periodontal health during orthodontic treatment. In order to maintain and improve dental and periodontal health during orthodontic treatment, an oral hygiene management program, and an integrated treatment plan regarding the type and application of device, and the treatment timing and method are necessary.



<Presidential Lecture>

Third Molars in Orthodontics: To retain, or not to retain, that is the question.

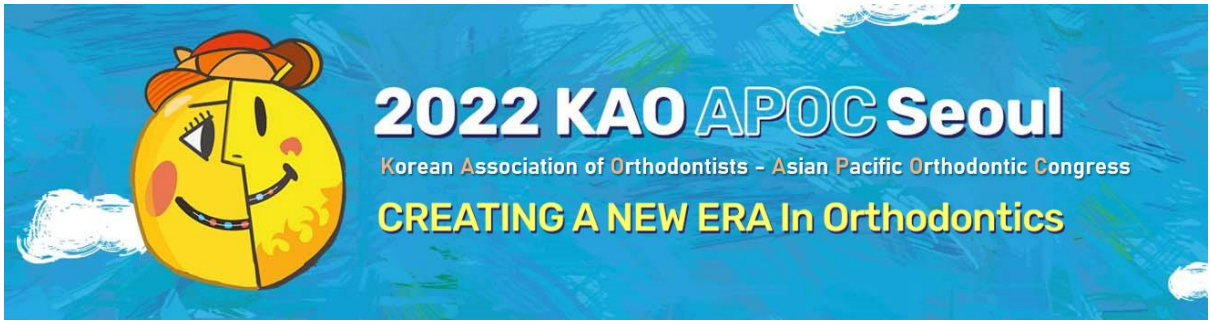
Kyung-Ho Kim

Orthodontists are often confronted with the question of whether to retain or extract the third molar. And if extraction is indicated, when is the ideal extraction time?

An asymptomatic third molar with no possibility of harmful effects on the dentition should be retained. However, if the third molar can threaten the stability of orthodontic results, extraction should be performed.

Recent trends of non-extraction treatment with molar distalization using temporary anchorage devices (TADs) are the reasons for the higher need of attention regarding the third molar management. In addition, a missing or hopeless tooth due to various reasons such as severe dental caries, is a good candidate for substitution by the third molar.

In this lecture, I will discuss the beneficial uses (positional/angular changes of the third molar after upper and/or lower second molar extraction and substitution of a molar by a third molar), as well as the potentially harmful effects (occlusal changes adjacent to the third molar, poor relation to adjacent molar) of the retained third molar.



OP-01

Predictable Orthodontic Treatment with TAD's and Digital Splint

Ajit Kalia

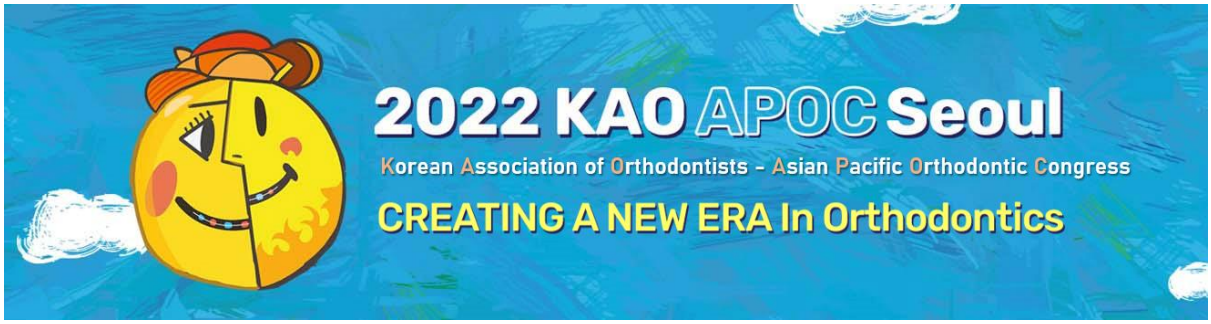
Department of Orthodontics and Dentofacial Orthopaedics MA Rangoowala College of Dental Sciences Pune, India

Introduction : Orthodontic treatment which demands more anchorage control and less patient compliance has led to the development of various orthodontic implants and skeletal anchorage systems. Temporary anchorage devices (TADS) have not only increased the horizons of orthodontic treatment but has also enabled clinicians to perform predictable tooth movement with minimum patient compliance.

Temporary anchorage devices (TADS) have many advantages such as low cost, simple surgical procedures and convenient size of the implants. Use of skeletal anchorage system for distalization/mesialisation /intrusions/retraction not only prevents anchorage loss but also allows predictable tooth movement in shorter period of time.

Materials and Methods : New imaging techniques like CBCT, CAD-CAM, digital printing has allowed us to take innovative steps towards the planning of the treatment with more precision. And combining it with 3D printing has enabled construction of customized appliances. CAD-CAM based fabrication has several advantages over manual production method, which includes greater consistency among laboratory, better quality control during manufacturing procedure and faster production.

Conclusions : This presentation describes the use of customized splint made with digital imaging, CAD-CAM technology and TADS to achieve predictable orthodontic tooth movement. This presentation describes the use of customized splint made with digital imaging, CAD-CAM technology and TADS to achieve predictable orthodontic tooth movement.



OP-02

Stability of Bimaxillary Proclination Cases Following Fixed Appliances Treatment: A Randomised Controlled Trial

Norhidayah @ Nor zahidah Mohd Tahir, Wan Nurazreena Wan Hassan, NurulHuda Maskim

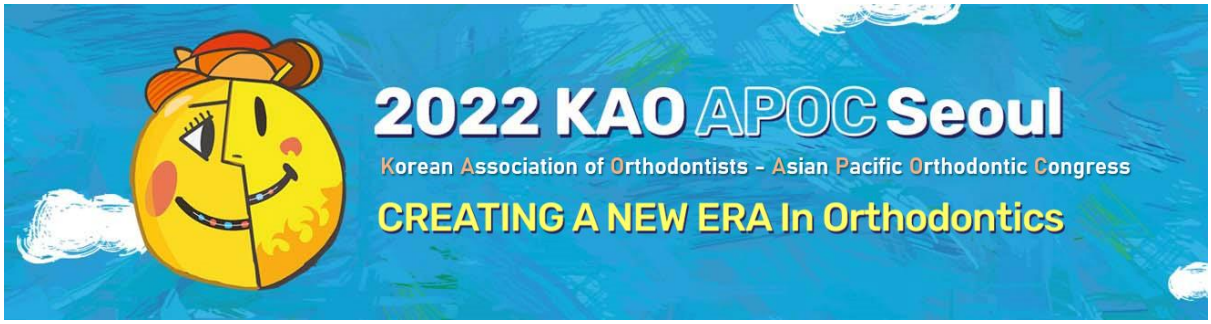
Faculty of Dentistry, Universiti Malaya, Kuala Lumpur, Malaysia

Purpose : To identify the most effective retention strategy for corrected bimaxillary proclination cases treated with extraction of four premolars and pre-adjusted fixed appliance.

Materials and methods : 27 patients who had four premolars extraction and fixed appliance treatment at Faculty of Dentistry, Universiti Malaya were recruited and allocated by block randomisation into three groups [i.e., fixed bonded retainers (FB), double retainers (DR) and vacuum formed retainers (VFR)]. Data were collected periodically from debond (T0) up to 12 months (T4). The dental tissue (DT) and soft tissue (ST) parameters were measured from manually traced lateral cephalograms (LC). Dental casts were measured for intra-arch changes. Patients' compliance and frequency of breakages were also recorded. Data were analysed by repeated measures ANOVA.

Results : At 12 months, the ST cephalometric parameters show significant ($p < 0.05$) relapse for lower and upper lips to SN-7 line and labiomental fold angle. The DT cephalometric and study cast parameters revealed significant relapse for the upper incisor to SN-7 line, upper and lower incisor angulations and interincisal angle. Only the upper incisor angle (UIA) showed significant differences between groups ($\eta 2 = 0.296$; $p = 0.015$). Post-hoc comparisons found FB and VFR [(mean difference = 3.33 degrees; 95% CI 0.46, 6.21; $p = 0.019$) and (mean difference =3.22 degrees; 95% CI -6.09, -0.35; $p = 0.024$), respectively] had more relapse than DR of the UIA at T4.

Conclusions : All three types of retainers showed no differences in most of the soft and dental tissue parameters. However, DR was found to be more superior than FB and VFR in maintaining the UIA of corrected bimaxillary proclinations.



OP-03

Management of malposed, impacted and transposed canines - Case Series

Amit Nagar

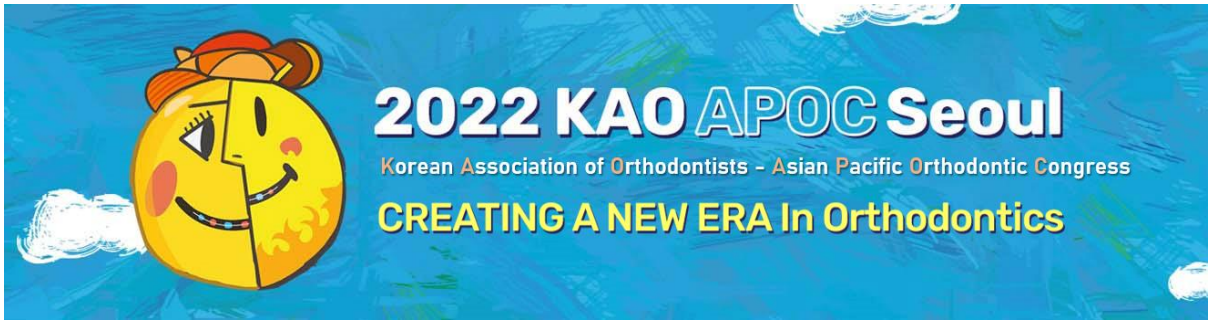
Professor,Deptt. of Orthodontics and Dentofacial Orthopedics, Faculty of Dental Sciences,King George,s Medical University,Lucknow-226003,INDIA

Introduction : Ectopic teeth are frequently encountered in Orthodontic practice. These may be in variety of situations like impaction, transposition and malposition. Maxillary canine is the second most frequently impacted tooth in dental arch after 3rd molars. Impactions are common in females. Canine has the longest period of development, deepest area of development and most devious course to travel from its area of origin to erupt into proper occlusion. From crown calcification to eruption, it takes nearly twice as long as compared to other permanent teeth which makes it susceptible to much longer period of environmental influences both favourable and unfavourable.

Both palatal and buccal impaction of canine have different etiology. Treatment options for all of above situations is based on its position and risk factors in individual case. Extraction of an impacted canine may be the best treatment alternative in certain circumstances, but because of the unique functional and esthetic characteristics of the permanent canine, clinicians prefer to bring an impacted canine into its proper position in the arch.

Materials and Methods : A series of buccal, palatal and transposed canine cases have been discussed. Orthodontic management of such cases are very complex and require a carefully planned interdisciplinary approach. The surgical orthodontic treatment of impacted canines is aimed at bringing the tooth into its correct position in the dental arch without causing periodontal damage. Various forms of inter-arch and intra-arch mechanics have been developed for the eruption of impeded, impacted, transposed teeth.

Conclusions : The availability of newer materials with variable modulus and variable transition temperature has stimulated the development of various appliances designs with newer materials and configurations.



OP-04

How Did We Create "Magic Wand" to Manage Orthodontic Complications

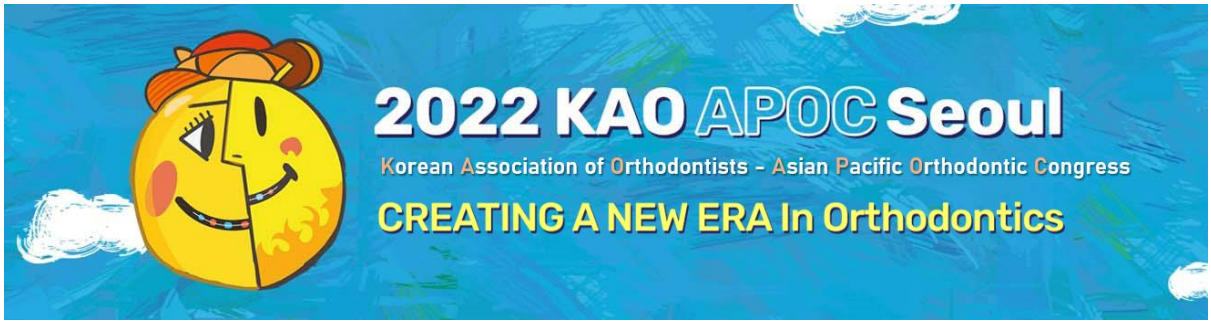
Tingxi Wu

Forsyth Institute

Introduction : Orthodontic appliances hamper effective oral hygiene with heavy accumulation of dental plaques in the area, leading to the negative consequences such as decalcification of enamel surface (white spot lesions), caries, as well as gingival inflammation. So far, no effective methods could control the dental plaque in orthodontic patients. Thus, a novel way to inhibit bracket-induced plaque formation has been developed and will be presented here.

Materials and Methods : First, several chemical compounds that have anti-plaque formation effect were discovered based on the previous finding in the lab and then were formulated into toothpaste with strong inhibitory effect against bracket-induced plaque in vitro. Furthermore, building on the strong preliminary data, a randomized, double-blinded, placebo-controlled, pilot clinical study was conducted to evaluate the safety and efficacy of this newly formulated toothpaste in vivo. The new formula is safe without adverse event during the clinic study.

Conclusions : The clinic results suggested that this novel formulation could potentially manage microbial associated complications in orthodontic patients.



OP-05

Application of Mini-implants and a New-type Posterior Tube Appliance for Premolar Extraction Cases

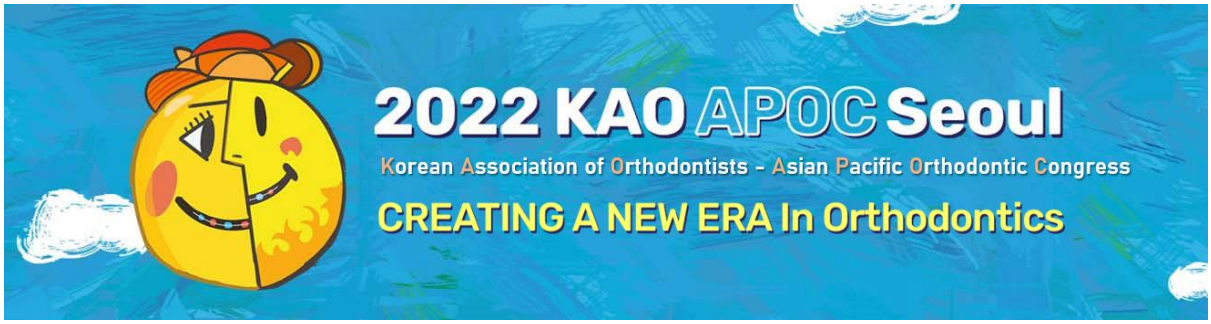
Jin-Young Choi

Department of Orthodontics, Kyung Hee University Dental Hospital

Introduction : With the use of mini-screws or mini-implants as temporary skeletal anchorage devices (TSADs), the scope of orthodontic treatment has been expanded. However, unexpected side effects such as unwanted molar movement have also occurred. Among various TSADs, a mini-implant with a hole on its head has been introduced and used.

Discussion : In cases with good molar occlusion or poor periodontal condition, it would be better to minimize the period of bonding fixed orthodontic appliances on the posterior teeth. By passing the archwire through the head hole of mini-implant, it is possible to minimize the bonding period of the posterior teeth without the side effects that often occurred when using conventional mini-screws. It can also promote effective tooth movement during the space closing stage by reducing friction between the appliance and the archwire. In addition, a new tube-type appliance that is bonded on the mandibular posterior teeth has been developed. They are used as an auxiliary device, connecting mandibular premolar and molar to reinforce the anchorage.

Conclusion : In the presentation, the pros and cons of this approach identified through clinical experience are presented. It is expected that the suggested method will help in planning orthodontic treatment for premolars extraction cases as an extra option.



OP-06

Four premolar extraction using clear aligner

Hong-Sik Park

Dr. Hong Orthodontic Clinic

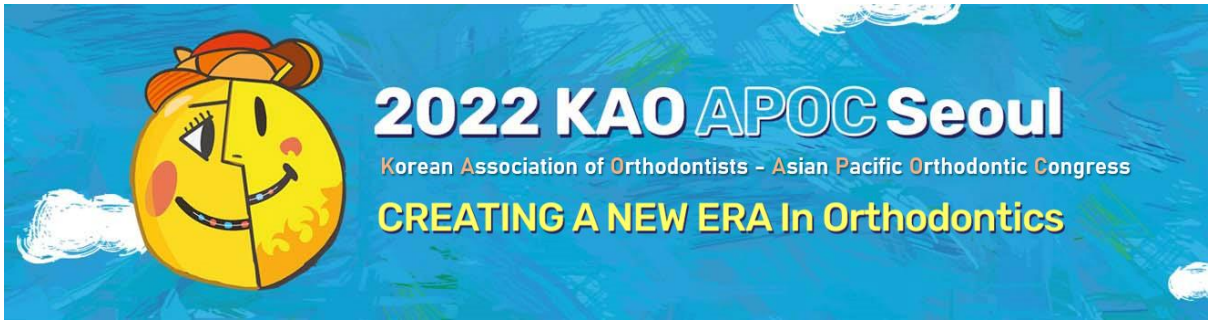
Introduction : Clear aligners have been used for decades, but only in non-extraction cases and mild crowding cases. There have been many innovations in aligner materials, biomechanics, and staging system recently. These changes make it possible to treat premolar extraction using clear aligners. However, it is still considered as the most difficult cases with aligners. The objective of this presentation is to discuss consideration factors in 3 aspects: patient, the biomechanics of clear aligner, and doctor.

Discussion : 1. Patient : Aligners require highly motivated patient's compliance. Doctors or dental staffs must educate them all about aligners including use and care instructions, insertion and removal,and good fitting.

2. Biomechanics of Clear Aligner : The nature and biomechanics of aligners are different from braces and wires. Proper attachments should be designed and positioned. Staged retraction, vertical control, delayed extraction is recommended.

3. Doctor : For now, first premolar extraction is accepted more predictable than second premolar in aligner therapy. Anchorage control and continuous monitoring is necessary during whole treatment time. Furthermore, combination with other appliances could be an option.

Conclusion : Clear aligner is an esthetic orthodontic treatment option. Educated patient, properly set biomechanics, and well-designed treatment planning all together could make better and acceptable treatment outcomes.



OP-07

Hybrid removable appliances design for treatment of various malocclusion

Jae Ho Baek

We.Smile Orthodontic Clinic

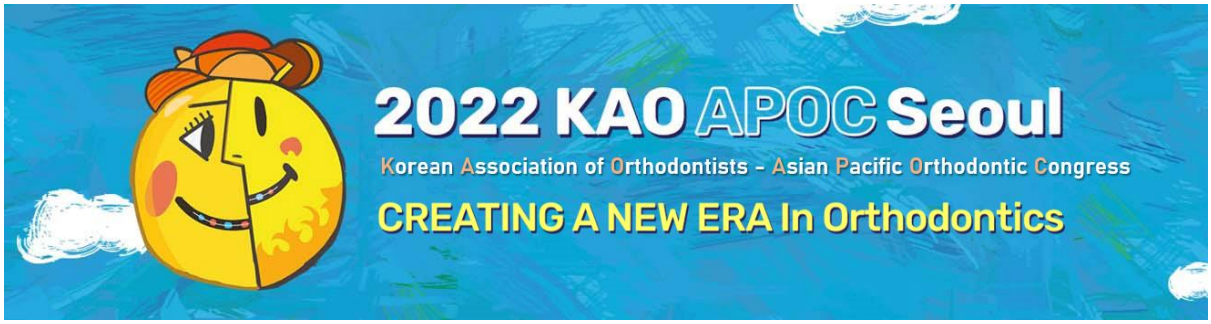
Introduction : Due to the increase in aesthetic interest, recently, various removable devices have been used again widely in the orthodontic field. Among them, the representative will be a group including Invisalign and Clear aligner. However, despite many advantages, these devices have many biomechanical disadvantages also. This presentation will introduce the design and effect of a hybrid removable devices that adds elements which can effectively overcome these shortcomings.

Case Summary : 1. Hybrid appliances for space closing ; These devices are very effective in correcting multiple spaces as well as relapse of the extraction space after orthodontic treatment. Unlike conventional devices, this purpose can be achieved with one device without periodic replacement of the device.

2. Hybrid appliances for expansion ; Without screw type expander, effect maxillary or mandibular arch expansion can be achieved using this appliances. There is also an advantage that many patients who use the device can become accustomed to using this device in a short time compared to the conventional removable devices.

3. Hybrid appliances for Class II or Class III correction ; When implemented with proper muscle control, it is possible to effectively improve crossbite or large overjet only by adding parts that can induce alveolar bone stimulation.

Conclusion : Aligner-type removable devices have fundamental limitations, including materials' characteristics, despite the advantage that occlusal force can be used for treatment. This presentation introduced the use of parts that can overcome these shortcomings and the new invented designs of aligner for correcting various malocclusion were introduced also. The introduced hybrid devices were patient-friendly and the clinical results were very effective compared to the existing devices.



OP-08

Effective uprighting method for horizontally impacted lower third molar: the modified bonded cantilever spring

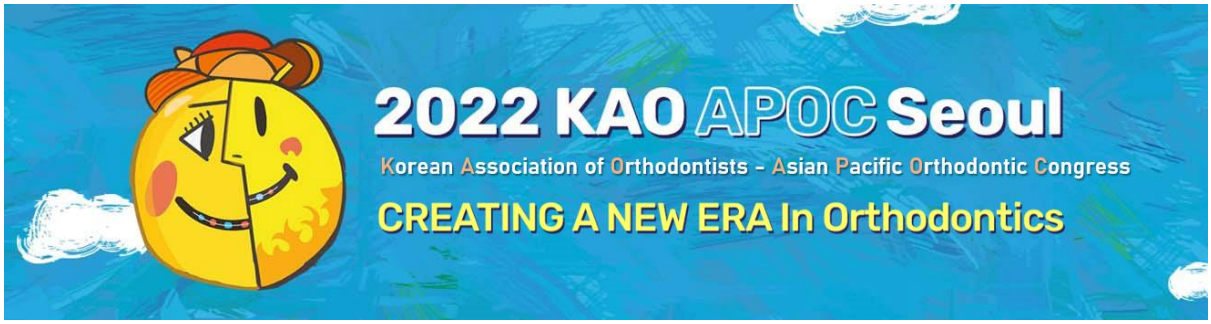
Seung-Min Lim

Gajirunee orthodonitc clinic

Introduction : Introduction: It has been reported that a maxillary or a mandibular permanent third molar was uprighted and acceptably replaced the second molar after extraction in orthodontic treatment. The alignment of the permanent third molars after the extraction of the permanent first or second molars is a useful option for adult patients when the permanent first or second molars are severely damaged.

Discussion : Discussion: Several orthodontic mechanics and devices have been proposed to verticalize and disimpact the mesially tipped mandibular molars. Removable and fixed appliances and, more recently, skeletal anchorage have been used with push springs, open-coil and closed-coil springs tip-back cantilevers, looped springs to perform the challenging task of uprighting tipped molars. A clinical advantage of the modified bonded cantilever spring is that it does not depend on exposure of the buccal surface of the tooth for bonding of orthodontic tube, as generally required by conventional cantilevers, because this area is frequently unavailable in patients with extremely tipped and partially erupted mandibular molars. Another mechanical advantage is that the moment produced by the modified bonded cantilever spring, unlike some uprighting mechanics, does not depend on any distal force. Extremely tipped mandibular molars frequently have the center of resistance close to the line of action of the distal forces, generating reduced moments of force and tending to produce distal bodily movement of the tipped molar, which can reduce molar uprighting efficiency. Therefore, this mechanical characteristic can be an effective method when root movement is prioritized.

Conclusion : Conclusion: the modified bonded cantilever spring is an effective mechanics for uprighting of horizontally impacted lower third molar without surgical exposure of buccal tooth surface.



OP-09

Computer-aided Orthodontics for Precise Diagnosis

Sung-Hwan Choi

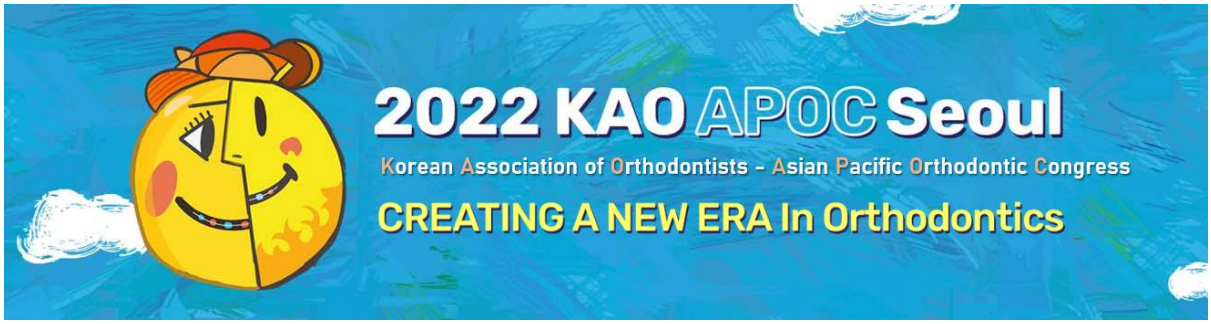
Department of Orthodontics, The Institute of Craniofacial Deformity, College of Dentistry, Yonsei University

Introduction : To establish a treatment plan for orthodontic treatment and orthognathic surgery, it is necessary to analyze cephalometric radiographs. Although bilateral landmarks such as porion or orbitale were very important reference points setting the FH plane, they overlapped each other, so accurate detection could not be achieved. This was one of the causes of the difference in the analysis results for each investigator. In addition, when analyzing facial asymmetry through PA cephalometric radiographs, we mainly depended only on the direction of menton deviation and the distance away from the midsagittal plane. In this way, it is difficult to diagnose the three-dimensional stereoscopic asymmetry of the mandible.

Recently, CBCT has been popularized and analysis using 3D reconstructed images is possible. However, without anatomical expertise, the measurement itself is very difficult, and it takes more time and effort compared to the analysis of two-dimensional radiographs, so it is difficult to use in a private clinic.

Discussion : In this presentation, I would like to introduce CBCT automatic landmark detection technology. Also, I would like to introduce a new concept using a similarity index and tomographic similarity scan that can maximize facial symmetry during orthognathic surgery by mirroring both structures based on the newly proposed computed modified absolute midsagittal plane of the mandible.

Conclusion : This presentation demonstrates the potential of 3D automatic tracing, SI, and ToSS curves in orthodontic and surgical simulation software to improve the precision in the clinical decision-making process.



OP-10

Automatic evaluation of SMI and bone age using artificial intelligence and deep learning

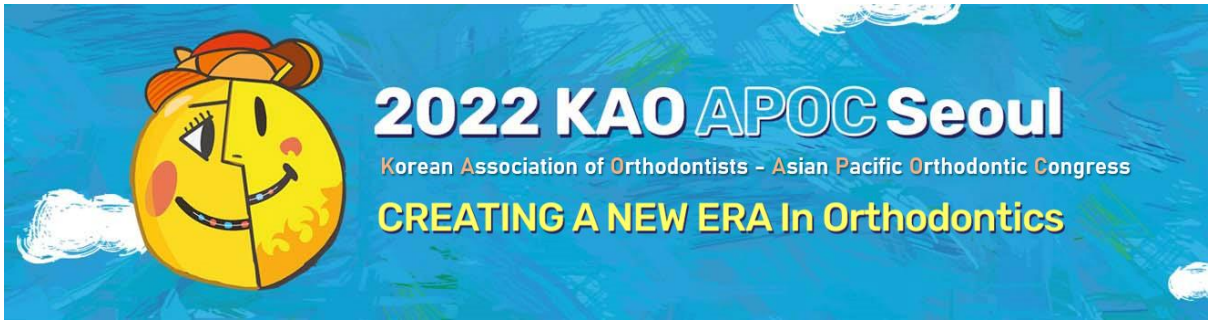
Jungsuk Kim

Goun-miso dental clinic (private practice), Bung-dang, Kyoung-gi, Korea

Introduction : With the development of AI, it has been possible to evaluate the growth status of children in the growing phase by evaluating the bone age through handwrist-xray. Although the bone age evaluation, which is important in determining the evaluation of facial bone growth and treatment timing, has large inter- and intra-observer errors in growth modification orthodontics, we will apply it to clinical orthodontic treatment using the newly developed automatic SMI evaluation.

Discussion : In orthodontics, cervical vertabrae maturity, hand-wrist x-ray, height growth, secondary sexual characteristics, and many growth evaluation methods are used in clinical practice, but the application of various growth evaluation results to clinical practice is still controversial. Developed a few years ago and used for adult height prediction estimation, the verified TW3, GP method is upgraded, big data and Retina deep neural network model are used, and an artificial intelligence method that integrates analysis with a vision transformer series deep neural model is used. It was possible to obtain the Fishman's Skeletal Maturity index, which can be evaluated objectively, quickly and accurately.

Conclusion : Orthodontists can improve the quality of skeletal growth improvement treatment by using the objective SMI evaluation to identify the growth stage of the facial skeleton in growing patients and determine the timing of treatment. In addition, it is possible to explain to the patient information about the evaluation of the child's adult predicted height and early growth or growth retardation.



OP-11

Face Driven Orthodontic Solution: Let's make a 3D face!

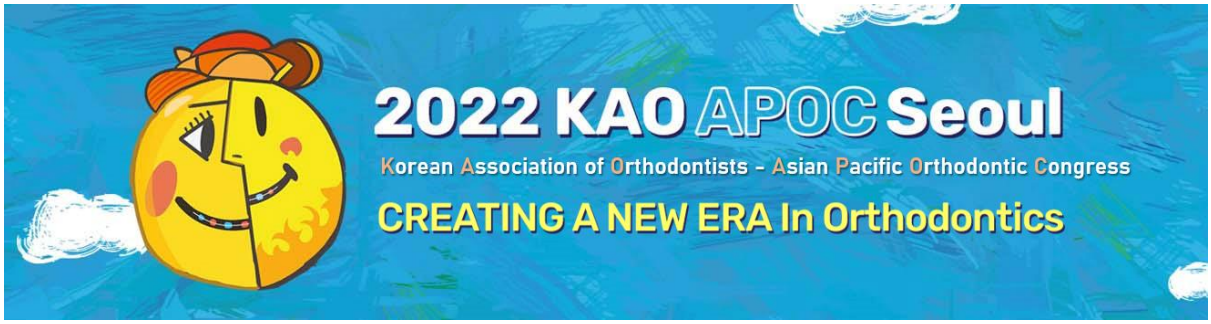
Sangmi Lee[1,2]

[1]Star Orthodontic Clinic [2]Roth Orthodontic Society

Introduction : For satisfactory results of orthodontic treatment, practitioners require precise diagnosis not only on the dentition and occlusion of the patients, but also on the skeletal structures including bone and cartilage, and on the facial soft tissues including skins, connective tissues, fats and muscles.

Discussion : In the history of orthodontic and orthognathic treatment inherited from Angle's paradigm, accomplishing ideal hard tissue relations have always had priority. Therefore, the cephalometric radiographs and the dental models maintained their position as essential diagnostic tools, while the soft tissue relations were only limited to the 2-dimensional (2D) facial photos. In the meantime, 3-dimensional (3D) diagnostic tools as cone-beam computed tomography (CBCT) and intraoral scanners have developed and came into the general use in orthodontic treatment. Consequently, demands for 3D surface images of patient's soft tissue which can be integrated to the 3D hard tissue image are increasing and some commercialized products have been introduced for clinical usage.

Conclusion : With the appropriate use of 3D surface image, clinicians can establish an ideal treatment plan that contains extensive information and changes of patient's soft tissue. In this presentation, the understanding and application of 3D surface image to be integrated to the 3D hard tissue images will be discussed for the orthodontic/orthognathic treatment.



OP-12

Case reports of orthodontic treatments by directly 3D printed clear aligners

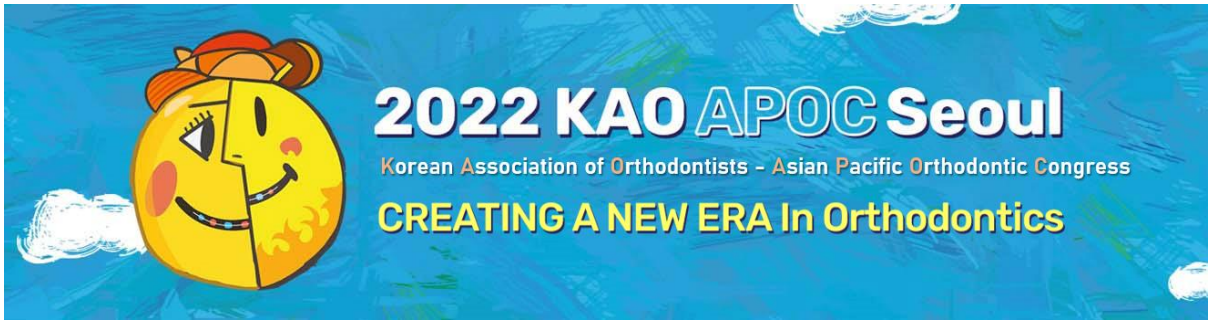
Miyoung Sim, Hiroshi Tomonari

Department of Orthodontics and Dentofacial Orthopedics, Tsurumi University School of Dental Medicinee

Introduction : Since Invisalign was first commercialized in 1999, Invisalign treatment has been positioned as an alternative to bracket and wire treatments, and it has continued to challenge various and even so-called difficult cases. The Invisalign-like clear aligners are made by 3D printing the interim models and vacuum-forming the transparent sheets. Although they have advantages compared to conventional orthodontic treatments, they also have some disadvantages such as making interim models which can precipitate environmental issues and waste time and cost, and needing a lot of attachments, and so on. Recently, as the introduction of digital systems such as oral scanners, milling machines, and 3D printers has been accelerated in the orthodontic field as well as in the dental field, attempts are being made to directly 3D print clear aligners using 3D printers in the areas of orthodontic departments. This directly 3D printed clear aligner does not need to make intermediate models, and the shape and thickness of the aligners can be adjusted depending on the shell parts by software. So, there are many advantages such as saving time, cost, and workflow, relieving environmental problems, simplifying the devices, and increasing mechanical efficiency.

Case Summary : I will report cases of 7 male and female patients from the ages of 20s to that of 50s with spacings and minor crowdings treated by clear aligners which were directly 3D printed by various types of printers.
Pre-treatment and post-treatment photographs and cephalometric and panoramic X-rays demonstrated effective, stable, and good treatment results.

Conclusion : Directly 3D printed clear aligners have successfully accomplished the orthodontic treatment of patients with malocclusions. Good and effective results were obtained by the directly 3D printed clear aligners. And they had the potential as an alternative to Invisalign-like clear aligners.



OP-13

Strategies for successful non-extraction orthodontic treatment

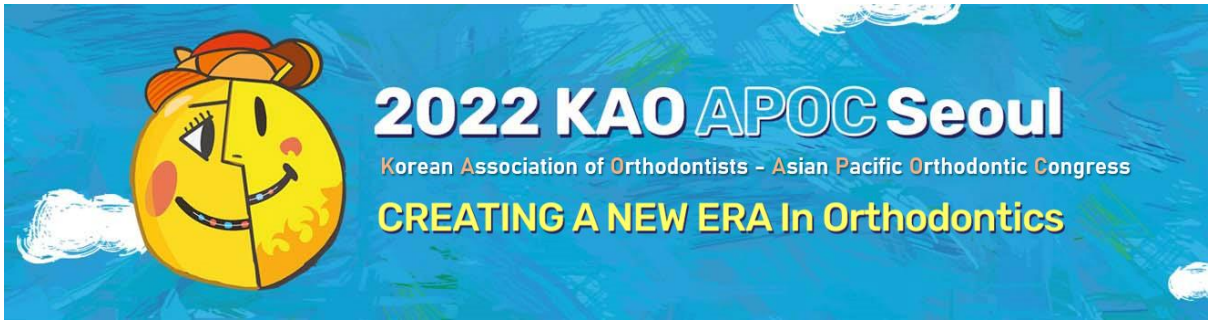
Hyung Sik Yoon

Seoul Allbarun Orthodontic Clinic

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 : Five non-extraction cases were successfully treated using combination of 4 methods (full arch retraction; FAR, arch expansion, interproximal reduction; IPR and torque bends) without flaring anterior teeth regardless of gender, age and malocclusion type. Appropriate combination of 4 methods for each case was determined and used. It is important to take a strategic approach for each dental arch by considering the patient's soft tissue, the type of malocclusion, and the inclination of upper and lower incisors in combination.

Conclusion : Our results demonstrate that combination of 4 methods is an effective strategy 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 4 methods would be suitable for each case. And we suggest that one should consider availability of these methods from the first step in orthodontic treatment in making diagnosis, to determine extraction or nonextraction.



OP-14

Which Prescription Should We Use? Comparison Between Bracket Manufacturers & Tips for Individualized Prescription Selection

Byungju Joh

Shine Orthodontic Dental Hospital

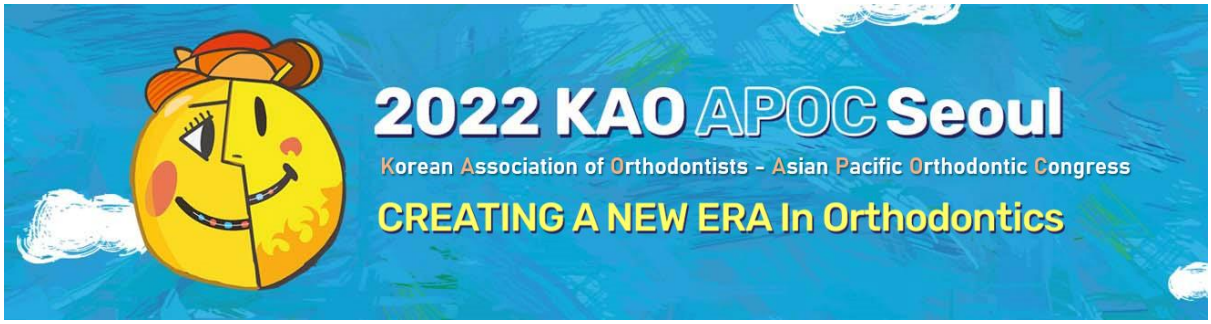
Introduction : Selection of adequate bracket prescriptions for each patient became an important factor in the convenience and outcome of orthodontic treatment. However, there are difficulties in using fully tailored prescriptions for each patient due to limitations in the manufacturer's prescription selection options and difficulties in bracket inventory management . Therefore, in this presentation I would like to explain 1. key characteristics and differences between manufacturers' prescriptions 2. Tips for choosing a prescription adequate for each individual patient 3. Tips for managing bracket inventory in clinical practice.

Discussion : In order for your treatment to go as planned, you need to know what your bracket prescription is. Surprisingly, there is a difference between manufacturers even for prescriptions with the same name (MBT or Roth, etc). For reference, a few manufacturers provide special prescriptions (low torque, etc).

Then which prescription should we use? Clinically useful individualized selection points will be discussed. Regarding upper incisors, I will introduce a simple cephalometric analysis method for selecting a prescription suitable for each patient. Canine prescriptions also require concerns for establishing canine guidance related to archforms. In molars, the prescription needs adequate selection depending on the crown morphology or presence of prothesises.

Finally I will introduce clinical inventory management for various prescriptions in our clinic.

Conclusion : By accurately recognizing the bracket prescriptions of various manufacturers, creating an efficient and appropriate system for selecting and using a prescription suitable for each patient, treatment efficiency and treatment results can be improved.



OP-15

A Novel Approach for Growth Modification in Skeletal Class II High Angle Patients

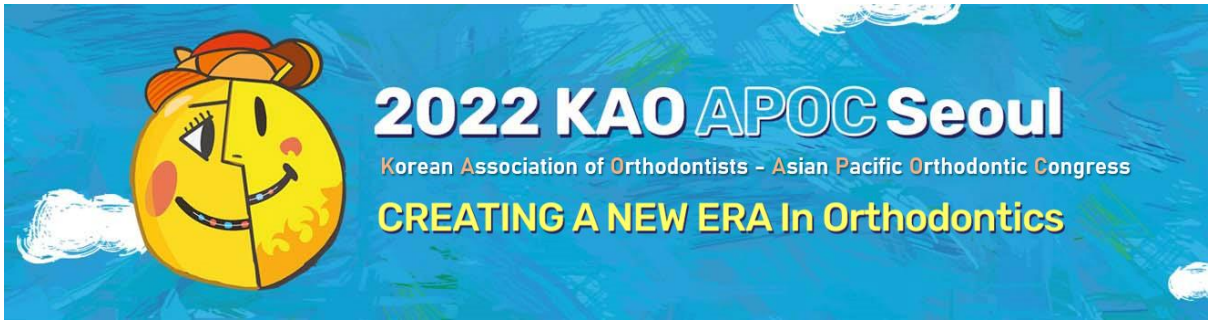
Hoon Kim

Kim Hoon Orthodontics

Introduction : Craniofacial growth is influenced by the interaction between genetically controlled cell proliferation and environmental factors that can modify the genetic program. This genetic expression can also be either upregulated or downregulated by mechanical stresses. Since these epigenetic changes can affect gene expression by turning "on" or "off" specific genes, the effect of specific environmental influences on craniofacial development can be established in the stomatognathic system.

Discussion : In treating severe sagittal and vertical skeletal discrepancies in growing patients, orthodontists only have clinical control over environmental factors such as airway and articulation. Various mechanotherapies for growing skeletal Class II high angle patients have been discussed for several decades. Among them, high-pull headgear has been widely utilized by clinicians to inhibit the eruption of posterior maxillary dentition. However, a recent study reported that using cervical headgear showed better control over the vertical dimension and produced more favorable changes in the growth of the mandible by normalizing the occlusal plane in high-angle skeletal Class II patients.

Conclusion : Since skeletal Class II with high angle tendency often worsens with growth, a proper intervention with the application of cervical headgear and myofunctional therapy (MFT), including the guidance of nasal breathing and lip sealing, must be incorporated in order to correct both sagittal and vertical skeletal discrepancies. This presentation will demonstrate the most up-to-date and unique mechanotherapy, which results in favorable responses in growing high-angle skeletal Class II patients addressing both sagittal and vertical skeletal discrepancies.



OP-16

The Lower Lip Profile Change During Total Distalization of the Mandibular Dentition

Hwa Sung Chae

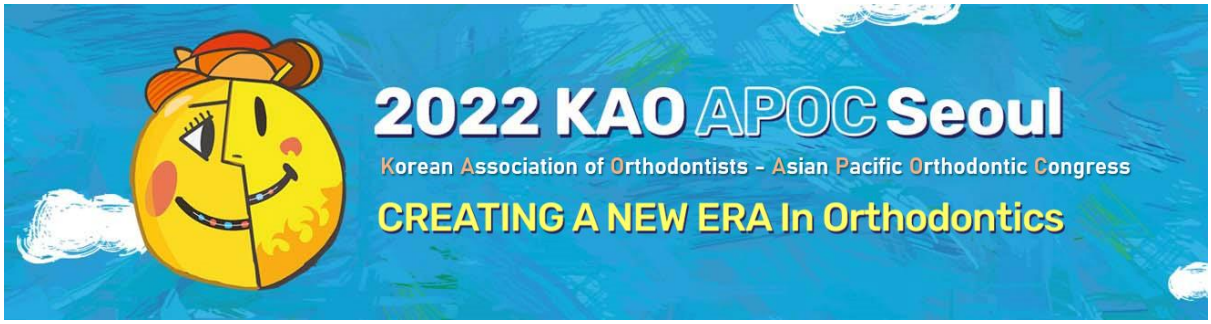
Department of Orthodontics, Institute of Oral Health Science, Ajou University School of Medicine

Objectives : This study aimed to determine the factors influencing the lower lip profile during Class III lower total arch distalization camouflage treatment.

Material and Methods : The cohort included 45 patients diagnosed with skeletal Class III malocclusion. These patients underwent camouflage orthodontic treatment with lower arch total distalization. Lateral cephalograms were taken at the pretreatment and posttreatment stages. Cephalometric measurements were analyzed to unravel the influencing factors of the lower lip profile. This study defined new variables, i.e., CK and CKA, for detailed soft tissue analysis.

Results : Novel soft tissue measurements presented in this study showed statistically significant changes after treatment. The CK angle and L1 to A Pog, L1 to NB, and IMPA were statistically correlated. Simple regression analysis was conducted between variables. The formula was ΔCKA = 0.79(Δ L1 to NB) -1.6, and multiple regression resulted in ΔCKA = 0.5(Δ L1 to NB) – 0.42 ('LL to Eline', before treatment)

Conclusion : The present study provided evidence that the lower lip evaluations, including the novel CKA and CKHA, were significantly related to the mandibular incisal position during total distalization of the mandibular dentition. The results demonstrated that clinically significant lip retraction could be obtained. Therefore, non-extraction with distalization must be suggested as the first treatment option in mild skeletal Class III malocclusion patients.



<Symposium>

Orthopedic treatment of skeletal Class III malocclusions with bone-borne appliances

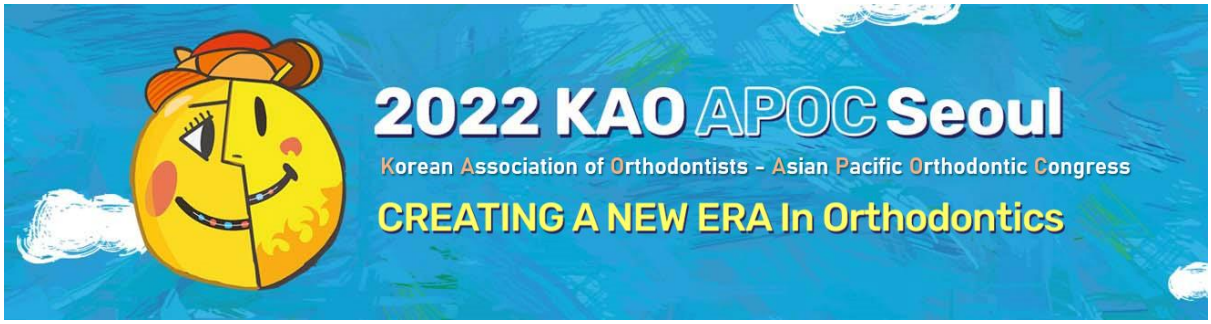
Sang-Min Lee

Class III malocclusion is one of the most difficult malocclusions to treat for the orthodontist. Although the form of malocclusion appears from an early age, only the maxilla can be protracted to a certain degree; the mandible growth cannot easily be suppressed and only the vertical direction of the growth can be slightly changed. Even such orthopedic treatments are only effective under the ages of 10, when the circummaxillary sutures can be disarticulated. The cause of the malocclusion cannot be fully understood, and resolving the few known causes (e.g., heredity, rhinitis, etc.) is often very difficult. Even after the orthopedic treatment, these unblocked causes can lead to an unfavorable growth pattern for as long as the patient's growth persists. Moreover, due to the cephalocaudal gradient law of growth, which states an increased, latter growth farther away from the head, treatment is inevitably prolonged as the mandible growth occurs until a later stage.

In the early stages of Class III malocclusion treatment, not only is it important to improve the morphology of the malocclusion, but relieving the factors causing the malocclusion is critical. If the underlying cause cannot be resolved, the overall prognosis would be very poor due to the subsequent unfavorable growth pattern no matter how effective the early treatment was.

Another important treatment goal to take into consideration along with the successful improvement of causative factors is to prolong the orthopedic effects until a later age. As previously described, it is often impossible to completely eliminate the underlying cause of the malocclusion – therefore, the treatment outcome depends on how long the orthopedic treatment can compensate for unfavorable growth. Recently developed skeletal-anchored appliances that delivers the orthopedic forces directly to the maxilla are utilized today in many forms to achieve this goal.

This presentation will discuss methods to alleviate the causative factors that can be applied in early treatment of class III malocclusion, and also address various ways to prolong the application of orthopedic forces until the later stage of growth.



When should we initiate orthodontic intervention for skeletal Class II?

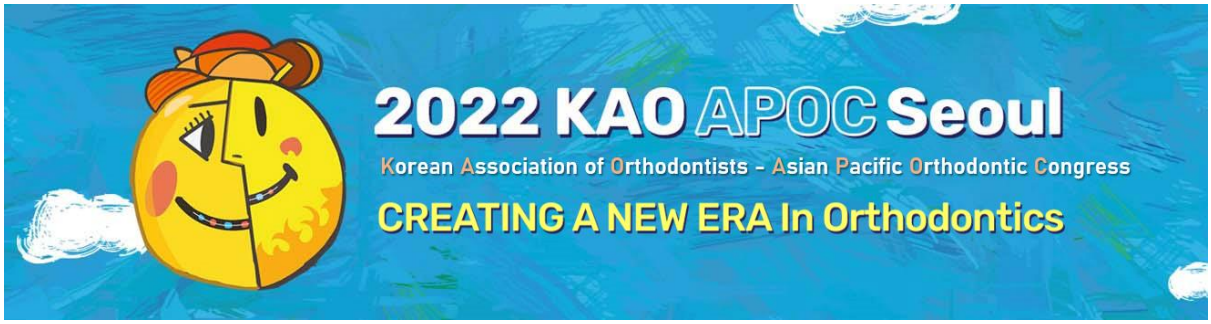
Hyo-Won Ahn

Class II orthopedics with functional appliances has been established as a primary treatment modality for growth modification since 1930s. Although, some updated evidence on the treatment effects of functional appliances has shown skeptical aspects regarding long term response and predictability of mandibular growth. The goal of functional orthopedics in the treatment of skeletal Class II is to provide normal functional environment inducing advancement of tongue, enlargement of the constricted upper airway, and favorable muscle response which would ultimately stimulate mandibular growth. It is impossible to expect mandibular growth beyond genetic potential by growth modification, however it is critical to eliminate any epigenetic factors which would exacerbate skeletal discrepancy.

Understanding the mandibular growth rate and morphologic changes is essential for determination of timing of functional orthopedics. Up to now, it is well known that the timing of successful Class II growth modification is pubertal growth spurt. Most previous studies have focused on the age of patients in preadolescent, adolescent, and post adolescent based on puberty, and there has been no studies on functional orthopedics in early childhood or infancy. In this presentation, the greater potential of mandibular growth in infants and early childhood is highlighted and it will be further discussed whether this period can be considered as a window of opportunity for early treatment.

Learning objective

- Understand the pattern of mandibular growth from birth to post-adolescent
- The possibility of Class II functional orthopedics at a younger age before puberty

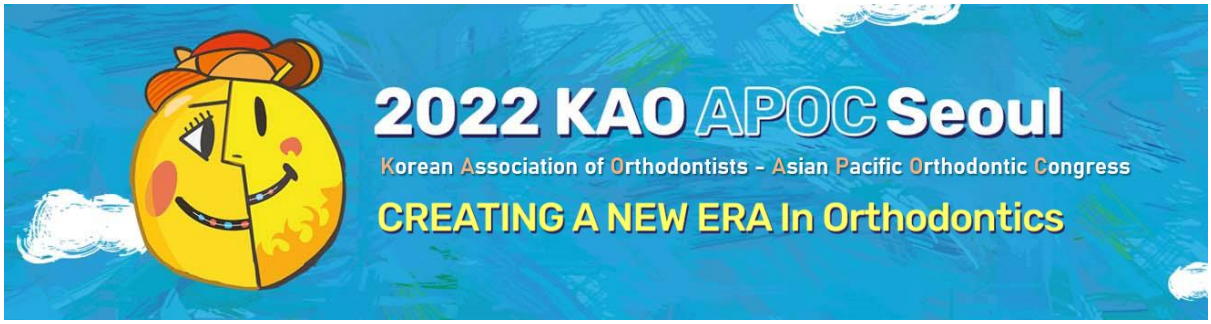


Long-term evaluation of Class II treatment in adolescents with hyperdivergent growth pattern

Do-Keun Kim

Treatment of skeletal hyperdivergent Class II malocclusion is challenging for clinicians, especially in growing patients. Although vertical and sagittal skeletal relationships of Class II subjects tend to improve with growth, prediction of facial growth is more difficult in patients with hyperdivergent skeletal patterns due to higher probability of unfavorable growth. Traditional treatment approaches include use of high-pull headgear and/or functional appliances for orthopedic effects, such as inhibition of maxillary forward-downward growth and enhancement of mandibular forward growth, along with dental effects. However, the optimal timing of treatment according to the vertical skeletal pattern remains controversial. There is limited evidence on long-term skeletal effects of conventional appliances followed by fixed orthodontic treatment with or without extractions in adolescents. Moreover, treatment effects of conventional approaches heavily depend on patients' compliance, and often require prolonged use of appliances to control vertical growth during fixed treatment and retention as well. Mini-implants, non-compliant appliances, are also a possible treatment option in growing patients by controlling vertical eruptions of molars, though only few studies have reported treatment results and long-term stability.

Therefore, the purpose of this presentation is to examine long-term effects of conventional Class II treatment in adolescents with the hyperdivergent growth pattern, and to compare post-treatment changes between patients with different treatment responses through statistical analysis of a pilot study. Furthermore, I would like to discuss the effectiveness of mini-implants by reviewing the clinical cases.

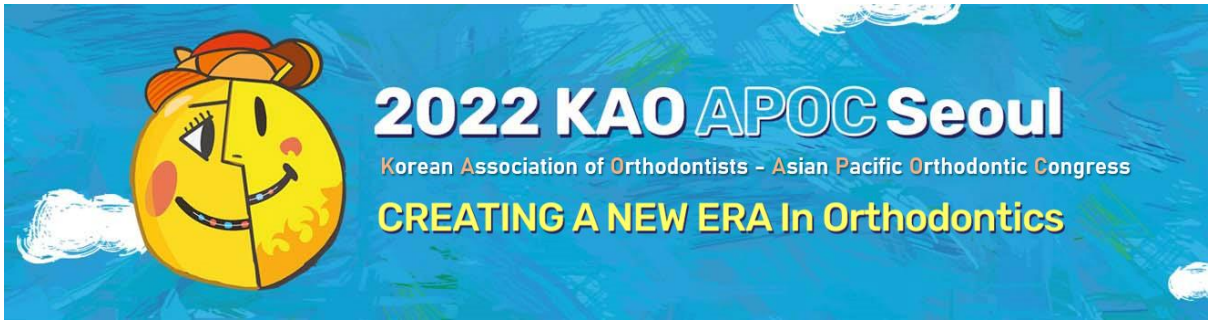


Consideration of Aging in Growing Patients

Jin-Hyoung Cho

When we meet growing children for orthodontic treatment in clinical practice, it is common to find difficult cases about sagittal or vertical or horizontal skeletal disharmony, but there are also some cases with congenital missing of multiple permanent teeth. It is not easy to induce and maintain the normal growth and development of the jaw or alveolar bone in the case of a young patient with 2 or 3 or more tooth missing. In addition, it is a well-known fact that it is very difficult to make a decision in the clinic when the residual primary teeth are extracted due to poor prognosis due to caries or severe inflammation, or when ankyloses are occurred.

Therefore, I would like to share the diagnosis and treatment plan establishment that can achieve functional and esthetics in consideration of the future adult and middle-aged growth of a growing patient who is accompanied by multiple permanent tooth missing and who has had loss of or ankyloses of the primary teeth. In fact, clinicians' approaches to multiple tooth missing often establish a treatment plan considering the crown space. However, in this lecture, the treatment plan decision taking into account the development of the alveolar and jaw bones as well as the space required for the crown when the child becomes an adult will be discussed with cases.



P-001

Correlation between maxillary canine palatal impaction and the volume of nasal cavity and maxillary sinus

Min-Hee Oh, Young-Ho Jung, Soo-Yeon Oh, Yuchen Zheng, Jin-Hyoung Cho

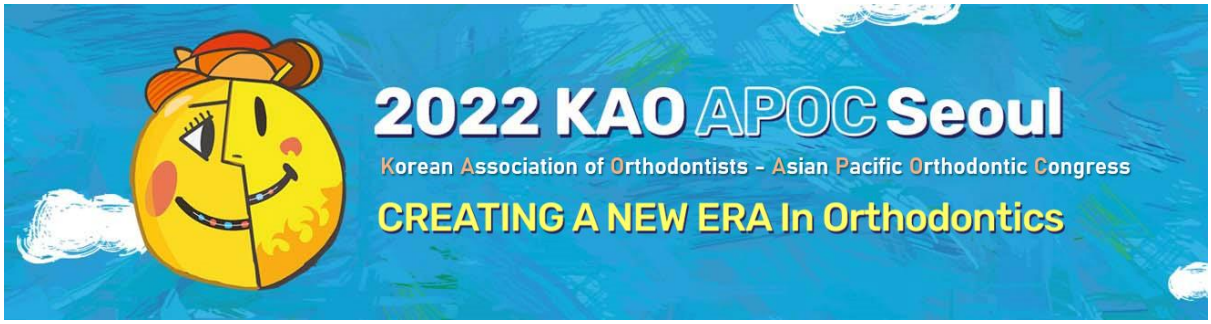
Department of Orthodontics, School of Dentistry, Chonnam National University

Objectives : This study was conducted to find out whether there is a correlation between maxillary canine palatal impaction and the volume of the nasal cavity and maxillary sinus.

Material and Methods : Among the patients who visited Chonnam National University Dental Hospital from 2011 to 2020, 1) In case of unilateral impaction, 2) In case of no local pathological factors such as dental tumor and cyst, 3) In case of palatal impaction, 4) When mucosal thickening was not observed due to upper respiratory infection, 16 patients who satisfy all four conditions were selected and the volume of nasal cavity and maxillary sinus on the impacted and non-impacted side was measured through image segmentation. In the case of the nasal cavity, the normal distribution was not followed, so the volume comparison of the nasal cavity of the impacted side and the non-impacted side was performed by a nonparametric test. The volume comparison of the maxillary sinus was performed by a paired t test.

Results : When the volume of the nasal cavity was analyzed, the value of 7307.09 (median value 6058.00) for the impacted side and 7771.05 (median value 6013.10) for the non-impacted side was found. There was no statistically significant difference between the impacted side and the non-impacted side. When the maxillary sinus volume was analyzed, it was measured at 16521.15 (median value 15783.50) for impacted side and 16672.86 (median value 16463.90) for non-impacted side. Likewise, there was no statistically significant difference.

Conclusion : There was no statistically significant difference in the volume of the nasal cavity and maxillary sinus on the impacted and non-impacted side in patients with maxillary canine palatal impaction, so the palatal impaction of the maxillary canine is not related to the volume of the nasal cavity and maxillary sinus.



P-002

Three-dimensional assessment of morphology and position of temporomandibular joint according to facial asymmetry pattern

Jinung Jang[1], Hyein Ku[2], Dongmin Yang[3], Jiwon Lee[4], Kyung-A Kim[2]

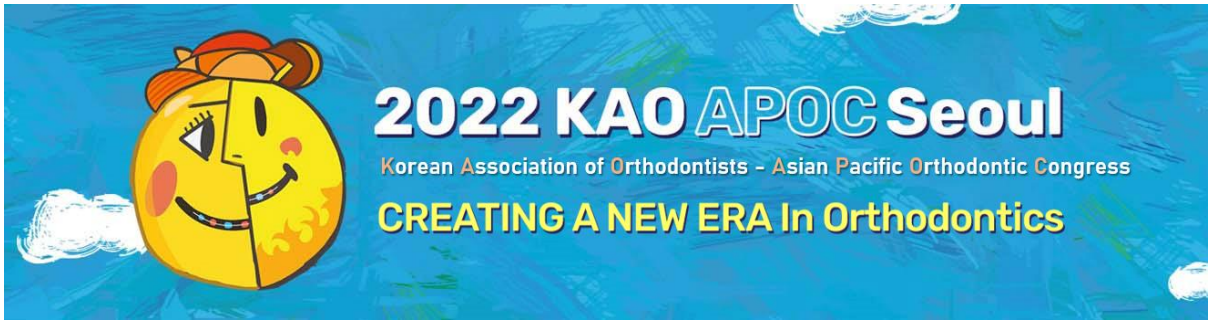
[1]Ceramic Dental Clinic [2]Kyung Hee University Dental Hospital [3]Vaant orthodontic clinic [4]Ezone orthodontic clinic

Objectives : The objectives of this presentation to investigate the differences in Temporomandibular joint (TMJ) morphology and position according to the facial asymmetry pattern.

