THE 57th ANNUAL SCIENTIFIC CONGRESS

2024

KOREAN ASSOCIATION OF ORTHODONTISTS

The 10th Joint Meeting of the Korean Association of Orthodontists and the Japanese Orthodontic Society

BIG CHANGE, BIG CHANGE!

OCT 9-11, 2024

COEX, SEOUL

대한치과교정학회

Korean Association of Orthodontists

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Program at a Glance

Wed, Oct. 9th (Day 1)		Thu, Oct. 10th (Day 2)				Fri, Oct. 11th (Day 3)	
Time	Grand Ballroom 104-105	Time	Auditorium	Grand Ballroom 101-103	Grand Ballroom 104-105	Time	Auditorium
		08:30-08:50	Young Investigator Award Presentation				
		08:50-09:40	Special Lecture I	Special Lecture II		09:00-09:20	KAOF Scientific Research Presentation
		09:40-10:10	Opening Ceremony			09:20-09:40	KAO Scientific Research Presentation
		10:10-11:20	Special Session I: Orthognathic Surgery by Navigation	Special Session II: Hospital Management	09:00-12:20 Staff Lecture	09:50-10:40	Veteran's Lecture
						10:40-11:00	Coffee Break / Booth Tour
		11:20-12:30	Special Session III: Orthodontics for Sleep Disorder	Special Session IV: Orthodontics by AI		11:00-11:50	Ryu's Lecture Award
						11:50-12:40	Presidential Lecture
12:00-13:40	Pre-Congress I	12:30-14:00	Poster Exhibition / Lunch Box Seminar		12:40-13:40 Ethics Lecture	12:40-14:00	Poster Exhibition / Lunch Break
13:50-15:30	Pre-Congress II	14:00-15:20	Clinical Oral Presentation I	Clinical Oral Presentation II		14:00-16:30	KAO-JOS Joint Symposium: Orthodontics for Seniors
16:00-18:00	KAO Council Meeting (Conference Room North 201)	15:20-15:50	Coffee Break / Booth Tour				
18:30-20:00	Welcome Reception (Conference Room North 202)	15:50-17:10	Clinical Oral Presentation III	Clinical Oral Presentation IV		16:30-17:00	Closing Ceremony

2024-Pre-Congress-001

Effective Treatment Planning Using the CBCT Integrated ClinCheck of the Invisalign System

Hyeok Ji
Misoarum Dental Clinic

In the fast-evolving field of orthodontics, our clinical process has embraced full digitalization through the integration of intraoral scanners and digital setup programs. This technological advancement helps us create treatment plans that accurately match the dentist's goals. The greatest advantage of clear aligner systems lies in their ability to create precise treatment plans tailored to each patient, considering biomechanics for optimal results. This is especially useful for difficult cases that require significant tooth movement, as clear aligner systems can achieve high-quality outcomes with minimal effort.

This presentation focuses on the strategic setup of treatment plans using the CBCT integrated ClinCheck system. Digital planning allows for meticulous control of individual teeth, accommodating three-dimensional movement patterns and biological limitations. Unlike preadjusted brackets, which come with predefined prescriptions, clear aligner systems require a unique, patient-specific approach. By utilizing a model that replicates both crowns and roots, we can adjust tooth positions within the patient's biological limits.

We will discuss how to set up treatment plans in digital setup software to achieve predictable and effective results. Following a well-made digital plan and wearing the aligners correctly can lead to successful treatments for various types of malocclusions. This presentation aims to provide insights into maximizing the benefits of the CBCT integrated ClinCheck system for precise and efficient orthodontic treatment.

2024-Pre-Congress-002

Possibility of Shape memory aligner -Next generation Aligner Orthodontics-

Kenji Ojima
Smile Innovation Orthodontics

3D printed shape memory aligners are more versatile than conventional press type aligners. When heated, the material temporarily increases in malleability, allowing for aligner coverage to the undercut, which in turn increases aligner hold and leads to more effective control of tooth movement. This presentation will discuss how shape memory aligners are used clinically. It will also present common issues with conventional press aligners, and discuss solutions provided by shape memory aligners. In addition, the workflow of aligner creation using digital planning will also be introduced.

-Attendees of this presentation will better understand improvements in shape aligner technology compared with conventional press aligners.
shape memory Aligners
-Attendees of this presentation will understand how to reach better and more predictable treatment outcomes through use of shape memory aligners with strong fundamental consideration of aligner orthodontic biomechanics.
-Attendees of this presentation will understand the role and procedure of digital planning for shape memory Aligners.

2024-Special Lecture-001

Navigating the Present and Future of Surgery First for Class III Deformities

Jorge Faber
University of Brasilia

Surgery First (SF) anticipates the aesthetic and functional breathing benefits derived from surgery at an early stage of treatment. It does not alter the surgical technique but rather the orthodontic approach. In SF, dental decompensations are carried out in the post-surgical period, leveraging the accelerated tooth movement at this stage to achieve significant decompensations. The Class III malocclusion is often converted into Class II, and the post-surgical orthodontic biomechanics aim to treat Class II. This can be managed with fixed appliances or aligners. Miniplates are typically employed to ensure the planned dental movement is executed. The main reason for using mini plates instead of mini implants is that most large hospitals do not permit the use of materials not listed as surgical materials, meaning the surgeon cannot bring a mini implant into the operating room and install it in the patient.
SF offers advantages over traditional orthodontic preparation for orthognathic surgery, such as improved quality of life during treatment and shorter orthodontic treatment durations. This approach necessitates meticulous and complex overall treatment planning, requiring careful coordination between the surgical and orthodontic treatments, as one depends on the other.
Due to the acceleration of orthodontic movement after surgery, substantial dental movements are performed more efficiently, making SF particularly beneficial for patients requiring pronounced dental decompensations. In this lecture, framed by an evidence-based approach, we will present our 20 years of experience utilizing SF in a private practice setting to achieve excellence in finishing with both fixed appliances and aligners.

2024-Special Lecture-002

AI and Digital Takeover: Quality or Convenience, Progression or Regression, and Advancement or Demise of Orthodontics?

Won Moon[1,2]
[1]The ADA Forsyth Institude
[2]Ajou University

The discipline of orthodontics is going through drastic changes with the advent of new concepts and technologies. Digital workflow, AI incorporation and 3D printing technologies propelled clinical interests in various forms of customized and digitally programed appliances. Among these, clear aligner treatments have taken center stage. Although numerous research data and successful clinical cases have been presented in recent years, there are many unanswered questions, shortcomings, and challenges, which lead to accepting a less-than-optimal treatment result.

Furthermore, many other novel products have been introduced in the marketplace, with claims of certain advantages over existing systems. As these new innovations flood the orthodontic world, the obvious question becomes the relevance of the existing systems. The world of orthodontics is evolving at a furious speed, and it is easy to lose sight of the fundamental concepts of orthodontic biomechanics and the desire to produce the most optimal treatment outcome.

On the other hand, digital technology can greatly enhance the accuracy of many difficult tasks such as 3D surgical prediction, craniofacial patient management, surgical guide fabrication, morphometrics, etc. Digital and AI technology have certainly made orthodontic treatment more convenient; however, quality of treatment may have suffered. With the advancement of technology, orthodontics may face inevitable regression if we continue this path of accepting compromised results. Instead, we must overcome these digital and AI shortcomings as we learn to adapt these novel treatment concepts.

As we embrace changes and incorporate new technology, the future of orthodontics will be determined by our final stance on the quality of our treatment results.

2024-Veteran's Lecture

Orthodontists in the era of 5th industrial revolution

Young Guk Park[1,2]
[1]Department of Orthodontics, School of Dentistry, Kyung Hee University
[2]FDI World Dental Federation

The orthodontic professionalism is poised to undergo transformative changes as we enter the era of the 5th Industrial Revolution. This presentation explores the evolutionary journey from the First Industrial Revolution to the present, highlighting pivotal technological advancements and societal shifts at each stage. In the 5th Industrial Revolution, characterized by the fusion of digital, biological, and physical technologies, society will experience unprecedented integration of human intelligence with advanced AI, robotics, and biotechnologies.

This convergence is set to revolutionize the orthodontic avenue. Personalized treatment process will be enhanced by AI-driven diagnostics, 3D technologies will enable custom orthodontic devices, and tele-orthodontics will broaden access to care and expand to universal health coverage. Moreover, the emphasis on sustainable and ethical practices will reshape how orthodontists approach both treatment and patient interaction.

Orthodontists must prepare by embracing continuous education in emerging technologies, fostering interdisciplinary and interprofessional collaborations involving humanities scholars, and adapting to new patient care models. This forward-thinking approach will not only enhance clinical outcomes but also ensure that practitioners remain at the forefront of this rapidly evolving landscape.

By understanding the implications of the 5th Industrial Revolution, orthodontists can proactively shape their practices to meet future demands and continue delivering exceptional patient care in an increasingly interconnected world.

2024-Presidential Lecture

Quo Vadis: Orthognathic Surgery or Orthodontic Treatment for Patients with Class III Malocclusion

Seung-Hak Baek
Department of Orthodontics, School of Dentistry, Seoul National University

The most important objectives of orthodontic treatment are to obtain pleasing smile and stable occlusion. Although the concept about envelope of discrepancy can give a guideline for deciding surgical and non-surgical camouflage treatment, it is not easy to give a proper differential diagnosis in patients with Class III malocclusion. The three factors that we should consider are as follows: (1) Host factor (Personality, Attractiveness, History of previous treatment and degree of relapse); (2) Anatomical factor (Cephalometric Measurement, Dentoalveolar Housing); and (3) Biomechanics (Distalization of the Mandibular Dentition, open bite, asymmetry). The purposes of this presentation are to explain these factors and to show cases treated with surgical and non-surgical camouflage treatment.

2024-Ryu's Lecture Award

Biocreative Orthodontic Strategy: A New Perspective on Orthodontics

Kyu-Rhim Chung
Department of Orthodontics, School of Dentistry, Kyung Hee University

The inception of the "Biocreative Orthodontic Strategy" began by faithfully following the invaluable teachings of our predecessors. The extensive experience gained from consistently applying the same treatment methods motivated us to gradually modify them to suit our circumstances. To secure scientific evidence, we continuously submitted our findings to various related academic journals.

The "Biocreative Orthodontic Strategy" actively embraces new orthodontic devices that evolve with the times. However, it does not necessarily produce higher treatment outcomes compared to other orthodontic methods. Its distinctiveness lies in the design that allows practitioners to easily recognize and promptly correct any judgment errors during treatment planning and evaluation, thereby achieving the patient's goals in an optimal timeframe.

In summary, the method can be introduced as follows:

1. "Analyze orthodontic treatment issues from a triangular perspective."
2. "Establish a treatment plan that conforms to human biological phenomena."
3. "Adopt treatment methods with a simple action-reaction interpretation."

Through the prepared materials, I will explain how these preconditions are applied and utilized in orthodontic treatment. Additionally, I hope that this valuable opportunity will allow me to be recognized for contributing to the advancement of Korean Orthodontics (K Orthodontics).

2024-Special session I

How to make the best of 3D images for your treatment?

Gye-Hyeong Lee
21st century orthodontic clinic, Yeosu

It is not difficult to express a 3D object in 2D, but on the contrary, 3D object cannot be represented accurately using 2D data due to lack of data between reference planes. The same thing has happened so far in the diagnosis process for orthodontic treatment. There are limits to accurately depicting a three-dimensional human body through two-dimensional photographs and cephalograms, and orthodontists need a lot of effort and experience to develop their visualization skills. Considering this, it is not surprising that attempts to use 3D data in orthodontics have been made since the early 1900s. Later, when the cephalogram was developed by Broadbent, it was ultimately attempted to determine the patient's three-dimensional positional relationship by taking images simultaneously from the lateral and frontal sides.

The full-fledged use of 3D data in dentistry began with the development of CBCT in 1996. Afterwards, intra-oral (model) scanners that clearly indicate the condition of the dentition became popular, and recently face scanners have been used clinically to analyze facial soft tissues. Unfortunately, there is no 3D data that well represents all of the skeleton, dentition, and facial soft tissues required for orthodontic diagnosis, so it is inevitable that CBCT, intra-oral scanner, and face scanner must be integrated and used according to the purpose of use. Therefore, in order to utilize 3D images well, it is necessary to understand the characteristics and limitations of each 3D data and the principles of integration of various 3D data.

Through this presentation, I would like to learn about 3D images that can be used in the field of orthodontics and present their effective use in orthodontics.

2024-Special session I

Surgical-Orthodontic Treatment Using Digital Technology in Unusual Cases

Sung-Hwan Choi[1], Jun-Young Kim[2]
[1]Department of Orthodontics, College of Dentistry, Yonsei University
[2]Department of Oral and Maxillofacial Surgery, College of Dentistry, Yonsei University

Currently, three-dimensional (3D) cephalometric analysis using cone beam computed tomography (CBCT) has become common during surgical orthodontic treatment. Treatment plans are established through 3D analysis, and post-surgical treatment results are analyzed and evaluated. The first thing that must be done for 3D analysis is to position the patient's head reproducibly every time CBCT is performed to detect consistent anatomical landmarks. Conventionally, a natural head position is recommended. However, if a patient has difficulty controlling voluntary muscle movements due to a systemic disease such as epilepsy, the success of treatment cannot be assured with traditional methods based on natural head position.
In this presentation, we would like to introduce the surgical orthodontic collaboration system between orthodontists and oral and maxillofacial surgeons for an unusual patient with epilepsy. To consistently maintain this patient's head posture, we developed a landmark-free reorientation methodology based on principal component analysis (PCA) for harmonious orientation of serially captured CBCTs. Furthermore, in our approach to orthognathic planning, we have leveraged advanced digital technologies to enhance precision and effectiveness. We can create comprehensive virtual treatment plans using digital simulation tools, allowing for detailed pre-surgical visualization and adjustment. Moreover, we would like to introduce an algorithm that can automatically detect curvilinear landmarks such as Orbitale and Porion to minimize human landmark detection errors. This enabled automatic reference planes without human manipulation and precise 3D analysis, enabling more reliable treatment.
This digital integration facilitates better communication between the surgical and orthodontic teams, ensuring that the planned surgical outcomes align closely with the desired orthodontic results. By incorporating these digital methods, we enhance the accuracy and predictability of orthognathic surgeries, leading to improved patient outcomes.

2024-Special session II

Management of the difficult patient

Bong-Jin Hahm[1,2]
[1]Department of Psychiatry and Behavioral Sciences, Seoul National University College of Medicine
[2]Department of Psychiatry, Seoul National University Hospital

The difficult patient is one who, through a variety of behaviors, provokes a series of negative feelings in most dentists. About 15% to 20% of dentist-patient encounters are considered difficult. Difficult encounters result in dissatisfaction with care, nonadherence to treatment, and poorer treatment outcomes among patients, as well as burnout, mental health problems, and reduced quality of life among dentists. Difficult encounters can be attributed to factors associated with the dentist, patient, situation, or a combination of these. Patient factors include behavioral issues (angry or argumentative, demanding, highly anxious, manipulative, hypervigilant to body sensations, etc.) and psychiatric conditions (somatic symptom disorders, depressive disorders, bipolar disorders, substance use disorders, and personality disorders). Factors related to the dentist and situational factors include poor communication skills and situational stressors. Education in behavioral medicine may empower dental students and dentists to understand and manage the factors contributing to difficult encounters.

2024-Special session II

Orthodontic office management based on the patient's royalty and job engagement of the staffs

Edward Chang Jin Park
Dr.Park's Orthodontics for better smile

In every business, The human resource management is the fundamental in running the organization. The other critical area is the marketing to get the profit which is essential part of the business. With the decrease of the population and the changes of the views to jobs in young generations, orthodontists are struggling to manage the offices.

The majorities go through the hard times to find the right employee and keep them for a long time. also try to find new patients with various methods as advertisement, social media, YouTube but sometimes it comes down to lower treatment fee.

I want to share the experience and knowledge about the employee engagement through understanding their professionalism. Also, The way how we can get the patients loyalty and avoid the ineffective and useless, even harmful commercial approach to find a new patients will be discussed. The so-called 'royal customers' are very cooperative to the treatment and accept the treatments easily. and they are the real source of the referral through the testimonials with sincerity. The patients in their retention period will have the different position after this lecture.

For the stable office, The orthodontists must look at the matters beyond the orthodontic treatment itself. As an owner and managing director of a business entity, we must focus on the human resource management and marketing also.

Through this lecture, I hope you can get some different point of view beyond the TAD, Clear aligners and self-ligation braces to run the successful orthodontic office.

2024-Special session III

Working towards Common Goals: Interdisciplinary Care and the Management of Sleep Disordered Breathing

Mitchell Levine
University of North Carolina

This presentation will focus on the uncertainty of the evidence that orthodontics and dentofacial orthopedics play in the management of OSA. Accordingly, the presentation will reference current literature and highlight weaknesses that may give pause to the evidenced based orthodontist. From there, the presentation will show two cases that highlight the interdisciplinary work that orthodontists might embark upon to remain true to evidenced based dentistry.

2024-Special session III

Sleep Apnea and the Orthodontist

Juan Palomo
Case Western Reserve University

Traditionally we are trained to see and analyze the airway from only the lateral view on a cephalometric film. However, the airway is a three-dimensional (3D) structure, and that third dimension may be hiding something relevant to our diagnosis. With more than 80 respiratory disorders, the orthodontist can play a big role in helping children and adults, especially regarding Obstructive Sleep Apnea (OSA). This presentation will show how the orthodontist can help identify and manage OSA in pediatric and adult patients, the difference between treatment and management, the potential effects of orthodontic treatment, and possible solutions. As healthcare providers, there is a lot more that we can do for our patients, but this does not mean that it needs to interfere with the efficiency and the practice flow already in place.

2024-Special session IV

Exploring Malocclusion through the Eyes of AI: A New Way to Understand

Jeong-Ho Choi[1,2]
[1]Smile Future Orthodontics
[2]Department of Orthodontics, School of Dentistry, Seoul National University

In orthodontic diagnosis, the most crucial stage of orthodontic treatment, AI is being used in numerous ways. It automatically analyzes skeletal and soft tissues from cephalograms and CBCT 3D volume imaging and can identify facial asymmetry and dentofacial syndromes from facial photos. AI is also used in predicting facial growth, performing automatic diagnostic setups, and forecasting treatment outcomes (VTO). With these diverse applications, AI has made diagnosing orthodontic patients more convenient and accurate.
So, how does AI understand malocclusion and the diagnostic data used for orthodontic treatment? How can we develop better AIs for orthodontists? And how can orthodontists benefit from these AIs? This lecture aims to answer these questions. In addition to exploring analytical AI, the traditional method of AI research and application, we will also examine the potential of applying generative AI to orthodontic diagnosis. Furthermore, studies and cases in which AI aids in diagnosis and treatment planning in orthodontics will be discussed.
This lecture will empower the audience with a deeper understanding of how Artificial Intelligence is revolutionizing the field of orthodontics, fostering a bridge between cutting-edge technology and orthodontic expertise. Attendees will gain insights into the latest advancements in AI technology and how these innovations are paving the way for a new era in orthodontic care.

2024-Special session IV

Increase Aligner-Confidence Leveraging Efficient Biomechanics, Optimizing Clinical Workflow, and Technology

Kasper Dahl Kristensen
Section of Orthodontics, Aarhus University, Denmark

Orthodontic aligners are gaining popularity among orthodontic professionals, reflecting their increased use in modern practice. They are now employed for a broader range of patients, beyond minor teeth straightening in adults. Skilled orthodontists can utilize aligners effectively to achieve favorable outcomes. However, a fundamental question persists: "How well can aligners deliver efficient and predictable results for various types of patients?" Learning to use aligners efficiently differs significantly from mastering fixed braces for more complex cases. The distinction between the effectiveness and efficiency of aligners versus fixed braces is intricate and warrants thorough exploration, which is the central focus of this lecture.

We will explore strategies to avoid less-than-ideal treatment methods, emphasizing consistently achieving positive results within a reasonable timeframe to satisfy both orthodontists and patients. The lecture will delve into the learning curve associated with aligners and highlight common mistakes that may arise in comprehensive orthodontic treatments.

Furthermore, practical, evidence-based guidelines will be provided to streamline the process of setting up cases with aligners, enhancing both efficiency and predictability. Additionally, we will discuss the integration of artificial intelligence (AI) in everyday orthodontic practice. AI-powered tools can significantly improve the precision of treatment planning and monitoring, offering real-time adjustments and personalized treatment pathways.

This incorporation of AI enhances our ability to deliver consistently outstanding outcomes for patients treated with aligners, ensuring high levels of satisfaction and efficiency in orthodontic care. This comprehensive approach will empower you to consistently achieve exceptional results in aligner treatments.

2024-Joint Symposium

Elderly Patients Seeking Orthodontic Treatment: Psychological and Esthetic Expectations

Yoon-Goo Kang
Department of Orthodontics, Kyung Hee University Dental Hospital at Gangdong

In clinical orthodontics, a notable transformation in recent times has undergone with an increase in the number of older patients seeking intervention to address dental misalignment and other related concerns. While orthodontic treatment has traditionally been associated with adolescents and young adults, there has been a perceptible shift towards a broader age spectrum seeking such interventions. This phenomenon has spurred a burgeoning interest in unraveling the intricate psychological dimensions that underlie the decision-making process of older patients pursuing orthodontic treatment.

The decision to pursue orthodontic treatment in later life is influenced by a complex intermingling of factors, ranging from evolving societal norms surrounding beauty and self-care to advancements in orthodontic technologies that offer more discreet and convenient treatment options. These patients, who might have previously foregone orthodontic correction due to personal or logistical reasons, now embark on journeys that extend beyond functional benefits to encompass psychological and social dimensions. Through a comprehensive review of existing literature and potential firsthand insights, we endeavor to uncover the motivations, challenges, and transformative outcomes that define this emerging trend.

Through an understanding of the psychological intricacies and esthetic aspirations of senior patients, orthodontic practitioners can refine their approaches and provide personalized care that goes beyond conventional orthodontic standards. This presentation will navigate part of the senior orthodontics realm, uncovering the interplay between psychological well-being and esthetic considerations in achieving optimal outcomes for this diverse and deserving patient group.

2024-Joint Symposium

Orthodontic Management of Aging : Improve Function and Beneficial Retention

Sang Jin Sung
Department of Orthodontics, Asan Medical Center, Uni
versity of Ulsan College of Medicine

The age of seniors varies depending on the government policy, international organizations, and businesses. Senior orthodontic patients have the characteristics that they want to treat malocclusion that has been neglected so that their natural teeth can maintain their function more stably for the rest of their lives, or they need multidisciplinary treatment to treat secondary malocclusion caused by partial tooth loss.
Oral application treatment for the decline in sleep quality due to aging is also an area that orthodontists should not miss as part of senior treatment.
The average life span of a prosthesis is known to be about 10 years. How many years of retention can we guarantee for patients who have completed orthodontic treatment? As my career as an orthodontist progresses, the patients I treated will also become seniors and continue with me. It is necessary to think about the retention that patients and orthodontists can provide benefits to each other.

2024-Joint Symposium

Orthodontics for middle-aged and elderly individuals in Japan

Haruhisa Nakano
Department of Orthodontics, Showa University School of Dentistry, Tokyo, Japan.

In the 2022 World Health Statistics published by WHO, Japan was ranked as the world's top country for longevity, with an average life expectancy of 84.3 years. Thus, Japan, a super-aging developed country, is facing problems the rest of the world has never experienced before. There is a gap of approximately 10 years between average life expectancy and healthy life expectancy, and in order to narrow the gap, daily maintenance of healthy diet, exercise, sleep, and the teeth is essential. In particular, the number of remaining teeth and molar occlusal support have been suggested to correlate with declines in health and cognitive function. A study by Mogi et al. reported that favorable teeth alignment and occlusion were observed in individuals having 20 or more teeth at the age of 80 years. This suggests that correct teeth alignment and occlusion help maintain the number of remaining teeth, thus contributing to health.

On the other hand, jaw deformities are a severe type of malocclusion. Particularly, it is extremely difficult to treat cases involving facial asymmetry. In general, middle-aged and elderly individuals with molar crossbite occlusion often have prostheses or defects in the molar region. Thus, aiming to "elucidate the causes of jaw deformities," we have conducted "research on the causes of jaw deformities using experimental models" and "biomechanics research on the mandible." Also, we are conducting "statistical clinical research on osteoarthrosis (OA) of the temporomandibular joint and idiopathic/progressive condylar resorption (ICR/PCR)."

In recent years, prosthodontists and other dentists have been asked to improve malocclusion like unilateral crossbite because of difficulties in treating dentures and implants. In this lecture, we will present middle-aged and elderly cases of patients with jaw deformities and discuss what we, as orthodontists, can do to extend healthy life expectancy.

2024-Joint Symposium

Periodontal considerations in orthodontic force system: Middle-aged and Elderly Patients treatment

Kunihiko Otsubo
Otsubo Orthodontics Clinic

In recent years, the number of orthodontic patients in middle-aged and elderly age groups has been increasing. These patients have reduced surface area of the periodontal ligament supported by the alveolar bone, and their periodontal tissues are less responsive to orthodontic forces. Superelastic NiTi wire which had been developed 30 years ago possess only 1/3 the stiffness of stainless steel wires. Its superelasticity allows light continuous orthodontic forces, which may be suitable for the treatment of multi-bracket systems in elderly patients. While round NiTi wires are excellent for leveling, rectangular NiTi wires are superior for space closing and finishing stages. This is due to the fact that superelastic NiTi alloy wires have shape memory, excellent springback properties, as well as shock absorption and vibration damping capacity. And in order to effectively use these superelastic NiTi alloys, bending by an electric current heat-treatment machine is necessary. But do we understand the orthodontic forces expressed in the oral cavity of NiTi wires? Does superelasticity not convert into excessive orthodontic forces? Is excellent springback property not harmful? What kind of orthodontic force does a wire with high stress hysteresis produce? Will a wire that has been subjected to electric current heat treatment become stiff? Can we answer these questions?

In this presentation, I will discuss the basic characteristics of NiTi alloy wires, changes in orthodontic force with intraoral temperature alteration, changes in wire characteristics due to electric heat treatment machines, and the force system using NiTi alloy wires in my practice. Understanding the properties of NiTi alloy in the intraoral environment and how to properly modify the wire will enable us to provide appropriate treatment.

2024-Young Investigator Award 2024

A Network Analysis of Cephalometric Variables with Normal Occlusion

Seorin Jeong
Department of Orthodontics College of Dentistry Chosun University

A fundamental understanding of the correlation between cephalometric measurements is essential for advancing our comprehension of the anatomy of the oral and maxillofacial regions. Given the potential for discrepancies in input data due to the analyst's choices, it is crucial to minimize bias and establish a reliable standard for malocclusion research. To this end, a comprehensive range of variables was employed to investigate the correlation structure of the cephalometric measurement variables.

Furthermore, in order to conduct data-driven analyses of various malocclusions, it is essential to establish a reference point based on studies of normal occlusion. The study was performed using data from 735 adults aged 18–25 years with normal occlusion.

Network analysis can be utilized to examine the complex correlation structure between a multitude of variables. This structure can be elucidated through the application of weighted network analysis and minimum spanning trees. This analytical approach allows for the identification of the structure of clusters and the determination of the core structure of the correlation between cephalometry variables.

It is proposed that an investigation of the correlation between cephalometric variables through network analysis may significantly enhance our understanding of the anatomical characteristics of the oral and maxillofacial regions. Furthermore, this will provide an important foundation for studying malocclusion using artificial intelligence based on data.

2024-KAOF Scientific Research Presentation

Tailored Orthodontic Intervention on Obstructive Sleep Apnea by Age Group: A Novel Approach Triggering Precision Orthodontics

Su-Jung Kim

Department of Orthodontics, School of Dentistry, Kyung Hee University

A New era of *Precision Orthodontics* is coming. Likely that Precision Medicine is an innovative approach to tailor disease prevention and treatment in consideration of each patent's gene, environment, and lifestyle, *Precision Orthodontics* is anticipated to differentiate our clinic in the very near future. In this context, obstructive sleep apnea (OSA) may be the first target that leads the *Precision Orthodontics*. Precision application of relevant orthodontic treatment modality based on the differentiation of Craniofacial skeletal phenotype (CSP) in each patient could provide with personalized esthetic, functional, and life quality improvements. It's time to establish clinical roadmaps applicable to OSA patients with craniofacial anatomical problems by age group.

Previously, most studies investigating the effects of OSA treatment modalities have been designed for the "average patients" as a one-size-fits-all approach, thus failed to set up the scientific evidences on the clinical guideline. In this presentation, I would like to integrate our research outcomes so far on the Multi-dimensional characteristics of the CSP of OSA in Korean orthodontic population, and on the therapeutic effects of precision orthodontic intervention on OSA in growing and nongrowing patients. Based on this, I hope that I could inspire orthodontists to prepare a new trend of *Precision Orthodontics* with embracing OSA in a daily practice.

2024-KAOF Scientific Research Presentation

Aligning Safety with Innovation: Biocompatibility of Direct Printed Aligners

HyoWon Ahn
Department of Orthodontics, School of Dentistry, Kyung Hee University

Orthodontic treatment using aligners for a wide range of malocclusions has become increasingly popular in recent years, particularly due to the growing demand from adult patients. The materials and designs of aligners have evolved rapidly, and Direct Printed Aligners (DPAs) have emerged as a promising alternative to conventional thermoforming aligners. Although this technique appears promising, the current evidence base is limited and has only been studied recently. Preliminary research suggests that DPAs possess acceptable mechanical properties; however, concerns about their biocompatibility persist. The incomplete conversion of monomers to polymers can result in residual monomers leaching into the oral cavity's saliva, potentially causing adverse biological reactions in the tissues. In terms of cytotoxicity of clear aligners, studies regarding thermoforming aligners have demonstrated controversial results, and research on DPAs is even scarcer. Therefore, this presentation will address the biocompatibility issues related to DPAs. Based on in-vitro study settings, the results can show a wide range of variability. In this presentation, the cytotoxicity of DPAs will be discussed in a simulated clinical condition involving the repeated use of aligners sequentially in artificial saliva, and potential solutions to this problem will also be considered.

O-01

Extended Reality (XR) Technology and Cloud-based Digital Workflow for Efficient Orthognathic Surgery

Daisuke Tomita
Mirise Orthodontics Minamiaoyama, Mirise Clinic Minamiaoyama

【Background and Objectives】
Recent advancements in digital workflow integration in orthognathic surgery have shown promising results in improving planning precision and surgical outcomes. This study aims to enhance the efficiency and accuracy of orthognathic surgery by incorporating cloud-based telemedicine and extended reality (XR) technology within the digital workflow.

【Methods】
A retrospective analysis was conducted on 69 patients (15 males, 54 females, average age 29 years 7 months) who underwent orthognathic surgery at Mirise Clinic Minamiaoyama（Tokyo,Japan） from January 2022 to June 2024. In this study, a comparative analysis and patient questionnaires were conducted to superimpose surgical planning using preoperative 3D simulation, CAD/CAM technology, and XR technology on actual surgical results.

【Results】
All patients were discharged within 24 hours post-surgery with no complications reported. The surgical duration ranged from 3 hours 18 minutes to 6 hours 18 minutes, with an average of 4 hours 1 minute. Patient surveys indicated that 31% returned to society within 4-6 days, 28.6% within over 14 days, 21.4% within 7-13 days, 14.3% within 2-3 days, and 4.8% the next day. Surgeries using these digital workflows were not only more accurate, but also resulted in higher overall patient satisfaction, with an average score of 8.9 out of 10.

【Discussion】
The integration of digital workflow and XR technology significantly improved surgical efficiency and accuracy. The use of 3D holographic models with XR technology was particularly beneficial for preoperative planning and intraoperative guidance, potentially reducing postoperative complications. Additionally, digital technology proved effective in providing psychological care for patients, enhancing their overall recovery experience.

【Conclusion】
The integrated digital workflow with cloud-based telemedicine and XR technology significantly enhances the planning and outcomes of orthognathic surgery, improving patient quality of life. Future research should focus on long-term data collection from a larger patient cohort to further validate these findings.

O-02

Key Facts about Clear Aligners Attachments and Movements Predictability

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Clear aligner attachments, which play a pivotal role in biomechanical control and predictability of tooth movements. In this presentation I will talk about attachments, focusing on their biomechanical principles, rules for selection and placement, and strategies to enhance predictability of treatment outcomes. In the format of, when to place attachments, which one to use for different movements, which one suite that type of movement, how to place, one or multiple attachments, attachments or pressure areas or both of them.

Biomechanics in clear aligner therapy are governed by the design and placement of attachments, which serve to apply precise forces to teeth. Understanding these biomechanics rules will help us to accurately select the proper attachment shape and the proper placement technique which will help us to achieve predictable tooth movements and so successful clear aligner treatments.

The predictability of clear aligner movements varies across different types of malocclusions and treatment complexities. This presentation will explore factors influencing predictability and discuss strategies to increase the reliability of treatment outcomes. Techniques such as digital treatment planning, proper staging techniques, overcorrection, optimized attachment protocols, and integrating auxillaries (buttons and elastics, miniscrews, power arms, minitubes) in to enhance predictability and achieving superior clinical results.

This knowledge empowers clinicians to optimize treatment planning, improve biomechanical outcomes, and elevate the predictability of clear aligner therapy, thereby advancing patient care and satisfaction in orthodontic practice.

O-03

A New Way for Orthodontic Treatment: Directly 3D-Printed Clear Aligners

Miyoung Sim
Chung-Ang University Kwangmyeong Hospital Dept. of Orthodontics

Since Invisalign was first commercialized in 1999, orthodontic treatment with clear aligners has been positioned as an alternative to treatment with brackets and wires. It has continued to challenge various and even so-called difficult cases, reporting successful results. And the number of clear aligner therapy suppliers has been increasing more and more. Invisalign-like clear aligners are made by 3D printing interim models and vacuum-forming or thermoforming 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 requiring many attachments, and so on.
Recently, with the invention of clear resin and the development of 3D printers and CAD software programs, attempts are being made to print clear aligners directly. The directly 3D-printed clear aligner does not need intermediate models, and the shape and thickness of the aligner can be adjusted depending on the shell parts by software. There are many advantages, such as saving time, cost, and workflow, relieving environmental problems, simplifying the devices, and increasing mechanical efficiency.
In this presentation, I would like to introduce directly 3D-printed modelless clear aligners, their properties, and the clinical cases treated with them.

O-04

Efficient orthodontic treatment for successful orthognathic surgery

Yoonji Kim
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Effective pre- and post-surgical orthodontic treatment is essential in achieving esthetic and stable outcomes from orthognathic surgery. In conventional surgical orthodontic treatment, pre-surgical orthodontic treatment generally takes relatively long, while post-surgical orthodontic treatment is usually straightforward, focusing on the refinement and retention of the orthodontic and surgical results. The concept of “surgery-first protocol” is not new, however, the re-emergence of this concept and general acceptance by both surgeons and orthodontists have resulted in increased options and flexibility in orthodontic treatment. The so-called “minimal presurgical orthodontic treatment” may be more appropriate term than the strict “surgery-first protocol” for describing contemporary orthodontic treatment combined with orthognathic surgery.
When surgery is performed earlier, it is crucial to 1) clearly set and efficiently execute the pre- and post-surgical orthodontic treatment goals due to limited time; 2) predict and prepare for the dynamic and somewhat different post-surgical occlusal changes according to the timing of the surgery should be understood and prepared in advance; and 3) coordinate all objectives and sequencing with maxillofacial surgeons to develop a comprehensive treatment plan and to gain sufficient understanding. In contemporary orthodontic sequencing for orthognathic surgery, the importance of appropriate orthodontic treatment increases. Therefore, I would like to present some insights on efficient pre- and post-operative orthodontic treatment with minimal pre-surgical orthodontic treatment.

O-05

Do Vertical Skeletal Patterns Matter in Treatment Planning? -An Update for The Holdaway Difference

HeKyong Kang
New York University Department of Orthodontics

Introduction: Holdaway proposed a 1:1 ratio of NB-L1: NB-Pog as an ideal relationship between mandibular incisors (L1) and bony chin for white populations. When the Holdaway ratio is not 1:1, the Holdaway difference (NB-L1 — NB-Pog) provides a quantitative judgment regarding the L1 position relative to chin projection for diagnosis and treatment planning. Steiner incorporated the Holdaway ratio into his chevrons to create customized solutions for each patient. The desired L1 position in the 2nd set of predictions in his chevrons is derived by estimated NB-Pog in 2 or 3 years of treatment using the 1:1 ratio of NB-L1: NB-Pog. However, many studies have found that the ratios were not close to 1:1 for the samples with pleasing faces. The presentation aims to show 1) treatment changes of the Holdaway difference based on treatment outcome assessment on 52 skeletal Class I and 53 skeletal II Caucasian adolescents with 3 different vertical skeletal patterns (6 subgroups) and 2) clinical application using updated Holdaway difference guidelines.

Discussion: The skeletal Class II group showed significantly higher Holdaway difference values than the skeletal Class I group. The Holdaway difference increased as the skeletal vertical dimension became more divergent. The findings imply that each subgroup needs an individualized Holdaway difference to improve diagnosis and treatment planning accuracy when using the Steiner analysis and chevron: 1mm, 2mm, and 3mm for skeletal Class I hypo-, normo- and hyperdivergent patients respectively, and 3mm, 5mm, and 7mm for skeletal Class II hypo-, normo- and hyperdivergent patients respectively.

Conclusion: Maintaining initial Holdaway differences for those with skeletal hypo- and normodivergent patterns is suggested to induce favorable soft tissue profile changes in adolescent patients. Reducing Holdaway difference is essential for improving facial convexity in skeletal hyperdivergent growing patients.

O-06

Adding Reliability to Lateral Cephalometric Radiographs

Ilgon KIM
Gajirun-e Orthodontic Clinic

Cephalometric radiographs are essential diagnostic tools for orthodontists, alongside dental models, panoramic radiographs, and facial and intraoral photographs. Since Dr. Broadbent developed the cephalometric radiography technique in 1931 and Dr. Downs introduced cephalometric analysis in 1948, various analytical methods have been proposed and continue to be crucial for evaluating pre- and post-orthodontic treatment and growth. However, there has been little mention of the conditions for capturing cephalometric radiographs since the concept of Natural Head Posture. For decades, the instructions have simply stated to fix the patient's head with "bilateral ear rods and a Nasion relator while gazing at a frontal mirror," without detailed guidelines or standards on head positioning.
Therefore, I propose the "Centric Head Posture" and emphasize the need for laser projection lines to achieve this posture accurately. Additionally, having practiced as an orthodontist for 20 years and using four different cephalometric radiographic devices, I have encountered challenges in superimposing radiographs taken under different conditions with each equipment change. Based on this experience, I have developed the "Ceph Verification Plate," a device designed to calculate magnification differences before and after equipment replacement. This presentation will introduce this tool and highlight the necessity of regular validation to monitor for radiographic distortions.

O-07

How to upright mandibular molars with different inclinations using no intermaxillary elastics approach?

Seong-Hun Kim
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Predictable control of the vertical dimension during orthodontic treatment is closely linked to long-term post-treatment stability. Successful strategy might include correcting the mesial angulation of mandibular posteriors, without extruding them, but many tactics showed the target molars' extrusion during the uprignthing phase. The use of intermaxillary elastic bands, especially Class III elastics, is sometimes considered to be harmful for TMD patients. To prevent from unpredicted reaction during molars uprighting, we developed "Biocreative reverse curve technique, BRC technique" and it has proved to be a successful method. In the BRC technique, a C-tube miniplate fixed to the lower labial symphysis and connected with a ready-made nickel-titanium reverse-curved archwire provided effective uprighting of the lower molars, without the need of orthodontic appliances on the mandibular anteriors. Overall treatment effects of the BRC technique could be summarized as lower occlusal plane reconstruction to facilitate counterclockwise mandibular rotation direction with intrusive uprighting of mandibular molars. In this presentation, I will introduce biocreative reverse curve technique to simplify complicated tipped molars treatment only by orthodontic treatment without orthognathic surgery or complex mechanics through updated scientific research and excellent case reports. Audience members will learn specific clinical tactics and overall treatment protocols that will broaden their scope of treatment options.

O-08

Anterior Torque Control: Are We Using the Optimal Force System?

Sungkwon Choi
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The inclination of maxillary and mandibular anterior teeth impacts not only smile aesthetics but also the shape of the lips, making appropriate control essential. In orthodontic treatment, failure to control the torque of anterior teeth is mainly due to inadequate crown labial torque. This inadequacy increases vertical overlap and creates bracket interference, delaying treatment.

The moment applied to control the inclination of anterior teeth is primarily generated by the torsion between rectangular archwires and edgewise bracket systems. When a twisted archwire is inserted into the bracket, it creates a couple between the two wings. Due to the short distance between these two forces, a very large force is required to generate the desired amount of moment. This large force can cause pain during wire insertion and may result in bracket breakage. Such strong forces contrast with the modern orthodontic philosophy that considers light continuous force to be ideal.

Furthermore, the moment generated between the archwire and the bracket does not couple with the traction force of the dentition, making it difficult to maintain a consistent M/F ratio. This inconsistency results in unnecessary jiggling during the treatment process.

This presentation proposes a new force system that reduces reliance on brackets for controlling the inclination of anterior teeth.

O-09

Customized Orthodontics, not Camouflage Treatment for Middle Aged Adults

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Edentulous sites, periodontal breakdown, prosthetics bridges or dental implant restorations and severe abrasion with loss of vertical dimension are common clinical conditions accompanied with malocclusion in middle-aged adults. With these complex situations, hopeless teeth or preexisting restorations can be extracted or removed instead of healthy premolars, and accordingly, asymmetric anchorage control and additional detailed managements to overcome the differences in tooth shape and size maybe necessary. Orthodontic treatment can also be a part of a multi-disciplinary or a full mouth rehabilitation protocol with additional application of adult dentofacial orthopedic protocols such as palatal expansion, clockwise and counterclockwise rotation of the mandible.
As an orthodontist, we do our best to “customize” our treatment protocol to overcome the compromised clinical situations and to provide the most functional as well as esthetic treatment outcome regardless of age. However, in reality adult comprehensive treatment is classified by definition, “camouflage” or “limited” treatment unless surgery is accompanied to improve the skeletal discrepancies. This seems like an unfair definition in the era of 3D tooth movement of all ages. This lecture will provide an overview of customize orthodontics for the middle-aged adults, which should not be defined as camouflage treatment. Clinical decisions to overcome the uneven/ asymmetric extraction scheme, clinical management to control 3-dimensional tooth movement and anchorage as well as to overcome the esthetic limitations will be shared with treatment outcome and long-term prognosis.

O-10

Importance of Occlusal Plane in Treating Skeletal Class II High Angle Adult Patient

Hoon Kim
Kim Hoon Orthodontics

Introduction

Although there are numerous methods of analysis for orthodontic treatment, Even the representative analysis that we are familiar with, such as the Down, Steiner, Harvold, Witts, and McNamara analysis, do not mention where it is best to place the occlusal plane in the skeletal structure. But Dr. Jack G. Dale has called the occlusal plane the workbench of orthodontics.

Discussion

When treating a non-growing patient with severe sagittal and vertical skeletal discrepancy who does not want surgery, it is essential to consider whether orthodontists can effectively solve the problem by obtaining the counterclockwise rotation of the mandible. One of the most critical factors in the treatment is the location of the occlusal plane within a given skeletal framework. This is not just a technical detail but a crucial element in achieving aesthetic and functional occlusion, which can significantly improve the quality of life for our patients. Past studies have reported that the occlusal plane is closely related to the orientation of the masticatory muscles. Hoon's arbitrary occlusal plane, established through trial and error, suggests the direction of the occlusal plane to be located when treating patients with sagittal and vertical skeletal discrepancies. Normalizing the occlusal plane in high-angle skeletal class II adult patients as an environmental factor may favor the adaptation and compensation of the mandible throughout life.

Conclusion

This presentation will report on Hoon's arbitrary occlusal plane and, through case studies, explain how it can be effectively implemented in diagnosis and treatment.

O-11

Management of Tooth Ankylosis Before, During and After Orthodontic Treatment

Seong-Min Bae
Bae's orthodontic clinic

Tooth ankylosis is a local etiologic factor of malocclusion that can have deleterious effects on normal dental development. Therefore, it is very important to diagnose the problem as early as possible so that interception can be performed at the correct time.
Tooth ankylosis is an eruption anomaly defined as the union of the tooth root to the alveolar bone, with local elimination of the periodontal ligament. This condition can result in replacement root resorption, in which the root is substituted by bone.
Its cause is not well defined, but it can be associated with dental trauma, metabolic disturbance,a genetic tendency, or a local deficiency in vertical bone growth.
In general, cases that should be differentially diagnosed with tooth ankylosis include primary failure of eruption, presence or absence of replacement resorption, cortical bone engagement of root, and unexplained tooth movement impediment. Treatment for tooth ankylosis includes surgical luxation followed by immediate orthodontic force loading, surgical repositioning, transplantation, extraction, and observation. Treatment for tooth ankylosis, which can be easily diagnosed clinically before orthodontic treatment, is relatively simple, but tooth ankylosis can occur during orthodontic treatment or even during the maintenance period. In this regard, I would like to share my clinical experience on diagnosis and treatment for each treatment period for tooth ankylosis.

O-12

Simple and Novel Appliance to Retract Deeply Impacted Maxillary Canine

Sang Su Han
Han's dental clinic

Maxillary canine is one of the most frequently impacted teeth after third molar. Tooth-size/arch-size discrepancy (lack of space) is a common etiologic factor of impacted canines and maxillary transverse deficiency is considered to be related with it. To retract the impacted canine successfully, we should make space for the canine and apply appropriate retracting force vector. I think miniscrew assisted-Haas type RPE and cervical pull headgear are good option for making space in mixed dentition, because these appliances can act well without interruption. After making space, surgical opening (full flap closure) and button bonding is done. If the position of impacted canine is severely distal or mesial compared with expected normal canine position, anteroposterior correction of the impacted canine should be preceded for preventing colliding among impacted canine crown and neighboring teeth root during vertical traction. Simple 0.7mm SS wire extension from RPE can attain this correction. After correcting anteroposterior position of impacted canine, guiding wire for canine retraction made by 0.7mm SS wire is attached to the RPE by flowable resin and vertical traction force generated by elastic thread is applied from RPE to the canine through guiding wire hole. Ligature wire extension from the impacted canine is passed through the primary canine root socket for mimicking natural tooth eruption during vertical traction procedure. Elastic thread was changed 4 weeks interval and ligature wire extension from impacted canine was shortened properly. About 9 months later, deeply impacted canine can be retracted successfully, without any side effect such as anchorage problem, occlusal plane canting and periodontal health problem. I will present typical 3 impacted maxillary canine cases treated by these concept and appliances and one impacted maxillary canine case treated by traditional method.

O-13

The Use of Microimplants/TADs in both Conventional and Digital Orthodontics for Challenging Malocclusion

Mihee Hong
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In the conventional orthodontic treatment protocols using fixed appliances, skeletal anchorage using microimplants/TADs has dealt with the limitations of patient compliance arising from intermaxillary elastics and extraoral headgear.

Digital orthodontics is digitally planned and guided on the computer in real time using CAD/CAM appliances. Recently, digital technology in the field of orthodontics has been developed through the fabrication of thermoplastic clear aligners using 3D-printed models and directly printed aligners using intraoral scanners, virtual orthodontics treatment planning, virtual set-up and simulation software of orthognathic surgery.

Clear aligners' esthetics and the ease of maintaining oral hygiene are increasing the demand by patients. However, these are removable appliances that need patient compliance and in fact, virtually planned movements would not have been fully implemented. Although patient selection for clear aligners is mentioned as a solution, clinicians pursue outcomes as high as the conventional approaches have achieved. More than ever, orthodontic treatment with newer advanced protocols still requires the help of microimplant/TADs anchorage.

A new role for microimplants/TADs for efficient and effective orthodontic treatment outcomes is essential for the thrilling, high-tech approach. Therefore, challenging conventional and clear aligner orthodontic cases including micro-implant anchorages/TADs have been prepared for presenting various types of tooth movements in challenging malocclusion.

O-14

Total Arch Intrusion in Adolescent Patients

MIN-HO JUNG
HONORS Orthodontics

Every orthodontist now knows that anterior open bite can be effectively treated by the posterior teeth intrusion using skeletal anchorage such as orthodontic mini-implants. Anterior open bite, which was difficult to treat without the patient's active cooperation, can now be treated even if the patient's cooperation is not good, and it is also possible to improve the long face caused by vertical overgrowth, which is often found in patients with anterior open bite.
The intrusion of the posterior teeth rotates the mandibular plane counterclockwise, reducing the anterior facial height and simultaneously moving the chin tip forward, which can have the effect of improving a class II skeletal relationship, so patients with long anterior facial height and anterior open bites with a class II skeletal pattern It can be said to be an excellent treatment that can improve several problems at once.
Patients with normal overbite but long anterior facial height and class II skeleton are also often seen. If vertical overbite is normal, intrusion of posterior teeth increases vertical overbite, making it difficult to use posterior intrusion to improve facial appearance. Recently, total arch intrusion(TAI) treatment, which can improve facial appearance regardless of the amount of overbite by the simultaneous intrusion of anterior and posterior teeth, has been introduced in various literature. I want to introduce a case in which an adolescent was treated through TAI and show how the TAI treatment of adolescents differs from that of adults and what the pros and cons are.

O-16

Recovery Bone Formation on Radiographic Bone Dehiscence after Tooth Retraction with Microimplants

Ho-Jin Kim
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Introduction:
The skeletal anchorage has extended the envelope of discrepancy in orthodontic treatment by broadening the possible amounts of tooth movement. Because of this increased tooth movement, the consideration of anatomical limits began to be revisited recently using cone-beam computed tomography (CBCT). In addition, the considerable tooth movement over the anatomical limits can raise clinicians' concerns about complications such as gingival recession, bone dehiscence, or root resorption. Therefore, this presentation will discuss the anatomical limits for tooth movements using CBCT, the dentoalveolar changes after substantial tooth movement through the limiting structures, and their long-term retention.

Discussion:
With the advent of the microimplants, as the possible extent of tooth movement has been crucially increased, clinicians now need to consider the related anatomical limitations further. Recently, the anatomical limit can be accurately investigated using CBCT, and the limiting structures would be the anterior palatal/lingual alveolar cortical plate, posterior wall of the maxillary tuberosity, or posterior lingual cortical plate of the mandibular body. In our current series of CBCT research, the palatal or lingual bone was significantly thinned and the root protruding through the cortex was observed along with radiographic bone dehiscence after maxillary incisor retraction (by 8.0 mm) or mandibular molar distalization (by 2.8 mm) with microimplants. Further, the bone loss significantly recovered with newly formed thin bone loss during the retention period (51.28 ± 21.64 months). Continuous tooth movement with physiologic force and cautious observation of surrounding tissues during treatment might be critical to obtaining favorable bone recovery and minimizing adverse effects.

Conclusions:
Considerable tooth movement using microimplants can significantly decrease palatal/lingual alveolar bone thickness and height and lead to radiographic bone dehiscence. These were favorably recovered with newly formed bone during retention.

P-001

Transverse Cranial Base Dimensions in Various Craniofacial Skeletal Relationships: A Cone-beam Computed Tomography Study.

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Purpose : Most cephalometric studies focused on the length and angle in the anteroposterior direction to compare the cranial base's size. However, investigating the transverse dimensions of the anterior, middle, and posterior cranial base is challenging. This study aimed to investigate the transverse dimensions of the cranial base in different craniofacial skeletal patterns and sexes using cone-beam computed tomography (CBCT).

Materials and methods : A total of 210 adults (105 males and 105 females), including three different skeletal relationships, were included in the study. The cranial base dimensions were measured on a three-dimensional image structure rendered by CBCT. Statistical methods included the Kappa statistic for analysis of consistency and reproducibility and the independent t-test for differences in cranial base dimensions between sexes. A general linear model (GLM) was used to compare the transverse size of the cranial base among skeletal Class I, II, and III groups. The Pearson correlation coefficient explored the correlation among the cranial base dimensions.

Results : The cranial base dimensions did not differ significantly between skeletal Class I, II, and III. The more prominent cranial base size was found in males than females, except for the crista galli length (CGL) and cribriform ethmoid plate width (CEPW). The cranial base dimensions did not differ significantly between different skeletal relationships. Most dimensions have significant correlations in the middle and the posterior cranial base.

Conclusions : The cranial base's transverse dimensions in Taiwanese adults show no significant differences between craniofacial skeletal relationships. In the middle and posterior cranial base, transverse measurements revealed significant sexual dimorphism.

P-002

Application of 3D Tooth Model for Assessment of Inter-radicular Space for Implant Fixture Positioning

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Objectives : Although a cone-beam computed tomography (CBCT) is preferred for its accuracy, high radiation dose has raised concerns. The purposes of this study were to evaluate the accuracy of the inter-radicular distance and inter-root angulation obtained from three-dimensional (3D) virtual tooth models composed of the intraoral-scanned crown and CBCT-scanned root, and to suggest the application of 3D virtual tooth model for monitoring edentulous space for implant installation during orthodontic treatment.
Material and Methods : Patients who were planning for implant installation during or after the orthodontic treatment and who have intraoral scans and CBCT scans at pretreatment and posttreatment stage were selected. 3D virtual tooth models of 12 cases were fabricated by merging intraoral-scanned crown and its corresponding CBCT-scanned root obtained at pretreatment stage. Tooth position at the posttreatment stage was estimated by integrating 3D virtual tooth models into posttreatment intraoral scans. Actual tooth position was obtained by posttreatment CBCT scans. The discrepancies of the estimated and actual tooth position including inter-radicular distances and inter-root angulation were compared.
Results : Average inter-radicular distance difference of estimated and actual tooth position was 0.14 mm. For inter-root angulation, mean difference was 0.17°. When comparing distance measurements at each landmark with different levels, all measurements except measurement at buccolingual midpoint of cementoenamel junction were not significantly different. Minimum inter-radicular distance between two adjacent teeth proved not significantly different between estimated and actual tooth position.
Conclusion : Estimated tooth position and angulation by 3D virtual tooth model showed clinically acceptable accuracy compared to actual tooth position measured with CBCT-scanned data. Application of the 3D virtual tooth model can potentially allow clinician to accurately assess edentulous space planned for dental implant installation without additional radiation exposure to the patient.

P-003

Effect of Different Head Positions on 3D Facial Images

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Objectives : With recent advancements in digital technology, the development of three-dimensional (3D) imaging techniques has greatly progressed. 3D facial scanners are now being utilized in the esthetic analysis of the face, offering benefits such as the reproduction of facial color and texture. However, connective tissue, unlike hard tissue, varies depending on the patient's position. The purpose of this study was to determine whether head posture affects 3D facial images.
Material and Methods : This study evaluated 3D facial images of 10 mannequins, which are taken from standard postures, left and right rotations, and up and down rotations. Frontal image of each mannequin was obtained by positioning the line connecting the mannequin's left and right pupils parallel to the floor. Then, facial images were taken with variations in head rotation; the head of the mannequin was rotated to the left, right, up, and down directions. The images with changed head posture were superimposed onto the standard head posture image, and the difference between the two images was used to evaluate deformations in images with the changed head postures.
Results : Analyzing the overall average of differences in 3D facial images, there were statistically significant differences in the same direction when rotated 5 degrees to the left or right. However, for the two head positions rotated up and down, there were no statistically significant differences.
Conclusion : This study showed that 3D facial images can deform based on head position, with different areas affected depending on the position. Therefore, it is essential to consider head position during image acquisition in clinical settings.

P-004

Anterior Space Closure with Total Protraction in a Patient with Traumatic Anterior Incisor Loss

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Introduction : Teeth with a history of trauma may be considered for orthodontic treatment with extraction due to the potential for adhesions or root resorption. In particular, when a traumatized maxillary central incisor is extracted, it can be replaced by a lateral incisor or a canine, and there are a number of considerations that need to be taken into account. In this case series, we present a case of anterior space closure in patients with traumatic loss of maxillary central incisors and lateral incisors.

Case Summary : A 21-year-old male patient presented for orthodontic treatment after losing #11,12,21 in a car accident 11 years ago. He was diagnosed with a skeletal Class I malocclusion, which was unaesthetic due to the predominant exposure of the mandibular anterior teeth when smiling, and a deep curve of Spee was observed due to the mandibular anterior teeth eruption caused by the loss of the maxillary anterior teeth. Treatment consisted of moving the posterior teeth, including #13, to the #12 area to create a full Class II relationship on the right side and place #11,21 implants. Class III elastics were used continuously as the patient did not wish to have screws placed for anchorage. To resolve the deep curve of Spee in the mandible, interproximal reproximations of anterior teeth and reverse curved archwire were performed. After 9 months of retention, a stable occlusal relationship, adequate horizontal and vertical occlusion, and good maintenance were noted.

Conclusion : This is a case of a patient with traumatic loss of the anterior maxilla, who successfully achieved functional and aesthetic recovery with space closure and implant prosthesis by anterior migration of the entire posterior row of teeth.

P-005

A Case of Skeletal Maxillary Protrusion with Mandibular Enostosis

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Introduction : Orthodontically, the presence of enostosis between the roots of teeth has been reported to interfere with tooth movement. In this study, we report a case of skeletal maxillary protrusion with enostosis between the second premolar and first molar on the right side of the mandible, in which good results were obtained by using orthodontic anchoring screws (OAS) and treatment mechanics.

Summary : The patient was a female, aged 23 years. Her molar relationship was Class II on both sides, and she had an ANB +7.2°, L-1 to NB 8.0 mm, and overjet +10 mm. Dental cone-beam computed tomography revealed enostosis between the mandibular right second premolar and first molar. Based on the above, we diagnosed this case as a skeletal maxillary protrusion with enostosis in the mandible. The treatment plan was to extract the maxillary left and right lateral first premolars, and then use an edgewise appliance with mid-palatal OAS in the molar region. We chose however not to perform extraction in the mandible, anticipating difficulty in mesial movement of the mandibular molars due to the presence of enostosis. The treatment results showed that distal movement of the mandibular molars using Class III elastics allowed maintenance of L-1 to NB 8.0 mm. The maxillary central incisor moved 8.0 mm lingually, and the overjet improved to 2.0 mm. In addition, as an effect of OAS, the mesial movement of the maxillary molars, which is a reaction to the Class III elastics, was prevented. Furthermore, intrusion of the maxillary molars was achieved, the mandible did not rotate clockwise.

Conclusions : In cases where enostosis is present between the roots, the direction of tooth movement may be restricted and treatment goals may be compromised. In this case, good results were obtained by using OAS while taking into consideration treatment mechanics.

P-006

Non-surgical Orthodontic Treatment Involving Maxillary Anterior Intrusion for Gummy Smile: Associated Periodontal Tissue Changes

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Introduction : The recent introduction of temporary anchorage devices (TADs) has enabled improvement of skeletal gummy smiles with non-surgical orthodontic treatment. Maxillary anterior intrusion is associated with risk of root resorption, which is one of the disadvantages of orthodontic treatment for gummy smiles. This case report describes new points to consider and methods for improving gummy smiles with non-surgical orthodontic treatment.
Summary : An 18-year-old woman presented with chief complaints of protruding anterior teeth and visible gums. Examination revealed marked labial tilt of the maxillary anterior teeth and maxillary prognathism with a severe gummy smile. The patient underwent non-surgical orthodontic treatment using TADs and a modified palatal bar. This treatment resulted in improvement of the gummy smile comparable to that achievable with surgical orthodontic treatment. However, periodontal tissue remodeling could not keep up with the pronounced intrusion of the maxillary anterior teeth, necessitating gingivectomy on the labial side of the maxillary anterior teeth and surgical crown lengthening with osteoplasty on the palatal side after the completion of maxillary anterior intrusion. At 25 months after the end of treatment, no relapse of gummy smile was observed and the maxillary anterior palatal gingiva and alveolar bone remained stable.
Conclusions : In addition to the well-known risk of root resorption associated with maxillary anterior intrusion, the need for periodontal surgery when gingival and alveolar bone remodeling does not keep up with the maxillary anterior intrusion was identified as a new point to be considered. In the event of reduced crown length, determining the appropriate periodontal surgical treatment approach based on the findings of periodontal tissue examination and dental cone-beam CT imaging can lead to restoration of the biologic width and stable periodontal tissue after the completion of dynamic treatment.

P-008

A Case of Angle's Class II Division 1 Malocclusion Treated by Maxillary First Premolars Extraction

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Introduction : Angle's Class II division 1 malocclusion is usually associated with class II skeletal base, proclination of maxillary incisors, and an increased overjet with a convex profile. For non-growing patient, the treatment intervention may involve fixed appliances with non-extractions assisted by TADs or tooth extractions, such as four premolars extraction or two maxillary premolars extraction. The extraction of only 2 maxillary premolars is generally indicated when there is no crowding or cephalometric discrepancy in the mandibular arch. This clinical report presents an adult with Class II division 1 malocclusion, treated by maxillary first premolars extraction and TADs.

Summary : This 30-year-old female patient sought treatment of lower lip biting. Clinical examinations revealed a Class II molar relation, proclined incisors with an overjet of 6mm. The profile of the patient was convex with mild mentalis muscle strain. The patient underwent orthodontic treatment with fixed appliance. Whole arch distalization assisted by TADs was taken as the first treatment alternative. However, due to the anatomic limitation of maxillary tuberosity, the large overjet could not be corrected effectively. Maxillary first premolars were then decided to extract to obtain additional space. After 44 months of treatment, proclined incisors and large overjet were corrected. Ideal occlusion and harmonious facial profile were both achieved.

Conclusions : Angle's Class II division 1 malocclusion is usually characterized by proclined anterior teeth with large overjet. It could be corrected by distal movement of upper molars assisted with TADs or 2 to 4 premolars extraction. Four to six mm of distal movement is quite possible, but may be limited by anatomic structure, such as the width and length of the tuberosity. In this case, bilateral maxillary first premolars were extracted for overjet correction and ideal outcome was achieved.

P-009

Long-term Report on Periodontal Orthodontic Treatment in a Patient with Moderate Periodontitis

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Introduction : Malocclusion reduces occlusal function and worsens periodontitis. Moderate to severe periodontitis leads to tooth loss and alveolar bone resorption, further affecting occlusal function and aesthetics. Inadequate inflammation control during orthodontic treatment can cause acute attacks and bone resorption. Effective treatment requires bridging the gap between healthcare providers and patients to plan future-oriented treatments together. This study presents a 10-year follow-up case based on detailed periodontal examination before orthodontic treatment.
Summary : A 35-year-old male presented in June 2010 with complaints of jaw crowding and pain in teeth 26 and 27. Initial findings included significant calculus, gingival swelling, probing depths of 5mm to 8mm, and suppuration from wisdom teeth. The diagnosis was Angle class II, skeletal class III crowding, and generalized chronic periodontitis stage IIIA.

The treatment plan involved initial periodontal treatment, extractions, placement of a multi-bracket appliance, orthodontic treatment with implant anchors, final prosthetic treatment, supportive periodontal therapy (SPT), and maintenance. Plaque control improved, gingival stabilization took 2 months, and extensive subgingival calculus required multiple scaling sessions. After 6 months, probing depth improved to 2mm to 3mm, and bleeding rates decreased to below 10%. Non-viable teeth were extracted, followed by implant anchors and multi-bracket appliance placement. The active treatment period was 2 years and 10 months. After 10 years and 6 months of retention, no relapse was observed, maintaining stable periodontal tissues and occlusion.
Conclusions : In a patient with generalized chronic periodontitis and probing depths of 5mm to 8mm, thorough periodontal treatment and patient cooperation in plaque control reduced pockets and halted bone resorption. Main complaints of crowding and pain were resolved. Non-surgical treatment maintained stable epithelial attachment, avoiding bone resorption or acute symptoms. Periodontal stability for 10 years was achieved through effective communication, shared goals, and continuous self-care and professional care.

P-010

A Case of Periodontal Disease Improved by Orthodontic Treatment

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Introduction : The close association between malocclusion and periodontal disease has been reported in numerous reports, and some reports suggest that orthodontic treatment is effective in the prevention and treatment of periodontal disease.There are also scattered reports that incorporation of orthodontic treatment into periodontal therapy may lead to progressive periodontal tissue destruction, but is not contraindicated if inflammation is well controlled. In our clinic, we provide basic periodontal treatment to patients with periodontal disease who have malocclusion before orthodontic treatment begins, and then continue with basic periodontal treatment after orthodontic treatment begins. In this study, we report on the evaluation of changes in periodontal disease before and after orthodontic treatment.
Summary : Female, age 26 years and 4 months at the time of initial examination. She presented to our clinic with complaints of plexus and pain around ⌜8 Angle class II div. 1 overbite plexus case, 7⊥7 and ⌜7 with 4 mm moderate periodontitis, 7⌝ with 6 mm severe periodontitis, PCR100 %, BOP 79%, PPD ≥4mm in 20% of the sites, and gingival erythema and swelling in all jaws. Basic periodontal treatment (oral cleaning instruction, SRP, and PMTC) was performed first. After about 1 year and 4 months (27 years and 8 months) of basic periodontal treatment, PCR of 21%, BOP of 9% or less, and PPD of 4 mm or more disappeared, gingival redness and swelling disappeared, and improvement of periodontal pockets was observed. However, BOP was observed in the mandibular plexus area, and there was no significant improvement. Since the patient's motivation and skill in plaque control improved, orthodontic treatment was initiated.
Conclusions : In patients with periodontal disease, it is very effective to perform orthodontic treatment after prior periodontal treatment. In addition, the improvement in cleanability due to the elimination of plexus led to increased patient motivation and awareness of oral health. This change is thought to have led to the preservation of teeth with a high possibility of periodontal tissue destruction in the future, and better function and esthetics were achieved.

P-011

Surgically and Miniscrew-assisted Rapid Palatal Expansion in Adult Patient with Transverse Discrepancy

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Introduction : As age increases, the midpalatal suture becomes more tightly fused, and structural resistance in the surrounding maxillofacial area increases, making skeletal expansion of the maxilla more challenging in adult patients. Failure in achieving skeletal expansion can result in complications such as buccal root resorption, alveolar bone dehiscence, pain, and relapse. Therefore, surgically assisted rapid palatal expansion (SARPE) is often necessary. Recently, miniscrew-assisted rapid palatal expansion (MARPE) has been used to expand the maxilla in adults. This case presents the combined use of SARPE and MARPE for achieving orthopedic effects in an adult patient.

Case Summary : A 27-year-old male patient presented with dental crowding and mandibular protrusion. Clinical examination revealed bilateral posterior crossbite and a V-shaped narrow maxillary arch. He was diagnosed with skeletal Class I malocclusion with a crowding of the maxillary dentition, posterior crossbite, and protrusive chin. Maxillary expansion using SARPE or MARPE was necessary to create space for alignment and correct the posterior crossbite. For facial improvement, genioplasty and anguloplasty was recommended over orthognathic surgery. Osteotomy of the midpalatal suture and zygomatic buttresses was performed concurrently during genioplasty and anguloplasty with the patient's consent. MARPE was also employed to enhance the skeletal effect.

The expansion procedure was conducted twice daily for two weeks, followed by orthodontic treatment with fixed orthodontic appliances without extractions. The total treatment duration was 16 months, resulting in improved dental alignment and occlusion. CBCT evaluation showed 4.0 mm (67%) expansion at the alveolar bone level and 1.8 mm (30%) at the basal bone level, with no periodontal complications.

Conclusion : In this case, favorable expansion of the dental arch was achieved, correcting transverse discrepancies and minimizing adverse effects. However, despite using both SARPE and MARPE, significant skeletal expansion was not observed, reaffirming the challenges of rapid palatal expansion in adult patients.

P-012

Non-surgical Treatment of a Class II Malocclusion with Facial Asymmetry

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Introduction : Facial asymmetry results from a combination of skeletal, functional, and soft tissue discrepancies. A precise diagnosis of the underlying etiology is crucial for a favorable prognosis in orthodontic treatment. Despite its significance, the functional factor is often overlooked during the initial assessment. This case illustrates the relief of facial asymmetry through the correction of CR-CO discrepancy in a patient with skeletal Class II malocclusion and a displaced condyle position.

Case Summary : A 19-year-old female was referred from OMFS after a year of stabilization splint treatment. She presented skeletal Class II, hyperdivergent profile with a 10mm Menton deviation and lip protrusion. Additionally, she exhibited an anterior openbite, a missing #26, and a fully erupted #28. Interference from #28 caused a functional shift to the right, and the anteriorly displaced position of the left condyle on CBCT coincided with the direction of the CR-CO discrepancy.

To correct her anterior openbite and improve her hyperdivergent profile, maxillary molars were intruded using TADs, resulting in mandibular autorotation. Subsequently, both arches were distalized to improve the protrusion and overall occlusion. Special attention was given to the control of tooth #28 to alleviate the CR-CO discrepancy. This approach achieved stable occlusion and an improved facial profile, along with a slight relief of asymmetry and a more stable condyle position.

Conclusion : Meticulous identification of the CR-CO discrepancy and condyle displacement at diagnosis led to a successful nonsurgical treatment outcome in a patient with skeletal Class II malocclusion and facial asymmetry.

P-013

Orthodontic Retreatment With Severe Bone Resorption; Combination Of Anterior Teeth Extraction, Autotransplantation and periodontal regeneration

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Introduction : Adult orthodontic retreatment can pose challenges, often necessitating additional interventions such as tooth extraction. In the present case report, the decision of extraction of 3 maxillary anterior teeth was made in response to teeth of mobility and accompanying severe alveolar bone loss. The treatment approach employed combination of premolar autotransplantation and periodontal bone regeneration, which prevented possible tooth substitution with implant or prostheses.
Summary : A 37-year-old female patient with a history of four years of orthodontic treatment, which included the traction of impacted bilateral maxillary canines during adolescence. She presented to our clinic with crowding and tooth mobility of maxillary bilateral lateral incisors and left canine by Grade II Millers classification. Cone-beam computed tomography (CBCT) revealed substantial bone resorption. The treatment plan comprised the extraction of the maxillary bilateral lateral incisors and left canine, bilateral mandibular first premolars. Additionally, transplantation of the mandibular left first premolar to mesial aspect of maxillary left lateral incisor with concurrently periodontal regeneration therapy by using platelet-rich plasma (PRP) and Emdogain. Total treatment time of 3 years and 7 months, all extractions sites have been closed without any major root resorptions while achieving good parallelism of the adjacent teeth. After 4 years of retention, a stable occlusion remained stable without root resorption and mobility.
Conclusions : This case underscores the periodontal ligament and alveolar bone to be a functional unit to robust bone remodeling in alveolar bone loss. With correct diagnosis, careful force system and appliance management, enhancement and preservation of alveolar bone level could be achieved. Furthermore, integrating periodontal regeneration to tooth autotransplantation is a valid approach, especially in bone deficient area.