Material and Methods : In the three-dimensional cone-beam computed tomography (3D-CBCT), a group with chin deviation of 2 mm or more was selected as the asymmetric group. Seven parameters (maxillary height, maxillary width, ramal height, vertical gonion position, frontal ramal inclination, lateral ramal inclination, and mandibular body length) were measured for craniofacial morphological evaluation. The following parameters were measured to evaluate the morphology and position of TMJ; Condylar width, condylar length, condylar height, sagittal superior joint space, anterior joint space, posterior joint space, coronal superior joint space, lateral joint space, medial joint space, axial condylar angle, vertical condylar position, transverse condylar position, AP condylar position, fossa length, fossa height.

Results : The asymmetric group was classified into 4 types of asymmetry groups according to the craniofacial pattern. Cluster-1, the horizontally different-dominant type, demonstrated a significant difference in the condylar length and height, AP condylar position, and glenoid fossa length between the deviated and non-deviated sides. Cluster-2, the vertically different-dominant type, demonstrated a significant difference in the condylar height and transverse condylar position between two sides. In cluster-3, the frontal ramal's inclination different-dominant type, there was no significant difference in the condylar width, length, and height between two sides. Cluster-4, the most severe type, demonstrated the largest difference in condylar height and anterior joint space between two sides.

Conclusion : It was meaningful to assess morphology and position of TMJ according to asymmetry pattern whereas previous studies evaluated only deviated and nondeviated sides of TMJ morphology.



P-003

3-Dimensional evaluation on mandibular retromolar space for molar distalization in Class I and Class III malocclusions

Jungeun Seol[2], Lyun Kwang Ham[1,2], Jaehyun Kim[1,2], Jiyoung Oh[1,2], Yoonji Kim[1,2], Yoon Ah Kook[1,2]

[1]Department of Orthodontics, Seoul St. Mary`s Hospital, The Catholic University of Korea
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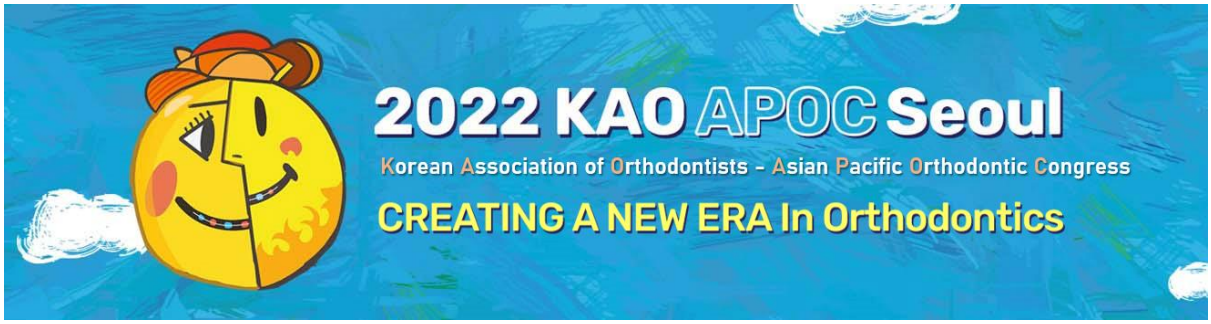
Objectives : The purpose of this study was to analyze the available retromolar space in patients with Class I and Class III molar relationship with and without third molars using linear and volumetric analysis on CBCT images.

Material and Methods : CBCT images of subjects with Class I occlusion(30 adults) and Class III malocclusion(31 adults) were selected for this study. Available retromolar space was assessed at 4 axial root levels. One-way analysis of Variance (ANOVA) was applied to compare the variables according to the Angle classification and the existence of third molars. Available retromolar space bone volume and second molar root volume were evaluated using OnDemand3DTM software. 2-way analysis of Variance (ANOVA) was applied to compare the variables according to the Angle classification and the existence of third molars.

Results : For all groups, the smallest available retromolar space was at 6 mm apical to cementoenamel junction (CEJ). Class III group showed greater space available than Class I. The space was also greater (9.73 mm; $P < 0.001$) in the group that had the third molars than those without (6.92 mm). The bone volume was significantly greater in Class III patients than in Class I, and in the existence of the third molars than in absence ($P < 0.001$).

Conclusion : Class III patients with third molars showed the largest available retromolar space (10.15mm) and bone volume (1.56mm3) compared to Class I patients and those without third molars. This suggests that the space available is equivalent to the space created from the extraction of premolars. Therefore, it is recommended for clinicians to consider the molar distalization as a viable treatment option.



P-004

The Characteristics of the Mandible in C II Div 1 and Div 2 Asymmetry Patients.

Youngtaek Gong, Sanghee Lee, Cheol-Hyun Moon

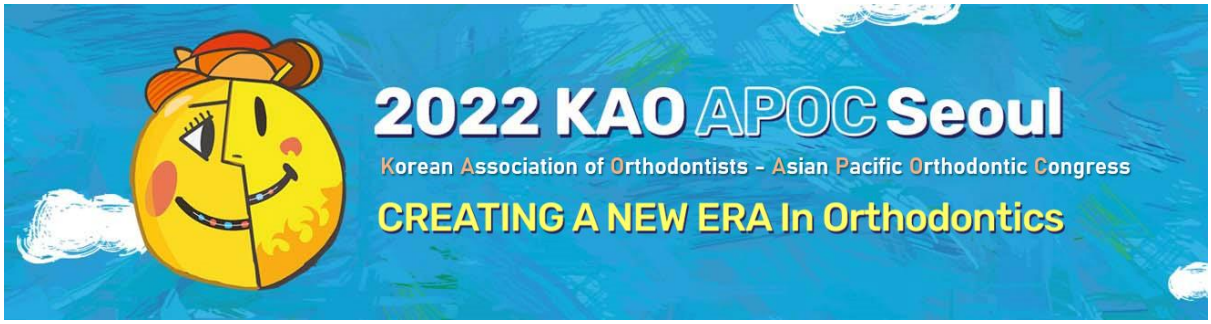
Department of Orthodontics, Gachon University Gil Dental Hospital

Objectives : The purposes of this study were to evaluate the condylar and mandibular characteristics of skeletal Class II division 1 and 2 patients with asymmetry.

Material and Methods : We included 84 patients who visited the Gil hospital from January 2010 to January 2020. The each symmetric group consisted of 20 patients. The asymmetry group consisted of 12 patients with Class II division 1 and 2. More than 4 mm of the distance from the menton to the median plane was classified as the asymmetric group. 17 items were measured and compared for evaluation.

Results : The symmetric groups showed no significant difference between the deviated side and the non-deviated sides. In the asymmetric groups, the AC, CH, MBL, RH, and FRI of the deviated side were significantly smaller than those of the non-deviated side. In the Go-MSP value, the deviated side was significantly larger value than the non-deviated side. The RH of the Class II division 1 asymmetry group's deviated side was significantly smaller than the mean value of symmetry groups. The AC on the deviated side of the Class II division 2 asymmetry group was significantly smaller than the mean value of the Class I symmetry group, And Co-MSP on the deviated side was significantly larger than the mean value of Class II division 2 symmetry group. Between the Class II division 1 and 2 asymmetry groups, the LRI and Co-MSP values of the Class II division 1 were significantly smaller than those of the Class II division 2 on the deviated side.

Conclusion : In the Class II division 1 and 2 asymmetry groups, there were differences between the deviated and non-deviated sides in mandible and condyle. In addition, the asymmetric group was different from the symmetric group. Between the Class II division 1 and 2 asymmetry groups, there were differences only on the deviated side.



P-005

Effect of Calcium Phosphate and Calcium Sulfate 3D-printed Scaffold for Cell Attachment.

Nattanan Wattanaanek[1], Assoc. Prof. Dr. Bancha Samruajbenjakun[1], Assoc. Prof. Dr. Srisurang Suttapreyasri[2]

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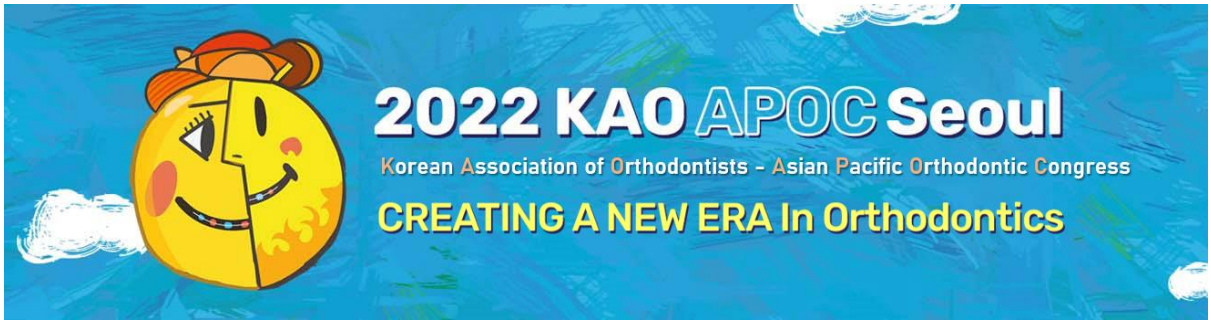
[2]Department of Oral and Maxillofacial Surgery, Faculty of Dentistry, Prince of Songkla University, Hat Yai, Songkhla, Thailand

Purpose : The osteoblast cell at the scaffold surface is fundamental to the formation of bone tissue. This study aimed to compare the number of viable cells among two groups of 3D-printed scaffolds.

Materials and methods : The experimental (CP/CS) composition was mixed using calcium phosphate, calcium sulfate, alginate, and cellulose. The control group combined only alginate and cellulose. The 3D printer was then used in both groups to fabricate the scaffold. The mouse osteoblast-like cell line MC3T3-E1 was utilized to test the initial cell attachment and viable cell number by using the scanning electron microscope (SEM) and fluorescence microscopy, respectively.

Results : The multilayer scaffold design was created by using computer aid design. The staggered filaments were crossed with 0º/90º arrangement for 10 layers. The CP/CS group showed longer pseudopodia of cells than the control group on day 1. Moreover, the numbers of viable cells were significantly higher than the control group (p-value < 0.01). On day 7, the SEM displayed widespread osteoblast cells and the fluorescence image especially showed a more significant number of cells in the CP/CS group than in the control group (p-value = 0.00).

Conclusions : The calcium phosphate and the calcium sulfate compositions affected the mouse osteoblast cells' adherence as well as the osteoblast cell number.



P-006

Effect of Sustained Delivery of VEGF from Liposomal Hydrogel on the Osteogenesis of MG-63 Cells

Milton Hongli Tsai[1], Rohaya Megat Abdul Wahab[1], Farinawati Yazid[2], Fazren Azmi[3]

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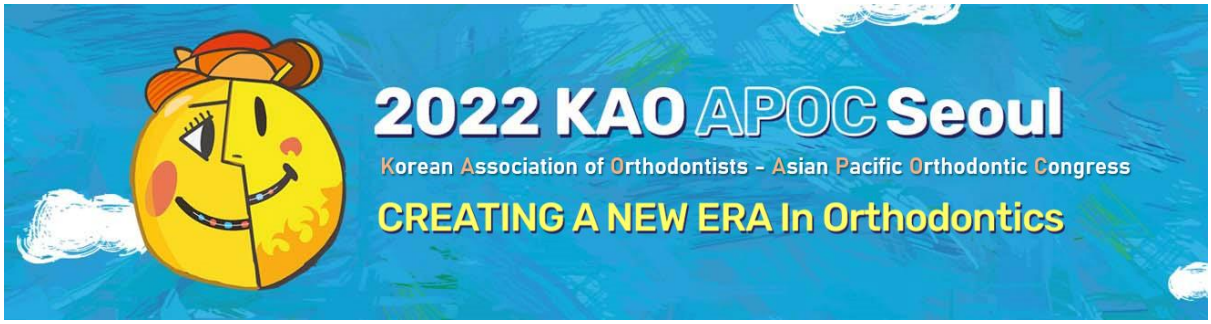
[3]Faculty of Pharmacy, National University of Malaysia.

Purpose : The purpose of this study was to formulate liposomal hydrogel as an innovative sustained delivery system for vascular endothelial growth factor (VEGF) and to investigate its effects on osteoblastic differentiation in vitro.

Materials and methods : VEFG-loaded liposomes were formulated using the thin lipid film hydration method while liposomal hydrogel was fabricated using a sol-gel method. The MG-63 cell line was used as the osteoblastic in vitro model. We first characterized the liposomal hydrogel scaffold and then examined the cell-material interaction for 21 days. The control groups were plain hydrogel without liposomes, osteogenic medium (OM) supplemented with a bolus of VEGF, and OM without VEGF.

Results : The tube inverting method verified the thermoresponsive behaviour of the liposomal hydrogel. The FESEM results showed the addition of liposomes maintained the spongy and porous microstructure of the hydrogel. VEGF protein could be released in a sustained manner from the liposomal hydrogel, as shown by the release profile over a 21-day period. MTT, ALP and Alizarin Red quantitative assays showed that the liposomal hydrogel group enhanced the proliferation, differentiation, and mineralisation of MG-63 cells over the 3 weeks of cultivation compared with the control groups ($p<0.05$).

Conclusions : Liposomal hydrogel is a promising vehicle to deliver VEGF in a sustained manner to enhance the osteogenesis of osteoblast-like cells, as demonstrated by the increase in cell attachment, proliferation, differentiation and mineralisation, suggesting the potential of this release strategy in bone tissue regeneration such as in cleft lip and palate cases.



P-007

Accuracy and Stability of Computer-Aided Customized Lingual Fixed Retainer

Seunghyun Kang[1], Jae-Sung Kwon[2], Chooryung Chung[1], Jung-Yul Cha[1], Kee-Joon Lee[1]

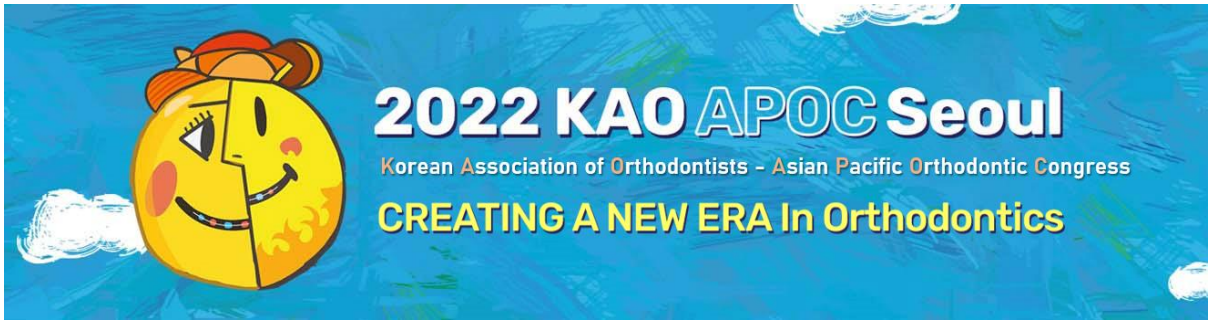
[1]Department of Orthodontics, The Institute of Craniofacial Deformity, College of Dentistry, Yonsei University
[2]Department and Research Institute of Dental Biomaterials and Bioengineering, Yonsei University College of Densitrty

Objectives : With advances in digital technology, new types of lingual fixed retainers are being developed. However, there are few studies that quantitatively evaluate the accuracy and stability of lingual fixed retainers. The aim of this study was to assess the accuracy and stability of two types of computer-aided customized lingual fixed retainers and a conventional lingual fixed retainer.

Material and Methods : A total of 10 maxillary and 10 mandibular duplicated dental models were selected, then three types of retainers were fabricated on the canine-to-canine area for each model. To evaluate accuracy, wire clearance at interproximal area (WCI) was measured using superimposition analysis. Initial flatness deformation was also measured for vertical distortion of retainers. Lateral width, anteroposterior length, and flatness deformation were measured at three time points for stability assessment. Thermocycling was used to induce 6 months of time flow.

Results : The custom-bent group showed significantly higher WCI than the custom-cut and manual groups in the maxillary arch ($P=0.002$). The custom-cut group showed significantly less flatness deformation, which was followed by the custom-bent and manual groups in both the maxillary and mandibular arch ($P<0.001$). There was no significant difference in stability between the three retainer groups during 5,100 cycles of thermocycling (corresponding to 6-month period).

Conclusion : Since there was no difference in stability between the three groups, it is recommended to use custom-cut type retainers in light of accuracy. However, accuracy and stability are not the only factors to consider when selecting type of retainers. Because each retainer has advantages and disadvantages, the type of retainers should be decided in consideration of the clinical environment.



P-008

Analysis of the surface roughness on the slots and wings of various ceramic self-ligating brackets

Ki-Ho Park[1], Youn-Soo Chung[1], Sang-Hyun Lee[2], Byung-Suh Lim[3], Young-Guk Park[1]

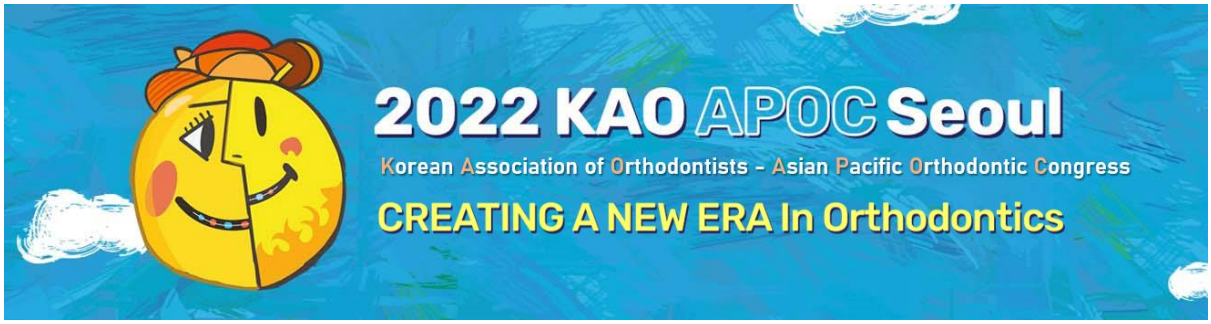
[1]Department of Orthodontics, Kyung Hee University Dental Hospital
[2]Misozain orthodontic clinic
[3]IS Dental Clinic

Objectives : The surface roughness of orthodontic appliances could affect numerous clinical factors such as bacterial aggregation, biofilm formation and friction. This study aimed to compare and analyze the chemical composition and surface roughness on the slots and wings of various ceramic self-ligating brackets using a 3-dimensional atomic force microscopy (3D AFM).

Material and Methods : The experimental groups consist of four type of ceramic self-ligating brackets (Damon clear (DC), Empower clear (EC), In-Ovation C (IC), and QuicKlear (QK)). The control group is a metal self-ligating bracket (Empower-2 (EM)). A energy-dispersive x-ray spectroscope (EDS) were used to analyze the chemical composition of each bracket slot and wing. And 3D AFM used to scan the surface roughness of each bracket slot and wing.

Results : The control group consist of ferrum and chrome, but the experimental groups were made of aluminum and oxide. There was a significant difference in the roughness average (Sa) among the self-ligating brackets. The slots in the EC group had the lowest Sa, followed by the DC, IC, EM, and QK groups. The wings in the IC group had the lowest Sa, followed by the EC, DC, EM and QK groups.

Conclusion : There is a significant difference in the surface roughness of the various ceramic self-ligating bracket slots and wings.



P-009

Changes in physical properties of clear thermoplastic orthodontic aligners after an extended period of wear

Seong Ho Han[1], Byung Chun Je[2], Ja-In Baek[2]

[1]The Catholic University of Korea, College of Medicine, St. Vincent's Hospital, Department of Dentistry, Division of Orthodontics

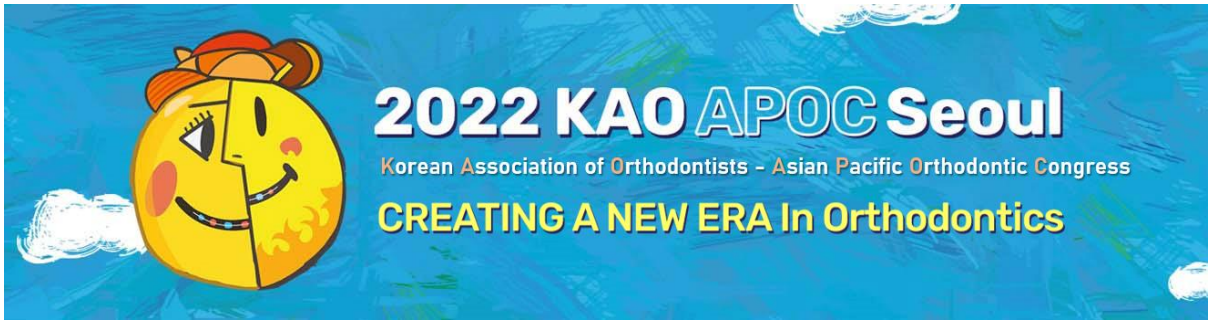
[2]The Catholic University of Korea, Graduate School of Clinical Dental Science, Department of Orthodontics

Objectives : Often clear thermoplastic orthodontic aligners (CTOA) have to be worn beyond two weeks of routine instructions for various reasons. Therefore, the purpose of this investigation was to evaluate the changes in physical properties such as thickness, flexural force and tensile force before and after four continuous weeks of CTOA wear.

Material and Methods : During maxillary canine retraction ten treatment stages of were randomly selected based on ClinCheckTM. Next, selected space closing stage (n stage) and its immediately following stage (n+1 stage) aligners as well as maxillary casts at n stage were prepared. To simulate clinical use of 4-week period, aligners at n+1 stage were placed on the casts at n stage and kept in a humidor at 37℃ for 4 weeks except for its removal and re-application 5 times each day to mimic daily food intake. For thickness, the points on canine distal occlusal angles were measured by a micrometer 3 times each and their mean values were used for statistics. For flexural and tensile force assessment, the Instron Universal Testing devices were used at 0.25mm, 0.5mm, 1.0mm and maximum displacement. Descriptive statistics, Shapiro-Wilk test, and t-tests were done and the statistical significance was set at $p < 0.5$.

Results : The mean thickness of aligners was significantly decreased by 25.8% from 0.89±0.06mm to 0.66±0.05mm after use ($p < 0.001$). The flexural forces at 0.25mm, 0.5mm, 1.0mm displacement and the maximum flexural force magnitude displayed no statistical differences between the two groups. Likewise, the tensile strength showed no significant changes after use except at 0.25mm where the force level increased from 0.86±0.28N to 1.31±0.28N ($p < 0.008$).

Conclusion : Though thickness and initial tensile strength of CTOA were significantly changed, the force delivery characteristics involving flexural and tensile strength remained mainly intact after 4 weeks of use.



P-010

Comparison of mechanical properties of vacuum-formed and 3D printed Clear orthodontic appliance: A pilot study

Hyeji Shin, Mihee Hong

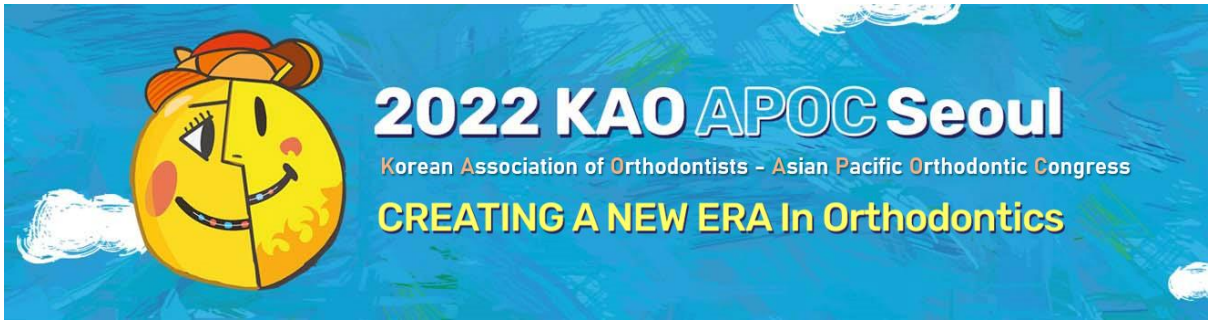
Department of Orthodontics, School of Dentistry, Kyungpook National University

Objectives : The demand for clear aligner is increasing due to easy oral hygiene care, invisible appliance and chair time-saving. Traditionally, the method of manufacturing a clear aligner has been a vacuum-formed method using thin transparent plastic sheets on plaster casts. However, traditional vacuum-formed aligners were reported to have limitations such as volume instability, low wear resistance and strength. Therefore, the material of the clear aligners and the manufacturing method have developed. The purpose of this study is by comparing the mechanical properties of the existing vacuum-formed and 3D printed clear aligner, we quantified it to examine the applicability of orthodontic treatment of 3D printed clear aligner.

Material and Methods : 1) Specimen preparation: The following thermoplastic material and direct 3D printing aligner were evaluated in this study: Zendura FLX, Duran, 3A MEDES for thermoplastic material and TC-85 DAC (Graphy, Seoul, Korea) for direct 3D printing aligner. 2) Three-point bending test: Five rectangular specimens(9mm x 40mm) were subjected to Three-point bending test using a universal testing machine. Record the load value (F1) and calculate the bending coefficient according to the formula.
E(MPa) (bending modulus, flexural modulus) = $F_1 l^3 / 4bh^3 d$

Results : Overall, vacuum-formed sheets (ZenduraFLX, Duran, 3A MEDES) were higher than 3D printed sheet (TC-85DAC) in Flexural strength and Bending modulus. Especially, Duran has the most highest value of any other materials.

Conclusion : When comparing the meaterial for 3D printing (TC-85 DAC) and the meaterials for vacuum-formed use (Zendura FLX, Duran, 3A MEDES), the flexural strength was higher in the thermoformed meaterial except for Zendura FLX, and the flexural modulus was all higher in the thermoformed meaterial. This indicates that the thermoformed meaterials are more efficient in moving the teeth. Therefore, it seems that there is still a limit to the clinical application of 3D print meaterial.



P-011

Evaluation of long-term stability of orthodontic microimplant based on torque values

Hojin Kim, Jae sung Lim, Hyosang Park

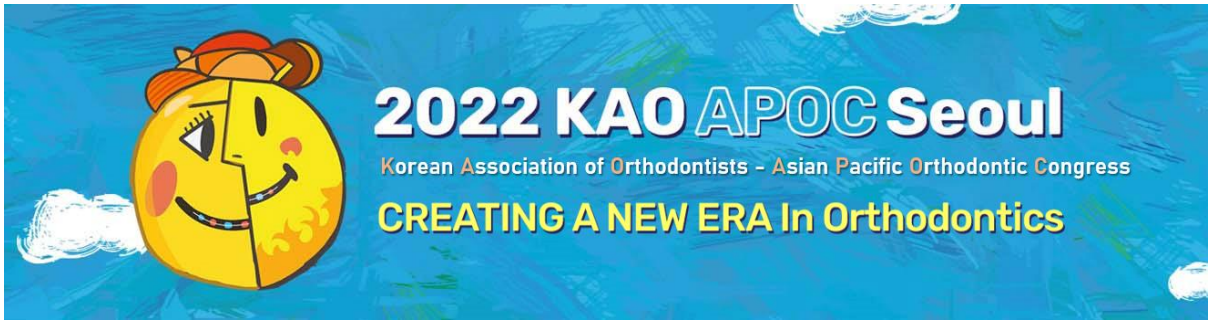
Department of Orthodontics, School of Dentistry, Kyungpook National University

Objectives : In this study, the factors affecting stability for a long period of time are evaluated using the implantation/removal torque value of microimplants, and the correlation between the removal torque value and clinical factors are investigated.

Material and Methods : The measured torque values according to the diameter/length, implantation method, and duration of 703 microimplants planted in 354 orthodontic patients were compared and evaluated. Pearson correlation analysis and stepwise multiple regression analysis were performed to investigate the correlation between factors related to removal torque.

Results : The removal torque value of the mandible was significantly larger than that of the maxillary bone, and the removal torque value of the mouth/post tooth was also significantly larger than that of the preposition part. There was no significant difference according to gender. Regardless of the implantation torque value, the removal torque value was relatively constant at about 4Ncm. In the bead drilling and drilling groups, the length and diameter of the microimplant showed a significant correlation with the removal torque value, respectively. In addition, the removal torque value of the bead drilling group showed a significant correlation with the duration of the microimplant

Conclusion : The removal torque value of the microimplant was associated with the planted position, age, implantation method, diameter and length of the microimplant, and the duration. The removal torque values of microimplants in the posterior teeth or retromolar areas were significantly higher than those of in the anterior teeth area. The older groups showed significantly higher removal torque values than the teenager group in the mandible. Both long and wide microimplants had significantly high removal torque values, except for the wide ones in the maxilla. The length and diameter of microimplants were correlated with removal torque in the selfdrilling and pre-drilling groups, respectively.



P-012

Micro-computed tomographic evaluation of the effect of fluoride agents on white spot lesions

Soo-Young Lee[1], Sook-Chan Hong[2], Dong-Yul Lee[1], Yae-Jin Kim[1]

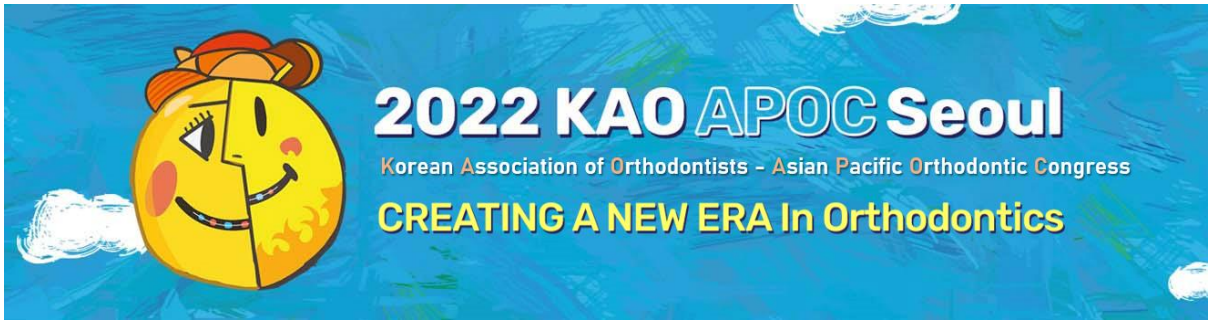
[1]Department of Orthodontics, Korea University Guro Hospital
[2]Department of Orthodontics, Graduate School of Clinical Dentistry, Korea University

Objectives : To investigate remineralizing effect of three fluoride regimens on artificially demineralized enamel around orthodontic bracket by analyzing mineral density (MD) acquired from micro-computed tomography (micro-CT).

Material and Methods : Forty-eight bracket bonded bovine incisors were prepared to create demineralized enamel (DE) surface. The samples were divided into four groups according to the fluoride regimen: 1) no fluoridation, 2) 1.23% acidulated phosphate fluoride (APF) gel, 3) fluoridated toothpaste, and 4) 0.05% sodium fluoride mouthwash. Micro-CT was scanned after demineralization (T0), and 2 weeks (T1) and 4 weeks (T2) of fluoridation.

Results : All treatment groups showed a higher remineralization effect during the T1–T0 interval than that during the T2–T1 interval. Acidulated phosphate fluoride gel showed highest remineralization of DE during T1–T0 interval among the groups ($p < 0.05$); followed by toothpaste, mouthwash and no fluoridation. Acidulated phosphate fluoride gel and toothpaste demonstrated significant increase in MD after 4 weeks of application ($p < 0.05$). Despite daily application, the NaF solution group showed the lowest remineralization effect among the treatment groups.
Moreover, the overall change in the MD of the toothpaste group was higher but to an insignificant degree compared to NaF solution. The use of high concentration fluoride is not recommended as it arrests remineralization and demineralization, leading to unwanted staining. However, very low concentrations of fluoride (< 50 ppm) were also shown to be ineffective for treating WSLs.12 Nonetheless, the daily use of 0.05% NaF in combination with fluoride toothpaste increased remineralization effect compared to toothpaste alone.

Conclusion : Remineralization effects of three fluoride regimens were depicted through micro-computed tomography analysis, of which acidulated phosphate fluoride gel was most effective.



P-013

Anti-aging and Antifouling Properties of Poly(2- methoxyethyl acrylate)-based Denture Base Resin

Jie Jin[1], Jae-Sung Kwon[2], Jung-Yul Cha[1], Kee-Joon Lee[1], Hyung-Seog Yu[1], Sung-Hwan Choi[1]

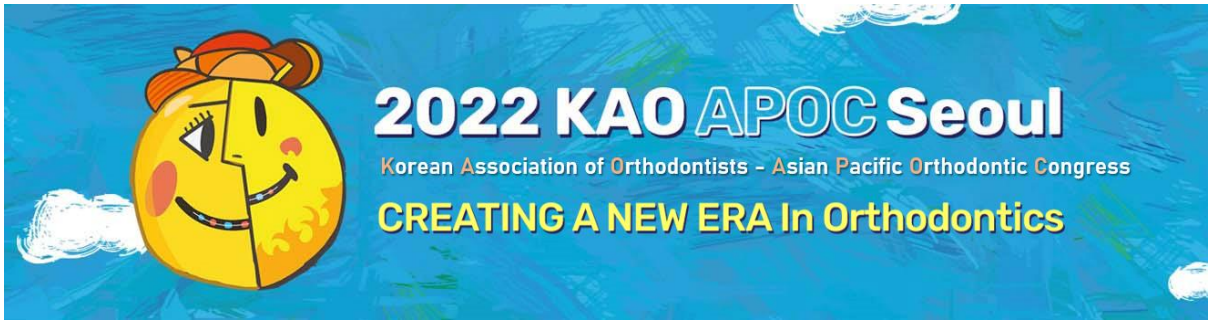
[1]Department of Orthodontics, The Institute of Craniofacial Deformity, College of Dentistry, Yonsei University
[2]Department and Research Institute of Dental Biomaterials and Bioengineering, Yonsei University College of Dentistry

Objectives : Poly(methyl methacrylate) (PMMA)-based denture base resins easily develop oral bacterial and fungal biofilms, which may constitute a significant health risk. Conventional bacterial-resistant additives and coatings often cause undesirable changes in the resin. Reduced bacterial resistance over time in the harsh oral environment is a major challenge in resin development. Poly(2-methoxyethyl acrylate) (PMEA) has anti-fouling properties; however, due to the oily/rubbery state of this polymer, and its surface aggregation tendency in a resin mixture, its direct use as a resin additive is limited. This study aimed to optimize the use of PMEA in dental resins.

Material and Methods : The PMEA samples with 2,200 g/mol, 19,000 g/mol, 164,000 g/mol and 400,000 g/mol molecular weight (MW) were synthesized and denoted as PMEA-1, PMEA-2, PMEA-3, and PMEA-4, respectively. Acrylic resins containing a series of PMEA polymers at different concentrations were prepared, and the mechanical properties, surface gloss, direct transmittance, and cytotoxicity were evaluated, along with the distribution of PMEA in the resin.

Results : Resins with PMEA-1 at low concentrations satisfied the clinical requirements for denture resins, and the PMEA was homogeneously distributed. The anti-fouling performance of the resin was evaluated for protein adsorption, bacterial and fungal attachment, and saliva-derived biofilm formation. The PMEA-1 resin most effectively inhibited biofilm formation (~50% reduction in biofilm mass and thickness compared to those of the control). Post-aged resins maintained their mechanical properties and anti-fouling activity, and polished surfaces had the same anti-biofilm behavior.

Conclusion : Based on wettability and tribological results, the low-MW PMEA additive creates a non-stick surface to inhibit biofilm formation. This study demonstrated that low-MW PMEA additives can provide a stable and biocompatible anti-fouling surface, without sacrificing the mechanical properties and aesthetics of denture resins.



P-014

Perceptual and quantitative analysis of discoloration of orthodontic elastomeric chains by food

Hyun-Joo Chung, Seok-Ki Jung, Yae-Jin Kim

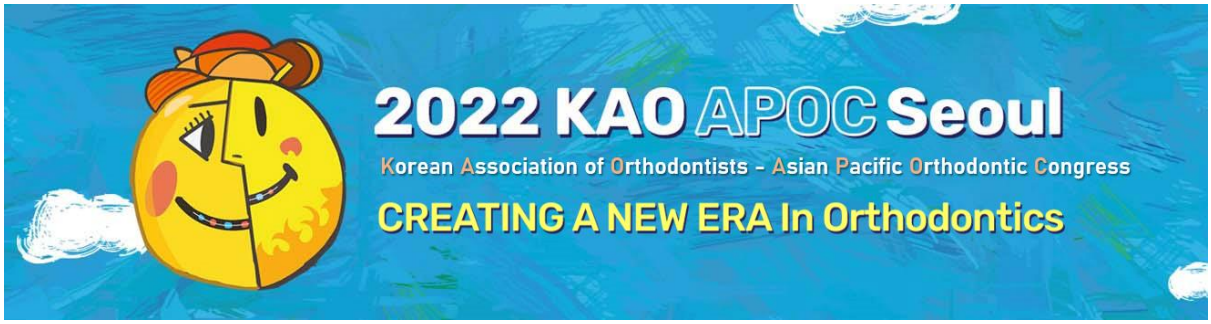
Department of Orthodontics, Korea University Guro Hospital

Objectives : Purpose of this study is to measure the color changes in orthodontic elastomeric modules after exposure to high-pigment food and beverages (curry, coffee and wine) in-vitro over a 4-week period, and to correlate the measurements with the actual visual assessments, identifying a visual threshold for perceptibility and acceptability in color changes of the elastomeric modules.

Material and Methods : Nine typodont models were divided into three different experimental groups. All models were immersed into the prepared solutions three times a day. Digital images of the samples were acquired and color analysis was done by using an imaging software. An online survey tool was used for collecting visual scoring data and its correlation to measured color changes were investigated in order to determine thresholds for perceptibility and acceptability.

Results : Discoloration tended to increase over immersion period. And color changes showed statistically significant variance among immersion solutions; curry > coffee > wine at all times. Statistical significance was found between measured color difference and visual assessment scores. According to scoring data plotted as a function of color change, observers showed varied tolerance for perceptibility and acceptability toward different types of dietary media (curry - 6.34 ΔE, 6.34 ΔE, coffee - 4.52 ΔE, 4.46 ΔE, wine solution - 4.65 ΔE, 9.98 ΔE).

Conclusion : Within the limitations of this study, the following conclusions were made;
1. Discoloration of elastomeric modules varies according to immersion solutions (curry > coffee > wine) and immersion periods (increase with time). And discoloration is mainly accounted for mechanical staining than chemical aging.
2. Statistical significance was found between measured color measurements and visual assessment by observers. Observers showed varied tolerance for perceptibility and acceptability toward different types of dietary media.
3. Visual thresholds for perceptibility and acceptability can be used as a reference to examine esthetic demands of patients in advance.



P-015

The effect of anterior intrusion between standard and straight leg reverse curve of spee archwire

Rr. Paramita Noviasari, Cendrawasih Andusyana .F

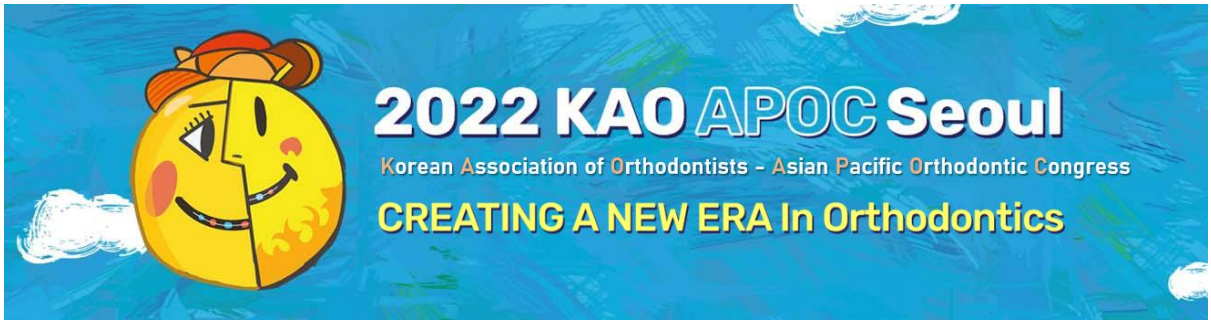
Department of Orthodontic, Faculty Of Dentistry, Universitas Gadjah Mada, Yogyakarta 55281 Indonesia

Purpose : The purpose of this study was to determine the difference between the anterior intrusion effect between the Standard R.C.S. Archwires and Straight Leg R.C.S. Archwires to the Curves of Spee, overjet, overbite, and molar angulation. Orthodontic treatment for deep overbite can use the Reverse Curve of Spee archwire (R.C.S). There are two types of Reverse Curve of Spee archwire (R.C.S), standard and straight legs. Standard R.C.S. Archwires: most popular rocking chair curve with a moderate radius, Straight Leg R.C.S. Archwires: the anterior portion of the wire has a rocking horse curve, and the legs of the wire are flat and level.

Materials and methods : Twelve Typodonts were divided into two groups. Typodont group I use Standard R.C.S. Archwires 0.016x0.022inch NiTi and typodont group II uses Straight Leg R.C.S. Archwires 0.016x0.022inch NiTi. Typodont's teeth were arranged in a class I angle malocclusion with an overjet and overbite of 6 mm. Typodont I and II have immersed in temperature 50 degrees Celcius water bath for 10 minutes and deactivated for 15 minutes in the temperature room. The curve of Spee, overjet, overbite dan molar angulation was measured after deactivation was done. The results were processed statistically with MANOVA.

Results : The results showed there were significant differences in the Curve of Spee, overjet, overbite, and molar angulation among standard and straight leg R.C.S archwire. Standard R.C.S archwire further reduces the Curve of Spee, overjet, and overbite, but enlarges upper and lower molar angulation.

Conclusions : The Differences in both archwires can produce the different effects of anterior teeth intrusion



P-016

MAXIMUM BITE FORCE IN VIETNAMESE HEALTHY ADULTS USING BITE FORCE METER

Thao Tran, Trang Ho, Thu Nguyen, Anh Nguyen

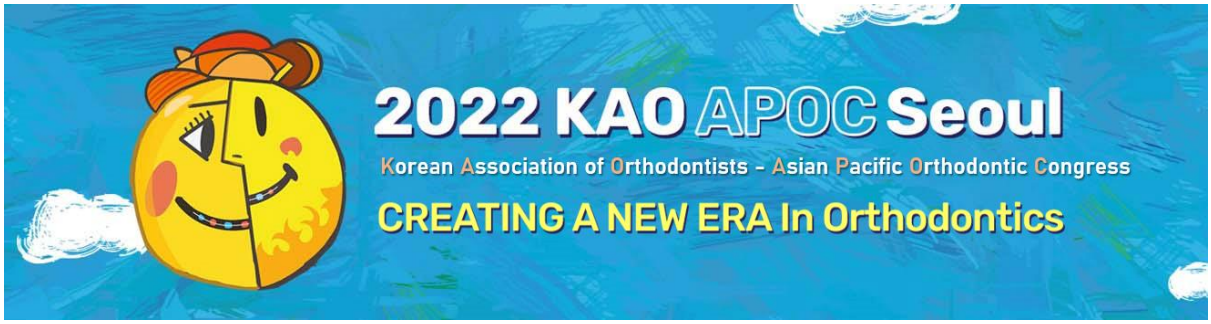
University of Medicine and Pharmacy at Ho Chi Minh City

Purpose : Maximum bite force is an important parameter to evaluate the functional status of the masticatory system and the effectiveness of dental restorations. This work determined maximum bite force in Vietnamese healthy young adults using a novel, affordable and accurate bite force meter (BFM).

Materials and methods : Cross-sectional descriptive study, 36 volunteers (18 males and 18 females) aged between 21 and 30 years were chosen as they have a healthy natural dentition with Class I molar relationship. Using the BFM which was designed and fabricated by the Faculty of Odonto-Stomatology at HCMC University of Medicine and Pharmacy in 2019 to record maximum bite force at the first molar, premolar, and incisor. The subjects are instructed to clench the BFM thrice in each position. The maximum individual bite force for a subject is the highest peak force recorded among the three repeated bites performed at that position.

Results : The mean values of maximum bite forces at first molar, premolar and incisor region are 624.64N±55.91N; 499.08N±97.02N and 161.04N±54.17N, respectively. The maximum bite force on the left side is higher than the right side and is greater in men than in women; however, the differences are statistically non-significant.

Conclusions : The maximum bite force in adults is a useful database to help evaluating the functional status of the masticatory system, as well as the effectiveness of prosthetic and surgical treatments.



P-017

Biological and chemical degradation of orthodontic wires and brackets : the effect on sliding mechanics

Hun-Kyung Park, Do-Gil Kim, Min-Hee Oh, Jin-Hyoung Cho

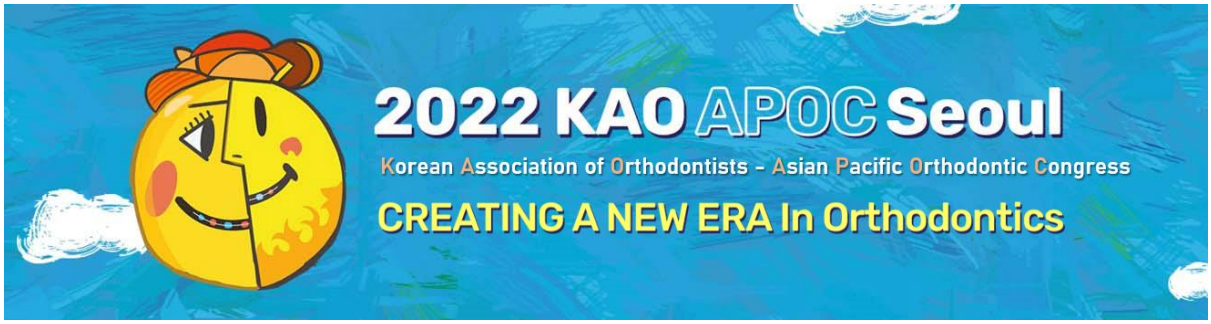
Department of Orthodontics, School of Dentistry, Chonnam National University

Objectives : The purpose of this study is to evaluate how biological or chemical degradation affects the surface roughness and ion releasing of brackets and archwires and to compare and assess frictional resistance changes on sliding mechanics.

Material and Methods : 019 x 025 stainless steel (S-S) wires, S-S standard edgewise 022 inch slot brackets were used. Distilled water, Streptococcus mutans solution and 1% citric acid liquid were used for biological and chemical degradation solutions respectively. After 28 days of immersion, surface roughness was measured using 3D - Optic Profiler. Ion release and acidity changes were measured using an Inductively Coupled Plasma Optical Emission Spectroscopy (ICP-OES) and pH meter. Static and kinetic resistances of each bracket and wire assembly was measured to assess frictional changes using a universal testing machine.

Results : S. mutans and citric acid can cause biological and chemical degradation increasing the surface roughness and ion release of brackets and archwires. Biological and chemical degradation has an effect on static and kinetic resistance increasing frictional values on sliding mechanics.

Conclusion : The results of this study indicated that both S. mutans and citric acid might cause degradation of orthodontic devices. It means that clinicians should take this into consideration to move teeth using sliding mechanics during orthodontic treatment.



P-018

Strategic Intrusion for Periodontally Compromised Patients

Seunghyun Kang[1], Hai-Van Giap[1], Ji Yoon Jeon[1], Kee Deog Kim[2], Kee-Joon Lee[1]

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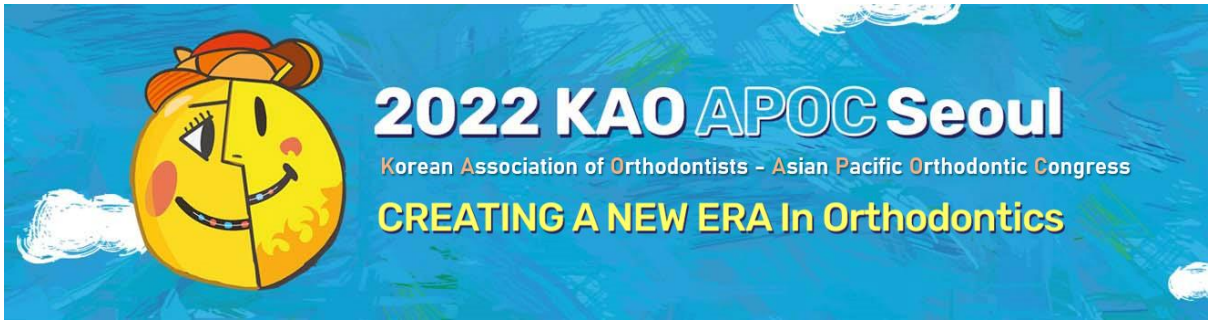
Introduction : Pathologic tooth migration (PTM) is often seen in periodontally compromised patients and a variety of factors including periodontal inflammation, occlusal factors, soft tissue pressures, oral habits can affect the occurrence of PTM. In this situation, indiscriminate using of continuous leveling archwire can develop trauma from occlusion (TFO), accelerate periodontal destruction, and worsen the situation eventually in a vicious circle. Considering that extrusive force is unfavorable for resolution of PTM, It would be helpful to use intrusive mechanics to minimize TFO. With the miniscrews and finite element analysis of center of resistance, intrusive movement of specific segment has become more predictable.

Case Summary : We report two cases with severe dental crowding patients related to PTM. In these cases, periodontal treatment was performed prior to orthodontic treatment to control active periodontal disease. Preliminary extraction or distalization of posterior segment was performed. Subsequently, anterior segmental intrusion was conducted using miniscrews inserted between canine and first premolar or first premolar and second premolar based on the estimated center of resistance of anterior segment. After the treatment, dental esthetics was achieved and there was no significant sign of exacerbation of periodontal status based on radiographic analysis.

Conclusion : Orthodontic treatment of periodontally compromised patients with PTM is challenging because of possible iatrogenic TFO and subsequent periodontal destruction. Biological and biomechanical considerations should be preceded for strategic tooth movement and using the intrusive mechanics would be beneficial to avoid TFO.



P-019

Evaluation of occlusal and mandibular plane after maxillary distalization with buccal or palatal skeletal anchorage

Hai-Ji Park[1], Jung-Jin Park[1], Jong-Won Kang[2], Young-Suck Kim[3], Ji-Young Kim[4], Yoon-Goo Kang[1]

[1]Department of Orthodontics, Kyung Hee University Dental Hospital at Gang-Dong
[2]Barune Dental Clinic, Chunchen-si, Gangwon-do
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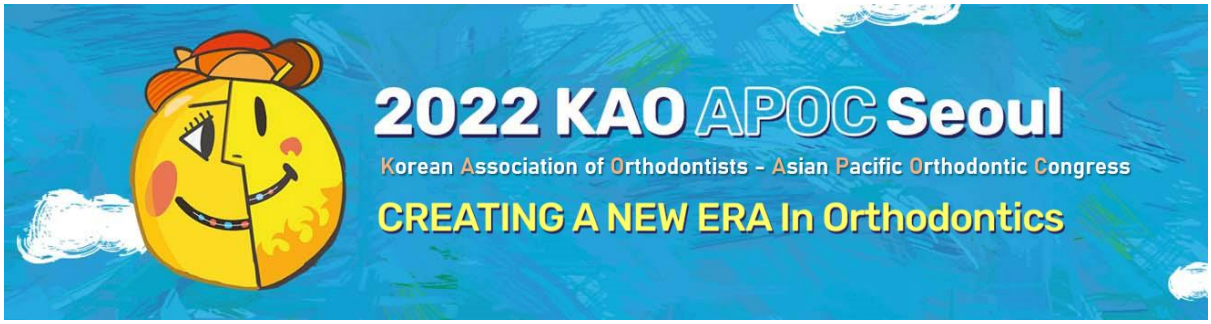
Objectives : To evaluate the changes in sagittal and vertical position of maxillary dentition and occlusal plane after maxillary distalization with buccal or palatal skeletal anchorage.

Material and Methods : The sample consisted of 102 lateral cephalograms of 51 Class II patients (mean 22.2 years old; 37 women and 14 men) treated by total maxillary arch distalization using skeletal anchorage. The patients were divided into three groups; maxillary total distalization with buccal skeletal anchorage is Group 1, palatal skeletal anchorage and lingual arch is Group 2, palatal skeletal anchorage with pendulum type wire is Group 3. Lateral cephalograms were taken using a DENTRI (HDXWILL., Seoul, Korea) with a centric occlusion in the natural head position before (T1) and after (T2) treatment. Cephalometric tracing was digitized using the V-ceph program (Osstem Inc., Seoul, Korea).

Results : Comparing before and after treatment, all three groups showed significant maxillary molar distalization ($p < 0.01$). Maxillary molar to Palatal plane showed insignificant vertical change. Frankfort horizontal plane (FH) to anatomical occlusal plane angle steepened by 1.96±2.88° ($p < 0.05$) in the Group 2 and by 2.51±2.57° ($p < 0.01$) in the Group 3. There were no significant differences in FH to mandibular plane angle in all three groups.

Conclusion : The change of occlusal plane during the treatment varies depending on the position of skeletal anchorage and distalization appliances. Therefore, clinicians need to consider the occlusal plane of patients before maxillary total distalization.



P-020

Comparison of torque expression of metal brackets manufactured through metal injection molding(MIM) and computerized numerical control(CNC)

Jae Sung Park, Kyung Hwa Kang

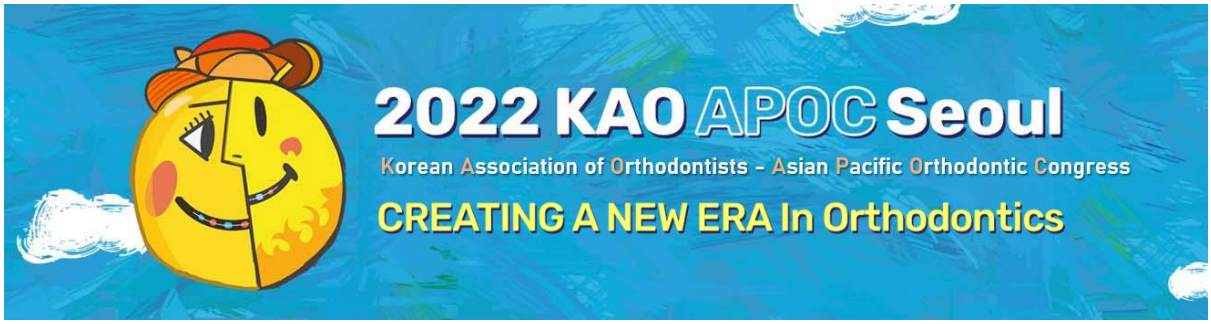
Department of Orthodontics, College of Dentistry, Wonkwang University

Objectives : The purpose of this article is to investigate and evaluate the deviation angle and the twist angle expressing the torque of 10 Nmm and 20 Nmm of metal injection molding(MIM) brackets and computerized numerical control(CNC) brackets with respect to stainless steel(SS) and titanium-molybdenum alloy(TMA) archwires.

Material and Methods : Four MIM bracket series with 0.022-inch slot were selected as follows: Di MIM mini Twin(Ortho Organizers, USA), Mini Diamond Roth(Ormco, USA), Gemini MBT(3M Unitek, USA), Formula R Roth(Tomy, Japan).- v - Four CNC bracket series with 0.022-inch slot were selected as follows: Econoline MBT(Adenta, Germany), Legend mini MBT (GC orthodontics,Japan), Crown mini MBT(Adenta, Germany), Evolve MBT(DB orthodontics,UK). Torque expressions were measured with the measuring instrument that had been customized specifically by the firm of device(UKEI, Incheon, Korea) in order to meet the requirement for this study. SS wires(Orthotechnology, SC, USA) and TMA wires(G& H Orthodontics, IN, USA) have the dimensions of 0.019×0.025-inch and 0.021×0.025-inch. SS wire(3M Unitek, USA) for steel ligation has the dimension of 0.008-inch.

Results : Deviation angle with respect to all wires was significantly highest in DiMIM, Econoline bracket and lowest in Evolve bracket($p<0.001$). Twist angle expressing the torques of 10 Nmm with respect to all wires was significantly highest in Di MIM, Econoline bracket and lowest in Evolve bracket. Twist angle expressing the torques of 20 Nmm with respect to all wires significantly highest in Di MIM bracket and lowest in Evolve bracket($p<0.001$).

Conclusion : This study found that deviation angle and twist angle expressing the torque of 10 Nmm and 20 Nmm depended on slot dimension of bracket rather than manufacturing methods of bracket. Twist angle expressing the torque of 10 Nmm and 20 Nmm was lower in SS wire than in TMA wire because torsional stiffness of SS wire is higher than that of TMA wire($p<0.001$)



P-021

Biomechanical analysis of the maxillary molar intrusion: A finite element study

Hye-Jeong Lee, Na-Young Chang, Jong-Moon Chae

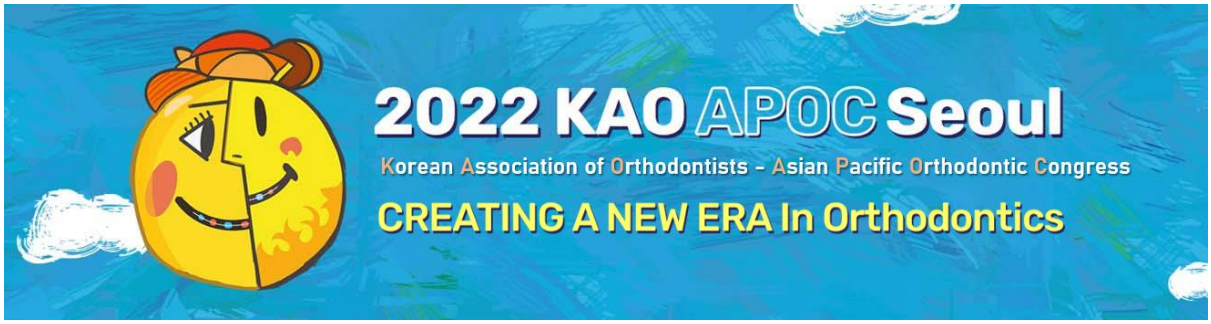
Department of Orthodontics, Wonkwang University Daejeon Dental Hospital

Objectives : The purpose of this study was to analyze and clarify tooth movement when intruding the maxillary molars using intrusive forces between the maxillary first and second molars.

Material and Methods : A finite element method was used to simulate the long-term orthodontic movement of the maxillary dentition by accumulating the initial displacement of teeth produced by elastic deformation of the periodontal ligament. Intrusive forces of 2N were applied buccally to the archwire between the maxillary first and second molars. Two different sized transpalatal arches (TPAs) (0.036-in and 0.06-in) and a gradually increased constriction bend and torque toward the posterior teeth were applied to prevent buccal tipping of the posterior teeth when intruding the maxillary posterior teeth.

Results : The whole maxillary dentition rotated clockwise as the intrusive force passed posteriorly to the center of resistance. Buccal crown tipping of the maxillary posterior teeth and lingual tipping of the maxillary incisors occurred. Their tipping decreased with a constriction bend and lingual crown torque and when a TPA was applied. Mesial crown tipping of the second molars occured in all groups.

Conclusion : Supplemental procedures such as a constriction bend and lingual crown torque and a TPA could effectively prevent the buccal crown tipping of the maxillary posterior teeth when intruding on them.



P-022

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

Ye-Hyun Lee, Jong-Moon Chae, Na-Young Chang

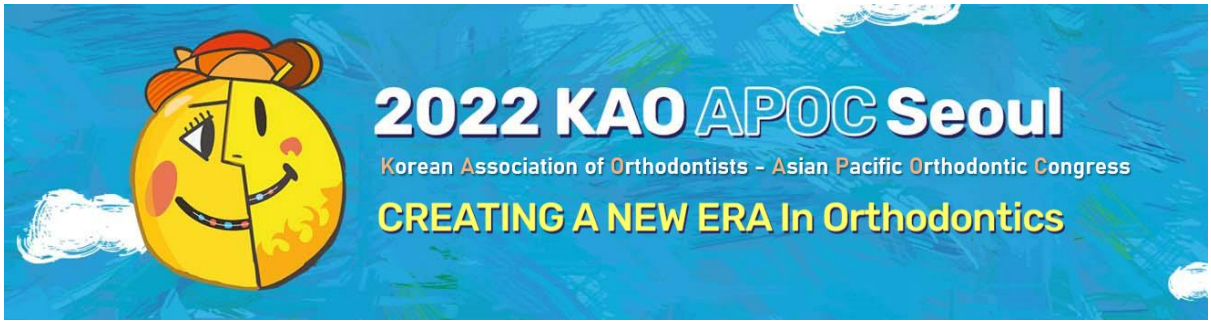
Department of Orthodontics, Wonkwang University Daejeon Dental Hospital

Objectives : This study aimed to identify the tooth movement patterns relative to various force angulations(FAs) when distalizing the total maxillary dentition.