P-014

Multidisciplinary Approach Involving Orthodontic Treatment for Older Adults

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Introduction : With an increase in life expectancy and awareness of dental health and orthodontic treatment among adults in their forties, older adults, and seniors, there is increased demand for esthetic and more satisfactory outcomes after comprehensive dental treatment. The chief complaints why older adults decided confidently the orthodontic treatment in this report were multiple interdental spaces including large black triangles, malalignment and traumatic functional occlusion of anterior teeth. This case report presents how orthodontists could diagnose and slove the problem lists with multidisciplinary comprehensive dental treatment involving orthodontic treatment for older adults.

Case Summary : First of all, before bracketing periodontal curettage with antibiotic therapy were preceded in divided 6 sections of all dentition under local infiltrated anesthesia. After that, periodontal health was also carefully monitored during the whole orthodontic treatment with repeted scaling and root planning without anesthesia. In general, light and continuous orthodontic forces cautiously were applied and we used miniscrews as bone anchorage and long hooks for bodily movement of teeth. Anatomically improper size, shape, and severe attrition of clinical crown were treated through esthetic grinding and tooth reshaping as gradual orthodontically extrusion, gingival plasty, and correcting stable crown/root ratio. Endodontic root canal treatment for incisors with periapical abscess or cyst was combined during early orthodontic treatment but final prosthetic restorations were completed in the latest orthodontic stage before debonding, which intervened bracketing on provisional direct resin crown.
Large black triangles reduced by interproximal reduction and power chain closing.
Occlusal stabilization were acquired through fuctional occlusal rebabilitation obtaining balanced right and left molar occlusion using bite block adjusting, ideal anterior overjet and overbite, canine- and anterior guidance with relieving temporomandibular disorder symptoms.

Conclusion : For older adults, it is needed multidisciplinary comprehensive dental treatment involving orthodontic treatment which showed the satisfactory dentofacial esthetic advancement and functional rehabilitation with stable occlusion.

P-015

Orthodontic Uprighting of a Mesially Impacted Mandibular Third Molar

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Introduction : Impacted molars are associated with sequelae such as dental caries, periodontal disease, dentigerous cyst formation and potential root resorption of adjacent teeth. Some considerations during the planning for orthodontically uprighting an impacted molar include the severity of the impaction as well as the need for auxiliaries or temporary skeletal anchorage devices to aid effective mechanics. Other treatment options such as surgical uprighting or excision of the impacted tooth with subsequent prosthodontic replacement are also available. The final treatment decision for the management of impacted molars therefore needs to be carefully weighed to achieve optimal and functional results.
Summary : This case reports describes the treatment of a 17-year-old male with a class II division 1 malocclusion, on a skeletal I base with mild maxillary and moderate mandibular crowding and mesial impaction of the lower left second and third molar. Due to root resorption of the distal root for the lower left first molar, the decision to excise the lower left second molar was made. Treatment was carried out with fixed appliances, auxiliary springs and a lingual arch to upright and align the lower left third molar, and substitute it in the position of the second molar.
Conclusions : With fixed appliances and auxiliaries, impacted molars can be effectively treated without the use of temporary skeletal anchorage devices, achieving a functional occlusion.

P-016

The Differences in Mandibular Plane Angle (FMA) Change Between Mandibular First and Second Premolars Extraction

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Objectives : This study aims to identify how the changes in facial vertical pattern and its related factors vary depending on the mandibular premolar extraction pattern.
Material and Methods : This study used lateral cephalometric radiographs of the 60 adult patients who visited the Department of Orthodontics, Kyungpook National University Dental Hospital from 2011 to 2020. The patients were divided into two groups. Group 1 consisted of 30 cases with maxillary and mandibular first premolar extractions, and Group 2 consisted of 30 cases with maxillary first and mandibular second premolar extractions. All pretreatment (T1) and posttreatment (T2) cephalograms were traced and measured by 1 examiner (J.S.L.).
Results : In both the mandibular first premolar extraction group (Group 1) and the second premolar extraction group (Group 2), SNA and ANB decreased. Significant changes were shown in the linear measurements of all teeth except the maxillary first molar. When comparing Group 1 and Group 2, Group 2 showed a larger amount of lower mandibular protraction and a smaller amount of lower incisor retraction with statistical significance. In terms of changes in the facial vertical dimension (FMA, AFH, LAFH), Group 1 showed no significant change while Group 2 showed a significant decrease.
Conclusion : 1. Group 2 showed a smaller amount of mandibular incisor retraction (ΔLC-L1) and a greater amount of anchorage loss (ΔLC-L6).
2. The vertical distances of maxillary and mandibular teeth from each reference plane were significantly decreased in Group 2.
3. The decrease in vertical height of the whole dentition and protraction of mandibular molars in Group 2 led to the counter-clockwise rotation of the mandible, resulting in a significant decrease in the facial vertical dimension (FMA, LFH).
4. The multiple linear regression analysis illustrated that the change of vertical position of maxillary, mandibular first molar (ΔPP-U6, ΔMP-L6), and mandibular anchorage loss (ΔLC-L6) were significantly correlated with the FMA change.

P-017

Treatment Outcome Comparison of Invisalign vs Fixed Appliance Treatment in First Premolar Extraction Patients

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Objectives : This study aimed to compare dentition changes following treatment with Invisalign versus conventional orthodontic treatment involving extraction of four first premolars.
Material and Methods : We conducted a retrospective study comprising 57 patients who required extraction of four first premolars due to bialveolar protrusion. Among these, 27 patients underwent treatment using Invisalign (mean age, 25.5 ± 5.2 years) and 30 patients were treated with conventional fixed appliances. Changes in angular and linear positions of maxillary and mandibular central incisors, second premolars, first molars, and second molars were assessed using lateral cephalograms taken before and after treatment. Angular changes in canines and second premolars were evaluated using panoramic radiographs.
Results : Significant increases in overbite and interincisal angle were observed in the Invisalign group compared to the conventional fixed appliance group. In the Invisalign group, maxillary central incisors exhibited greater lingual tipping, whereas no significant difference was found in the angular changes of mandibular incisors between groups. Maxillary first and second molars showed mesial tipping in the Invisalign group, and there was mesial movement observed in maxillary second premolars, first and second molars, as well as mandibular second molars.
Conclusion : After maximum retraction of anterior teeth, the Invisalign group demonstrated statistically significant trends including greater lingual tipping of maxillary central incisors, distal tipping of maxillary canines, and mesial tipping of maxillary first and second molars compared to the fixed appliance group.

P-018

Three-dimensional Analysis of Buccally Unilateral Maxillary Impacted Canines

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Objectives : The aim was to conduct a three-dimensional comparison of impacted canines with their contralateral normal counterparts in patients exhibiting unilateral buccal impaction of the maxillary canine, utilizing the palatal plane as the benchmark reference.
Material and Methods : Computed tomography scans from a cohort of 31 patients diagnosed with unilateral buccal impaction of the maxillary canine were analyzed. The impacted canine was examined against the contralateral normal canine, focusing on the variables of rotation, torque, angulation, root length, and root volume. The disparities in these parameters between the left and right canines and their association with patient age were evaluated.
Results : Notable differences were observed in rotation, angulation, torque, root length, and root volume when comparing the impacted canine to its contralateral normal counterpart. Furthermore, a significant positive correlation was identified between the age of the patients and the root length discrepancy of the impacted and contralateral normal canines.
Conclusion : The palatal plane proves to be a viable skeletal reference for predicting the impaction of maxillary canines, with rotation, angulation, and torque serving as reliable indicators. The study further elucidates that the unilateral buccally impacted maxillary canine is characterized by a discernibly shorter root length and diminished root volume in comparison to the contralateral normal canine.

P-019

Cone-beam Computed Tomography Analysis of the Association Between Tongue And Transverse Skeletal And Dentoalveolar Dimensions

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Objectives : The purpose of this study was to evaluate effects of tongue posture and volume to transverse skeletal and dentoalveolar dimensions in adult patients with various types of malocclusion.
Material and Methods : Forty eight malocclusion patients who have undergone come beam computed tomography for orthodontic diagnosis at Korea University Anam Hospital from March 2016 to February 2017 were included for this study. Tongue posture, tongue volume, maxillary width, palatal cross sectional area, mandibular bone width, transverse width and inclination of maxillary and mandibular teeth was measured.
Multivariate linear regression analysis was performed to evaluate associations of tongue posture and volume with transverse skeletal and dento-alveolar dimensions.
Results : The increase in volume of the tongue and the increase in the cross-sectional area of the palatal vault were significantly related. The high posture of mid-anterior position of tongue and low posture of mid-posterior position of tongue, and the volume reduction of the tongue were significantly related to the buccal inclinations of the maxillary first molars. Greater tongue volume was significantly correlated with increased intergonial width. The lower posture of the anterior position of tongue was significantly related to the lingual inclination of the mandibular molar.
Conclusion : 1. The increase in volume of the tongue and the increase in the cross-sectional area of the maxillary molar region are significantly related.
2. The high posture of mid-anterior position of tongue and low posture of mid-posterior position of tongue, and the volume reduction of the tongue are significantly related to the labial inclinations of the maxillary first molars.
3. The increase in tongue volume and the increase in intergonial width are significantly related.
4. The lower posture of the anterior position of tongue is significantly related to the lingual inclination of the mandibular molar.

P-020

Evaluation of Postoperative Soft Tissue Changes in Mandibular Prognathism with Different Vertical Facial Pattern

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Doctor

Purpose : This study aims to evaluate the postoperative changes in soft tissue chin thickness among mandibular prognathism patients, focusing on those presenting different divergence patterns, such as hyperdivergent and normodivergent patients.
Materials and methods : Cone-beam computed tomography images were selected from 56 skeletal Class III patients who underwent only mandibular setback. Based on the vertical skeletal relationship, patients were divided into the normodivergent group (27°<SN-MP37°) group. The three-dimensional displacements of Infradentale (Id), B point (B), and Pogonion (Pog), the soft tissue thickness of Id-Li (Labrale inferius), B-B' (soft tissue B point), and Pog-Pog' (soft tissue Pog point) were measured. Factors influencing the change in soft tissue thickness were investigated.
Results : Preoperative B-B' and Pog-Pog' thickness were significantly thinner in the hyperdivergent group (10.53 mm and 9.17 mm) than normodivergent group (12.20 mm and 10.76 mm). Postoperative changes in B-B' and Pog-Pog' thickness were significantly larger in the hyperdivergent group (1.75 mm and 1.79 mm) than the normodivergent group (0.46 mm and 0.43 mm). A significant correlation was found between soft tissue thickness change (B-B' and Pog-Pog') and the preoperative soft tissue thickness and superior movement (B and Pog).
Conclusions : Hyperdivergent patients with skeletal class III have thinner preoperative soft tissue thickness (B-B' and Pog-Pog') than normodivergent patients in the preoperation. Postoperative changes in B-B' and Pog-Pog' thickness were significantly larger in the hyperdivergent group than normodivergent group. Postoperative superior movement of B and Pog correlated with postoperative change of soft tissue thickness.

P-021

The Treatment of Multiple Supernumerary and Impacted Teeth in a Non-syndromic Patient

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Introduction : Introduction: Supernumerary teeth may be defined as any teeth or tooth substances in excess of the usual configuration of 20 deciduous and 32 permanent teeth. And an impacted tooth refers to a permanent tooth whose root is developed in excess of its expected length and whose spontaneous eruption is not expected in a reasonable time. The occurrence of multiple supernumerary and impacted teeth without any associated systemic conditions or syndromes, however, is rare. The aim of this report is to explain proper approaches to treat multiple supernumerary and impacted teeth in a non-syndromic patient.
Case Summary : Case Summary: I report the case of a 14-years-old woman who had 14 supernumerary teeth and 12 impacted teeth without any syndromic disease. Treatment was decided to be divided into removal of supernumerary teeth and traction of impacted teeth(first-stage treatment), and then total alignment (second-stage treatment). Total of 17 teeth, including 14 supernumerary teeth, #25 (lack of traction space), #38 and 48, were removed by oral surgeon. At the same time, hooks for traction were attached to 9 impacted teeth. For traction anchorage, 4 orthodontic miniscrews were placed on the palate, and Moon's appliance was manufactured and installed. Traction of 8 impacted teeth were successful. But one impacted tooth(#44) underwent additional surgery to change the direction of the hook during traction. Among the 12 impacted teeth, 1 was extracted (#25), 8 were retracted, and 2 were spontaneously erupted. 1st phase pre-treatment and post-treatment photographs demonstrate effective treatment results. It took 16 months to place 8 impacted teeth within the dental arch. The patient has not been decided yet when to start the second-stage treatment.
Conclusion : Conclusion: Close cooperation between the Orthodontist and Oral Surgeon is required for the treatment of multiple supernumerary and impacted teeth. In addition, appropriate anchorage for traction of impacted teeth is very important.

P-022

Treatment of Dental Class II Malocclusion Using 3D Direct Printed Clear Aligners at Finishing Stage

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Introduction : In adult orthodontic treatment, clear aligners are increasingly in demand as an aesthetic treatment method as an alternative to traditional fixed aligners. However, it is reported that there are limitations to achieving specific tooth movements using clear aligners. Direct printed aligners have several advantages over thermoformed aligners. It is possible to manufacture clear aligner of a uniform thickness. Also, it is eco-friendly and time saving since there is no need to print the dental model.
Case Summary : The purpose of this case report is to describe the treatment of dental Class II malocclusion patient using 3D direct printed clear aligners at the finishing stage. A 23-year-old female presented with a chief complaint of impacted maxillary left second premolar. Clinical examination showed straight profile with mild crowding. Intraorally, she exhibited both Class II molar relationship. Decrowding was performed using nitinol wire. After decrowding, orthodontic microimplants were used for dis¬talization of the maxillary dentition. Debonding was performed before the finishing stage according to the patient's request, and finishing was performed using clear aligners. Insufficient tooth movement was overcome by manufacturing and delivering additional clear aligners on the same day that the patient came to the hospital.
Conclusion : In the finishing stage, the use of 3D direct printed clear aligners made it possible to make fine tooth movements, and a stable occlusal relationship was achieved.

P-023

Anterior Open Bite Correction Using Simple Segment Wire and Mini-screws in Adult patient

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Introduction : Various methods using mini-screws have been reported to correct anterior open bite without surgical approach. For intruding target teeth, We recommend in-office method using mini-screws and simple segment wire.
Case Summary : We report the case of a 23 years old woman who had a skeletal Class II malocclusion, severe anterior open bite, lip incompetency, missing teeth. Extraction of two premolars and intrusion of upper molars were planned to correct protrusive profile and anterior open bite. Before extraction of premolars, intrusion of upper molars was achieved effectively with 4 mini-screws and direct tooth-bonding segment wire. After bonding lingual button to the palatal surface of first and second upper molars, 0.016*0.022 stainless steel segment wire was engaged to lingual button. Mini-screws were placed buccal and palatal side between first and second upper molars. Using power chain, segment wires were connected to mini-screws at palatal side. Buccal side mini-screws were connected to main arch wire with power chain. Anterior open bite was decreased after Intrusion of upper molars. Pre-treatment, post-treatment and retention photographs of this patient demonstrate effective, esthetically pleasing, and stable treatment results.
Conclusion : Simple segment wire and mini-screws would reduce difficulty of in-office technic for target teeth intrusion and would accomplish effective molar intrusion.

P-024

Treatments of a Crossbite in Maxillary Lateral Incisor According to Available Space in Mixed Dentition

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Introduction : A common type of malocclusion observed in patients in the mixed dentition stage is a crossbite in maxillary lateral incisor. Important causes of a crossbite in the lateral incisor include: 1) lack of space for the eruption of the lateral incisor, 2) prolonged retained primary lateral incisor, 3) problem of the labial movement of the maxillary lateral incisor due to interference with the lower primary canine, 4) abnormal position of the tooth germ of the lateral incisor, 5) problem of the eruption path in maxillary lateral incisor.
Case Summary : If a tendency for a crossbite is observed along with the prolonged primary lateral incisor, it can be extracted immediately, and the patient can wait for the eruption of the lateral incisor. However, if the permanent lateral incisors are already erupting and cannot erupt normally on the labial side due to interference with the mandibular primary canines, orthodontic treatment is necessary. A crossbite of the maxillary lateral incisors can be resolved through orthodontic treatment in 1 to 2 months, as long as there is enough space for the lateral incisors to be properly aligned. If there is not enough space for the maxillary lateral incisors to erupt, the teeth can be aligned after first creating space for the maxillary lateral incisors to be aligned. And an orthodontic treatment period of more than 6 months may be required.
Conclusion : This report presents a case study of two mixed dentition patients with maxillary lateral incisor crossbite with different tooth alignment spaces using a mini-tube appliance.

P-025

Treatment of a Class II Growing Patient Using a Maxillary Plate and Fixed Appliances

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Introduction : Class II patients can be treated with upper molar distalization or premolar extraction as camouflage treatment. Extraction treatment should be carefully evaluated in cases with retrusive lips and severe crowding to avoid worsening the patient's profile. If extraction is not acceptable to relieve the crowding, arch expansion or distalization of the maxillary molars is considered.
Case Summary : We report the case of an 11-year-old girl who had a skeletal Class II malocclusion, straight profile, palatal constriction, and vertical growth pattern. The patient also showed severe crowding, anterior crossbite on the upper lateral incisors, diastema, shallow overbite, and Class II molar relationship. The patient underwent a first-phase treatment with a removable maxillary plate. The plate was designed to include three expansion screws for lateral expansion and distal movement of maxillary molars. After 10 months, the arch length discrepancy was decreased and the Class I molar relationship was achieved. The second phase of treatment was accomplished with fixed appliances for 13 months. After treatment, a Class I molar relationship with optimal overbite and overjet was achieved.
Conclusion : A growing patient with Class II malocclusion, vertical growth pattern, and severe crowding was successfully treated using a removable maxillary plate and fixed appliances. Using a removable maxillary plate can enhance the prospects of non-extraction treatment and reduce the need for extraction.

P-026

Total Retraction with Direct Printing Aligner in Class Ⅱ TMD Patient

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Introduction : These days, the clear aligner is becoming the preferred method to many doctors and patients due to its aesthetics, oral hygiene maintenance and less emergency visit. Most of the current clear aligners follow the vacuum forming method. This vacuum forming method has some problems. Among them, the main problem is that it requires a printed real model to make a vacuum forming aligner in every step and it provides a less gripping force on the teeth due to the limitation of fabrication. In order to overcome this limitation, we created a Direct Printing Aligner (DPA). DPA is directly fabricated from 3D printer after designing the tooth movement on a virtual set-up model. In this poster, we will present the case of a patient who was treated with a newly developed DPA.

Case Summary : A 35-year-old female patient with long-standing TMD pain was referred to our hospital. She had orthodontic treatment 20 years ago, however Class Ⅱ canine and molar relationship was presented on both side. Second molars were occluded only in CR position and the difference between the CO and CR was 2 mm in overjet. The large CO-CR discrepancy of patient was considered as the cause of her pain, so the intrusion of maxillary second molars was planned and auto-rotation of the mandible was expected during the treatment. Total retraction of upper arch was applied to reduce the overjet. When the intrusion of the second molars was finished, total retraction was started.

A button was designed and printed on the gingival position of upper canine for total retraction. After treatment, class Ⅰ occlusal relationship was achieved and overjet and overbite were also within the normal range of 2mm.

Conclusion : It can be seen that orthodontic treatment with total retraction is possible with DPA efficiently.

P-027

A Case of Anterior Crossbite Patient Using Direct Printing Aligner (DPA) and Direct Printing Attachment (DPAT)

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Introduction : Compared to vacuum forming clear aligner, Direct Printing Aligner(DPA) requires fewer steps to produce, resulting in less material waste, less environmental impact, and lower production costs. In addition, DPA can be inserted on the undercut of teeth, making tooth movement more efficient. In this poster, we would like to present a case of a patient with an anterior crossbite that was effectively treated using DPA.

Case Summary : The patient is a 32-year-old male patient who completed orthodontic treatment 17 years ago and presented to CC with anterior crowding. The patient wanted clear aligner for aesthetic reasons, so we decided to use DPA. To solve his chief complaint we decide to treat the crowding by stripping and match the midline as much as possible. As a result, the patient's CC of anterior crossbite, midline discrepancy, and crowding were all resolved. The patient did not have any difficulties with appliance or hygiene during the treatment, and the aesthetic satisfaction was very high. Even when attachments are required, the jig of Direct Printing Attachment(DPAT), rather than a conventional template, allows the attachments to be applied precisely at the desired location and in the desired size, allowing the force to be applied as planned.

Conclusion : Therefore, we believe that DPA will become a more widely used method for orthodontic treatment in the future.

P-028

Interdigitation Improvement on Anterior Crossbite Case using T spring and Z spring in Growing Patient

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Introduction : Angle Class III malocclusion occur when the mesiobuccal groove of the mandibular first molar is mesial to the mesiobuccal cusp of the maxillary first molar. This condition usually associated with anterior crossbite. Treatment of anterior crossbite in growing patients can use removable appliance with various springs. The purpose of this case report is to present the successful use of T-springs and Z-springs for correcting anterior crossbite in growing patients. Therefore, better interdigitation can be achieved

Summary : A 12 years old girl with chief complaint of anterior crossbite, unable to have a good digitation and effected the esthetical perception. The diagnosis was Angle Class III with anterior crossbite and protruded lower incisor with skeletal Class I (SNA 78, SNB 77 and ANB 1). Overjet was – 2,4 mm it presents as unilateral anterior crossbite and overbite was 0 mm. There was midline shift 1,6 mm to the left. Patient was treated by removable appliance with active component of T spring and Z spring. Z spring to correct 22 mesiopalatal centric rotation and T spring to correct 11 mesiopalatal centric rotation and 21 palatoversion. The passive component was labial bow at 13 until 23, adam clasp at 16, ball clasp at 24 dan 25, and bite riser on bilateral posterior region. The T spring and Z spring was activated in every 2 weeks.

Conclusions : The result in 17 weeks was anterior crossbite became corrected and the anterior teeth was jumped. Overjet increased by 5,6 mm, overbite increased by 2,7 mm and the midline shift was decreased by 0,8 mm to the left. Eventually the interdigitation was improved to the ideal position.

P-029

Long Term Follow-up Cases Report Using Orthodontic Extrusion to Save Natural Teeth Over 10 Yrs

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Han's dental clinic

Introduction : When tooth crown is severely destructed by trauma or dental caries, dental implant placement or traditional prosthetic treatment option after extraction it is usually considered. But if the patient wants to save the teeth, dentist should provide options to extend the life of natural teeth.
To save the severely destructed teeth, we should gain "ferrule effect" using orthodontic extrusion, surgical extrusion or clinical crown lengthening method.
Case Summary : Orthodontic extrusion is much safer than surgical extrusion in frequency of root fracture and the former is more bio-compatible and lesser traumatic to periodontal ligament than the later. Prosthetic result using orthodontic extrusion is more esthetic than that of clinical crown lengthening method because the former has normal crown length.
I will focus about the orthodontic extrusion technique and look over the prognosis after presenting long term follow up cases over 10 years using it.
Conclusion : As a dentist, I think we should do our best to save natural teeth. For this, we should provide "ferrule effect" to the severely destructed teeth for long term good prognosis. Orthodontic extrusion method to gain "ferrule effect" is bio-compatible and safe and the prosthetic result using it is esthetic because it has normal clinical crown length.
I think orthodontic extrusion method to save natural teeth has good prognosis over 10 years.

P-030

Treatment of Severe Crowding in the Mixed Dentition with Clear Aligner System

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Introduction : Recently a clear aligner system called Invisalign became an orthodontic treatment option for cases of mild and moderate malocclusion. Invisalign First system (IFS) was first introduced in 2018, targeting mixed dentition children who needed Phase I treatment. IFS has replaced certain modalities in Phase I treatment with removable acrylic expanders and conventional fixed appliances. One of the challenges of Phase I therapy is that significant dental changes occur over a short time frame. Phase I therapy also requires the management of children, who are generally not as compliant or as motivated as the adult or late teenager population. This case report demonstrates the effectiveness of IFS in the treatment of severe crowding in the mixed dentition.
Case Summary : A 12-year-old male patient presented with a chief complaint of crowding and discomfort due to interference of anterior incisors. Intraoral examination showed severe anterior crowding, interference due to cross-bite between 1.1 and 3.1, gingival recession of 3.1 as a result of interference and Angle Class I molar relationship. Facial and cephalometric analyses indicated that the patient had a hyperdivergent facial type, a straight profile, a favorable sagittal maxillomandibular relationship and a mild lip incompetence. The panoramic radiograph presented developing four third molars and no apparent condylar disorders. He and his parents strongly preferred non-extraction treatment even though we discussed the possibility of premolars extraction. His dental development was delayed and fortunately met the criteria for IFS. The treatment outcome was satisfactory at last although it took 29 months, 12 months after expiration date, and three sets of additional aligner were used because of his compliance issue.
Conclusion : In the mixed dentition, IFS could be effective in treating crowding if compliance issue could be resolved.

P-031

Unilateral Extraction of Maxillary First Premolar Using Clear Aligners in a Patient with Severe Crowding

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Introduction : The utilization of clear aligner therapy as an orthodontic device for dental alignment has significantly increased among adults. This case study details a unilateral premolar extraction managed with clear aligners, and discusses critical considerations encountered during the treatment process

Case Summary : A 27-year-old female patient presented with a high canine on tooth #23, severe crowding of tooth #23, and 3.5mm crowding of the mandibular incisors. To maintain the maxillary dental midline, the treatment plan involved the extraction of the upper left first premolar (#24) and overall interproximal reduction (IPR). For aesthetic reasons, clear aligners were used. A series of custom aligners were fabricated to gradually move the teeth. The patient was instructed to wear the aligners for 22 hours a day. Over 24 months, three sets of aligners(25+34+19 =78 pairs) were used to gradually achieve the desired tooth alignment.

Conclusion : Over a 24-month period, 2-times-refinements were made to successfully alleviate crowding. Maintaining the proper aligner facilitated the buccal inclination of the lingually tilted mandibular molar (#37). The roots of the left maxillary molars (#25-27) were moved forward parallel to the extraction space.

The decision to extract the unilateral premolar (#24) was deemed appropriate given the root position of tooth #23. An accurate stage model was created, and the aligners were precisely fabricated, resulting in a successful treatment outcome. The use of clear aligner treatment with root movement attachments and straight trim lines allowed for a tailored treatment plan to the patient’s specific needs. In addition, the patient’s adherence to wearing and maintaining the aligners was a key factor in the success of the treatment.

This case highlights the importance of individualized treatment planning and further research into clear aligner extraction treatment.

P-032

Orthodontic Treatment of Bilateral Scissor Bite by Using Mini-screw

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Introduction : Scissor bite is a malocclusion that the buccal cusps of mandibular teeth occlude to the lingual cusps of maxillary teeth on the same side. Prevalence of scissor bite has been reported to 1.0-1.6% of the population. Scissor bite can be caused from dental arch space discrepancies, narrow mandibular arches, or abnormalities in oral muscle function, potentially leading to decreased masticatory efficiency, temporomandibular joint pain, and facial asymmetry. This case report aims to introduce a case of bilateral scissor bite in an adult patient treated with mini-screws.
Case Summary : A 21-year-old male presented with bilateral scissor bite on premolar. The patient exhibited skeletal Class II, Angle's Class II molar relationship, and facial asymmetry with chin to left side. Crowding on both dentition, deep bite, large overjet, and midline deviation to left side on mandibular dentition were observed. Treatment plan involved intrusion of lower premolar with mini-screws placed in buccal alveolar bone. After sequential orthodontic treatment, stable occlusal relationship was achieved.
Conclusion : Using cross-elastics to correct a scissor bite offers the advantage of achieving reciprocal movement of the upper and lower teeth. However, extrusion caused by the elastics can exacerbate occlusal contact during the scissor bite correction process. Additionally, achieving the desired treatment goals can be challenging without sufficient patient cooperation. Buccal mini-screws in the mandible, on the other hand, provide intrusive forces on the lingually positioned mandibular teeth during buccal traction, significantly reducing the risk of traumatic occlusion during the scissor bite correction process. This approach does not rely on patient cooperation, leading to more predictable treatment outcomes.

P-033

Comparision of Clear Aligner and Fixed Orthodontic Braces for Treatment of Deep Bite Patient

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Introduction : The treatment of deep bite patients is always a challenging topic for all orthodontists. When performing treatment with a traditional fixed orthodontic device, bite lamp was essential because the attachment of the mandibular device was initially limited due to the deep bite. As It caused additional discomfort to the patient. However, as the treatment method using Invisalign became known, this discomfort was reduced. We would like to compare the treatment efficiency of Invisalign and fixed orthodontic devices.
Case Summary : Case1 was treated with Invisalign appliance, 22Y 2M old woman diagnosed Class II malocclusion. It showed 5.5mm OB. It used 30 devices totally. Each device was worn for six days. Total treatment time was 6 month.

In Case 2, a 27 years old man was Class I malocclusion with 5.0mm deep OB and 6.0mm OJ . He was treated with Invisalign appliance. Total 38 devices was used. Each device was worn for 8 days. Total treatment time was 8 month.

Case3 was treated with a fixed orthodontic device in an 11Y 8M old girl diagnosed with Class II malocclusion. It showed a 7.0 mm OB and a 0.5mm OJ the upper dentition was first arranged in Damon clear bracket for about 5 months, and then the lower braces was setted. the MTA (Mini Tube Appliance) device was used for three months before replacing it with the Damon clear bracket because of insufficient space. The treatment was finished after two years totally.

Conclusion : Through the case report, it was found that treatment with Invisalign reduces patient discomfort and enables faster improvement of deep bite.

P-035

Clinical Applications of Personalized Ni-Ti Alloy Wire

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Introduction : Recently, with the advance of digital technology, it has become possible to obtain intraoral information through intraoral scanning without taking alginate impressions. Subsequently, CAD/CAM technology can be used to create more precise appliances when applying to patients. Ni-Ti alloy, with its shape memory and superelastic properties, is utilized in various ways in orthodontic treatment. The purpose of this paper is to introduce the latest devices using personalized Ni-Ti alloy and to explore their advantages compared to traditional devices.
Case Summary : The first case applied fixed retainer made of Ni-Ti alloy instead of using a traditional fixed retainer for retention after orthodontic treatment. It fits more securely and stably on the tooth surface compared to the traditional fixed retainer.
In the second case, Ni-Ti alloy was used as a space maintainer to maintain space following the early extraction of a primary molar. This facilitated the normal eruption of the permanent tooth.
The third case involved a failure to maintain space after the early loss of a primary molar. A Ni-Ti alloy was fabricated as a space regainer and was applied to recover the lost space, which promoted the normal eruption of the permanent tooth.
The fourth case involved uprighting a mesially tipped second molar using a Ni-Ti alloy device.
In the fifth case, a Ni-Ti alloy device in the form of a lingual arch was fabricated and used as a palatal expander, which successfully corrected a transverse discrepancy.
Conclusion : Personalized Ni-Ti alloy appliances using CAD/CAM technology offer several advantages over traditional devices. They can replace traditional appliances in various clinical cases, providing more convenient and efficient treatment for both patients and practitioners.

P-036

Skeletal Palatal Expansion with Clear Aligners

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Introduction : Clear aligners are known as effective tools for arch expansion and coordination. However, their effect is limited to dental expansion. Meanwhile, skeletal expansion appliances are also well developed and widely used for resolving transverse problem. That is, a harmonious solution combining these two appliances is needed to solve skeletal arch discrepancies.
Discussion : There are two types of palatal expansion according to rate of expansion; slow and rapid. Although Recent researches show the rate of expansion is not related to success and failure of expansion, most practitioners prefer rapid expansion protocol and there are much more researches about rapid protocol, especially in adult patients. Rapid expansion resolves major transverse problem first. Thus, it has advantages of increasing predictability and relieving case complexity. Nevertheless, there is a risk of expansion failure and asymmetric expansion. Therefore, clear aligner treatment should start after those uncertainties are removed. Because there is time gap between scanning or impression and aligner delivery, there should be a way to maintain tooth position as the record was taken. Temporary restoration between diastema is easy and useful way to maintain expanded palatal state while waiting for aligners production. After expansion, aligner is a competitive treatment option because it has advantages to align severely crooked teeth like anterior cross bite.
Conclusion : Skeletal transverse problem is regarded as a limitation of clear aligner treatment. Combination of skeletal expander and clear aligner could expand the boundaries of aligner orthodontics.

P-038

Second Molar Control by Using Light NiTi Wire

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Introduction : Ectopic eruption of second molars is one of the challenges that arise in the early permanent dentition period, particularly when the case is treated in the manner of non-extraction. It is usual that there is no enough room for the conventional orthodontic appliances. Mini-tube appliances can be placed instead of brackets. A light NiTi wire is used to upright the unlocked molar. In this presentation, a simple and efficient method is suggested to unlock ectopically erupting second molars using minitubes and light NiTi wire.
Discussion : A small minitube is placed on the locked molars. 012 NiTi wire is used to unlock the molars. If necessary, thermo-active NiTi wire is preferred to allow for an easy insertion into small minitubes. The wire can be inserted directly into the tube, or used after forming a stop by step-down bending. To expect a sure distal uprighting, the wire can be inserted in the fashion of C shape. Ectopically erupting second molars can be unlocked simply by using a light NiTi wire. One additional advantage is that anchorage burden is reduced tremendously with the use of light forces, thereby simplifying appliance design.
Conclusion : Ectopically erupting second molars can be unlocked simply and efficiently by using minitubes and light NiTi wire.

P-039

Use of Orientation and Magnetic Fusion Sensors for 3D 6-degrees-of-freedom Jaw Movement Analysis

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Purpose : Conventional jaw movement tracking devices require the subject to wear a large measurement device such as a face bow with wiring, which may disturb the subject's physiological movement and posture. The purpose of this study was to develop a mouthpiece-type portable jaw movement tracking device that can measure 6-degrees of freedom (6-DOF) with natural head position, and to analyze the results using 3D moving images.
Materials and methods : Two volunteered for this study. A mouthpiece, mounted with a magnet, magnetic sensor, and orientation sensor, was custom-made for each patient. The orientation and magnetic sensing devices used in this study were waterproofed and placed on the buccal side of upper and lower jaw mouthpieces. Before taking measurements on the subject, the accuracy was verified on a robot arm moving along a defined trajectory. As well as being fitted with this system, subjects were fitted with a conventional jaw movement tracking device for simultaneous measurement, and the trajectories were compared. A 3D movie was also constructed by combining the stereolithography (STL) data of the intraoral dentition obtained using an intraoral scanner with the data collected by the sensors.
Results : Our findings indicate that position of maximum mouth opening can be measured by combining magnetic and orientation sensors. The ability to display jaw movement in 3D allows for various types of analysis and evaluation at any position. However, it was also found that near the maximum aperture, the distance between sensors increased and the position resolution decreased.
Conclusions : The measurement system used in this study applied small magnetic and orientation sensors. In the future, we plan to improve the measurement accuracy and make the device wireless to develop a jaw movement measurement method that more easily provides information about the oral environment and is more widely applicable.