Material and Methods : Long-term orthodontic movement of the maxillary dentition was simulated by accumulating the initial displacement of teeth produced by elastic deflection of the periodontal ligament using a finite element analysis. Distalization forces of 3 N were applied to the archwire between the maxillary canine and first premolar at 5 different FAs (-30˚, -15˚, 0˚ 15˚, and 30˚) to the occlusal plane.

Results : Maxillary incisors and molars showed lingual and distal tipping at all FAs, respectively. At a force
angulation of 30˚, almost bodily distalization of the total maxillary dentition occurred, but incisors showed considerable lingual tipping because of the effect of clearance gap (0.003-in, 0.022 X 0.025-in bracket slot, 0.019 X 0.025-in archwire) and elastic deflection of the archwire. Medial displacement of the maxillary anterior teeth occurred because of lingual tipping during distalization. The occlusal plane rotated clockwise at all FAs because of extrusion of the maxillary incisors and intrusion of the maxillary second molars, and the amounts decreased as FA increased.

Conclusion : Tooth movement patterns during distalization of the total maxillary dentition were recognized. With an understanding of the mechanics, a proper treatment plan can be established.



P-023

Skeletal and alveolar changes in RPE and MARPE: a prospective randomized clinical trial using CBCT

Joo-Hee Chun[1], Kyung-Ho Kim[1], Sung-Hwan Choi[1], Chang-Sung Kim[2], Kee-Joon Lee[1]

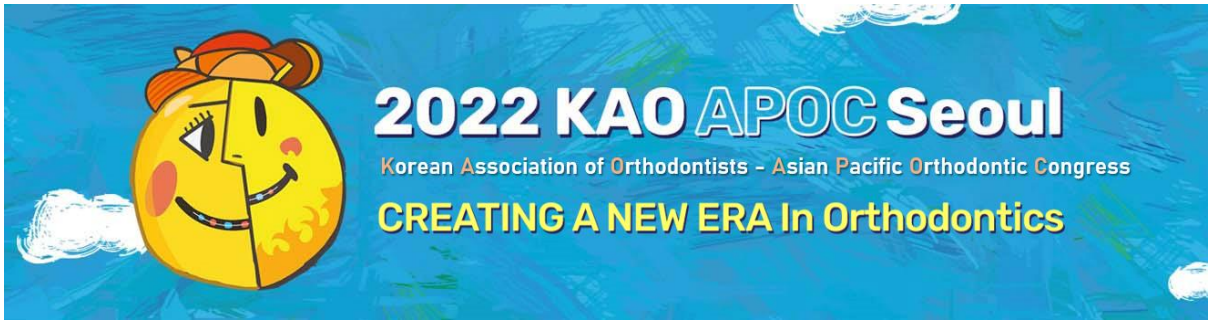
[1]Department of Orthodontics, Institute of Craniofacial Deformity, College of Dentistry, Yonsei University [2]Department of Periodontology, College of Dentistry, Yonsei University

Objectives : This prospective randomized clinical trial aimed to evaluate the immediate and short-term skeletal, dentoalveolar, and periodontal effects of rapid palatal expansion (RPE) and miniscrew-assisted RPE (MARPE) in adolescent and young adult patients.

Material and Methods : Forty patients (14 men and 26 women) requiring maxillary expansion were randomly allocated to the RPE (n=20, age=14.0 ± 4.5) or MARPE (n=20, age=14.1 ± 4.2) groups. The assignment was performed via computer-generated block randomization, with a block size of four. Upon identical (35 turns) amount of expansion, low-dose cone-beam computed tomography images were taken before treatment (T0), immediately after expansion (T1), and after a 3-month consolidation period (T2). The primary outcome of this study comprised the assessment of midpalatal suture separation. Secondary outcomes included, skeletal, dentoalveolar, and periodontal measurements, which were performed at each time point.

Results : The frequency of midpalatal suture separation was 90% (18/20) and 95% (19/20) for the RPE and MARPE groups, respectively. A greater increase in nasal width in the molar region (M-NW) and greater palatine foramen (GPF) was observed immediately after the expansion (T1-T0) and consolidation periods (T2-T0) in the MARPE group compared to the RPE group ($P<0.05$). The MARPE and RPE groups showed similar dentoalveolar changes except for the maxillary width (PM-MW, M-MW). The MARPE group presented greater bilateral first premolar (PM-MW) and molar (M-MW) maxillary width in relation to the RPE group ($P<0.05$). Through the expansion and consolidation periods (T2-T0), lesser buccal displacement of the anchor teeth was observed in the MARPE group ($P<0.05$).

Conclusion : Midpalatal suture separation was observed in 90% and 95% of patients in the RPE and MARPE groups, respectively. Both RPE and MARPE groups exhibited significant triangular basal bone expansion and skeletal relapse during consolidation. The reinforcement of RPE with miniscrews contributes to the maintenance of the basal bone during consolidation period.



P-024

The Success and effectiveness of miniscrew-assited rapid palatal expansion are age- and sex-dependent

Ji Yoon Jeon[1], Sung-Hwan Choi[1], Chooryung Chung[2,3], Kee-Joon Lee[1]

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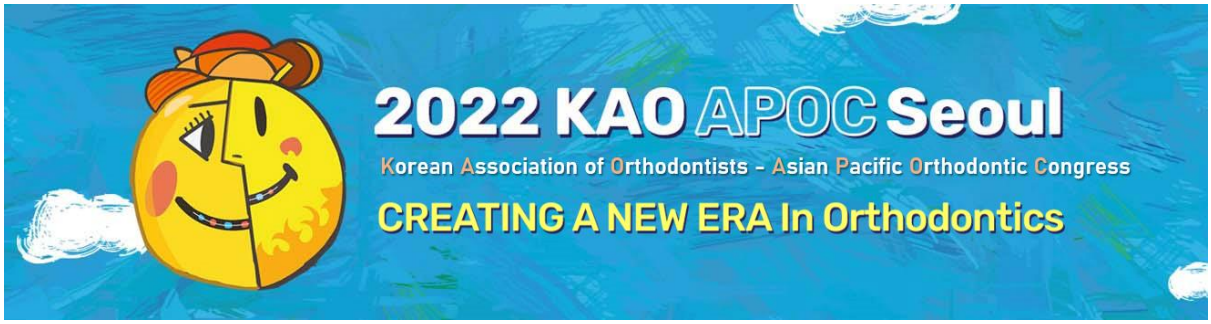
[2]Department of Orthodontics, Gangnam Severance Dental Hospital, The Institute of Craniofacial Deformity, College of Dentistry, Yonsei University
[3]Institute of Craniofacial Deformity, Yonsei University College of Dentistry

Objectives : This study aimed to assess the success rate and the amount of suture separation after the miniscrew-assisted rapid palatal expansion (MARPE) procedure in relation to the chronological age and sex of the patients.

Material and Methods : The periapical radiographs of 215 subjects (95 male; 120 female; range, 6–60 years) who had undergone MARPE treatment were retrospectively analyzed. The success of suture separation was determined and, in suture-separated subjects, the amount of suture separation was evaluated by suture separation ratio calculated from the periapical radiograph obtained after active expansion. Association tests were performed using linear-by-linear association, the Jonckheere-Terpstra test, Fisher's exact test, and the Mann–Whitney U test, and linear regression models were also developed.

Results : The success rate of suture separation was 61.05% in male, 94.17% in female, and 79.53% in both sexes. There was a statistically significant association between older age and suture nonseparation in male ($p < 0.001$), but not in female ($p = 0.221$). In suture-separated subjects, there was a statistically significant trend toward a low amount of suture separation with older age subgroups in both sexes ($p < 0.001$); however, there was no statistically significant difference in the amount of suture separation between male and female in all age subgroups.

Conclusion : Older patients treated with MARPE, particularly in male, may have a reduced likelihood of both success in suture separation and sufficient basal bone expansion. This study demonstrates that clinicians should consider that the success rate of MARPE and the amount of suture separation may depend on chronological age and sex.



P-025

3-dimensional changes of the condylar region after comprehensive orthodontic treatment in adults

Hosik Jang[1,2], Hyuna Lee[1,2], Ji-Hyun Lee[1,2], Kyung-Ho Kim[1,2], Chooryung J. Chung[1,2]

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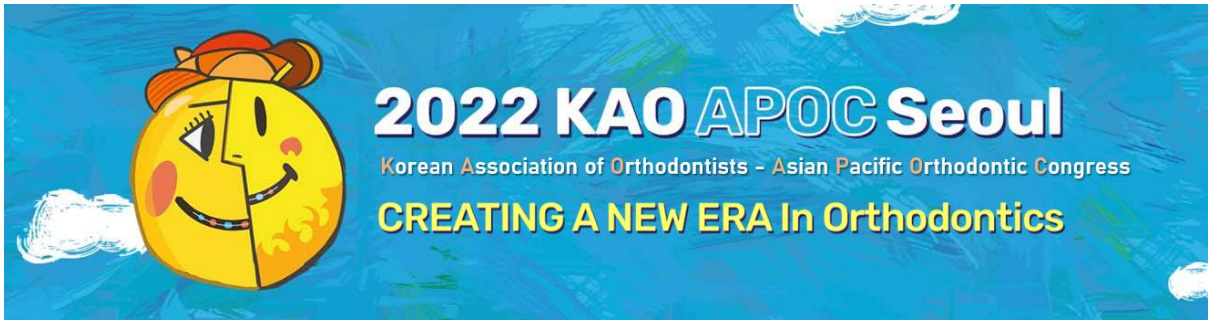
[2]Department of Orthodontics, The Institute of Craniofacial Deformity, College of Dentistry, Yonsei University

Objectives : Displacement or unexpected changes of the mandibular position, especially posterior displacement of the mandible during or after orthodontic treatment may induce negative effects on the overall treatment outcome as well as the long-term stability. The aim of this study was to evaluated the incidence of unexpected condylar displacement in adult orthodontic patients and to identified the displacement pattern and clinical risk factors associated with the changes.

Material and Methods : Pre and post-treatment CBCT sets of 291 adults (age over 18) orthodontic patient cohort who underwent comprehensive orthodontic treatment were three-dimensionally superimposed and evaluated. The incidence of excessive condylar displacement (>1mm) after orthodontic treatment and its pattern were investigated along with the association with clinical factors such as gender, age, extraction, skeletal relationship and temporomandibular joint disorder history.

Results : The incidence rate of unexpected condylar displacement (>1mm) among adult orthodontic patients was 6.2%. The incidence of unexpected condylar displacement occurred more frequently in females (8.7%) than males (1.0%), and in Skeletal Class II malocclusion (12.5%) than in Skeletal I (2.6%) or III (0.0%) malocclusion ($p<0.05$). Age, extraction, or the pretreatment history of TMD was not associated with the incidence of unexpected condylar displacement after orthodontic treatment. Significant condylar resorption or clinical symptoms were not noted for ones with unexpected condylar displacement.

Conclusion : In about 6% of adult patients who underwent orthodontic treatment, unexpected condylar displacement was confirmed compared to before treatment. The unexpected condylar displacement itself seems to have little association to induce clinical symptoms or condylar resorption.



P-027

Autotransplantation as a unique inter-disciplinary approach to restore multiple traumatized incisors

CHIEH SHEN KOO

KK Hospital

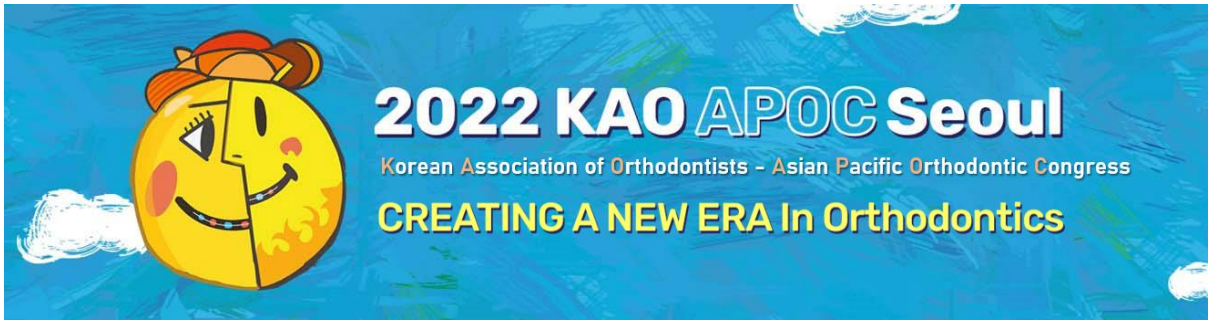
Introduction : Traumatic dental injuries present with its challenges due to the increased childhood incidence, complexity of injury and protracted treatment duration. The aim of this case report is to describe a successful inter-disciplinary management of multiple traumatized incisors in a growing patient.

Summary : An 11-year-old boy presented at our clinic with history of dental trauma from falling off a bicycle. Tooth #11 was avulsed, while #12 and#21 were ankylosed and deemed to be of poor prognosis. An initial examination revealed a Class II skeletal relationship, convex profile, with an 11mm overjet and severe lower crowding in the mandibular arch.

The patient's parents were not keen restoring the space with dental implants, as this would require a long-term pontic for space maintenance especially since he was still growing. After discussion with the inter-disciplinary team, autotransplantation was favored as it was considered more suitable and beneficial for the growing patient.

Tooth #12 was restored by autotransplantation of an immature donor tooth, #45, into the recipient site. The patient underwent orthodontic treatment to close the donor site space and bring the autotransplanted tooth into an ideal position. Clinical and radiographic follow up showed continued root development, pulp vitality, and pulpal obliteration of the transplanted tooth. After orthodontic treatment had completed, the prosthodontist was able to restore and blend the autotransplanted tooth into a harmonious smile. Four years after the autotransplantation procedure, a peri-apical radiograph was taken, showing good stability of the autotransplanted tooth.

Conclusions : The results from this case demonstrate that autotransplantation offers a unique advantage as a treatment modality for the restoration of traumatized teeth, particularly in growing children.



P-028

Management of ectopic canine with differential premolar extraction using standard edgewise appliance (Case Report)

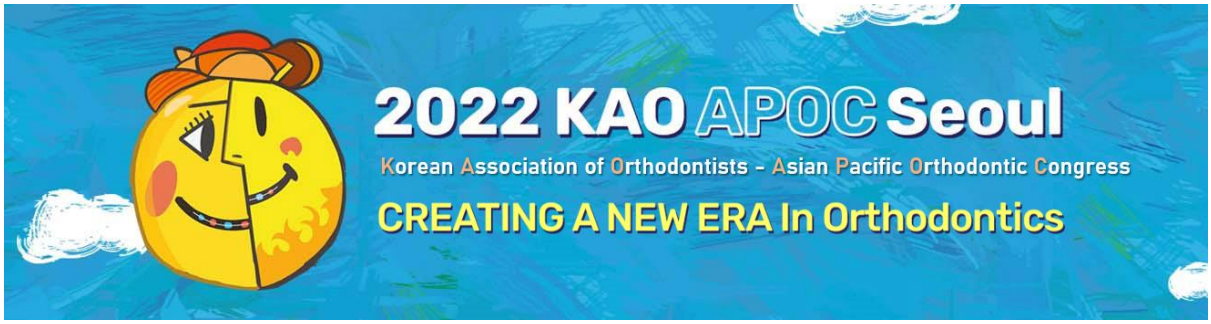
Astri Nariswari

Padjajaran University Indonesia

Introduction : Selecting which teeth to be extracted as an alternative to solve the problem of lack of space is an important decision in orthodontic treatment, determined based on the biomechanics to be used and the overall health of the teeth.

Summary : A 19-year-old female patient came with the chief complaint of crowding accompanied by the presence of ectopic canine. Space analysis in the maxilla showed different ALD, -7.5 mm on the right and -3.5 mm on the left. In this case, space was obtained by differential premolar extraction of 14 and 25 to maintain the midline, to get class 1 molar and canine relationship, and to make the space closure more efficient. The treatment used a standard edgewise appliance and was initiated using multiple loop Stainless Steel (SS) 0.014-inch wire with active laceback on 13 which produce a light force but was efficient in correcting malposition and expanding the arch. After the ectopic canines were aligned, a plain archwire with the sequence of 0.014-inch SS, 0.016-inch SS, 0.016×0.022-inch SS, and 0.017×0.025-inch SS was used. The remaining space was closed by En masse retraction and mesialization of posterior teeth with a moderate anchorage system.

Conclusions : Differential premolar extraction should be carried out by considering ALD and anchoring systems. Orthodontic treatment with optimum force will move the teeth efficiently.



P-029

Orthodontic management of buccally displaced maxillary permanent canine with standard edgewise fixed appliance (Case Report)

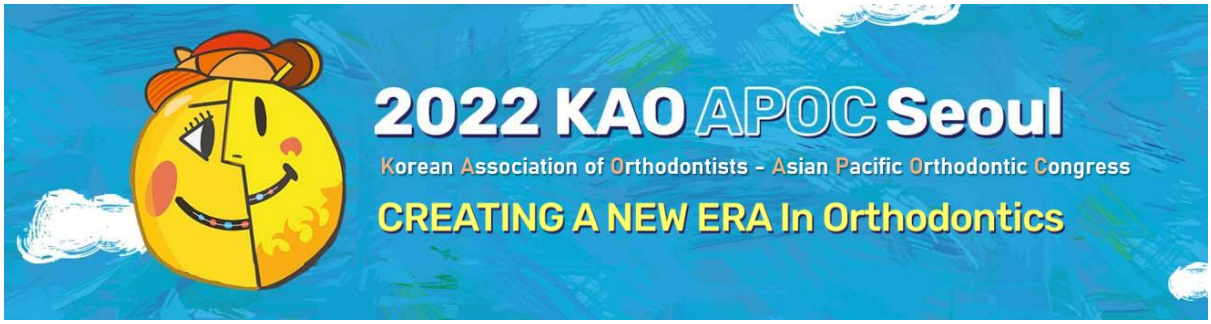
Andrew Laurent, Endah Mardiati

Padjadjaran University

Introduction : Buccally displaced canines (BDC) are frequently found in orthodontic practice. BDC can be unilateral or bilateral. BDC are more commonly related to insufficient arch length and strongly associated with crowding.

Summary : A 15-year-8-month-old boy presented with the chief complaint of buccally displaced maxillary canine. Intraoral examination revealed a Class I molar and canine relationship on both sides. The maxillary midline deviated to the right 1 mm and the mandibular midline deviated to the left 2 mm. The maxillary and mandibular arches exhibited moderate crowding. The maxillary right canine had erupted buccally displaced in the arch. Cast analysis showed length discrepancy of 6,5 mm in the maxillary arch and 4,5 mm in the mandible. The lateral cephalometric analysis revealed the patient had a skeletal Class I relationship. Full-fixed 0.018-in slots edgewise appliances were placed on both arches. A 0.014-in stainless steel archwire with multiple loops was engaged in the maxillary and mandibular arch to relieve crowding and to accommodate the buccally displaced canine. Alignment of the canine and maxillary and mandibular dentition greatly improved as the wire progressed from 0.014-in to a 0.016 x 0.022-in stainless steel archwire.

Conclusions : Non-extraction treatment approach using standard edgewise fixed appliance managed to correct the buccally displaced canine. The treatment was finished with excellent results.



P-030

Treatment for Class I Malocclusion with Incisor Protrusion and Proposition Using Pre-Adjusted Edgewise Appliance

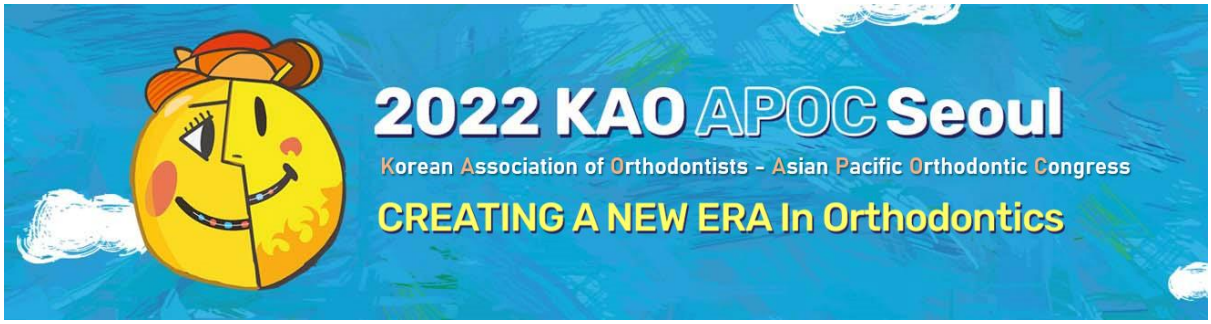
Irnamanda D Yakin Hasbullah, Endah Mardiati

Padjadjaran University, Indonesia

Introduction : Nowadays, patient with the slightest misalignment of teeth demand orthodontic treatment to get it corrected and improve their smile and facial profile. In orthodontic practice, protrusion and proposition of anterior teeth, both maxilla and mandibula, are often the reasons why patients seek orthodontic treatment. Fixed orthodontic treatment using pre-adjusted edgewise appliance can be an effective treatment method to overcome the proposition and protrusion of incisor teeth and improved patient's facial profile and smile.

Summary : A 27-years-old female patient came with chief complaint of protruded anterior teeth and dissatisfied with her facial appearance. Extraoral examination showed a normal, symmetrical face with convex profile. Intraoral examination shows a class I malocclusion, incisor protrusion, crowding teeth, missing right mandibular first molar, interpremolar and intermolar constriction, and Bolton discrepancy. Lateral cephalometric analysis showed that the patient had a skeletal class I relationship, proposition of lower incisor, protrusion and proposition of upper incisor. Treatment involved alignment, leveling, finishing and settling using MBT prescription with 0.022 slot brackets, space maintaining and retention using wrap around retainer for the upper arch and Hawley retainer modified with prothesis for the lower arch to replace the missing right mandibular first molar.

Conclusions : The treatment using fixed orthodontic appliance with MBT prescription to overcome the incisor protrusion and proposition was done with satisfying result in a short period of time.



P-031

Management of lingually ectopic mandibular lateral incisor with piggyback technique

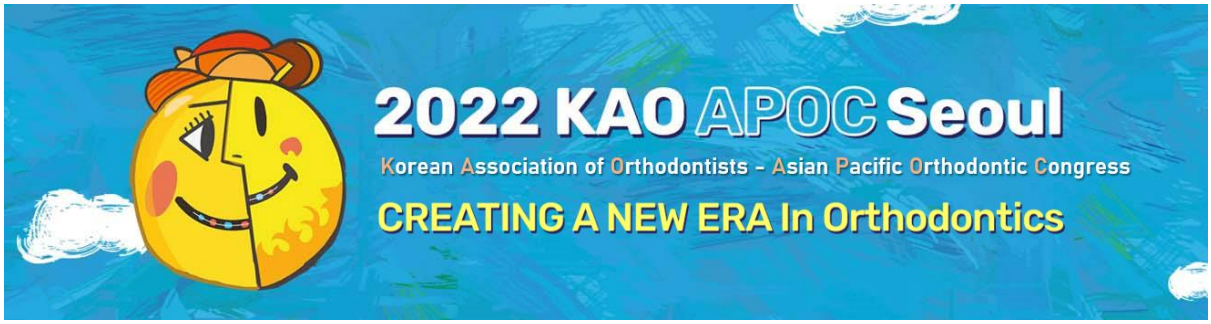
Grace Audrey Widiyanti, Laviana Avi

Padjadjaran University, Indonesia

Introduction : Various eruption problems arise during the transitional dentition period, among which is ectopic eruption. Ectopic eruption is a condition in which the permanent teeth does not follow its usual course due to deficiency of growth in the jaw. Persistent deciduous teeth can be one of the etiology causing lingually ectopic teeth. Lateral incisor is the most often ectopically displaced tooth in the mandibular arch. Piggyback technique is a segmented fixed orthodontic treatment technique which involve smaller diameter nickel titanium 'piggy back' wire to align the individual tooth into the main arch form, combined with a stiff stainless steel base wire to maintain the arch form.

Summary : A 28-year-old female patient presented with chief complaint of irregularly placed teeth and discomfort with her lingually placed lower anterior teeth. Analysis and diagnosis showed a convex profile, wide buccal corridor, Class I malocclusion with crowding, lingually ectopic right mandibular lateral incisor, large overjet, shifting of the mandibular median line to the right, and missing left mandibular first molar. Treatment involved alignment and leveling using straight wire appliance, opening the space for the ectopic tooth, and correcting the median line. This treatment is modified with piggyback technique to pull teeth forward.

Conclusions : Piggyback technique can be used as an alternative treatment for lingually ectopic teeth, giving more predictable result within shorter period of time.



P-032

Interdisciplinary management for patient with Class III malocclusions and cleft lip and palate

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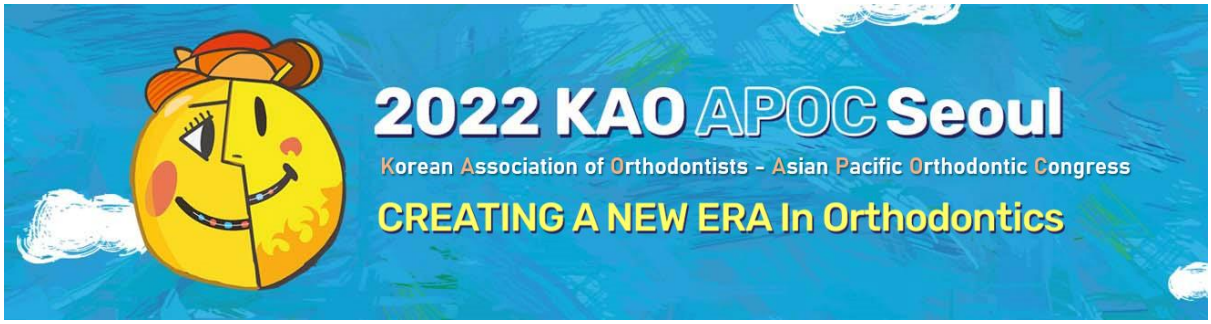
Introduction : A cleft lip or palate (CLP) is one of the most common birth defects of the jaw. Individuals with CLP had a significantly shorter maxillary length (maxillary constriction) and resulting skeletal class III malocclusion. Oral rehabilitation can be difficult for patients who were born with CLP. Purpose: The purpose of this case study was to highlight the necessity of a sequential interdisciplinary management to improving facial esthetics and correcting functional difficulties for a patient with CLP

Summary : The case was a 20-years-old woman with complaint of an unpleasant appearance of her upper front teeth. She had a concave profile with Class III skeletal patterns (SNA: 78O; SNB: 82O; ANB: -4O), cleft lip and palate, anterior and posterior crossbite. Case Management: A combined orthodontic, endodontic, conservative, periodontic and prosthetic approach was proposed to achieve of a normal occlusion, function, and harmonious profile. The combination of rapid maxillary expansion and fixed orthodontics edgewise standard appliance established a good general alignment and a Class I relationship. After ten months of treatment, both the posterior and the anterior crossbite had completely corrected. In order to address the gingival margin differences, the patient was instructed to make another appointment with the periodontist, referred to endodontist to do veneer restoration and to the prosthodontist for fabrication of removable denture with obturator.

Conclusions : This interdisciplinary approach improved both the esthetic aspect and functional of CLP patient greatly. The patient was satisfied with the results achieved.



P-033

Orthodontic Treatment of Multiple Impacted Maxillary Anterior Teeth with Dentigerous Cysts and Dental Agenesis

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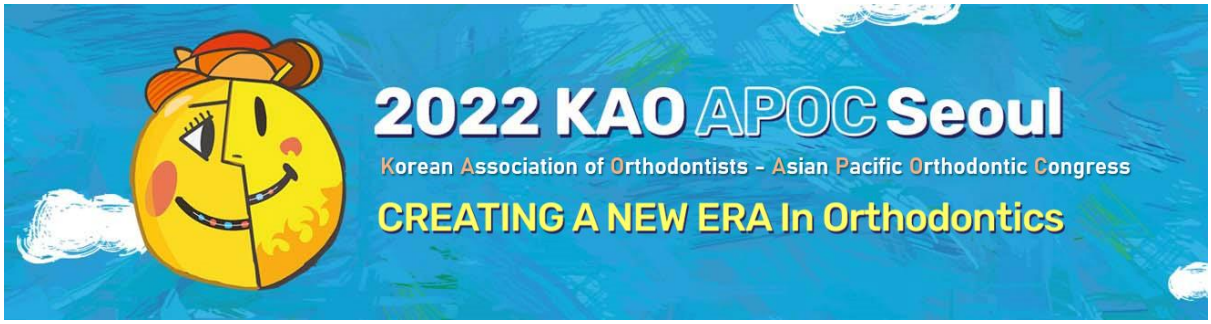
Introduction : Introduction: Impaction of maxillary canines and dentigerous cysts are frequently encountered clinical problems, likewise, Dental agenesis is the most common developmental anomaly in humans and is frequently associated with several other oral abnormalities. The management treatment of which usually requires an interdisciplinary approach. The aim of this case report is to describe the interdisciplinary orthodontic management of a case of multiple impacted teeth accompanied by dentigerous cysts and dental agenesis.

Summary : Case summary: We report the case of a 16-year-old girl with Class I malocclusion, 2.7mm overjet, 2.6mm overbite, left lateral incisor impaction and bilateral maxillary canine impaction accompanied by dentigerous cysts, bilateral mandibular central incisors agenesis, missing of the bilateral mandibular first molar. A comprehensive orthodontic treatment was completed in conjunction with interdisciplinary strategies. Enucleation and surgical exposure were completed by an oral surgeon. Orthodontic fixed appliances were performed to treat this case, divided into two phases, pre-surgical exposure and post-surgical exposure.

Conclusions : Conclusion: The treatment of multiple impacted maxillary anterior teeth with Dentigerous Cysts and Dental Agenesis presented a clinical challenge, and successful orthodontic treatment of this case can be achieved through radiographic examination, detailed evaluation as well as proper biomechanical control, and good communications between patients and interdisciplinary team.



P-034

Orthodontic-periodontics Interdisciplinary Treatment in Adult Patient: A Case Report

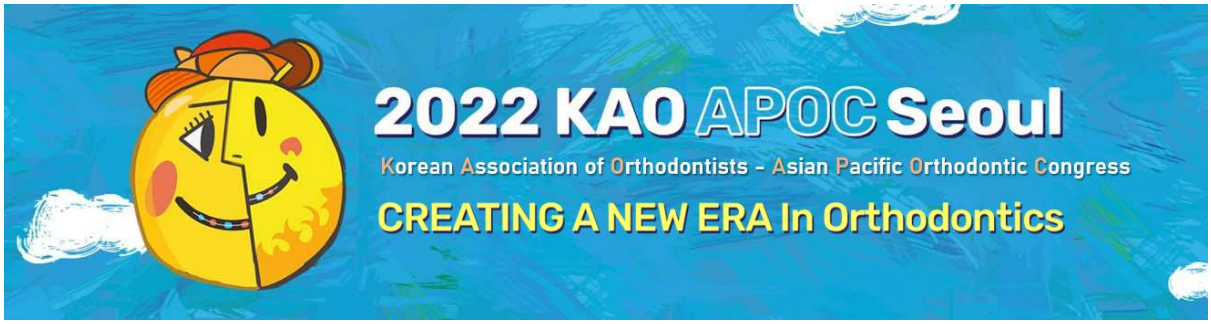
Livia Yonathan

Fadli Jazaldi

Introduction : The interdisciplinary treatment of an adult patient with periodontal disease focused on eliminating or reducing the severity of periodontitis sequelae. Orthodontic treatment requires the application of force against tooth movement while minimizing damage to the root, periodontal ligament, and alveolar bone. The presence of a combination orthodontic-periodontics treatment can improve the alveolar bone support, changes in topography and regeneration of periodontal tissue, and rapid remodeling of the bone by stimulating the teeth to move biomechanically.

Summary : We report the case of a 29-year-old woman who had a skeletal Class I malocclusion with periodontitis stage II grade C, severe gingival recession 8 mm with extruded in left lower lateral incisor, and mild crowding. The treatment plan and sequence established by correction of dental position using self-ligating fixed appliances and the combination of orthodontic intrusion with periodontal therapy using connective tissue graft failed to treat the problem of gingival recession in the left lower lateral incisor. The intrusion of the left lower lateral incisor was performed by using the piggy-back technique with auxiliary wire and the tooth was moved vertically while the alveolar bone successfully regenerated. Pre-treatment, post-treatment, and retention photographs of this patient demonstrate bone tissue repair effectively, reduced trauma from occlusion by the orthodontic intrusion, reduced gingival recession, and functionally stable treatment results.

Conclusions : The treatment results within limitations were performed to correct the malocclusion and orthodontic-periodontics problem using a self-ligating system can help to intrude the tooth, and repair periodontal tissues and provide better mastication.



P-036

Growth modification and camouflage treatment of growing skeletal Class I patient with facial asymmetry

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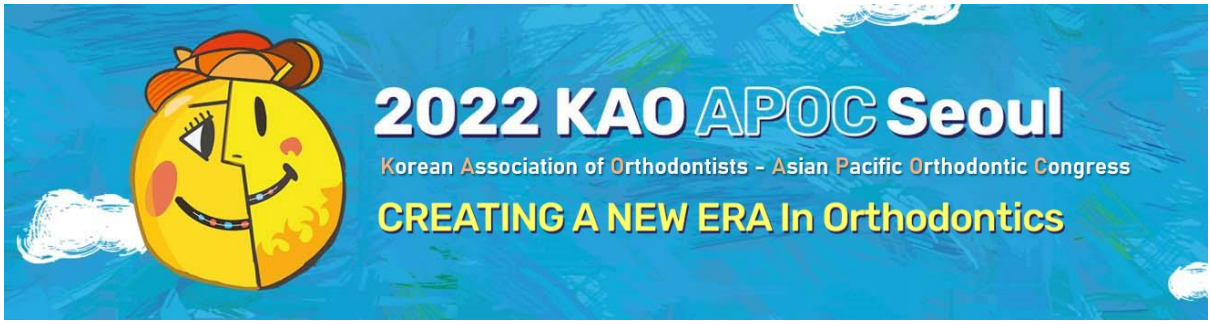
Introduction : Malocclusion including facial asymmetry accounts for 12 to 37% of patients visiting for orthodontic treatment. In the case of adult patients, orthognathic surgery should be performed to treat facial asymmetry. On the other hand, growing patients can obtain harmonious facial appearance through growth modification using orthopedic appliance. To do with, it is necessary to establish a timely treatment plan according to the growth stage along with an accurate diagnosis of facial asymmetry.

Case Summary : We report the case of a 9-year-old boy with facial asymmetry, open bite and space deficiency in the maxillary and mandibular arch. Adenoidectomy was performed 6 months before the first dental examination, and he also had mouth breathing due to rhinitis, and tongue-thrusting habit. According to hand-wrist radiograph, his skeletal maturity indicators (SMI) stage was 0. Bonded type maxillary expansion followed by plate with midline expansion screw appliance with tongue crib was used for space gaining and habit control. At the time of peak pubertal growth, asymmetric activator was used to encourage left mandibular growth and a midline expansion screw was incorporated in order to correct the transverse discrepancy. After the active growth modification, we notified the patient to continue night appliance wear. When the skeletal maturation was completed, camouflage treatment using fixed appliance and TAD was performed. The final occlusion was favorable and an esthetic facial profile was achieved.

Conclusion : A patient with skeletal Class I and facial asymmetry could be successfully treated by growth modification and camouflage treatment.



P-037

Effects of orthodontic force application on a traumatically intruded and repositioned incisor

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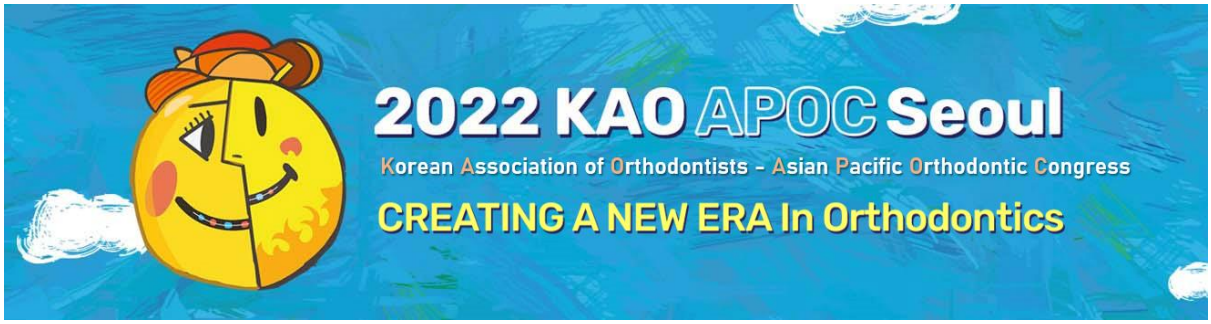
Introduction : The treatment of choice for traumatically intruded incisors is an immediate surgical reduction. However, its prognosis is reported to be questionable. The main reasons for the unsuccessful treatment would be the failure of initial healing and replacement root resorption due to damage to the periodontal ligament (PDL) cells. In order to stimulate proliferation and differentiation of PDL cells, application of orthodontic force has been suggested. Such an increased PDL cellular activity is expected to prevent development of replacement root resorption and ankylosis.

Discussion : A 59-year-old gentleman presented with a traumatically intruded incisor due to fallen-down injury. Oral examination showed that right side central incisor was intruded completely into the alveolar bone. Cone-beam CT revealed that alveolar bone was bent due to the trauma. Immediate reduction was performed on the incisor and surrounding bone block. As a fixation, mini-tube appliances were used. The patient has also anterior crowding. Mini-tubes were placed on six anterior teeth and 40°C thermo-active 012 NiTi wire was inserted as an initial wire. After overall alignment, the wire was changed to 012 standard NiTi wire. Total treatment time was 5 months. Although traumatic injury was severe, the incisor did not show any sign of ankylosis or replacement root resorption

Conclusion : Application of an orthodontic force might be a useful option to prevent a development of replacement root resorption and ankylosis in the treatment of a traumatically intruded incisor.



P-038

Treatment of a patient with Eisenmenger syndrome and root resorption of maxillary incisors

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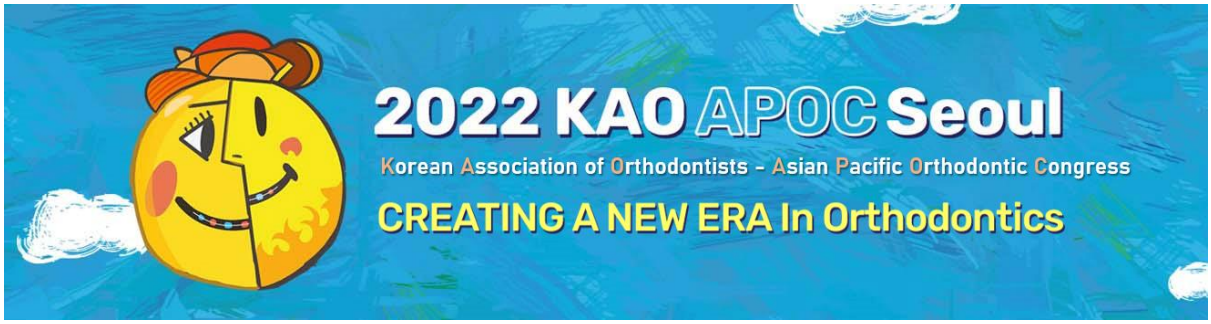
Introduction : Eisenmenger syndrome represents the most severe phenotype of pulmonary arterial hypertension associated with congenital heart disease. Patients with congenital heart diseases including Eisenmenger syndrome are known to have a high incidence of enamel dysplasia, delayed teeth eruption, and marginal gingivitis. Oral hygiene management is emphasized in these patients to prevent infective endocarditis, and prophylactic antibiotics are recommended prior to certain dental procedures.

Case Summary : We report the case of a 21-year-old patient with Eisenmenger syndrome and skeletal Class I malocclusion, root resorption of maxillary incisors, impacted maxillary left canine, and severe crowding. To minimize the risk of bacteremia, the impacted canine was extracted rather than surgical exposure and eruption guide, and the first premolars were extracted in the other quadrants. Maxillary incisor tooth movement was postponed until the extraction space was fully closed, and were aligned in the finishing stage with minimum tooth movement during a short period of time, resulting in no additional root resorption after treatment. Amoxicillin 2g was prescribed prior to tooth extraction and insertion of miniscrews, and oral hygiene instruction was thoroughly conducted so that there was no risk of infection during the whole treatment period.

Conclusion : An Eisenmenger syndrome patient with root resorption of maxillary incisors and impacted maxillary canine was treated successfully with proper treatment planning including: (1) minimal tooth movement in order to prevent further root resorption, (2) extraction of impacted canine to reduce the risk of infection during surgical opening and guide, and (3) appropriate antibiotic prophylaxis and oral hygiene instruction to prevent infective endocarditis.



P-039

Treatment of a patient with anterior open bite and bilateral maxillary peg lateralis

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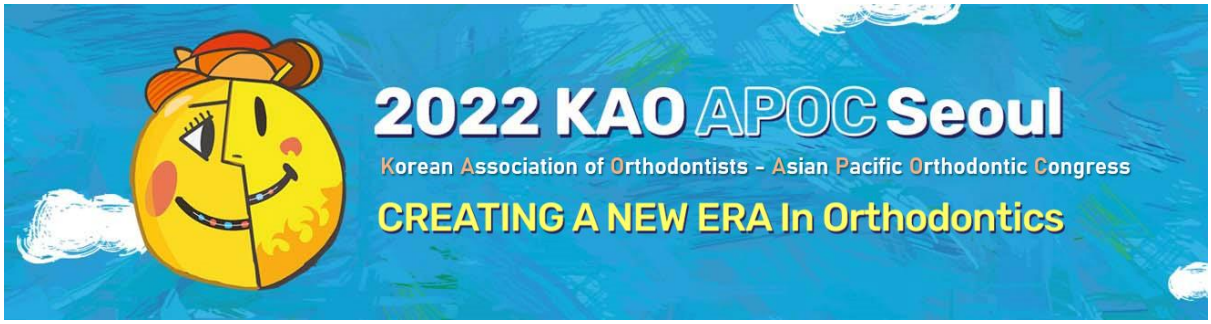
Introduction : Treatment of anterior open bite is a great challenge in orthodontics. For adult patients with skeletal Class II, open bite malocclusion, molar intrusion with temporary anchorage devices is a less invasive option compared to orthognathic surgery with similar treatment outcomes.
Maxillary peg lateralis can complicate the process of orthodontic diagnosis and treatment planning. There can be several treatment options such as extraction and substitution or restoring the lateral incisor into its proper size after appropriate space gaining. Facial profile, tooth size relationship, and size and shape of the canine should be considered for optimal treatment planning. In this case report, we describe the successful treatment outcome of a patient with openbite and peg lateralis.

Case Summary : We report the case of a 19-year-old female patient with skeletal Class II malocclusion, peg lateralis, anterior crowding, openbite, and facial asymmetry. Peg lateralis on the right side and three premolars were extracted in order to improve anterior crowding and protrusive profile. For openbite correction, upper molar intrusion was carried out using miniscrews on buccal and palatal area. Right maxillary lateral incisor and canine were successfully substituted with canine and first premolar through incisal edge reshaping and occlusal adjustment. On the left side, resin build up was performed after appropriate space regaining. After orthodontic treatment, final occlusion was favorable and esthetic facial profile was achieved through autorotation of the mandible. For retention, clear retainer and miniscrews on maxillary posterior area were used for active retention.

Conclusion : A skeletal Class II patient with open bite malocclusion and peg lateralis was treated successfully with extraction of maxillary lateral incisor and premolars.



P-040

Treatment of a patient with anterior crowding and unilateral missing lateral incisor by asymmetric extraction

Byoungsoo Cho[1,2], Hankyul Kim[1,2], Ji-Hyun Lee[1,2], Chooryung J. Chung[1,2], Kyung-Ho Kim[1,2]

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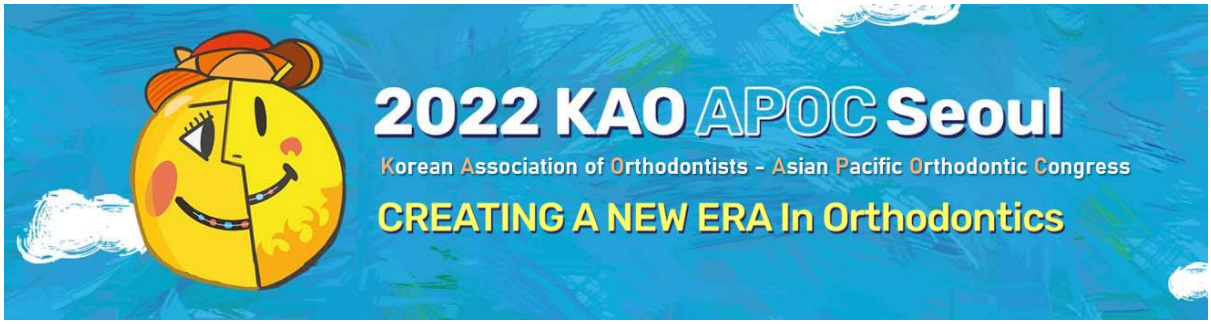
Introduction : It is important to decide which teeth we should extract when we encounter severe crowding. In general, extraction of premolars is performed but extraction of anterior teeth can be planned in case of crowding in the anterior region, transposition and alveolar bone condition. Meanwhile, there are several treatment options for patients with missing mandibular lateral incisors, such as canine substitution or prosthetic restoration. In this case report, we describe the successful treatment outcome of a patient with anterior crowding and unilateral missing mandibular lateral incisor by asymmetric extraction.

Case Summary : We report the case of a 21-year-old female patient with skeletal Class I, congenitally missing mandibular left lateral incisor, anterior crowding, lip protrusion, and transposition on maxillary left canine and lateral incisor. To improve the facial profile and relieve crowding, extraction was inevitable. On the right side, maxillary canine was extracted due to buccal alveolar bone dehiscence and short root, whereas on the left side, it was better to extract the transpositioned maxillary left lateral incisor considering there was vertical bone loss on mesial side of maxillary left lateral incisor. First premolar was extracted on the right side of the mandible. TADs were inserted on each quadrant for space closure and anterior teeth retraction. Since there was tooth size discrepancy between premolar and canine, interproximal reduction was performed on mandibular anterior teeth. Finally, maxillary bilateral first premolars and mandibular left first premolars successfully replaced canines, and both sides accomplished a Class I molar relationship. In addition, ideal overjet, overbite and esthetic facial profile were obtained.

Conclusion : A skeletal Class I patient with anterior crowding and congenitally missing unilateral mandibular lateral incisor was treated successfully by a carefully planned extraction strategy.



P-041

Camouflage treatment of a skeletal Class II with openbite and multiple missing teeth

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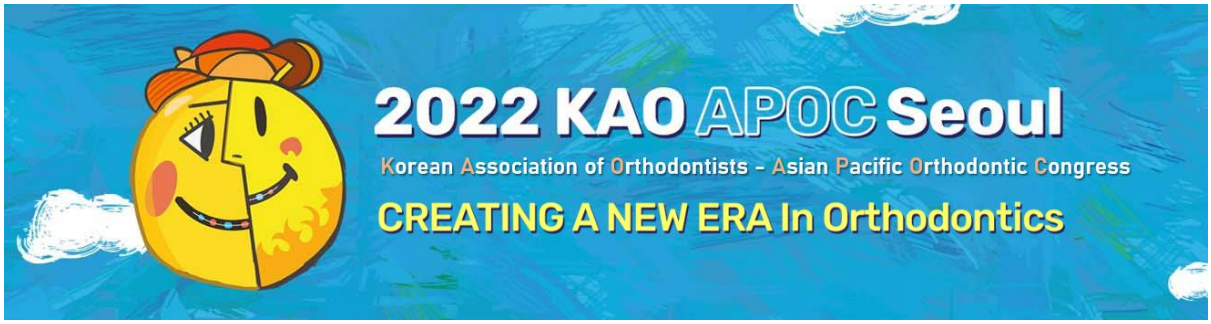
Introduction : Treatment options for adult patients with skeletal Class II and openbite are orthognathic surgery and camouflage treatment. Camouflage treatment can be achieved by upper molar intrusion and autorotation of the mandible. In this case report, we describe the successful treatment outcome of a skeletal Class II adult patient with openbite, multiple missing teeth, lip protrusion, and retrognathic mandible.

Case Summary : We report the case of a 30-year-old female patient with skeletal Class II, openbite, lip protrusion, convex profile and missing upper right first molar, upper left canine, first premolar and mandibular right first molar. Upper right first premolar and lower left first premolar were extracted to improve the facial profile and achieve a good occlusion. Since two teeth on upper left side were missing, implant placement on the canine was planned following orthodontic treatment. Inter-radicular TADs on upper posterior teeth and midpalatal area were inserted to intrude upper molars for openbite correction. Autorotation of the mandible was followed by molar intrusion. Also, TADs were used to maximize the amount of anterior teeth retraction and to correct the midline. In the case of lower right quadrant, where the first molar was missing, protraction of second molar and third molar was performed. After orthodontic treatment, proper overjet, overbite and occlusion were achieved and facial profile became more esthetic. For active retention, the patient was instructed to wear elastics connecting upper buccal screws and clear retainer.

Conclusion : A skeletal Class II patient with openbite, multiple missing teeth and lip protrusion was treated successfully by upper molar intrusion, autorotation of the mandible and anterior teeth retraction with controlled tipping of upper and lower anterior teeth.



P-042

Treatment of skeletal class III malocclusion growing patient with primary failure of eruption

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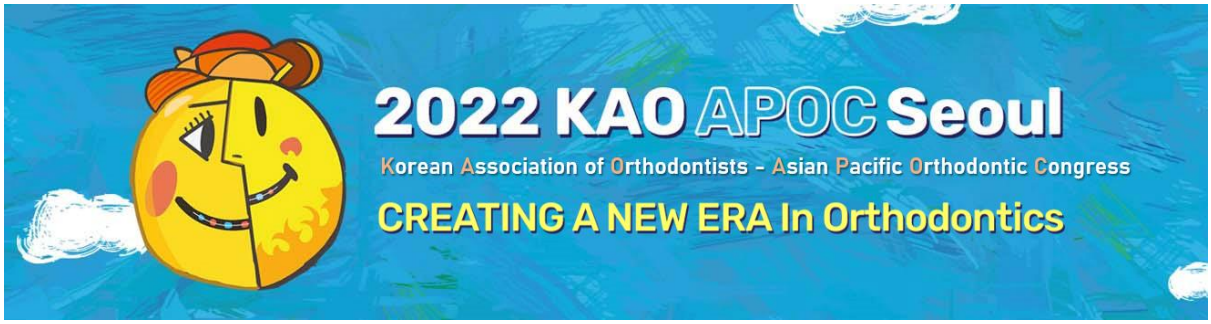
Yon-Sei Gajirun-e Orthodontic clinic

Introduction : Primary failure of eruption(PFE) is a rare disease defined as incomplete tooth eruption despite the no lack of space for the eruption or there were no external causes. A confirmatory diagnosis is done by the gene analysis of PTH1R gene mutation. Treatment of such a condition is tricky because affected teeth do not move even when orthodontic force is applied.
In this case report, we present a case of traction of the #17 after extraction of the #16 affected by PFE, with long-term orthopedic treatment in skeletal class III malocclusion growing patient.

Case Summary : This case is a 10-year-old boy with anterior crossbite and mandibular prognathism who was diagnosed hyperdivergent skeletal classIII malocclusion. It was observed that the #16 and #22 had not erupt. The treatment objective was to resolve anterior crossbite through orthopedic treatment and secure eruption space for the #22 with evaluating the eruption of the #16 and #22. After 30 months of treatment, eruption of the #22 and #23 were progressed but the #16 did not erupt so closed traction technique was decided. For about 17 months, traction of the #16 using mini-implants had been tried but failed. So, we decided to extract the #16 and use closed traction technique for the #17. Orthopedic appliances, periodic growth evaluation and fixed appliances were performed with almost 8 years treatment period. As a result, the #17 was well aligned instead of #16, good occlusion and esthetic profile were accomplished. The further observation of late mandibular growth and #18 developing are required.

Conclusion : When faced with failure of eruption, a careful observation of the presentation and the responses of teeth during treatment are very important. It is important to remember that affected teeth will not respond to orthodontic force. Therefore, the knowledge about PFE is necessary in formulating diagnosis and planning treatment.



P-044

Interceptive Treatment of Growing Patients with Prefabricated Removable Appliance and Myofunctional Therapy

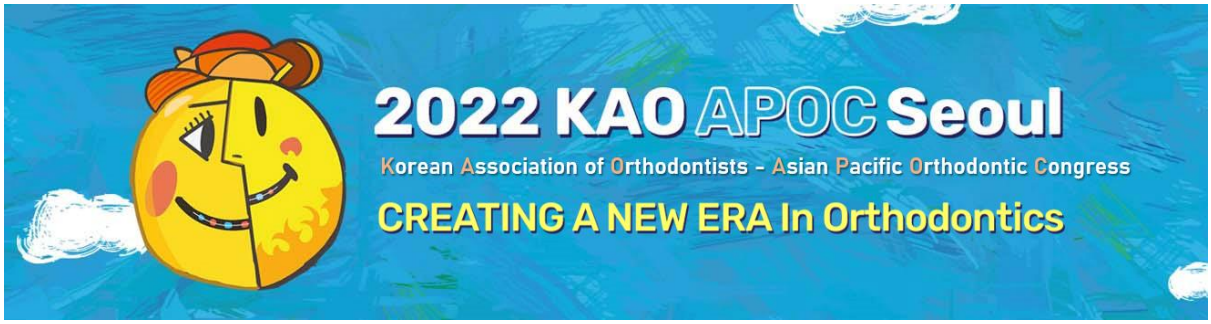
Dong-hyun Lee[1], Jae Yong Lee[3], Geun-su Song[2]

[1]Bloom Orthodontic Clinic
[2]Gajirun E Orthodontic Clinic
[3]Lee Jae Yong Dental Clinic

Introduction : Genetic and environmental factors can contribute to the development of malocclusion in growing patients. When environmental factors become the main factor of malocclusion, interceptive orthodontic treatment will be needed. Prefabricated removable appliance was effective for intercepting parafunctional oral habit and inducing normal growth in growing patients.

Case Summary : Patient 1 was 8-year-old female with large overjet and deep bite. As the cause of large overjet was judged to be 'trapped lower lip', PreOrtho® Type 1, soft type was used for night wear. Wearing the apliance, lips were tightly closed to strengthen the muscles around the lips. After 11 months of the treatment, the large overjet improved, and the lower lip also improved to a normal position. Patient 2 is a 7-year-old male with tongue thrust habit and lip incompetency. Anterior crossbite and labioversion of lower anterior teeth with spacing were observed. As he showed CO-MI discrepancy during the bite and parafunctional habit, PreOrtho® Type 3, soft type was used for night wear and myofunctional therapy for tongue thrust habit was also accompanied. After 8 months of the treatment, anterior crossbite was successfully corrected and lower anterior space was closed. Tongue thrust habit also disappeared and lip competence was observed.

Conclusion : PreOrtho® was effective for interceptive orthodontic treatment in growing patients with parafunctional habit.



P-045

Orthodontic Treatment in a Patient with Congenitally Missing Mandibular Central Incisors

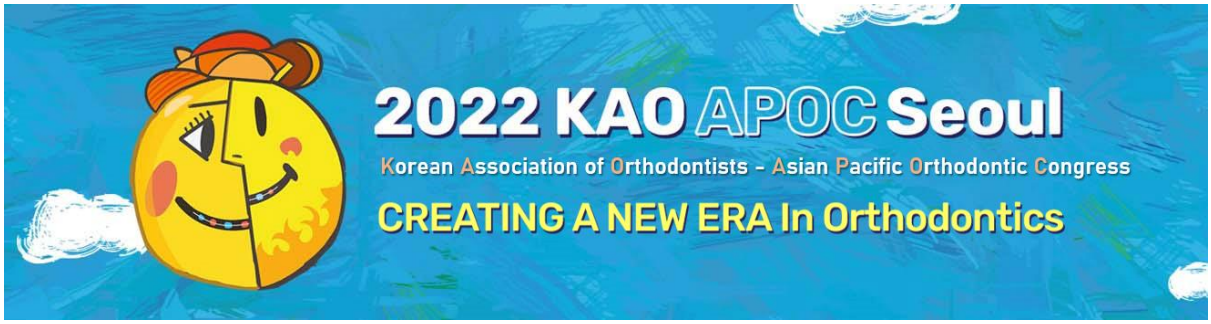
Kihyun Kim

Smile Design Dental Hospital

Introduction : In most orthodontic cases, mandibular incisor agenesis is a complicating treatment factor. The scientific literature has suggested 3 treatment modalities for mandibular incisor agenesis: (1) space opening for a fixed prosthesis or an implant; (2) teeth extraction in the opposite arch to reduce the overjet by retracting the anterior teeth; and (3) space closure by moving the mandibular canines and the posterior teeth forward. This case report presents the orthodontic treatment of a patient with congenitally missing mandibular central incisors. Three treatment alternatives were suggested by digital diagnostic setups.

Case Summary : A 19-year-old male patient presented with a chief complaint of congenitally missing mandibular central incisors. Two deciduous incisors remained on the missing area. The maxillary arch width was narrow and there was a mild crowding of the maxillary arch. Cephalometrically the patient had a skeletal Class III pattern. Facial photographs showed a straight profile and the patient wanted to keep his profile. Three diagnostic setups were suggested: (1) space closure by moving the mandibular lateral incisors, canines and the posterior teeth forward; (2) space leaving for a single implant on the central incisor and finishing 3-incisors case; (3) space opening for two implants on the lateral incisor area by moving the mandibular lateral incisors mesially. Plan (3) was determined. He had full-fixed orthodontic treatment with a mini-screw assisted rapid palatal expansion (MARPE) appliance and temporary anchorage devices (TADs). The orthodontic treatment took approximately 43 months (extended due to military service). The patient was satisfied with treatment outcomes.

Conclusion : For a patient with congenital missing teeth, there are several treatment alternatives. Creating digital multiple setups is helpful to communicate with a patient and determine treatment plan. By moving mandibular lateral incisors into missing central incisors spaces, placing dental implant in that position of the lateral incisor gives satisfactory results functionally and esthetically.



P-046

Growth Modification of Skeletal Class II Hyperdivergent Pattern with Mouth Breathing using Myofunctional Therapy

Sung-Jae Ahn[1], Hyein Ku[1], Minki Noh[2], Seunghyun Noh[3], Tae-Joon Park[4], Kyung-A Kim[1]

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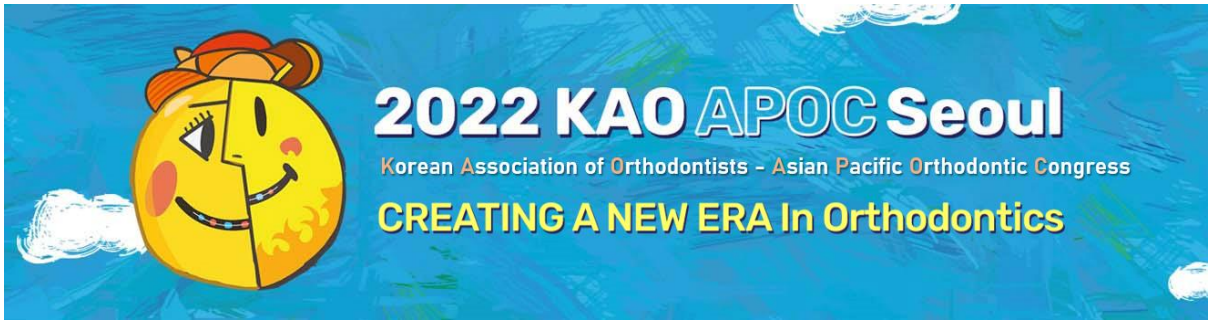
Introduction : In growing patients, it is usually accompanied by functional problems as well as structural problems which can affect the growth of the craniofacial. If the oral environment is out of balance due to mouth breathing, craniofacial deformities become severe. Therefore, it is important to diagnose the cause of problems differentially and to break the relationship between mouth breathing and skeleton by determining the appropriate timing and method of intervention. The purpose of this case is to show that treatment in growing patient with mouth breathing was achieved by the combination of myofunctional therapy(MFT) and miniscrew-assisted rapid palatal expansion(MARPE).