P-040

Changes in the Cross-sectional Dimensions of Orthodontic Stainless-steel Wires due to Arch-shape Fabrication

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Purpose : In materials science, bending metals is known to produce dimensional changes due to alterations in cross-sectional morphology. However, in orthodontics, there is significant uncertainty about the dimensional changes that are produced by the bending of wires. Therefore, the present study investigated dimensional changes in orthodontic stainless steel wires with different cross-sectional dimensions.
Materials and methods : This study used three types of stainless steel wires with cross-sectional dimensions of 0.016×0.022 inch, 0.017×0.025 inch, and 0.019×0.025 inch (G&H Orthodontics Stainless Steel 14” Straight Lengths). Initially, five straight wires were randomly selected, and their edgewise and flatwise dimensions were measured using a micrometer (Crimp Height Micrometer No. 342-271, Mitutoyo, Kawasaki) as the control group. Subsequently, the straight wires of each size were shaped into arch forms using a turret (Arch Former No.810-1004, TOMY INTERNATIONAL, Japan) to match templates based on the mandibular dental arch of Japanese normal occlusion. Five arch wires were fabricated for each size. The edgewise and flatwise dimensions of the arch wires were measured at the bracket positions of the incisor, canine, and first molar. Mean values and standard deviations were calculated for each position. A one-sample t-test compared the control group dimensions with those at the incisor, canine, and first molar positions.
Results : In the edgewise configuration, both the 0.016×0.022 inch and 0.019×0.025 inch wires showed significantly greater dimensions in the incisor, canine, and first molar positions compared to the control group ($p < 0.05$). For the 0.017×0.025 inch wire, significant enlargement was observed only in the canine position ($p < 0.05$). In the flatwise configuration, no significant differences were observed in any region for all wire sizes when compared to the control group.
Conclusions : The edgewise dimension of orthodontic stainless steel wires increased during the fabrication of the archform.

P-041

Comparison of the Composition of Preformed Nickel-titanium Alloy Archwires from Different Manufacturers

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Purpose : Previous studies have revealed that the mechanical behavior of preformed nickel-titanium alloy (NiTi) archwires used in edgewise appliances varies depending on the composition of the archwire. Preformed NiTi archwires are available from various manufacturers; however, differences in alloy composition among manufacturers have not been clarified. Therefore, this study analyzed the composition of alloys contained in preformed NiTi archwires and compared them among manufacturers.
Materials and methods : Thirty-two types of 0.019×0.025 in mandibular preformed NiTi archwire from 6 manufacturers were selected for analysis. First, for sample preparation, approximately 20 mm was cut from the end of each archwire and fixed on the sample stage of a scanning electron microscope. After observing the fixed samples under ×1000 magnification at 20 kV, composition analysis was conducted. Five different points on each sample were randomly selected for analysis. Regarding the Ni content (atom%) obtained in the analysis, the mean value and standard deviation for each manufacturer were calculated. The Ni content was then statistically compared among the 6 manufacturers using one-way ANOVA. The significance level was set at 5%.
Results : The mean Ni content of the NiTi preformed archwires ranged from 49.14% to 51.51%. Furthermore, a significant difference in Ni content was observed among the six manufacturers ($P < 0.05$). These results suggest that the Ni content of commercially available preformed NiTi archwires varies among manufacturers, which could be one of the factors contributing to variation in their mechanical properties.
Conclusions : The composition of commercially available preformed NiTi archwires differs among manufacturers.

P-042

Comparison of Measured and Nominal Values of Preformed Archwires Produced by Different Manufacturers

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Purpose : Preformed archwires from several manufacturers are currently available, but the dimensional characteristics of the archwires produced by each manufacturer remain unclear. Therefore, the present study measured the dimensions of preformed rectangular archwires and compared them with the values published by the manufacturers (hereafter referred to as nominal values), and investigated the dimensional characteristics for each manufacturer.
Materials and methods : Forty-three types of 0.019 × 0.025-inch preformed rectangular nickel-titanium alloy mandibular archwire from 4 manufacturers (American Orthodontics, Forestadent, G&H, and Ormco) were selected. Five preformed archwires of each type were randomly selected from one package for measurement. The edgewise and flatwise dimensions of each preformed archwire were measured at the terminal end using a micrometer. After measurement, the mean value and standard deviation of the edgewise and flatwise dimensions for each manufacturer were calculated and compared with the nominal values using a one-sample t-test. The level of significance was set at 5%.
Results : For the edgewise dimension, a significant difference was observed between the measured value and the nominal value for all manufacturers except American Orthodontics. Moreover, the measured values for Ormco archwires were significantly larger than the nominal values, while those for G&H and Forestadent archwires were significantly smaller ($P < 0.05$). For the flatwise dimension, the measured values for archwires from all manufacturers were significantly smaller than the nominal values ($P < 0.05$).
Conclusions : The preformed rectangular archwires showed variations for the edgewise dimension among the manufacturers and were significantly smaller than the nominal values for the flatwise dimension.

P-043

Stress Distribution in the Clip Insertion Slot of Active Ceramic Self-Ligating Brackets

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Objectives : To assess the stress distribution and deformation of active ceramic self-ligating brackets when tensile force in the labial direction was applied, to make modified bracket design and to compare modified design to original one for improving structural stability.
Material and Methods : Three-dimensional (3D) models containing an active-type ceramic self-ligating bracket and a stainless steel archwire were constructed for finite element analysis. Analytical models were classified as follows: a 16mm long 0.016x0.022-inch or a 0.021x0.025-inch SS wire and (1) a bracket for mandibular central incisor with a MBT 0.022-inch slot prescription (Clippy-C®, Tomy, Futaba, Fukushima, Japan) (2) a modified design bracket with increased clip thickness and (3) a modified design bracket with increased labial clip guard thickness. Tensile force was applied to these models by displacing the bilateral end of the wire (at intervals of 0.2mm from 0 to 1.4mm).
Results : In the model with increased labial clip guard thickness, the stress generated within the clip insertion slot at all bilateral end displacements showed a reduction of more than 20% compared to the original model. Unlike the original bracket model, even at the bilateral end displacement of 1.4mm, stress exceeding the tensile strength of alumina occurred only in some parts of the labial surface of the clip insertion slot. In particular, the deformation of alumina decreased by more than 50% compared to the deformation in the original bracket model, irrespective of the wire displacement.
Conclusion : It is possibly predicted that the fracture of an active ceramic self-ligating bracket with 0.22-inch slot occurs when bilateral end displacement of the SS rectangular archwire reaches 1.1mm, regardless of the dimension of the SS rectangular archwire.
Increasing the inner thickness of the labial clip guard, regardless of the archwire dimension, is an effective way for improving the structural stability of an active ceramic self-ligating bracket.

P-044

Predicting Factors for the Success Rate of Pure Bone-borne Maxillary Skeletal Expander

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Objectives : This study aimed to evaluate the success rate of achieving desired transverse expansion, along with the patterns of expansion and potential correlations with patient factors, using the ATOZ expander, a type of pure bone-borne maxillary skeletal expander.
Material and Methods : The study included 42 orthodontic patients (12 males, 30 females, mean age of 18.14 years) diagnosed with maxillary transverse discrepancy. These patients underwent ATOZ expander expansion exceeding 7mm and had cone-beam computed tomography (CBCT) images taken both before and after expansion. Indirect skeletal measurements, including expansion amounts in the anterior palate (AP), posterior palate (PP), midface (MIF), and the distance between jugal points (J-J), were analyzed. The success of ATOZ expansion was defined as the complete separation of the midpalatal suture (MPS), and clinical success (CS) was defined as achieving both anterior and posterior midpalate expansion exceeding 1.0 mm on CBCT measurements. Correlation and regression analysis were conducted to explore the relationships between skeletal measurements, patient age, MPS maturation stage, and the influence of these factors on achieving CS.
Results : The ATOZ expander achieved a 92.8% success rate. Patient sex showed no statistically significant relation with CS, however, increased MPS maturation stage and initial age were associated with lower odds of CS. Larger changes in PP, MIF, and J-J were correlated with higher success rates, whereas changes in AP did not statistically affect CS.
Conclusion : The ATOZ expander, a type of pure bone-borne maxillary skeletal expander, is a promising option for maxillary expansion, particularly for younger patients with less mature MPS. Considering individual factors such as age and suture maturity can lead to personalized treatment plans that optimize skeletal expansion outcomes.

P-045

Three-dimensional Evaluation of Dentopalatal Changes After Rapid Maxillary Expansion in Growing Children

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Objectives : In growing children with transverse malocclusion problems, various types of rapid maxillary expanders (RMEs) have been effectively used in skeletal and dental expansions. The objective of this study was to compare the three dimensional dentopalatal changes of dental expansion and palatal soft tissue expansion using different types of expansion appliances.

Material and Methods : We investigated 3-dimensional dentopalatal changes in 20 patients treated with bonded RMEs, 19 with RMEs, and 38 control patients. Dental plaster models before and after expansion were scanned and superimposed to evaluate transverse expansion, expansion ratio, angular expansion, and palatal expansion height ratio.

Results : Using bonded RMEs, similar anterior and posterior dental expansions were achieved, and palatal soft-tissue expansion occurred more apically in the posterior than in the anterior. Using RMEs, a larger posterior dental expansion was achieved than anterior dental expansion, and palatal soft-tissue expansion occurred more apically in the posterior area than anterior area.

Conclusion : The expansion groups exhibited transverse and angular expansion of both the teeth and palatal soft tissue. However, none resulted in significant changes in palatal height. Dental expansions in the anterior and posterior areas were similar using bonded RMEs, whereas the posterior dental expansions were larger than those of the anterior area using RMEs. The entire palatal soft-tissue slope expanded in the posterior area, whereas the occlusal part expanded in the anterior area using RMEs and bonded RMEs.

P-047

Impact of Slot Cover Design on Stress in Passive Self-ligating Brackets: A Finite Element Analysis

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Objectives : This study aims to compare the stress distribution characteristics of three finite element models representing aesthetic passive self-ligating brackets with different slot cover designs. Specifically, keyhole type (bracket A), drawer type (bracket B), and newly designed dovetail type (bracket C) are evaluated to assess their structural stability under varying orthodontic archwire conditions.
Material and Methods : Finite element analysis was conducted to simulate tensile stress distribution in the brackets under specific compressive loads. Each model was evaluated under extreme and general conditions of vertical and horizontal displacement to simulate clinical scenarios. Stress patterns were visualized and numerically analyzed to assess differences in tensile stress distribution across the brackets' bodies and clips.
Results : Bracket C demonstrated lower tensile stress on its body, particularly on the slider, compared to brackets A and B. However, bracket C's clip exhibited higher and broader tensile stress distribution. Under extreme horizontal displacement, bracket C showed lower maximal tensile stress on its body than brackets A and B, while its clip displayed higher stress levels. In general horizontal displacement scenarios, bracket C exhibited the lowest maximal tensile stress on its body. Bracket A showed lower maximal tensile stress in the clip compared to its body, whereas bracket B showed similar maximal tensile stress in both body and clip regions.
Conclusion : Factors beyond structural stability, such as tooth movement efficiency, bond strength, aesthetics, patient comfort, and cost should guide bracket selection. Understanding bracket stability under specific conditions is crucial for clinicians to apply appropriate mechanics throughout treatment stages. Utilizing finite element models can streamline bracket development, offering time and cost savings compared to conventional methods.

P-048

Clinical Application of Artificial Intelligence-based Software to Predict Fishman's Skeletal Maturity Indicators

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Introduction : A software program designed to automatically evaluate Fishman's Skeletal Maturity Indicators (SMI) through artificial intelligence and deep learning aims to enhance the timing of orthodontic treatment in growing children and adolescents.
Discussion : Traditionally, skeletal evaluations such as hand-wrist, cervical vertebrae, and clinical puberty assessments have been performed by orthodontists. Currently, an objective hand-wrist growth assessment utilizing artificial intelligence is being implemented. Crescom's MediAI-BA AI program evaluates bone age and predicts final height at the completion of growth from hand-wrist radiographs using the TW3 and GP methods. Additionally, the program employs the Swin Transformer model and Deep Convolutional Neural Network (CNN) RetinaNet to determine the SMI. For skeletal Class II cases, growth control effects diminish after the growth peak, whereas for skeletal Class III cases, significant remaining growth is necessary for effective skeletal improvement. Confirming the completion of skeletal growth is also crucial for retention and predicting late mandibular growth. Therefore, implementing a program that can objectively obtain the SMI value aids in determining the optimal timing for orthodontic treatment.
Conclusion : The AI evaluation method reduces inter- and intra-observer errors compared to traditional manual SMI measurement methods. It allows for quick and objective explanations to patients and can be applied in growth correction treatment. This method can be effectively used in the diagnosis, treatment planning, maintenance, and prognosis evaluation for the treatment of anteroposterior skeletal discrepancies.

P-049

Enhancing Biofilm Resistance and Preserving Optical Translucency of 3D Printed Clear Aligners Through Surface Treatment

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Purpose : This study aimed to use a carboxybetaine methacrylate (CBMA) copolymer solution (CCS) to surface treat 3D printed clear aligners at different fabrication stages, to impart antifouling properties, and assess the surface treatment at various fabrication stages' impact on physico-mechanical characteristics.
Materials and methods : Surface treatments using a blend of 2-hydroxyethyl methacrylate (HEMA) and CBMA, termed CCS, were performed at various stages of 3D printed clear aligner fabrication. Experimental groups, CB1, CB2, and CB3, were determined by the stage of surface treatment during post-processing. CB1, CB2, and CB3 received treatment before post-curing, after post-curing, and after post-processing, respectively. Untreated samples served as controls. Physical and mechanical properties were assessed through tensile testing, Fourier-transform infrared spectroscopy (FTIR), differential scanning calorimetry (DSC), and UV-Vis spectroscopy. The surface was further characterized through scanning electron microscopy and contact angle measurements. Biocompatibility was assessed using human gingival fibroblasts. Lastly, bacterial biofilm resistance was evaluated using confocal laser scanning microscopy. Crystal violet assay was performed using Streptococcus mutans.
Results : Surface treatment during CB1 stage exerted the most significantly unfavorable influence on properties of the 3D printed aligner resin. CB2 samples showed the maximum preservation of translucency even after 7-day aging. CB2 and CB3 phases showed enhanced hydrophilicity of sample surfaces with reduced adhesion of multispecies biofilm and S. mutans.
Conclusions : Surface treatment with CCS can significantly improve bacterial biofilm resistance to 3D printed clear aligners without a tangible effect on physico-mechanical properties. The correct stage of surface treatment with solution like CCS is crucial to impart bacterial resistance to 3D printed aligners. The present experiment offers a theoretical foundation for the selection of surface treatment stage of 3D printed clear aligners.

P-050

Dimensional Accuracy, Mechanical Property, and Optical Stability of Zirconia Orthodontic Bracket According to Yttria Proportions

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Purpose : This in vitro study comprehensively evaluated the performances of zirconia brackets with varying yttria proportions in manufacturing advanced orthodontic brackets.

Materials and methods : Three experimental groups of zirconia brackets were fabricated using yttria-stabilized zirconia (YSZ) materials with different yttria proportions—3 mol% yttria (3Y-YSZ), 4 mol% yttria (4Y-YSZ), and 5 mol% yttria (5Y-YSZ) (Tosoh Ceramic, Japan). A polycrystalline alumina ceramic bracket (3MTM ClarityTM Advanced, MBT 0.022-in. slot) was employed as the control group. Morphological properties, including slot surface structure and dimensions, were examined using scanning electron microscopy and surface profiler analysis. Manufacturing accuracy was assessed with root mean square calculations of trueness and precision. Mechanical properties were tested, encompassing static and kinetic frictional resistance (FR) and fracture strength. Optical stability was evaluated through 20,000 cycles of thermocycling and a 7-day immersion in various coloring agents.

Results : In the experimental groups, the trueness values for the slot base angle showed no significant deviation from the digital reference design values, and the precision values for all slot dimension parameters were found to be consistent and reproducible. Among the groups, the 3Y-YSZ group presented the lowest surface roughness parameters, the least frictional forces for all wire types tested, and the highest fracture strength of the bracket tie wing ($p < 0.05$). The control group demonstrated the highest direct light transmission, succeeded by the 5Y-YSZ group. Significant color changes occurred in all bracket groups; however, no marked intergroup differences in the degree of color change were detected under the experimental conditions.

Conclusions : Within the limitations of this study, zirconia brackets containing 3 to 5 mol% YSZ presented enhanced reliability in terms of dimensional accuracy and demonstrated favorable optical stability. Notably, owing to its advantageous mechanical properties, the 3Y-YSZ variant showed remarkable potential as an advanced material for fabricating orthodontic brackets.

P-051

Surface analysis of various metal clips of ceramic self-ligating brackets

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Objectives : This study aimed to analyze the surface composition, roughness and friction of various metal clips of ceramic self-ligating bracket using Atomic Force Microscopy(AFM)-Lateral Force Microscopy(LFM) and Scanning Electron Microscopy(SEM)-Energy Dispersive X-ray Spectroscopy(EDS).
Material and Methods : Five types of ceramic self-ligating brackets were separated into experimental groups (CC, EC, MA, QK, and WA), while a metal self-ligating bracket(mC) was used as the control group. The sample size of each bracket was 30 in this study. Atomic force microscopy-lateral force microscopy(AFM-LFM) and scanning electron microscopy-energy-dispersive X-ray spectroscopy(SEM-EDS) were used to analyze the surface of each bracket clip.
Results : All the clips in the experimental groups were coated with rhodium except for the QK clip. The main components on the outer clip surface of mC and QK were cobalt, chrome, and nickel. The main components on the inner clip surface of mC were cobalt, nickel, and chrome, and those for QK were cobalt and chrome. The main component on the outer and inner clip surfaces of CC, EC, MA, and WA was rhodium. The results showed that the QK clip had the lowest average roughness and relative friction on the outer surface, followed by the MA, EC, WA, and CC clips. However, the CC clip had the lowest average roughness and relative friction on the inner surface, followed by the QK, WA, MA, and EC clips.
Conclusion : The surface roughness and relative friction of the rhodium-coated clips, except the CC clip, were generally higher than those of the uncoated clips.

P-052

Verification of a new 3-dimensional jaw movement tracking method using facial reference point and depth

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Purpose : To validate a new method for three-dimensional (3D) jaw movement tracking using facial reference point detection and depth information from RGB-D cameras and compare it to a conventional device.

Materials and methods : The subjects consisted of six adults (3 men and 3 women; average age 26.9 ± 0.94) with individual normal occlusion and no abnormalities in the stomatognathic system. This study was approved by the Institutional Review Board (approval number: D2023-014) and conducted in accordance with the Declaration of Helsinki. Informed consent was obtained from all the participants prior to the experiment. For comparison, tracking was also simultaneously performed by a conventional device attached to the head and lower incisors (Mandibular Kinesiograph). A marker was attached to the subject's chin as a reference point. The lateral border movement was recorded using two RGB-D cameras to measure and confirm the sagittal plane. Experiments were conducted at two different positions on the subject’s chin to determine the most reliable reference point.

Results : After comparing the sagittal and frontal planes, the maximum deviations in the left and right directions for this method were sufficiently accurate with an average error of less than 2.0 mm. The reference points for the method were different from the conventional device; therefore the displacement in the vertical and depth directions was different from that for the conventional device. However, there were similarities in the path of the jaw movements between the new method and the conventional method.

Conclusions : The new method makes it possible to track jaw movements and may be as effective in screening abnormal jaw movements as conventional devices. Although the new method should be tested on more subjects, it allows the jaw trajectory to be obtained under physiological conditions without attachments, making it possible to measure more natural jaw movements.

P-053

Mechanical analysis of novel method for mandibular molar protraction using improved super-elastic Ni-Ti alloy wire

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Purpose : Rigid wires are commonly used to close extraction spaces, whereas Ni–Ti alloy wires are mainly used for leveling. However, we have been using improved superelastic Ni-Ti alloy wires (ISW) to close and align the teeth simultaneously. ISW have low stiffness, which makes it challenging to generate sufficient moments to protract mandibular molars mesially. This study aimed to elucidate whether fixing a long hook on ISW and applying a contractile force is useful for leveling and protracting a molar effectively.

Materials and methods : Assuming crowding of the teeth after mandibular second premolar extraction, we designed a model in which the first premolar could be simulated. To this end, 0.018 × 0.025-inch slot self-ligating brackets were bonded to the simulated canine and premolar, and a tube was bonded to the simulated molar. The distance between the brackets was 7 mm between the canine and premolar and 16.5 mm between the premolar and molar. Next, a 0.016 × 0.022-inch ISW was ligatured into the brackets. A long hook or crimpable hook was attached next to the premolar bracket, and the hook and molar tube were pulled with a 150gf Ni-Ti closed-coil spring.

Results : When the first molar was protracted from the crimpable hook, all three simulated teeth collapsed into the extraction space. However, we applied a counter moment to the molar using an ISW combined with a long hook and moved it bodily without using rigid wires.

Conclusions : Although Ni-Ti wires are usually used only for the leveling and aligning stages, we adopted a system in which all treatment stages are completed with a single archwire, indicating that space closure can be achieved from the early stages of treatment by adding an appropriate counter moment by protracting the molar from the long hook.

P-055

Skeletal Class III Case Treated With Extraction of Traumatized Mandibular Right Central and Lateral Incisors

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Introduction : It is reported12-23% of children before 12 years old that experienced trauma to permanent teeth, most commonly to the maxillary anterior teeth. We report a mandibular protrusion case with traumatized mandibular right central and lateral incisors extraction.
Summary : A 14-year-old girl with a chief complaint of protruding mouth. History of traumatic mandibular right central and lateral incisors avulsion and reimplantation in 7 years old. Angle Class I malocclusion with overbite +0.5mm and overjet +1.0mm. Cephalometrically, anterior positioned of mandible to the cranium with ANB of 0°, and labially inclined maxillary anterior teeth was noticed. Fistula was found to the root apex of the mandibular right lateral incisor. Radiographically revealed a radiolucency of root canal treated mandibular right lateral central incisor and root resorption of about 1/2 of the root. The patient was diagnosed with skeletal mandibular protrusion with labial inclination of the maxillary anterior teeth. Treatment plan was extraction of maxillary bilateral second premolars, mandibular right central and lateral incisors and aligned with preadjusted edgewise appliance. Treatment period was 2 years and 3 months. After 4 years of retention, the occlusion is stable without anterior gingival recession.
Conclusions : In this case, space-closing was proceeded with .018" x .025" slot brackets and .016" x .022" superelastic NiTi wire as working wires, light continuous orthodontic force was applied by 50 gf superelastic NiTi closed coil spring. Regional acceleratory phenomenon (RAP) was expected by starting space-closing promptly after tooth extraction. Tooth movement was achieved in alveolar bone housing, satisfactory functional and esthetic results were obtained.

P-057

Early Space Distribution Using Lever Jigs : A Clinical Proposal

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Introduction : The comprehensive orthodontic treatment process typically progresses through three main stages: alignment and leveling, improvement of molar relationships and space closure, and finishing. Nevertheless, in order to achieve effective alignment and leveling, it is often necessary to create space in the target area, which may involve distributing space early on.
Discussion : In the context of premolar extraction orthodontics, moving the canines distally to secure space for anterior alignment can inadvertently cause unwanted vertical bowing. This bowing increases the vertical overlap of the anterior teeth and hinders efficient tooth movement. Also, The posterior inclination of the canines can cause deformation of the archwire, which in turn applies extrusive forces to the anterior teeth, worsening the anterior torque. To prevent this, it is crucial to effectively control the moments generated during the distal movement of the canines. At the alignment and leveling stage, it is challenging to insert wires with sufficient strength to generate the desired moments using the main archwire alone.
Conclusion : The lever jig is a device that leverages the principle of levers to generate adequate moments and can be used alongside relatively flexible main archwires. This presentation aims to introduce the mechanism and advantages of the lever jig, along with its fabrication methods and clinical applications.

P-058

Comparison of orthodontic force between the positions of the trimming line in orthodontic aligners

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Purpose : Orthodontic aligners require complex and precise designs to move individual teeth, but their biomechanics remain unclear. Therefore, the present study aimed to clarify the relationship between orthodontic force and the position of the trimming line in orthodontic aligners.
Materials and methods : The aligner orthodontic force measurement system was developed to measure three-dimensional forces applied by an aligner to the maxillary right central incisor. Using this system, a 6-axis force sensor was placed on the right central incisor of a maxillary dental model. First, 0.2 mm of labial displacement and 0.2 mm of infraocclusion of the maxillary right central incisor were simulated. The following three types of aligners with trimming lines at different positions were fabricated: an aligner with the trimming line at the height of the cervical line (0 mm); an aligner with the trimming line 1 mm longer than the cervical line (1 mm); and an aligner with the trimming line 2 mm longer than the cervical line (2 mm). Then, each aligner was set, and the orthodontic force applied to the maxillary central incisor was measured. Each aligner was measured five times, and the mean and standard deviation were calculated. In addition, the magnitude of orthodontic force was compared using analysis of variance among the trimming line positions (0 mm, 1 mm, and 2 mm).
Results : The magnitude of orthodontic force ranged from 179.3 ± 8.5 gf to 231.2 ± 6.7 gf for labial displacement and from 116.0 ± 8.1 gf to 167.6 ± 6.7 gf for infraocclusion. In both labial displacement and infraocclusion, the orthodontic force significantly increased as the position of the trimming line became longer.
Conclusions : The magnitude of orthodontic force varied depending on the position of the trimming line in the orthodontic aligner.

P-059

Orthodontic forces determined by the intercanine/intermolar width ratio of NiTi preformed archwires

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Purpose : Preformed nickel-titanium alloy (NiTi) archwires are widely used in orthodontics, and the selection of a product that fits the patient's pre-treatment dental archform and inter-canine width is recommended. However, the magnitude and direction of the orthodontic forces delivered to the dental arch remain poorly understood. Therefore, the present study aimed to determine the orthodontic forces delivered to the mandibular dental arch by preformed NiTi archwires based on their inter-canine/inter-molar width ratio.
Materials and methods : Thirty-one types of 0.019×0.025-inch preformed NiTi archwire were examined. Based on the mean values of the canine and first molar depth in normal occlusion, the inter-canine width (ICW) and inter-molar width (IMW) were measured. Each archwire was ligated to brackets (Damon Q, Ormco Corporation, Glendora, CA) on a multi-sensor measurement system that simulated the mean mandibular dental archform of normal occlusion. The orthodontic forces delivered to the central incisor, canine, and first molar were measured, and the mean values were calculated. Correlations between the ICW/IMW ratio and the orthodontic force were analyzed by Spearman's correlation coefficient. The significance level was set at $P = 0.05$.
Results : Significant negative correlations were found for the central incisors ($\rho = -0.842$, $P < 0.05$) and first molars ($\rho = -0.962$, $P < 0.05$) for orthodontic force in the labial direction. In contrast, a significant positive correlation was found for the canines ($\rho = 0.865$, $P < 0.05$) for orthodontic force in the labial direction.
Conclusions : Preformed archwires with a smaller ICW/IMW ratio delivered greater labial orthodontic forces to the mandibular central incisors, leading to labial tipping and increasing the risks of periodontal tissue damage and loss of post-treatment stability. These findings indicate that the inter-canine and inter-first molar width ratio in preformed archwires determines the magnitude and direction of the orthodontic forces delivered to the dental arch.

P-060

Tooth movement and alveolar bone changes in GD3 synthase knockout mice

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Purpose : Tooth movement during orthodontic treatment is caused by bone resorption and bone formation by orthodontic force, which are involved in alveolar bone metabolism. Ganglioside GD3, a type of glycolipid, is expressed in brains, cranial nerves, and osteoclasts. In this study, we performed tooth movement experiments using GD3 synthases knockout mice (GD3S KO) and analyzed the effects on alveolar bone metabolism.
Materials and methods : 1. Tooth movement experiment:Closed coil springs were attached to the alveolar region of the maxillary anterior teeth and the maxillary left first molar (M1) of the GD3S KO mice (n=6) and the wild type mice (WT) (n=6). Orthodontic force was applied for 21 days.2. Measurement of tooth movement distance: After 21 days, the mice were sacrificed, and the tooth movement distance was measured using μCT. 3. Measurement of remaining amount of alveolar bone: The remaining amount of alveolar bone, measuring by bone volume to total volume (BV/TV), in M1 interradicular septum of the maxilla was measured using μCT. ４. Histological observations: Osteoblasts were counted by HE staining. Osteoclasts were counted using TRAP staining, and sympathetic nerve activity was evaluated using immunohistostaining.
Results : The tooth movement was significantly reduced in GD3S KO compared to WT.The BV/TV ratio was shown to be increased in the interradicular septum in GD3S KO compared to WT. No significant difference was observed in the number of osteoblasts between GD3S KO and WT, but the number of osteoclasts was reduced in GD3S KO compared to WT. Furthermore, GD3S KO showed significantly lower tyrosine hydroxylase activity compared to WT.
Conclusions : These results suggest that bone resorption in GD3S KO was suppressed by a decrease in osteoclasts, resulting in reduced tooth movement.They also suggested that the number of osteoclasts may have decreased in response to decreased sympathetic nerve activity.

P-061

Suppression of alveolar bone resorption by miglustat in a mice model of periodontal disease

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Purpose : In orthodontic patients, periodontal disease can not only cause alveolar bone resorption, but can also impede the progress of treatment. In addition, prevention of periodontal disease is important because tooth movement in the presence of periodontal disease may exacerbate periodontal disease. Miglustat, a glucosylceramide synthase inhibitor for the treatment of Niemann-Pick type C, has been reported to inhibit osteoclasts and bone resorption, and may prevent alveolar bone resorption in periodontal disease. In this study, we decided to investigate the preventive effect of Miglustat on periodontal disease by administering Miglustat to model mice with periodontal disease.
Materials and methods : A 0.1 mm ligature was placed at the contact point between the maxillary first and second molars of C57/BL6/J mice to create a model of periodontal disease. Miglustat(10 mg/kg) was administered topically once daily to the buccal gingiva of the model mice (n=5-7). The administration periods were at 8 and 12 weeks, and saline was administered topically to the control group. After completion of topical administration, maxillary bone was harvested and three-dimensional bone structural analysis of the remaining alveolar bone volume between the first and second molars was performed using micro-CT. Tissue sections were also prepared and subjected to HE and TRAP staining to measure the percentage of attachment level and osteoclast count. Immunohiststaining (IL-1β, TNF-α) was also performed.
Results : Comparison of the control and Miglustat-treated groups after ligature wire placement showed that at 8 and 12 weeks, the Miglustat-treated group showed higher values for alveolar bone and smaller values for the percentage of attachment level. In addition, a decrease in osteoclast counts and IL-1β and TNF-α staining scores were observed.
Conclusions : In a mice model, topical administration of Miglustat may inhibit periodontal disease.

P-062

The effects of astaxanthin on high glucose-induced bone loss and osteoclast activity in diabetes-induced mice

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Objectives : Studies have shown that astaxanthin (ASTX) may alleviate and/or improve hyperglycemia-associated chronic complications. However, the exact effects of ASTX on the periodontium and bone mass accrual relative to long-term hyperglycemia are not yet completely understood. Accordingly, the aims of this study were focused to investigate whether the long-term hyperglycemia actually defects periodontal tissues and bone homeostatic maintenance, and whether these complications are recovered by supplementation with ASTX.
Material and Methods : A mouse model of type 1 diabetes was produced by injecting male C57BL/6 mice with streptozotocin at single dose of 150 mg/kg body weight. For comparison of each group, the bone structure and density of the alveolar bone and femur were evaluated using Micro CT, and the destruction of the pancreatic islet in the soft tissue section and bone loss due to osteoclast activity in the femur in the hard tissue section were observed through H&E staining. The presence of osteoclasts in periodontal tissue or femur was quantified through TRAP staining, and RANKL levels in alveolar tissue sections were evaluated through immunohistochemistry.
Results : The untreated diabetic mice exhibited significant degradation in periodontal tissues and decreased bone parameters compared to the control group. In contrast, mice supplemented with ASTX maintained periodontal and bone parameters similar to those of the control group, suggesting a protective effect of ASTX against hyperglycemia-induced damage. ASTX supplementation demonstrated its ability to preserve bone mass by suppressing osteoclastic activation. Specifically, ASTX-treated mice showed restoration of bone parameters to control levels, indicating its potential to prevent diabetes-induced bone loss and improve bone microenvironment and stem cell function.
Conclusion : This research underscores the potential therapeutic benefits of ASTX in managing complications related to diabetes, particularly in preserving periodontal health and bone integrity. These findings suggest that ASTX supplementation could be a promising approach to mitigate diabetes-induced deterioration in bone health and periodontal tissues.

P-063

Maxilla Protraction in Class Ⅲ Achondroplasia Patient; a Case Report

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Introduction : Patients with craniofacial deformities should be treated differently depending on the etiology, even if they present with similar clinical symptoms. Because patients with achondroplasia have abnormal circum-maxillary synchondrosis but normal sutural growth, they respond successfully to maxilla protraction treatment with facemask, which stimulates sutural growth. There are various ways to protract maxilla in patients having deficient growth of maxilla. Using facemask with dental anchorage, using facemask with bone anchorage, and using bone anchorage with class Ⅲ elastics are the most typical treatment. Each treatment has different effects on patients' vertical skeletal pattern or dentition, so clinician should choose the appropriate treatment depending on the case.

Case Summary : This case is a 11-year-old girl diagnosed with achondroplasia, with recessive growth of the maxilla and a depressed midface. Considering the patient's age beyond the appropriate time for treatment, systemic condition and hypodivergent skeletal relationship, maxillary protraction was planned using a Miniscrew-Assisted Rapid Palatal Expander(MARPE) and facemask. After treatment, the patient obtained a favorable overjet and overbite and changed to a Class Ⅰ skeletal relationship. The total treatment period was 15 months.

Conclusion : In patients with achondroplasia, maxilla protraction to improve soft tissue appearance and alter skeletal relationships is possible and can be accomplished more efficiently with bone-anchorage. Considering the patient's systemic etiology, skeletal and dental relationships, selecting the appropriate treatment will help achieve treatment goals.

P-064

Growth Modification and Orthodontic Treatment of Unilateral Cleft Lip and Palate Patient

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Introduction : Patients with cleft palate develop a posterior crossbite due to scar tissue formation after closure surgery, which inhibits anterior maxillary growth, and, normal mandibular growth occurs, resulting in a skeletal Class III malocclusion. Therefore, stimulation of maxillary growth and control of mandibular growth are critical. The aim of this poster is to introduce a case of growth modification and orthodontic treatment of unilateral cleft lip and palate patient with severe arch constriction and congenital missing of upper lateral incisor.

Case Summary : A 6-year-old patient had unilateral cleft lip and palate on right side and severe maxillary arch constriction with anterior crossbite. The upper left lateral incisor was congenitally missing. As for treatment objective and plan, phase I treatment includes the arch form establishment using Quad-helix (Q-helix) and the correction of anterior crossbite. For phase II treatment, after permanent teeth eruption, the full bonding started and the upper arch form was slightly expanded by using PLA (precision lingual arch). The space for upper left lateral incisor was regained and consolidated for future prosthetic restoration. After 14-year of treatment, harmonious jaw relation, normal overjet and overbite and occlusion with improved upper arch form were obtained.

Conclusion : Arch form development is important for patients with cleft lip & palate and proper use of device is necessary for this. Q-helix is useful for active expansion of upper arch form and the PLA is useful for the retention or slight expansion. In addition, stimulation of maxillary growth and control of mandibular growth are critical for patients with cleft lip & palate. For growing patients with maxillary deficiency and arch constriction, growth modification treatment can provide many advantages to patients if given as soon as possible at younger age.

P-065

Orthodontic and prosthetic treatment of a patient with cleft lip and palate : Case report

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Introduction : Dental treatment of cleft lip and palate patients has many considerations. These are congenital missing teeth, alveolar bone defects and physical instability of the defective area, asymmetry, and uneven lip lines.
The aim of this case report was to present the successful interdisciplinary treatment between orthodontics and prosthetics of an adult patient with bilateral cleft lip and unilateral cleft palate and congenitally missing.
Case Summary : A 25-year old woman with bilateral cleft lip & right sided cleft palate and a missing in the right maxillary lateral incisor was required for orthodontic and prosthetic treatment. Total distalization of maxillary tooth was required because the maxilla was protruded and molar relationship was class II. A conventional bracket-wire appliance was used, and the total distalization of the maxillary tooth was performed using miniscrew to achieve a class I molar relationship, and at the same time, a space of missing site was regaining. After proper orthodontic treatment, the missing site was reconstructed with a 3-unit bridge prosthesis.
The alignment of teeth and class I molar relationship were achieved, and the missing space was constructed through prosthetics. The patient finished treatment with an proper mastication function and esthetic smile.
Conclusion : This case report demonstrates that the functional and esthetic aspects of cleft lip and palate patient were successfully improved through interdisciplinary treatment with orthodontics and dental prosthetics.

P-066

Craniofacial Morphological Characteristics in Orthodontic Patients with Microtia: a CBCT Analysis

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Objectives : The purpose of this study was to investigate the prevalence of microtia among orthodontic patients and to analyze their craniofacial morphology in three dimensions using CBCT.
Material and Methods : We retrospectively evaluated the frontal facial photos of 3,425 patients who visited the Department of Orthodontics, Gangneung-Wonju National University Dental Hospital over the past decade. Cephalometric radiographs, CBCT and plaster casts of 34 patients with microtia (16 males and 18 females) were analyzed. Patients were classified by maxillomandibular relationship based on ANB and mandibular plane angle from cephalometric radiographs. CBCT was used for three-dimensional comparison of skeletal asymmetry between affected and non-affected sides. The mesiodistal width of the permanent teeth was measured on plaster casts for patients with permanent dentition, comparing tooth sizes between affected and non-affected sides.
Results : Microtia was found in about 1.0% of orthodontic patients. Severity classification showed Grade I in 79.4%, Grade II in 5.9%, and Grade III in 14.7% of cases; there were no Grade IV cases corresponding to anotia. When classified according to the side affected by microtia, the left side had a high morbidity rate with 76.5%. In terms of skeletal relationships, 13 patients (38.2%) were skeletal Class I, 10 patients (29.4%) were skeletal Class II, and 11 patients (32.4%) were skeletal Class III. Vertically, 5 patients (14.7%) were hypodivergent, 15 patients (44.1%) were normodivergent, and 14 patients (41.2%) were hyperdivergent. CBCT analysis revealed no transverse differences but significant anteroposterior and vertical differences in skeletal asymmetry between affected and non-affected sides. There was no significant difference in tooth size between affected and unaffected sides.
Conclusion : Microtia was found in approximately 1% of orthodontic patients and was associated with anterior-posterior and vertical craniofacial structural asymmetry. Observing microtia can be used for an early diagnosis of craniofacial skeletal asymmetry.

P-067

Evaluation of Graft Survival and Contributing Factors in Early Secondary Alveolar Bone Graft

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Objectives : This study aims to evaluate the survival volume of bone grafts in patients undergoing early secondary alveolar bone grafting (SABG) and to identify the factors that influence graft survival.
Material and Methods : The study included 22 patients who received alveolar bone grafts and were monitored for one year postoperatively. Patients were divided into two groups based on the age at surgery and the presence of lateral incisors: the early SABG group and the conventional SABG group. Graft survival volume was measured by calculating the difference between the initial defect volume and the postoperative defect volume. The Mann-Whitney U test was used to compare graft survival between the two groups. Additional factors, such as the direction of graft filling and the eruption pattern of the lateral incisors, were also analyzed.
Results : The early SABG group demonstrated significantly higher graft survival compared to the conventional SABG group. The vertical direction showed less graft filling compared to the anteroposterior direction. Lateral incisors in the early SABG group exhibited distal angulation during eruption, while canines in the conventional SABG group tended to erupt with mesial angulation. Additionally, lateral incisors occupied more space in the graft area due to their buccal movement and distal rotation.
Conclusion : The findings of this study suggest that early SABG results in higher graft survival compared to conventional SABG. This increased survival may be associated with the eruption pattern of the lateral incisors.

P-068

Diagnostic Application of an Activator in Late Adolescent Class II Division 1 Malocclusion

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Introduction : Functional orthopedic appliance treatment of Class II malocclusion is recommended to be initiated at Cervical Vertebral Maturation stage 3 (CVM 3, around age 12). While the fixed Herbst appliance can be effective even later, it often causes considerable discomfort. Using other removable appliances at a later stage is not recommended due to their limited skeletal effects, primarily resulting in dental changes. However, if removable appliances can induce the necessary tooth movement through their dental effects alone, they can serve as diagnostic treatment before comprehensive orthodontics, considering existing studies that show significant variation in individual growth patterns.

Case Summary : A 16-year-and-4-month-old male with Class II Division 1 malocclusion (CVM 5-6, SMI 10-11) was treated with Class II activator for 18 months, improving molar relationships and reducing overjet. This treatment served a diagnostic purpose to determine the necessity of premolar extraction. Following this, comprehensive non-extraction orthodontic treatment was carried out, resulting in stable occlusion by age 22 years and 11 months.

Although the patient was already 16 years and 4 months old at the start, significant vertical mandibular growth was evident during orthopedic treatment. While it cannot be conclusively stated that the activator caused the mandibular growth, considering individual growth variations and the dental effects of Class II orthopedic appliances, the treatment effectively induced favorable tooth movement and improved diagnostic accuracy.

Moreover, considering the lip position 3 years after debonding (-6.4mm for the upper lip and -3.8mm for the lower lip), extraction orthodontics might have resulted in an excessively flat and unesthetic profile. Thus, proceeding with initial orthodontic treatment using an activator followed by comprehensive non-extraction fixed orthodontics was an appropriate choice.

Conclusion : Class II orthopedic appliances work best at CVM 3 but can be considered even later. The combination of an activator and non-extraction fixed orthodontics resulted in stable occlusion and enhanced facial aesthetics.

P-069

Orthodontic Traction of an Impacted Tooth in Adenomatoid Odontogenic Tumor : a Case Report

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Introduction : Adenomatoid odontogenic tumor (AOT) is a relatively uncommon odontogenic neoplasm that predominantly occurs in the anterior maxilla of young individuals. Histologically, it is characterized by epithelial proliferation in a variety of patterns and often associated with impacted teeth. Orthodontic traction of impacted teeth affected by AOT presents challenges due to the tumor's encapsulated nature and its impact on the periodontal ligament.
Case Summary : We report the case of an AOT in a 12-year-old boy who had an impacted right maxillary lateral incisor with AOT. Cone beam computed tomography confirmed a well-defined cystic lesion extending beyond the cementoenamel junction. Additionally, a radiopaque mixed density was observed within the lesion. Surgical exposure and removal of the lesion from the right maxillary lateral incisor was performed, followed by histopathological examination confirming the diagnosis of AOT. Due to minimal invasion of the lesion into the root, orthodontic traction of the tooth was initiated, with consideration given to auto-replantation if there is no response. After 8 months of treatment, successful repositioning of the tooth was achieved without any significant root resorption.
Conclusion : This case demonstrates that orthodontic traction may be attempted even for impacted teeth in AOT, particularly when the lesion is confined to the cervical third of the root.

P-070

Orthodontic Treatment of Growing Patients with Deep Bite

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Introduction : Common features of growing patients with deep bite are narrow maxillary arch and insufficient mandibular growth. Rapid palatal expander (RPE) is used to correct transverse discrepancies between maxilla and mandible, and functional appliances are used to correct skeletal discrepancies through pressure change of soft tissue and muscle function. By using RPE and functional appliances for growing patients with deep bite, the improvement of skeletal growth and dental relationship can be obtained.

Case Summary : Case 1) A 13-year-old male patient with deep bite and congenital missing of mandibular central incisors showed dental Class II relationship, narrow maxillary arch, and hypodivergent growth pattern. Maxillary arch was expanded using RPE, and mandibular growth and extrusion of posterior teeth were promoted by using Class II activator. Then, fixed appliances and twin block appliance were used together for additional mandibular vertical growth and correction of dental relationship.

Case 2) A 14-year-old female patient with deep bite and large overjet showed narrow maxillary arch and hyperdivergent growth pattern. Maxillary arch expansion was performed by using RPE. Then, twin block appliance with high-pull headgear was used for vertical control of upper posterior teeth and inhibition of the vertical growth of the mandible while stimulating horizontal growth of the mandible.

Conclusion : For growing patients with deep bite, it is necessary to develop a treatment strategy in accordance with the vertical growth pattern. The combined use of maxillary arch expansion and functional appliances can induce physiologic changes of neuromuscular pattern, which can lead to the promotion of residual growth of the mandible.

P-072

Skeletal Class II Jaw Relation Treated by Orthodontic Temporary Anchorage Device - A Case Report

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Introduction : Deepbite, large overjet and retruded mandible are often seen in patients with Class II jaw relation and malocclusion. Sometimes it is difficult to deal with these problem orthodontically without surgery. But when circumstances permit, camouflage treatment in orthodontics can also be a viable option. This clinical report presents a case of skeletal Class II jaw relationship with mandibular retrognathism and hyperdivergent facial pattern treated by orthodontic camouflage treatment.
Summary : A 18-year-old adult male patient with chief complaints of gummy smile and crooked teeth came to our OPD for evaluation. Extra-oral examinations revealed a convex lateral profile. Orthodontic camouflage treatment is selected after discussion with the patient and her family. Full-mouth fixed appliances were bonded and bilateral maxillary first bicuspid were extracted. And bilateral anterior subapical screws and IZC screws were placed at 6th and 13th month. After 36 months of treatment, the treatment goal was achieved.
Conclusions : Conclusion:
To achieve proper skeletal relationship, stable occlusion, and acceptable facial profile, orthodontic camouflage treatment was selected. We extracted bilateral maxillary first bicuspids and placed maxillary TADs to correct the large overjet. Additionally, bilateral subapical screws were placed to address the excessive gum show. The patient was satisfied with the treatment result. After further post-treatment follow-up, the treatment result was stable, and any relapse was insignificant, demonstrating the long-term effectiveness of the approach. Regular maintenance visits ensured the patient's occlusion and facial profile remained optimal.

P-073

Compensatory Treatment with Maxillary Expansion in a Patient with Three Mandibular Incisors

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Introduction : In patients with congenital absence of a mandibular incisor, the decision to restore the missing tooth or to align the three incisors as they are depends on the patient's age, tooth size ratio, and aesthetic demands. Aligning the three incisors without restroing missing tooth, results in a Class III molar relationship and misaligned midlines, but avoids additional surgery or tooth reduction required for implant or a 3-unit bridge. This presentation reports a case of a patient with a narrow maxillary arch and three mandibular incisors, treated with skeletal maxillary expansion, finishing with a Class III occlusion.

Case Summary : A 13-year-old female patient presented with a chief complaint of protrusive anterior teeth. The patient exhibited Angle's Class III malocclusion with a skeletal Class III relationship, along with a narrow maxillary arch, crowding in the anterior regions of both arches, a large overjet, and congenital missing of tooth #42. Given the patient's age, implant restoration was excluded. Restoration with a 3-unit bridge was also avoided due to the need for additional tooth reduction. Considering these factors, it was decided to align the three incisors and form a Class III molar relationship. The patient's narrow maxillary arch was expanded using MARPE, preventing the protrusion of lip profile. During the final stages of treatment, Class II elastics were applied to achieve appropriate overjet and overbite.

Conclusion : Generally, forming a Class I molar relationship should be the primary treatment goal. However, in special cases such as incisor missing, treatment goals can be adjusted considering various factors. For patients with three mandibular incisors, achieving a Class III molar relationship can complete the alignment without additional tooth reduction. Thus, forming a Class III occlusion can be an appropriate alternative for patients with three mandibular incisors.

P-074

Non-extraction treatment of severe crowding with palatally ectopic erupted maxillary premolars by segmental molar distalization

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Introduction : Although extraction is a common treatment option for orthodontists, it can present significant challenges to patients and their caregivers. It is therefore recommended that orthodontists treat borderline cases as non-extraction cases and, in some cases, even extraction cases should be treated as non-extraction cases. Nevertheless, it is evident that even if non-extraction orthodontic treatment is selected, the stability of the result after treatment should be considered without compromising the quality of treatment. This case report presents a case in which space was gained through retraction of the posterior dentition using skeletal anchorage.
Case Summary : A 16-year-old female patient presented with complaints of spacing of the maxillary anterior dentition and palatal translation of premolars. Furthermore, the patient exhibited peg lateralis on both sides of the maxillary teeth, which may have contributed to the observed spacing. Due to the palatal translation of premolars, maxillary first molars showed mesial shift and mesial-in rotation, causing Angle's Class II molar relationship. The potential for treating the patient through the extraction of premolars was also considered due to the protrusion of the lips. However, as the patient expressed a preference against extraction, the treatment plan was modified to minimize lip protrusion through the distalization of the maxillary posterior dentition. The treatment was completed approximately five years after its commencement. Despite a considerable time investment, the patient expressed satisfaction with the desired occlusion and aesthetics.
Conclusion : This case demonstrates that space regaining through distalization can achieve aesthetically desirable results without altering the patient's facial appearance. Although extraction of the premolars is the most logical way to address severe crowding in orthodontic treatment, non-extraction with active utilization of the posterior space can be a reasonable option for patients who wish to preserve their teeth as much as possible.

P-075

Autotransplantation combined strategic treatment in Class I malocclusion with asymmetric distribution of multiple missing teeth

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Introduction : Multiple premolars are frequently extracted for orthodontic purposes, but when premolars are congenitally missing, the edentulous sites can be closed as an alternative. In clinical situations where multiple missing teeth are asymmetrically limited to one quadrant orthodontically extracted premolar from another quadrant can be recycled to replace one of the edentulous sites. This case illustrate the improvement of malocclusion associated with asymmetric distribution of 2 missing premolars on the maxillary right side but no missing teeth on the left. One extracted premolar from the left side was used as a donor tooth and autotransplanted as a right premolar in addition to space closure of the edentulous sites.

Case Summary : A 14-year-old female patient presented mild protrusion, moderate crowding and multiple missing premolars (#15,14,35,45) with remaining deciduous second molars(#55,75,85). Due to the multiple missing limited to the maxillary right side and not the left side, maxillary midline was deviated to the right.

In general, 4 premolar extraction with space closure would be the standard of care to improve crowding as well as protrusion. However, under the circumstances of multiple missing teeth, 3 deciduous second molars(#55,75,85) and one maxillary left premolar(#24) was alternatively extracted. The extracted #24 was autotransplated to the right side to replace #14. Given that the donor tooth indicated open apex, root healing was expected. Within 2 months, routine orthodontic treatment was carried out including the transplant.

Occlusion, facial esthetics and the smile improved. Balanced occlusion with equal number of teeth for all 4 quadrants were achieved. The transplant indicated good prognosis throughout the orthodontic treatment. Root development was noted with apical closure and pulp obliteration, but there was no sign of ankylosis or root resorption.

Conclusion : Autotransplantation of orthodontically extracted premolar along with strategic space closure successfully improved the malocclusion associated with asymmetric distribution of multiple missing teeth.

P-076

Orthodontic treatment of patient with multiple impacted teeth extraction and bone graft

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Introduction : In the case of patients with multiple impacted teeth, there may be several treatment options, such as extracting impacted teeth and closing the space, or traction of impacted teeth. If extraction is chosen as the treatment plan, depending on the range of the bone defect site, orthodontic treatment can be continued after alveolar bone graft. Tooth movement to the alveolar bone graft site may affect the rate of tooth movement, alveolar bone remodeling, and root resorption, depending on the timing of starting tooth movement and the type of bone graft material, so a careful approach is needed. In this case, after extraction of multiple impacted teeth and alveolar bone graft, a clinically satisfactory alveolar bone remodeling was obtained as well as a good occlusion, and improved aesthetics and function.
Case Summary : A 21-year-old male patient came to our clinic for treatment of crowding. There was no significant medical history reported, but there was a dental history of an extraction of maxillary right second premolar due to crowding and dental caries. Based on facial and intraoral analysis, a diagnosis was made of Skeletal Class I malocclusion with missing of right maxillary first premolar and multiple impacted teeth including mandibular first premolar on both sides. Comprehensive orthodontic treatment with extraction of left maxillary second premolar and multiple impacted teeth, alveolar bone graft on extraction site of mandible was done. Clinically satisfactory alveolar bone remodeling was obtained as well as a good occlusion, and improved aesthetics and function.
Conclusion : Comprehensive orthodontic treatment with alveolar bone graft after extraction of multiple impacted teeth, proper timing of orthodontic tooth movement after alveolar bone graft can lead to decreasing in treatment period, reducing patient’s discomfort, satisfactory alveolar bone remodeling.

P-077

Consideration of facial aesthetics in camouflage treatment of anterior open bite

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Introduction : In anterior open bite cases, non-surgical orthodontic treatment options include extrusion of the incisors or molar intrusion. In a skeletal Class II and hyperdivergent patients, treatment with intrusion mechanism should be the treatment of choice, because the counterclockwise rotation of the mandible due to molar intrusion will improve the facial aesthetics in a favorable direction. In this presentation, we introduce a case in which good facial aesthetics and stable occlusion were obtained through orthodontic treatment accompanied by extraction of premolars and total intrusion in anterior open bite with hyperdivergent face.
Case Summary : A 25-year-old female patient with a chief complaint of lip protrusion and anterior open bite was diagnosed with skeletal Class II malocclusion with anterior open bite and clockwise rotation of the mandible. Additionally, transverse discrepancy and lip incompetency were observed. Orthodontic treatment with extraction was required to correct mild crowding, protruded lips and a skeletal rapid palatal expander was applied to correct transverse discrepancy in the patient. Subsequently, miniscrews were used to intrude the posterior teeth, promoting couterclockwise rotation of the mandible, resulting in a stable occlusion and improvement of the facial profile.
Conclusion : In skeletal Class II and hyperdivergent patients, intrusion of the upper and lower molars is an indicated treatment option for closing an open bite, resulting in counterclockwise rotation of the mandible. This counterclockwise rotation contributes to the improvement of a retrognathic chin profile and lip incompetence. For optimal long-term treatment results, a comprehensive understanding of aesthetics, occlusion and the establishment of an appropriate treatment plan was necessary.

P-078

A New Suggestion for Diagnosis of Posterior Transverse Discrepancy

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Introduction : Regardless of the degree of crowding, past studies have reported that the location of the root apices is almost at the center of the basal bone. Therefore, measuring the distance in the left and right root apices of 1st molars would be reasonable to diagnose posterior transverse discrepancy.
Discussion : According to the CRE proposed by the ABO, the line connecting the left and right buccal cusp tips and the lingual cusp tips should be within 1 mm. This inclination of the molars creates a functional occlusion that protects the teeth from grinding during lateral guidance, especially during sleep, minimizing occlusal interference in the posterior teeth. The method of measuring the distance in the furcations of the left and right 1st molars reported in the previous study may not be able to reflect the inclination of the upper and lower molars by ABO standards in diagnosis for the posterior transverse discrepancy. YTI has shown a mean value of -0.39 mm when diagnosing posterior transverse discrepancy based on the furcation. This value may mean that the posterior transverse dimension in the mandible is greater than the maxilla. Our study shows a mean value of 0.59 mm when measuring the posterior transverse dimensions from the 1/3 root apex of the left and right 1st molars. This study supports the popular idea that the width of the maxillary arch should be wider than the width of the mandibular arch at the end of treatment with the ABO standards.
Conclusion : Our study makes more sense when measuring the posterior transverse dimensions from the 1/3 root apex level of the left and right 1st molars than the posterior transverse dimension at the furcation level.

P-079

Factors influencing the Mentolabial angle in camouflage orthodontic treatment of skeletal Class III malocclusion

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Objectives : The purpose of this study is to identify and analyze factors influencing the mentolabial angle (MLA) in camouflage treatment of skeletal Class III malocclusion.
Material and Methods : 40 skeletal Class III (age: 20.8, ANB angle<0.5°) patients participated in this study. Lateral cephalograms obtained at the beginning and the end of the treatment treatment were analyzed. Variables including MLA, mandibular plane angle, incisors position, incisors angle, mandibular plane-B point-U1 tip angle, Pogonion-B-U1 tip angle, overjet, overbite, and lower lip thickness, were measured using software programs. Spearman correlation and Pearson correlation analysis was conducted to assess the relationships between MLA and each of variables. For variables showing significant correlations, multiple stepwise regression analysis was conducted with MLA.
Results : Pogonion-B point-U1 tip angle ($p<0.001$), FMA ($p<0.01$) showed the positive correlation with MLA while mandibular plane-B point-U1 tip angle ($p<0.001$) and lower lip thickness ($p<0.05$) exhibited a negative correlation with MLA. Multiple stepwise regression analysis revealed that Mp-B-U1 (β coefficient = -0.367, $p<0.001$) and FMA (β coefficient = 1.076, $p<0.21$) have an influence on MLA.
Conclusion : In the camouflage treatment of skeletal Class III malocclusion, clockwise rotation of the mandibular plane can result in an increase MLA. Augmentation of the B point through distalization of the mandibular dentition, combined with maxillary incisor extrusion can contribute to a reduction in MLA. To achieve an esthetically pleasing facial profile, consideration of the coordination between mandibular plane rotation and mandibular dentition posterior movement is essential in orthodontic treatment. As the MLA decreases, leading to an increase in the thickness of the lower lip, it is crucial to consider this correlation when anticipating how the lower lip will respond to the distalization of the mandibular dentition.

P-080

Development and possibilities about 3D measurement system for dental model using "Measurement Templates"

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Purpose : Conventional oral cavity measurement method by directly placing a caliper on a dental model has limitations such as results vary depending on the operator, no records of the measurement process can be kept, and measurement items are limited to length measurement. The purpose of this study is to solve this problem by using digital data from CT scans for measurements and propose more advanced measurement items.
Materials and methods : Dental model was imaged with a CT scanner. The obtained 3D images were visualized and converted into 2D images using 3D image visualization software and used this to create measurement templates. Then the orthodontist adjusted the measurement points on the measurement templates and performed measurement processing using dedicated programs. In the measurement process, the coordinates of the measurement points on the measurement template were matched with the coordinates in the 3D image, followed by spatial distance measurement and palatal volume measurement. The results of these measurements were plotted and summarized in a variety of ways and it was visualized as 3D images.
Results : Measurement of distance and palatal volume with a resolution of 0.1 mm was achieved. In addition, since this is not fully automated, and the orthodontist indicates the measurement points, the accuracy of the results is guaranteed.
Conclusions : Measurement using measurement templates and 3D images contribute to realizing accurate and fast dental measurement. In particular, it is expected that the measurement of palate volume will be useful in future research. This is a new measurement item that can be realized by using 3D images.

P-081

Assessment of Mandibular Symphysis Tissue Thickness in Skeletal Class III Patients with Different Vertical Patterns

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Objectives : The aim of this study is to assess the bony and soft tissue parameters at the mandibular symphysis in skeletal Class III patients with varying vertical growth patterns, using cone-beam computed tomography (CBCT). This study specifically focuses on differentiating the parameters according to vertical patterns and their possible interrelationships.
Material and Methods : CBCT images of 60 skeletal Class III non-growing patients were evaluated. Study samples were classified into three vertical patterns based on the mandibular plane angle (SN-NP angle): low, normal, and high angle. The bony and soft tissue parameters at the mandibular symphysis were measured and compared.
Results : Regarding the hard tissue parameters, symphysis and pogonion width were significantly narrower in the high-angle group ($p < 0.05$). Additionally, the thickness of the buccal cortex at the pogonion was also significantly thinner in the high-angle group ($p < 0.01$). While symphysis height showed increasing tendency from low-angle to the high-angle group, no significant differences were observed in chin width and height across different vertical patterns. In terms of soft tissue parameters, the low-angle group exhibited the highest thickness, which progressively decreased in the high-angle group. Statistically significant differences in soft tissue thickness were found at Menton (Me) and Gnathion (Gn) ($p < 0.05$). Correlation analysis revealed an inverse relationship between the SN-MP angle and the thickness of both hard and soft tissues.
Conclusion : In skeletal Class III subjects, significant differences existed in both hard and soft tissues at the mandibular symphysis, based on vertical growth patterns. These findings offer a comprehensive evaluation of the symphyseal area, which can aid clinicians in determining appropriate treatment approaches, especially for combined orthognathic and orthodontic treatment.

P-082

Circumpubertal Maxillomandibular Growth Compared with Skeletal Maturation Evaluated by Stature, Hand-wrist and Lateral Cephalometric Radiographs

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Objectives : The purpose of this presentation is to compare maxillary and mandibular growth with the skeletal growth evaluation of hand-wrist x-rays and lateral head films as well as records of every 6 months' stature growth from the local Korean patients treated in this presenter's private clinic for the past 2 decades.

Material and Methods : 37 patients (17 males, 20 females) were used. The hand-wrist radiographs were taken every 6 months and lateral cephalograms annually, and statures were measured biannually from 9-10yr 6m until 2-3 yr after pubertal growth peak period estimated by stature growth. The hand-wrist radiographs were evaluated for skeletal maturation indicator(SMI) according to Fishman. The cervical vertebrae were staged in the 6 stages of maturation(CVM) described by Baccetti and McNamara Jr, et al. Maxillary and mandibular length was measured as the distance of ANS-PNS and CO-Gn. Each evaluations of all patients were described as figures according to stature growth in chronologic age. The interval from the most increase to the most decrease in each measurement of stature and maxillomandibular length was compared as the circumpubertal period. The comparisons were presented on the figures and the tables.
Results : The growth peak was not depicted in a pointed peak but as a ridge (broad peak). The circumpubertal growth period was almost SMI 5 to 7 (range 3 to 8) in male and 4 to 7 (range 3 to 8) in female, CVM 2 to 5 (range 1 to 5) in both. Mandible showed almost similar growth tendency to stature growth, but maxilla showed a little late growth as compared with SMI and CVM. Mandible showed late longer growth even after the end point of SMI and CVM particularly in males.
Conclusion : The stature measurement, the cervical vertebra and hand-wrist evaluations were the clinically useful growth predictors of maxilla and mandible.

P-083

Factors on the panoramic radiograph associated with the mandibular posterior available space

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Objectives : The purpose of this study was to analyze the correlation between various factors measured on the panoramic radiograph and the mandibular posterior available space (MnPAS) measured using cone-beam computed tomography (CBCT).
Material and Methods : The subjects were 62 patients in their twenties whose eruption patterns on the left and right mandibular third molars (L8) were different in panoramic radiographs. MnPAS was measured at the root apex level along the posterior occlusal line connecting the center of resistance of the first and second molars on the axial slices of reconstructed images from CBCT. The difference in MnPAS according to the difference in eruption patterns of L8 was measured, and the correlation between MnPAS and various variables measured on panoramic radiograph were evaluated.
Results : MnPAS was significantly larger on average by 0.88mm on the side with upright L8 ($p < 0.05$) and it also larger on average by 0.96mm on the side with L8 erupted to the occlusal plane ($p < 0.05$). Among variables in panoramic radiograph, the vertical distance (Pano-V) from the distal root apex of mandibular second molar (L7) to the upper cortex of inferior alveolar canal (IAC) exhibited a high statistically significant correlation ($r = 0.734$, $p < 0.001$) with MnPAS. As a result of regression analysis and discriminant analysis of Pano-V in MnPAS, the coefficient of determination of predicted MnPAS was 0.535, and it identified that in 83.1% of cases where Pano-V was measured less than 2.26mm, distal root of the mandibular second molar was in contact with the lingual cortex.
Conclusion : The difference in MnPAS according to the difference in eruption patterns of left and right L8 was less than 1mm on average. Pano-V showed a high correlation with MnPAS, and CBCT assessment is recommended for patients requiring significant posterior movement of molars, when Pano-V is measured to be less than 2.26mm.

P-084

Analysis of unilateral impacted maxillary canine crown tip and apex position

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Objectives : The purpose of this study was to analyze the position of the unilateral impacted maxillary canine compared to the fully erupted maxillary canine on the opposite side by using Cone-beam computed tomography (CBCT).
Material and Methods : This study was conducted based on the data of permanent dentition patients with unilateral impacted maxillary canine and fully erupted maxillary canine on opposite sides who visited the Department of Orthodontics, Yonsei University Dental Hospital between 2018 and 2022. A total of 30 patients consisting of 19 Females and 11 Males were selected, and the average age was 15.0 years (Range 9~38Y). The analysis was performed by projecting crown tips and apex coordinates on the occlusal plane and comparing the impacted canine quadrant to the normally erupted canine quadrant. The sector was divided according to proximity to each tooth; Central incisor(U1), lateral incisor(U2), canine (U3), first premolar(U4), second premolar(U5)
Results : For the crown tip, 14 cases on U1, 10 cases on U2, 5 cases on U3, 1 case on U4, and no case on U5 were found. Most of the crown tips were found near the central and lateral incisor apex, meaning mainly palatal impaction. For the apex, 2 cases on U1, 2 cases on U2, 10 cases on U3, 12 cases on U4, 4 cases on U5. Most of the apex were found at the canine and premolar apex palatal side. It means that guiding the eruption of impacted canines is the correction of not only the crown but also the apex.
Conclusion : Most of the impacted canine analyzed showed palatal impaction and disto-palatally positioned apex compared to normally erupted canine. Evaluating not only the crown tip but also the apex will be important for successful treatment.

P-085

Influence of Facial Width on Perception of Lip Protrusion and Its Differences Between Profile & 3-D Videoclip

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Objectives : This study evaluated the influence of facial width on the perception of lip protrusion and investigated the concordance between 2-dimensional (2D) profile images and 3-dimensional (3D) video clips in assessing lip protrusion.
Material and Methods : An Asian female standard head model was created using 3D modeling software. Eight head models were constructed by modifying the standard head model in terms of facial width (broad, neutral, and slim) and lip protrusion (retrusive, straight, and protrusive). Overall, 97 Asian raters rated the lip protrusion from the 2D profiles and 3D rotation video clips of the 9 models.
Results : No significant differences were found in the perception of lip protrusion in terms of sex, age, or occupation. Compared with the 2D profiles, the 3D video clips were rated as more protrusive in 8 of the 9 head models, with the retrusive broad, retrusive neutral, straight broad, and straight slim faces showing statistical significance ($P < 0.01$). The rating is significantly higher in slim faces than in broad faces across the 3 groups of 2D profiles ($P < 0.01$). For 3D video clips, the rating was higher in slim faces than in broad faces in all 3 groups, whereas differences were significant in the straight and protrusive groups only ($P < 0.01$)
Conclusion : In this study, 3D video clips were more sensitive to the perception of lip protrusion than were 2D profiles to some extent. The lips were rated relatively more protrusive in a slim face than in a broad face. Therefore, the relationship between facial width and lip protrusion should be considered in orthodontic treatment goals and treatment plans.

P-086

Factors influencing the successful eruption of maxillary third molar after extraction of maxillary second molar

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Objectives : The objective of this study was to assess the occlusal status of the maxillary third molars that erupted spontaneously after extraction of the maxillary second molars and investigate the factors that influenced the occlusal status of the maxillary third molars.

Material and Methods : 136 upper 2nd molars from 87 patients were extracted and the eruption of 3rd molars were followed up. The patients regularly visited the hospital and verified the time of complete eruption of the maxillary third molar. Panoramic and lateral cephalometric x-rays and study model were taken from the time of maxillary second molar extraction to the complete eruption of the maxillary third molar. The study model was measured by ABO grading system. The position of maxillary third molar was evaluated with the panoramic x-ray. The maxillary tuberosity space was measured using lateral cephalometric x-ray.

Results : The success rate of upper 3rd molar eruption was 100%. Among them, 47.8% exhibited good occlusion(G group), 17.6% was acceptable(A group), and 34.6% showed poor occlusion(P group). The G group had h higher proportion of Nolla stages 4~7, and a lower proportion of Nolla stages 8~10.

The distance between the PTM and upper 1st molar, as well as the Nolla stage of the 3rd molar, influenced the ultimate occlusion. Whereas the initial status of upper 3rd molar did not have any impact on the final occlusion.

Conclusion : Good-to-acceptable occlusion was seen in 65.4% of the maxillary third molars after maxillary second molar extraction. Insufficient increase in the maxillary tuberosity space and Nolla stage 8 or higher at T0 negatively influenced the maxillary third molar eruption.

P-087

Maturity Evaluation and Correlation Analysis of Skeletal Maturity Indices and Orthodontically Important Sutures: CBCT Study

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Objectives : The purpose of this study was to evaluate the maturation stages of Cervical vertebral maturation (CVM), Spheno-occipital synchondrosis (SOS), Midpalatal suture (MPS), Zygomaticomaxillary suture (ZMS), and Zygomaticotemporal suture (ZTS) in patients aged 6 to 20 years and identify correlations between the maturation stages of these structures.
Material and Methods : The study was based on cone-beam computed tomography images of 203 patients with no orthodontic treatment history. Skeletal maturity was evaluated using the CVM and SOS, and suture maturity was assessed for MPS, ZMS, and ZTS.
Single investigator assessed skeletal maturity indices and suture maturation for all subjects with intra-examiner repeatability assessed using weighted kappa. To observe the correlations between each maturity indices, Spearman's rho rank order correlation analysis was performed. Additionally, crosstab analyses between the sexes were performed to find any sex differences.
Results : All values showed statistically significant positive correlations. ($p < 0.01$)
There was a strong correlation between skeletal maturity indices (CVM-SOS, 0.887) and Correlations between skeletal maturity indices and suture maturation were relatively weak. (0.726 ~ 0.788)
A strong correlation was observed between ZMS and ZTS (0.880), and the correlation between MPS and other suture stages was relatively weak. (MPS-ZTS, 0.690 and MPS-ZMS, 0.643) A wide age distribution was observed for suture maturation. Similar results were shown for both genders, but the correlations were more apparent for men than women.
Conclusion : This study found a positive correlation between the skeletal maturity indices and the maturity of orthodontically important sutures. but suture maturation shows a wider age distribution than skeletal maturity indices, which means that when planning dentofacial orthopedic treatment, simply considering age and skeletal maturity is not enough. Therefore, Maturity analysis of MPS, ZMS, and ZTS, which act as major resistance to orthopedic forces, is helpful in determining when and whether to intervene in treatment and predicting treatment response.