Case Summary : This patient was a 13-year-old male with anterior open bite, a history of adenotonsillectomy, and mouth breathing. Skeletal Class II malocclusion with narrow nasomaxillary complex, retruded mandible, hyperdivergent pattern, low tongue position, and mouth breathing was diagnosed. Non-extraction treatment using MARPE with vertical control and MFT was accompanied to expand the constricted maxilla to facilitate nasal breathing and to achieve lip competency and elevation of the tongue. As a result of treatment, open bite was resolved with spontaneous lip sealing. The electromyography test showed an increase in masseter muscle after treatment. Mouth breathing and tongue position were resolved with improved facial appearance.

Conclusion : In this patient, it was accomplished by combination of structural and functional improvement through MFT and orthodontic treatment with MARPE. Orthodontist's important role is to break the vicious cycle that leads to abnormal craniofacial development in growing patients.



P-047

Two-wire technique for anterior teeth alignment

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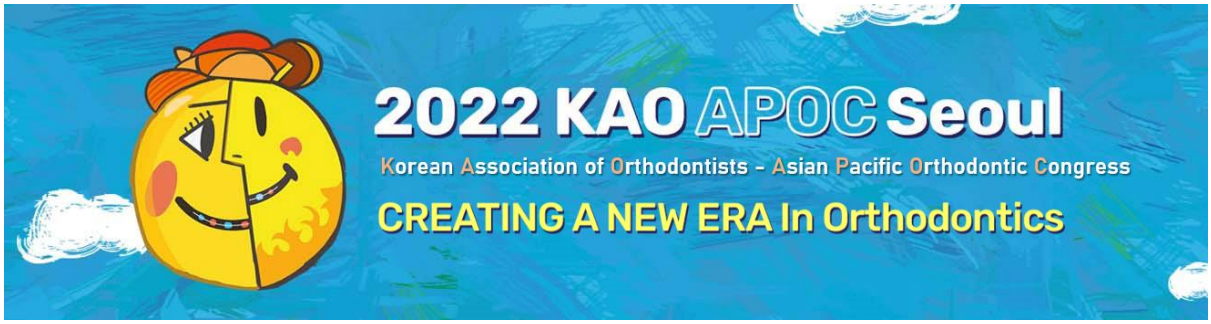
Introduction : Transparent clear aligner, which have fascinated patients who dislike brackets, have already been used for about 30 years. However, braces are not as effective as brackets, so patients still struggle with using them. Thinking that it is time to use a new device, this speaker is going to introduce a clinical case in which a new device system considering aesthetics while maximizing the advantages of brackets is applied when there is mild or moderate crowding in the lower anterior teeth. With a time difference on the labial and lingual side, only two niti wires were used to align the anterior part and replace it with a retainer after treatment.

Case Summary : How to use 1st WIRE
1. Attach a .008” or .010” thick coated E-wire to the labial side of the mandibular anterior teeth.
2. After attaching E-wire to all the teeth region with a flowable resin, melt the coating material with water to form a gap between the wire and the resin to allow the wire to operate.
4. After a certain period of time, if it is determined that partial reattachment is necessary, grind the resin in the area to expose E-wire. After applying the liquid coating agent developed by us to the exposed wire surface, put the resin in the correct position.
5. In the case of moderate crowding, it is difficult to accurately attach E-wire to the tooth surface at the beginning, so improve the tooth alignment by 70-80% through reattachment after a row of teeth is improved.

How to use 2nd WIRE
1. Use A 3D jig to accurately bond the Velodrom wire (fine tuning function) developed by us to the lingual surface of the mandibular incisors.
3. The attached Velodrom wire can be replaced with a retainer after completing a perfect row of teeth.



P-048

Non-surgical treatment with strategic premolar extraction in skeletal class III

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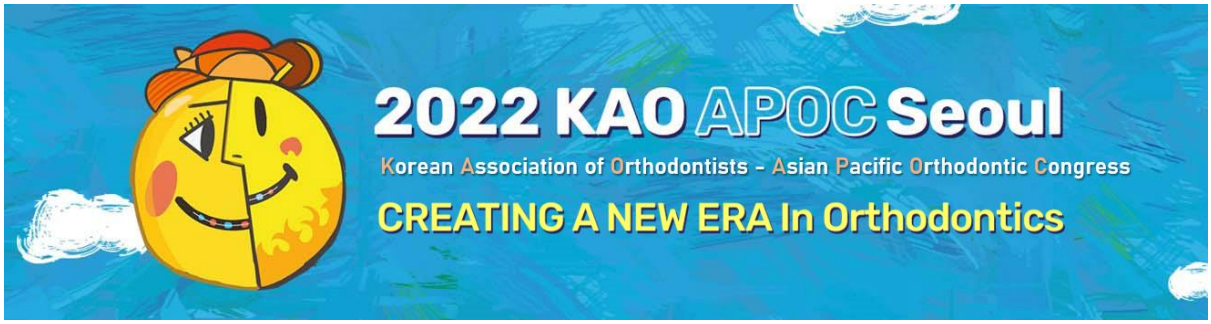
Introduction : With the introduction of skeletal anchors, the number of cases of non-surgical camouflage treatment of skeletal class III patients instead of surgical approach is increasing. In camouflage treatment of skeletal class Ill patients, formation of the proper position and inclination of the anterior teeth is an important factor influencing the satisfaction of the treatment along with the improvement of the molar relationship.

Case Summary : A 17-year-old male patient visited our clinic complaining of anterior crowding. He showed moderate skeletal class III relationship, severe Angle's Class III molar relationship. He had lingual inclination of the both incisors, severe crowding accompanied with anterior deep bite. We planned camouflage orthodontic treatment with extraction of premolars, which strategically position upper and lower incisors, and then improve the molar relationship based on anterior teeth. For the mandibular dentition, the first premolars were extracted, and mandibular canines were retracted from early stage to relieve crowding and to prevent labioversion of incisors, simultanously. For the maxillary dentition, leveling was performed first and then premolars were extracted for inducing labioversion of upper incisors. Afterwards, the maxillary molars were protracted with skeletal anchorage. In order to improve the position of the mandibular canine which showed severe distal inclination, reverse curve of spee and MEAW were used during the overall treatment period.

Conclusion : The incisor position, overjet and overbite control is a key factors in camouflage treatment of patients with skeletal class III relationship without worsening facial appearance. In skeletal class III camouflage therapy, it is thought that satisfactory treatment outcomes can be obtained if cases are appropriately selected and an effective treatment strategy is made.



P-049

One-phase versus two-phase treatment for Class II growing patients: A comparison of identical twins

Hyub-Soo Lee[1], Jane Cho[2], Eunhye Jang[3,4]

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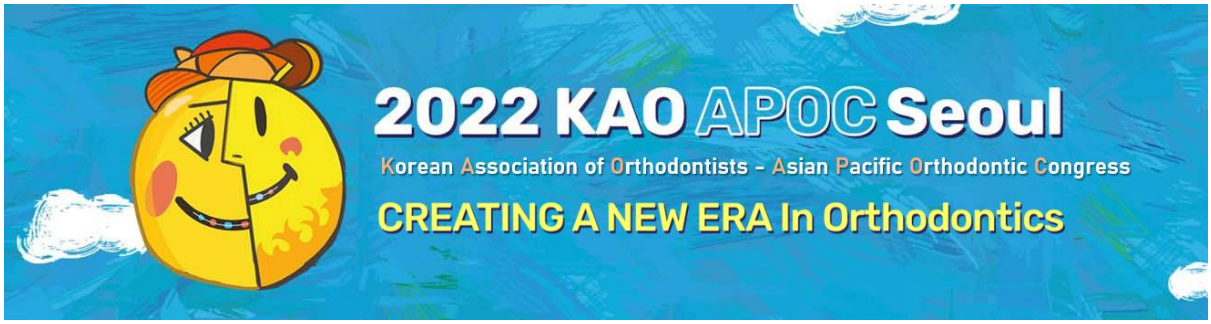
Introduction : There have been lots of debates about the effects of functional appliances on increasing mandibular length in patients with mandibular retrusion. The following twin cases would help us understand the effects of different treatment modalities (one-phase vs two-phase) on genetic traits.

Case Summary : The patients were twin boys (A and B) 11 years 1 month at the start of treatment. Patients showed a skeletal Class II with retruded mandible and normal growth pattern. Even though they were identical twins, they had slightly different skeletal and dentoalveolar representations, especially in the mandibular length and shape. Patient A with a normal ANB was treated with one-phase treatment using fixed orthodontic appliances and Class II elastics. Patient B who had a smaller and retruded mandible, was treated with two-phase treatment using an activator and anterior high pull headgear combination followed by fixed orthodontic appliances. The results showed equal mandibular length of the twins, whereas noticeable differences in anterior facial height, palatal plane angle, occlusal plane angle, and mandibular plane angle were present. All of these were maintained when the patients the reached their growth end-stage (R-I stage) at the age of 13 years and 9 months.

Conclusion : Identical twin patients were treated with one-phase and two-phase treatment depending on the degree of skeletal discrepancy. In two-phase treatment, although it had a minor effect on true mandibular growth, it is supported that functional appliance in class II malocclusion might have combination effects by affecting the maxilla, glenoid fossa, and dentoalveolar structures.



P-050

Treatment of anterior open bite with ICR : A case report with stable results.

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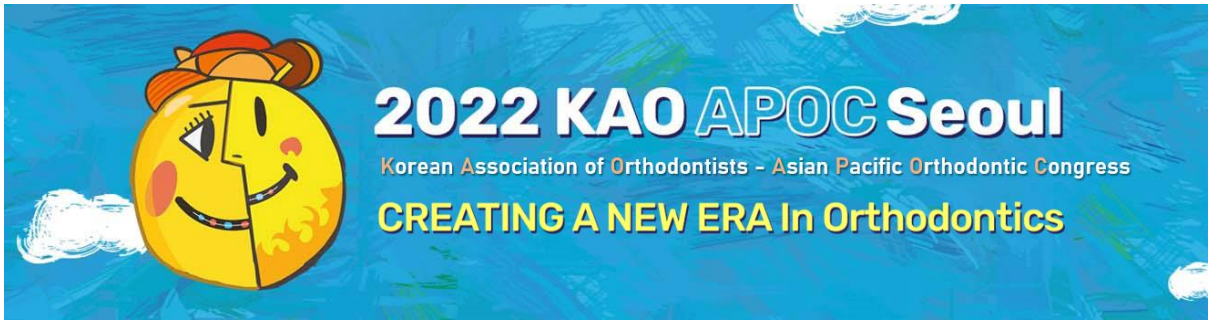
Introduction : Idiopathic condylar resorption (ICR) is characterized by progressive resorption of the TMJ condylar heads. Although the exact cause is unknown, several possibilities have been proposed, such as increased mechanical loading on TMJ. ICR can create occlusal and skeletal instability, dentofacial deformities, TMJ dysfunction, and pain. Orthodontic treatment along with an occlusal splint is considered quite effective for managing ICR.

Case Summary : A 16-year-old man presented with the chief complaint of lip protrusion and anterior open bite. Bone scan showed bone changes of both condylar heads. The cephalometric and clinical analysis showed a skeletal Class II, dental Class II relation with anterior open bite. Before the orthodontic treatment, a stabilization occlusal splint was placed to stabilize condylar position in the mandibular fossa. After he confirmed there is no discomfort in TMJ, no occlusal point change showed on splint and there is no degenerative progress on TMJ CT, maxillary arch was expanded with miniscrew assisted RPE. Then the four premolars were extracted and miniscrews were used for bimaxillary molar intrusion. After orthodontic treatment, the overbite increased and the molar relationships changed to Class I on both sides. At 2-year follow up, there was slight anterior bite opening but normal overjet and overbite was retained.

Conclusion : Bimaxillary molar intrusion along with an occlusal splint can be used to treat patients with ICR and anterior open bite. It is thought that ICR ceased probably because the load on the condyle was reduced by the occlusal splint. Bimaxillary molar intrusion with miniscrews leads anterior open bite closure, mandibular counterclockwise rotation and Class I molar relationship. The result of treatment is stable without severe relapse.



P-051

Longterm follow-up after treatment of an impacted canine: a case report

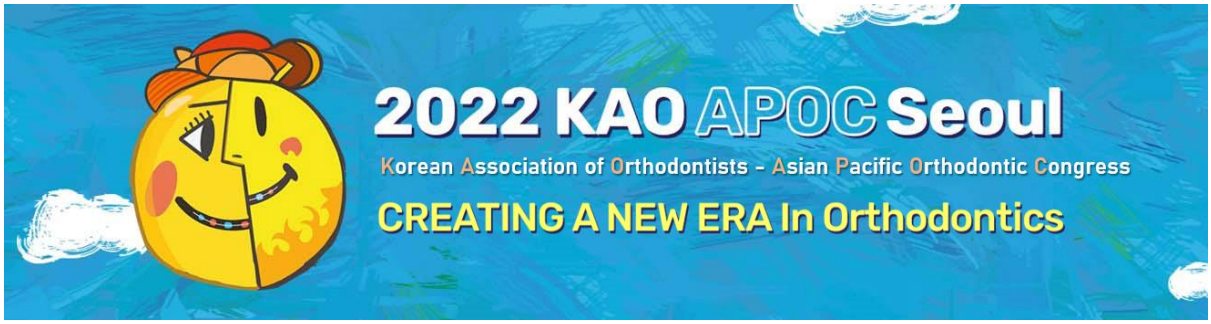
Sang Hee Hwang

Keimyung University Dong San Hospital

Introduction : In orthodontic practice, impaction of canines is a frequently encountered clinical problem. Following the third molar, the canine is the most frequently impacted tooth.
After orthodontic treatment, some teeth undergo external root resorption due to various factors. Root resorption is also commonly encountered problem.

Case Summary : A 14-year-old boy was referred from local dental clinic for the treatment of an unerupted permanent maxillary canine. He had short roots of maxillary central incisors. The patient and his parents were notified the problem of short roots and root resorption.
An ordinary surgical traction has successfully ended.
After 15 years of follow-up, root resorption of maxillary central incisors was revealed by periodically radiographic examination. But, the morphology of shortened root has been stable for many years.

Conclusion : Root resorption is defined as a condition associated with either physiologic or pathologic process resulting in the loss of dentine, cementum, or bone. Root resorption is the second most common unfavorable consequence of orthodontic treatment after white spot lesions of the enamel.
The etiology and pathogenesis of root resorption are not completely revealed.
But, the orthodontists can detect root resorption early by periodic radiographic examination if they pay a little more attention and, shortened roots may be maintained in a stable state with close observation.



P-052

Long-term follow up of post operative orthodontic treatment after codylectomy for condyle osteochondroma

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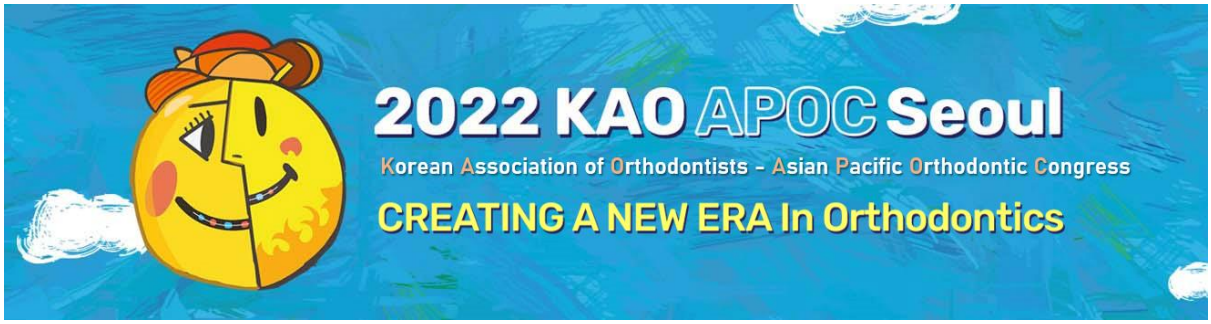
[1]Department of Orthodontics, School of Dentistry, Jeonbuk National University
[2]Institute of Oral Bioscience, Jeonbuk National University

Introduction : Osteochondroma is a rare benign tumor on mandibular condyle, which gradually enlarges and causes displacement mandibular position, mouth opening limitation, and severe facial asymmetry. Comprehensive diagnosis and treatment is essential considering clinical symptoms and radiological findings, three-dimesional analysis through CBCT, etc. And longterm observation of condyle remodeling and subsequent occlusal changes after orthodontic treatment following condylectomy is required.

Case Summary : A 34-year-old female patient visited clinic complaining of a misaligned mandible and difficulty in mastication after left condylectomy for osteochondroma. The radiograph showed a skeletal Class II relationship, and clinical examination showed crowding on both dentition, cross bite of right molar, anterior open bite, and maxillary and mandibular dental midline were displaced to the left and right respectively. A PLA(Precision Lingual Arch) was use for right mandibular cross bite through unilateral arch constriction on lower right molar, and then elastics were used to improve the anterior open bite and posterior transverse relationship. After 13 months treatment stable occlusion was obtained clinically. Radiographycally, condyle bone resorption rate was confirmed to be slowed and cortical bone ossification on left conyle was observed. After debonding, 6 year follow up was carried out annually, it was confirmed that condyle position and a occlusal relationship remain stable.

Conclusion : In this case, proper occlusion and facial appearance were improved with post-operative orthodontic treatment following condylectomy, After 6 year follow up stable codyle position and occlusion was maintained. However, it is difficult to predict accurately the amount of morphological change and resorption due to condyle remodeling after osteochondroma removal, and studies on long-term stability are rare. So, orthodontists should be active on cheking and coping with on condyle remodeling and occlusal changes by continuous long-term follow-up.



P-053

A treatment using facemask and MSE in a patient with severe crowding and anterior crossbite

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[1]SMILE E ORTHODONTIC CLINIC
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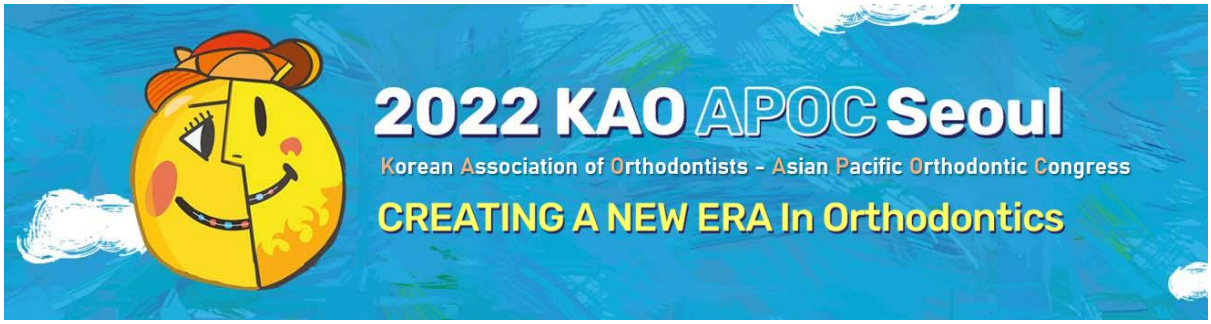
[3]L Dental clinic

Introduction : In patients with anterior crossbite, various functional devices and fixed appliances with elastic and TAD are used for treatment. If a patient with a crossbite shows severe dental crowding, the orthodontist considers orthodontic treatment with premolar extraction. However, in patients with skeletal III pattern, orthodontic treatment with premolar extraction has the following two problems. 1. Lingual inclination of anterior teeth, 2. Relative chin protrusion according to anterior teeth retraction. Therefore, caution is required for premolar extraction in patients with class III malocclusion. Patients with skeletal III malocclusion also have transverse disharmony between upper and lower arch. In such cases, expanding the maxillary arch helps to increase the stability of the occlusion later.

Case Summary : A 12-year-old male patient with severe crowding in which the maxillary canines cannot be erupted. This patient had an anterior crossbite and a skeletal class III malocclusion with excessive mandible. As a treatment plan, it was decided to first improve the anterior crossbite by using a facemask, and then use MSE(Maxillary skeletal expander) to expand the maxilla and create a space for teeth alignment in the maxillary arch. In case of orthodontic treatment with premolar extraction for Class III malocclusion, severe lingual inclination of the mandibular incisors may occur. I decided to proceed with non-extraction for fixed orthodontic treatment. In addition, a chin-cap was used as an adjunct to control the growth of the mandible during fixed orthodontic treatment.

Conclusion : In this clinical case presentation, I introduced a treatment that avoids the disadvantages of orthodontic treatment with premolar extraction in patients with anterior crossbite and severe dental crowding. Stable dental class I occlusion was achieved in a growing patient by using facemask treatment to improve some skeletal effects and anterior crossbite, and MSE device to expand the maxillary arch and create teeth alignment space.



P-054

Improvement of obstructive sleep apnea in a child with Down syndrome with rapid palatal expansion

Ahhyeon Kim, Jungki Moon, Seungwoo Song, Fahad Almehizia, Yoonjeong Choi

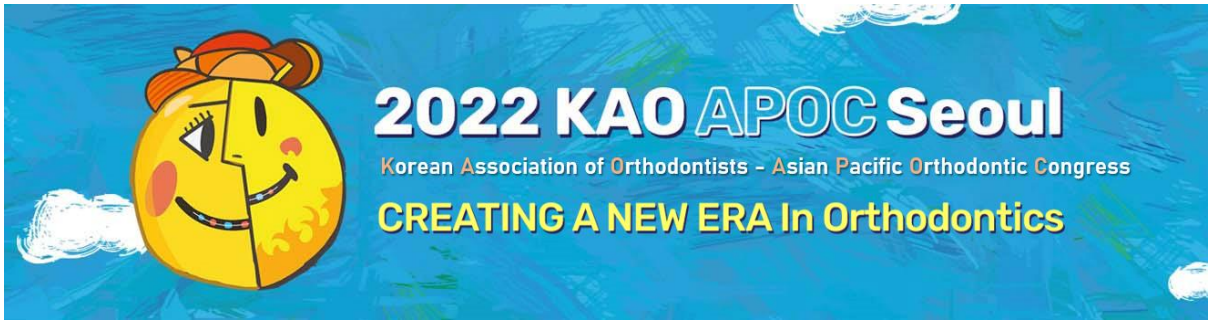
Department of Orthodontics, The Institute of Craniofacial Deformity, College of Dentistry, Yonsei University

Introduction : Children with Down syndrome (DS) are more susceptible to obstructive sleep apnea (OSA) than those without DS. The patient in this report had the typical orofacial features of DS and severe OSA. However, most treatment options for OSA are less effective or less viable for children with DS. Rapid palatal expansion (RPE) with a fixed orthodontic appliance can be a viable alternative for DS patients because it contributes to dilating the airway without patient's adherence.

Case Summary : A 15-year-old boy presented typical orofacial characteristics of DS, including midfacial hypoplasia, prognathic facial profile, low nasal bridge, and narrow palate. Polysomnography (PSG) revealed a total obstructive apnea/hypopnea index (OAHI) of 46.2, sleep efficiency of 62.1%, and arousal index of 40.9, and he was diagnosed with severe OSA. Continuous positive airway pressure (CPAP) is a non-invasive and effective treatment method; however, it was not considered for this patient due to his adherence. Instead, maxillary expansion was selected for dilatation of the upper airway.

After maxillary expansion through RPE, the most notable change was improvements in his OAHI, sleep efficiency, and arousal index, and he was subsequently diagnosed with mild OSA. The orthodontic changes were also remarkable. The maxillary expansion resulted in improvement of the transverse discrepancy, crowding, and posterior crossbite. Also, the movement of the maxillary molars allowed backward movement of the mandible, thus improving his prognathic profile.

Conclusion : Patients with OSA and DS rarely exhibit good adherence to conventional OSA treatment modalities. RPE can be a viable treatment option for both OSA and malocclusion in patients with DS because it is effective in resolving both sleep and orthodontic problems without patient's adherence.



P-055

Treatment strategies for mandibular 3 incisors

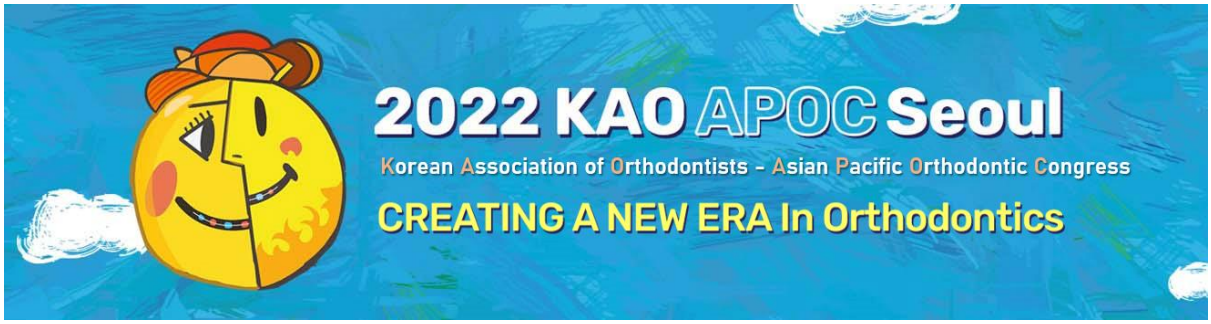
Sumin Hong, Jae-Sung Choi, Seung-Cheol Song, Sun-Hyung Park

Department of Orthodontics, The Institute of Craniofacial Deformity, College of Dentistry, Yonsei University

Introduction : The causes of mandibular 3 anterior teeth include traumatic, infectious, hereditary, or phylogenetic, and there are various treatment strategies. This case report is intended to examine the considerations and treatment strategies for mandibular 3 incisors, and to introduce successful cases of orthodontic treatment for patients with 3 mandibular incisors.

Case Summary : The first case, a 17-year-old female, was a skeletal Class III patient with congenital missing of #32. She was treated with 2-jaw surgery with extraction of #12.
The second case, a 32-year-old female, was a skeletal Class II patient with missing of #32 due to trauma. She was treated with implant restoration in the missing tooth area. As a result, treatment was completed with the Class I key for both canines and molars.
The third case, a 14-year-old female, was a skeletal Class I patient with congenital missing of #42. She was treated with extraction of #12, 22 and closure of lower spaces by retraction of the mandibular incisors.

Conclusion : The causes of mandibular 3 anterior teeth are various, and in order to obtain aesthetic and functional treatment results, factors such as type of skeletal discrepancy, tooth size and ratio, aesthetic must be considered. In orthodontic treatment for patients with mandibular 3 incisors, there are the following treatment strategies to obtain a stable occlusion: close the missing lower incisor spaces, create a space for prosthetics in the place of the missing incisor, or extract maxillary premolars or lateral incisors.



P-056

Orthodontic traction of three-impacted teeth after periodic decompression of a severe dentigerous cyst:a case report

Ju-Heon Lee[1], Tae-Hyun Choi[1], Pil-Young Yun[2], Nam-Ki Lee[1]

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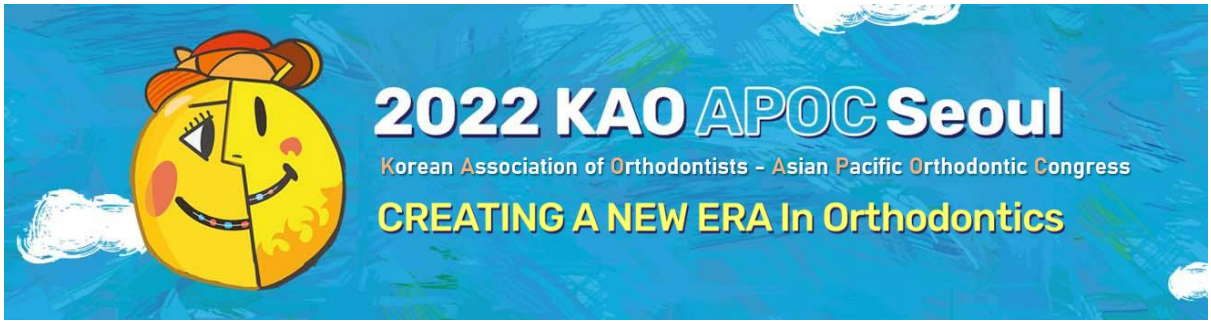
[2]Epartment of Oral and Maxillofacial Surgery, Seoul National University Bundang Hospital

Introduction : Dentigerous cyst is an odontogenic cyst that occurs in an unerupted tooth crown. Dentigerous cysts are associated with impacted teeth and occur most frequently in the 3rd molars, maxillary canines, and mandibular 2nd premolars. Treatments modalities of the cyst are mainly enucleation, marsupialization, and de-compression. This report presents a case of orthodontic traction after periodic decompression of a large cyst to induce spontaneous drifting of severely displaced teeth and preserve bone.

Case Summary : A 10-year-old male patient visited the department of Oral and Maxillofacial Surgery and Orthodontics with a chief complaint of a mandibular bone lesion. The patient was diagnosed with delayed eruption and impaction of the left mandibular canine and premolars due to a dentigerous cyst. The left mandibular canine and second premolar were displaced to the inferior border of the mandibular body. Firstly, decompression of the cyst was performed using aspiration to minimize damage to bone and nerves and induce the positional change of severely displaced teeth. Aspiration was carried out every 2~4 weeks for one and half years. As the size of the cyst decreased and the position of the displaced canines and premolars improved, their surgical window opening and orthodontic traction were performed with a modified lingual arch. After successful traction of three impacted teeth, orthodontic treatment using a fixed orthodontic appliance was accomplished to establish appropriate occlusion.

Conclusion : Timely intervention and careful surgical-orthodontic management in a patient with multiple teeth impaction due to a large dentigerous cyst resulted in the successful improvement of oral function and occlusion with minimal trauma.



P-057

Surgery First Orthognathic Treatment in Skeletal Class III with Asymmetry

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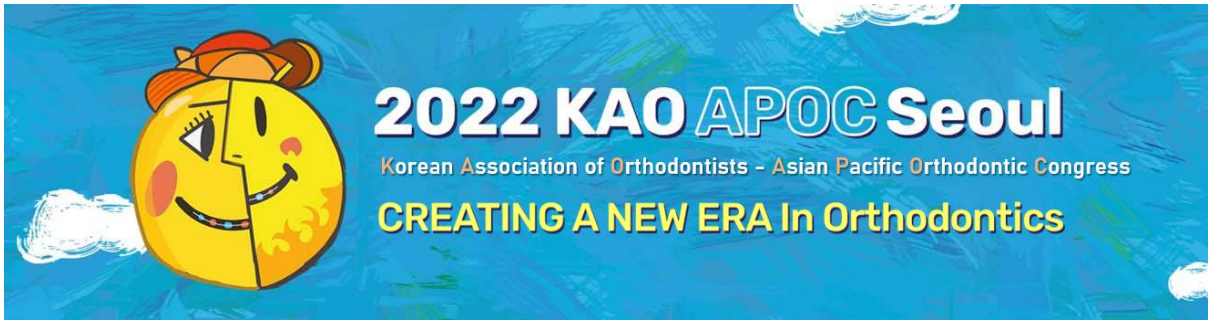
Department of Orthodontics, School of Dentistry, Seoul National University

Introduction : Surgery-first orthognathic treatment has been introduced to shorten the treatment duration as well as to prevent deterioration of the facial profile during pre-surgical orthodontic treatment. Post-surgical orthodontic treatment became more important for surgery-first orthognathic treatment. To achieve stable occlusion, challenging procedures including decompensation, de-crowding and resolution of asymmetry are required. Here, we present a patient with skeletal Class III malocclusion with severe asymmetry who was successfully treated after orthognathic surgery followed by a demanding post-surgical orthodontic treatment.

Case Summary : An 18-year-old female patient visited the Department of Orthodontics at SNUDH with a chief complaint of lower jaw protrusion with asymmetry. The patient's facial profile was skeletal Class III, chin point was deviated 10mm to the right, and the mandible canted down to the right side. Surgery-first treatment was planned because the patient wanted to improve her facial profile before entering college. Posterior impaction and canting correction of the maxilla were achieved by Le Fort I segmental osteotomy, and setback of the mandible by intraoral vertical ramus osteotomy.
Immediately after the surgery, dental midlines of the maxilla and mandible were deviated to the right from facial midline by 4mm and 6mm, respectively. To correct the midline, mini-implants and segmented palatal appliance were used. Mini-implants were placed at the left side of the maxilla and mandible. Segmented palatal appliance with elastomeric chain to the mini-implant was used to distalize the left posterior teeth of the maxilla. At debonding, the Class I canine and molar key was obtained. The midlines of the maxilla and mandible were aligned with the facial midline.

Conclusion : Surgery-first orthognathic treatment can improve facial profile in a shorter period of time, while post-surgical treatment can become challenging. By applying appropriate technique and appliance, challenges of surgery-first orthognathic treatment may be overcome and successful results can be obtained.



P-058

Camouflage Treatment of Class III Malocclusion with Impacted Maxillary Canine.

Jo Yeon Hwang[1], Jong Ghee Kim[1,2], Young Mi Jeon[1,2]

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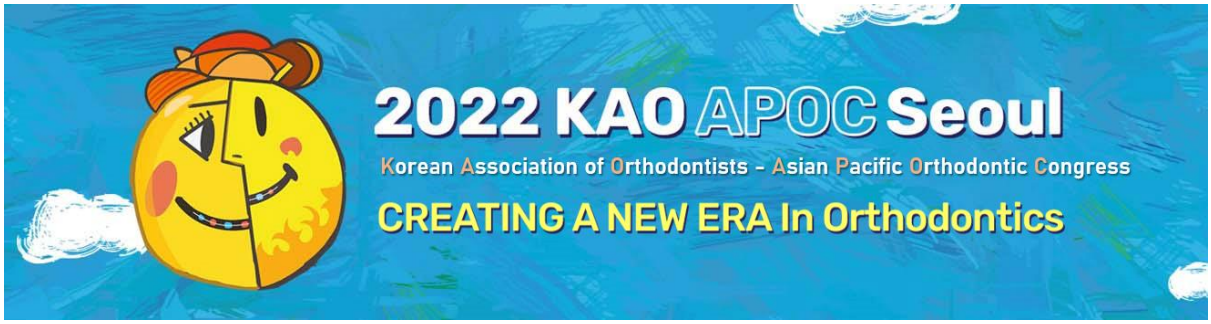
[2]Institute of Oral Bioscience, Jeonbuk National University

Introduction : The maxillary canine is functionally and aesthetically important in the dental arch. The prevalence of impaction of maxillary canines was 0.8~5.2%, showing the highest prevalence excluding maxillary and mandibular third molars. An impacted tooth requires treatment as it can cause root resorption of adjacent teeth, decrease in dental arch length and the potential for cyst formation. Extraction, autograft, and orthodontic traction may be considered for the treatment of impacted teeth. In this case, considerations for orthodontic traction of an impacted maxillary canine will be discussed.

Case Summary : 20-year-old women, who had chief complaint of impacted maxillary canine with transverse discrepancy, crowding and Angle's Class III molar relationship visited dental clinic. Impacted canine was evaluated using CBCT. Skeletal expansion was carried out to resolve transverse discrepancy and secure space for orthodontic traction and arrangement of impacted canines. Orthodontic traction was carried out using a closed technique after surgical exposure at the alveolar crest. For the antero-posterior discrepancy, distalization of mandibular dentition and Class III elastic were used.

Conclusion : For the treatment of impacted teeth, orthodontist consider the appropriate surgical method and orthodontics traction method by identifying the three-dimensional position of the impacted tooth, such as the location, inclination, and relationship with adjacent teeth, through clinical and radiological examination. The root of the impacted tooth was located on the lateral wall of the maxillary sinus, and the crown on the palatal side. A closed technique was used to preserve the attached gingiva during orthodontic traction of the canine. Torque control was actively carried out in the traction and arrangement process. Long-term observation for the canine and attached gingiva seems to be necessary.



P-059

Nonsurgical treatment by intrusion of posterior teeth on open bite patient

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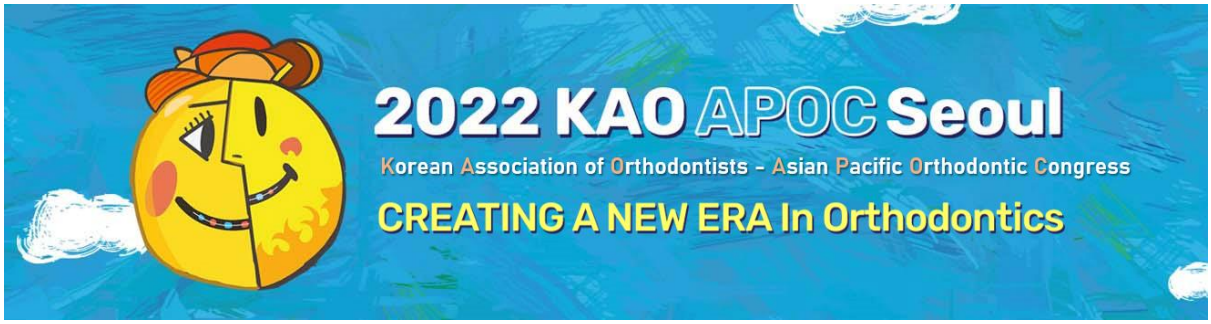
Introduction : Open bite treatment options include functional or bad habits removal, orthopedic treatment, orthognathic surgery, orthodontic treatment. The miniscrew is a skeletal anchor that is implanted in the alveolar bone, and it enables posterior teeth intrusion to achieve similar treatment results to those of orthognathic surgery. In this case, we would like to report a case of non-surgical orthodontic treatment on an open bite patient using a miniscrew for posterior teeth intrusion.

Case Summary : The case was a 22-year-old female who visited the hospital for anterior open bite. The patient complained that an open bite occurred after TMD splint treatment. Skeletal class I, Angle's Class III molar relationship, shallow buccal overjet of the left dentition, and #42 congenital missing were observed. In order to solve the list of chief complain and other problems, comprehensive orthodontic treatment was planed with upper and lower molar intrusion. Intrusion was performed by placing 6mm miniscrews on the mid-palate and the buccal area of maxillary and mandibular molars. To prevent crossbite of the posterior dentition, the mandible was constricted using the precision lingual arch. After completing leveling and intrusion, the occlusion was established with Class III and up & down elastics.

Conclusion : With the introduction of miniscrew, vertical control of the posterior dentition has become relatively convenient, and open bite can be easily treated without orthognathic surgery. In the case of posterior intrusion, the occlusal force acts as a force to suppress relapse, and it is considered a desirable treatment method because of its high stability. Therefore treatment of open bite through posterior intrusion using miniscrew can be a useful treatment method if an appropriate case is selected, and long-term follow-up for stability is required.



P-060

Orthodontic treatment of horizontally impacted mandibular molars using miniscrew

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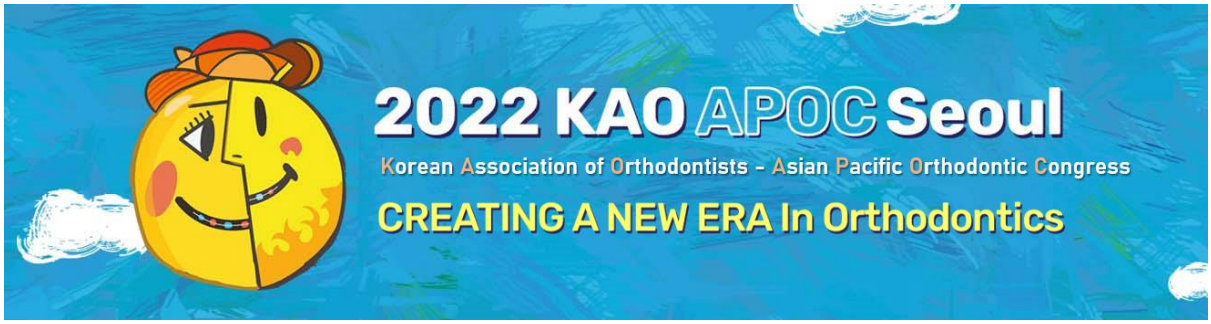
Introduction : Impaction of molar can cause various problems such as posterior open bite, inclination of adjacent teeth and a short lower facial height. Treatment of impacted molars requires surgical reposition or orthodontic traction and orthodontic traction using miniscrew can be helpful if the impaction depth is too deep or in a position that is difficult to surgically extract. Therefore, this presentation introduces a case in which deeply horizontally impacted mandibular 1st and 2nd molars were treated by orthodontic traction using surgical exposure and miniscrew.

Case Summary : A 12-year-old male was referred from DNMS with the problems of the 1st and 2nd molar impaction on the left side of the mandible. The patient was observed to have skeletal and Angle Class II relationship and a normal growth pattern. The treatment plan was surgical exposure of the mandibular 1st and 2nd molar after the extraction of the 3rd molar, and sequentially orthodontic traction and intrusion of the left extruded maxillary teeth using miniscrew. The total treatment period took 3 years and 1 month. After completion of orthodontic treatment, the impacted mandibular molars were uprighted and a good occlusion was formed.

Conclusion : Successful treatment results can be obtained if appropriate diagnosis and treatment are made for the mandibular 1st and 2nd molar that have been deeply impacted. If the molar doesn't emerge at the time of a normal eruption period, a close evaluation should be made and treatment should be involved. In this case, when the 3rd molar are present together, it is possible to apply a distal and vertical force to the severely mesial and horizontal impacted 1st and 2nd molar by using a miniscrew together with surgical extraction of the third molar. Therefore, the design of appropriate anchorage and mechanism is necessary to achieve successful treatment results when orthodontic traction of the impacted molar.



P-061

Orthodontic Treatment of Class II Adolescent Patient with Large Overjet and Deep Bite

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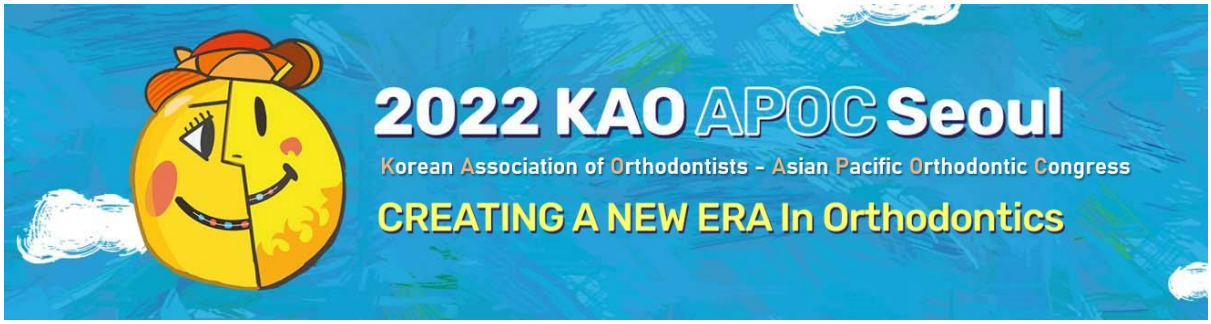
Introduction : Deep bite can have detrimental effects on abnormal mandibular function, tooth abrasion, temporomandibular joint disorder and mandibular growth potential. Even in patients with normal mandibular growth potential, malocclusion may be aggravated by a deep bite. According to Baccetti's study, orthodontic treatment is needed to correct deep bite in growing patients, as the average overbite reduction is 1.3 mm on average without orthodontic treatment. Proffit said that rapid growth of the mandible can occur when deep bite is corrected, and Woods said that anterior growth of the B point can be expected when the deep bite is improved. In this case, a Class II malocclusion patient with large overjet was treated based on natural growth of the mandible through improvement of deep bite problem in a growing patient.

Case Summary : A 12-year-old boy who had chief complaint of large overjet with deep bite and Angle's Class II molar relationship visited dental clinic. Anterior bite plate was used for molar extrusion. After improvement of vertical relationship, it was observed that mandibular growth occurred without change of mandibular plane angle. A decrease in overjet was observed with the anterior growth of the mandible. Fixed functional appliance was used and distalization of maxillary dentition was carried out because patient cooperation was not good.

Conclusion : Deep bite correction in growing patients allows the potential growth of the mandible and form an improved skeletal relationship. Improvement of skeletal relationship by growth can simplify the problem of orthodontic treatment. The orthodontist must carefully establish a treatment plan based on the residual growth when treating a growing patient. In addition, long-term observation is necessary in consideration of the possibility of occlusion change due to growth.



P-062

Retreatment of Skeletal Class II Malocclusion Patient with Gummy Smile and Deep Bite Using Mini-screws.

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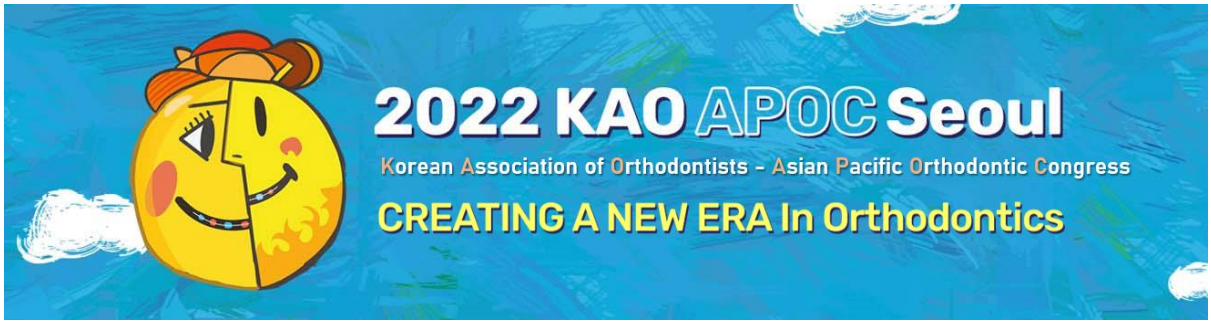
Yena Orthodontic Clinic

Introduction : If a treatment plan includes an extraction in lip protrusion and gummy smile patient, careful treatment plan is required to ensure appropriate torque control of anterior teeth after retraction. Also, making a treatment plan a patient who already had orthodontic treatment is more challenging. Therefore accurate evaluation of present illness and proper biomechanics should be applied for retreatment to prevent additional problems.

Case Summary : We report the case of a 23-year-old woman who had a skeletal
Class II malocclusion, deep bite and gummy smile. Previously, the patient had a orthodontic treatment history with extraction of both maxillary and mandibular first premolars in local clinic 4 years ago due to lip protrusion. To correct the excess of upper incisor exposure and anterioposterior problems, we totally intruded and retracted maxillary anterior teeth with mini-screws. After retreatment, we could establish proper occlusion and anterior teeth relationship including overjet and overbite. Also, smile line was improved.

Conclusion : Retreatment of the skeletal Class II malocclusion patient was performed to correct the patient's deep bite and gummy smile. Aesthetic and functionally satisfactory results can be obtained by accurate diagnosis and proper treatment mechanics. Otherwise, improper diagnosis and treatment mechanics would result in unfavorable results such as bowing of dental arch and inappropriate torque on anterior teeth during orthodontic space closure.



P-063

Oocclusal Plane Control in a Class II Division 2 Patient

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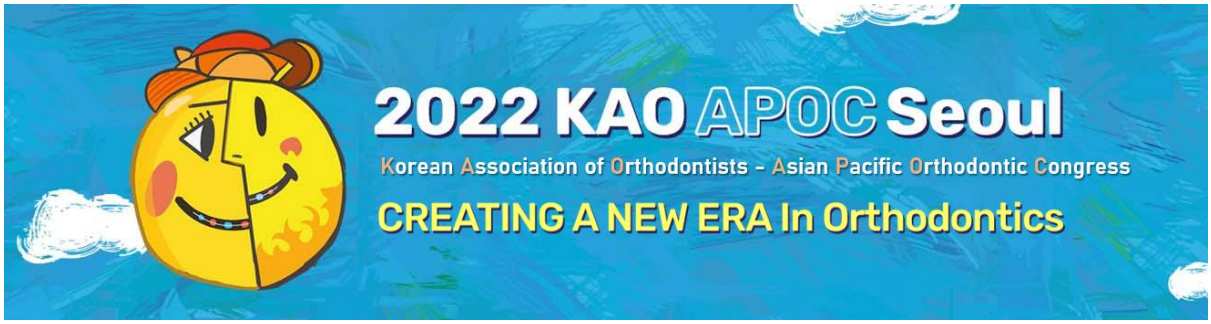
Introduction : Treatment of Class II division 2, represented by anterior deep bite and severe curve of spee in a mandible, is considered as a challenge for orthodontists. Especially, in a case of an adult without growth, extrusion of teeth during leveling may cause clockwise rotation of mandible, which leads to difficulties in establishing class I key resulting in prolonged treatment period. However, a significant development of biomechanics with temporary anchorage device (TAD) enables orthodontists to obtain desired tooth movement, thereby enabling more efficient treatment.

Case Summary : A 24-year-old woman exhibited skeletal and dental class II relationship, mild crowding, severe deep bite, curve of spee, peg lateralis, and posterior cross bite in right side second molars. Due to patient's desire for non-extraction treatment, we had to find ways to avoid extraction.
At first, severe deep bite allow approach only to maxillary dentition. After leveling of maxillary arch and correction of crossbite between second molars, total arch Intrusion was performed using TADs considering center of resistance of dentition. Additional force for distalization of maxillary arch was applied and leveling of mandibular arch was started. The extrusion of mandibular molars was allowed to resolve the curve of spee, as it was expected that the intrusion of maxillary tooth would compensate and not affect to vertical dimension. These movement of teeth (Maxillary arch: intrusion and distalization, Mandibular arch: molar extrusion and incisor intrusion) resulted in clockwise rotation of occlusal plane, without any changes of vertical dimension. Total treatment period was 29 months and favorable outcomes were obtained.

Conclusion : Rotation of occlusal plane, carefully planned movement with TADs, could be an alternative non-extraction treatment option for class II division 2 patients.



P-064

Orthodontic Uprighting of Completely Impacted Mandibular Second Molars

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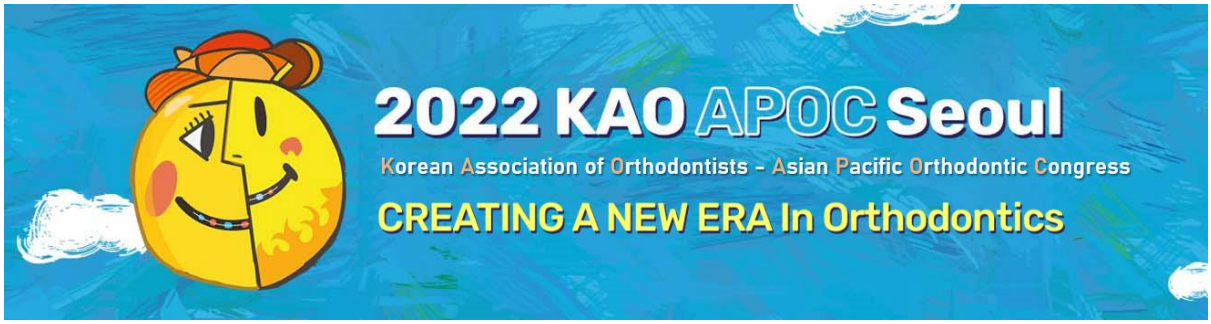
Introduction : Impaction of the mandibular second molar is known to be very rare, and bilateral impaction is even rarer. Known causes of impaction include a physical barrier in the path of eruption, an unusual orientation of the tooth germ, early loss of the first molar, or premature eruption of the third molar. The purpose of this report is to introduce a method of uprighting horizontally impacted mandibular second molars by using mini-implants placed in the extraction socket of third molars.

Case Summary : A 20-year-old female presented with the chief complaint of impacted mandibular right and left second molars. Both mandibular second molars were completely horizontally impacted, and both mandibular third molars fully erupted with mesial angulation. After the extraction of the mandibular left third molars, an orthodontic mini-implant was placed in the extraction socket. On the right side, a mini-implant was placed distal to the extraction socket of the third molar. Buttons were bonded to the occlusal surface of both mandibular second molars. Two mini-implants were placed on the palatal side for maxillary molar distalization to correct the Class II molar relationships and the maxillary anterior crowding. When mandibular second molars were exposed into the oral cavity by uprighting, simple tubes were bonded and a NiTi wire segment was placed for more uprighting and finishing. Treatment was completed using simple tubes and buccal tubes, and brackets were used only for maxillary second premolars.

Conclusion : Horizontally impacted second molars can be uprighted using mini-implants placed in the extraction socket of third molars. Finishing after molar uprighting with mini-implnat can be achieved using simple tubes.



P-065

Orthognathic Surgery Treatment in a Patient with Canting-type Facial Asymmetry and Transverse Discrepancy

Seung Eun Baek, Jeong Hwa Cho, Aerin Choi, Sung Hun Kim, Yong Il Kim, Seong Sik Kim, Soo Byung Park

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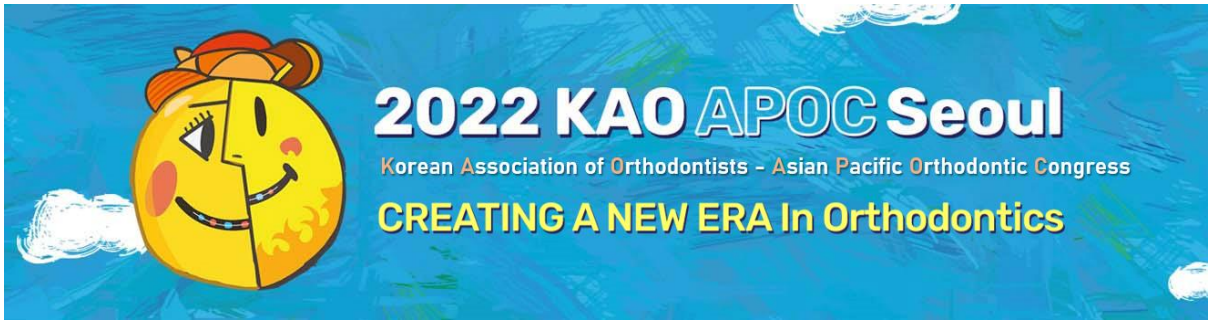
Introduction : Facial asymmetry often causes aesthetic problems as well as functional problems. The orthognathic surgery may be required for improvement depending on the degree of skeletal discrepancy. This paper introduces a case of orthognathic surgery in a patient with canting-type facial asymmetry and transverse discrepancy.

Case Summary : An 18-year-old female patient had a mandibular prognathism and canting-type facial asymmetry. Transverse discrepancy and compensatory extrusion of the left mandibular posterior teeth were observed. In order to improve the transverse discrepancy, the maxilla was expanded using miniscrew-assisted rapid palatal expander (MARPE). For the intrusion of the left mandibular posterior teeth, bite raising was performed. Then, 2-jaw orthognathic surgery was performed to correct facial asymmetry and mandibular prognathism. The detailing and finishing process including space closure was continued during postoperative orthodontic treatment. After postoperative orthodontic treatment, midline deviation was corrected and dental midline was coincided with facial midline. Also, canting-type facial asymmetry was successfully corrected by eliminating dental compensation. In addition, Class I canine and molar relationship was achieved and no skeletal relapse tendency was observed during retention period.

Conclusion : In patients with facial asymmetry, skeletal discrepancy and dental compensation should be accurately evaluated with 3D CBCT. In case of canting-type facial asymmetry, vertical decompensation is necessary. To achieve improvement in facial asymmetry, the orthognathic surgery should be performed after dental decompensation.



P-066

How To Improve The Canting Of Maxillary Occlusal Plane In Patients With Asymmetry

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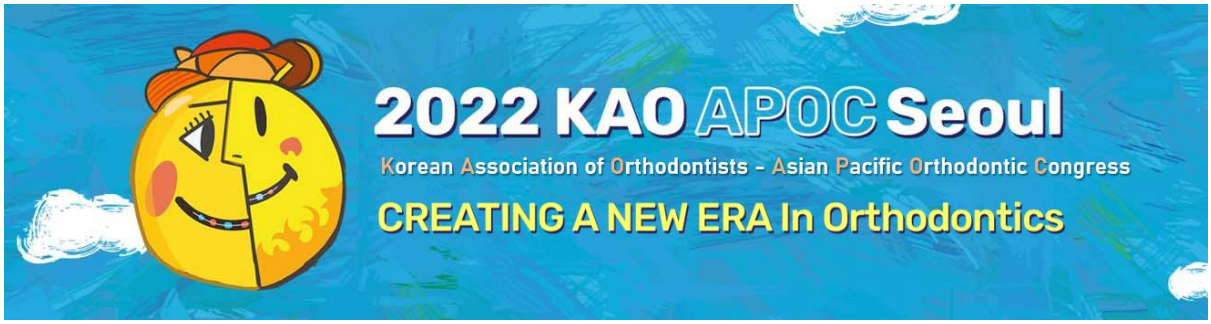
Introduction : In patients with malocclusion with severe asymmetry, there is not only lateral asymmetry, but also a difference in left and right vertical heights. If a canting of occlusal plane exists before surgery, it can be resolved with orthognathic surgery or postoperative orthodontic extrusion. The two cases were presented as case presentations.

Case Summary : we present 2 patients with facial asymmetry.
Both patients had severe asymmetry and a canting of occlusal plane was present.
One patient underwent 1-jaw surgery to improve skeletal malocclusion after preoperative orthodontics. During preoperative orhodontics, active canting correction through unilateral intrusion was not performed. In order to correct the asymmetry, the operation was performed leaving a unilateral posterior open bite, and the posterior open bite was resolved through postoperative orthodontic extrusion.
One patient underwent 2-jaw surgery to improve skeletal malocclusion after preoperative orthodontics. In order to improve the asymmetry, Lefort I surgery and segmental osteotomy were performed together in the maxilla. After surgery, both posterior teeth were in uniform contact.

Conclusion : This case report suggests that postoperative orthodontic extrusion and segmental osteotomy during surgery are both effective in asymmetric patients with maxillary canting. If an attempt was made to correct a maxillary canting during preoperative period, the period of preoperative orthodontics would be prolonged and additional anchors such as miniscrews would have been required. However, the preoperative period could be reduced because orthodontic extrusion was performed after surgery. And orthodontic extrusion was performed while wearing a wafer, so the occlusal improvement was achieved while the postoperative result was maintained stably.
Also, after surgery with segmental osteotomy along with two jaw surgery, it was possible to maintain a stable result by hanging elastics to the miniscrew with wafer. Since it was miniscrews that were placed during surgery, no additional placement was required.



P-067

Unilateral Molar Distalization using Palatal S-shaped Arm and Mini-implant

Jeong Hwa Cho, Seung Eun Baek, Aerin Choi, Sung Hun Kim, Yong Il Kim, Seong Sik Kim, Soo Byung Park

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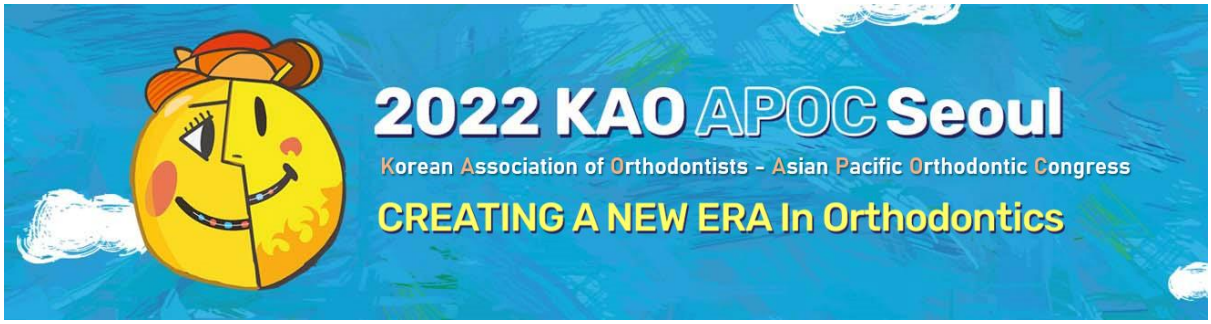
Introduction : The traditional method used for maxillary molar distalization is headgear appliance. However, its outcome depended on patient's compliance. Therefore, other appliances were developed: distal jet appliance, jones jig and pendulum. These appliances even allow unilateral molar distalization. But, they also have unwanted side effect which is the anchorage loss and extrusion of molar. As mini-implant is developed, it provides absolute anchorage and allows bodily movement of molar. Also, mini-implant can be inserted on both palatal and buccal side of maxillary to reduce unwanted side effects: distal tipping and rotation of maxillary molar. In this case, palatal S-shaped arm was fabricated to distalize maxillary molar unilaterally with mini-implant.

Case Summary : A 20-year-old female presented with Class I malocculsion, severe crowding, bimaxillary protrusion and unilateral Class II molar relationship on the left side due to ectopic eruption of the left maxillary canine. The extraction of 4 first premolars and unilateral molar distalization were performed with mini-implant insertion between the second premolar and the first molar on both buccal and palatal side. Before actively distalizing left maxillary molar, buccally erupted left maxillary canine was retracted and placed into the extraction site of the first premolar using buccal and palatal mini-implant to avoid anchorage loss. Once the left maxillary canine was placed into the premolar extraction site, distalization of the left maxillary molar was performed with S-shaped palatal arm and mini-implant. In order to ensure bodily movement of molar, S shape part, mini-implant and the first molar's center of resistance were aligned at the same level.

Conclusion : Anchorage loss was minimized using mini-implant and Class I molar relationship was established throughout unilateral molar distalization with palatal S-shaped arm.



P-068

Maxillary Protraction with Combined Facemask and MARPE in a Growing Class III Patient

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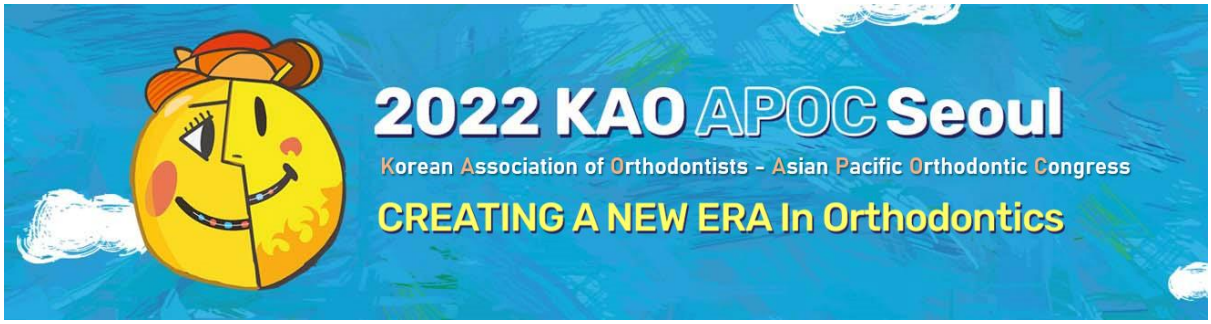
Introduction : When growing patients present maxillary retrognathism, use of a facemask is one of the traditional approaches. This treatment modality involves utilization of maxillary dentition as an anchorage unit, often resulting in excessive flaring of the upper incisors and an increase in the vertical dimension by extrusion of maxillary posterior dentition. Incorporating miniscrew-assisted rapid palatal expander (MARPE) and facemask, in order to avoid the unwanted dental side effects, results in significantly better outcomes. When MARPE is applied in combination with facemask, almost negligible vertical side effects are observed and the skeletal protraction is possible.

Case Summary : This case report presents a growing Class III patient with maxillary retrognathism. It was started prior to the time of the peak growth period and there was no family history of mandibular prognathism. We decided to protract the maxilla with combined facemask and MARPE to minimize dental side effects and optimize the skeletal maxillary protraction. 9 months after the treatment, the maxilla itself was protracted forward significantly. The SNA was increased and the anterior crossbite was improved.

Conclusion : Maxillary protraction with combined facemask and MARPE in a growing Class III patient is reliable treatment modality. The maxillary itself was protracted with minimum flaring of the upper incisors and the concave profile was significantly improved.



P-069

Effective Use of Removable Appliance in Growth-completed Patient with Dental Crossbite

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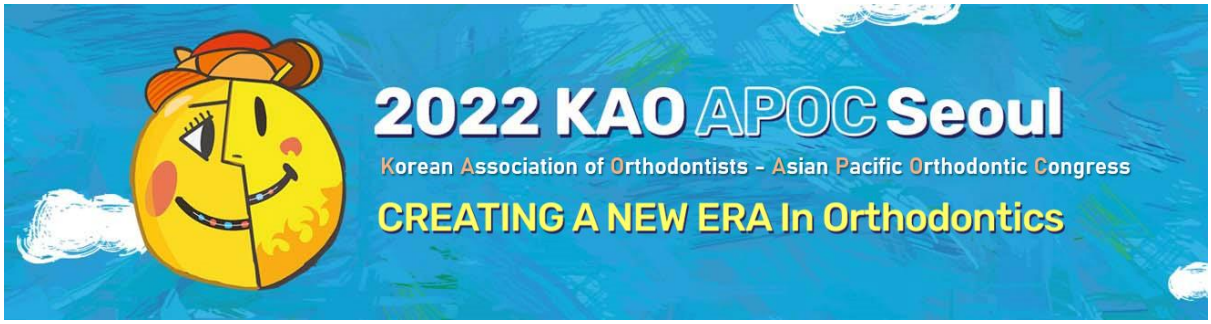
Introduction : Removable appliances are often used in growing patients with crossbite. However, when pubertal growth has passed, it is difficult to expect the orthopedic effect of removable appliances, so the fixed appliances are usually used to improve malocclusion. For this, if there is a crossbite, a complicated and inconvenient process such as raising the bite resin high for bite jumping is often performed.
In this case, I present a case in which the dental crossbite was corrected using a short-term removable appliance and the treatment was completed more comfortably with fixed appliances.

Case Summary : A 16-year-old male patient came to the clinic with anterior crossbite of #31, 32 and #41, dental midline discrepancy and spacing of both dentitions. There was concern about gingival recession of the lower central incisors, which were displaced a lot to the labial side. Because of the discomfort caused by applying the bite resin and the concern about side effects due to anterior occlusal interference during bite jumping in fixed appliances, I devised the removable appliance first. A posterior bite plate with double finger springs of #11, 21, and #22 was fabricated, and full-time wearing was instructed. The patient's cooperation was good, so the crossbite corrected within 2 months. After wearing it for 2 more months, the lower incisors were repositioned naturally to the lingual side without occlusal interference, and then DBS was performed. The total treatment period was 2 years and 9 months. There was no gingival recession in the lower anteriors, and the satisfaction with the overall treatment including the removable appliance was very high for the patient and his mother.

Conclusion : Even after the pubertal growth is completed, in some cases, the treatment of fixed appliances can be performed more effectively through the combined use of removable appliances.



P-070

Camouflage treatment of skeletal Class III malocclusion with facial asymmetry and posterior transverse discrepancy

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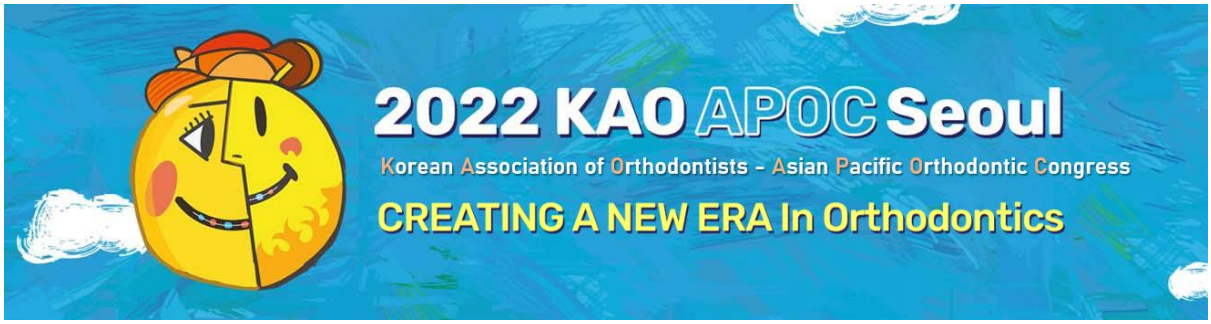
Introduction : In this case, the patient had skeletal Class III malocclusion with facial asymmetry and posterior transverse discrepancy. Non-surgical camouflage treatment through rapid palatal expansion and distal movement of mandibular left dentition using miniplate as skeletal anchorage proceeded successfully.

Case Summary : 21Y / Female
Chief complaint : I heard that I need treatment for the malocclusion.
Facial analysis showed asymmetry of the mandible was observed to the right. Chin prominence and concave lateral profile were noticed. In panoramic radiograph, the impaction of the maxillary left third molar was observed. In oral examination, the maxillary right first premolar was missing, and there was severe rotation of the maxillary right second premolar. Crowding was not observed, and the right posterior and anterior crossbite were observed. Class I molar relationship on right, Class III molar relationship on left, and Class III canine relationship on both sides were observed.
In this case, rapid palatal expansion and total arch distalization on lower left side was planned for correction of posterior crossbite and establishment of Class I molar key on left. And mesial movement of the maxillary molars and distal movement of the mandibular dentition using the Class III elastic was planned on right.

Conclusion : This case is camouflage treatment of skeletal Class III and facial asymmetry using a skeletal anchorage device without orthognathic surgery. The posterior crossbite was corrected, and proper overjet, overbite, Class II molar and Class I canine relationship on right, Class I molar and canine relationship on left was achieved through the mesial movement of the maxillary right molars along with the distal movement of mandibular dentition.



P-071

Extraction decision and anchorage consideration for fixed functional appliance treatment

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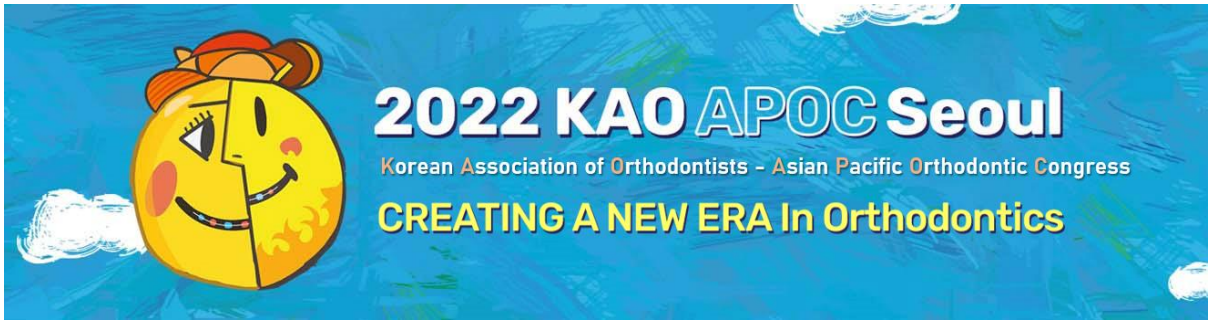
HONORS Orthodontics

Introduction : Fixed functional appliance (FFA) is widely used in recent years because systematic reviews showed early treatment cannot produce long term skeletal changes and FFA does not require patient cooperation. The force vector of the FFA tends to push the upper molar posteriorly and the lower incisor forward. These characteristics can affect the extraction site decision and the amount of anchorage required.

Case Summary : This case report shows treatment of a ten-year-old girl with severe lip protrusion and large overjet using Forsus, a type of FFA. Although she showed Class II molar relationship and large overjet, in consideration of biomechanics of Forsus, upper and lower first premolar extraction was planned. After correction of Class II molar relation and overjet, her parents wanted to use FFA longer in anticipation of more mandibular growth. After discussion, orthodontic mini-implants (OMIs) was placed in the lower arch to retract lower teeth. Results showed that incisor retraction and favorable mandibular growth improved her facial profile successfully. It seems that the pushing force of Forsus and retraction force of OMIs helped to prevent opening of mandibular plane in this patient with a vertical skeletal pattern.

Conclusion : To treat the Class II protrusion patient using FFA, differential anchorage evaluation methods and extraction strategies should be used to obtain the successful occlusal and facial changes.



P-072

Nonextraction Treatment of Severe Class II Malocclusion Using the Herbst Appliance in a Postpubertal Patient

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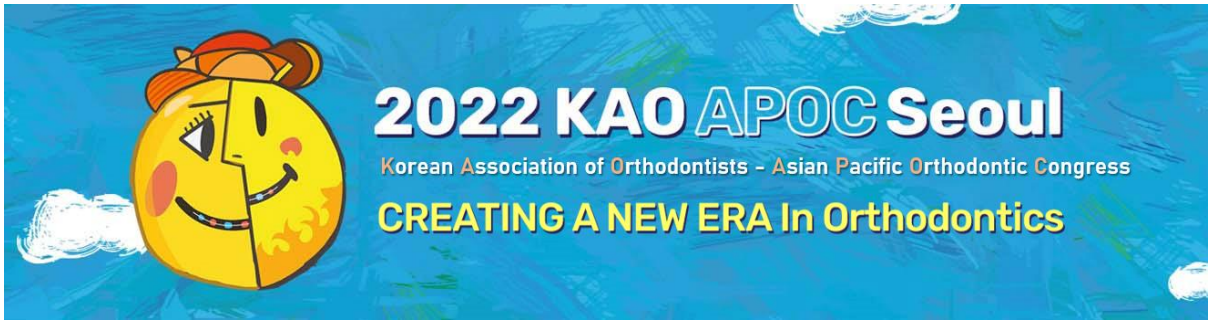
Introduction : The Herbst appliance is effective functional appliance in the treatment of Class II malocclusion. Skeletal effects of the Herbst appliance treatment include enhancement of mandibular growth, anterior displacement of the mandibular arch, reduction of maxillary growth, posterior displacement of the maxillary arch, and TMJ remodeling. This case presentation is the treatment of severe Class II malocclusion using the Herbst appliance and the fixed orthodontic appliances in a post-pubertal patient.

Case Summary : A 14.3-year-old girl presented with a Class II malocclusion with a constricted maxillary arch, and a retruded mandible. She had permanent dentition and her hand-wrist radiograph demonstrated MP3-H stage indicating a post-pubertal growth phase and she had menarche 10 months ago. An acrylic splint type of the Herbst appliance combined with a bonded rapid maxillary expander was applied. After 11 months, the Herbst appliance was removed and non-extraction treatment was performed using the fixed orthodontic appliances for 12 months. The facial profile was improved with harmony between the upper and lower lips, and Class I molar relationship, normal anterior overjet, and good interdigitating occlusion were achieved. Posttreatment radiographs showed a reduced maxillomandibular transverse and sagittal discrepancy.

Conclusion : Herbst appliance is an effective and efficient orthopedic appliance for treatment of Class II malocclusion in postpubertal patient.



P-073

A Camouflage Treatment with Maxillary Second Premolar Extraction in Class II Division 1: Case Report

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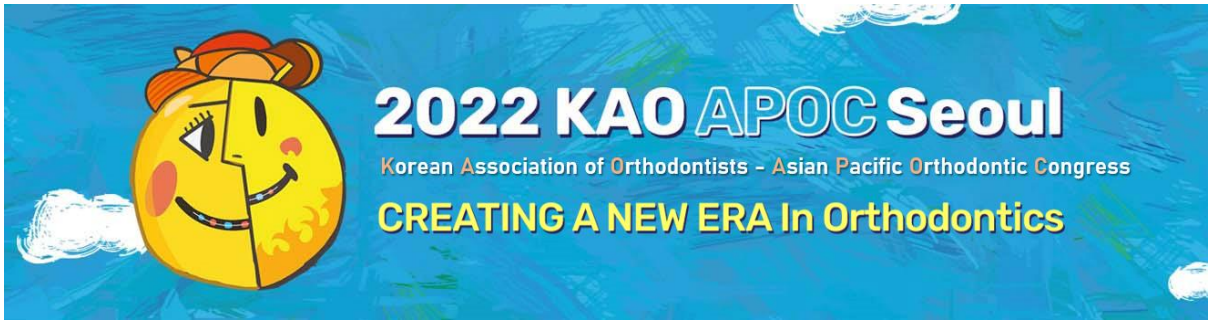
Introduction : In the Class II division 1, Class II molar relationship is formed due to maxillomandibular discrepancy, and excessive overjet is observed in the anterior region. Premolar extraction only is a selective treatment performed when no crowding exists in the mandibular arch or when repositioning of the mandibular incisors is not required. Anterior protrusion is restored to normal level and facial appearance is improved by closing the extraction site through moving the protruded maxillary incisors distally while maintaining the class II molar key. The maxillary 2nd premolar extraction only was performed in three cases. This study intended to examine the indications, advantages and limitation of maxillary extraction only.

Case Summary : Case I : Skeletal class II, dental class II, low angle, protrusion, large overjet, deep bite, anterior spacing of mandible
Case II : Skeletal class II, dental class II, high angle, crowding, protrusion, deep bite, large overjet
Case III : Skeletal class II, dental class II, low angle, protrusion, large overjet, deep bite, anterior spacing of maxilla

Conclusion : The maxillary extraction only hardly requires a strong anchor in the maxilla, improves the appearance through a small number of extractions, and has a relatively short treatment period. However, the crowding on the mandible may increase by the occlusal force. In addition, for the relief of crowding and flattening of curve of spee, the mandibular incisors may be labially inclined, or a residual space may occur on the maxilla. The location of mandibular incisor and protrusion level of the lower lip provide an appropriate diagnostic basis for determining extraction only vs extraction both in a case with large overjet. In the case of patients with large overjet, whose labial inclination of the mandibular incisors and the protrusion of the lower lip are not severe, the extraction only was an alternative option for good outcomes.



P-074

Correction of lip protrusion by total arch intrusion and distalization using a micro-implant

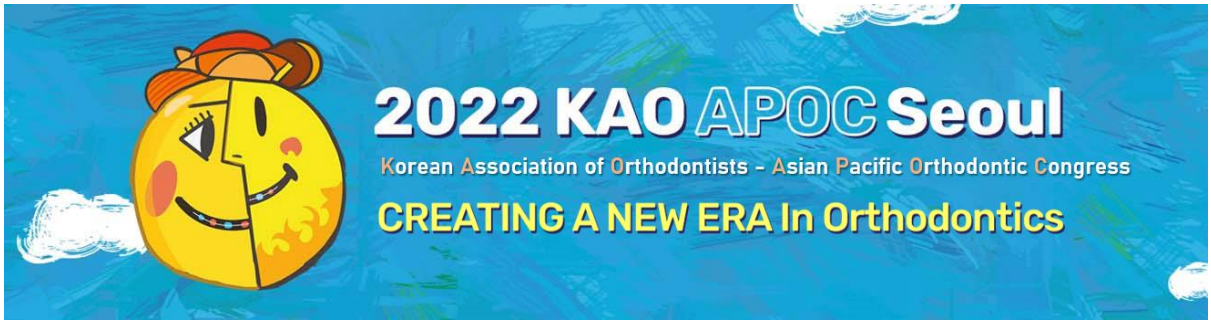
LEE BA WOOL

Jinsim Orthodontic Clinic

Introduction : Nowadays, use of micro-implant placed at the interdental alveolar bone is becoming popular for total arch intrusion and distalization. The application of micro-implant is well known for its effectiveness in the intrusion and distalization. This case report shows the patient of skeletal Class II malocclusion with lip protrusion treated by total arch intrusion and distalization using a micro-implant.

Case Summary : 12Y07M / Female
Chief complaint: Lip protrusion
A 12-year-old female had a chief complaint of lip protrusion. Facial analysis showed lip protrusion. The cephlometric analysis showed skeletal Class II malocclusion. She had a convex profile with a retrognathic mandible and marked lip protrusion. An intraoral examination indicated deep overbite(5mm) and large overjet(8mm) and Class II canine and molar relationship. To correct lip protrusion, she was treated with total arch intrusion and distalization using a micro-implant. After treatment, lip protrusion was relieved facial profile was improved. The occlusion was completed with a Class I canine and molar relationship along with ideal overjet and overbite.

Conclusion : In this case, total arch intrusion and distalization using micro-implant was successfully performed. Facial and smile esthetics and functional results were improved with the treatment. In treatment of patients with skeletal Class II malocclusion with large overjet, total arch intrusion and distalization using multiple micro-implant is a viable option.



P-075

Comparison of Two Different Types of Treatment Using Skeletal Anchorage in Class III Growing Patients

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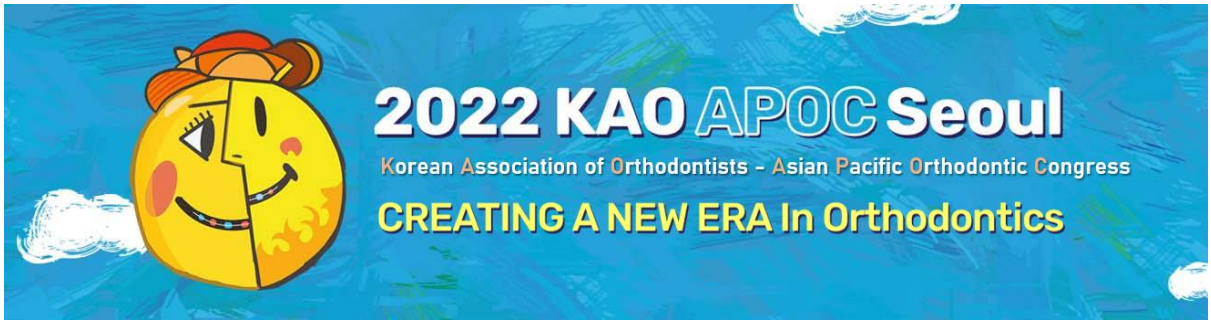
Department of Orthodontics, Dankook University Jukjeon Dental Hospital

Introduction : Skeletal class III malocclusion is caused by underdeveloped maxilla and overgrown mandible, or a combination of both. There are several treatment modalities for class III malocclusions in growing patients. Among them, two methods using skeletal anchorage system are compared and reviewed through cases in this study.

Case Summary : (Case 1) A 11-year-old male patient was diagnosed as a skeletal class III malocclusion with vertical growth pattern, slight facial asymmetry with chin point deviation to the left side. In intraoral examination, anterior edgebite and posterior crossbite were observed. Bone anchored Facemask(BAFM) with bilateral maxillary plates (on paranasal area) was performed with 15 months. His profile was improved through forward movement of maxilla. His hyperdivergent pattern was not getting worse rather lower facial height was decreased.
(Case 2) The other patient was a 12-year-old male patient and he was also diagnosed as skeletal class III malocclusion with hyperdivergent pattern, slight facial asymmetry with chin point deviation to the right side. In intraoral examination, anterior crossbite and bilaterally Angle class III molar relation were observed. Bone anchored maxillary protraction(BAMP) was performed with 18 months. After treatment, forward movement with slight counterclockwise rotation of maxilla was obtained. Also, his vertical growth pattern was not getting worse as case 1.

Conclusion : In case of skeletal class III malocclusions, through these two cases, both facemask and class III elastics with skeletal anchorage system was successfully confirmed that not only the maxilla but the entire mid-face could be traction. In addition, since there is remodeling of the condylar fossa and swing-back effect of the mandible, few side effects can be expected in high-angle patients.



P-076

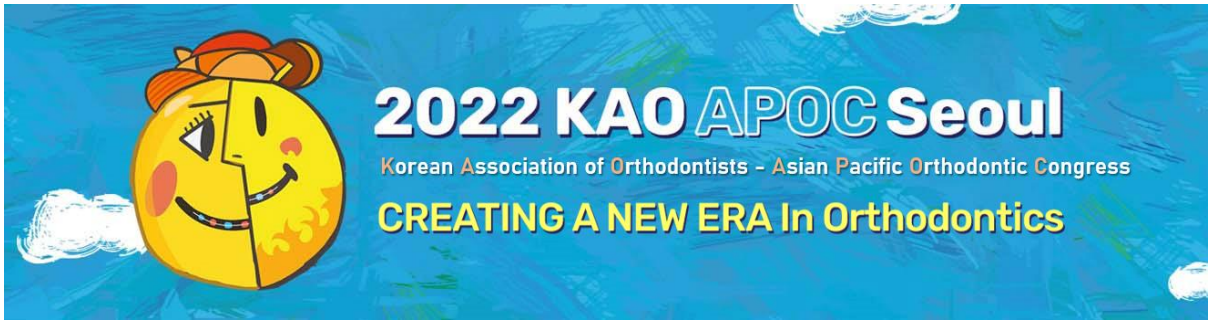
Treatment of transposed canine and lateral incisor in a young patient

DOOHYUNG KIM, SUJIN KIM, YOUNG CHEL PARK

YONSEI YEOWOO DENTAL CLINIC

Introduction : Transposition of maxillary canine and lateral incisor causes functional and esthetic problems. Repositioning teeth to their proper positions requires careful control to preserve the teeth's roots and supporting systems. To resolve transpositions, it is important to use simple and effective mechanisms.

Case Summary : Clinical examination of an 11-year-old girl revealed an anterior crossbite, skeletal Class III malocclusion, and transposition of the maxillary left canine and lateral incisor. The canine was buccally and highly displaced between the central and lateral incisors, with 2 mm-wide attached gingiva.
0.018-inch slotted orthodontic brackets were bonded to all the maxillary teeth, from the first molar to the first molar, except for the left canine. To prevent interference with the canine, the crown of the lateral incisor was pushed lingually by a 5 mm-thick bracket base and straight wire technique. The canine was retracted using the primary canine as an anchor. During retraction, the attached gingiva of the canine was inflamed for several months. After repositioning, the torques of the teeth were controlled. The canine and lateral incisors restored esthetics and function in their proper positions, including healthy keratinized gingiva.
Conclusion : Transposed canine and lateral incisors can be repositioned and aligned in a young patient using well-designed mechanics with minimal side effects.



P-077

Non-extraction treatment of gummy smile patient using miniscrews

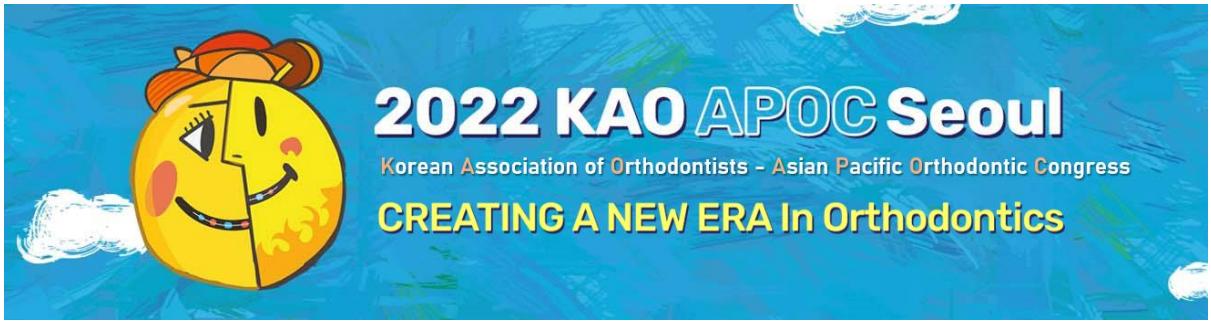
Bumsoo Kim, Eun Young Son, Su In Baek, Sung Yeon Jeon

Department of Orthodontics, Wonju Severance Christian Hospital, Yonsei University

Introduction : There are many causes of gummy smile and the treatment should be directed toward solving the causes. To treat gummy smile having over-exposure of upper anterior teeth vertically, retraction force is needed as well as intrusion force. We report non-extraction treatment of gummy smile patient using miniscrews.

Case Summary : We report a case of a 26-year-old woman who had a skeletal Class II malocclusion, spacing of upper teeth, crowding of lower teeth, anterior deep bite and gummy smile. It was diagnosed that gummy smile was caused by over-exposure of upper anterior teeth vertically.
To intrude upper incisors, we inserted a miniscrew between upper central incisors and applied light force. Additional miniscrews were inserted between premolars to apply retraction force, as upper incisors were expected to be flared after intrusion.
When a certain amount of intrusion occurred, intrusion from the screw between upper central incisors was stopped not to make the smile line too flat. After that, retraction was performed using the miniscrews between the premolars and small amount of additional intrusion was performed using a compensating curve.
As a result of treatment, the patient had a good profile and a normal smile line. The overjet & overbite was normal and the molar key was class I.

Conclusion : To correct the gummy smile patient having over-exposure of upper anterior teeth vertically, it needs not only intrusion force but also retraction force. In order to arrange upper anterior teeth in a good vertical position, it is recommended to determine the degree of intrusion carefully while observing the actual smile line during treatment.



P-078

Assessment of tongue and hyoid bone position according to incisal relationships using cone-beam computed tomography

Hieu Nguyen[1], Ji-Hye Park[2], Euk Joo[3], Jong Suk Lee[4], Yoon Jeong Choi[1]

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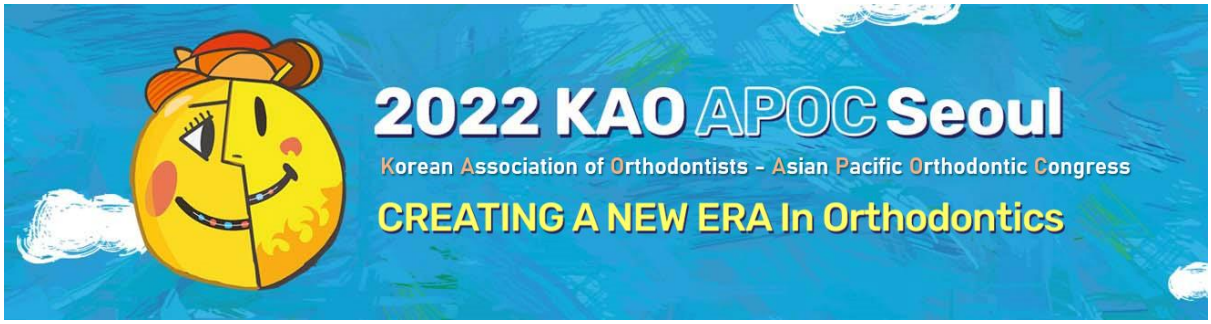
[3]Yonsei Mirae Dental Clinic
[4]Gonet Clinic

Purpose : The purpose of this study was to investigate the sagittal and vertical positions of the tongue and hyoid bone at rest according to the incisal relationships using cone-beam computed tomogram (CBCT) images. Also, it aimed to examine whether the variables of transverse arch width, vertical and sagittal skeletal cephalometric measurements are correlated with position of the tongue and hyoid bone.

Materials and methods : The subjects consisted of 119 adult patients with lateral cephalogram and CBCT images, including from the nasal floor to the epiglottis, captured at centric occlusion and relaxed tongue/ lip position. Subjects were divided into four groups (normal occlusion, anterior open-bite, anterior cross-bite, and anterior open & cross-bite group) according to overjet (OJ) and overbite (OB). Linear, angular, and volumetric measurements for tongue dimension, tongue position, and hyoid bone position were compared amongst the four groups. Pearson correlation coefficients were calculated to evaluate the relationships of tongue and hyoid bone position with transverse arch discrepancy, facial height ratio, mandibular plane angle, and palatal plane angle.

Results : The downward and forward movement of the tongue and hyoid bone position was related to the anterior cross-bite, but not the anterior open-bite. In addition, the inferior position of the tongue and the hyoid bone corresponded with constricted maxilla. The horizontal position of the hyoid bone and the ratio of tongue tip had positive correlations with the facial height ratio, but negative correlations with mandibular plane angle and palatal plane angle.

Conclusions : The tongue position was related to the most anteriorly positioned teeth, and anterior position of the tongue and hyoid bone corresponded with the hypodivergent skeletal pattern.



P-079

Investigating the efficacy of 850 nm near-infrared imaging for detection of proximal enamel caries in-vitro

Qi-Yan Chung[1], Li Zhen Lim[2], Yee Cheau Hwang[2], Vinicius Rosa[2], Kelvin Foong[2]

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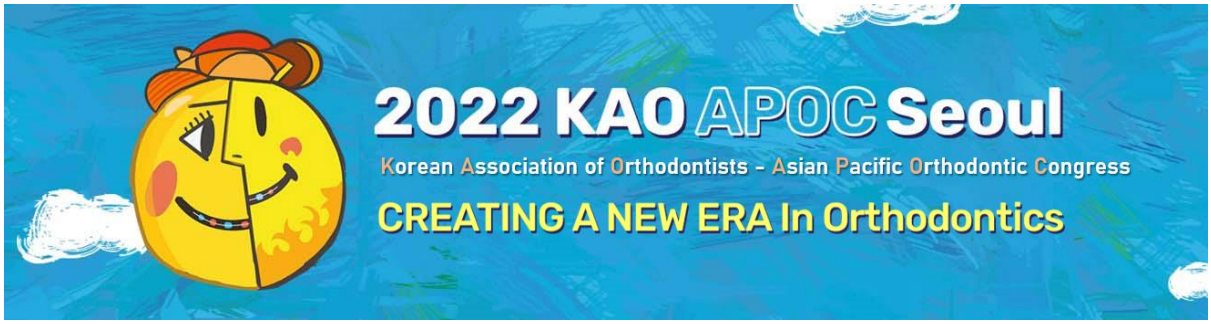
[2]National University of Singapore

Purpose : To investigate the efficacy of near-infrared imaging (NIRI) technology at 850 nm wavelength, in detection of proximal enamel caries using microcomputed tomography (μCT) as a reference standard, comparing its performance against digital radiographs (DRG), conventional fibre optic transillumination (FOTI) and laser fluorescence (LF) detection techniques with and without metal orthodontic brackets.

Materials and methods : 50 extracted teeth with caries free proximal surfaces were set in pairs to simulate 25 proximal contact points. Baseline measurements prior to proximal caries simulation were taken using NIRI, LF, DRG and FOTI. Enamel caries were simulated on the proximal surfaces using a pH cycling method. Measurements and scans with and without metal orthodontic brackets where taken using the four different diagnostic techniques. μCT was used as a reference standard to evaluate the various methods. Sensitivity, specificity and accuracy were calculated for each technique against the μCT. The McNemar test was used to compare the differences between the four diagnostic techniques, as well as with and without metal orthodontic fixed appliances.

Results : The sensitivity/specificity values calculated for NIRI, DRG, FOTI and LF were 73.3%/80%, 91.7%/54.4%, 78.3%/66.7% and 93.3%/25.6%, respectively at E0. For caries depths of E1, NIRI, DRG, FOTI and LF has sensitivity/specificity of 62.5%/74.2%, 51%/91.9%, 53.4%/78.6% and 17%/93.5% respectively. The overall accuracy for NIRI, DRG, FOTI and LF measured with reference to μCT was 66.7%, 68%, 63.3% and 48% respectively, with NIRI, DRG and FOTI demonstrating no significant differences. There was no significant difference in accuracy with or without metal orthodontic brackets for all four diagnostic techniques.

Conclusions : NIRI has comparable accuracy to DRG and FOTI for the detection of E1 proximal caries lesions, and reduced accuracy compared to DRG and LF for the detection of E0 proximal lesions, in vitro. The presence of fixed orthodontic appliances had no effect on the accuracy of all the tested diagnostic techniques.



P-080

Integration accuracy of intraoral scans into cone-beam computed tomography images

Suk-Cheol Lee, Byeong-Hyun Go, Ha-Eun Moon, Kyung-Min Lee

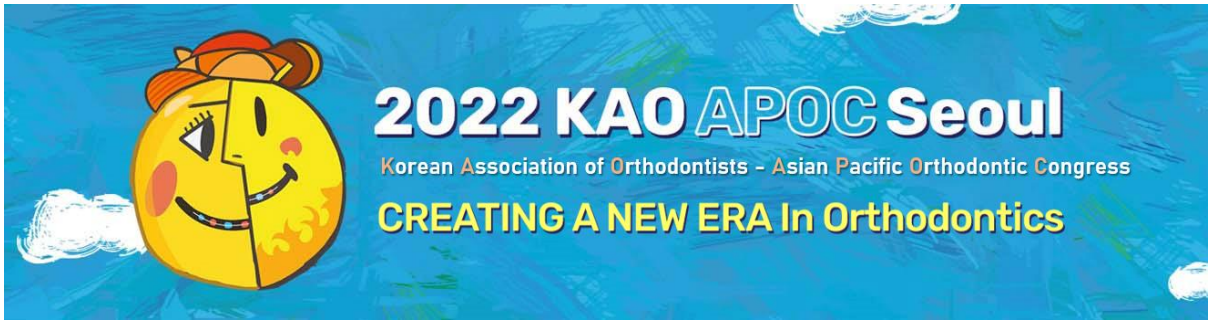
Department of Orthodontics, School of Dentistry, Chonnam National University

Objectives : The purposes of this study were to evaluate tooth root position before and after orthodontic treatment using three-dimensional (3D) tooth models composed of intraoral-scanned crown and cone-beam computed tomography (CBCT)-scanned root and to compare the fabrication process using automatic and manual approaches.

Material and Methods : Intraoral scans and its corresponding CBCT scans before and after treatment were obtained from 15 patients who completed orthodontic treatment with premolar extraction. 3D tooth model was generated using automatic and manual approaches, respectively, by merging the intraoral scans and CBCT scans at pretreatment. Posttreatment intraoral scans were integrated into the tooth model and the resulting position of the root estimated were compared to the actual root position at posttreatment CBCT scans. The discrepancies of the estimated and actual root position including average surface difference, arch width, inter-root distance, and root axis angle were obtained in each automatic and manual approaches, and these measurements were compared between the two approaches.

Results : Average surface difference of estimated and actual tooth model was 0.02 mm for maxillary arch and 0.03 mm for mandibular arch in manual approach. In automatic approach, discrepancy was 0.07 mm for maxillary arch and 0.08 mm for mandibular arch. For the measurements of arch width, inter-root distance, and root axis angle, there were no statistically significant difference between estimated and actual models both in manual and automatic approaches except for some measurements. In comparison of manual and automatic approaches, only three measurements showed statistically significant differences between the two approaches. The procedure times taken to obtain the measurements were longer in manual approach than in automatic approach.

Conclusion : Both automatic and manual approaches showed similar accuracy in the integration of intraoral scans and CBCT images. Considering the time and efficiency, automatic approach is more likely to be applied to clinical practice.



P-081

The effect of perception and knowledge to orthodontic treatment decision in adults

Ae-Hyun Park, Song-Ha Kim, Meiling Zhang, Min-Hee Oh, Jin-Hyoung Cho

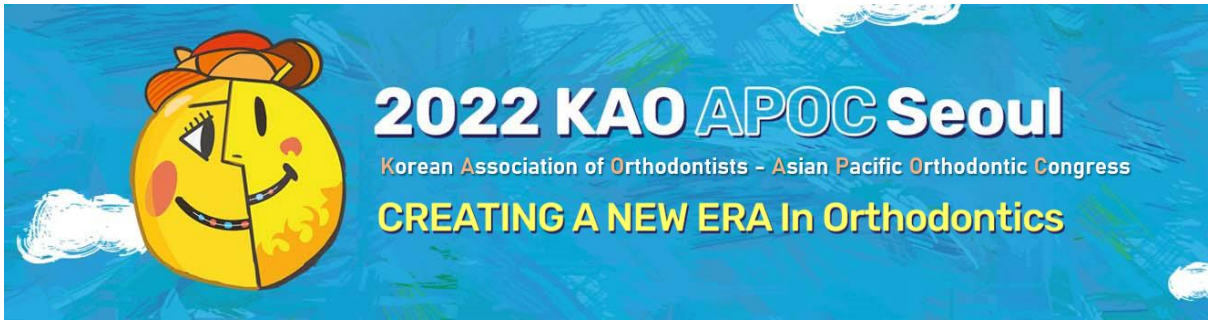
Department of Orthodontics, School of Dentistry, Chonnam National University

Objectives : This study was performed to identify the perceptions of orthodontic treatment among Korean adults and to determine the factors that drive them to seek orthodontic treatment.

Material and Methods : The participants were divided into three groups according to experience or willingness to orthodontic treatment: experience, acceptance, and non-acceptance groups. Analysis of variance with post-hoc analysis and multinomial logistic regression analysis were performed.

Results : The influencing factors on adult orthodontic treatment decision were general characteristics, oral hygiene related characteristic, demand for orthodontic treatment, psychosocial impact of dental aesthetics, perception of orthodontic treatment and intention of adult orthodontic treatment. For the general characteristics, younger group of people, women, married people and college graduates showed high willingness to orthodontic treatment. For the oral hygiene related characteristics, the higher interest and awareness of oral health group showed higher intention to orthodontic treatment. For the perception of orthodontic treatment, the need for orthodontic treatment is further recognized in cases of those who have experienced or had intention of orthodontic treatment. For the psychosocial impact of dental aesthetics, psychosocial expectations for orthodontic treatment may affect the intention of orthodontic treatment. For the perception for orthodontic treatment, awareness of orthodontic treatment may affect the intention of orthodontic treatment.

Conclusion : General characteristics, oral hygiene related characteristic, demand for orthodontic treatment, psychosocial impact of dental aesthetics, perception of orthodontic treatment and intention of adult orthodontic treatment may affect orthodontic treatment decision in adults.



P-082

Diagnosis of obstructive sleep apnea with prediction of flow characteristics according to airway morphology

JungKi Moon[1], Susie Ryu[2], Hwi-Dong Jung[3], Hyung-Ju Cho[4], Joon Sang Lee[2], Yoon Jeong Choi[1]

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[2]School of Mechanical Engineering, College of Engineering, Yonsei University
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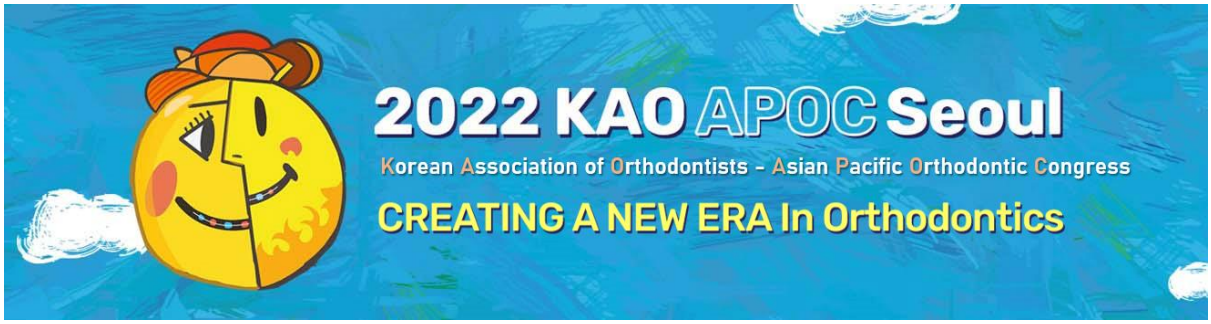
[4]Department of Otorhinolaryngology, Yonsei University College of Medicine, Seoul, South Korea

Objectives : To overcome the challenges of time and cost faced by conventional diagnostic methods of obstructive sleep apnea, this study proposes computational fluid dynamics and machine-learning approaches that are derived from the upper-airway morphology with automatic segmentation using deep learning

Material and Methods : For automatic segmentation, CT data from 88 patients taken in Severance Hospital were selected and randomly divided intro 73 dataset for training and 15 dataset for testing. For OSA diagnosis, CT images from 173 OSA patients (46 of normal/mild and 127 of moderate) confirmed by polysomnography were studied. To prevent data bias 121 dataset were randomly selected for training and 52 dataset for testing. A 3D UNet model was adopted to segment the airways in the CT images. To create flow characteristics of the upper airway training data, we analyzed the changes in flow characteristics according to the upper-airway morphology using CFD. A multivariate Gaussian process regression (MVGPR) model was used to train the flow characteristic values. The trained MVGPR enables the prompt prediction of the aerodynamic features of the upper airway without simulation. As a diagnostic step, a support vector machine (SVM) with predicted aerodynamic and biometric features was used to classify patients as healthy or moderate OSAS. As the patient dataset is small, the Monte Carlo cross-validation was used to validate the trained model. Furthermore, to overcome the imbalanced data problem, the oversampling method was applied

Results : The segmented upper airway results of the high-resolution and low-resolution models present overall average dice coefficients of 0.76 ±0.041 and 0.74 ±0.052. Furthermore, the classification accuracy, sensitivity, specificity, and F1-score of the diagnosis algorithm were 81.5%, 89.3%, 86.2%, and 87.6%.

Conclusion : The convenience and accuracy of OSA diagnosis are improved using deep learning and machine learning. Therefore, the proposed method can aid clinicians in making appropriate decisions to evaluate the possible applications of OSAS.



P-083

Accuracy of posteroanterior cephalometric measurements obtained using artificial intelligence algorithm

Sung-Hoon Han, Kyung-Hwa Kang

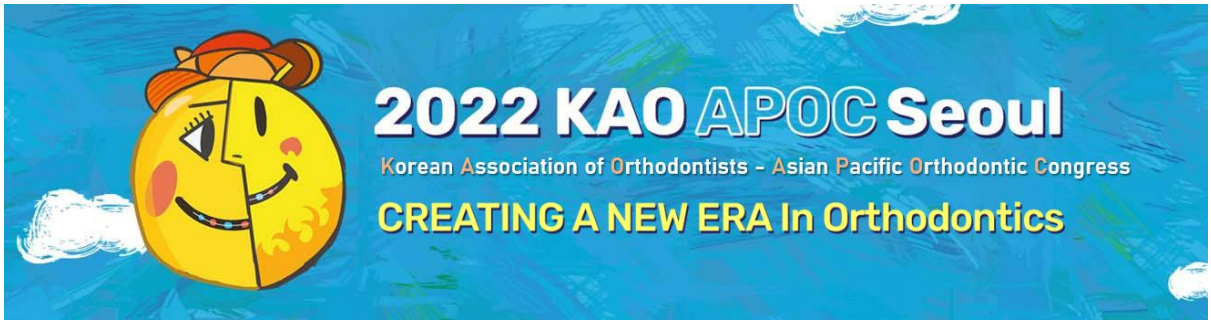
Department of Orthodontics, College of Dentistry, Wonkwang University

Objectives : The purpose of this study is to evaluate the accuracy of AI by using cascade convolutional neural network (CNN) to obtain PA landmarks and measurements, and comparing them with human-measured values.

Material and Methods : Among 2,903 PA cephalograms from 9 university hospitals, 2,526 images were used to train the CNN algorithm for auto-identification of PA cephalometric landmarks. The remaining 377 test set images were used to investigate the accuracy of auto-identification of the CNN algorithm by comparison with human examiners using V-Ceph 8.0 (Ostem, Seoul, Korea). ANOVA was performed to compare the point-to-point error and measurements error between AI and two examiners. And Tukey's test was performed as a post hoc test.

Results : AI showed a relatively higher level of accuracy than humans with clinically acceptable point-to-point error (average 1.26mm) and SDR (average within 2mm) of 83.2%. 4 landmarks (both FZP, both Lo) on the x-coordinate and 7 landmarks (Cg, ANS, LDM, both FZP, both Lo) on the y-coordinate showed statistically significant high accuracy. A statistically significant difference was observed in the measurements taken by AI and two examiners in the three groups, but, the amount was less than 1mm.

Conclusion : Casecade CNN algorithm for auto-identification of PA cephalometric landmarks showed a clinically acceptable level of accuracy, which was higher than that of humans. These results were also the same for measurements.



P-084

Three-dimensional Comparison of Landmarks for Indicating the Chin Position using Cone Beam Computed Tomography

Joo-Yeong Lee[1], Jin-Woo Lee[1], Sang-Min Lee[1], Dong-Hwa Chung[1,2], Mo-Hyun Lee[1], Young-Seo Heo[1], Ji-Hoon Jang[1]

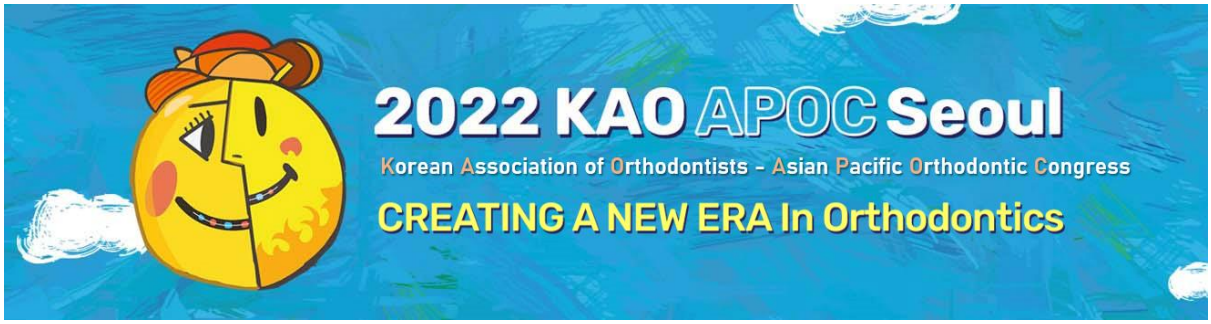
[1]Department of Orthodontics, College of Dentistry, Dankook University
[2]Department of Orthodontics, Dankook University Jukjeon Dental Hospital

Objectives : to test the null hypotheses as following using CBCT images: (1) There is no significant difference in three-dimensional coordinates and Euclidean distance between 4 landmarks (Me, GT, MLF, Pog); (2) There is no influence of skeletal vertical pattern on landmark identification; (3) There is no influence of asymmetry on landmark identification.

Material and Methods : CBCT images of 32 patients were analysed to identify Me, GT, MLF, Pog. All landmarks were plotted by two examiners using X, Y, and Z coordinates and Euclidean distance. The intra- and inter-class correlation coefficient (ICC) and Dahlberg's error were calculated. The Bland-Altman plot was drawn to compare visually. Subgroup analysis was conducted to compare in different gender, skeletal vertical patterns, and asymmetry.

Results : A high intra- and interobserver reliability was found for all landmarks (ICC > 0.9), slightly lower being the GT and MLF in vertical direction. There was no significant in different gender but, there were significant within other subgroups both in vertical direction: (1) GT is reliable in hypodivergent group than hyperdivergent group, in vertical direction (P = 0.042). Dahlberg's error of MLF in hypodivergent group was 1.27mm and 1.51mm in hyperdivergent group; (2) GT is reliable in asymmetric group than symmetric group, in anteroposterior (P = 0.035), vertical direction (P = 0.004) and Euclidean distance (P = 0.006). MLF in symmetric group was 1.51mm and 1.28mm in asymmetric group.

Conclusion : (1) All four landmarks are clinically useful landmarks to indicate the chin position. GT and MLF is less reliable in vertical direction than Me and Pog. (2) In vertical direction, the reliability of GT in hyperdivergent pattern is lower than hypodivergent pattern and MLF showed lower reliability regardless of skeletal vertical pattern. (3) In vertical direction, the reliability of GT in symmetric group is lower than asymmetric group and MLF showed lower reliability regardless of mandibular asymmetry.



P-085

A Retrospective Study on the Prevalence of Orthodontic Problems in 6,7,8-year-old Korean Using Panoramic Radiograph

Ji Yeon Lee, Dae Yeob Kim, Jin Seob Yang, Seok Young Kim, Jung Hoon Kim

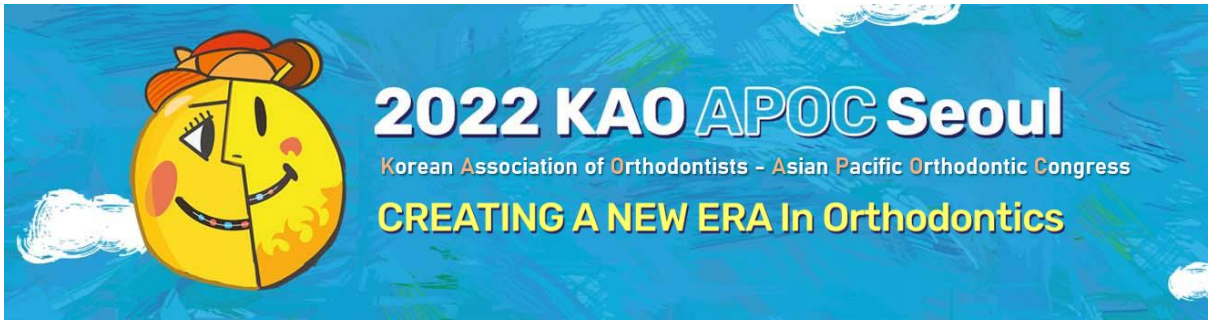
Department of Orthodontics, National Health Insurance Service Ilsan Hospital

Objectives : The purpose of this study is to retrospectively analyze the prevalence of orthodontic problems and the proportion of patients who underwent the examination for orthodontic diagnosis in the 6-year-old(n=300), 7-year-old(n=400), 8-year-old(n=400) children who took the panoramic radiographs.

Material and Methods : 6,7,8-year-old children who took panoramic radiographs were divided into five groups; the department of conservative dentistry (COD), oral and maxillofacial surgery (OMS), orthodontics (ORD), periodontics (PDD), and prosthodontics (PRD) according to the patients' chief complain. We investigated the patients' chief complaints and checked the eruption of the first molars, the lack of eruption space of the incisors, the frequency of patients with tooth eruption disorders, lack of space, impaction, supernumerary tooth(SNT), missing tooth, and ectopic eruption. Among the 4 groups whose main complaint is not for the orthodontic department, the numbers of patients with dental problems required orthodontic treatment were counted. We studied the rate of the patients with orthodontic problems who received orthodontic diagnosis or not.

Results : Dental trauma(44,34%,respectively) showed the most frequent chief complaints in 6 and 8-year-old patients, but SNT(26%) in 7-year-old patients. The coronal inclination of canines of all patient groups showed mesial inclination. Only 1.5%(6-year-old), 23%(7,8-year-old) of patients with orthodontic problems who first visited OMS & COD underwent the examination for orthodontic diagnosis.

Conclusion : In this study, most of the canines showed mesial inclination in all age groups. The proportion of patients who had orthodontic problems increased along with age. However, only 1.5, 23, 23%(6,7,8-year-old, respectively) of patients who required orthodontic treatment underwent the examination for orthodontic diagnosis. Even though the appropriate time for orthodontic treatment is different for each patient, orthodontic diagnostic examination should be performed to establish an accurate treatment plan and solve the problem. Accurate information should be provided to correct the misconception that it is appropriate to delay orthodontic examination until permanent dentition to patient caregivers.



P-086

Novel Body Mandibular Plane Using Mental Foramen in Analyzing Mandibular Asymmetry Compared With Conventional Plane

Ho-Jin Kim, Hyung-Kyu Noh, Hyo-Sang Park

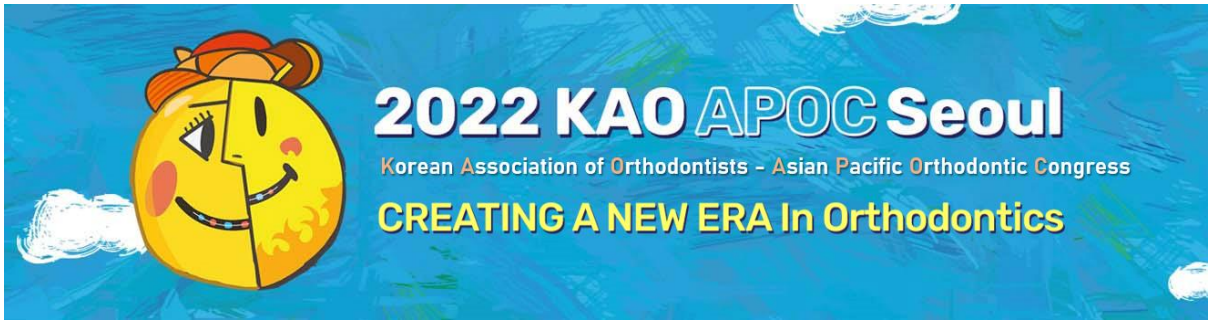
Department of Orthodontics, School of Dentistry, Kyungpook National University

Objectives : This study aimed to compare a novel body mandibular plane (mental foramen–protuberance menti; Body-MHP) with the conventional border mandibular plane (gonion–menton[Me]; Border-MHP) in assessment of dental compensation and mandibular body inclination of the skeletal Class III patients with and without facial asymmetry.

Material and Methods : Data obtained from diagnostic cone-beam computed tomography (CBCT) of 90 skeletal Class III patients (mean age, 21.67 ± 2.93 years; range, 15.0–30.6 years) were included in this study and divided into symmetry (n = 30, Me deviation < 2 mm) and asymmetry groups (n = 60, Me deviation > 4 mm); the asymmetry group was subdivided into the roll (n = 30, side-to-side difference in ramus height > 3 mm) and non-roll types (n = 30, side-to-side difference in ramus height < 1.5 mm). To compare the two mandibular planes, three-dimensional skeletal and dental measurements (distance and angle) were compared between the groups

Results : Mandibular body inclinations were not different between the sides relative to the Body-MHP in patients with roll-type asymmetric mandible, whereas they were different relative to the Border-MHP ($P < 0.001$). In addition, regarding vertical distance and inclination of the mandibular first molars relative to the Border-MHP, the vertical distance difference between the sides was undermeasured, and the inclination difference was overmeasured compared with the Body-MHP.

Conclusion : In patients with roll-type facial asymmetry, the novel body mandibular plane demonstrated better similarity of bilateral body inclination compared with the conventional border mandibular plane. Based on stable landmarks, the novel body mandibular plane can ensure an accurate diagnosis for tooth movement and jaw surgery, particularly in the roll-type asymmetry of the mandible.



P-087

Optimal Microimplant Sites in the Mandibular Retromolar Area: Mesh Analysis of Cortical Bone Thickness and Density in CBCT Images

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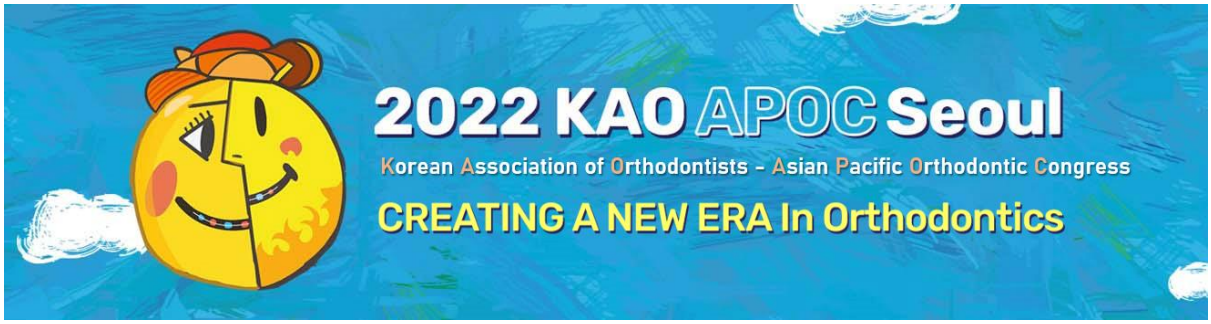
Objectives : Accordingly, this study was performed to measure the thickness and density of mandibular retromolar cortical bone at various sites by using CBCT images; it also explored correlations between retromolar measurements and patient characteristics, and then identified optimal microimplant sites in these areas.

Material and Methods : For this retrospective study, CBCT records were screened for 173 Korean patients who had visited the Kyungpook National University Dental Hospital during the period from November 4, 2010 to October 10, 2018. Five parallel sagittal lines were drawn with 2 mm intervals from the distobuccal side of the second molar. Five parallel coronal lines were drawn at 2 mm intervals from the distal surface of the second molar on coronal slices of CBCT images. And cortical bone thickness and density were measured at site C (2 mm buccal on the distal surface line of the second molar), and site B (2 mm mesial to site C), and site A (site between first and second molars, 5 mm below the alveolar crest).

Results : Our results showed that cortical bone thickness in the retromolar area was 2.35 ±0.76 mm. It was consistent with a previous study stating that the retromolar area had sufficient cortical bone thickness (1.96 to 2.06 mm), although it was thinner than in our study. The density of the retromolar area was 530.49 ± 188.83 HU; these results were consistent with the findings of Misch, who evaluated the D3 (350–850 HU) in the posterior mandible and maxilla. Thus, the mandibular retromolar area is suitable for microimplant placement.

Conclusion : We recommend placing microimplants into the distobuccal sites in the retromolar for distal uprighting of mesially tipped molars, and into the mesiobuccal site in the retromolar area (S5C1) or site B and site A for distalization of the mandibular dentition.



P-088

Analysis of yaw rotation of dental arch, maxilla and mandible in facial asymmetry patients

Su-geun Bae, Min Jung Kang, Hyo-sang Park

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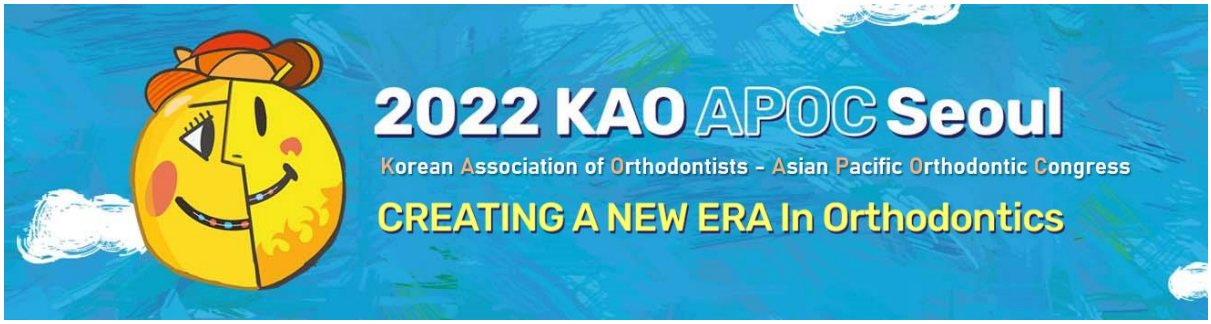
Objectives : Investigating the existence of yaw of dental arch, maxilla, and mandible in facial asymmetry patients, using 3D CBCT, in order to assist in the appropriate diagnosing and treatment planning.