P-088

Assessing Orthodontic Treatment Need in Virtual Consultations: A Comparison of Photographic Evaluations and Clinical Grading

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Purpose : The rise of virtual orthodontic consultations using photographs prompts a need for rigorous evaluation to determine the accuracy and reliability compared to actual orthodontic treatment requirements. This study aimed to establish the consistency of orthodontic treatment need assessments from photographs, comparing evaluations between dental professionals and laypeople and the Index of Orthodontic Treatment Need Dental Health Component (IOTN DHC) grading of study models within the same patient cohort.
Materials and methods : A retrospective analysis was conducted using intra-oral photographs and digital study models selected from 50 orthodontic patients from a national dental center's records archive, representing specific occlusal traits. Twenty-four assessors were categorized into orthodontists, general dentists, non-orthodontic specialists, orthodontic residents, and laypeople. Inter-group evaluations of treatment need based on photographs were compared with the IOTN DHC grade of digital study models, employing Kappa statistics and percentage agreement for analysis.
Results : Orthodontists, orthodontic residents, and general dentists exhibited higher agreement (k=0.339-0.655) for photographic assessments in comparison to non-orthodontic specialists and laypeople (k=0.075-0.468) against the IOTN DHC grade. Across all groups, agreement was substantial for photographs depicting crowding (k=0.493-0.602) and low for spacing (k=-0.039-0.237). Spacing was perceived to require higher treatment intervention than indicated by IOTN DHC across all groups. Orthodontists and general dentists perceived reverse overjet, posterior crossbite, and lateral open bite photographs to necessitate higher treatment need compared to laypeople.
Conclusions : Orthodontic treatment need can be reliably assessed from photographs by dental professionals and laypeople, except for spacing, reverse overjet, posterior crossbite, and lateral open bite.

P-089

Difference in Perception of Chin Deviation between Mandibular Retrusion and Mandibular Protrusion Patients

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Objectives : The purpose of this study was to identify how orthodontists and laypersons perceive the degree of chin deviation of mandibular retrusion patients and that of mandibular protrusion patients.
Material and Methods : Eighteen facial asymmetry patients with evenly distributed menton deviation and ANB values were selected based on frontal and lateral cephalograms. Nine patients had mandibular retrusion and the other 9 had mandibular protrusion. Panels of 20 orthodontists and 20 laypersons evaluated the chin deviation of 18 randomly presented frontal facial photographs by making a mark on a visual analogue scale (VAS). The degree of perception was analyzed based on menton deivation and ANB, and was compared between orthodontists and laypersons.
Results : The degree of facial asymmetry perception of chin deviation, expressed in VAS, was proportionate to the degree of menton deviation. The degree of perception of orthodontists was generally higher than that of laypersons regardless of maxillo-mandibular discrepancy. The degree of perception of chin deviation in mandibular protrusion patients was higher than that in mandibular retrusion patients regardless of menton deviation. The degree of perception of chin deviation in mandibular protrusion patients becomes greater than that in mandibular retrusion patients as maxillo-mandibular discrepancy becomes bigger.
Conclusion : The results of this study suggest that the perception of chin deviation in mandibular protrusion patients is higher than in mandibular retrusion patients. This indicates that more careful evaluation for chin deviation is required in mandibular protrusion patients.

P-090

Implant Restoration Case After Clear Aligner Treatment

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Introduction : The transparent aligner that has been widely used in recent years has the advantage of being comfortable to wear because it is corrected without attaching a conventional bracket. Therefore, adults prefer clear aligners. Learn about cases where the dentition was corrected using a clear aligner and the missing tooth was repaired with implants.
Case Summary : Using the Clear Aligner device, the step-by-step design of the aligner is set up and set up to start the orthodontic treatment first. Then, once you have a space to place the implant, place the implant in that location. Temporary teeth can be manufactured and masticated, and at the same time, the power of the implant prosthesis can increase the corrective power and accelerate the orthodontic treatment. With the implant temporary tooth inserted, a new oral scan can be made and a clear aligner can be made.
Conclusion : In conclusion, orthodontic treatment is becoming a concurrent treatment for patients who need implants. As more and more patients need orthodontic and prosthodontic treatment at the same time, it is hoped that dentists performing orthodontic treatment will also have a perspective to properly secure the space needed for prosthetics. In recent years, there has been an increasing number of patients with aesthetic needs, so it is expected that the number of cases in which implants are applied after correction using clear aligners is expected to increase.

P-091

Orthodontic Treatment Using Digital Articulator

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Introduction : For successful orthodontic treatment, it is necessary to precisely evaluate the occlusion. Especially in patients with an unstable occlusion, an additional process evaluating condyle position and mandibular movement using an articulator is needed prior to orthodontic treatment. However, using a conventional articulator requires a complicated working process with a high possibility of accumulation of laboratory errors. This case report introduces the clinical application of a digital articulator in orthodontics, which can be more accurate and convenient compared to the conventional articulator.
Case Summary : A 24-year-old female patient with skeletal Class II malocclusion and hyperdivergent skeletal pattern presented with a dual bite, irregular margins on the surfaces of both condyles, and history of temporomandibular joint (TMJ) pain. Digital mounting was performed to determine whether centric relation occlusion-maximum intercuspal position (CRO-MIP) discrepancy is within an acceptable range using only with a patient's intraoral scan and cone-beam computed tomography (CBCT) data. Condyle position was monitored during orthodontic treatment with extraction of premolars. Stable occlusion was maintained after 2-year follow up.
Conclusion : Digital articulators enable precise and repeatable evaluation of the condyle position without complicated and time-consuming laboratory processes compared to conventional articulators. Therefore, using a digital articulator prior to orthodontic treatment planning in patients with CRO-MIP discrepancy can result in successful and predictable orthodontic treatment.

P-093

Fabrication of orthodontic devices by metal 3D printer: Design specialized for personal customization

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Introduction : Recently, the advent of metal 3D printers has revolutionized the medical field, making it possible to manufacture complex designs on CAD software with the features of additive manufacturing. In addition, the use of metal has the advantage of high strength and stability. In the field of orthodontics, this technology is revolutionary since it enables the design and fabrication of a wide variety of devices. In this report, we present a case of mandibular protrusion treated with a metal 3D printer fabricated maxillary protractive appliance (MPA).
Materials and Methods : Manufacturing devices using the digital workflow begins with an intraoral scan, followed by the design of the device using CAD software. Next, a metal 3D printer is used to fabricate the device. In this case, the patient was diagnosed with mandibular protrusion, requiring treatment using maxillary protraction; MPA was employed to treat this. MPA fabricated in this study maintains the conventional functionality, but the external shape has been significantly changed. The design considered the improvement of the lingual feeling by a smooth outline, and the direction to facilitate traction of the maxillary bone and the mesial tipping of the maxillary left first molar. After treatment, the skeletal proportion and anterior crossbite was improved, along with the mesial tipping of the maxillary left first molar, yielding successful results.
Conclusions : In this report, successful treatment results were obtained using an MPA fabricated by a metal 3D printer. The digital workflow has the advantage of flexibility in design, enabling individualized and specialized designs that improve the patient's discomfort with the orthodontic appliance. It also has the advantage of simplifying treatment procedure. In this case, the fabrication of an orthodontic device using a metal 3D printer and its effectiveness in clinical practice were demonstrated.

P-094

Changes in the Occlusal and Mandibular Planes After Clear Aligner Treatment in Deepbite Patients

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Objectives : Deep bite patients with accompanying extrusion of the lower anterior teeth are commonly observed and considered one of the treatment objectives in achieving normal occlusion by intrusion of the lower incisors. Conventional fixed appliances mostly utilize reverse curve of spee or sectional archwires. However, this approach frequently leads to extrusion in the molar region, inadvertently increasing the vertical height of the lower face and resulting in undesirable changes in facial aesthetics and occlusion. Although there are reports on the use of Clear Aligners for the treatment of deep bite, studies extensively reviewing changes in the occlusal plane are rare. The Null hypothesis of this study is that Invisalign treatment can improve deep bite without increasing the mandibular plane.
Material and Methods : In a study conducted at Ajou University Dental Hospital, cephalometric analysis was performed on 21 patients with Class I and II deepbite to measure changes in various cephalometric parameters, including ANB, SNB, FMA, SN-GMe, IMPA, and the occlusal plane. The results were compared with the planned tooth movements outlined in the ClinCheck software. During the Invisalign treatment, the G5 protocol was employed, especially incorporating intrusion attachments on the mandibular canines.
Results : The overbite was decreased and normalized. ANB, FMA, and IMPA did not change significantly, while the lower occlusal plane increased significantly. The lower incisors intruded statistically significantly, 1.6, 1.9, 1.7mm at the crown tip, centroid, and root apex, respectively, confirming pure intrusion while the extrusion of lower molars was not significant. The average lower incisor inclination change in the ClinCheck was correlated with IMPA.
Conclusion : The deepbite correction utilizing Invisalign was successfully achieved through the pure intrusion of the lower incisors and increment of the occlusal plane.

P-095

A Study on the Compressive Strength of 3DPA for the Specific Design of Clear Aligner

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Objectives : This study aimed to evaluate the compressive strength of 3D direct printing aligners(3DPA) compared to conventional thermo-forming aligners(TFA) to investigate their clinical applicability
Material and Methods : In the experimental group, the 3DPA material TC-85(TC-85 full) was used to create angular protrusions termed Rectangular Pressure Areas (RPAs). A protrusion akin to the Power-Ridge typically used in conventional TFAs was made from PETG (PETG; control 1). RPA using the same TC-85 without filling the protrusions was employed (TC-85 blank; control 2). Compression cycle tests were conducted on an LTM 3 HR electro-dynamic testing machine (Zwick Roell, Germany), with the number of cycles set at 500 and compression depths of 100, 300, 500, and 700μm. A total of 20 specimens were tested for PETG, 17 for TC-85 blank, and 19 for TC-85 full
Results : Changes in compressive force were assessed by varying material type and thickness. The results indicated significantly higher and broader range compressive strengths for specimens fabricated with the 3DPA material TC-85 compared to those made from PETG. Among the TC-85 specimens, TC-85 full demonstrated the highest and statistically significant compressive strength compared to TC-85 blank
Conclusion : The 3DPA technology enables precise modifications in aligner shape and inner thickness at specific dental sites, including the creation of ridges at targeted areas. These alterations enhance the biomechanical capability of the aligners to exert selective forces necessary for desired tooth movement while reducing the number of attachments, showcasing the clinical potential of 3DPAs in orthodontic treatment

P-096

The Effect of a Surgical Guide on the Success Rate and Root Proximity of Miniscrews

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Objectives : To assess the success rate and proximity to the root of miniscrews by utilizing surgical guides produced through the integration of data obtained from dental CBCT and intraoral scanned models.
Material and Methods : A retrospective study was conducted involving 123 patients (224 miniscrews) who underwent miniscrew placement as part of orthodontic treatment. Two operators placed miniscrews between the buccal alveolar bone of each patient and assessed the initial stability by measuring Periotest value (PTV) and insertion torque (IT). Periapical radiographs were taken to evaluate root contact. Miniscrews that remained in place for over 6 months were considered successful.
Results : There was a statistically significant difference in the Kaplan-Meier survival curve between groups ($P < 0.05$). The success rates of miniscrew were 79.1% for the manual group and 90.5% for the surgical guide group respectively, showing a significant difference between the groups ($P < 0.05$). The root contact rate was 17.5% in the manual group and 0.1% in the surgical guide group, showing a statistically significant difference ($P < 0.001$). The PTV and IT did not show significant different between the groups.
Conclusion : Proximity to the root and the use of guides have the most direct impact on the success rate of miniscrews, and through the use of miniscrew surgical guides, proximity to the root can be effectively reduced. Therefore, it is recommended to use a miniscrew surgical guide to increase the success rate of miniscrews as a stable anchorage device, especially in cases where the interradicular space is narrow.

P-097

Success Rate and Initial Stability of Orthodontic Mini-screws Implanted with In-office Fabricated Surgical Guides

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Purpose : This study aims to evaluate the survival rate and initial stability of orthodontic miniscrews implanted using metal sleeve-free surgical guides by residents compared to traditional manual methods.
Materials and methods : In this prospective single-center, two-arm parallel randomized controlled trial (RCT), 60 adult patients with 120 miniscrews were assigned to either the Manual group (M group) or Surgical guide group (SG group). Root proximity and initial stability were assessed in both groups, and the success of miniscrews was monitored throughout the six months of observation.
Results : One patient dropped out this RCT and finally 60 miniscrews in M group and 58 miniscrews in SG groups and were evaluated. No significant differences in baseline characteristics were found between the groups. The SG group exhibited a higher success rate (84.5%) compared to the Manual group (68.3%) at six months post-implantation but not statistically significant. However the survival rate based on Kaplan-Meier survival curve showed significant difference between 2 groups. No notable variations were observed in insertion torque or Periotest values. However, the study found that root proximity and interradicular distance had a significant effect on the success rate ($P<0.05$).
Conclusions : In conclusion, these surgical guides enhance the survival rate of orthodontic miniscrews, offering a reduced risk of root injury.

P-098

Accuracy & Reliability of Interproximal Space Measurement in Different Orthodontic Virtual Set-up programs

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Objectives : The purpose of this study is to evaluate accuracy and reliability of interproximal space measurement in two different virtual set-up programs in comparison with clinical space.
Material and Methods : This study includes 85 interproximal area samples from 23 patients (mean age = 29.2 ± 10.8) The inclusion criteria are as follows: 1) anterior spacing between canines in maxillary and/or mandibular dentition, 2) virtual space (VS) measured on intra-oral scanned models including the teeth and gingiva, 3) clinical space (CS) measured using a strip gauge in 0.05mm unit, and 4) healthy periodontium. Virtual spaces (VS) were analyzed by two different programs: semi-automatic segmentation - Orthoanalyzer (3shape; VS1) and full-automatic segmentation - Autolign (Dirco; VS2). The intra-observer reliability (VS1, VS2) and mean difference (CS-VS1, CS-VS2) were analyzed statistically. In addition, the accuracy of space measurement according to the amount of space was compared.
Results : Intra-observer reliability showed almost perfect in both VS1 (0.932) and VS2 (0.944). The mean amounts of VS were 0.10 mm and 0.13 mm in VS1 and VS2, respectively, compared to 0.21mm of mean CS ($P < 0.05$). This means that both VS were underestimated. The mean difference between VS1 and CS (CS-VS1) showed significantly greater than that between VS2 and CS ($P < 0.05$), which indicated VS1 showed large measurement errors. In addition, according to the all intervals of space amounts, the mean differences of CS-VS1 showed significance compared to those of CS-VS2. Especially, these differences were significantly found in the space amount below 0.25mm interval.
Conclusion : This study suggests that intraoral scanning and virtual segmentation can underestimate space measurement of interproximal spacing. Therefore, a clinician may need to evaluate actual clinical space and prescribe overcorrection for space closure in virtual setup for spaces less than 0.25mm.

P-099

Comparison of Four Different Measurement Methods in the Accuracy of Anterior Bolton Ratio

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Objectives : The aim of the study was to evaluate the accuracy of anterior Bolton ratio using four different measurement methods: 3D scan files, 3D printed models, traditional plaster models, and measurements taken directly from the patient's mouth.
Material and Methods : The study consisted of 20 patient records from the diagnostic orthodontic database. Plaster models were obtained using the same type of dental stone, while intraoral scans were performed and printed using the same 3D scanner, printer, and filaments. Four different measurements were calculated for each patient using digital caliper and digital software. The accuracy of these measurements was analyzed using paired t-tests to compare the differences between the groups. In addition, the Intraclass Correlation Coefficient (ICC) was used to determine the agreement between the measurements.
Results : The P-values from the paired t-tests for the anterior Bolton ratio between the groups were all greater than 0.05, indicating that there were no statistically significant differences between the groups. Additionally, the Intraclass Correlation Coefficient (ICC) showed that the anterior Bolton ratio obtained from four different measurement methods exhibited excellent agreement. Furthermore, the tooth size discrepancies were all within the clinically acceptable limit of 1.5 mm as suggested by Dr. Profitt.
Conclusion : 3D scan files, 3D printed models and traditional plaster models all exhibited clinically acceptable accuracy in assessing anterior Bolton ratio when compared to measurements taken directly from the patient's mouth.

P-100

The combined use of SBJA and high-pull J-hook headgear improve gummy smile in growing patient

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Introduction : In recent years, a method for improving gummy smiles in adults using an orthodontic anchor screw has been reported, but there is yet to be a treatment for the gummy smiles of those in the growth period. We report a case of class II patient with gummy smile during the growth period, using a simple bite jumping appliance (SBJA) in combination with the high-pull J-hook headgear.

Summary : The patient was a Japanese boy of 10 years and 7 months at the time of his initial examination, with a chief complaint of deep overbite. When smiling, the distance between the upper lip to the maxillary left central incisor cervical line was 6.0 mm, and a gummy smile was notable. This case was diagnosed as a case of skeletal class II, accompanied by a gummy smile due to the vertical excessive growth of the upper jaw, and a deep overbite. We decided to use the SBJA for the purpose of improving the overbite, and skeletal maxillary prognathism. Furthermore, we elected to suppress the vertical growth of the maxillary anterior teeth and to improve the gummy smile by using a combination of SBJA and high-pull J-hook headgear. In this patient, as a result of treatment, SNA remained unchanged from 85.0°, while SNB increased from 78.5°to 80.5°. As a result, ANB changed from 6.5°to 4.5°, and the skeletal maxillary prognathism improved. The left central incisor cervical exposure while smiling decreased from 6.0 mm to 0.0 mm, thus improving the gummy smile. In addition, the deep overbite improved, and the molar relationship changed from class II to class I.

Conclusions : SBJA in combination with the high-pull J-hook headgear inhibited the vertical growth of the maxillary anterior teeth and improve the gummy smile in growing patient.

P-101

Correction of Asymmetry in a Hyperdivergent Skeletal Class I Growing Patient with Transverse Discrepancy

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Introduction : Facial asymmetry and transverse discrepancy, especially when accompanied with hyperdivergent growth pattern present significant challenges in orthodontic treatment. Effective management of these complex conditions during the growth period requires precise orthopedic interventions. This case report describes the treatment of a growing patient with hyperdivergent skeletal Class I malocclusion and transverse discrepancy, focusing on the correction of facial asymmetry and transverse discrepancy using targeted orthopedic techniques.
Case Summary : This case report is about an 11-year-old patient who had hyperdivergent skeletal Class I malocclusion with transverse discrepancy and facial asymmetry. To correct transverse discrepancy, an active plate with expansion screw was utilized. For the correction of facial asymmetry and control of hyperdivergent growth, posterior biteblock was modified based on the concept of the “Mongini splint” by selectively grinding one side to create disocclusion, redistributing occlusal forces to guide the mandible into a more symmetrical position. The strategic modification of posterior biteblock and the correction of the transverse discrepancy led to a noticeable improvement in facial asymmetry. The orthopedic treatment effectively addressed the transverse and asymmetrical aspects of the malocclusion, with further orthodontic interventions planned for comprehensive correction.
Conclusion : Utilizing an active plate with an expansion screw and a strategically modified posterior biteblock, successful treatment of transverse discrepancy and facial asymmetry was achieved in a growing hyperdivergent skeletal Class I patient.

P-102

Nonextraction Treatment of Severe Class II Malocclusion Using the Double plate in a Post-pubertal Patient

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Introduction : The double plate appliance is an effective functional appliance for the treatment of Class II malocclusions. The skeletal effects of the double plate include mandibular growth enhancement, mandibular arch anterior displacement, maxillary growth reduction, maxillary arch posterior displacement, and temporomandibular joint remodeling. This case presentation describes the treatment of a severe Class II malocclusion with mandibular retrusion using the double plate appliance and fixed orthodontic appliances in a post-pubertal patient.
Case Summary : A 12.9-year-old girl presented with a class II malocclusion with a constricted maxillary arch and a retruded mandible. Her hand-wrist radiograph was R-I stage, indicating post-pubertal growth, and she had menarche 7 months ago. The double plate appliance was used to expand maxillary molar width, as well as to correct the sagittal discrepancy. After 12 months, the double plate appliance was stopped and fixed orthodontic appliances were used to align the dentition and improve the maxillomandibular interdigitation. The facial profile was improved with harmony between the upper and lower lips. And Class I molar relationship, normal anterior overjet and good interdigital occlusion were achieved. Post-treatment radiographs showed reduced maxillomandibular sagittal discrepancy.
Conclusion : The double plate appliance is an effective and efficient orthopedic appliance for the treatment of class II malocclusions in post-pubertal patients.

P-103

Growth modification and Camouflage treatment for skeletal class II division 1 with congenital missing tooth

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Introduction : Skeletal Class II Division 1 malocclusion presents problems such as protrusion of the maxillary anterior teeth, increased overjet and mandibular deficiency. These problems become more severe when there is a congenital missing of the mandibular incisor. In growing patients with skeletal class II division 1 malocclusion, orthodontic intervention for growth modification can be performed with various functional appliances. The desired effect of treatment using these appliances would be to inhibit horizontal and vertical growth of the maxilla and stimulate the horizontal growth of the mandible to attain optimal occlusion. Class II activator can be an effective appliance for regulating mandibular growth direction to a more forward and upward position. Moreover, high-pull headgear can increase skeletal inhibition of forward maxillary growth, control the occlusal plane and lower anterior facial height by adjusting the force vector. Considerable improvements in the soft tissue profile can be obtained with a combination of high-pull headgear and Class II activator treatment.
Case Summary : The patient was an 8-year-old female whose chief complaint was upper incisor protrusion. Clinical evaluation showed a convex facial profile, lip incompetency at rest position with increased overjet and congenital missing of the right lower cuspid. Based on the clinical examination and cephalometric analysis, the patient was diagnosed with skeletal Class II Division 1 malocclusion with protrusion of the maxillary teeth and mandibular retrognathism. 1st phase of treatment was done with a combination of high-pull headgear and Class II activator. After the 1st phase of treatment, fixed appliances were bonded to close the anterior spacing. The facial appearance changed significantly, the lip position related to the esthetic line was improved, and stable occlusion was established
Conclusion : High-pull headgear and class II activator provided an efficient growth modification by inhibiting the maxillary growth and promoting the mandibular growth, while improving soft tissue profile.

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Growth Modification Treatment of Skeletal Class II Children: Case Report

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Introduction : Most children with skeletal Class II malocclusion are related to retrognathic mandible. Functional appliances can be effective treatment option for these patients. There are various type of functional appliances and methods to enhance mandibular growth. Most of them can produce good treatment results if used at the appropriate time.

Case Summary : In the first case, a 7-year-old boy with Class II malocclusion, large overjet, small mandble was reffered. Class II acivator was used after waiting approximately 2 years to start treatment during the period of active growth of the mandible. The second case is a 9-year-old boy with mandibular retrognathia. Class II activator was used, too.

The third and forth cases present 10-year-old skeletal Class II girl and boy. They had protrusion and spacing on maxillary anterior teeth, and Class II molar relationship. After using functional appliance, treatment was followed by fixed appliances for space closure.

After treatment, Class I molar relationship, harmonious overjet and overbite, and more esthetic profile was established.

Conclusion : Treatment with funtional appliance can be a good treatment option for growing skeletal Class II children. If the appliance is used at the right time, it is possible to induce the growth of the mandibe, restore molar relationship and obtain an esthetic facial profile, without extraction.

P-105

Early orthopedic treatment of skeletal Class II malocclusion using activator combined with high-pull headgear.

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Introduction : Class II malocclusion can be treated in the mixed dentition via orthopedic and orthodontic treatment. Early orthopedic treatment, in the case of mandibular retrognathism and maxillary excess combined, the funcional appliances activator and headgear can be used together.
Case Summary : We report the case of a adolescent patient with skeletal Class II malocclusion, deep overbite and maxillary excess. Class II activator combined with high pull headgear was used for mandibular advancement device and to restrict maxillary growth simultaneously. After using activator combined with headgear to the skeletal Class II malocclusion patient in the mixed dentition for 18 months of treatment, the results were as follows: retraction of the maxillary incisors and decrease of the anterior overjet and overbite was achieved. In addition, the counter-clockwise rotation of the mandible was spontaneously occurred as total intrusion of the maxillary dental arch and molar relationship was changed to class I molar relationship.
Conclusion : Early orthopedic treatment, in the case of mandibular retrognathism and maxillary excess combined Class II adolescent patient, the funcional appliances with activator and headgear can be used together. At the conclusion, careful case selection and motivated patient are also important to achieve a favorable growth pattern and the correction of Class II malocclusion.

P-106

Considerations of Retainers in Growing Class III Patients During Intermittent Phase

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Introduction : Mandibular growth is completed in late adolescence to early adulthood, patients with skeletal Class III malocclusions during growth require long-term follow-up. A two-phase treatment approach is usually required. In the first phase, orthodontic treatment is performed to manage functional factors associated with mandibular growth and to induce maxillary growth to improve the maxillo-mandibular relationship. In the second phase, orthodontic treatment is carried out to camouflage the discrepancies in the dentition. There is a pause between these two phases. During this intermittent phase, the degree of intervention by the dentist must be taken into account.

Discussion : Continued active treatment during the intermittent phase can increase fatigue for both patient and caregiver, potentially leading to decreased compliance. However, in the absence of intervention, it may be difficult to maintain the treatment effects achieved in the first phase, increasing anxiety for the patient and caregiver. Therefore, we added Class III elastics between the U-loop and Adam's clasp when applying a wrap-around retainer after the first phase of treatment. The patient was encouraged to follow the method during the intermittent phase and we confirmed that the treatment results achieved in the first phase were well maintained.

Conclusion : Simply adding Class III elastics to a wrap-around retainer during the intermittent phase for growing patients with Class III malocclusions effectively maintains previous treatment effects without significantly increasing patient fatigue, while providing additional growth control.

P-107

Factors influencing the treatment duration of Class III skeletal malocclusion with a facemask

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Objectives : To improve maxillary growth, a Facemask can be used during the growth phase. Facemask treatment is most effective when administered to children under 10 years old and shows long-term stability post-treatment. The duration of treatment is influenced by various factors such as the need for extraction, overall health, and occlusal relationships. Patient compliance is noted as the most significant factor. This study aimed to investigate skeletal and dental conditions using cephalometric radiographs in skeletal growth phase patients with Class III malocclusion, analyze these in relation to treatment duration, and identify factors influencing this duration.
Material and Methods : 42 patients diagnosed with Class III malocclusion and treated with a Facemask were selected from a total of 250 patients. Cephalometric radiographs were randomly chosen before measurements, and tracing and measurements were conducted twice at one-week intervals by the same measurer. The correlation between treatment duration and gender was tested using a T-test, while Pearson correlation analysis was used to assess correlations between treatment duration, age, and 39 measurement variables.
Results : According to the research results, among the patient's age, gender, and 39 measurement variables, only Ramus Height showed a correlation with treatment duration. Simple regression analysis confirmed its significance. In the simple regression analysis between Ramus Height and treatment duration, an R = .131 indicates that Ramus Height explains 13.1% of the total variation in the regression model. This model has shown statistically significant meaning.
Conclusion : In Facemask treatment, there is counterclockwise rotation of the maxilla and clockwise rotation of the mandible. In this study, various measurements were analyzed for their correlation with treatment duration, revealing that factors like SN-GoGn did not show significance, while Ramus Height did. This suggests that Ramus Height may be associated with the counterclockwise rotation of the maxilla and clockwise rotation of the mandible in Facemask treatment.

P-108

Clear Aligners vs. Headgear/Activator for Class II Correction in Growing Children: A Comparative Study

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Objectives : The purpose of this study was to compare the effects of clear aligners with mandibular advancement and conventional headgear/Activator treatment in growing children (mean age 11.7 years) with skeletal Class II malocclusion.
Material and Methods : A total of 20 patients (12 girls, 8 boys) with a mean age of 11.7 ± 1.6 years were included: 10 were treated with Activator/headgear (Conventional Group), and 10 with clear aligners with mandibular advancement (Aligner Group). Both groups had a cervical vertebral maturation stage (CVMS) of II or III at pre-treatment. Pre-treatment and post-treatment lateral cephalometric radiographs were analyzed for skeletal, dental, and soft tissue changes. Treatment outcomes within each group were analyzed, and treatment effects were compared between the groups.
Results : The mean treatment time 12.3 ± 4.5 months in the Conventional Group, and 12.3 ± 8.3 months in the Aligner Group. Both treatments significantly reduced ANB, Wits, overjet, and facial convexity. However, conventional treatment limited maxillary advancement more effectively, resulting in greater improvement in ANB (-1.60 ± 2.09° vs. -0.58 ± 0.63°) and facial convexity (-3.85 ± 4.93° vs. -1.25 ± 1.16°). Conversely, aligners showed a trend towards controlling vertical growth, with a slight decrease in FMA (-0.06 ± 1.15°) compared to an increase with conventional treatment (1.36 ± 1.28°).
Conclusion : Both modalities effectively corrected Class II malocclusion, but headgear/Activator may be preferred for restricting maxillary growth, while aligners could offer enhanced vertical control.

P-109

Treatment effects of maxillary protraction with or without miniscrews in growing Class III patients

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Objectives : This study aims to evaluate the skeletal and dental effects of maxillary protraction using MARPE (tooth-bone-borne) and RPE (tooth-borne) appliance in growing patients with skeletal Class III malocclusion.
Material and Methods : This study involves 59 growing patients who visited Kyung-Hee University Dental Hospital at Gangdong from January 2013 to August 2023. The patients were divided into three groups: Group 1 (18 patients) received maxillary expansion and protraction using MARPE, Group 2 (20 patients) used tooth-borne maxillary expansion appliances followed by maxillary protraction, and Group 3 (21 patients) served as a control group without any intervention affecting maxillofacial growth. Lateral cephalometric radiographs were taken at the initial visit (T0) and within three months post-treatment (T1) to measure skeletal and dental changes.
Results : Both treatment groups showed significant increases in SNA and ANB angles post-treatment compared to the control group, with Group 1 demonstrating a significantly greater increase than Group 2. The angle between the Frankfort horizontal plane and the mandibular plane (FH to MP) increased significantly in both treatment groups but not in the control group. Group 2 exhibited a greater increase in FH to MP angle compared to Group 1. Additionally, the maxillary incisor inclination (SN to U1) increased significantly in both treatment groups, with Group 2 showing a greater increase than Group 1.
Conclusion : Maxillary protraction using MARPE(tooth-bone-borne appliance) proved to be more effective in advancing the maxilla compared to tooth-borne maxillary expansion appliances. MARPE resulted in less proclination of the maxillary incisors and less clockwise rotation of the mandible. These findings suggest that MARPE is a clinically effective device for treating patients with severe maxillary deficiency or hyperdivergent skeletal patterns, offering superior skeletal outcomes with less dental side effects.

P-110

Facial soft tissue changes after rapid palatal expander supported facemask according to anchorage types

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Objectives : The aim of this study is to delineate facial soft tissue changes after maxillary protraction with facemask and conventional rapid palatal expander (RPE) and miniscrew-assisted RPE (MARPE).
Material and Methods : Patients of 7-9 years old who received facemask therapy within the period of January 2015 to July 2023 were included in this study. Patients were divided into two groups according to their RPE design: conventional RPE (Group 1) and MARPE (Group 2). For the control group, patients of 7-9 years old with Class I skeletal relation who received simple orthodontic treatments that do not influence maxillo-mandibular growth were included. Lateral cephalograms taken before treatment (T1) and after treatment (T2) were collected and facial scan data were collected. Collected radiographs and scan data were measured and statistically analyzed.
Results : Intergroup comparison showed statistically significant increase in midfacial volume to total facial volume ratio in both Group 1 and 2 compared to the control group. In cheek prominence measurements, Group 2 showed more increase in both vertical and horizontal angles compared Group 1. Cheek prominence in transverse dimension increased significantly in Group 2 and the control group at T2 compared to T1 but decreased in Group 1. Both Group 1 and Group 2 showed significant increase in cheek prominence in vertical dimension and facial soft tissue convexity compared to the control group. Nose width increase most in the Group 2 followed by Group 1 and the control group. Skeletal measurements and soft tissue measurements showed no correlation in all three groups.
Conclusion : Facemask treatment with rapid palatal expander results in significant increase in midfacial volume ratio. Using MARPE results in more increase in cheek prominence and midface area (㎟) and midface volume compared to conventional RPE.

P-111

Cephalometric variables to predict long-term stability in the early orthopedic treatment of Class III malocclusion

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Objectives : This study aims to identify factors influencing the prognosis of maxillary protraction orthopedic treatment in patients with skeletal Class III malocclusion by analyzing cephalometric measurements from frontal and lateral cephalograms over a long-term follow-up period.
Material and Methods : This study included 44 patients who underwent maxillary protraction orthopedic treatment and had follow-up data available after growth completion. Cephalometric measurements were taken at the initial visit (T0), post-treatment (T1), and at least 5 years post-treatment (T2). Patients were categorized into favorable growth (FG) with overjet > 2mm and ANB > 0° at T2, and unfavorable growth (UG) with overjet ≤ 0mm and ANB ≤ 0°. Cephalometric values at T0, T1, and T2 were compared. Factor analysis categorized initial T0 measurements into five predictive variable groups (PV). Multiple linear regression identified predictive variables influencing T2 ANB. Decision tree regression was used to differentiate FG and UG.
Results : Significant differences between UG and FG were found at T0 in Mn. length - Mx. length, AB-MP, IMPA from lateral cephalograms, and maxillary width and transverse relationships from frontal cephalograms. At T1, significant differences were observed in ramus height, APDI, AB-MP, and IMPA. At T2, additional differences were found in SNA and SNB. Factor analysis showed PV1 (nasal floor ratio, alveolar bone width), PV2 (maxillary width, transverse ratios), and PV3 (vertical measurements, mandibular height) predicted T2 ANB. Decision tree regression identified T0 variables Mn. width - Mx. width (16.91mm), AB-MP (61.35°), and SUM (395.98°) with 97.4% accuracy.
Conclusion : This study highlights the importance of evaluating transverse relationships of the maxilla and mandible, in addition to anteroposterior and vertical relationships, for predicting the prognosis of orthopedic treatment in skeletal Class III growing patients. The decision tree using Mn. width - Mx. width, AB-MP, and SUM variables demonstrated high predictive accuracy.

P-112

Comparative Study of Treatment Duration for Class III Orthopedic Treatment during COVID-19 and Preceding Period

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Objectives : This study aims to compare the treatment durations of skeletal Class III malocclusion patients who received facemask orthopedic treatment during the COVID-19 pandemic with those in the preceding period and to identify factors influencing the effectiveness of orthopedic appliances in growing children.
Material and Methods : Patients diagnosed with skeletal Class III malocclusion who visited Ilsan Hospital from 2017 to 2022 and received facemask treatment were included. Those patients treated between 2017 and 2019 were classified as the pre-COVID-19 treated group (PCG), while those treated between 2020 and 2022 were classified as the during-COVID-19 treated Group (CG), and each group consisted of 40 patients. The treatment duration and cephalogram analysis values before and after treatment were compared between the two groups. The average age in the PCG was 7.75±1.86 years, with 19 males and 21 females. The average age in the CG was 7.90±1.48 years, with 20 males and 20 females. Treatment durations and changes in cephalometric values (ANB, Wits appraisal, lip protrusion relative to E-line) were analyzed using an independent t-test to determine statistical significance.
Results : The CG showed higher values in all measurements. Treatment duration was shorter in the CG (8.6±2.2 months) compared to the PCG (11.6±3.3 months), showing a statistically significant difference. The differences in cephalometric values before and after treatment were not statistically significant.
Conclusion : During the COVID-19 pandemic, the increased time spent indoors led to longer facemask wear times compared to the previous period, significantly reducing the total treatment duration. These results underscore the importance of patient compliance in orthopedic treatment and further highlight the need for developing orthopedic treatments that do not rely heavily on patient compliance.