Material and Methods : Selected 50 patients over the age of 17 who have taken 3D CBCT and meet the following criteria and they were classified as asymmetry group (menton deviation for facial midline > 4.0mm, 25 patients) and symmetry group (menton deviation for facial midline < 2.0mm, 25 patients). 3D CBCT images were obtained by transferring the DICOM files acquired through the computed tomography to an IBM compatible computer, then the images were reconstructed by using Angel3D software (INS BIO CO., Ltd., Seoul, Korea), a 3D image program.

Results : 1. There was a significant difference in maxillary anterior teeth deviation ($p<0.001$). However, there was no statistically significant difference in yaw of maxilla, maxillary anterior teeth, and posterior teeth.
2. There was a significant difference in mandibular anterior teeth deviation ($p<0.001$). However, there was statistically significant difference in yaw of mandible ($p<0.001$) and mandibular posterior teeth ($p<0.01$). In the yaw of the mandibular incisor, there was a significant difference at the root center level ($p=0.0008$). On the other hand, at the cusp tip level, $P=0.079$ is considered statistically significant, however it is clear that it is close to p-value<0.05.
3. There was no statistically significant difference in yaw of maxilla and there was no significant correlation between the yaw of maxilla and the measurements. As for the jaw of mandible, deviation of mandibular central incisor, mandibular ant. and post. Teeth were highly correlated.

Conclusion : Yaw was not observed in maxillary teeth and maxilla of facial asymmetry patients, and significant yaw was observed only in mandible.



P-089

Radiographical Characteristics and Traction Duration of Impacted Maxillary Canine Requiring Surgical Exposure

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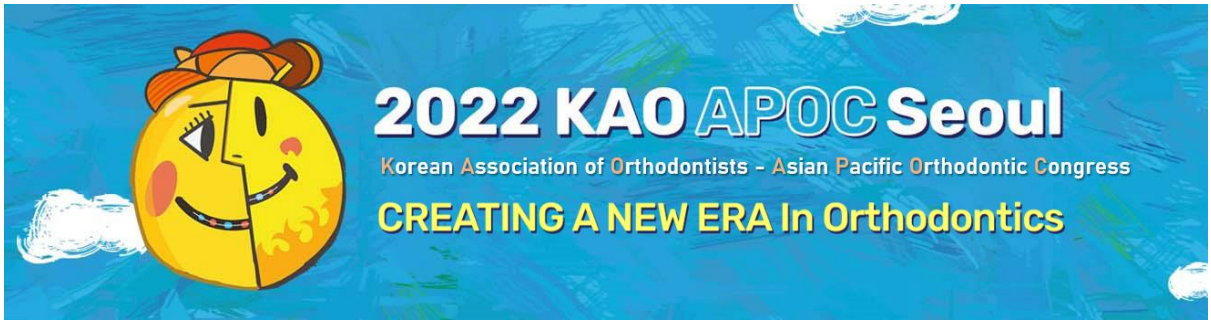
Objectives : This study aimed to classify the radiographical characteristics of impacted maxillary canines that were surgically exposed followed by orthodontic traction and to investigate the correlation between these characteristics and the traction duration for impacted maxillary canines.

Material and Methods : This retrospective study enrolled 74 patients with 87 maxillary canines. Cone beam computed tomography images, panoramic radiographs, and medical records were analyzed.

Results : Cyst formation and resorption of adjacent roots were observed in 26.4% and 23.0% of cases, respectively. Impacted maxillary canines were mostly distributed in the lateral incisor area. The average traction duration for 47 teeth that met the study criteria was 13.9±8.9 months. The distance from the maxillary canines to the occlusal plane (3c-OP) and to the midline and the angle between the midline and maxillary canines showed a statistically significant correlation with traction duration ($p<0.05$). The 3c-OP showed the strongest correlation with traction duration ($r=0.519$, $p<0.01$). The traction duration of impacted maxillary canines was most strongly related to its distance from the occlusal plane rather than the angle.

Conclusion : Using the characteristics of impacted maxillary canines based on their mesiodistal position and correlation with traction duration may facilitate proper diagnosis and treatment planning for impacted maxillary canines. Furthermore, if we combine the results of this study with recent advances in AI technology, in the near future, simple panoramic images can reveal the expected traction time duration and whether the unerupted canine requires orthodontic intervention.



P-090

Exploring genetic factors of fused teeth by whole exome sequencing

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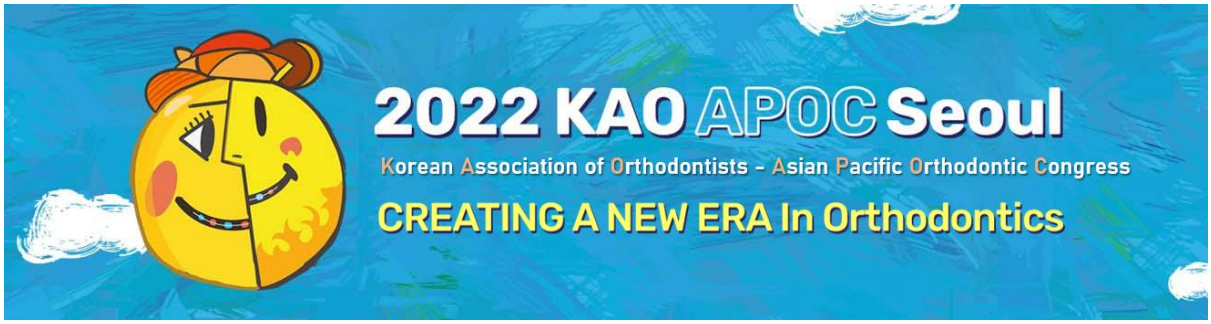
Purpose : Fused teeth is a dental disorder of abnormal tooth morphology and development, defined as two or more teeth fused by enamel, dentin, and cementum. The most frequently affected site of fused teeth is the mandibular incisor region, with an incidence of 0.5 to 2.5% in primary dentition and 0.1% in permanent dentition. The etiology of fused teeth is unclear, but there have been a few reported cases of familial occurrence. The purpose of this study is to explore the genetic factors of fused teeth using whole exome sequencing (WES).

Materials and methods : Saliva samples of patients with fused teeth and their family members were collected at Kanagawa Dental University Hospital and Pusan National University Dental Hospital. Patients with congenital diseases were excluded. Saliva was collected using the Oragene-DNA Kit (DNA Genotek Inc., Canada), and DNA was extracted according to the standard method. The DNA of 6 families, a total of 15 individuals, was analyzed at WES. WES data were analyzed to obtain a variant gene list, and candidate variant genes were extracted by filtering the variant gene list.

Results : 6 genes were extracted from the results of WES in 15 individuals from 6 families, which may be involved in the etiology of fused teeth.

Conclusions : In this study, we successfully extracted candidate genes for the etiology of fused teeth through the first genomic analysis in the world. This study is expected to assist in understanding the etiology of fused teeth and to predict malocclusion by early diagnosis, its treatment, and oral care in the future. Furthermore, understanding the mechanism of development of fused teeth will lead to a better understanding of the relationship between tooth development and genes, which will be helpful in terms of tooth regeneration and gene therapy in the future.



P-092

A longitudinal study of the osteoarthritic changes to the TMJ using a three-dimensional superimposition method

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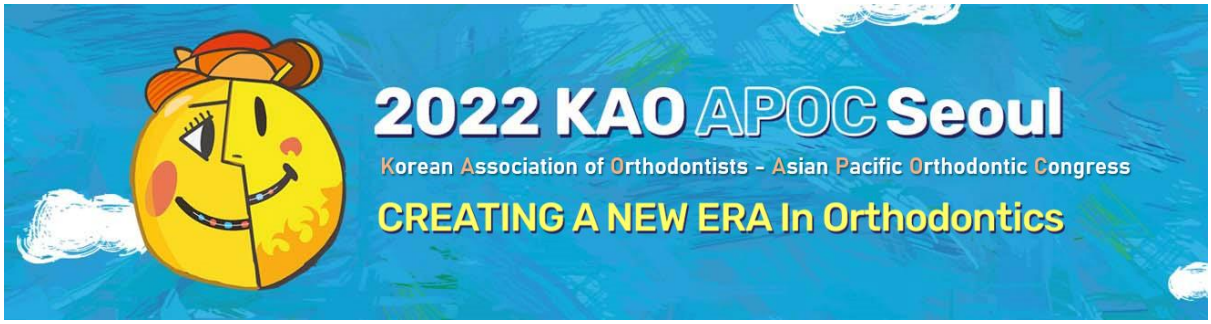
Department of Orthodontics, Korea University Guro Hospital

Objectives : With the development of cone beam computed tomography (CBCT), tissue changes caused by TMJ osteoarthritis can be observed better. Osteoarthritic bone changes in the hard tissue, such as erosion, flattening, and osteophytes, can be observed using CBCT. Thus, the aim of this study was to assess individual condylar changes for 5–8 years in patients with TMJ osteoarthritis using a 3D CBCT superimposition technique.

Material and Methods : This retrospective study included 67 condyles of 43 patient who visited or were referred to a dental clinic that specialized in orofacial pain with symptoms of temporomandibular joint disorders.
CBCT was performed at least 5 years apart from T0 to T2. Semi-automatic discrimination procedures were performed to obtain 3D condylar models using DICOM files taken by CBCT. To observe the osteoarthritic condylar changes, we superimposed the T0, T1, and T2 models of each patient.

Results : The greatest amount of resorption (− 7.48 mm) was observed in the superior condylar region. The highest apposition (2.66 mm) was also observed in the superior region. The mean resorption and apposition amounts during the average follow-up period of 5 years and 6 months were − 2.69 mm and 1.44 mm, respectively. In contrast to resorption, which was mainly observed in
the superior region, apposition was more frequent in the posterior region. When the differences between the medial and lateral parts were compared, resorption occurred at a higher
frequency in the lateral than in the medial part in the superior, posterior, and lateral regions.

Conclusion : Evaluation of the changes in each condyle showed that osteoarthritis leads to both resorption and apposition. Our superimposition method reveals that both resorption and apposition were observed in condyles with TMJ osteoarthritis, and resorption/apposition patterns depend on the individual condyle and its sites.



P-093

Chin morphology in relation to skeletal pattern, age, gender, and ethnicity

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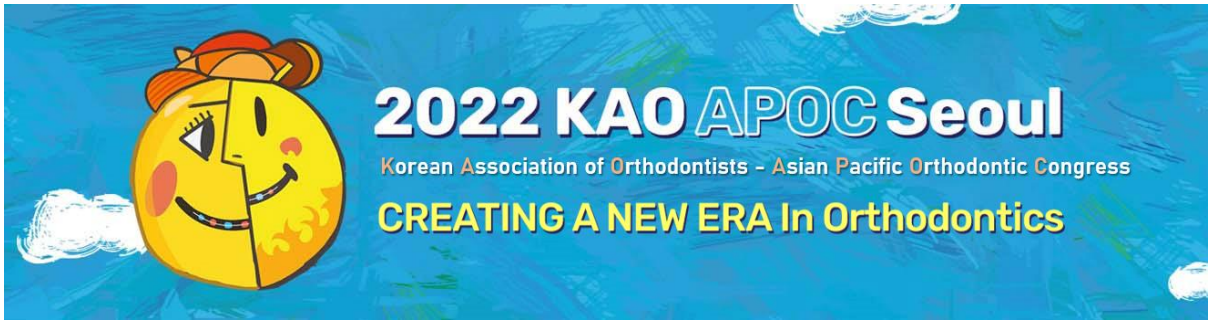
Purpose : The morphology of the chin is highly associated with a visually impactful and harmonious facial appearance. The purpose of this study was to examine the relationship between chin size and skeletal pattern, age, gender, and ethnicity.

Materials and methods : In this study, cone-beam computed tomography (CBCT) images of a total of 208 subjects (males: 90, females: 118), 63 of whom are Koreans and 145 of whom are Egyptians, aged 18 years and older were used. Chin size was evaluated in linear dimensions and volume. The skeletal pattern was evaluated for anteroposterior (Class I, II and III) and vertical (hypodivergent, normodivergent and hypodivergent) patterns.

Results : The larger the vertical skeletal pattern, the larger the chin volume and the smaller the width. In the anteroposterior skeletal pattern, Class III showed a larger volume than Classes I and II. There was no significant association for age with any of the chin-related measurements. Regarding gender, it was shown that the width, height, and volume of chins were larger for men than for women. Ethnicity showed that Koreans had greater chin volume than Egyptians.

Conclusions : Chin size was shown to be significantly associated with all items except age among skeletal patterns, sex, age, and ethnicity, indicating that various factors have a combined effect.



P-094

Growth modification of developing Class II division 1 malocclusion using myofunctional appliances

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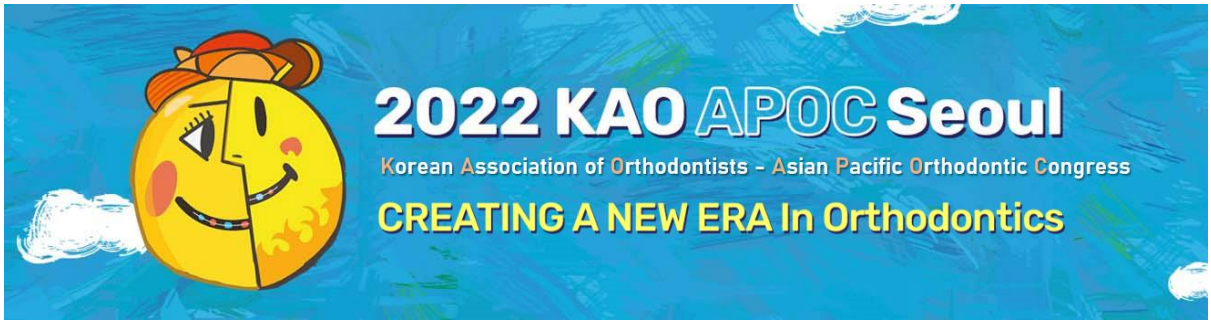
Introduction : Interceptive orthodontics is the phase of orthodontics in which possible abnormalities, malposition, and potential malocclusions in growing dentofacial complex are identified and corrected. Myofunctional appliances are an essential component of this stage. This case report outlines the use of Myobrace® appliances for the successful early treatment of a developing Class II malocclusion in mixed dentition.

Summary : We report the case of a 9-year-old girl with a Class II division 1, a 7mm overjet, 6mm overbite, a V-shaped maxillary arch, a convex profile with an overdeveloped maxilla as well as lip hypertonicity, and deep labiomental fold. She had the tendency of mouth breathing and lip sucking habit. Myobrace® appliance was employed to give myofunctional therapy for the treatment of poor oral habits, such as improper lip function and mouth breathing. Myobrace® combines the dental alignment abilities of rigid and soft appliances. Its structure replicates a fixed appliance: the soft outer part acts as the orthodontic wire, while the inner hard part engages the teeth individually. At first stage, Myobrace® T1 was used to initiate habit correction (training the patient to breathe through their nose rather than through their mouth, adapting their tongue to rest in the appropriate position, and swallowing in the correct manner), then Myobrace® T2 provides arch development. The Myobrace® T3 was used to give additional space for erupting teeth. Final alignment in this case may necessitate a shorter length of treatment with fixed appliance to get ideal interdigitation. The intraoral, facial pictures and cephalogram taken after treatment reveal an improvement in the facial profile, both overjet and overbite were reduced by 4 mm, and a relationship corresponding to Angle Class I was obtained.

Conclusions : Myobrace® may be a simple and good choice to treat skeletal malocclusion with oral habit, because to its greater compliance and favorable results.



P-095

Awareness and usage of mobile applications as an orthodontic diagnostic tool

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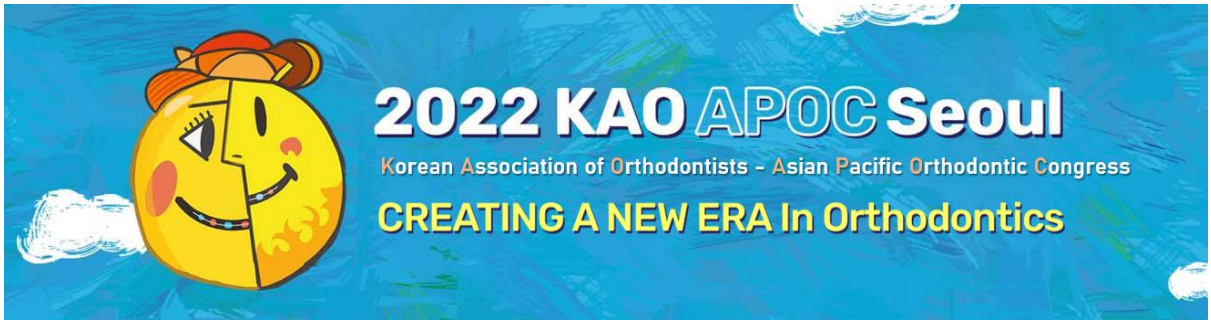
[2]Department of Orthodontics, University of Zagreb School of Dental Medicine, Zagreb, Croatia

Purpose : The purpose of this study was to assess the impact of orthodontic qualification length on the awareness and usage of mobile applications as an orthodontic diagnostic tool.

Materials and methods : This cross-sectional study was conducted using a questionnaire with 12 questions compiled and distributed to orthodontic clinicians registered in the Republic of Croatia. Data from 92 questionnaires (65% response rate) were compiled and analysed with a significance level of $p < 0.05$.

Results : The study involved 75 women (81.5%) and 17 male (18.5%) respondents. Kolmogorov - Smirnov test did not report normal sample distribution, hence Chi-squared test was used. The median of orthodontic qualification length was 12 years, therefore, respondents were divided into two groups; Group 1 with ≤ 12 years (N = 52) and Group 2 with > 12 years (N = 40) since qualification. When asked about the awareness of orthodontic mobile applications, 31.5 % (N = 29) have never heard of them, while only 4.3% (N = 4) have heard and use them daily. However, after availability insight, 43.5% (N = 40) of respondents, particularly those in Group 1, expressed an interest in using mobile applications instead of computer software for digital tissue analysis ($p = 0.05$). Although awareness of orthodontic mobile apps is not high, after analysing questions and answers of respondents about similar softwares and platforms, Spearman's rank correlation coefficient indicated that consumption of other mobile applications for practice management, patient support or social platforms is in positive correlation with knowledge and awareness of orthodontic mobile applications ($p = 0.05$).

Conclusions : Orthodontists in Croatia are not aware of the existence of mobile orthodontic applications, independently of the length of orthodontic qualification. Even so, there is a willingness to implement and use evidence-based mobile applications instead of computer software as an orthodontic diagnostic tool for hard and soft tissue analysis.



P-096

Relationship between tooth development and skeletal maturation: A retrospective longitudinal study

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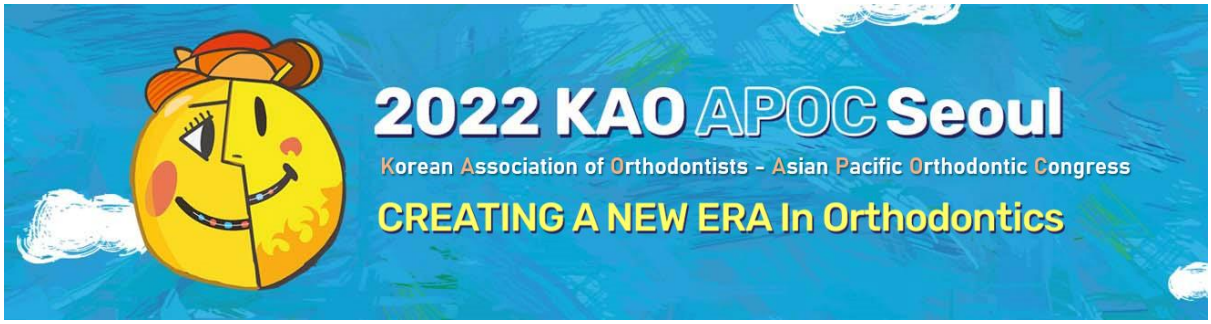
Objectives : The purpose of this study was to analyze the correlation between skeletal maturation and tooth development in growing children based on longitudinal data obtained through continuous growth observation, and to confirm the predictive value of skeletal maturation via tooth developmental stage assessment.

Material and Methods : Studies were conducted on 23 boys and 24 girls who periodically took hand-wrist and panoramic radiographs. For skeletal maturation assessment, skeletal maturity indicators (SMI) by Fishman was used. Tooth development was evaluated based on the Demirjian method.

Results : Both genders showed a high positive correlation between tooth development and skeletal maturation. Comparing the correlation by tooth, the tooth development of the mandibular second molar had the highest correlation with SMI compared to the maxillary canine and mandibular canine in boys, but there was no significant difference among the correlation between each tooth and SMI in girls. As a result of confirming the predictive value of tooth development for skeletal maturation, at the time of complete root formation of the mandibular second molar, 98.92% of the boys and 95.75% of the girls were beyond their growth peak (SMI 5-6 for boys, SMI 6-7 for girls). If the formation of the mandibular canine was not completed, 90.53% of the boys and 87.58% of the girls did not reach the growth peak.

Conclusion : Tooth development stage assessment is a clinically useful and reliable method for skeletal maturity evaluation.



P-097

Non-extraction treatment for Class II malocclusion and large overjet with Activator-posterior high pull headgear combination

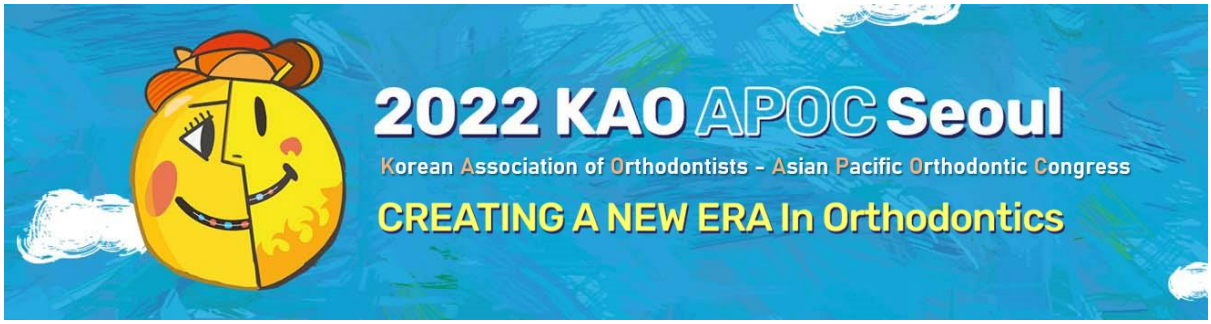
Dalsun Yun, Jina Park

Chuncheon Ye Dental clinic

Introduction : Severe large overjet doesn't only cause esthetic problems but also, abnormal perioral muscle functions like lip incompetence and mouth breathing. Usually, malocclusion with large overjet is treated with premolar extractions. But using functional appliances during early age could enhances esthetic and functional problems without premolar extraction.

Case Summary : We report the case of a 11-year-old boy who had a skeletal Class II malocclusion, spacing, and severe large overjet which led to lip incompetence and dry mouth. Hand and wrist radiograph illustrated that the patient showed pubertal growth peak. To treat skeletal Class II malocclusion, Two-phase orthodontic treatment was planned. During Phase one treatment, Class II malocclusion and severe large overjet were treated with activator and posterior high pull headgear. Overjet was so large that we needed two activators to treat Class II malocclusion. After activator-headgear combination treatment, maxillary anterior spacing was closed with braces (Phase two treatment). Fixed appliance orthodontic treatment was performed without extraction. After comprehensive treatment, stable occlusion and esthetic facial line were obtained. And patients showed competent lip posture. Treatment results were stable in retention photographs.

Conclusion : Activator-posterior high pull headgear combination treatment helps to treat Class II malocclusion. And severe large overjet could be treated without premolar extraction in an appropriate Two-phase orthodontic treatment plan.



P-098

Volumetric changes of frontal sinus after correction of anterior open bite

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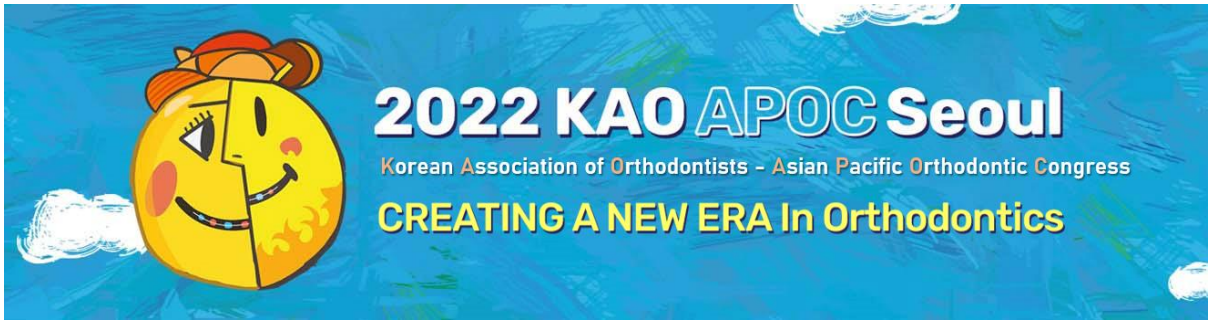
Department of Orthodontics, College of Dentistry, Gangneung-Wonju National University

Objectives : To investigate volumetric changes of frontal sinus after non-surgical or surgical orthodontic treatment for patients with anterior open bite.

Material and Methods : Samples for this retrospective study consisted of cone beam computed tomography (CBCT) images taken for patients diagnosed with anterior open bites. Seventeen patients of a non-surgical group had undergone conventional orthodontic treatment and 13 patients of a surgical group received orthodontic treatment with orthognathic surgery. The control group consisted of another 17 patients who had minor crowding and normal anterior overbite. Segmentation and three-dimensional reconstruction of the frontal sinus were performed. The volume of the frontal sinus was measured using ITK-SNAP program on CBCT images before (T1) and after treatment (T2). Volumetric changes were compared within groups and between groups.

Results : Though the volume of frontal sinus was significantly decreased at T2 in the non-surgical group compared to that in the control group, the differences was within the range of method error. Volumetric changes in the surgical group were not statistically significant.

Conclusion : The opacity of the inferior border of the frontal sinus was slightly increased after non-surgical orthodontic treatment in adult patients with anterior open bite. However, improvement of occlusion did not cause substantial dimensional changes of the frontal sinus in the surgical or non-surgical orthodontic group.



P-099

Bone age evaluation based on cervical vertebrae using lateral cephalograms

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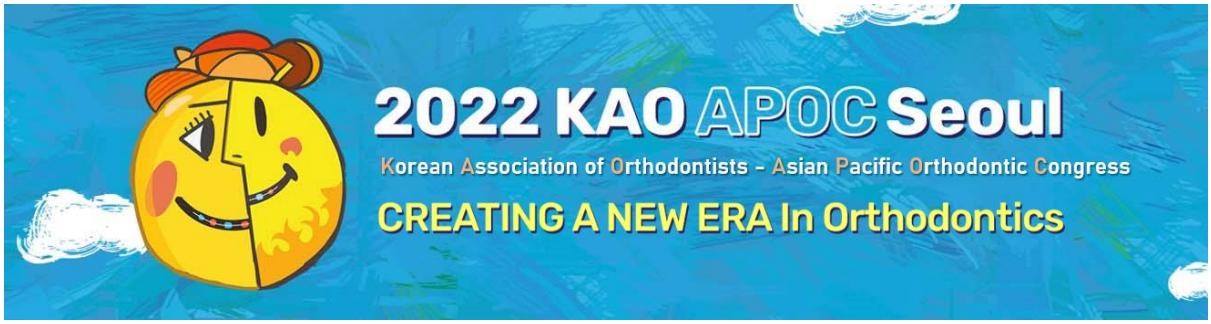
Objectives : This study is aimed to investigate the correlation of chronological age and the maturity of hand-wrist bones and cervical vertebrae and the difference of growth pattern according to facial skeletal type.

Material and Methods : A total of 286 patients (chronological age 11.3±2.0 years, SMI stage 5.6±3.2) were included in this retrospective study and consisted of 124 males and 162 females. Lateral cephalometric radiographs and hand-wrist radiographs were used. For the evaluation of growth spurt in different facial type, patients of SMI stage 4 to 7 were divided into three groups (group1,2and 3) based on ANB angle for anteroposterior facial pattern and three groups (group L,N and H) based on FMA angle for vertical facial pattern.

Results : In both male and female, there was significant correlation among chronological age and skeletal maturity of hand-wrist bones and cervical vertebrae. Hand-wrist bones maturity showed the highest correlation with chronological age in both male ($r = 0.866$) and female ($r = 0.864$) ($p < 0.01$). Of the various features of cervical vertebrae morphology, height/width ratio of the fourth cervical vertebrae was correlated the most significantly with both chronological age (male $r = 0.702$, female $r = 0.741$; $p < 0.01$) and hand-wrist bones maturity (male $r = 0.735$, female $r = 0.838$; $p < 0.01$). Moreover, chronological age of patients in group 3 was significantly higher than other groups (male $p < 0.001$, female $p = 0.006$) and the group H showed the significantly lowest chronological age among three groups of vertical facial skeletal pattern (male $p < 0.001$, female $p=0.001$).

Conclusion : The correlation of chronological age and the maturity of hand-wrist bones and cervical vertebrae was statistically significant. Moreover, it is recommended to observe the growth of patients with skeletal class III malocclusion until late adolescence and begin orthopedic treatment early in patients with hyperdivergent facial profile.



P-100

Correction of unilateral posterior scissor-bite using removable orthodontic appliance in growing patient.

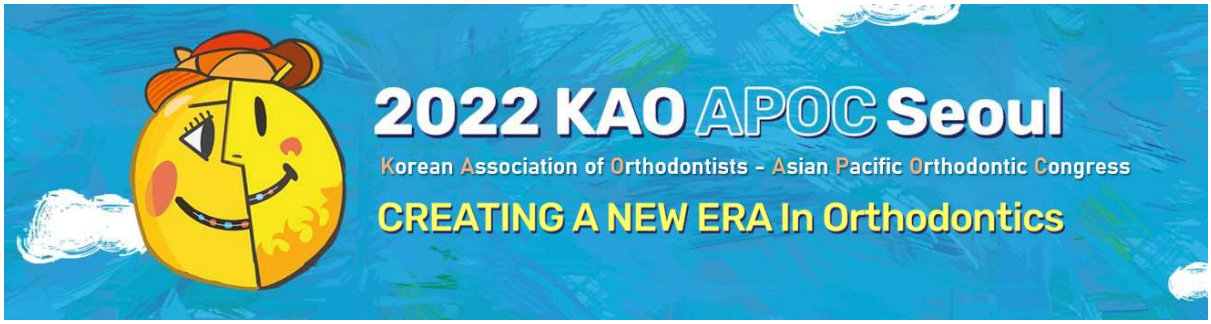
Kyoung-hoon Lee[1,3], Hye-rim Choi[2,3]

[1]Barun Smile Orthodontic Clinic
[2]Dongtan Tooth & Jaw Dental Clinic
[3]KRSOO (Korean Research Society of Orofacial Orthopedics)

Introduction : A scissor bite in the posterior teeth is an occlusion which occurs when the palatal cusp of the maxillary posterior teeth are positioned buccally to the buccal cusp of the mandibular posterior teeth, either unilaterally or bilaterally. The Posterior scissor bite in growing patients can cause masticatory disfunction, temporomandibular joint disorders, disharmony in dental arch and facial asymmetry. Therefore, early orthodontic intervention is important in the growing patients with the posterior scissor bite.

Case Summary : We report the case of a 12 year-old boy had a skeletal Class II malocclusion, posterior scissor bite on right side, anterior deep bite, deviation of mandibular dental midline to left side. The width of palatal suture to the maxillary first premolar and deciduous second molar on right side was larger than the left side. Active plate with posterior bite blocks was used to move the maxillary first premolar and deciduous second molar on right side to palatally and cross elastics were used to correct scissor bite. As scissor bite was improved, the left posterior bite block was removed gradually for extrusion of the left mandibular posterior teeth and occlusion of the left posterior teeth.

Conclusion : Early treatment of the unilateral posterior scissor bite is important to prevent problems such as masticatory disfunction, temporomandibular joint disorders, facial asymmetry. Removable appliances such as active plate and cross elastics are effective method to improve posterior scissor bite.



P-101

Effects of maxillary protraction with palatal plates versus tooth-borne anchorage in growing Class III patients

You-sun Lee[1], Jaehyun Kim[2,1], Yoonji Kim[2,1], Yoon-Ah Kook[2,1]

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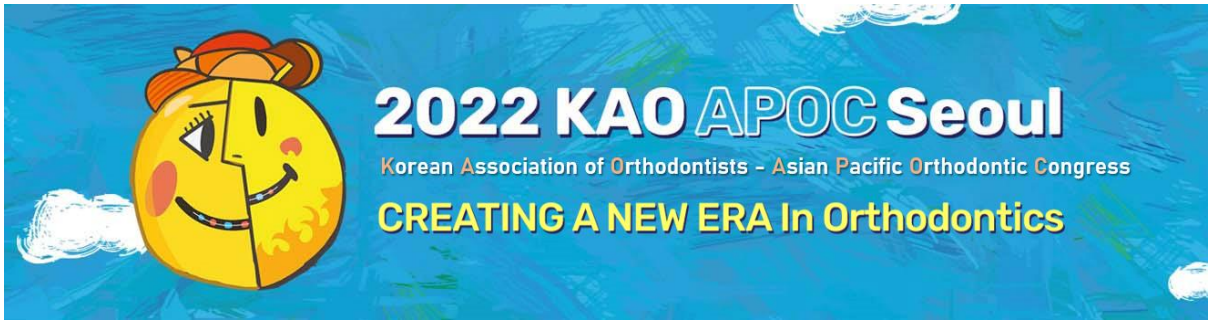
[2]Department of Orthodontics, Seoul St. Mary`s Hospital, The Catholic University of Korea

Objectives : The purpose of this study was to evaluate the treatment effects of maxillary protraction using palatal plates and compare them to those with conventional tooth-borne anchorage in growing Class III patients.

Material and Methods : Forty patients were divided into two groups according to the type of anchorage used: Group 1 (n=20; mean age= 10.5±1.6 years; palatal plates) and Group 2 (n=20; mean age= 10.0±1.2 years; tooth-borne appliances). In Group 1, the plate was placed in the paramedian-palatal area with three self-drilling mini-screws. In Group 2, a conventional tooth-borne appliance was used with a facemask for maxillary protraction. Lateral cephalograms were taken before (T0) and after maxillary protraction (T1). Skeletal, dental, and soft-tissue variables were measured. For statistical analysis, paired and independent t-tests were performed.

Results : Group 1 showed maxilla advancement by 2.3±1.0 mm compared to Group 2 by 0.9±0.6 mm, Group 2 indicated clockwise rotation of the mandible, but there was no such clockwise rotation in Group 1 ($P<0.001$). Group 1 had a less lingual inclination of the mandibular incisors than Group 2 (IMPA, -1.0±3.8˚ vs. -3.8±2.8˚; $P<0.05$). There was no difference in soft tissue changes between the two groups.

Conclusion : A facemask with palatal plate induced maxillary advancement with less mandibular clockwise rotation and dental movement than conventional tooth-borne anchorage. Therefore, facemask with palatal plates can be used as an efficient modality for maxillary protraction in growing Class III patients.



P-102

Differences in 3-dimensional aging changes of the lips among skeletal malocclusions in women.

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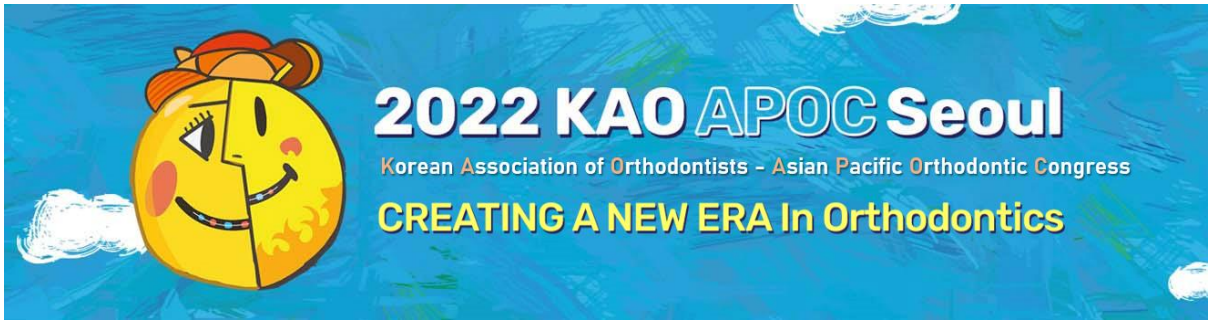
Objectives : The objective of the study was to evaluate and compare the three-dimensional aging changes of the lips among skeletal Class I, II and III malocclusions in women.

Material and Methods : CBCT and lateral cephalograms of 270 female adult patients (20 ≤age <50) were evaluated. Age groups were divided into subjects age as 20s, age 20-29y; 30s, age 30-39y; and 40s, age 40-49y. Skeletal malocclusion was classified as Class I, 0 ≤ ANB ≤ 4 degree; Class II, ANB>4 degree; Class III, ANB < 0 degree using lateral cephalograms. A total of 10 linear, 5 angular, 4 slope and 3 volume variables were analyzed surrounding the lip region.

Results : Cheilion significant moved backward at 40s than the 20s regardless of malocclusion ($p<0.05$). For Class I and II malocclusion, lip height decreased($p<0.001$) while the mouth width and cheilion depth increased($p<0.05$) resulting in the decrease in lip volume with age (20s> 40s). Especially for Class II, aging changes in lower lip prominence angle significantly decreased($p<0.001$) inducing prominent changes in lower lip morphology compared to the upper lip.
For Class III malocclusion in their 20s, lip volume was significantly lower than those of Class I and II counterparts ($p<0.001$). However, the decrease in lip volume with age was not prominent for class III malocclusion, thus the overall lip volume in the 40s became similar among Class I, II and III malocclusions.

Conclusion : Aging changes of the lips were more prominent in the lateral and paramedian regions than the median region. Underlying skeletal malocclusion may affect the 3-dimensional aging changes of the lips.



P-103

Introduction of SMI-level automatic classification technique using artificial intelligence.

JungSuk Kim[1], Cheol Soon Kim[1], Jae Joon Lee[2], Harim Kim[3], Sung Hwan Choi[3], Jung yul Cha[3]

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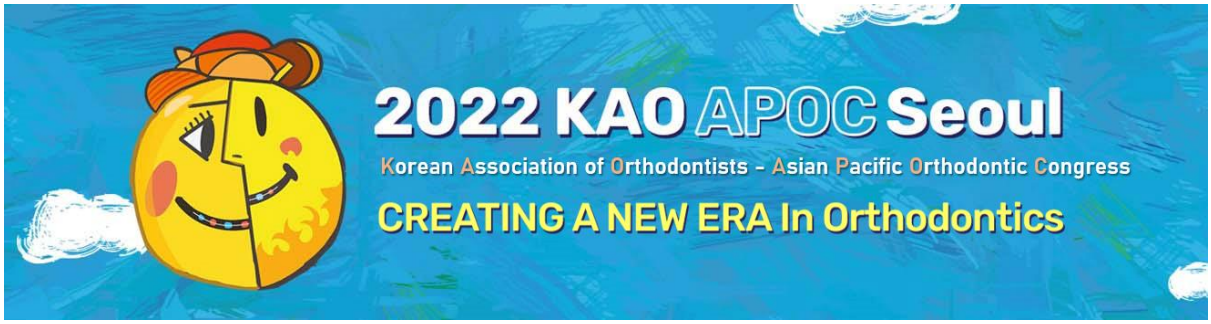
[3]Department of Orthodontics, The Institute of Craniofacial Deformity, College of Dentistry, Yonsei University

Objectives : The purpose of this study is to introduce a program that automatically evaluates Fishman's Skeletal Maturity Index through artificial intelligence and deep learning.

Material and Methods : Crescom's MediAI-BA artificial intelligence program uses the RetinaNet deep neural network model for automatic region detection and automatic analysis of bone maturation by region while deriving bone age evaluation and adult height prediction using TW3 and GP methods from hand-wrist radiographs. A deep learning model of the Vision transformer series is used, and the SMI stage classification is mapped to a subset of 34 stages of bone maturity of the TW3 analysis transformation.

Results : Based on the open dataset (RSNA 2017 dataset, DHA dataset) and Korea University Anam Hospital dataset, 20,000 learning cases and 1561 correctional hospital cases were verified. When comparing the results of the expert and the AI results, the overall mean absolute error (MAE) was 0.496, and by gender, it was 0.484 for females and 0.511 for males.

Conclusion : The AI evaluation method presented here reduces inter- and intra-measurement errors compared to measuring manual SMI method, and can be quickly and objectively explained to the patient and applied to growth modification treatment. Bone age evaluation informs the growth status of the patient and adult predicted height , thereby providing higher satisfaction to patients and parents.



P-104

Long term effects of Class III treatment with tooth-borne and skeletal anchorage maxillary protraction

Ji-woo Jang[1], Dong-hwa Chung[1,2], Jin-woo Lee[1], Sang-min Lee[1], Mo-hyun Lee[1], Eu-jin Jang[1,2]

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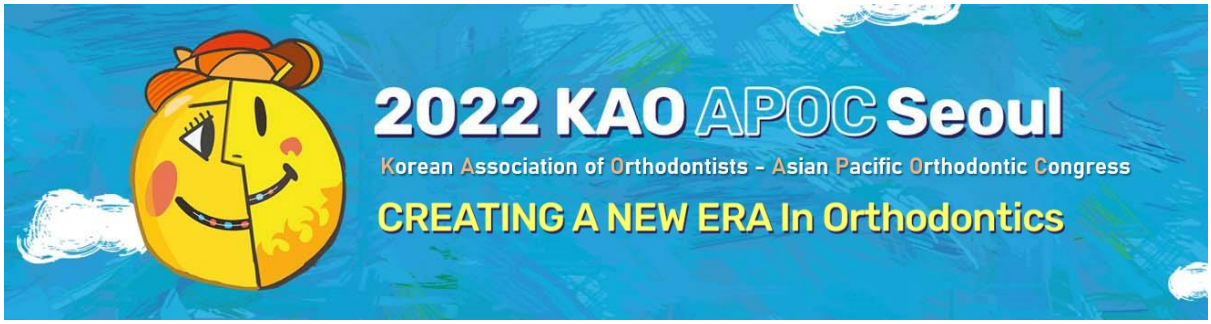
Objectives : Skeletal anchored facemask is an effective protocol in protracting the maxilla in growing skeletal class III patients. Although its efficacy is widely reported, its long-term stability remains questionable. The purpose of the present study was to investigate the long term effect and stability of skeletal anchored facemask in comparison to conventional tooth borne facemask in growing Class III patients.

Material and Methods : Of total 180 subjects screened, 34 subjects were confirmed and grouped into skeletal anchored maxillary protraction (SAMP, n=17) group, and tooth borne maxillary protraction group (TBMP, n=17) Cephalograms were taken at the initial observation (T0), after the protraction (T1), and after about 5 years follow up (T2). Cephalometric analysis was performed and significance was assessed between the two groups.

Results : After traction period (T0-T1), greater advancement was attained in SAMP group. There was significant difference in A point (SNA, Co-A point, A point to VRL) and Orbitale (SN-Or, Or to VRL). Intermaxillary relationship was also improved (ANB, AB to mandible plane) and greater counterclockwise rotation was observed (FH – palatal plane).
After the total follow up period (T0-T2), the difference was partially maintained. SN-Or, Or to VRL, APDI, and FH – palatal plane werewas significantly different between two groups

Conclusion : The orthopaedic effects of SAMP in maxillary protraction and intermaxillary relationship were greater compared to TBMP after protraction. After around 5 years of follow up, the difference between two groups was partially maintained, and the effect of Skeletal anchored facemask was diluted due to phase II treatment and remaining growth.



P-105

Changes in natural head position after facemask therapy according to the methods of anchorage

Tae-Hoon Kim, Chan-Woo Yeo, Dong-Soon Choi, Insan Jang, Bong-Kuen Cha

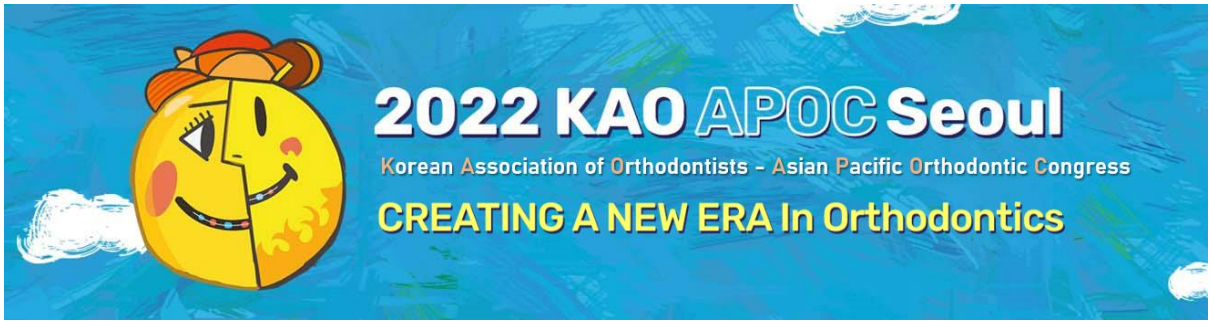
Department of Orthodontics, College of Dentistry, Gangneung-Wonju National University

Objectives : To compare changes in natural head position (NHP) in skeletal Class III children who were treated by skeletal anchored facemask therapy with those of conventional tooth-borne facemask therapy.

Material and Methods : Sixteen Class III patients who received facemask (FM) therapy with miniplates as anchorage for maxillary protraction (Miniplate/FM group, mean age: 9.9 ± 1.4 years old) and thirty-four Class III patients who were treated by facemask therapy with rapid maxillary expander (RME/FM group, mean age: 8.4 ± 1.7 years old) were selected for this retrospective study. Lateral cephalometric radiographs at pre-treatment (T1) and post-treatment (T2), and lateral facial photographs in NHP at T1, T2, and post-treatment (T3) were collected for this study. Changes in the cephalometric measurements and NHP were compared between groups.

Results : The cephalometric measurements between two groups in T1 show that there were no significant differences between groups except wits appraisal. NHP changes which were measured by the angle between canthus-tragus line and true horizontal line during T1-T2 and T2-T3 were -2.1° and 0.8° in Miniplate/FM group, respectively, and those in RME/FM group were 0.3° and 0°, respectively. During the treatment period (T1-T2), no statistically significant NHP change was found in RME/FM group. But in Miniplate/FM group, NHP change was significantly decreased, meaning head flexion (P=0.032). In observation period (T2-T3), there were no statistically significant differences in NHP changes in either between groups or within groups.

Conclusion : The results of this study suggest that NHP in Class III children who were treated by facemask therapy with skeletal anchorage changes significantly in ways toward head flexion and it maintained during a 1.4-year observation period. Tooth-borne facemask therapy did not seem to change NHP significantly.



P-106

Reducing orthodontic relapse in a rabbit model by osteoclastogenesis inhibition induced by simvastatin local administration

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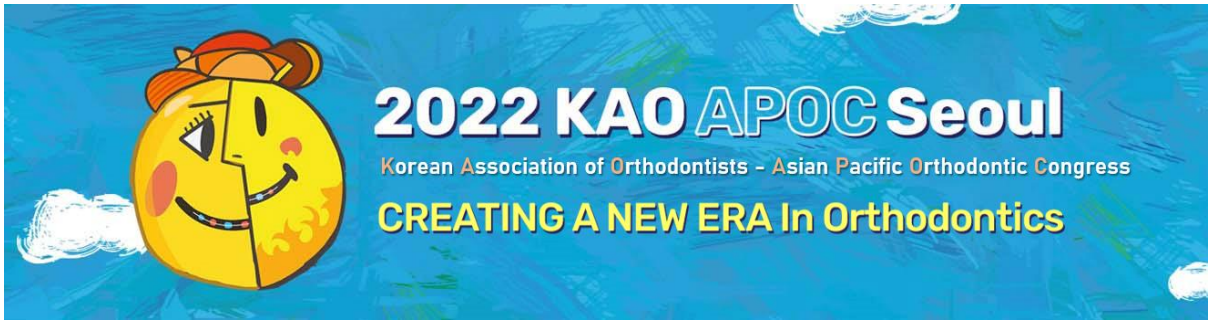
Purpose : This study aims to determine the effect of simvastatin hydrogel administration during orthodontic relapse through osteoclastogenesis inhibition by modulating the expression of RANKL and OPG

Materials and methods : Twenty-four rabbits (Oryctolagus cuniculus) were divided into a control group (n=12) and a treatment group (n=12). The lower incisors were subjected to orthodontic force and moved distally by an open coil spring for one week and retained in a new position for 3 weeks (stabilization period). The treatment group received local simvastatin hydrogel administration during the stabilization period, and the other group received hydrogel without simvastatin. The springs were debonded from both groups afterward. The plaster models of the mandible were obtained from impressions material and the gingival crevicular fluid was isolated consecutively according to observation days (days 3, 7, 14, and 21). The relapse rate was measured in a model study using digital calipers. Levels of OPG and RANKL were analyzed using ELISA. The data obtained were analyzed using a statistical test.

Results : The administration of simvastatin hydrogel significantly decreases the relapse rate on days 7, 14, and 21. The level of RANK was significantly lower on day 14. Moreover, simvastatin increases the level of OPG on day 3 (P

Conclusions : The local simvastatin hydrogel administration during the retention period can prevent orthodontic relapse by reducing osteoclastogenesis in a rabbit model.



P-107

BBS7-SHH signaling activity regulates periodontal homeostasis in hypofunctional teeth

Pi En CHANG[1], Shujin Li[2], Dong-Joon Lee[2], Han-Sung Jung[2], Yoon Jeong Choi[1]

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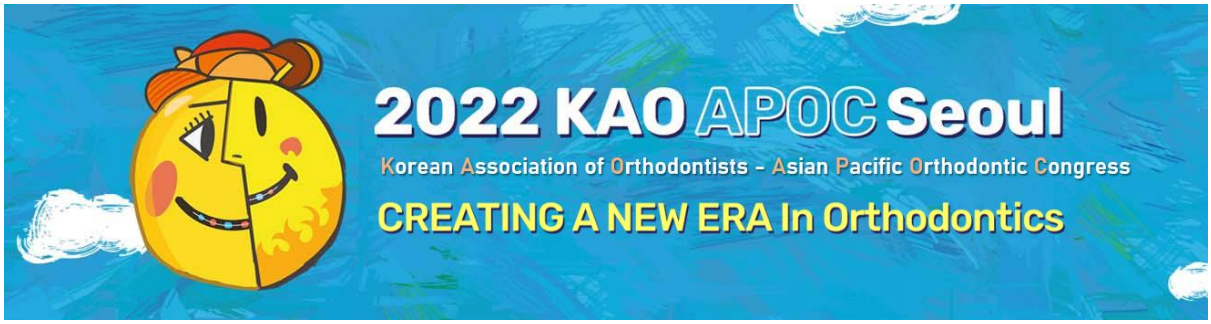
Objectives : Mechanical stimuli are essential for the maintenance of periodontal ligament (PDL) homeostasis. Despite several studies on atrophic changes in PDL due to occlusal hypofunction, the underlying mechanism is still unknown. Here, we aimed to explore the changes of gene expression between normal and occlusal hypofunctional PDL and to investigate and elucidate the related role in maintaining the PDL homeostasis.

Material and Methods : Thirty-four human premolars which had been scheduled for orthodontic extraction were divided into control group with occlusal contact on one side (left or right) and hypofunction group without occlusal contact on the other side. To investigate the transcriptomic difference between control and hypofunctional PDL tissue, RNA sequencing was performed on the 34 human teeth. The atrophic changes in PDL were evaluated by histological analysis. The effect of Bardet-Biedl syndrome 7 (BBS7) knockdown was evaluated by RT-qPCR, western blot, wound healing assay, and tubule formation assay.

Results : We detected that the expression of BBS7 was downregulated in occlusal hypofunctional PDL through RNA-sequencing. Dynamic changes, including a decrease in the number of PDL cells, direction changes of collagen fibers from horizontal to parallel to root surface, decrease in the diameter of blood vessels, and significant reduction of primary cilia, and torturous oxytalan fibers, were observed following occlusal hypofunction. Furthermore, Sonic Hedgehog (Shh) signaling activity was closely associated with BBS7 expression in PDL cells. In addition, the cell migration and angiogenesis were also suppressed by BBS7 knockdown in vitro.

Conclusion : Occlusal force regulates the expression of BBS7 to mediate Shh signaling activity, which orchestrates cell migration and angiogenesis for proper PDL homeostasis. BBS7 plays an essential role in maintaining Shh signaling activity for PDL homeostasis.



P-108

Evaluation of Periodic Stability of the Oral Microbiome from a Healthy Cohort

Utkarsh Mangal[1], Kowoon Noh[2], Seeyoon Lee[1], Jae-Sung Kwon[2], Jung-Yul Cha[1], Kee-Joon Lee[1], Sung-Hwan Choi[1]

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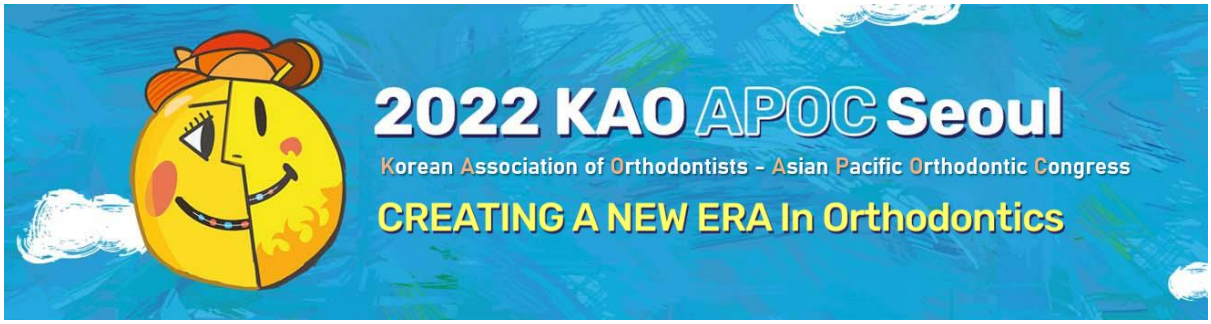
[2]Department and Research Institute of Dental Biomaterials and Bioengineering, Yonsei University College of Dentistry

Objectives : The use of 16S ribosomal RNA gene sequencing analyses has rapidly increased in clinical oral studies. However, cohort-based clinical research has not sufficiently accounted for the periodic stability in oral microbiota. Herein, we aimed to assess the stability of the oral microbiome across time from an intervention-free "healthy" cohort.

Material and Methods : We obtained 33 supragingival samples of 11 healthy participants from the biobank. For each participant, we processed one sample as baseline (T0) and two samples spaced at monthly (T1) and quarterly (T2) intervals for 16S ribosomal RNA gene sequencing analysis.

Results : We observed that taxonomic profiling had a similar pattern of dominant genera, namely Rothia, Prevotella, and Hemophilus, at all-time points. Shannon diversity revealed a significant increase from T0 ($p<0.05$). Bray Curtis dissimilarity was significant ($R=-0.02$, $p<0.01$) within the cohort at each time point. Clustering revealed marked differences in the grouping patterns between the three-time points. For all time points, the clusters presented a substantially dissimilar set of differentially abundant taxonomic and functional biomarkers.

Conclusion : Our observations confirmed presence of periodically different stable states within the oral microbiome in an intervention-free healthy cohort. Accounting for multi-stability will improve the understanding of future research and facilitate identifying and classifying the reliable markers of diseased, healing, healed, and healthy states.



P-109

Geometric Morphometric Analysis On Hard And Soft tissue changes in Class II Division 1 Malocclusion

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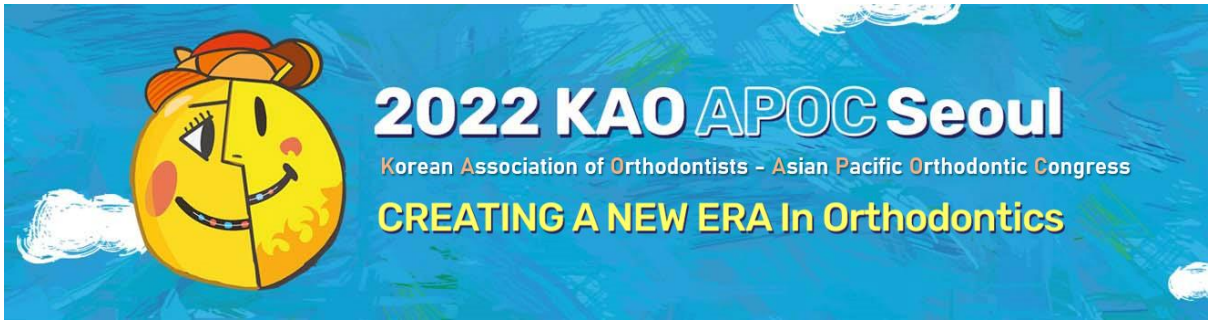
Purpose : To analyse the skeletal, dental and soft tissue shape variation before and after orthodontic treatment in Class II division 1 malocclusion using Geometric Morphometric Analysis (GMA).

Materials and methods : 64 pre and post orthodontic treatment lateral cephalometric radiographs of Class II div 1 malocclusion patient, aged between 11-30 years old were collected. 32 landmarks with x and y coordinates were identified using TPSDig2 and exported to MorphoJ. Generalized Procrustes Analysis, Procrustes ANOVA (PA) and Principal Component Analysis (PCA) was done to analyse shape variation. Discriminant Analysis (DA) and Conanical Variate Analysis (CVA) was done to compare pre and post upper incisors inclination (UII), Maxillary and Mandibular Plane Angle (MMPA) and Gonion angle (GA), shape changes.

Results : PCA showed vertical variation form increased in vertical face height, lip length and MMPA, to reduced vertical height, lip length and MMPA (PC1, 24.44%). PC2 showed antero-posterior variation from mild class II skeletal and retroclined lower incisors to severe class II skeletal and proclined lower incisor(16.36%). PC3 showed shape variation in the nasio-labial angle and mandibular body height (9.021%). PA and CVA showed that facial profile shape is affected by UII (5.330%, P

Conclusions : Post orthodontic treatment in class II div 1 involved uprighting of upper incisors and flattening of the upper lips. Significant skeletal, dental and soft tissue shape variation observed in Class II division 1 malocclusion and this information is important for clinical diagnosis and treatment planning.



P-110

RNA sequencing of expression osteoclast differentiation-related genes in osteocytes by TNF-α stimulation

Mariko Miura, Hideki Kitaura, Fumitoshi Oohori, Takahiro Noguchi, Aseel Marahleh, Ria Kinjo, Adya Pramusita, Ma Jinghan, Kayoko Kano, Itaru Mizoguchi

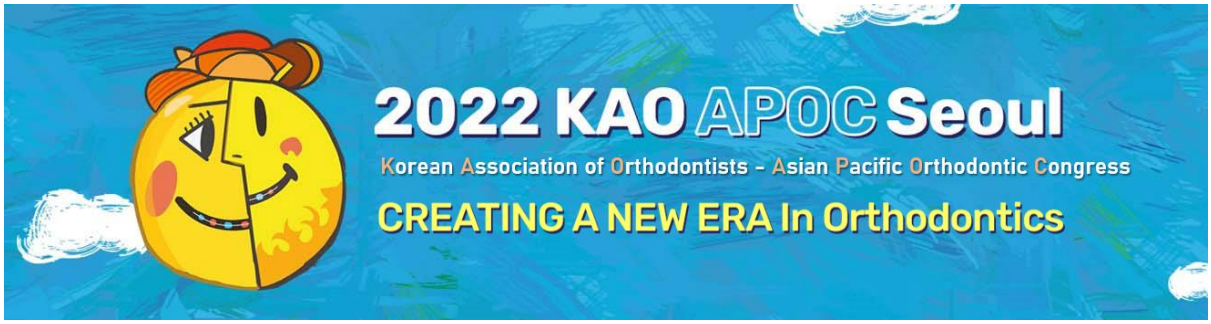
Division of Orthodontics and Dentofacial Orthopedics, Tohoku University Graduate School of Dentistry

Purpose : Osteoclastogenesis by TNF-α, which is expressed on the compression side, is important for orthodontic tooth movement. We have been studying which cells react with TNF-α during tooth movement and which cells play an important role in osteoclastogenesis. We found that the mechanism by which TNF-α acts on stromal cells, including osteocytes, to increase the expression of RANKL is important. We also found that the action of TNF-α on osteocytes is important because RANKL expression in osteocytes is decreased during orthodontic tooth movement in TNF receptor-deficient mice. However, the details of the mechanism by which RANKL is induced when TNF-α acts on osteocytes remain unclear. In this study, we aim to elucidate the mechanism of TNF-α action on osteocytes by comprehensively analyzing gene expression when TNF-α acts on osteocytes by RNA-sequencing.

Materials and methods : We isolated Topaz-positive osteocytes from the calvariae of 5-6 day-old DMP1-Topaz mice, whose osteocytes express green fluorescence protein, using a cell sorter (FACS Aria II). These osteocytes were cultured with TNF-α and total RNA was purified. RNA-seq was performed for comprehensive analysis of osteoclast differentiation-related genes.

Results : RNA-seq analysis revealed that osteoclast differentiation-related genes such as IL1A and Tnfsf11 were upregulated in TNF-α-treated osteocytes. The results suggested that TNF-α-stimulated osteocytes increase various osteoclastogenic factors including RANKL.

Conclusions : The expression of osteoclast differentiation related gene in osteocytes by TNF-α stimulation was found, suggesting that TNF-α stimulated osteocytes promote osteoclastogenesis.



P-111

Mechanism of accelerated tooth movement by micro-osteoperforations

Ria Kinjo, Hideki Kitaura, Saika Ogawa, Fumitoshi Ohori, Takahiro Noguchi, Aseel Marahleh, Yasuhiko Nara, Adya Pramsita, Jinghan Ma, Kayoko Kanou, Itaru Mizoguchi

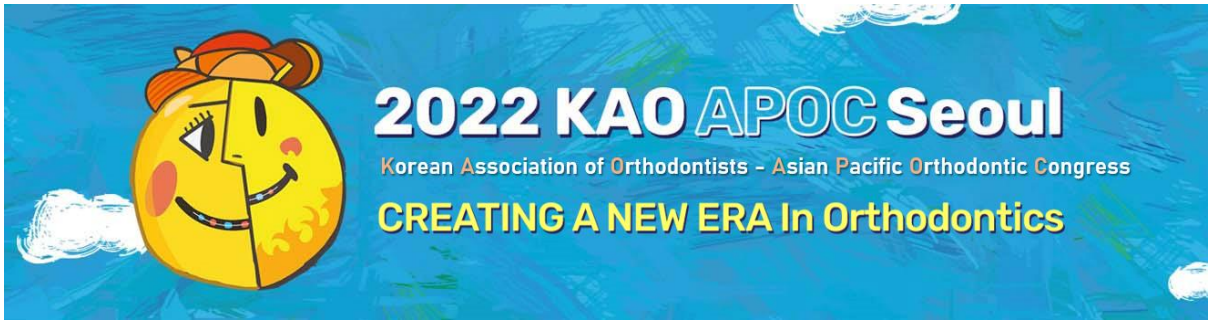
Division of Orthodontics and Dentofacial Orthopedics, Tohoku University Graduate School of Dentistry, Sendai, Japan

Purpose : It has been reported that TNF receptors deficient mice showed less tooth movement than wild-type mice, which indicated a significant role of TNF-α in orthodontic tooth movement (OTM). In addition, micro-osteoperforations (MOPs) have been reported to accelerate orthodontic tooth movement (OTM). However, the effects of MOPs on TNF-α expression during OTM and the mechanism of accelerated OTM by MOPs remain unclear. The purpose of this study is to investigate the effect of MOPs on OTM and mechanism of accelerated OTM by MOPs. In this report, the influence of MOPs during OTM was analyzed.

Materials and methods : We evaluated the expression of TNF-α with and without MOPs by RT-PCR analysis. A Ni-Ti closed-coil spring was fixed between the maxillary left first molar and incisors as an OTM mouse model to move the first molar in the mesial direction. MOPs were prepared on the lingual side and mesial side of the upper first molars. Furthermore, to investigate the target cell of TNF-α for osteoclast formation during OTM with MOPs in vivo, we created four types of chimeric mice in which bone marrow of wild-type (WT) or TNF receptor 1- and 2-deficient mice (KO) was transplanted into lethally irradiated WT or KO mice.

Results : The results showed that MOPs increased TNF-α expression, the distance of tooth movement and osteoclast formation significantly. Furthermore, mice with TNF-α-responsive stromal cells showed a significant increase in tooth movement and number of osteoclasts by MOPs.

Conclusions : We concluded that the expression of TNF-α was increased by MOPs and MOPs accelerated tooth movement. Furthermore, The increase in TNF-α expression and tooth movement is dependent on TNF-α-responsive stromal cells.



P-112

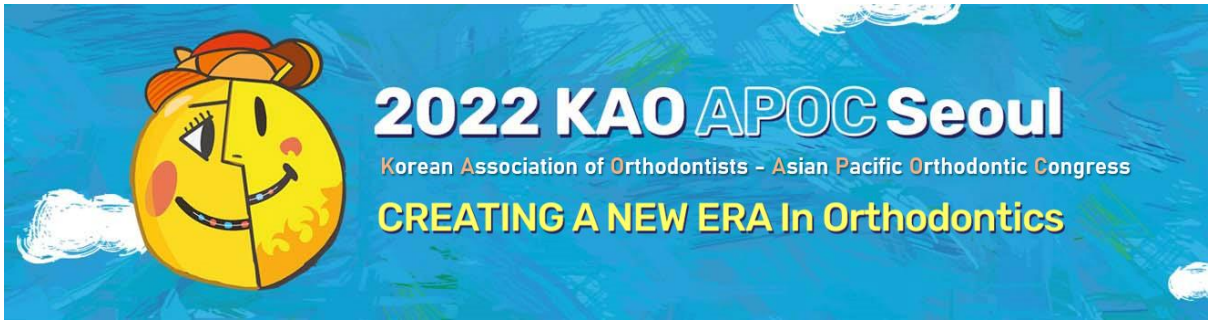
Mobile Application Instructions Compared to Chairside Instructions on Oral Hygiene to Orthodontic Patients

DEBORAH ANNE NATHAN DHANARAJU[1], NOOR SAM AHMAD[1], NURUL ASYIKIN YAHYA[1], ASMA ALHUSNA ABANG ABDULLAH[2]

Introduction : In current global conditions, judicious use of clinical time allocation is necessary in treating patients. Procedures such as the conveyance of post bond up instructions can be done remotely. Adequate information on how to care for oral health while undergoing orthodontic treatment is crucial to minimise the incidence of unwanted sequelae of treatment such as gingivitis and dental caries. A mobile app to deliver oral hygiene and post bond up of fixed appliance instructions to orthodontic patients was developed for this study. Thus, the objective of this study is to assess the effectiveness and ease of use of a mobile app-based post bond up instructions compared to chair side instructions among fixed orthodontic treatment patients.

Materials and Methods : The two-armed, parallel-group, single-blinded randomized controlled trial (RCT) has an experimental group that will receive the mobile app, and a control group that will receive verbal chairside instructions. Data will be collected during four routine orthodontic appointments: baseline (T0), 4-week follow-up (T1), 12-week follow-up (T2) and 6-month follow up (T3). The outcomes of the study are the presence of dental plaque (measured using the Al-Anezi and Harradine plaque index) and oral health behaviour assessment assessed via a self-reported questionnaire.

Conclusions : The null hypothesis is that there is no difference between mobile app conveyed instructions and chairside post bond up instructions in terms of oral health behaviour and oral hygiene status.



P-114

Non-extraction treatment of class III openbite malocclusion

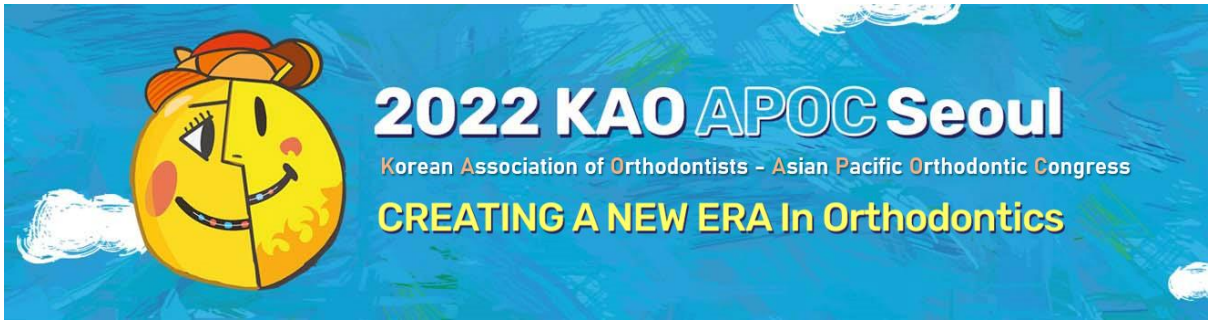
Donghyun Hwang

Thebaruni orthodontic clinic

Introduction : Class III openbite cases are one of the most difficult orthodontic cases. Treatment options such as orthognathic surgery and premolar extraction are also good choices for treating Class III openbite. Recently, new methods using miniscrew are also good treatment options. These new methods prevent orthognathic surgery and extraction.

Case Summary : 26 years 8 months old female patient visited with a chief complain of crowding. The patient had anterior openbite with overjet of -2.0 mm and overbite -3.0 mm, class III molar and canine relationships, severe crowding and narrow upper arch. Cephalometric analysis showed skeletal class III dysplasia with hyperdivergent pattern. Incisal showing of the patient was insufficient. Minicscrew assisted rapid palatal expansion was used for expanding the narrow upper arch. After extracting 4 third molars, upper and lower dentition were retraced using miniscrews. C II elastic between the upper anterior teeth and the screws on lower molar area was applied to increase the incisal showing.
After treatment, Angle Class I molar & canine relationships and normal overjet, overbite had achieved. A good facial appearance and occlusal relationship were obtained. Incisal showing of the patient was increased. The total active orthodontic treatment period was 23 months.

Conclusion : Our result of this clinical report suggests that miniscrew is useful for correction of skeletal class III openbite with severe crowding cases.



P-115

Long-Term CBCT Evaluation of Mandibular Third Molar Changes after Distalization in Adolescents

Hye-rim Hong[2], Jiyoung Oh[1,2], Jaehyun Kim[1,2], Lyun Kwang Ham[1,2], Yoonji Kim[1,2], Yoon-Ah Kook[1,2]

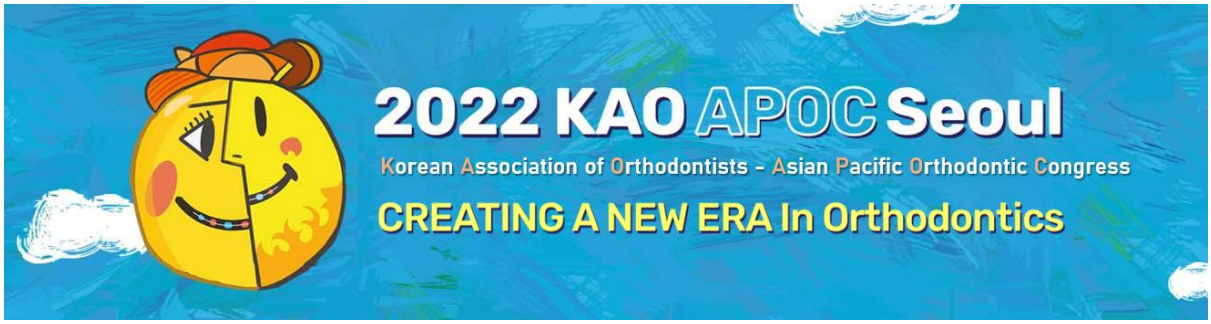
[1]Department of Orthodontics, Seoul St. Mary`s Hospital, The Catholic University of Korea
[2]Department of Orthodontics, Graduate School of Clinical Dental Science, The Catholic University of Korea

Objectives : This study aimed to evaluate mandibular molar changes after distalization using Class III elastics and modified C-palatal plates (MCPPs) in the maxilla and to use CBCT to specifically analyze the third-molar position after long-term retention in adolescents.

Material and Methods : The sample consisted of 65 mandibular third molars from 35 subjects, divided into two groups. Twenty-six of the third molars were from fourteen adolescent patients with Class I bimaxillary protrusion (mean age, 12.8 years) who had undergone bilateral maxillary distalization using an MCPP and mandibular distalization with Class III elastics with non-extraction treatment. For the control group, 39 third molars from 21 Class I normal-occlusion subjects were used. In the treated group, CBCT images were taken before distalization (T1), after molar distalization (T2), and at a long-term observation point (6.1 ± 2.7 years) (T3). Repeated measures ANOVA and a post hoc test with Bonferroni correction were used to analyze significant differences in the positions at the three points in time.

Results : There were 2.3 and 1.7 mm of distal movement at the crown of the mandibular first and second molars, with distal tipping of 5.2° and 5.3°, respectively, and 3.0° of distal tipping of the third molars. Comparing the treated group with the control group at T3, there was a significant change in the angulation of the third molars ($p < 0.001$). In the long-term, the third molars from the treated group showed a downward and buccal position after distalization.

Conclusion : In the long term, the developing mandibular third molar buds had downward and buccal positional changes after total arch distalization. These findings suggest the need for clinicians to consider the possibility of the impaction of developing third molars after mandibular total arch distalization in adolescents.



P-116

Alveolar bone change after the decompensation of anterior teeth in surgical skeletal Class III patients

Seok Young Kim, Dae Yeob Kim, Jin Seob Yang, Ji Yeon Lee, Jung Hoon Kim

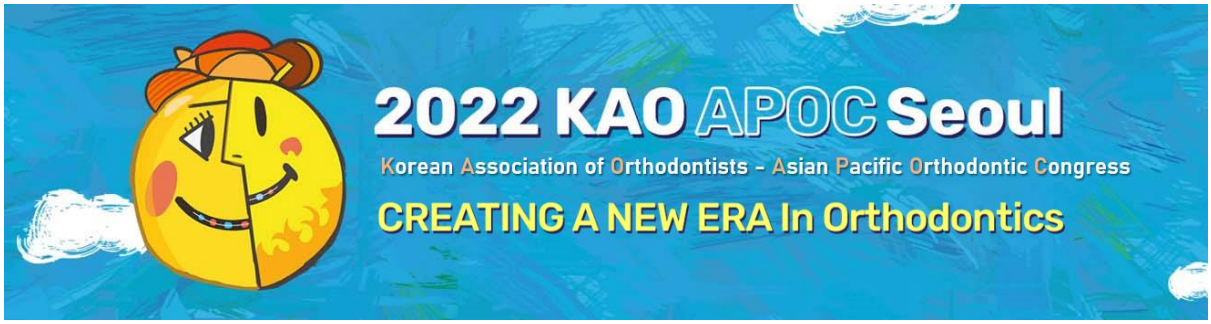
Department of Orthodontics, National Health Insurance Service Ilsan Hospital

Objectives : This study aimed to evaluate the alveolar bone change of maxillary and mandibular anterior teeth in skeletal Class III patients who had orthognathic surgery.

Material and Methods : 14 skeletal Class III patients who had orthognathic surgery and orthodontic treatment were included in this study. The cephalometric images and CT images at T0(initial), T1(before surgery), and T2(at least 1 year after surgery) were used for measurements. The inclination of maxillary and mandibular anterior teeth were measured on the cephalometric image, and alveolar bone heights and widths of buccal and palatal(lingual) sides were measured in CT images. Alveolar bone heights were defined as the distance from the CEJ to the alveolar crest of the most coronal part of the labial and palatal(lingual) surface, and alveolar bone widths were estimated at 3, 6, and 9mm levels from CEJ(cementoenamel junction) for each tooth

Results : All incisors except for labial side of maxillary lateral incisors showed reduced labial and palatal(lingual) alveolar bone heights at T1 and T2. For alveolar bone width of maxillary incisors, only palatal bone width decreased and there was no change on labial bone width. In mandibular incisors, alveolar bone width showed a different pattern according to the time and the site. Lingual bone width decreased during orthodontic decompensation(T0-T1) and labial bone width decreased after surgery(T1-T2).

Conclusion : In skeletal Class III patients who have pre-surgical orthodontic treatment, alveolar bone height and width of anterior teeth decrease due to the decompensation of anterior teeth. Such alveolar bone change cannot be recovered more than a year after orthognathic surgery. In conclusion, correction of compensated anterior teeth in skeletal Class III patients should be conducted with caution. If excessive anterior teeth movement is expected, alternative treatment plans such as premolar extraction, rapid palatal expansion, and anterior segmental osteotomy should be considered.



P-117

Post-treatment changes in masticatory function according to surgical or non-surgical correction of borderline skeletal ClassIII

MeiLing Fang[1], Song-Hyun Lee[1], Sung-Hwan Choi[1], Bock-Young Jung[3], Hee-Jin Kim[2], Hyung-Seog Yu[1], Kee-Joon Lee[1]

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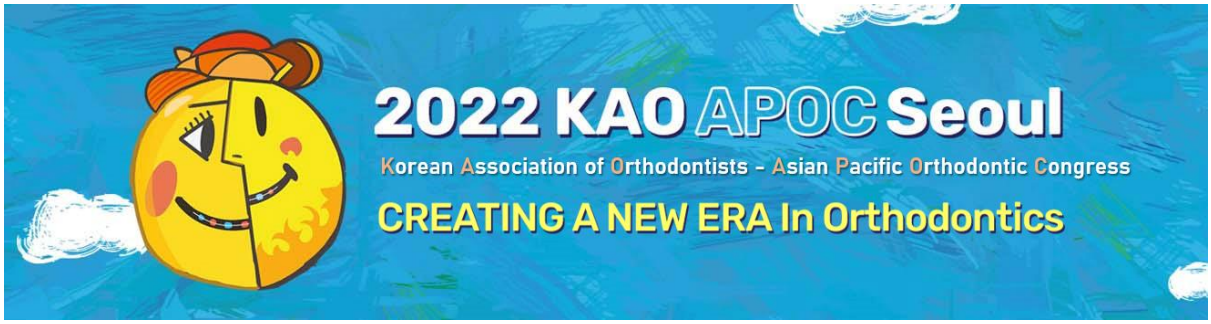
Objectives : The conventional treatment for skeletal Class III malocclusion had commonly been accompanied by orthognathic surgery for the improvement of facial profile and occlusion. However, in terms of the cost-effectiveness, risk of surgery and non-surgical treatment techniques have been developed, lots of patients prefer non-surgical orthodontic treatment. The aim of this study was to evaluate differences in masticatory function and recovery pattern of masticatory function following surgical or non-surgical correction of skeletal Class III malocclusion, and correlation between dynamic and static variables.

Material and Methods : Non-surgical group comprised 9 male patients (mean age 23.75 ± 3.01), surgical group comprised 8 male patients (mean age 26.25 ± 4.27). The variables were recorded immediately after the fixed appliance was removed (T0), 1 month post-treatment (T1), 6 months post-treatment (T2), 12 months post-treatment (T3).
Maximum bite force, occlusal contact area were measured with Dental Prescale II system, and mixing ability were measured with Viewgum software.

Results : The maximum bite force and occlusal contact area showed a time-dependent gradual increase in the non-surgical group and the surgical group after treatment ($P < 0.001$). There was no significant difference in the maintenance period.
The mixing ability showed a slow recovery pattern, but there was no statistically significant difference, and there was no significant difference of mixing ability comparison between two groups.
The correlation coefficient between occlusal force and occlusal area was 0.944 ($P < 0.001$) in the non-surgical group and 0.807 ($P < 0.05$) in the surgical group. There was no significant correlation between mixing ability and maximum bite force, mixing ability and occlusal contact area.

Conclusion : The above results are helpful in explaining changes in masticatory function in borderline skeletal Class III malocclusion.



P-118

Canine Crossbite Correction in Adult Patients by Using Light NiTi Wire

Sunyoung Lim, Hyeon-Shik Hwang

Hangboknanum Dental Clinic

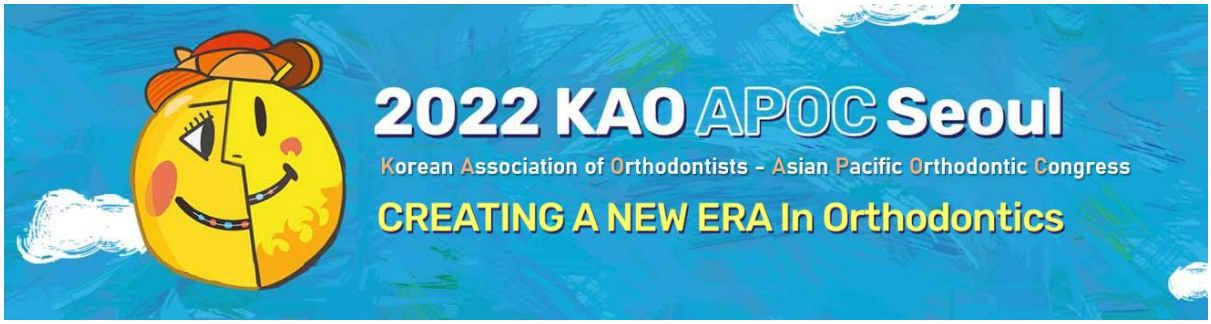
Introduction : If canine crossbite is present in patients who visit for the treatment of old prosthesis, orthodontic treatment to restore appropriate anterior stops and canine guidance is required for long-term stability of restorative treatment. Full bonding treatment may be considered, but adult patients hesitate to receive orthodontic treatment due to long treatment periods and discomfort of brackets. With the use of mini tube appliance and light wire adult patients with canine crossbite can be treated in a relatively short time without discomfort.

Case Summary : In this report, we present two cases of adult canine crossbite occlusion that was treated with mini tube appliance and 012 NiTi wire.

First case was a 46-year-old woman who visited for the old posterior restoration repair. She had anterior crowding with canine cross bite and mild mobility of posterior teeth. In cephalometric analysis, her skeletal pattern was Class I with slight open bite tendency. Crowding with canine crossbite was corrected by using one wire, 012 NiTi. For the first month, blue resin was used as temporary bite raising material. Bite jumping took place in two months, and five more months were taken to work on the details.

Second case was a 28-year-old man who had skeletal Class III. This patient also visited for the prosthetic restoration of old metal crowns on mandibular first molars. This case was managed also with light NiTi wire. One single wire, 012 NiTi, was used in this adult patients. Bite jumping was done in two months with the help of posterior temporary overlay crowns. Further eight months were taken for detailing and bite check. Even though the patient presented Class III, the canine crossbite was well corrected without occlusal alteration and discomfort.

Conclusion : Canine crossbite can be managed without discomfort by using mini tube appliance and light wire.



P-119

Stability of the maxillary and mandibular total arch distalization using temporary anchorage devices in adults

Byung-Jae Song[1], Ji-Min Lee[1], Jun-Hyung Bae[1], Soo-Hyun Nam[1], Sang-Wook Ryu[1], Kee-Joon Lee[1], Jung-Yul Cha[1], Jeong-Seob Lee[2], Sung-Seo Mo[3], Hyung-Seog Yu[1]

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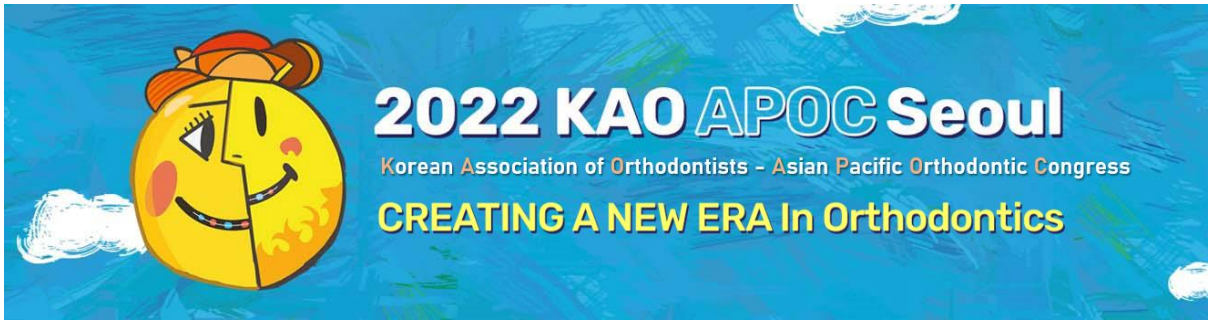
Objectives : Distalization with temporary anchorage devices(TADs) is commonly used to resolve crowding and to correct molar relationship in non-extraction cases. The purposes of this study were to quantify the treatment effects and posttreatment stability of total arch distalization with TADs in adults and thereby elucidate the clinical effect of this treatment modality.

Material and Methods : The subjects of the study were 39 adult orthodontic patients treated with total arch distalization with TADs. Lateral cephalograms and dental casts were taken at pre-treatment (T0), post-treatment (T1), and retention period (T2) to movement of teeth, arch width and molar rotation.

Results : The mandibular first molar (2.57±2.13 mm, $p<0.01$) and second molar (2.24±2.35 mm, $p<0.05$) were significantly distalized. Mesial movement of the arch during retention was obsereved though not significant. There were no changes in skeletal measurements except decrease in PTV-B. Posttreatment changes of distalized teeth were correlated with the amount of distalization but not with initial skeletal pattern and retention period.

Conclusion : It was concluded that even there was a little relapse in anteroposterior position of the maxillary and mandibular teeth during retention, there was no obvious relapse in facial profile. Therefore, the total arch distalization can be used in patients with moderate amount of arch length discrepancy effectively with stable retention.



P-120

The change of lip curvature through extraction and non-extraction orthodontic treatment

Boosung Kim

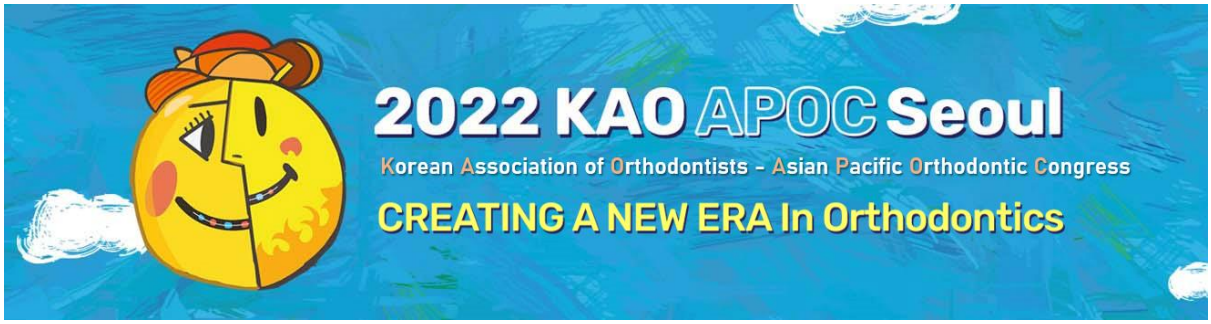
Division of Orthodontics, Department of Dentistry, Ajou University Medical Center

Objectives : In the orthodontic treatment plan, one of the significant anxiety factors in determining extraction is that the lip curve is flattened when the incisors move backward after extraction. However, despite its clinical importance, the quantitative curvature measurement has not yet been attempted. This study introduced new soft tissue measurements (SAL depth, SAL angle, PBL depth, PBL angle) that can be used to evaluate the lip curve and how this measurement correlates with other measurement factors.

Material and Methods : The 62 patients (male: 8, female: 54, mean age: 26.6 years) diagnosed with skeletal class I malocclusion and treated by extraction or non-extraction orthodontic treatment were included and compared. Lateral cephalograms were taken at the time of the initial and final stages. Cephalometric measurements were analyzed and compared.

Results : Paired T-test results showed statistically significant differences before and after treatment in U1 tip, U1 cervical, L1 tip, L1 cervical, SAL depth, SAL angle, UL to E, and LL to E values in the extraction patients. Regarding newly introduced values, SAL depth, SAL angle, PBL depth, and PBL angle in both groups, significant differences were observed before and after treatment only in the extraction patients. The multiple regression analysis in the extraction group formulated the equation.
ΔSAL angle = 0.66 ΔU1 tip -0.98 Δ L1 tip -1.58

Conclusion : Upper lip flattening was not displayed on moderate anchorage, controlled tipping, lower incisors, minimal retraction, and maintaining the lower lip curvature. Therefore, orthodontic treatment accompanying the retraction of the upper incisors does not always result in the obtuse lip contour. Newly introduced SAL depth, SAL angle, PBL depth, and PBL can represent a shape of a lip curve that cannot be identified by E-line (UL to E).



P-121

Effects of self-ligating brackets and other factors influencing orthodontic treatment outcomes

Min-Ho Jung

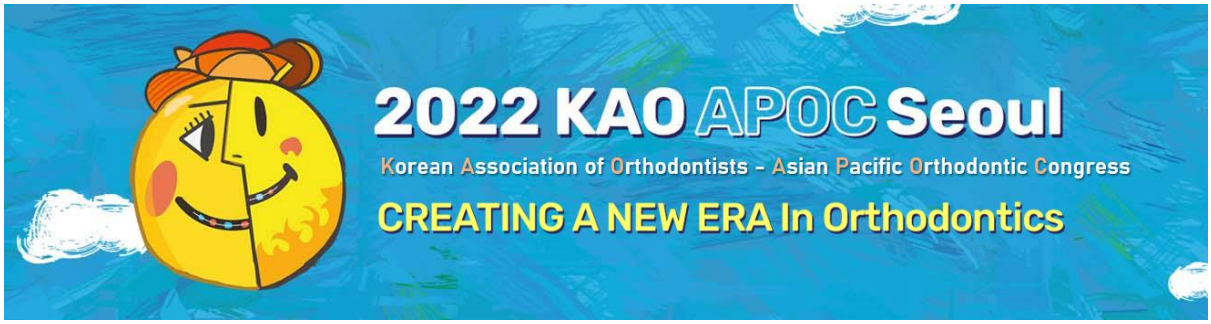
HONORS Orthodontics

Objectives : The purpose of this prospective cohort study was to evaluate the effects of self-ligating brackets (SBs) and other factors that influence orthodontic treatment outcomes.

Material and Methods : This two-armed cohort study included consecutively treated patients in a private practice. The patients were asked to choose between SBs and conventional brackets (CBs); if any patient did not have a preference, he or she was randomly allocated to the CB or SB group. All patients were treated using an identical archwire sequence. Evaluated parameters were as follows: treatment duration, number of bracket failures, poor oral hygiene, poor elastic wear, extraction, use of orthodontic mini-implants (OMI), OMI failure, American Board of Orthodontics (ABO) Discrepancy Index (DI), arch length discrepancy, and ABO Cast-Radiograph Evaluation (CRE) score. Stepwise regression analysis was performed to generate the equation for prediction of the CRE score.

Results : The final sample comprised 134 patients with an average age of 22.73 years. The average DI, CRE score, and treatment duration were 21.81, 14.25, and 28.63 months, respectively. Analysis of covariance showed a significant difference in CRE between the CB and SB groups after adjusting for the effects of confounding variables. Stepwise regression analysis using four variables (model 4), namely extraction, SB use, poor elastic wear, and additional appliance use, could explain only 25.2% of the variance in the CRE score.

Conclusion : Although the CRE score was significantly better for CBs than for SBs, the clinical significance of this result seems to be limited. Extraction, SB use, poor elastic wear, and additional appliance use may have significant effects on treatment outcomes.



P-122

Pathologic tooth movement (PTM) of front teeth in old adults(≥60 years): the orthodontic intervention.

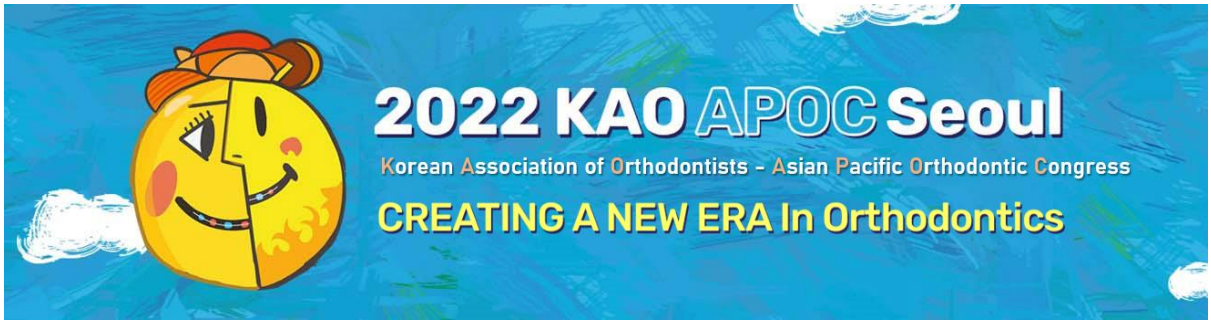
Ildong Kim

KimIldong Dental Clinic

Introduction : PTM is defined as a change in tooth position that occurs when there is disruption of forces that maintain teeth in a normal relationship. The PTM of front teeth almost appears to be diastema, extrusion, rotation, labial flaring and drifting. Prevalence of PTM among periodontal patients has been reported to range from 30.03% to 55.8%. The etiologic factors for PTM are referred as the destruction of periodontal tissues, occlusal forces, soft tissue pressures, habits, inflammation and eruptive force.

Discussion : Periodontitis stage III and IV are based on interdental clinical attachment loss (CAL, ≥5) in chronic severe periodontitis. Periodontal grade B and C should be controlled due to risk factors (smoking, DM: HbA1c≥7.0%). Occlusal factors include posterior bite collapse, large overjet and deep overbite, anterior component of functional force, worn posterior occlusal surfaces, from which the undesirable effects have been increased during long period of lifetime for old adults (>60 years).
Treatment of PTM includes an orthodontic intervention preceded by periodontal therapy, in either adjunctive or conventional full orthodontic treatment. The factors considered during the decision-making process with old adults includes patients' compliance, motivation to keep the natural teeth, skeletal factors, economics, systemic health, surgical treatment.
When diagnosed as having stable posterior occlusion, the orthodontic correction of front teeth is recommended for slightly tipping and up-righting except bodily translation. But the full fixed appliances are required with extraction of one lower anterior tooth in the case of severe anterior crowding and deep overbite.
But old adults often have implants, prostheses and severely worn teeth, which interfere with tooth movement from undesirable occlusal steps and bring difficulty in appliance bonding and positioning.

Conclusion : The aim of this presentation is to review the multidisciplinary approaches of PTM for the front teeth of old adults from the view of orthodontic aspects in the increasing aged population.



P-123

Three-dimensional Change of Lip Asymmetry after Orthognathic Surgery in Facial Asymmetry

Young-Jae Kim, Jong-Yun Kim, Hee-Jin Shin

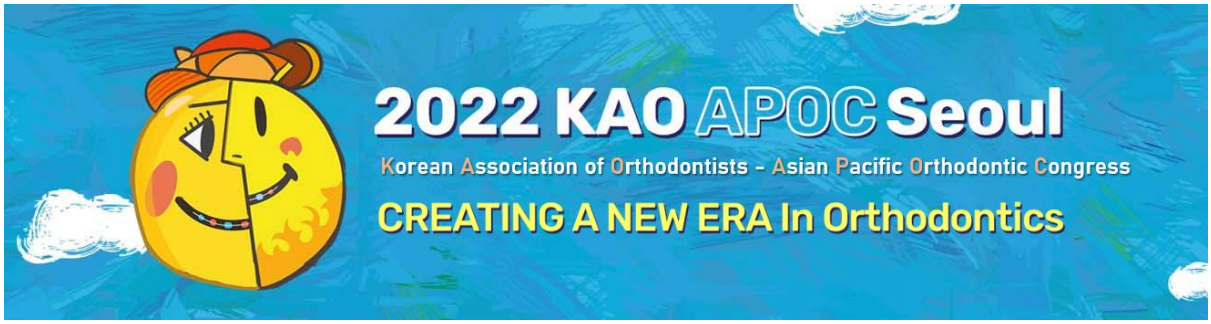
EU oral & maxillofacial surgery center

Objectives : We used cone-beam computed tomography (CBCT) to evaluate the three-dimensional change in lip asymmetry following two-jaw orthognathic surgery for patients with facial asymmetry.

Material and Methods : CBCT images were obtained approximately one month before and after 6 month bimaxillary surgery in 17 patients with skeletal class I facial asymmetry (menton deviation >5 ㎜). The pre- and post-operative CBCT images were superimposed. A total of 16 landmarks were identified and the changes in all landmarks were evaluated. We used the labrale superius (Ls), deviated/non-deviated side cheilions (Ch-D/Ch-ND), and labrale inferius (Li) to construct the upper and lower lip planes to evaluate lip asymmetry. Correlation analysis was performed to determine the factors related to the vertical change of the cheilions (ΔChZ-D/ND).

Results : In the transverse axis, all landmarks on lip planes moved to improve asymmetry after surgery. All landmarks, except for Ls, moved backward in the anteroposterior axis. In the vertical axis, Ch-ND and Li moved upward while Ls moved downward. Regarding the change in the lip plane, the difference in the height of Ch-D and Ch-ND was significantly reduced (2.74 ㎜ vs. 0.74 ㎜). The ΔCh-ND showed significant correlations with the maxillary impaction of the non-deviated side.

Conclusion : The improvement of lip asymmetry after surgery is mainly achieved by the movement of the lower lip and Ch-ND rather than that of the upper lip and Ch-D, respectively.



P-124

Total Maxillary Retraction Prior to Clear Aligner Therapy in Surgery-First Orthodontic Patient

Hyeon-Shik Hwang[1], Seung-Weon Lim[2], Joon-Sup Hwang[1], Heesoo Oh[3], Robert L. Boyd[3]

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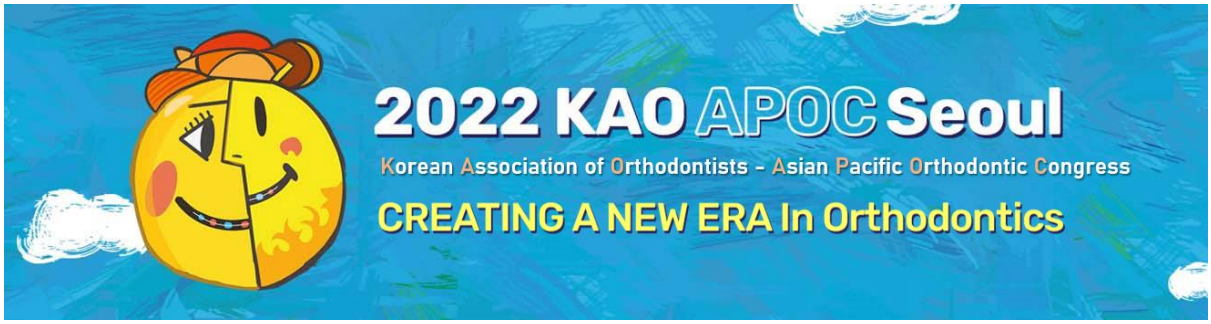
[2]Division of Orthodontics, Department of Dentistry, Hanyang University Medical Center
[3]University of the Pacific

Introduction : With an increasing trend on minimally invasive dentistry, 1-jaw surgery rather than 2-jaw surgery is preferred in some of dentofacial deformity patients. In this case, retraction of upper anteriors would be necessary for the proper dental decompensation. This case report describes an effective treatment for retracting the maxillary dentition using subzygomatic plate as anchorage in a patient who received surgery-first 1-jaw mandibular surgery.

Case Summary : A 20-year-old male had a mandibular prognathism with a long face. Two-jaw surgery, including posterior impaction of maxilla, was needed. However, the patient declined to receive 2-jaw surgery, but wanted 1-jaw mandibular surgery. After surgery-first orthognathic surgery, retraction of maxillary dentition was performed by using subzygomatic plate as skeletal anchorage. To facilitate the retraction of whole maxillary dentition, the second molars were removed. After maxillary retraction, clear aligners were used for the alignment and inter-arch coordination. Maxillary third molars were managed by using mini tube appliance. A satisfactory occlusion was achieved by orthodontic treatment using 3 sets of clear aligners. The 2-jaw surgery follow-up showed a stable result both esthetically and functionally.

Conclusion : With the help of total maxillary retraction, mandibular prognathism can be managed by 1-jaw mandibular surgery. This is possible also in clear aligner therapy patients.



P-125

Post-operative Stability of Orthognathic Surgery: Comparison Between Surgery-first Approach and Conventional Approach

Heejin Kim[1], Won-Cheul Choi[1], Ui-Lyong Lee[2], Young-Jun Choi[2]

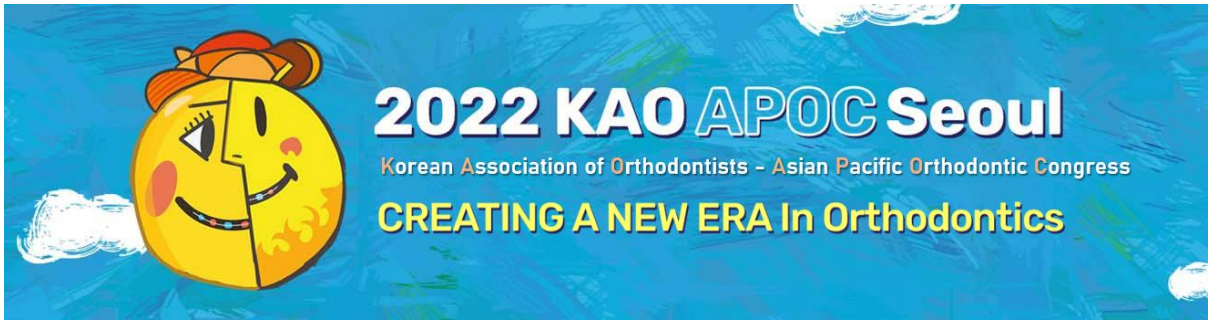
[1]Department of Orthodontics,Dental Center,Chung-Ang University Hospital
[2]Department of Oral and Maxillofacial Surgery,Dental Center,Chung-Ang University Hospital

Objectives : Comparing stability of two different approaches -Surgery-first(SF) and conventional orthodognathic surgery(CO)- for bimaxillary orthognathic surgery by superimpositioning lateral cephalograms.

Material and Methods : A total of 23 patients (11 males, 12 females) with skeletal Class III malocclusion who underwent LeFort 1 osteotomy and BSSRO at Chung-ang University hospital were included. 11 of them (5 males, 7 females) got the surgery with SF and the other 12 (7 males, 5 females) with CO. Lateral cephalograms were taken before the surgery(T0), 1 month after the surgery(T1), and at 1-year follow up(T2). To check the vertical relapse, anterior/posterior facial height were measured and to check the horizontal one, distance from point A/pogoninon to nasion perpendicular line were used.

Results : The average amount of vertical relapse in the CO group was 0.90±0.67mm (AFH), and -1.15±1.47mm (PFH). In SF group they were 1.34±0.89mm, -1.24±3.59mm respectively, which were not statistically significant ($p>0.05$). Meanwhile, the average amount of horizontal relapse in the CO group was -0.11±1.51mm in maxilla(A-N perp.), and 0.49±2.21mm in mandible(Pog-N perp.). It was also not statistically significantly different from the result of SF group ($p>0.05$), in which the results were -0.32±1.00mm and 0.91±1.98mm, respectively. However, the total treatment time of CO group were statistically significantly longer (24.92±8.39 months) than that of SF group (19.36±5.26 months).

Conclusion : There was no statistically significant difference in the amount of relapse between CO and SF groups. Therefore, Surgery-first approach can be considered as useful option to minimize total treatment time without risk of post-surgical relapse.



P-126

Surgery-First Approach with Clear Alinger to Correct Class lll Malocclusion with Facial Asymmetry

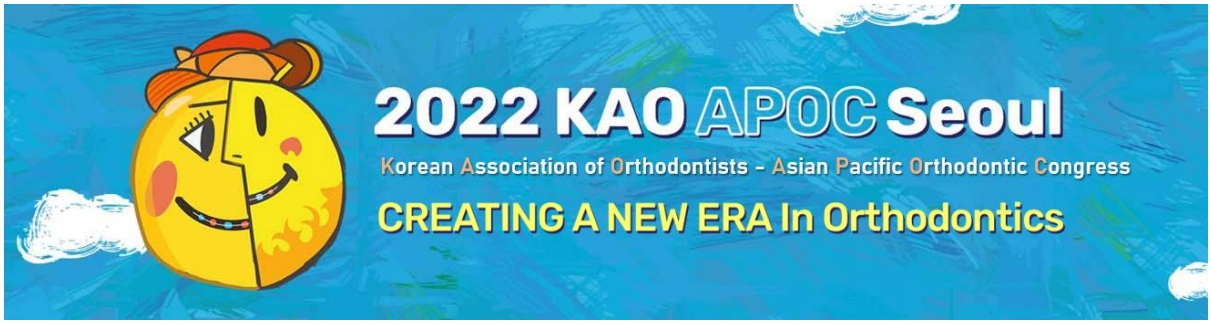
Dae-Yeong Kim[1], Bang-Hyun Lim[1,2], Su-Hyun Lee[1,2]

[1]Department of Orthodontics, Korea University Anam Hospital
[2]Department of Orthodontics, Graduate School of Clinical Dentistry, Korea University

Introduction : The treatment of adult patients with skeletal malocclusion and facial asymmetry requires orthognathic surgery. Nowadays, the “surgery-first” approach has been introduced as an alternative for conventional orthognathic approach. Also, Clear aligners are used in many cases for the benefit of convenience and esthetics.

Case Summary : We report the case of a 19-year-old woman who had Skeletal Class lll malocclusion, maxillary transverse deficiency, crossbite, facial asymmetry, and lip incompetence. Mini-screw Assisted Rapid Palatal Expander(MARPE) were used to increase arch width and followed by double jaw surgery. One month later, intraoral scan was carried out for clear aligner and the patient was required to change the aligner every one week. Change period was reduced to five days since tooth movement was favorable due to Regional Acceleratory Phenomenon(RAP). After treatment, facial profile was improved with proper chin protrusion and lip competence. Also, we could establish favorable occlusion with adequate overjet and overbite. However, there was deficient labial crown torque of lower anterior teeth compared with the treatment plan of clear aligner.

Conclusion : Clear aligner with the “surgery-first” approach was performed to correct skeletal Class lll malocclusion with facial asymmetry. Although there was discrepancy of tooth movement between planning and clinical outcome in lower anterior teeth, the results were acceptable.



P-127

An orthodontic-surgical approach of skeletal Class II patient with gummy smile and protrusion

Jiyoung Oh[1,2], Jaehyun Kim[1,2], Lyun Kwang Ham[1,2], Yoon-Ah Kook[1,2], Yoonji Kim[1,2]

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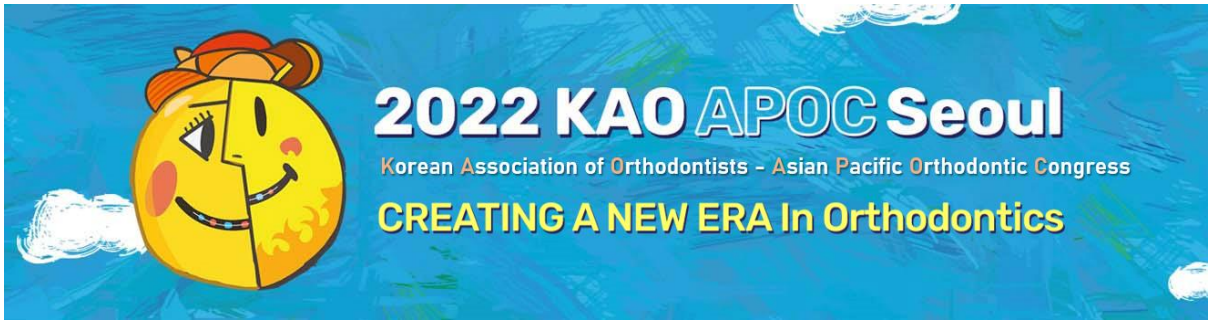
[2]Department of Orthodontics, Graduate School of Clinical Dental Science, The Catholic University of Korea

Introduction : Recently, patients' demands for not only functional but also aesthetic satisfaction has increased. When the patient has multifactorial problems in maxillary complex such as vertical maxillary excess, protrusion, and asymmetry due to canted occlusal plane, acceptable outcome can be attained through surgical correction. Superior repositioning of the maxilla has been used as an efficient surgical method especially for patients with vertical maxillary excess. It would be desirable to combine orthodontic and surgical treatment for more predictable and better esthetic result. This case report describes a case involving skeletal Class II protrusion with a gummy smile.

Case Summary : The patient was a 17-year-old female whose chief complaint was gummy smile and protrusion. The patient had slight Class II molar relationship and deep overbite, 4mm gingival exposure during full smile with maxillary protrusion. Her occlusal plane was canted to left side which resulting in asymmetry and scissorbite was found on upper left second molar.
Because of her mild crowding on maxillary dentition and looking for a short treatment period, non-extraction orthodontic treatment with surgical intervention was recommended.
Considering the surgical setback of the maxilla, overjet was increased intentionally during presurgical orthodontic treatment and scissorbite on the left side was corrected. LeFort I osteotomy was used for not only superior repositioning but also setback of the maxilla. The maxilla was acceptably impacted 2mm at the first molar and its canting was corrected to right side for making symmetrical occlusal plane. Additionally, advancement genioplasty was performed. Total treatment duration was about 1 year. Both the occlusion and facial appearance were significantly improved by this multidisciplinary treatment and two year follow-up showed stable results.

Conclusion : Although skeletal problem was not severe, well-coordination between orthodontic treatment and surgical execution made the total treatment time faster. And it provided greater esthetic satisfaction to the patient at the same time.



P-128

Surgical Correction of Transverse Maxillary Discrepancy Using Parasagittal Multi-segment Le Fort I Osteotomy

Nara Kang[1], Hye-Sung Bae[1], TaekWoo Kim[2]

[1]Department of Oral and Maxillofacial Surgery, Sun Dental Hospital
[2]Department of Orthodontics, Sun Dental Hospital

Introduction : Parasagittal multi-segment Le Fort I osteotomy was investigated to improve maxillary transverse discrepancy in relapse, operation time, and complications. We used oscillating saw and reciprocating saw to do parasagittal osteotomy and anterior segment osteotomy Instead of piezoelectric surgery and fissure bur.

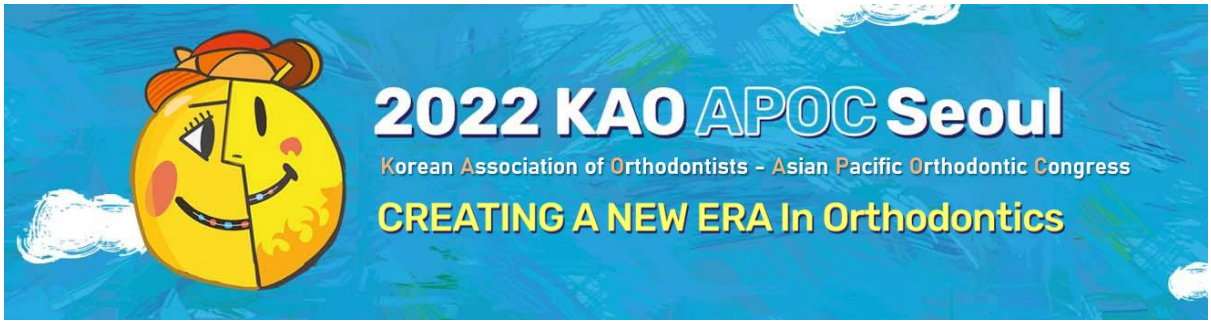
Case Summary : 140 patients with skeletal deformities who underwent multi-segment maxillary osteotomy at Sun Dental Hospital in Daejeon, South Korea between 2018 and 2021 were investigated.

According to the number of segment of piece, the patients were divided into 4 groups; 1 piece (group A), 2 piece (group B), 3 piece (group C), 4 piece (group D). Computed tomography (CT) was taken before surgery (T1), immediately after surgery (T2), and after a follow-up of 6 months (T3).

In this study, 28.8% (40/140) patients underwent 1 piece maxillary osteotomy (Group A) and rest of 71.2% underwent multi-piece maxillary osteotomy; 11.4% (16/140) patients underwent 2 piece maxillary osteotomy(Group B); 52.1% (73/140) patients underwent 3 piece maxillary osteotomy (Group C); 7.9%(11/140) patients underwent 4 piece maxillary osteotomy(Group D).

mean operation time : Group A 158 min, Group B 165 min, Group C 171 min, Group D 178min
No Difference in mean value between groups except Group A vs C and Group A vs D. additional operation time is about 20 min for segmental surgery. there are no significant complications in oronasal communication,tooth loss, bone loss in all groups after postoperative 6 months.

Conclusion : Maxillary transverse discrepancy is a major concern in nonsurgical and surgical orthodontic procedures. Parasagittal multi-segment maxillary osteotomy provide stability at both skeletal and dentoalveolar area and have less complication compared to traditional multi-segment maxillary osteotomy. It can be time-saving procedure to both patients and orthodontics to correct transverse discrepancy. More samples are necessary to provide statistical significance.



P-129

Three-dimensional analysis of airway changes after orthognathic surgery in skeletal Class II patients

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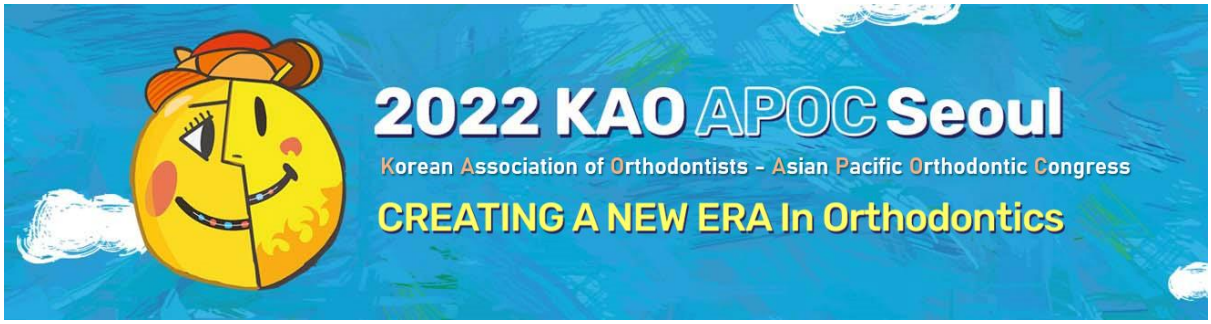
Objectives : This study aimed to analyze the long-term changes in the PAS and evaluate the post-operative association between these changes and the related bone in patients with skeletal Class II malocclusion who have undergone orthognathic surgery; aspects, such as the airway volume, cross-sectional area (SA), anteroposterior (AP) and transverse (TV) width, were evaluated using 3D multi-detector computed tomography (MDCT).

Material and Methods : The records of 21 patients with skeletal Class II malocclusion who had undergone orthognathic surgery were included. The anatomical modifications in both jaws, changes in volume, sectional area (SA), minimum sectional area (MSA), and anterior-posterior (AP) and transverse (TV) width in the airway at one month before surgery (T0), and one month (T1) and one year (T2) after surgery were analyzed using CT images. The association between the skeletal and airway changes was evaluated between T0, T1, and T2.

Results : After surgery, the ANS, A point, and PNS demonstrated significant posterior and superior movement. The B point and the Pogonion exhibited significant anterior and superior movement. The total and inferior oropharyngeal volume (vol 3, vol 4) notably increased, while the nasopharyngeal volume (vol 1) decreased. The anterior-posterior movement at the ANS and PNS after surgery was significantly associated with the total volume, vol 2, vol 3, SA 1, MSA, and TV width 1; while a substantial association with the total volume was found at the pogonion.

Conclusion : The results obtained from this study can be utilized as references by surgeons and orthodontists to establish an optimal treatment plan and consider the merits and demerits of orthognathic surgery concerning the PAS.



P-130

Three-dimensional Analysis of Central Incisor Root Resorption Before and After Orthodontic Extraction Treatment

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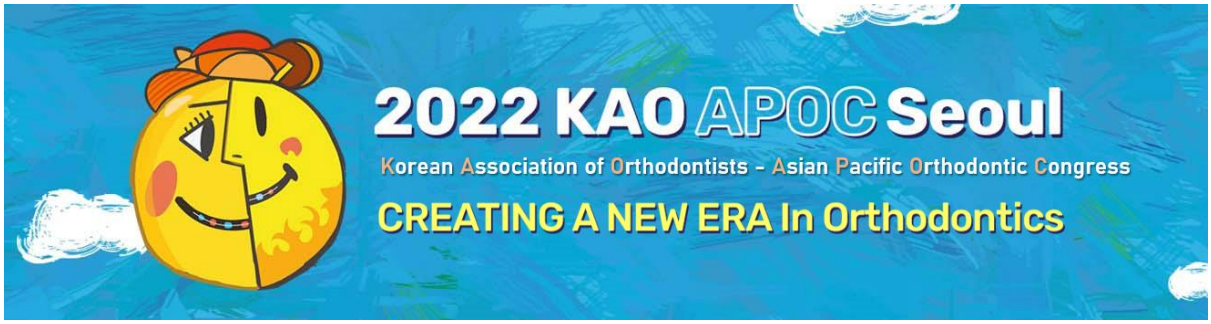
Objectives : Root resorption is a common and unavoidable side effect of permanent loss of external hard tissue at the root apex caused by orthodontic treatment. Among the many risk factors, treatment of the extraction of premolars increases the likelihood of root resorption. The maxillary central incisors were reported to be the most affected. In previous studies, two-dimensional radiation was the primary diagnostic method, but recently, three-dimensional studies using Cone-beam computed tomography (CBCT) images have been attempted. In the current three-dimensional study of teeth, confirming root resorption in a specific area was impossible, and the study focused on non-extraction treatment. The purpose of this study is to measure the root volume loss of maxillary central incisors due to tooth extraction in adult patients using CBCT.

Material and Methods : This study was performed on 30 adult patients who received orthodontic treatment using a fixed orthodontic device from 2013 to 2021. Pre-treatment (T0) and post-treatment (T1) CBCT images of the right maxillary central incisors (n=30) were reconstructed and superimposed. Based on the T0 model, it was segmented into six root sectors according to the axial, coronal, and CEJ plane: Labial apical, Palatal apical, Labial middle, Palatal middle, Labial cervical, and Palatal cervical. Determined the root volume loss according to the difference between T0 and T1 and calculated the percentage of root volume loss.

Results : The total root volume loss was 24.08±23.72mm³, while the reduction in root length was 2.21±1.52mm. It was statistically significant in all sectors except the labial cervical sector ($P<0.05$). The most root resorption was found in 1/3 of the root apex, followed by the middle and the cervical sector.

Conclusion : Through three-dimensional image reconstruction, it was possible to understand the root resorption pattern in three dimensions during extraction treatment.



P-131

Thickness and Fit of Direct 3D Printed Clear Aligners Compared with Thermoformed Aligners: Micro-CT Analysis

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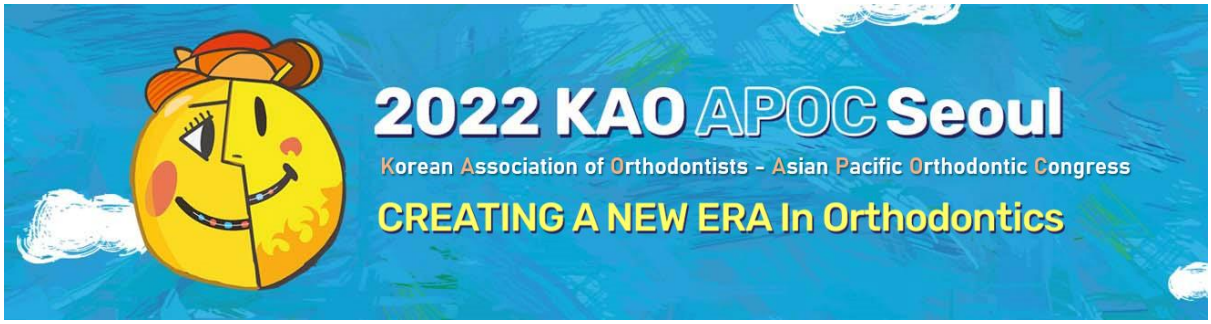
Objectives : The purpose of this study was to evaluate the thickness and fitness of direct 3D printed clear aligners (TC-85) compared with thermoformed clear aligners (PETG, copolysester-TPE-copolyester) using micro-CT analysis.