P-114

Astaxanthin supplementation protects diabetic mice from bone marrow and hematopoietic impairments caused by hyperglycemia

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Objectives : Diabetes mellitus (DM) causes chronic high blood glucose levels, disrupting lipid metabolism and damaging MSCs, HSCs, and BM. Astaxanthin (ASTX) has shown to mitigate hyperglycemia's systemic complications, notably by restoring normal hematopoiesis. This study used a mouse model of STZ-induced diabetes to investigate ASTX's impact on BM complications and stem cell functions, focusing on hematopoietic development, colony formation, and osteoblast differentiation.
Material and Methods : The study investigated the effects of ASTX on bone marrow stem cells in a hyperglycemia-induced diabetic mouse model. ASTX was administered orally to mice following STZ injection to induce hyperglycemia. Various assays, including flow cytometry and ex vivo culture experiments, assessed the impact of ASTX on stem cell populations and osteogenic differentiation. In addition, human periodontal ligament fibroblasts (hPDLFs) were cultured to explore ASTX's effects on mineralization and osteogenic protein expression. Results highlighted ASTX's potential in mitigating diabetes-induced bone complications through its antioxidative and osteogenic properties.
Results : Supplemental ASTX not only inhibits hyperglycemia-induced oxidative stress or senescence of BM HSCs and MSCs, but also recovers STZ-mediated abnormality in hematopoietic development. This study also shows that supplemental ASTX restores colony forming and osteogenic potencies of BMSCs derived from STZ-injected diabetic mice. Furthermore, this study supports the ability of ASTX to recover osteogenic potential in AGE-exposed hPDLFs.
Conclusion : ASTX has been observed to counteract the negative effects of hyperglycemia on BMSCs. Hyperglycemia impairs BMSC function, reducing their colony-forming ability and osteogenic potential. However, ASTX supplementation restores BMSC functions by enhancing colony formation and promoting osteoblast differentiation. Additionally, ASTX improves hematopoietic development by supporting hematopoietic colony formation and enhancing the stem functions of BM-derived stromal/stem cells. These findings suggest that ASTX plays a crucial role in mitigating hyperglycemia-induced disorders in BMSCs and enhancing both hematopoietic development and BMSC stem functions.

P-115

Surgical-orthodontic Treatment of Skeletal Class Ⅲ Malocclusion with Severe Anterior-posterior Vertical Discrepancies

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Introduction : Anterior openbite has a multifactorial aetiology including skeletal, dental, functional, and habitual components; it can be broadly described as being skeletal or dental in origin. The treatment of anterior open bite remains a challenge for orthodontists because of their high relapse rate.

Case Summary : A 37-year-old woman presented with complaints of poor chewing efficiency and mandibular prognathism. Clinical photographs and cephalograms indicated a skeletal and dental Class III malocclusion with anterior open bite and protrusion. Cone-beam Computed Tomography(CBCT) images showed facial asymmetry with maxillary canting, asymmetric dental arches, and the chin deviation to the right. Incisor inclination was within the normal range, and her protrusion was diagnosed as being due to protrusive maxilla and mandible. She had no notable medical history, Temoporomandibular joint(TMJ) issues, or parafunctional habits like tongue thrusting. The treatment goals were to improve the facial profile, and to provide stable and satisfactory occlusion.

Pre-surgical orthodontic treatment focused on symmetric arch coordination, removing anterior–posterior vertical discrepancies by premolar intrusion, and maintaining incisor inclination. The left side of the maxillary arch was expanded, while the right side was constricted using miniscrew-assisted rapid palatal expander(MARPE). For the intrusion of the maxillary and mandibular premolars, mini-screws were placed in the buccal region. Maxillary Le Fort I Osteotomy (3mm posterior impaction, 2mm setback) and mandibular bilateral sagittal splint ramus osteotomy(BSSRO) (9mm setback, 3mm leftward rotation) were performed after 11months of pre-surgical orthodontic treatment. Post-surgical orthodontic treatment was done for a sufficient time to settle the occlusion and check for open bite relapse.

The total duration of treatment was 22months. Post-treatment and 2-year retention photographs demonstrate effective, aesthetically pleasing, and stable results.

Conclusion : In skeletal Class III open bite patients with severe vertical discrepancies between anterior and posterior teeth, well-planned dental decompensation in the anterior-posterior, vertical, and transverse dimensions during pre-surgical orthodontic treatment ensures stable results.

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Surgically Treated Skeletal Class II Malocclusion Patient with a Finger Sucking Habit

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Introduction : Finger sucking habit can be a cause of severe malocclusion as the force of finger sucking is sufficient to displace teeth or deform growing bones.
This article describes the diagnosis and treatment of a skeletal Class II adolescent patient with a chronic finger sucking habit.
Case Summary : A 13-year-old girl presented with a chief complaint of lip protrusion. The patient showed a large overjet(14.8 mm), narrow maxillary canine width, and deep palate, skeletal class II (ANB 5.8˚).
Since she also had a severe thumb sucking habit, maxillary anterior segmental osteotomy was planned to not only change her profile but also abruptly change the oral environment to stop the chronic thumb sucking habit.
After treatment, the habit disappeared, Nasolabial angle and lip protrusion were greatly improved with proper incisal exposure. Adequate Class II molar relationship and Class I canine relationship with good dental interdigitation were achieved. And uprighting of the maxillary incisors, posterior movement of the molars, and labial inclination of the mandibular incisors were observed.
Conclusion : This case report demonstrates the treatment of a skeletal Class II malocclusion with chronic finger sucking habit by maxillary anterior segmental osteotomy. When a Class II patient with a large overjet that has active severe thumb sucking, surgery could be a good option to not only correct the malocclusion but also actively control the habit.

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Orthodontic and Two-Jaw Surgical Treatment for Class III Malocclusion with Facial Asymmetry: A Case Report

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Introduction : Clinically, orthodontic treatment for severe bone discrepancy requiring orthognathic surgery is already challenging. If combined with full-mouth reconstruction due to multiple missing teeth, the complexity of the treatment increases significantly. During the orthodontic process, it is also necessary to consider the anchorage preparation and space allocation.
Summary : This case is a 24-year-old male patient who presented with complaints of anterior crossbite, facial asymmetry, protrusive chin, multiple residual roots and missing teeth. Both esthetics and function were his concerns. Following clinical and radiographic examination, he was diagnosed with skeletal Class III and dental Class III malocclusion, along with chin deviation.
An orthodontic treatment combined with orthognathic surgery and full-mouth reconstruction was planned. Initially, all residual roots were extracted. After wound healing, full-mouth 0.022” self-ligating system brackets were bonded. Before the surgery, we conducted leveling and alignment to correct transverse discrepancies and decompensate anterior teeth. The orthognathic surgery included maxillary LeFort I osteotomy, mandibular intraoral vertical ramus osteotomy (IVRO), and genioplasty. After the surgery, orthodontic treatment continued for finishing and detailing. Subsequently, full-mouth reconstruction was completed with implants and bridges. Ultimately, acceptable facial esthetic and solid dental occlusion were achieved.
Conclusions : To deal with severe Class III malocclusion with multiple residual roots and missing teeth, a treatment plan combining orthognathic surgery and full-mouth reconstruction prosthodontics is often necessary. In our case, because of retrusive maxilla, protrusive chin and facial asymmetry , a two-jaw orthognathic surgery was performed. After all prostheses were delivered, the patient's profile became harmonious and the occlusion was stable.

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Surgery First Orthodontic Treatment of Temporomandibular Joint Total Joint Replacement Patient

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Introduction : Temporomandibular joint total joint replacement (TMJ TJR) may be considered when the function of condyle and joint cannot be restored due to the conditions such as idiopathic condylar resorption, ankylosis of the TMJ, or irreparable fractures of the mandible and condyle. If surgery alone does not improve the patient's occlusion and esthetics, orthodontic treatment may be necessary. The purpose of this case is to introduce the orthodontic treatment process, considerations, and stability of patient who has undergone TMJ TJR and surgery first orthodontic treatment.

Case Summary : A 33-year-old female patient was referred from the Oral and Maxillofacial Surgery department for TMJ TJR due to complaints of "chewing difficulty." This patient had bruxism and TMJ arthritis which led to the attrition of overall teeth and significant resorption of both mandibular condyles, respectively. As a result, a clockwise rotation of the mandible, skeletal Class II malocclusion, and open bite were observed. With such condition, surgical plan was made for mandibular advancement and TMJ TJR. Prior to post-surgical orthodontic treatment, gradual removal of the surgical splint was performed to facilitate extrusion of mandibular posterior teeth for establish occlusion. In post-surgical orthodontic treatment, fixed orthodontic appliances were attached using zig made by digital setup for precise tooth movement. Afterwards, treatment was completed using a Multiloop Edgewise archwire (MEAW) with step-up bend technique.

Conclusion : Orthognathic surgery combined with TMJ TJR can serve as an alternative for patients with severe condylar resorption where orthodontic treatment or orthognathic surgery alone may be challenging. After orthognathic surgery, mandibular clockwise rotation occurs and it is necessary to establish occlusion by extrusion of mandibular teeth. In addition, close monitoring of the stability of the artificial TMJ is essential during orthodontic treatment.

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Orthodontic Treatment combine Maxillomandibular Advancement in Patient with Obstructive Sleep Apnea – A Case Report

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Introduction : Obstructive Sleep Apnea (OSA) is defined as diminished (hypopnea) or absent (apnea) airflow due to repeated upper airway obstruction or collapse during sleep. Common symptoms of OSA include sleep fragmentation, snoring and excessive daytime sleepiness. This clinical case presents a patient with severe OSA who seeks for surgery option combined with orthodontic treatment.
Summary : A 32 years old male patient who suffered from snoring and excessive daytime sleepiness went to oral maxillofacial department seeking for treatment. Examination such as polysomnography (PSG), drug-induced sleep endoscopy (DISE) was done. Continuous positive airway pressure (CPAP) was worn for days but uncomfortable was complaint. After discussion with the surgeon, surgical early approach was decided. The patient has a Skeletal Class I jaw relation, Angle's Class I malocclusion and retrusive lip profile. Non-extraction orthodontic treatment with maxillomandibular advancement was performed. After 18 months of treatment, the patient has better sleep quality and ideal occlusion.
Conclusions : OSA can be treated conservatively by CPAP. However, some patients find it challenging to use CPAP properly. In dentistry, oral appliance like mandibular advancement devices are commonly used. If oral appliance and other conservative treatment are ineffective, surgical options are considered. Maxillomandibular advancement is an effective way for sever OSA patients by replacing maxilla and mandible at a more anterior position, which enlarges the airway and reduces the risk of airway collapse.

P-120

Jaw Stabilizer Design in Surgery-first Clear Aligner Treatment

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Introduction : With a growing trend towards clear aligner therapy in contemporary orthodontics, many surgical patients are opting for a surgery-first approach followed by clear aligners for post-surgical orthodontic treatment. However, orthodontic tooth movement cannot be initiated until the mandibular position is stabilized, potentially reducing the effect of the regional acceleratory phenomenon (RAP).
Case Summary : To maximize the RAP effect while achieving jaw stabilization post-surgery, a special feature called the “jaw stabilizer” was designed for the aligners. This feature was utilized in the treatment of a 28-year-old female patient who underwent orthognathic surgery for mandibular prognathism. Clear aligner therapy began five weeks after surgery, with jaw stabilizers added to the molar and canine areas in both the maxillary and mandibular aligners to maintain the mandibular orthognathic position during treatment. These stabilizers were used in up to 28 aligners for each arch. The patient was instructed to change the aligners at three-day intervals. After three months of aligner treatment, the only issue observed was a deficiency in the extrusion of the upper canine on one side, which was easily managed with the use of minitubes. With the help of a jaw stabilizer, orthodontic tooth movement could be initiated much earlier, resulting in faster tooth movement within a relatively short time.
Conclusion : This case demonstrates that clear aligners can be effectively used in surgery-first patients with the addition of a jaw stabilizer.

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Soft Tissue Paradigm based Treatment Planning in Skeletal Class III

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Objectives : The purpose of this study is to propose guidelines for the indications of non-extraction, extraction camouflage treatment, and orthognathic surgery, by comparing the degree of soft tissue improvement effects. This comparison focuses on the changes in the CKHA, a soft tissue indicator corresponding to the major hard tissue indicator ANB
Material and Methods : Sixty-six patients, comprising 25 males and 41 females, aged between 18 and 50 years and diagnosed with skeletal Class III malocclusion (ANB<0°), were enrolled in the study. These participants were categorized into three groups based on the treatment approach: G1,non-extraction (20), G2, extraction (20), and G3, orthognathic surgery(26). To assess the variations in treatment outcomes, measurements derived from lateral cephalometric radiographs obtained before and after the treatment were analyzed and compared across the different treatment methods.
Results : Significant differences were observed in the ANB between G1 and G2/G3. However, no significant differences were found in the CKHA after treatment. Furthermore, in G2, the CKHA approached the normal range at -1.8° (normal range: -2.0°), suggesting that soft tissue responses can normalize despite minimal changes in the skeletal structure.
Conclusion : While surgery resulted in the most significant skeletal changes, both camouflage groups demonstrated distinct advantages within the soft tissue paradigm. Particularly, in G2, a noticeable posterior movement of the lower lip was observed, along with a corresponding posterior shift in the soft tissue B point. This study has provided guidelines for three treatment methods aimed at achieving soft tissue objectives.

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Changes in head posture and airway volume after orthognathic surgery

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Objectives : The aim of this study is to investigate whether there are changes in head posture and airway volume after orthognathic surgery in patients with antero-posterior jaw discrepancy.
Material and Methods : The subjects comprised fourty-four patients with antero-posterior jaw discrepancy, who had received orthognathic surgery with orthodontic treatment. The patients were divided into two groups: the Class II group who underwent two-jaw surgery with mandibular advancement (n=23), and the Class III group who underwent two-jaw surgery with mandibular setback (n=21).
Changes in head posture were assessed using the craniocervical angle, which was measured preoperatively, at 5 weeks and 1 year post-surgery. The angle between the nasion-sella line and the odontoid process tangent (NSL/OPT), as well as the cervical vertebra tangent (NSL/CVT) were measured in lateral cephalogram.
The 3-dimensional airway volume were calculated using CBCT, which was taken preoperatively and at 3-months postoperatively. DICOM images and Invivo 6 software were used for segmentation.
Results : Before surgery, the craniocervical angle was generally higher in Class II patients than Class III cases (both NSL/OPT, NSL/CVT). After surgery, Class II patients exhibited a decreased craniocervical angle (indicating head flexion), while Class III patients showed an increased angle (indicating head extension). The measurements at 5-weeks post-surgery remained similar at 1-year post-surgery.
There wasn't a significant difference in airway volume between Class II and III patients before surgery. At 3-months post-surgery, Class II patients generally exhibited an increase in airway volume in CBCT scans, whereas Class III patients showed a slight decrease or no significant change.
Conclusion : After orthognathic surgery for patients with antero-posterior discrepancies, changes in both head posture and airway volume were observed. Class II patients showed head flexion and an increase in airway volume, while the opposite occured in Class III patients.

P-123

Relationship between Preoperative Maxillomandibular Transverse Discrepancy and Post-Surgical Stability in Class II Malocclusion

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Objectives : The aim of this study was to examine the relationship between the presurgical maxillo-mandibular transverse index and post-surgical stability one year after mandibular advancement.
Material and Methods : For the material and methods, twenty-two subjects who were treated with mandibular advancement were enrolled in this study. Postsurgical stability was defined as the horizontal mandibular position change of 〈2mm in lateral cephalogram 1 year after surgery. Subjects were divided into two groups according to the maintenance of postsurgical stability: a stable group (group S) and a less stable group (group LS). Presurgical maxillomandibular transverse index was determined as Yonsei transverse index (YTI) one month before surgery. A logistic analysis was performed on the postsurgical stability according to the YTI value. The presurgical, post-expansion target YTI value was obtained using receiver operating characteristic (ROC) curve.
Results : There were no notable differences in the baseline characteristics of the two groups except for vertical positions of point A, B, and gender distribution. Before surgery, however, there was a significant difference in YTI at both the fossa and CR level between the groups. The amount of mandibular advancement did not show a significant difference. The odds ratio for YTI was 0.35 (p=0.024). The prediction of stability of presurgical YTI yielded an area under the ROC curve of 0.88. The cut-off value for YTI was 1.45 mm.
Conclusion : Presurgical transverse index showed a correlation with postsurgical stability, and correcting it in the presurgical phase to a certain level appears to aid in securing postsurgical stability.

P-124

Pre- and post-operative anxiety in orthognathic surgery: the Asian context

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Purpose : The purpose of this study was to evaluate pre- and post-operative anxiety in orthognathic patients, and the effects of social support, resilience and coping on anxiety.
Materials and methods : This was a prospective longitudinal study involving 54 orthognathic patients recruited from a university hospital in Singapore. Participants completed a questionnaire at two time points (within 8 weeks prior to the surgery, and 1-2 weeks after surgery). The questionnaire included validated scales for measuring state and trait anxiety (State-Trait Anxiety Inventory), social support (Multidimensional Scale of Perceived Social Support), resilience (Connor-Davidson Resilience Scale 10), and coping styles (Brief COPE). Regression analyses were performed to investigate the presence of associations between social support, resilience, and coping styles and anxiety at both time points. Exploration of any significant changes in the key variables were undertaken using the Wilcoxon signed-rank test. Statistical significance for all tests was set at $p<0.05$.
Results : Prior to surgery, 74.1% of the participants were classified as having moderate or high levels of anxiety. Increased resilience was significantly associated with reduced anxiety ($p=0.021$), whilst the increased use of avoidance coping was significantly associated with increased state anxiety ($p=0.005$). Post-operatively, fewer participants (48.1%) had moderate or high anxiety. Increased resilience ($p<0.001$).
Conclusions : Increased resilience was significantly associated with reduced anxiety in both the pre- and post-operative stages, whilst stronger social support played a significant role only in the post-operative period. Increased use of coping through avoidance was significantly associated with higher levels of anxiety at both the pre- and post-operative time points.

P-125

A Survey of Surgery First and Early Surgery Approaches

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Purpose : In recent years, the demand for surgical orthodontic treatment has increased, and patients' requests have diversified to include aesthetic pursuits, early facial improvement, shorter treatment time, and the use of esthetic orthodontic appliances.In order to respond to the various complaints of patients, our group started to operate the Surgery First Approach (SF) and the Early Surgery Approach (ES) in 2022.In this study, we report on a survey of patients who newly came to our clinic and were treated with SF and ES.
Materials and methods : The subjects were 70 SF and ES patients who underwent upper and lower jaw movement surgery at our Clinic from January 2022 to June 2024, and a fact-finding survey was conducted.
Results : Women accounted for 78.6% of the patients, and the average age was 29.7 years old.Word of mouth accounted for 38.6% of visits, followed by referrals from other hospitals (14.3%).This may be attributed to the fact that patients at this hospital send out word-of-mouth messages via SNS.The majority of patients came from the suburbs of Tokyo (61.4%), followed by Kanagawa Prefecture (approximately 24 km from our clinic) (11.4%), indicating that patients tended to place importance on ease of access to the clinic.The clinical diagnosis was facial asymmetry with mandibular prognathism (32.9%), followed by maxillary prognathism with inferior mandibular growth (30%).The majority of patients with mandibular prognathism, including those with maxillary inferior growth and asymmetry, accounted for 65.7% of the total, which is similar to reports from other centers.

Conclusions : Patients seeking SF and ES tended to be more likely to be female than those reporting orthognathic treatment covered by regular insurance, and word-of-mouth and referrals were found to be a greater motivator for visits than general orthodontic treatment patients.

P-126

Alveolar bone remodeling after augmented corticotomy-assisted surgical orthodontic treatment in skeletal Class III patients

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Objectives : The aim of this study was to assess the long-term effect of dentoalveolar remodeling after augmented corticotomy-assisted decompensation in the mandibular anterior region and to analyze factors influencing the remodeling to propose the clinical significance of augmented corticotomy.
Material and Methods : The study involved 35 adult skeletal Class III patients who underwent augmented corticotomy-assisted surgical orthodontic treatment at Kyung Hee University Dental Hospital between January 2010 and December 2020. Measurements were recorded at several stages: at the initial visit (T0), at the end of augmented corticotomy combined pre-surgical orthodontic treatment (T1), and during the retention phase after the end of orthodontic treatment (T2). These measurements included skeletal parameters (SNA, SNB, ANB, FMA) to assess sagittal and vertical skeletal patterns, as well as dental measurements (IMPA) to evaluate mandibular anterior displacement. The study was conducted with collaboration from the Departments of Orthodontics, Periodontics, and Oral and Maxillofacial Surgery.
Results : Between T0 and T2, despite achieving sufficient decompensation of the mandibular anterior teeth, there was a significant increase in both the area and thickness of the labial alveolar bone compared to the initial values. Additionally, the position of the vertical alveolar bone moved upward. The dentoalveolar structure remained well-preserved even after an average of 4 years of retention.
In comparing genders, the female group showed a significantly greater increase in labial bone area and thickness of the middle and lower labial alveolar bone between T0 and T2. However, there were no significant differences between groups in any parameters based on vertical skeletal patterns.
Conclusion : The augmented corticotomy can be an effective strategy for achieving long-term dentoalveolar remodeling by protecting the dentoalveolar structure from periodontal side effects that may occur during decompensation. This is particularly beneficial for skeletal Class III patients with thin labial bones, who are susceptible to periodontal issues.

P-127

Considerations from a Case of Surgical Repositioning of an Impacted Canine in Adenomatoid Odontogenic Tumor

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Introduction : The adenomatoid odontogenic tumor (AOT) is a rare benign odontogenic tumor that occurs frequently in teenagers and is more prevalent in females. It is most commonly observed in the anterior maxilla, and Enucleation and Curettage along with an impacted tooth is the usual treatment of choice. This case report describes a case in which a maxillary left canine affected by AOT was treated with surgical repositioning. Through this case, we will examine considerations for the diagnosis and treatment of an impacted tooth affected by AOT.

Case Summary : A 10.8-year-old female patient had an impacted maxillary left canine. In the panoramic radiograph, a radiolucency was observed around the impacted tooth region that appeared to be a cystic lesion with a cortical border that included the crown and extended beyond CEJ to the root. In CBCT, there was no displacement of adjacent teeth, root curvature, or root resorption.

According to the treatment plan, marsupialization was first performed, followed by surgical exposure and orthodontic traction. However, as there was no improvement, surgical repositioning was performed to treat the impacted tooth associated with AOT.

After treatment, the aesthetics were improved and no recurrence related to the lesion was observed. Both the patient and guardian were satisfied with the treatment results.

Conclusion : It is important to make a differential diagnosis based on clinical, radiological, and histopathological characteristics to determine whether the lesion is an AOT type or an dentigerous cyst-type. If the lesion extends to the root of the tooth, including the crown, such as an AOT, It must be taken into consideration that the impacted tooth may not respond appropriately to orthodontic traction.

In terms of treatment, caution is required in performing orthodontic traction immediately as in general cystic lesions, and orthodontic traction may be performed after marsupialization or surgical repositioning and replantation may be further considered.

P-128

A new treatment protocol for teeth developmental & eruption disorders based on resolving etiological factors

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Introduction : Introduction : Teeth eruption disorders and developmental disturbance are one of the big issues during orthodontic treatment. They appear in various types, but most commonly appear as impacted or missing teeth. Traditionally, these problems have been solved by retracting the impacted teeth with surgical exposure or, in the case of a missing teeth, regaining space followed by prosthetic restoration procedure or space closing through mesio-distal tooth movement. However, despite various treatment methods, why these problems occur in individual patients has often been overlooked. In this presentation, a new protocol will be presented by evaluating how teeth formation and eruption problems can improve on their own when the causative factors are resolved.
Discussion : Materials & Methods : To analyze etiologic factors, common characteristics of 768 patients (369 male, 399 female) with teeth eruption and developmental disorders were analyzed. The most common external factors were mouth breathing and lip sucking (or biting) habits. Anatomically these problems were mainly occurred on the short side of the face. Most of them had a history of hospitalization during the period of tooth formation. The patients with mouth breathing and lip sucking (or biting) habits that could be improved through education were selected. And, it was evaluated whether these problems could improve spontaneously when the causative factors were resolved.
Conclusion : Conclusions : Through this new approach, various clinical cases were identified, including spontaneous eruption of impacted canines and molars, spontaneous closure of missing teeth spaces, and regeneration of missing teeth.
Discussions : The results of this study will serve as an opportunity to develop a more patient-oriented treatment protocol for treatment of teeth eruption and developmental disorders through evidence-based analysis and resolution of etiological factors.

P-129

Safety Screening Methods for Orthognathic Surgery under General Anesthesia in a Dental Facility

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Introduction : With increasing aesthetic and cosmetic concerns about facial appearance, the demand for orthognathic surgery has risen. Our facility began offering upper and lower jaw surgeries, with 24-hour postoperative management. Dental hygienist services were expanded to cover the entire treatment sequence, establishing a comprehensive oral management system for each step. This study discusses the importance and challenges of the dental hygienist's role in the medical-dental team for patients with jaw deformities.
Materials and Methods : Perioperative oral function management by dental hygienists included: (1) initial counseling, photography, and radiographic assistance; (2) intraoral and periodontal tissue examinations; (3) oral hygiene instruction and orientation; (4) preoperative PMTC, final patient confirmation, and anxiety alleviation through patient discussions; (5) intraoperative assistance and outpatient work; (6) postoperative oral care and nutritional guidance; and (7) assistance in postoperative orthodontic treatment. Additionally, dental hygienists played a vital role in providing patient education on maintaining oral hygiene and addressing any concerns or questions patients had throughout the treatment process.
Conclusions : A consensus was achieved among orthodontists, oral surgeons, dental anesthesiologists, nurses, and dental hygienists on an oral management system for patients undergoing surgery under general anesthesia. This collaboration allowed each professional to respect and support each other's roles, enhancing patient care. Dental hygienists significantly contributed to patient satisfaction by providing consistent psychological support, understanding the patient's background, and acquiring anesthesia management knowledge and skills. Their involvement ensured comprehensive care, minimized risks, and improved surgical outcomes, leading to higher patient satisfaction and better overall treatment experiences. The study emphasizes the vital role of dental hygienists in the multidisciplinary team, showcasing their impact on the success of orthognathic surgeries and overall patient well-being. By fostering a collaborative environment and focusing on holistic patient care, the dental team can achieve better health outcomes and improved patient confidence and comfort.

P-130

Development of CAD/CAM Jaw Stabilizer to Maintain Mandibular Orthognathic Position in Surgery-first Orthodontic Patients

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Introduction : Surgical patients often desire immediate improvements in their facial appearance and are hesitant to undergo orthodontic treatment with fixed appliances. To offer a more comfortable treatment, surgery-first (SF) clear aligners are suggested. However, initiating tooth movement must be postponed until the orthognathic position of the mandible is stabilized, particularly in cases without prior orthodontic preparation. To maintain the orthognathic position of the mandible during aligner treatment, a specifically designed jaw stabilizer can be incorporated into clear aligners using CAD/CAM technology.
Discussion : Using Materialise Magics 25.01 software, a pair of bite wings was designed on the buccal side of the aligners. The inclination of the interface between the upper and lower wings was determined by simulating the hinge movement of the temporomandibular joint after digitally mounting the upper and lower models. Clear aligners with the jaw stabilizer were fabricated using 3D printing technology, employing Tera Harz TC-85, a thermoplastic shape-memory polymer, for direct printing of these unique aligners. The solid bite wings maintain the postsurgical mandibular position both sagittally and transversely. This allows orthodontic tooth movement to begin much earlier, even when the postsurgical occlusion is unstable, thus enhancing the regional acceleratory phenomenon effect.
Conclusion : A CAD/CAM jaw stabilizer can be manufactured using 3D printing technology. The introduction of direct-printed aligners with a jaw stabilizer facilitates fast and accurate tooth movement, improving the overall treatment process.

P-131

Brushing Behavior after School Lunch for Children and Adolescents under Orthodontic Treatment pre-and post-COVID 19.

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Objectives : We evaluated how much adolescents undergoing orthodontic treatment brushed their teeth after school lunch before and after COVID-19.
Material and Methods : We surveyed 302 children and adolescents undergoing orthodontic treatment using a fixed device at an orthodontic clinic in 2019 before COVID-19, and 345 people in 2023 after the end of COVID-19, through a questionnaire on the practice of brushing teeth after lunch.
Results : The average number of times per day that children brushed their teeth before and after COVID-19 decreased from 2.4 to 2.2. It also decreased from 2.5 to 2.3 in the 2019 and 2022 Child Oral Health Survey.
The percentage of children who always brush after lunch at school decreased from 21.5% in 2019 to 6.9% in 2023 in our survey.
Elementary school students experienced the largest decrease in lunchtime brushing compared to middle and high school students, likely due to a lack of teacher guidance and supervision of brushing. In 2023, the most common reason for not brushing after lunch was unwillingness to brush alone (34.3%), followed by inconvenience of carrying a toothbrush and toothpaste, lack of time, lack of facilities, and lack of awareness of the need.
Conclusion : To prevent dental caries, decalcifications, and periodontal disease that can occur in children and adolescents due to lack of post-lunch brushing at school, schools need to implement systematic and repeated tooth brushing education, provide school facilities and sufficient time for oral hygiene, and provide active oral hygiene education in orthodontic clinic.

P-132

A study on the MBTI of orthodontic staff at a network dental clinic

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Objectives : In the modern era of dental treatment, a dentist alone cannot do everything from start to finish. In addition to receiving, greeting, x-raying, treating, and storing patients, a variety of other tasks are required, such as patient management, tool management, dental equipment and materials management, and patient CRM. We investigated the MBTI tendencies of network dental orthodontics staff.

Material and Methods : An MBTI survey was conducted on 31 dentists and 181 employees from 12 network orthodontic clinics. We investigated the relationship between the number of years of service and work experience as a hygienist and MBTI..

Results : Among orthodontists, ISTJ was the most common at 27.3%, followed by INTJ at 18.2%, and among employees, ISFJ was the highest at 26.1% and ISTP at 27.3%. When long-term service is more than 10 years, in the orthodontic department, I > E (25.8%>10.5%), N > S (42.9%>16.3%), T > F (22.7%>17.9%), J > P (28.6%>9.1%) showed more personality types.

Conclusion : the 16 MBTIs, and it is hoped that it will be helpful to identify the personality of new employees in the dental industry to solve problems such as high employee turnover and difficulty in recruiting, and to attempt to improve training and teamwork according to the personality of existing employees.

P-133

The Impact of Orthodontic Forced Eruption Timing on Root Development of Impacted Maxillary Canines

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Objectives : The aim of this study was to evaluate root development after forced eruption of the impacted maxillary canines before or after complete root development of the contralateral canine.
Material and Methods : A total of 50 patients (Male: 21, Female: 29; mean age: 12.4 years) with unilateral impaction of maxillary canine were included. The patients with incomplete root development of the contralateral canine were classified into 'Immature group' and the patients with complete root development of the contralateral canine were classified into 'Mature group'. Volume (Vol), total length (TL), crown length (CL), root length (RL) and root/crown ratio (R/C) of the impacted canine (IC) and the contralateral canine (CC) were measured and calculated from the posttreatment cone-beam computed tomography images.
Results : In the immature group, TL and RL of IC were 0.68 mm and 0.51 mm shorter than CC, respectively ($P < 0.05$). In the mature group, the values of V, TL, RL, and R/C of IC were respectively 37.90 mm^3, 2.43 mm, 2.53 mm and 0.26 smaller than CC ($P < 0.001$). CL also showed statistically significant difference between IC and CC ($P < 0.05$). When differences of IC and CC were compared between two groups, all variables showed statistically significant differences with the mean difference of TL and RL being 1.75 mm and 2.02 mm larger in the mature group, respectively ($P < 0.001$).
Conclusion : Regardless of the treatment timing, the total length and the root length of the impacted canine was shorter than the contralateral canine. Forced eruption of the impacted canine undertaken before the root development of the contralateral canine showed better results of root development in both linear and volumetric measurements. Root/crown ratio could provide a more precise evaluation of reduced root length for each tooth, compared to total length or root length.

P-134

Evaluation of the factors related to impaction of the mandibular second molar

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Objectives : The aim of this study was to evaluate the craniofacial morphology of patients with impacted mandibular second molars.
Material and Methods : 28 patients with impacted mandibular second molars (impaction group: 14 males, 14 females, mean age 14.4±2.0 years) and 110 patients with normally erupted mandibular second molars (control group: 55 males, 55 females, mean age 14.5±1.7 years) were selected from orthodontic patients using pre-treatment panoramic radiographs. Lateral cephalometric radiographs of the subjects were analyzed to compare the craniofacial morphology between the impaction and control groups.
Results : In the anteroposterior analysis, the impaction group had significantly higher values than the control group for ANB (impaction group: 5.17°; control group: 3.24°) and Wits appraisal (impaction group: 1.40 mm; control group: -1.16 mm) ($p<0.01$). Although not statistically significant, the mandibular body length tended to be smaller in the impaction group ($p=0.06$). In contrast, there were no significant differences between the groups in terms of vertical measurements (mandibular plane angle, occlusal plane angle, gonial angle, lower anterior facial height) and measurements related to the size and shape of the mandible (mandibular length, corpus length, mandible arc, ramus height, body length).
Conclusion : Malocclusion patients with impacted mandibular second molars exhibited a tendency towards skeletal Class II malocclusion. Early treatment of skeletal Class II malocclusion before the eruption of the mandibular second molars may help prevent impaction.

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Clinical and Statistical Study of Patients Receiving Myofunctional Therapy

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Purpose : Myofunctional Therapy (MFT) is an essential part of orthodontic practice, consisting of individual muscle training, chewing, swallowing, and pronunciation as well as postural training to correct abnormalities in the perioral muscles. The Showa University Dental Hospital Orthodontic Department has been conducting MFT since 1996. In this study, we report a clinical and statistical review of patients who underwent MFT at Showa University Dental Hospital.

Materials and methods : We included in this study patients who started MFT at Showa University Dental Hospital between November 2018 and March 2024. We investigated and reviewed the number of patients, age at initiation, sex ratio, and findings related to oral functional abnormalities (presence or absence of oral malpractice, presence or absence of mouth breathing, type of tongue protrusion, tongue pressure, lip pressure, etc.) using outpatient medical records and examination charts at the time of MFT.

Results : During a period of 5 years and 5 months, 446 patients were examined, and the mean age at the start of the MFT was 17 years and 2 months. The gender ratio tended to indicate female dominance (64%). The most common functional abnormality was the habit of opening the mouth. The most common tongue protrusion type was anterior protrusion. The mean tongue and lip pressure measurements were 28.0 kPa and 7.9 N, respectively. Of the 446 patients who started MFT, 76 displayed jaw deformities.

Conclusions : Patients exhibited various oral dysfunctions. When performing MFT, the implementation of individualized training programs for each functional problem is important. In addition, patients with jaw deformities displayed poor oral functions due to abnormalities in maxillofacial morphology and occlusion, reaffirming the importance of performing MFT prior to orthognathic surgery.