Material and Methods : Thermoformed clear aligners were divided into single-layer (TS group) with polyethylene terephthalate glycol sheet, and multi-layer (TM group) with thermoplastic elastomer, copolyester sheet. 3D printed clear aligners were divided into two groups with photo-polymerizable polyurethane resin TC-85 according to post-cleaning methods (alcohol cleaning; PA group, centrifugation; PC group).
0.75mm thickness of thermoplastic materials (TS, TM) were thermoformed on a standardized resin model. 0.5mm thickness of 3D printed clear aligners (PA, PC) were printed with a DLP-type 3D printer. All aligners (n=10) were scanned using a Skyscan1173 micro-CT at 40kV, 200uA, and 34.9㎛ of resolution. The target area of dentition (central incisor, canine, first premolar, first molar) were obtained using Dataviewer software. The thickness and gap of aligners were measured at reference points (gingival, occlusal, and middle of buccal and palatal) using CTAn software.

Results : The average thickness of TS, TM were 504.31 ㎛, 509.54 ㎛ showing 33%, and 32% reduction in thickness after thermoforming. The average thickness of PA, PC were 614.24 ㎛, 687.53 ㎛ showing 23%, and 38% increase in thickness compared with set thickness. Both PA and PC were thicker at the incisal, occlusal, and palatal area. The average gap of TS, TM, PA, and PC were 69.80±115.17, 52.35±89.87, 69.80±89.87, and 69.80±166.65㎛ respectively showing significant difference except for the TS group.

Conclusion : The thickness of the clear aligners can be significantly enlarged or reduced depending on the manufacturing method. The outcomes of fitness were similar for 3D printed clear aligners and thermoformed aligners. Furthermore, physical properties and clinical performance should be evaluated for clinical application.



P-132

Tooth-Bleaching During Conventional Orthodontic Treatment: A Review

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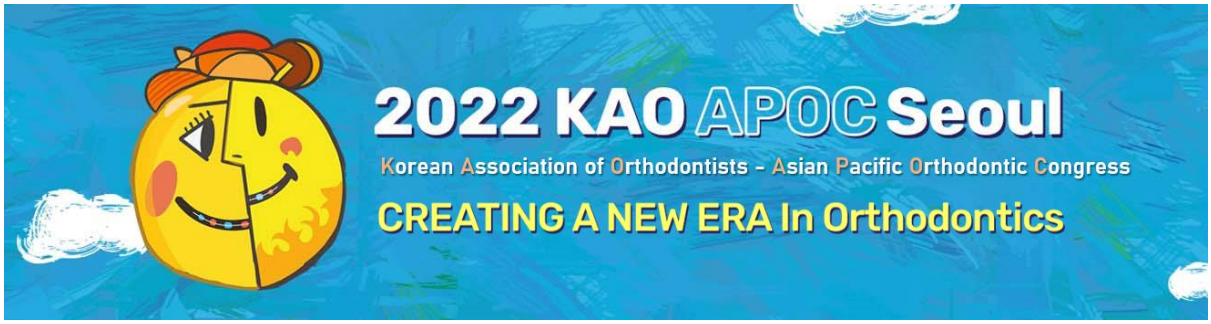
Purpose : To review the current literature on the effectiveness of tooth bleaching during conventional orthodontic treatment.

Materials and methods : An electronic search of PubMed, Scopus and ScienceDirect databases was conducted from 2010 till present using the keywords: “bleaching”, “whitening”, “orthodontic treatment” and “orthodontic brackets”.

Results : Initial literature search identified 66 potentially relevant studies. After evaluating their titles and abstracts, only 8 studies fulfilled the inclusion criteria and were selected, with 4 studies supported tooth-bleaching during orthodontic treatment and 4 studies against it. Several studies have proven that tooth whitening is do-able during orthodontic treatment. Gomes et al. 2017 proved that in-office bleaching done in the presence of orthodontic metal brackets did not leave a localised spot in the enamel surface where the brackets were bonded. These findings are further supported in studies done by Jadad et al. 2011, Montenegro-Arana et al. 2016 and Silvestre et al. 2021, whereby the spectrophotometric evaluation of colour alterations gave a significant result. On the other hand, some orthodontists were against the idea of bleaching during orthodontic treatment. Lunardi et al. 2014 stated that the presence of orthodontic brackets may affect the efficacy of whitening procedure and cause uncertainty in improvements of colours. De melo Oliveira et al. 2021 showed that there was increase in colour heterogeneity and reduction in bleaching effect when the bleaching was done in the presence of orthodontic brackets. Trakiniene et al. 2017 and Sardarian et al. 2019 showed that bleaching procedures done during orthodontic treatment would reduce the bond strength between the enamel and bracket interface and resulting in lesser degree of whitening effect compared to uncovered surface.

Conclusions : The result of the review highlights the potential for the use of bleaching during conventional orthodontic treatment. However, more research should be carried out as the current evidence are conflicting, inadequate and inconsistent.



P-133

Automated region-specific analysis of pharyngeal airway volume across different skeletal patterns using convolutional neural networks

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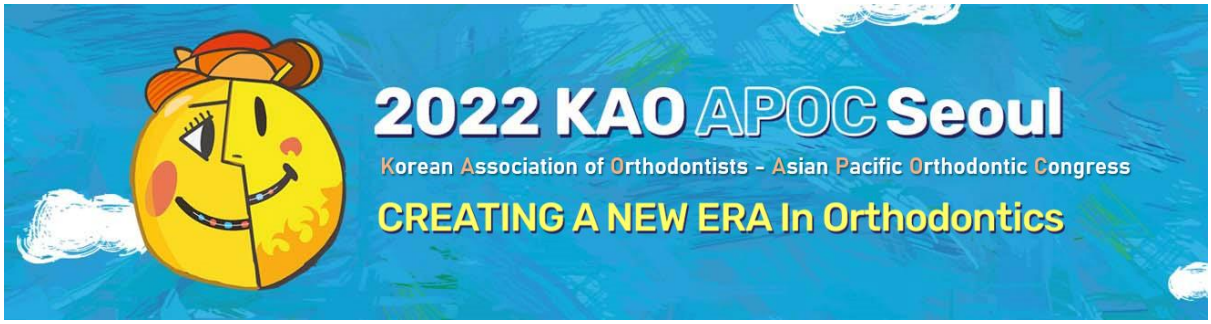
Objectives : We aimed to compare the segmentation accuracy of the 3-dimensional (3D) U-Net-based convolutional neural networks (CNNs) model in analyzing pharyngeal volume of interests (VOIs) among different skeletal and pharyngeal patterns.

Material and Methods : Two-hundred sixteen cone-beam computed tomography (CBCT) images of adult orthodontic patients were randomly allocated into training (n=100), validation (n=16), and test (n=100) sets. Using a Mimics(version 20.0; Materialise, Leuven, Belgium) and 3-Matics software(version 12; Materialise), one expert manually extracted total pharyngeal airway space (PAS) dividing into four VOIs: nasopharynx, velopharynx, glossopharynx, and hypopharynx. The segmentation performance of a modified 3D U-Net model was assessed by dice similarity coefficient (DSC), volumetric similarity (VS), precision, and recall values, and compared with the ground truth across different sagittal and vertical skeletal patterns.

Results : The proposed model achieved high segmentation accuracy of total PAS supported by a mean DSC of 0.928 ± 0.023, VS of 0.951 ± 0.022, precision of 0.925 ± 0.030, and recall of 0.921 ± 0.029. The model performance showed region-specific differences, revealing lower accuracy in the glossopharynx and hypopharynx than in the upper sections ($P < 0.001$). Although the total PAS volumes were significantly smaller in skeletal Class II and hyperdivergent patterns than other classes, the model performance to assess each pharyngeal VOIs showed no significant difference according to the skeletal patterns presenting with different pharyngeal dimensions.

Conclusion : With well-standardized CBCT scans to obtain relaxed pharyngeal outlines with soft palate and epiglottis position at rest, the CNNs-based region-specific pharyngeal airway analysis is promising to substitute for time-consuming manual analysis in every types of skeletal and pharyngeal pattern.



P-134

Detection of craze line using intraoral scanner and the influence of age and debonding history

Chaehee Oh[1,2], Hankyul Kim[1,2], Ji-Hyun Lee[1,2], Kyung-Ho Kim[1,2], Chooryung J. Chung[1,2]

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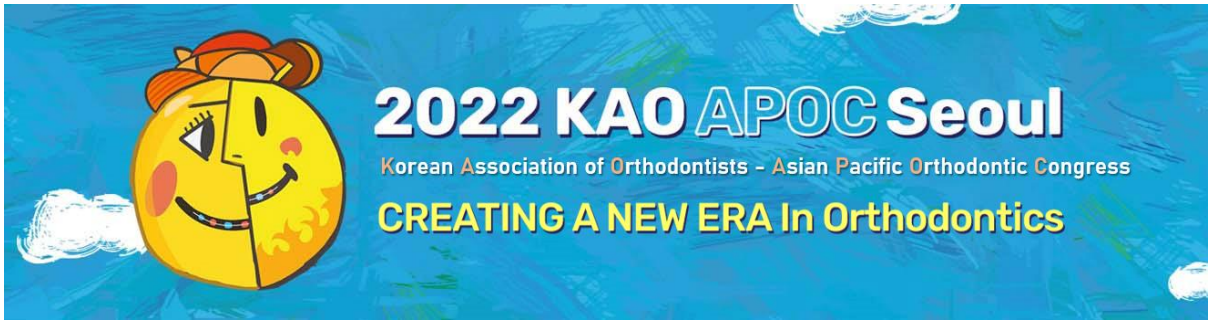
Objectives : The aim of this study was to utilize intraoral scanner with NIRI (near-infrared imaging; 850nm) to detect craze lines of the maxillary central incisors and to measure its prevalence among orthodontic patients, along with the influence of age and debonding history on its severity.

Material and Methods : Craze lines of the maxillary central incisors were detected using intraoral scan images as well as images from NIRI from 284 orthodontic patients classified according to the subjects' age (age groups; under 10s; 10s, 10-19y; 20s, 20-29; 30s, 30-39; 40s, 40-49; 50s, 50-59; over 60). Prevalence of craze line, defined as the presence of one or more detectable white line exceeding 1/3 of clinical crown height in the maxillary central incisor, and its severity, more than 3 craze line per incisor, were monitored. The differences in prevalence according to age and orthodontic appliance debonding history were compared.

Results : Craze lines were reliably detected as white line distinguishable from dark enamel using the NIRI of the intraoral scanners. The prevalence of craze line was 50.7% (144 out of 284 subjects). Prevalence of craze line was significantly higher for age groups 20y and over than age groups under 20y ($p<0.05$). Severe craze line was more frequent for age groups over 40y than age groups under 30y ($p<0.05$). Prevalence and severity of craze line according to orthodontic appliance debonding history was not statistically significant in all age groups.

Conclusion : Craze lines in the maxillary central incisors were clearly recorded and detected using intraoral scanning NIRI images. Prevalence of craze line in the maxillary central incisor was 50.7% among orthodontic patients. Prevalence of craze line was higher for adults compared to adolescents, however, debonding history of orthodontic appliances did not affect the prevalence or severity of craze lines.



P-135

Validation of A Newly Developed Kit in Root Resorption Detection

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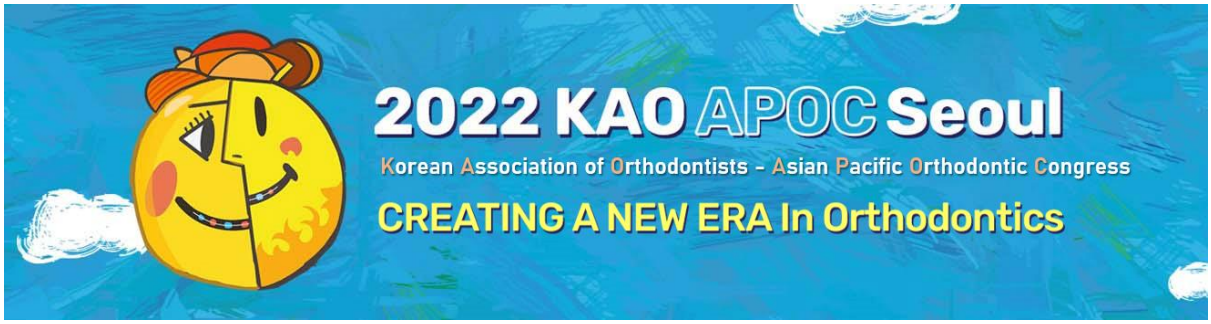
Purpose : The aim of this study was to validate a newly developed kit in detection of root resorption using dentine sialophosphoprotein (DSPP) biomarker.

Materials and methods : Gingival crevicular fluid (GCF) was collected from the permanent incisors of patients with no root resorption (control group, n = 8), permanent incisors of patients with mild root resorption who were undergoing active orthodontic treatment (mild group, n = 8), and primary second molars with half of the root resorbed (severe group, n = 8). DSPP concentration in the GCF were measured using enzyme-linked immunosorbent assay (ELISA) and presence of DSPP was detected by the newly developed kit using optical density (OD). Data were reported as a mean and standard deviation. Statistical analysis for comparison among the three groups for both ELISA and the newly developed kit were performed using one-way ANOVA. Sensitivity and specificity were calculated for the newly developed kit. Pearson correlation coefficient was performed to analyse the association between ELISA and the newly developed kit.

Results : The DSPP concentration was the highest in the severe group (6.47 ± 0.90 ng/ml) followed by the mild group (3.80 ± 0.34 ng/ml) and control group (1.82 ± 0.39 ng/ml). OD values also had the same pattern, severe group having the highest value (0.57 ± 0.08), followed by mild (0.29 ± 0.06), and control group (0.20 ± 0.06). Difference in concentration of DSPP and OD values were statistically significant among all the three groups ($p < 0.05$) where OD values were positively associated with DSPP concentration. Conclusion: The newly developed kit has been validated and can be an alternative method to detect root resorption.



P-136

Comparison of simulated and achieved root positions using virtual setup

Mirinae Park, Dong-Hyun Kim, Young-Soo Seo, Kyung-Min Lee

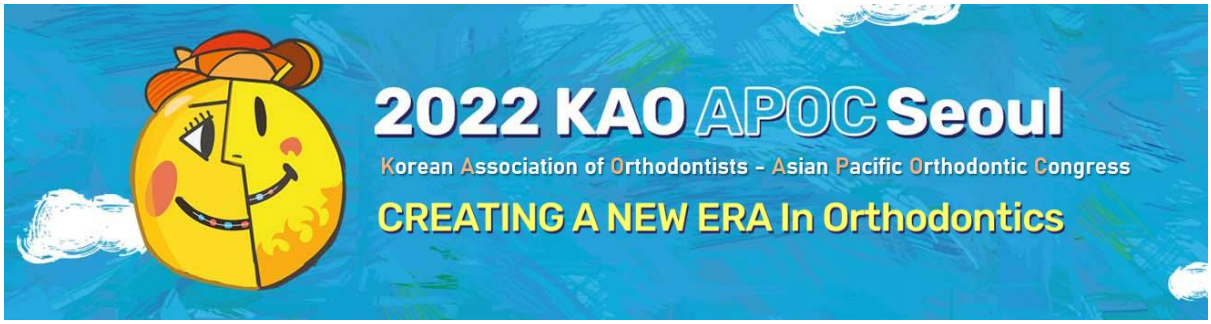
Department of Orthodontics, School of Dentistry, Chonnam National University

Objectives : The purpose of this study was to compare root positions in virtual tooth setup using only crown in simulated treatment, and to suggest a new approach for virtual setup process, including root positioning simulation, with tooth models fabricated by integrating intraoral scan (IOS) and cone-beam computed tomography (CBCT) data.

Material and Methods : IOSs and its CBCT scans before and after treatment were obtained from 15 patients who completed orthodontic treatment with premolar extraction. Three-dimensional (3D) tooth models were fabricated by merging the crown image from the virtual setup and the root image from the pretreatment 3D tooth model. The resulting expected root positions of the simulated pretreatment model were compared to those of the actual posttreatment tooth models. The discrepancy of the simulated and actual root position was measured for each tooth.

Results : There was a statistically significant difference in the accuracy of the 3D root position and inter-root angulation between the virtual setup and posttreatment 3D tooth models in all types of the teeth, except maxillary lateral incisors and first molars.

Conclusion : The virtual tooth setup using only crown data showed clinically acceptable accuracy and simulation for the root position. Clinical application of virtual tooth setup using both crown and root is necessary for accurate and precise treatment simulation, particularly in extraction cases.



P-137

Comparison of the Esthetic Perception on Various Anterior Malocclusion Between the Parents of Orthodontic Patients

Tae-Gyun Kim, Na-Young Chang, Jong-Moon Chae

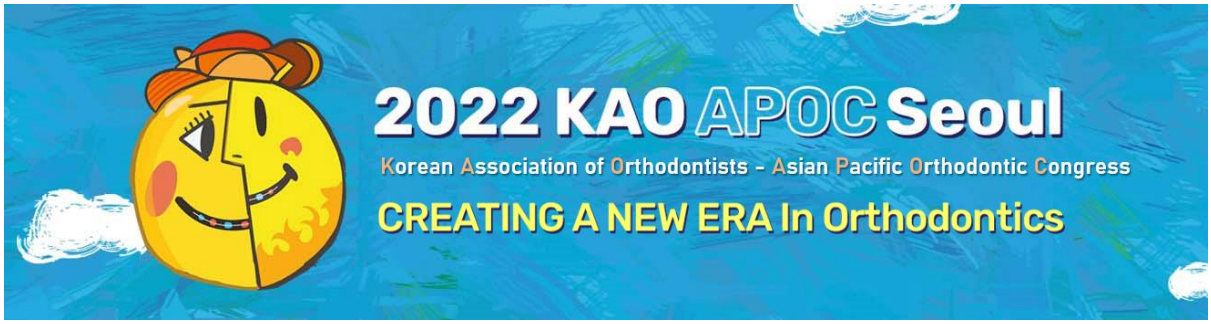
Department of Orthodontics, Wonkwang University Daejeon Dental Hospital

Objectives : The aim of this study is to compare the difference in the degree of esthetic perception of various malocclusions between parents and dentists using visual analog scale (VAS) and to see the sociodemographic characteristics in each type of malocclusion.

Material and Methods : Photos of seven types of malocclusion that can be seen at the front were selected and altered with an image software program. Parents were divided into seven groups according to the children's malocclusion; anterior crossbite group, crowding group, anterior deepbite group, diastema group, edge to edge bite group, maxillary incisor protrusion group, and anterior openbite group. And the dentist group was set as a control group. A questionnaire was made to evaluate the photos of seven types of malocclusion using a VAS and to investigate sociodemographic factors. The scale was 0 to 10, 0 meaning "unesthetic" and 10 meaning "esthetic".

Results : Compared to the total parent group, the dentist group gave a significantly lower VAS score to the anterior crossbite, edge to edge bite, and maxillary incisor protrusion photo ($p<0.05$). Every group showed the highest VAS in the edge to edge bite photo and the lowest in the crowding photo except the edge to edge bite group ($p<0.05$). Unlike other groups, the anterior openbite group gave the lowest VAS to the photo of their malocclusion, the anterior openbite photo ($p<0.05$). The anterior crossbite and crowding group showed significant differences in patient's age at the time of the first orthodontic consultation and the number of the examinations per year ($p<0.05$).

Conclusion : Parents' esthetic perception, patient's age at the first consultation, and the number of the examinations showed significant differences according to the type of malocclusion of the patient. Because of this difference, orthodontists should aware the possibility that parents will tend to have different standards in orthodontic treatment based on their child's malocclusion.



P-138

A study of gingival changes after removal of fixed orthodontic appliance using intraoral scan images

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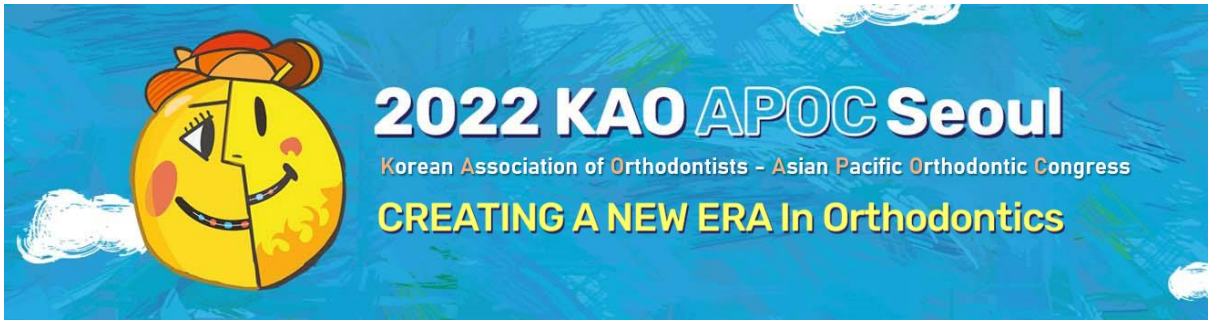
Department of Orthodontics, Seoul National University Bundang Hospital

Objectives : The purpose of this study is to evaluate the gingival changes over time using intraoral scan(IOS) images of the upper and lower arches after debonding orthodontic appliances.

Material and Methods : A total of sixty arches (Maxilla: 31, Mandible: 29) were scanned from 46 patients with intraoral scanner. Each arch was scanned three times: immediately (T0), 1 month (T1) and 3 months (T2) after debonding. The IOS images were cut at the mucogingival junction and above the lingual fixed retainer to involve teeth and attached gingiva, and superimposed by best-fit algorithm between the time intervals. Region of interest was buccal attached gingiva, including 14 cervical and 13 interproximal areas. The largest deviation value in each area between the time intervals was selected and calculated as the root mean square of the three-dimensional coordinates. Difference in gingival changes according to time was evaluated using RM-ANOVA, followed by post-hoc analysis. Differences according to region (posterior vs anterior, maxilla vs mandible, cervical vs interproximal, and extraction sites vs the other sites) were investigated using two-way RM-ANOVA and independent t-test.

Results : There was a significant difference in deviation values of gingival changes for each time interval. Their mean values between T0 vs. T1, T1 vs. T2, and T0 vs. T2 were 0.127, 0.014, and 0.158mm respectively, which indicate gradual decrease of swollen gingiva over time, with most changes within 1 month after debonding. There was no difference of gingival changes between maxilla and mandible. The maxillary posterior gingiva decreased significantly more than the anterior. Within maxillary anterior gingiva, the interproximal area showed more significant decrease than the cervical area. In particular, the interproximal gingiva of the extraction sites decreased significantly more after 1 month, compared to that of the other sites.

Conclusion : This study revealed a significant decrease of swollen gingiva over time after debonding orthodontic appliances, with regional differences.



P-139

Effects of Mini-Implant Assisted Rapid Palatal Expansion on Incisive Canal Morphology and Tooth-Canal Relationship

Yu-rim Kim, Min-seok Kim, Sung-kwon Choi, Kyung-hwa Kang

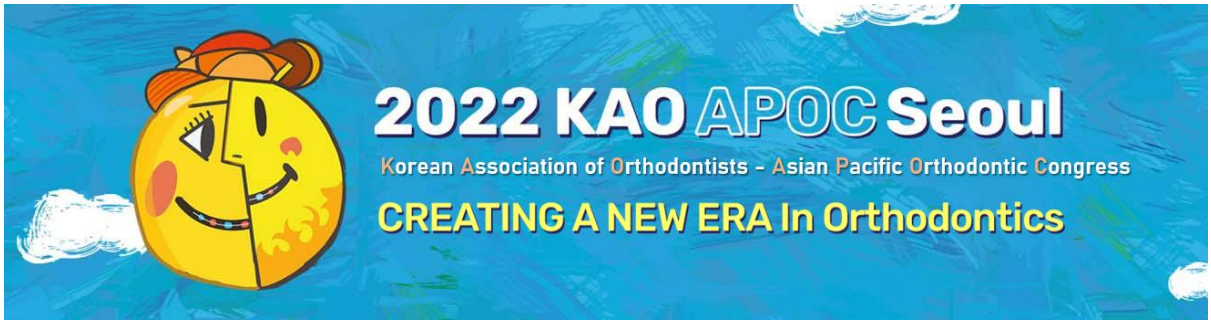
Department of Orthodontics, College of Dentistry, Wonkwang University

Objectives : The objective of this study was to identify the change of incisive canal (IC) morphology and tooth-canal relationship after mini-implant assisted rapid palatal expansion (MARPE).

Material and Methods : Pretreatment and posttreatment cone-beam computed tomography images of 30 subjects (aged 12-55 years) were retrospectively evaluated. The dimensional and volume changes of the IC after MARPE treatment were evaluated and the tooth-canal relationship and positional relationship between the maxillary central incisors were additionally compared in the group where the root apex of the maxillary central incisors was higher than the IC oral opening.

Results : The mediolateral and labiopalatal width of the IC were significantly increased in all three levels after MARPE treatment ($p < 0.01$). The amount of increase was greater in the mediolateral direction than in the labiopalatal direction. The anteroposterior distance from the mesial point of the maxillary central incisors to the anterior margin of the IC was significantly increased only in the oral opening level in the samples where the apices of the maxillary central incisors were located more superior to the oral opening of the IC ($p < 0.05$).
The mediolateral distance between the mesial points of the maxillary central incisors and the distance between the root apex of the maxillary central incisors significantly increased after MARPE ($p < 0.001$). However, the distance between the crown tips of the maxillary central incisors did not significantly increase, even after MARPE treatment ($p > 0.05$). The volume of the IC significantly increased after MARPE treatment ($p < 0.001$), and the average increase in the total volume of the IC was about 65%.

Conclusion : MARPE increased the width and volume of the IC and did not result in a clinically significant change in the root-canal relationship.



P-140

Effects of Mini-implant Assisted Rapid Palatal Expansion on Deviated Nasal Septum and Inferior Nasal Meatus

Ho-yeon Sim, Kyung-hwa Kang

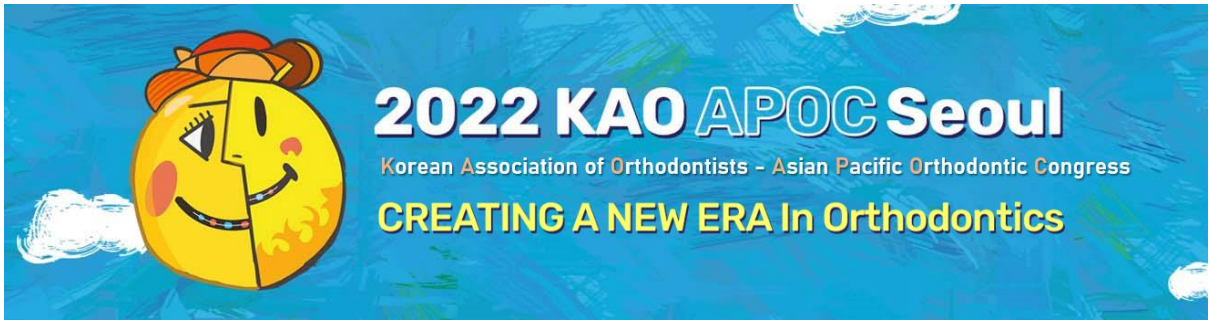
Department of Orthodontics, College of Dentistry, Wonkwang University

Objectives : The purpose of this study was to evaluate the effects of the mini-implant assisted rapid palatal expansion on the nasal septum and the inferior nasal meatus (INM) in the patients with nasal septal deviation.

Material and Methods : The CBCT images were taken before (T0), after (T1), and more than 5 months after (T2) MARPE in 17 patients who had NSD. According to the direction of the NSD, the concave side was set as group 1 and the convex side was set as group 2 by patient. The volume of the INM, nasal septal tortuosity ratio were calculated. Also, to evaluate 3-dimensional changes of the nasal septum, distance between C point (The junction of perpendicular plate of ethmoid bone and vomer) and three vertical planes were calculated. Distance between C point and lateral wall of nasal cavity was measured.

Results : The total volume of the INM increased significantly after MARPE ($p < 0.001$). The distance from the C point to the vertical plane increased significantly after MARPE ($p < 0.01$). Also, there was a significant difference between the groups in the distance between the C point and the lateral wall of nasal cavity ($p < 0.001$). But there was no difference in the increase ratio.

Conclusion : After MARPE, the volume of INM was significantly increased. The nasal septum was displaced to the deviated side without a significant morphological change. But the increase ratio of both side was similar. So, MARPE increases the volume of the INM without affecting the nasal septum



P-142

Effects of Increasing Occlusal Vertical Dimension on Young Adults' Soft Tissue Profile and Lip Incompetence

Nu-ri Ha, Sung-kwon Choi

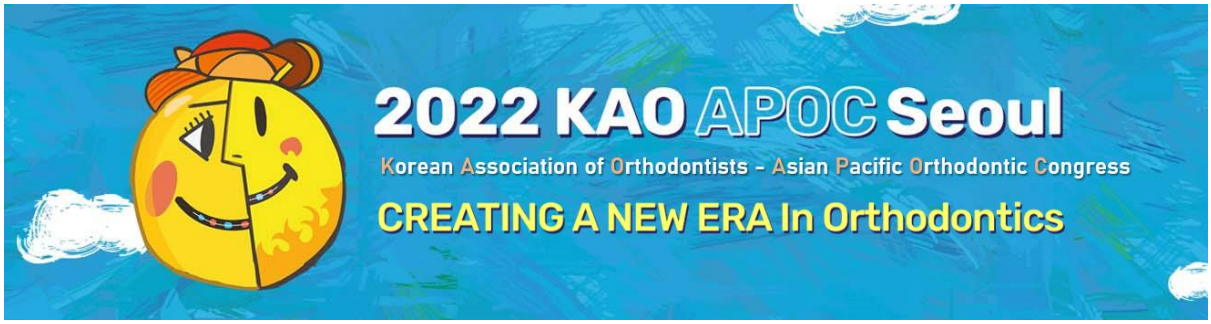
Department of Orthodontics, College of Dentistry, Wonkwang University

Objectives : The purpose of this study was to investigate the effect of an increase in occlusal vertical dimension (OVD) on the lip incompetence and soft tissue profile in young adults without lip incompetence.

Material and Methods : Twenty-four young adults with skeletal Class I, normal overjet and overbite, no vertical skeletal pattern, and no visible lip incompetence participated in this study. After the stone casts were mounted on the articulator, silicone occlusal registrations were fabricated with the OVD increased by 2, 4, 6, and 8 mm based on the mandibular incisor. In the natural head position (NHP), lateral facial photographs were taken with each occlusal registration, including maximum intercuspal position, and the point at which the occurrence of lip incompetence was determined by visual examination. Lateral facial photos were superimposed and the soft tissue parameters, including interlabial gap, upper lip to E-line, lower lip to E-line, upper lip protrusion, lower lip protrusion, chin protrusion, nasolabial angle, and mentolabial angle, were measured with a software program. Changes in linear and angular measurements according to OVD increase were statistically analyzed using analysis of variance (ANOVA) and the Kruskal-Wallis H test. The chi-square test was used to estimate the difference between the increase in OVD and the occurrence of lip incompetence.

Results : The interlabial gap, the upper and lower lip to E-line increased significantly as OVD increased, whereas the lower lip protrusion and the chin protrusion decreased significantly ($p < 0.001$). There was a statistically significant difference in the occurrence of lip incompetence according to the increase in OVD ($p < 0.001$).

Conclusion : The increase in OVD increases the interlabial gap and causes the upper and lower lips to protrude relative to the E-line, as well as the retrusion of the lower lip and the chin point. Also, the occurrence of lip incompetence increases with the increase in OVD.



P-143

Occlusal characteristics and functional disability in patients with Duchenne muscular dystrophy (DMD)

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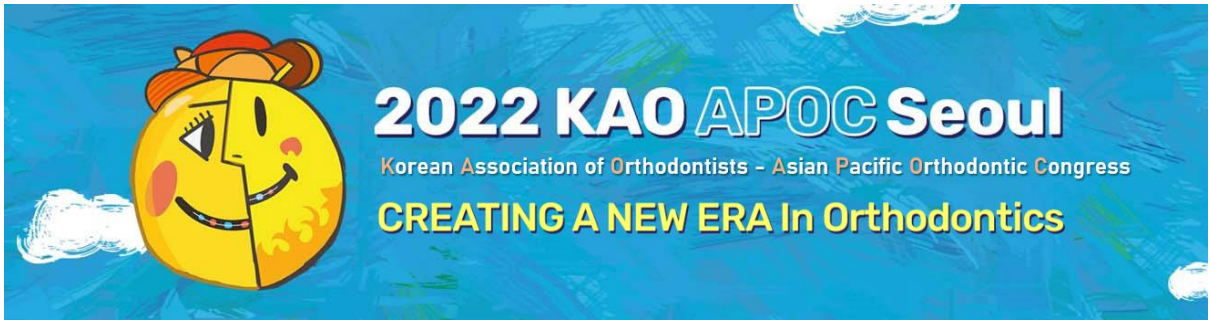
Objectives : Duchenne muscular dystrophy(DMD) is a degenerative disease that affects skeletal muscles. Decline in muscle strength and motor dysfunction first appears around the age of 3-5 and gradually, respiratory endurance starts to decrease in adolescence resulting in early death. Oral manifestations including openbite and crossbite have been reported in these patients. With the introduction of non-invasive intermittent positive pressure ventilation(NIPPV), the average life expectancy of DMD patients expanded in the recent years. Therefore, the aim of this study was to identify occlusal and skeletal characteristics of adult DMD patients undergoing respiratory rehabilitation, and to monitor the differences in oral functions.

Material and Methods : A total of 34 adult DMD patients(18-47, mean age 28.8) undergoing NIPPV were examined during the routine hospitalization period. Intra and extraoral examinations, cephalometric evaluation, maximum mouth opening(MMO), and maximum tongue pressure(MTP) were examined. Moderate and severe trismus was defined as opening limitation <35mm and <15mm. Tongue hypofunction was defined as MTP<30kPa and severe hypofunction as <15kPa.

Results : Adult DMD patients indicated specific occlusal characteristics such as posterior crossbite(26/30, 86.7%), openbite(17/30, 56.7%) and macroglossia(12/30, 40.0%). Skeletal openbite with long anterior facial height(11/11, 100%) and large FMA angle (9/11, 81.8%) was observed.
Maximum mouth opening(MMO) among adult DMD patients was 27.85±10.99mm. Moderate(<35mm) and severe trismus(<15mm) was observed in 70.6% (24/34) and 11.8%(4/34). Maximum tongue pressure(MTP) among adult DMD patients was 14.71±7.08kPa with all subjects indicating below 30Kpa. Severe tongue hypofunction was noted in 54.8%(17/31).

Conclusion : Majority of adult DMD patients indicated clinical features of skeletal openbite and crossbite as well as functional disability including limitation in mouth opening and decreased tongue function. While the gradual changes of its severity during adulthood is yet to be determined, oral care education, mouth opening and tongue exercises can be instructed to the care giver to assist and to promote patient's overall oral health and quality of life.



P-144

Cumulative functional incisal bite forces on an anterior bite plane fabricated from acrylic resin and thermoplastic materials: a randomized controlled study

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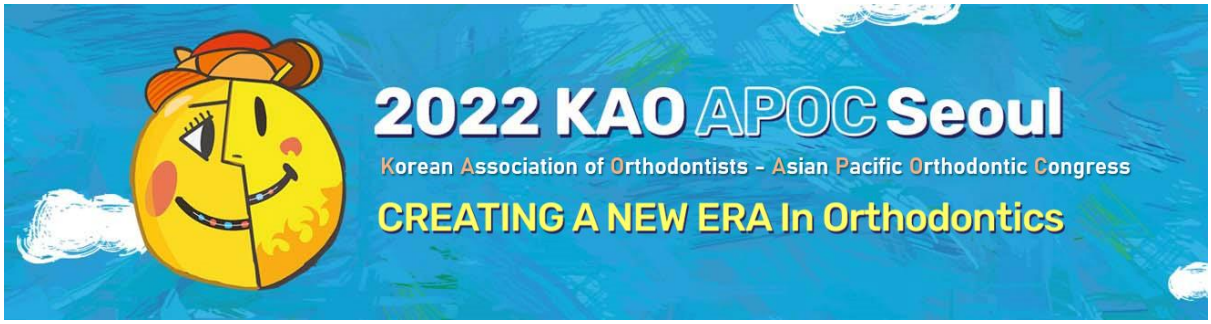
Purpose : This randomized clinical trial aimed to compare the cumulative functional incisal bite force (cFIBF) occurring to child subjects after one month of the administration of an anterior bite plane fabricated from acrylic resin (ABP) and bilaminate thermoplastic polyurethane and polyethylene materials (TBP) to correct deep bite.

Materials and methods : Thirty-four deep bite children (11.57 ± 1.30 years) were randomly treated with an ABP (n=17) and a TBP (n=17). The cFIBF during verbal reading a simple article (15 minute easy task) followed by playing a challenging computer game (15 minute difficult task) were recorded at 1 month after appliance delivery. Mann-Whitney U-tests were used to compare the difference between 2 groups. Significance level was determined at $p < 0.05$

Results : The numbers of incisal contacts to the bite plane were not different between ABP and TBP groups ($p>0.05$). The median cFIBF of the ABP and TBP groups were 932.06 ± 704.90 Newton and 582.63 ± 718 Newton, respectively (p

Conclusions : The cumulative functional incisal bite force was significantly lower in the TBP group than in the ABP group. The findings may imply that functional bite force transmitted to the lower incisors from the use of TBP was lower than ABP during 30 minutes of pre-determined activities.



P-145

Comparison of Trueness and Precision of Intraoral Scanner for Cleft Lip and Palate Infants

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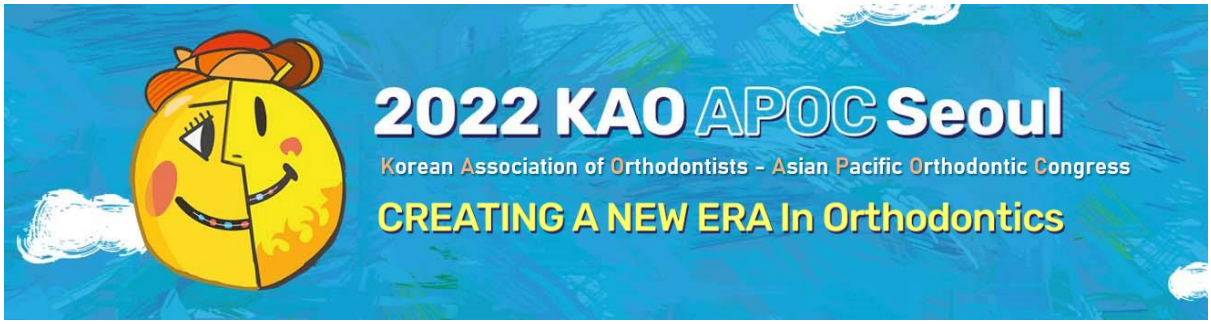
Purpose : Objectives: The purpose of this study is to compare trueness and precision of 5 different intraoral scanners in scanning the models with cleft lip and palate (CLP) .

Materials and methods : One complete unilateral and one complete bilateral CLP models were scanned by TRIOS E4, a laboratory scanner, and recorded in the standard tessellation language (STL) file as a reference scan. Then, the models were scanned by five different intraoral scanners including TRIOS 4, Virtuo Vivo, Medit i500, Aoralscan 3, and Panda P2. Each intraoral scanner scanned the file for 10 times and saved it as a test scan. Reference and test scans were superimposed by a software program to compare the differences. Trueness was a mean between the positive and negative deviations resulting from each superimposition of the digital surfaces. Less deviations meant higher trueness. The test scan with the highest value of trueness was then superimposed with the rest of the test scans resulting in deviation of precision value. The average and standard deviation of trueness and precision were undergone a normality test using Shapiro-Wilk test and evaluated to find the statistical difference using Krustal-Wallis test.

Results : All 5 intraoral scanners had high trueness and precision. It was found that Panda P2 had less trueness and precision statically significant compared to other intraoral scanners ($P<.001$).

Conclusions : Intraoral scanners could be used as substitutes and also decreased the risk of taking impressions for CLP. They should be recommended to be used in clinics more widely.



P-146

Unlocking of ectopically erupting molars using light wires

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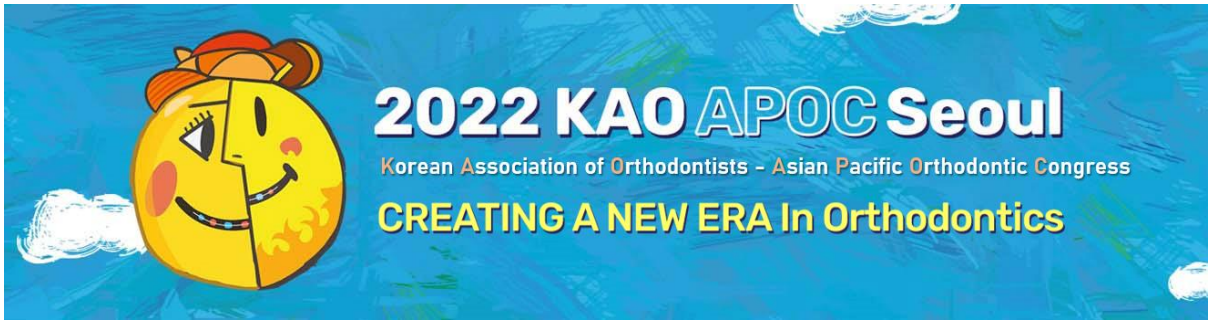
Introduction : Ectopic eruption of permanent molars is a challenging situation that can arise in the early mixed dentition. If not treated at appropriate time, it can reduce the eruption space for mesial succedaneous tooth and cause crowding. It can deteriorate to be horizontally impacted.
We used a light wire to treat ectopically erupting molars. This is because the exposed surface of the tipped molars in the oral cavity is small, making it difficult to bond conventional attachments. In addition, since it represents light force, tooth movement is fast and the anchorage burden is reduced.
This presentation describes a simple method to unlock the ectopically erupting molars using 012 NiTi wire.

Discussion : A typical case to unlock mesially tipped first molar using light NiTi wire was explained. A clinical tip to reduce dislodgement of the appliances was also introduced in children with multiple crowns on the primary molars. Activation method of 012 NiTi wire for mini-tube appliances and treatment effect were also described.

Conclusion : Ectopically erupting first molars in the mixed dentition should be corrected early. The light NiTi wire is very effective in unlocking ectopically erupting molars and no laboratory processes are involved. Appliance design is simple and mini-tube appliance can be concurrently used.



P-147

Digital Workflow for Fabrication of Stabilization Splint

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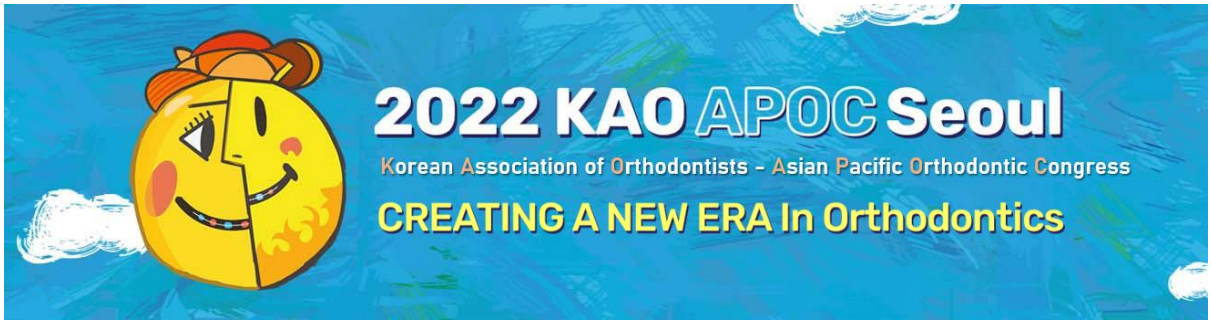
Introduction : The wind of digital transformation is sweeping not only in our daily lives, but also in dentistry. Unfortunately, if you look at the recently introduced digital workflow, you can see that it is just sloppily mimicking the analogue workflow using digital technology without accuracy and convenience, which are important principles in digital transformation. That might be just a simple digitalization rather than a real digital transformation.

Discussion : It is important to achieve a masticatory system that can function harmoniously as well as facial esthetics and proper intercuspation by orthodontic treatment. For this, a stable occlusal position in harmony with a stable joint position is required. If the patient's condyles are evaluated to be in orthopedically unstable position, the use of a stabilization splint is recommended prior to orthodontic treatment.
To make the proper stabilization splint, following conditions are required.
1) Patient's dental model should be mounted on articulator to reproduce the patient's anatomical intermaxillary relation accurately.
2) The anterior ramp angle of the stabilization splint should be determined based on the amount of anterior guidance that enables proper mandibular movements.
However, it is doubtful that some digital splints presented in various journals or You Tube were made properly as mentioned above.

Conclusion : Through this presentation, we would like to present a digital workflow for stabilization splint production with accuracy and convenience.



P-148

Three-dimensional evaluation of virtual setup considering roots and alveolar bone in molar distalization cases

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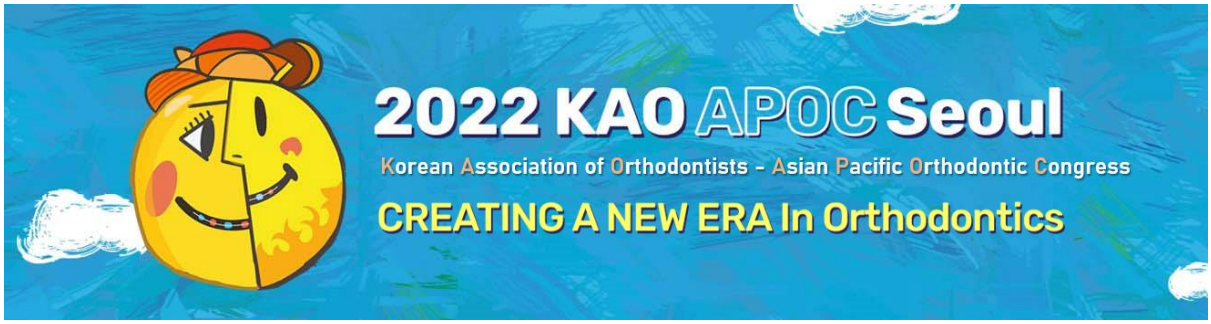
Objectives : The present study evaluated the parallelism and symmetry of the roots and the dehiscences or fenestrations through the virtual teeth setup including roots isolated from CBCT images.

Material and Methods : For 16 patients who were scheduled to undergo non-extraction orthodontic treatment with the molar distalization were selected for the study. After merging the roots isolated from CBCT and the crowns obtained from the intraoral scan, three methods of setup (crown setup considering only the crowns, root setup1 considering root alignment, root setup2 considering the roots and surrounding alveolar bones) were sequentially performed. The parallelism and left-right symmetry of the root angle among the three groups, and the amount and frequency of the root exposure were compared. Each setup result was printed using 3D printer and the qualitative differences in occlusion between groups were measured.

Results : As for the symmetry, the inclination of the maxillary incisors and the mesiodistal angulation of the mandibular incisors were significantly different between crown setup and root setup2. In terms of root parallelism, compared with the initial scan or crown setup, root setup1 or root setup2 showed significant differences except for some posterior teeth. When comparing the amount of root exposure, there was no significant difference between crown setup and root setup1, and root exposure in the maxilla was more frequent on the buccal surface except for the incisors whereas root exposure in the mandible was more frequently found on the lingual side. There was no statistical difference in ABO OGS scores among the three setups.

Conclusion : In non-extraction, molar distalization cases, the virtual setup considering roots improved the parallelism and symmetry of the roots and reduced the risk of root exposure compared to the crown setup without lowering the quality of final occlusion.



P-149

Accuracy of Automated Tooth Setup in Digital Dental Models.

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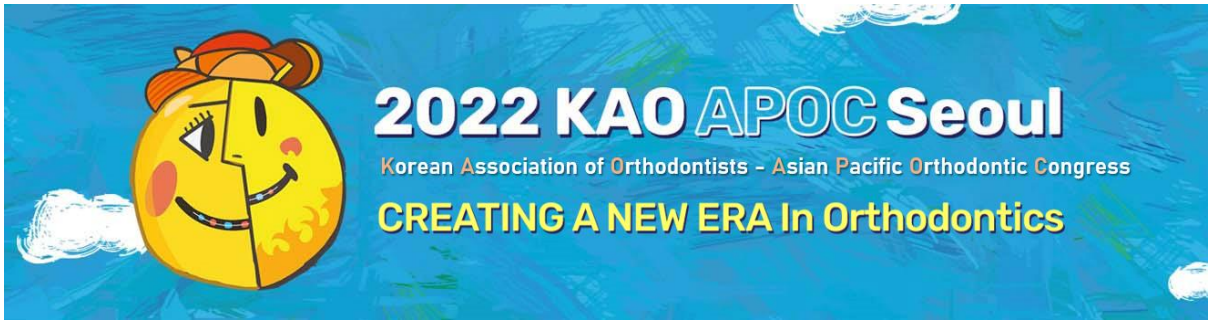
Objectives : To evaluate the accuracy and efficiency of fully-automated digital setup models (FS) and semi-automated digital setup models (SS) compared to manual digital setup models performed by a clinician (MS).

Material and Methods : The pretreatment maxillary and mandibular digital scans of 30 patients who had permanent dentition and planned for non-extraction treatment were included. The 3D differences of the tooth positions were calculated among incisors, premolars, and molars in the maxilla and the mandible. The types of tooth movements studied were 1) extrusion and intrusion, 2) buccal and lingual translation, 3) mesial and distal translation, 4) mesial and distal rotation, 5) mesial and distal angulation, and 6) buccal and lingual inclination.

Results : Mean differences of translation were 0.7 ± 0.5 mm between FS and MS and 1.0 ± 0.8 mm between SS and MS. Mean difference of angular movement were 2.5 ± 3.9° between FS and MS and 5.8 ± 4.6° between SS and MS.
Compared to the MS, maxillary central incisors were more extruded and buccally tipped in FS. Maxillary and mandibular molars were positioned mesially in FS. Distobuccal inclination of maxillary molars and mesiolingual inclination of mandibular molars were not corrected in FS.
Compared to the MS, maxillary and mandibular premolars and molars were positioned distally in SS. Maxillary premolars were more intruded and mandibular premolars were more extruded in SS. Maxillary molars were inclined palatally and mandibular molars were angulated distally in SS.

Conclusion : Fully and semi-automated tooth alignment system may have a significant difference from the clinical treatment objective, therefore the results of the FS or SS may be considered for consultation purposes. Further adjustments shall be made for clinical use such as indirect bonding and clear aligner therapy.



P-150

Bracket failure rate and clinical efficacy of orthodontic brackets with computer-aided transfer jig system

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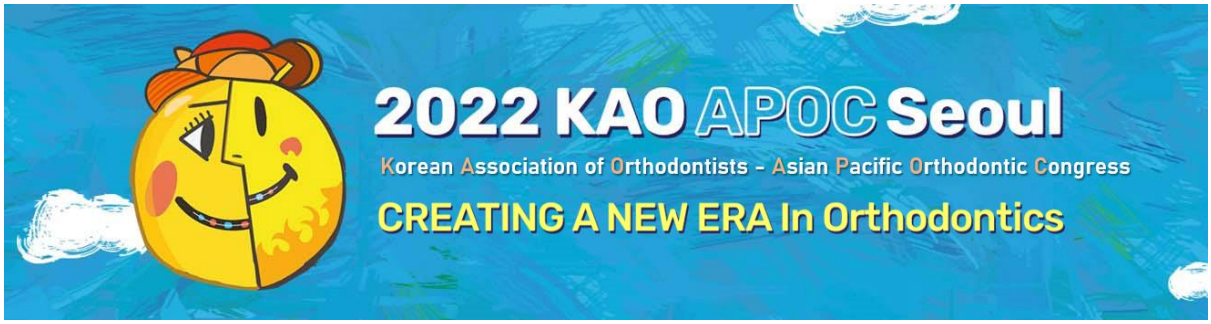
Objectives : This study was to evaluate the actual bracket failure rate and clinical efficacy of orthodontic bracket with computer aided design / computer aided manufacturing (CAD/CAM) based 3d-printed indirect bonding transfer tray.

Material and Methods : A total of 99 orthodontic patients undergoing fixed appliance treatment were subjected in this study (62 women and 37 men). All the brackets were bonded to the 2531 natural teeth (65 restorative teeth were excluded) with CAD/CAM based 3D-printing transfer jigs. Different variables such as age, sex, treatment periods, skeletal divergency, and teeth position related to bracket failure were evaluated.

Results : The total number of failed bracket were 573 and the bracket failure rate was 22.64%.. Statistically significant difference was found in the bracket failure according to sex and divergency pattern. Higher bracket failure rate of < 20 years group was noted in the first 6 months after bonding. Also < 20 years group showed higher failure rate in the premolars and molars than > 20 years group.

Conclusion : This research made the first try in evaluating actual bracket failure rate and related risk factor based on CAD/CAM based transfer jig system to the orthodontic patients. The results show that < 20 years patient on the posterior dentition more affected the bracket failure.



P-151

Assessment of root resorption of central incisors during orthodontic treatment using anterior bite raising.

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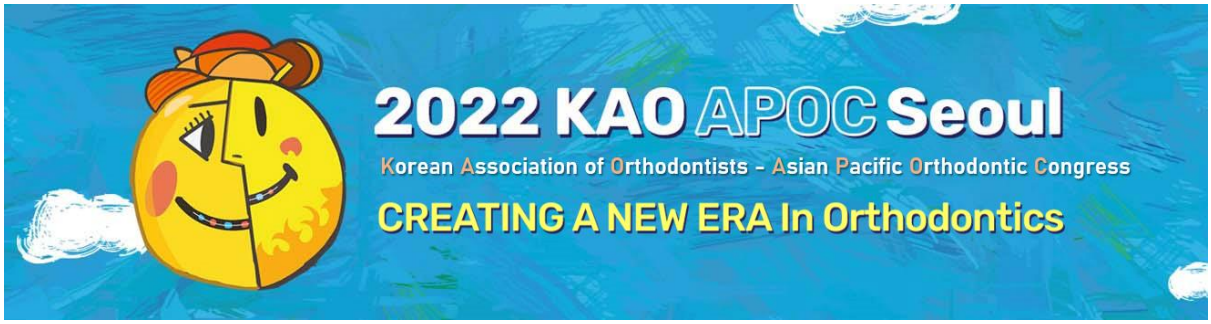
Objectives : Correction of a deepbite is one of the difficult process in orthodontic treatment. Bite raising on the lingual side of the maxillary incisors, it is possible to more conveniently and promptly improve a deepbite. However, there is a concern of an excessive root resorption when the treatment is performed with anterior bite raising. So we investigated amounts of root resorption of the anterior teeth using anterior bite raising.

Material and Methods : We included 100 Korean patients (50 anterior bite raising group and 50 control group) who underwent comprehensive orthodontic treatment with full fixed appliances in Goun-miso dental clinic. Anterior bite raising was performed by bonding band cement on the Lingual surfaces of upper central incisors. Patients underwent cone beam computed tomography(CBCT) examination before and after orthodontic treatment. The vertical root length of the maxillary and mandibular incisors were measured, and the amounts of root resorption were analyzed.

Results : Both the maxillary and mandibular incisors showed more root resorption in the anterior bite raising group, but there was no statistically significant difference. Also no statistical significance was observed between the patient's gender, age, treatment period, tooth extraction, with amount of root resorption.

Conclusion : The orthodontic treatment using anterior bite raising does not cause further root resorption in the maxillary and mandibular anterior teeth.



P-152

Alternative upper labial fixed retainer for periodontally involved anterior deepbite adults: clinical proposal

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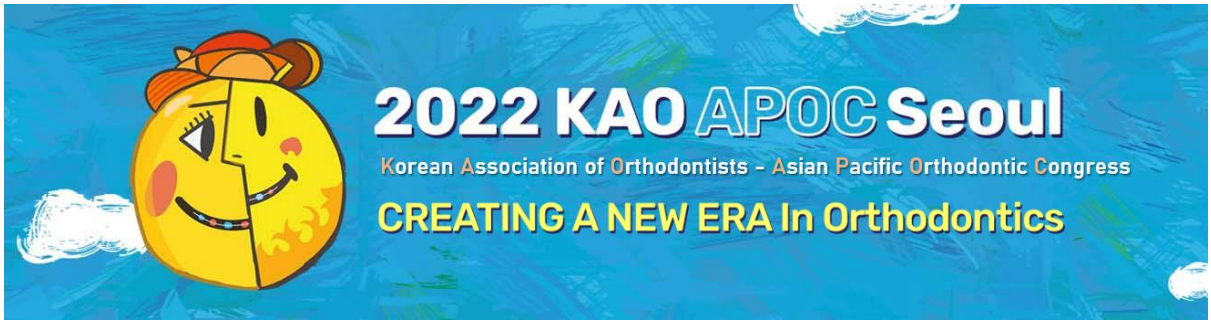
Introduction :
In middle-aged adults long after orthodontic treatment has been completed, in many cases, incisor rotation, spacing, and anterior deepbite occur due to fallen-out of the uppper lingual fixed retainer. However, patients refuse to re-align by braces or install a removable retainer. when re-setting up the lingual fixed retainer, they continue to fall off during mastication. We introduce a method that can maintain upper anterior alignment without patient cooperation with proper esthetics with a fixed retainer attached to the labial side instead of the lingual side.

Discussion : A three-method labial fixed retainer was introduced. There is a Quartz splint UD labial retainer that can be attached directly from the chairside without taking an impression. In addition, there are the very transparent Q.C.M labial fixed retainer, which requires laboratory work after taking the impression, and the labial resin pad retainer, which is the thinnest and shows the color of teeth, although it is manufactured through laboratory work after taking the impression.Because it is the side that is visible when talking, the labial resin pad retainer on the labial side is recommended first, because it has less coloration, is easy for oral hygiene, has the smallest size and is similar to the color of teeth.

Conclusion :
We introduce an esthetic labial fixed retainer that can replace the maxillary lingual fixed retainer that is frequently dropped in the maintenance phase after adult orthodontics.



P-153

Skeletal and Dento-alveolar Effects Using Different Types of Microimplant-assisted Rapid Palatal Expansion (MARPE)

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Objectives : The present study aims to evaluate the following null hypothesis: there is no difference in the coronal and axial expansion patterns in skeletal and dentoalveolar measurements using two different types of microimplant-assisted rapid palatal expander (MARPE) (U6 type and U46 type).

Material and Methods : Pre- and post- MARPE CBCT images of 32 patients (14 men and 18 women; mean age, 19.37 ± 4.44) were analyzed. We compared two different types of the tooth- and bone-borne MARPEs. Also, we grouped total samples into BE1,2 group and BE3,4 group based on the number of bicortical microimplants for comparison. MARPEs used in this study use maxillary first premolars, maxillary first molars, and four microimplants (U4,6 type, n=16) and the other use only maxillary first molars and microimplants (U6 type, n=16). we compared the expansion patterns in two different types of MARPE (U6 type and U46 type) and between BE groups.

Results : A significant difference was found in the posterior alveolar level expansion (P_alv) (p=0.036) and basal bone level molar expansion (BL_M_Exp) (p=0.043) between groups, showing a greater posterior skeletal and alveolar expansion in U6 type. Divided upon the number of bicortically engaged microimplants, the BE3,4 group showed significantly greater posterior mid nasal expansion (P_mid) (p = 0.02), and posterior alveolar level expansion (P_alv) (p = 0.001).

Conclusion : The U6 type showed a greater amount of posterior expansion at the alveolar and basal bone level, Both types of MARPE showed a pyramidal pattern of expansion in coronal view. Antero-posteriorly, the U6 type showed an almost parallel expansion pattern in the axial plane, and the AP_alv was significantly greater in the U6 type, whereas the U46 type showed a more anterior midpalatal suture opening. The group with successful bicortification of microimplants (BE3,4 group) showed a significantly larger value in P_alv, P_mid, and AP_alv than the group that did not.