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Impact of Low-Frequency Positive Square Wave Voltages on Periodontal Pathogen A. actinomycetemcomitans

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Objectives : The extremely low frequency electromagnetic field (ELF-EMF) encompasses a frequency range of 0-300 Hz. Studies have shown that ELF-EMF can influence biological aspects such as cell survival, growth, and function. Structural changes have been observed in the cell membranes of bacteria exposed to specific intensities of ELF-EMF, suggesting that such exposure can directly impact the cell membrane, thereby affecting the survival and growth of bacteria. The aim of this study is to explore the impact of low-frequency positive square wave voltages, within the extremely low-frequency electromagnetic field (ELF-EMF) range, on the growth of Aggregatibacter actinomycetemcomitans, a potential pathogen associated with periodontal disease.
Material and Methods : Aggregatibacter actinomycetemcomitans cultures were exposed to varying offsets, with square wave positive voltages ranging from 0-300 Hz and up to 20 V for a duration of up to 60 minutes. The changes in bacterial clusters were assessed using absorbance measurement, colony forming unit (CFU/ml) counts, and high-resolution field-emission scanning electron microscopy (HR FE-SEM).
Results : The optimal conditions for inhibiting the growth of A. actinomycetemcomitans were found to be an offset of 0.7V and a frequency of 7.83Hz. The inhibitory effect on bacterial growth was more pronounced with increased duration and voltage.
Conclusion : Bacterial growth inhibition was observed predominantly in the low-frequency range below 10 Hz, with the most significant effect at 7.83 Hz, corresponding to the Schumann resonance. This study experimentally demonstrates that parameters such as offset, frequency, applied voltage, and exposure time significantly influence the inhibition of A. actinomycetemcomitans growth.

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Usefulness of High Power Pulsed Blue LED Whitening during Orthodontic Treatment

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Purpose : Awareness of teeth whitening has increased, and demand for office whitening among orthodontic patients has grown. This study evaluated the efficacy of peroxide-free office bleaching using the Transcent Flash Bleaching System, a high-power pulsed blue LED device, on multi-bracket appliance surfaces, unsuitable for conventional peroxide bleaching.
Materials and methods : Approved by the Japan Oral Health Association (Approval No. 24005), the study used artificially colored teeth, bisected with a diamond disc, polished, and photographed. Brackets were attached, and the teeth were cleaned with a peroxide-free cleaner (EX Cleaner), then irradiated for 10 minutes with a high-power pulsed blue LED (CoolBright Transcent Flash Whitening). Color measurements of the cut surfaces were taken before and after irradiation using the ColorMeter RGB Colorimeter and VITA EASYSHADE V, recording CIE L*a*b* values.
Results : Significant bleaching effects were observed on dentin, with a notable correlation between pre- and post-irradiation. No significant difference in bleaching effect was found between surfaces with and without brackets. The oxidative bleaching effect is presumed to be caused by free radicals generated by the excitation of autofluorescent substances (endogenous staining factors) and plaque (exogenous staining factors) that absorbed the energy of the high-power pulsed blue LED.
Conclusions : The study suggests that peroxide-free office bleaching using high-power pulsed blue LEDs is a useful method for improving tooth discoloration on multi-bracket appliance surfaces. This method demonstrates its utility in cases previously unsuitable for conventional peroxide-based tooth bleaching techniques. The results indicate a promising alternative for achieving improved aesthetics without the use of peroxide, offering a safer and effective whitening solution for orthodontic patients. This could lead to broader adoption of non-peroxide whitening methods in dental practices, enhancing patient satisfaction and outcomes.

P-139

Effect of application of low-frequency square-wave positive voltage on the proliferation of S. mutans

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Objectives : This study aimed to examine the influence of frequency variations under conditions of low-frequency, square-wave positive voltage on the population dynamics of Streptococcus mutans (S. mutans).
Material and Methods : In this study, we investigated the changes in absorbance over time under the condition of a generator's offset voltage of 0.7 V and a frequency of 7.83 Hz, by varying the duty cycle of the square-wave output voltage to 0.1 ms, 1 ms, and 63.8 ms and applying a medium voltage of 5 V for 60 minutes. Additionally, under the conditions of a square wave's duty cycle of 63.8 ms and a frequency of 7.83 Hz, we explored the variations in absorbance and colony-forming units (CFU) 24 hours after applying voltages of 3 V, 4 V, and 5 V for durations of 1 hour, 2 hours, and 3 hours, respectively.
Results : The study revealed that bacterial proliferation was suppressed for 6 hours following the exposure of voltage under the condition of a square-wave positive voltage with a duty cycle of 63.8 ms. Additionally, under the conditions of a square wave's duty cycle of 63.8 ms and a frequency of 7.83 Hz, when the voltage was varied to 3 V, 4 V, and 5 V and the exposure time was changed to 1 h, 2 h, and 3 h, it was observed that the higher the voltage and the longer the exposure time, the more the bacterial proliferation was inhibited.
Conclusion : This study demonstrated that the effect on the bacterial proliferation of S. mutans varies depending on the time, voltage, and frequency range of the square-wave positive voltage. Despite using lower voltage and shorter exposure times at a specific frequency of 7.83 Hz, it was possible to more efficiently inhibit the survival and reproductive capability of S. mutans compared to other frequency ranges.

P-140

Airway Changes According to RPE Types: Tooth-Borne and Tooth-Bone-Borne, a CBCT Study

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Purpose : This retrospective clinical study aimed to evaluate the immediate and short-term changes in the volume and cross-sectional area of the nasal airway Tooth-Borne (RPE) and Tooth-Bone-Borne (MARPE) expansion methods.
Materials and methods : This retrospective study included patients who underwent maxillary expansion at the Department of Orthodontics. Initially, 51 patients were assessed, with 11 excluded for not meeting the inclusion criteria. The remaining 40 patients were randomly assigned to RPE (n = 20) or MARPE (n = 20) groups. During the study, one patient from the RPE group was excluded due to poor-quality X-rays, and two experienced maxillary expansion failure with RPE, and one with MARPE. Ultimately, data from 17 RPE patients and 19 MARPE patients were analyzed.
The RPE device involved bands on the maxillary first premolars and molars, while the MARPE device used bone screws for anchorage. Both devices were activated daily over a period resulting in a 7.0 mm expansion, followed by a 3-month consolidation period. CBCT images were taken at three stages: pre-expansion (T0), post-expansion (T1), and post-consolidation (T2) to assess airway changes.
Results : Both RPE and MARPE groups showed significant increases in airway volumes across all measured planes and time points. The MARPE group exhibited greater mean values in nasal cavity and total volume changes compared to the RPE group, though these differences were not statistically significant in the nasopharynx. The RPE group showed no significant difference in changes between T1-T2 and T0-T2.
Conclusions : The addition of mini-screws in the RPE is anticipated to enhance airway volumes, resulting in a positive impact. Based on current research results, the device may be particularly beneficial for individuals with sleep apnea. There is no significant difference in the nasopharynx between the two devices; it is not accurate to favor one device over the other for nasopharynx expansion.

P-141

Retention efficacy and patient experience with Vivera and circumferential retainer among non-extraction patients: 12-month RCT

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Objectives : The aim of this study was to evaluate retention efficacy by assessing retention stability and patient perspectives according to type of circumferential retainer: the wrap-around circumferential retainer (WCR) and customized clear retainer (CCR).
Material and Methods : This cohort follow-up study involved 52 patients aged 18–62 who underwent fixed-appliance orthodontic treatment without extractions or orthognathic surgery. Following screening consenting participants were divided into WCR and CCR groups. All participants before follow-up received fixed retainers for the upper and lower anteriors and respective removable retainers within two weeks post-debond. Intraoral scans and lateral cephalograms were taken immediately after debonding (T0) and again 12 months later. Dentoalveolar changes in several measurements were compared to evaluate retention efficacy. Surveys were conducted at 1 month (T1) and 12 months (T2) post-debonding to assess changes in patient experiences. Outcome assessments were blinded. Paired T-tests and independent T-tests were used for intragroup and intergroup comparisons of dentoalveolar measurements, respectively. Survey responses were analyzed using the Pearson Chi-Square test.
Results : The final assessment included 32 participants. Model analysis revealed no significant differences between the groups, except for maxillary intermolar width (P = .033). In the WCR group, cephalometric analysis indicated a significant increase in IMPA (P = .002) and a decrease in the interincisal angle (P = .014), while changes in the CCR group were statistically non-significant. Patient attitude evaluation showed similar trends for wear time and overall satisfaction. However, a higher percentage of respondents in the WCR group reported irritation when wearing the retainers (P = .037) at T1 and discomfort related to speech (P = .038) at T2.
Conclusion : CCR showed better retention efficacy in terms of lower incisor inclination. Patients experienced relatively less irritation and speech discomfort with CCRs.

P-142

Occlusal force changes after surgical and non-surgical orthodontic treatment in anterior openbite

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Objectives : Treatment of anterior openbite in adults can be performed by orthognathic surgery or orthodontic camouflage, depending on etiology and severity. Orthognathic surgery is indicated if the vertical discrepancy is severe and is accompanied by a sagittal or transverse discrepancy. In contrast, if the degree of openbite is mild to moderate, orthodontic tooth movement can resolve anterior openbite by extrusion of the anterior teeth, intrusion of the posterior teeth, or by the combination of both. The objectives of this study was to compare the occlusal contact area and occlusal force changes of anterior openbite patients treated by surgical and non-surgical orthodontic treatment.
Material and Methods : 19 openbite patients treated by molar intrusion, 37 patients treated by orthognathic surgery and 35 non-openbite patients treated with fixed orthodontic appliances were analyzed. We measured occlusal force and contact area at initial, final, and a 2-year follow-up period.
Results : In the intrusion group, the occlusal contact area initially decreases after debonding, but gradually increases, showing no significant difference compared to the non-openbite group after a 2-year follow-up. Occlusal force also decreases after treatment and gradually recovers, but remains lower than the non-openbite group after 2 years.
In the surgery group, both occlusal surface and force decrease post-treatment, but eventually rise to levels similar to those of the non-openbite group.
Conclusion : Orthognathic surgery and molar intrusion using orthodontic miniscrews can improve occlusal function similarly. Orthodontists can select either method depending on malocclusion severity and patient demand.

P-143

Survey Study about patient discomfort with retainers after orthodontic treatment

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Objectives : Orthodontic treatment involves not only moving teeth but also long-term observation, including retention periods, to prevent relapse caused by multiple factors. Patients' discomfort with retainers after orthodontic treatment and the factors affecting this are important for evaluating the outcome of orthodontic treatment and predicting the success of retention. In this study, a questionnaire survey was conducted to determine the subjective discomfort related to retainers after orthodontic treatment and to determine the perception of correction according to sex, age, type of retainer, duration of use, and routine care based on the responses of patients during the retention period after orthodontic treatment.
Material and Methods : The chi-square test, a method of comparing proportions, and the Cochran-Armitage test for trend analysis of ordered nominal variables were used to determine the associations between patient demographics, retainer type, retainer duration, number of retainer deformations, and discomfort.
Results : The discomfort responses of female respondents differed significantly according to the frequency of retainer deformation, age, and duration of retainer use.
Male respondents exhibited no significant differences in discomfort responses related to each of these variables.
In the univariate logistic analysis, the significant variables were sex and age category, duration of retainer use, regular care, and retainer failure or deformation, while in the multivariate analysis, the significant variable was the duration of retainer use.
Conclusion : As retainers are lifelong appliances that must be used to ensure safety after orthodontic treatment, healthcare providers must make efforts to reduce patient discomfort. Our results suggest that it is necessary to emphasize the importance of the duration of retainer use and to remind patients of the importance of regular maintenance.

P-144

Orthodontic Traction of a Canine Impacted in Mandibular Symphysis Using CBCT and Skeletal Anchorage System

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Introduction : Impaction of maxillary and mandibular canines is a frequently encountered clinical problem, the treatment of which usually requires an interdisciplinary approach.
However, surgical exposure of impacted canines and the complex orthodontic mechanisms applied to align the teeth into the arch may lead to varying amounts of damage like bone loss, root resorption, and gingival recession around the treated teeth.
Especially in case of impacted canine in mandibular symphysis, accurate evaluation of 3-dimensional position of impaction and minimally invasive traction mechanism to avoid further injuries should be planned before treatment.

Case Summary : We report a case of 14-year-old girl who had an impacted canine in mandibular symphysis.
The plan of surgical opening and orthodontic traction of a canine is recommended before growth completion instead of prosthetic plan.
Using 3-dimensional cone beam computed tomography(3D-CBCT), exact position of an impacted canine is visualized, optimized surgical approach and orthodontic tunneling path can be planned.
During traction, micro-implant anchored in buccal shelf allows the application of ideal traction forces in the most favorable direction, avoiding additional injuries to adjacent teeth and structures.
Conclusion : With early detection, proper clinical and radiographic diagnosis using 3D CBCT, well-managed surgical technique and careful orthodontic treatment mechanism forced by skeletal anchorage system, an impacted mandibular canine in mandibular symphysis area in growing patient can be guided and erupted to an appropriate location in the dental arch.

P-145

Removal of Orthodontic Mini-screw Displaced into the Maxillary Sinus: Case Report

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Introduction : Foreign bodies found in the maxillary sinus are very rare, but possible causes include injury, accident, or dental work. The most commonly reported foreign bodies are fractured tooth roots or teeth that fall into the maxillary sinus during extractions, while other foreign bodies include dental burs, endodontic materials, impressions, and, more recently, dental implants. We report three cases in which orthodontic mini-screws placed in the maxillary region migrated into the maxillary sinus after placement and the screws were removed by an intraoral approach.
Case Summary : Case 1: 25yr female: migration of a screw placed in the root of the maxillary second molar was removed by intraoral surgery under local anesthesia.
Case 2 :16yr male : after extraction of four premolars and screw loosening, a second screw was placed in the root canal of the #26. mild loosening at 1 month after placement & moved to the maxillary sinus, removed by intraoral surgery under local anesthesia.
Case 3 :27yr female : screws were placed to improve the midline and occlusion, but they fell out and were placed a second time, but the maxillary right screw moved into the maxillary sinus, and due to hypotension, asthma, and fear of dental treatment, the patient had the screw removed by intraoral surgery under general anesthesia at a university hospital.
Conclusion : Once a screw has migrated into the maxillary sinus, it is recommended that it be removed as soon as it is detected, and an oral and maxillofacial surgeon or otolaryngologist should be consulted to determine whether the maxillary ostium is obstructed, maxillary sinusitis, or oroantral fistula, and the presence of infection and clinical symptoms. Select an intraoral approach, the Caldwell-Luc approach, an intranasal approach, functional endoscopic maxillary sinus surgery, or a combination, to remove the screws

P-146

Non-surgical Approach for Skeletal Class III Patient with Anterior Open Bite

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Introduction : The treatment of skeletal class III patients with anterior open bite is considered a challenging area in orthodontics. The combination of the two malocclusions can be treated by orthognathic surgery or orthodontic camouflage treatment in late adolescent patients with completed growth. Non-surgical treatment of anterior open bite is mainly done with intrusion of upper molar. However, intrusion of posterior teeth induces counterclockwise rotation of mandible and can improve open bite but worsen skeletal class III tendency. Therefore, orthodontists should seek a breakthrough to solve both problems. This case report represents non-surgical treatment of skeletal class III patient with severe anterior open.

Case Summary : The patient was a 17-year-old woman who wanted to solve anterior open bite. She had a skeletal class III relationship with 1.5mm overjet, -6mm overbite, transverse discrepancy, lower anterior spacing, lack of maxillary incisor showing and hyperdivergent profile. Although orthognathic surgery was the first option, the patient wanted an orthodontic camouflage treatment. After maxillary expansion and mandibular constriction using miniscrew-assisted rapid palatal expander (MARPE) and lingual arch, intercuspation of molar area was improved and overbite was increased. Maxillary molar intrusion was performed for bite closure using remained palatal screws for MARPE. Anterior extrusive elastic was used to improve overbite and increase maxillary incisor exposure. After 29 months of orthodontic treatment, favorable anterior overbite and occlusion with beautiful smile can be achieved. The patient was instructed to wear clear retainer with intrusive elastic during the day and spring-loaded posterior bite-block at night to prevent relapse.

Conclusion : Proper treatment plan is one of the most important thing and orthodontists should focus on not only cephalometric value but also various diagnosis tools. In this case, by making detailed treatment plans, severe anterior open bite was treated non-surgically with proper overbite, occlusion, and incisor display.

P-147

Molar protraction in a patient with the congenital missing of the maxillary bilateral canines

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Introduction : Congenital missing of maxillary canines are not common, but when canines are missing, implants may be planned depending on the facial profile and dentition status, or the first premolar may be replaced in the canine position. This case report introduces a case in which the first premolar was placed into the canine position through molar protraction in an adolescent patient with congenital missing of maxillary bilateral canines without protrusion or crowding.
Case Summary : A 16-year-old male patient came with congenital missing of maxillary bilateral canines and diastema between the upper and lower central incisors. The proloned retention status of both maxillary primary canines and the overall small size of the teeth were observed. There was no facial protrusion, no crowding at all and he has Class I molar relationship, a plan for implant placement was considered. However, as the patient was not old enough, the primary canine was mobile, and the upper third molars were present on both sides, the patient hoped to close the canine space, so molar protraction was planned. The remaining maxillary primary canines were extracted and miniscrews were placed on buccal and palatal sides of the maxilla for molar protraction, and Class III elastic was used to improve shallow overjet. During the 3-year treatment period, the impacted maxillary third molar erupted into the second molar position, and the first premolar was placed in the canine position to achieve full cusp Class II occlusion.
Conclusion : In the case of adolescents with third molars, closure of the missing area is helpful in the long term, but since there is a possibility of prolonging the treatment period, various considerations regarding the patient's age and condition are required when establishing a treatment plan. And if there is a plan to move a large amount of teeth, an absolute anchor is essential.

P-148

The cases of maxillary expansion using customized tissue-borne MARPE

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Introduction : Transverse maxillary expansion in adults can now be accomplished in many cases without surgery owing to MARPE (Miniscrew-Assisted Rapid Palatal Expansion). However, conventional MARPE, which uses anchors from both bone and teeth, may lead to periodontal side effects in the anchor teeth. Additionally, because palatal expansion through MARPE is usually initiated prior to leveling and alignment, sometimes it is hard to install the device due to severe crowding. Therefore, tissue-borne MARPE can be considered especially in patients with periodontal problems or severe crowding, since customized tissue-borne MARPE uses only palatal anchors.
Case Summary : We present two skeletal class lll patients with maxillary constriction and mandibular prognathism, where pre-surgical orthodontics included maxillary expansion through customized tissue-borne MAPRE.
One patient, a 19-year-old female, exhibited severe maxillary and mandibular transverse discrepancies. Through concurrent maxillary arch expansion and alignment via bracket bonding, orthognathic surgery was conducted six months after initiating preoperative orthodontic treatment. The other patient is a 33-year-old female, who had dentoalveolar open bite, maxillary omega-shaped arch and moderate adult periodontitis. After 6 months of leveling and alignment, a re-evaluation was conducted regarding the need for maxillary premolar extractions or maxillary expansion. The patient preferred to avoid extractions, so it was decided to proceed with maxillary expansion using customized tissue-borne MARPE. In both cases customized tissue-borne MARPE allowed the brackets to remain in place, continuing dental alignment during the consolidation period, thereby shortening the overall pre-surgical orthodontic treatment time.
Conclusion : When tooth-borne MARPE is impractical, customized tissue-borne MARPE can be a beneficial alternative. It also offers advantages such as shortening the orthodontic treatment duration and providing flexibility in treatment plan.

P-149

Non-Surgical Camouflage Treatment of a Skeletal Class III Patient with Anterior Open Bite using micro-implants.

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Introduction : Skeletal Class III malocclusion with anterior open bite is one of the most challenging problems that orthodontists may encounter. Treatment considerations should focus on the patient's facial profile, skeletal pattern and severity of dental malocclusion. Depending on severity of problems, orthognathic surgery may be essential. However, many patients refuse the surgical option due to its cost or the invasive nature of the procedure. Non-surgical correction of skeletal Class III malocclusion can be performed by total distalization of the mandibular dentition. Non-surgical correction of an anterior open bite can be accomplished by the intrusion of the posterior teeth, extrusion of the anterior teeth. This case report demonstrates orthodontic camouflage as an option for adult patients with skeletal Class III malocclusion, anterior open bite and posterior crossbite using micro-implants.

Case Summary : Chief complaint: anterior open bite
A 22-year-old female patient had a chief complaint of anterior open bite. Clinical examinations showed anterior openbite, bilateral posterior crossbite with mandible prognathism. Treatment with orthognathic surgery was the first option to improve both skeletal and dental problems. However, the patient refused any surgical approach. The alternative treatment plan was non-surgical orthodontic camouflage treatment using micro-implants after extraction of the third molars. The patient with anterior open bite and posterior cross bite was treated successfully by miniscrew assisted rapid palatal expander(MARPE) and total distalization of the mandibular dentition. The anterior openbite and posterior crossbite was corrected, and ideal overjet and overbite relationships, midline coincidence and functional occlusion were all achieved. Satisfactory occlusal, functional, esthetic and stable results were obtained.

Conclusion : Non-surgical orthodontic camouflage treatment of a skeletal Class III patient with open bite successfully achieved acceptable skeletal and dental changes and smile esthetics with the proper biomechanical application of MARPE and micro-implants. The treatment results were acceptable within the limitation of the camouflage treatment.

P-150

An Orthodontic Treatment of a TMD Patient with Maxillary Posterior Intrusion Using TSADs

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Introduction : The orthodontic treatment of patients having temporomandibular disorders (TMDs) are some of the most complicated cases to treat. The positions of the mandibular condyles are often unstable, which means clinicians find it difficult to have definite criteria for making an accurate and reliable orthodontic diagnosis.
Case Summary : This E-poster reports the orthodontic treatment of a patient showing skeletal Class II and TMDs with condylar resorption. To stabilize the patient's condylar position and to relieve her symptoms in the temporomandibular joint (TMJ), a stabilization splint was used before orthodontic tooth movement. After the splint therapy, the patient exhibited significantly increased open bite and a more severe Class II occlusal relationship as her mandibular condyles were seated anteriorly and superiorly in the articular fossae. The occlusion and facial esthetics of the patient were improved by orthodontic camouflage treatment with the proper use of temporary skeletal anchorage devices and treatment mechanics
Conclusion : The orthodontic treatment plan needs to be based on the stabilized skeletal and occlusal relationship, and the treatment mechanics should ensure that the condyles remain in their stabilized position during the orthodontic tooth movements. Some patients who reveal an increased anterior open bite and a more severe Class II occlusal relationship after the stabilization of the condyles can be treated with posterior intrusion with the proper use of TSADs.

P-151

Non-extraction Orthodontic Treatment of Severe Crowding Using Miniscrews

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Introduction : This clinical report illustrated the successful orthodontic treatment of class II malocclusion with severe crowding by distalization of upper posteriors using minscrews. For significant posterior movement of the molars, we planned to apply forces from both buccal and palatal sides.

Case Summary : 29 years old male patient visited to our clinic with a chief complain of anterior crowding. The patient had an severe anterior crowding and Class II molar and Class II canine relationship. The upper left lateral incisor showed crossbite. There was no space for the upper left lateral incisor. The upper dental midline deviated about 5mm to the left side. The cephalometric analysis showed a skeletal Class I relationship with a hypodivergent facial pattern. We planned to move the posteriors distally until enough space was secured for aligning the anteriors. Distal force was applied form buccal and palatal sides using fixed appliances on posteriors and the lingual arch on the upper 2nd molars. 4 miniscrews were implanted on the upper molar area of buccal and palatal sides. After creating sufficient space on the upper anteiros, braces were bonded on the anteriors.

Conclusion : After 44 months of orthodontic treatment, Class I canine and molar relationships with proper overjet and overbite were achieved without extraction of premolars. Our result of this clinical report suggests that distalization of posteriors using miniscrews facilitate treating severe class II crowding case.

P-152

Non-extraction Treatment Case with Full Arch Distalization in Patients with Protrusive Lips

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Introduction : The introduction and development of skeletal anchorage was a good opportunity to obtain good treatment results without extraction in borderline cases. In this presentation, we would like to discuss about the considerations of non-extraction treatment in borderline cases with lip protrusion .

Case Summary : A 25-year-old female patient presented with the chief complaint of "Crowding and protrusive lips." She exhibited slight crowding in the upper and lower anterior regions, bilateral Class III molar relationship, and shallow overjet and overbite, along with protrusion of the upper and lower lips. The upper right first premolar had only the root remaining due to dental caries. The patient's skeletal relationship was Class I, but due to the shape of the chin, excessive lip retraction with extractions was not recommended. Therefore, after determining the required amount of upper anterior retraction to achieve appropriate lip retraction, a non-extraction treatment plan was chosen. To achieve this, maxillary skeletal expansion and mandibular arch expansion using a PLA were planned, followed by distalization of full dentition.

Conclusion : In borderline cases, various methods such as arch expansion, distalization of the dentition, and interproximal reduction can be performed to achieve the goal of appropriate treatment without extraction. In this case, arch expansion and by applying a continuous distalization force to the upper and lower dentition, lateral profile improvement could be achieved without extraction.

In borderline cases, more predictable and good treatment results will be obtained if treatment is presented in detail, a clear treatment strategy is established to achieve this, and treatment is carried out based on this.

P-153

Treatment of Class I Malocclusion with Moderate Crowding Using Clear Aligner with Mini Screws

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Introduction : In orthodontic treatment, mini screws are already widely used to solve many problems, and clear aligners(CA) have recently been widely used along with the trend of digitalization of dental treatment. The use of mini screws can be considered very important in clear aligner treatment(CAT). The purpose of this report is to report a case in which Class I malocclusion of moderate crowding was treated without protruding anterior teeth using clear aligner treatment with mini screws.
Case Summary : A 15-year-old male man presented with a chief complaint of anterior crowding. This patient had a skeletal and dental Class I malocclusion with moderate crowding of the anterior teeth and upper right high canines(#13). Treatment was performed both arch expansion, total distalization of approximately 2 mm in maxillary and mandibular right molars by placing miniscrews between the upper and lower right second premolars and first molars for maxillary and mandibular and interproximal reduction of mandibular anteriors with CA. While maintaining a Class I relationship during the treatment period, it was performed without forward movement of the upper and lower anterior teeth.
Conclusion : The application of mini screw in CAT can be used effectively to move the total distalization of the upper and lower posterior teeth if used well.

P-154

Non-surgical camouflage treatment of a skeletal Class III patient using TADs for molar distalization

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Introduction : Camouflage treatment can be an option for patients who have mild CIass III malocclusion or do not want orthognathic surgery due to high risk and cost. Even for patients with skeletal discrepancy, non-sugical orthodontic treatment has become possible because of the development of temporary anchorage devices (TADs). In this case report, we describe the successful camouflage treatment of skeletal Class III by using appropriate application of TADs and total distalization of the lower dentition.
Case Summary : We report the case of a 16-year-old male patient with the chief complaint of an edge to edge bite. Severe Class III molar relationship and impacted teeth on #17, 27 were observed. The patient showed a mild skeletal Class IIII relationship. In the early stage of treatment, rapid palatal expansion (MARPE) was used to improve transverse discrepancy. In early period of treatment, to establish a stable anterior occlusion with adequate overjet and overbite, Class III elastics were used on the maxillary first molar connected with palatal skeletal anchorage. Additionally, a mandibular miniscrews were placed on the mandibular both buccal shelf area between the first and second molar to distalization of whole mandibular dentition.
Conclusion : If conventional mechanics with Class III elastics had been used, the maxillary occlusal plane would have flattened, resulting in reduction of maxillary incisor display and deterioration of smile esthetics. To avoid this problem, it is possible to change the force vector by using TADs that can prevent the extrusion of molars. As a result, in the camouflage treatment of skeletal Class III malocclusions, an appropriate treatment strategy is necessary to minimize the duration of treatment by avoiding round-tripping of anterior bite.

P-156

Factors affecting external apical root resorption of maxillary incisors associated with microimplant-assisted rapid palatal expansion

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Objectives : The purpose of this study is to measure and compare EARR of the maxillary central and lateral incisors after MARPE, and to evaluate risk factors of root resorption after expansion.
Material and Methods : CBCT images of total 60 patients were taken before expansion(T1) and 3 to 6 months after expansion(T2). Tooth length(L), root length(r), crown length(c) were measured. Resorption length(RL) and resorption volume(RV) was defined as the difference in tooth length(L) and volume(V) between T1 and T2 period. Resorption length and volume percentage was calculated. Center of Resistance(Cre) was calculated as distance from both maxillary first molar's bifurcation point. The amount of expansion(E) was defined as the difference in Cre measured between T1 and T2 period.
Results : There was a significant difference in tooth length and volume of central and lateral incisors before and after expansion. Resorption index(RL, RLp, RV, RVp) was significantly higher in central incisor than in the lateral incisor. There was a significant correlation between age and RLp of central incisors, amount of expansion and RVp of central incisors, tooth length of the central incisors and RL, RLp of the central incisors, root/crown ratio of central incisors and RL of the central incisors, tooth length of the lateral incisors and the RL of the lateral incisors.
Conclusion : There is a significant maxillary incisor's root resorption after MARPE. Root resorption after MARPE was significantly higher in central incisors than in lateral incisors. Order initial age, larger amount of expansion, initial tooth length and root/crown ratio were risk factors of EARR after MARPE.

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Factors Affecting Asymmetric Expansion of Microimplant-Assisted Rapid Palatal Expansion

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Objectives : The present study aims to figure out factors related to asymmetric expansion of Microimplant-assisted rapid palatal expansion(MARPE). Skeletal factors such as canting, menton deviation and dental factor such as the first molar inclination were considered.
Material and Methods : Pre- and post- MARPE CBCT images of patients were analyzed. The CBCTs were superimposed, and the amount of expansion between right and left was analyzed to find out if the expansion was symmetric or asymmetric. The canting of the first molar, menton deviation, and inclination between the right and left first molar were analyzed. Each variable was analyzed to seek significant difference between two groups. The greater side of the asymmetric expansion was also analyzed if it correlates with the facial asymmetry.
Results : Total of 38 samples(19 symmetric expansion, 19 asymmetric expansion) were included. The total expansion amount, age was insignificant between the groups. Significant difference was found only on the first molar inclination difference measured by the palate. Plane canting, menton deviation, first molar inclination difference by the FH plane showed insignificant difference. The direction of asymmetric expansion showed no relation with the menton deviation side.
Conclusion : During palatal expansion using microimplant-assisted rapid palatal expansion, unilateral expansion may occur. The average difference at first molar inclination by the palate was bigger in the asymmetric expansion group. And the first molar inclination difference was the only influencing factor of asymmetric expansion.

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Evaluation of Modified C-palatal Plates on Speech Articulation Using Acoustic Analysis

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Objectives : The objective of the study was to evaluate the impact of modified C-palatal plates (MCPPs) on speech articulation over time using acoustic analysis. This study aimed to understand the extent of speech perturbation caused by MCPPs and the adaptation process in patients.
Material and Methods : The study involved 40 native Korean-speaking participants, divided into two groups: 20 wearing MCPPs and 20 wearing Trans-palatal arch(TPAs). The participants had no concurrent appliances affecting the lingual surfaces or the palate and were free of speech impediments. Speech recordings were made at six intervals: before appliance placement, immediately after, and at one, two, three, and four weeks post-placement.
Results : The results showed no significant differences in pitch and voice onset time between the MCPP and TPA groups. However, voice onset time increased immediately after placement for /n/, /r/, /tʃ/, and /j/ sounds in the MCPP group, normalizing within one week. The /t/ and /s/ sounds returned to baseline in two weeks, and /d/ normalized after three weeks. This suggests that MCPPs initially disrupt speech, but patients adapt quickly, with most sounds normalizing within a few weeks.
Conclusion : The study concluded that modified C-palatal plates (MCPPs) and transpalatal arches (TPAs) initially cause distortions in speech articulation, characterized by prolonged voice onset times (VOT) immediately after placement. However, these speech disturbances are temporary and generally resolve within one to three weeks. The findings suggest that patients and their parents should be informed about the possibility of temporary speech changes during pre-treatment counseling before MCPP placement to manage expectations and alleviate concerns.

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Changes of soft tissue after miniscrew-assisted rapid palatal expansion

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Objectives : To evaluate the changes of facial soft tissue after miniscrew-assisted rapid palatal expansion(MARPE) using cone beam computed tomography(CBCT).
Material and Methods : Thirty consecutive subjects(13 males, 17 females, mean age 22.9 ± 8.8 years) treated by MARPE who were scanned using CBCT before(T0) and after(T1) expansion were selected. After superimposition of both CBCT images with voxel-based registration based on cranial base, x, y, and z coordinates of 21 landmarks were obtained. Changes after expansion were evaluated by comparing the differences between coordinates before and after expansion and correlation with the amount of expansion. Moreover, differences of displacement between groups by sagittal and vertical skeletal classification and sex.
Results : Both alar bases and soft tissue over infraorbital foramen moved laterally, both alar base and left soft tissue over infraorbital foramen moved forward and both lip commissures moved downward($p<0.05$). Several coordinates of soft tissue around nose, infraorbital foramen, lip and zygoma showed moderate correlation with the amount of expansion($p<0.05$). Most of coordinates showed no statistically significant differences between groups by sagittal and vertical skeletal classification and sex.
Conclusion : There were 3-dimensional changes in facial soft tissue after MARPE and clinicians should anticipate these soft tissue changes before using MARPE.
1. The nasal width and soft tissue over infraorbital foramen expanded laterally after MARPE. Also, the nasal alar area and soft tissue over infraorbital foramen moved forward and lip commissure moved downward after MARPE.
2. Several coordinates of soft tissue around nose, infraorbital foramen, lip and zygoma had moderate correlation with the amount of expansion.
3. Most of coordinates didn’t show statistically significant differences between groups of anteroposterior, vertical skeletal classification and sex.
4. Hypodivergent group showed smaller amount of posterior expansion than the other groups.
5. The amount of anterior and posterior expansion didn’t show statistically significant differences between groups of anteroposterior skeletal classification and sex.

P-160

Anchor loss of indirect anchor tooth during minor tooth movement

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Objectives : The aim of this study was to evaluate stability of indirect anchorage system using temporary anchorage devices (TADs).
Material and Methods : Dental casts of 19 patients who had orthodontic treatment, including indirect anchor tooth on one side and sound corresponding tooth on the other side, were collected before and after treatment. The casts were digitally scanned and inverted to STL file. Pre- and Post-treatment models were superimposed using Geomagic control X (3D Systems, Morrisville, NC, USA). The x, y, z coordinates of the anchor tooth cusps (experimental group; n=64) and the corresponding tooth cusps (control group; n=64) were measured before and after treatment. One sample t-test was used to calculate the difference between displacement of the cusps and zero. Independent two sample t-test was used to compare the average value of each group. To verify whether there is change of the coordinates between each axis before and after treatment in both the experimental and control group, linear mixed model was used. Consistency of x, y, z axis was tested with the intraclass correlation coefficient (ICC).
Results : According to one sample t-test, the average displacement of coordinates pre- and post-treatment was 0.7907±0.5569 ($p<0.0001$). Using non-parametric test, the average value of the experimental group was 0.79±0.56 and the control group was 0.56±1.13, and the difference was statistically significant. After removing two outliers, the data followed normal distribution and the difference was still statistically significant. (experimental group: 0.79±0.56, control group: 0.36±0.2) The change of the coordinates between each axis was statistically insignificant and ICC values showed high consistency.
Conclusion : The displacement of the indirect anchor tooth in coordinate system was significant. However, displacement in each axis was insignificant. Despite the statistical significance, the total amount of anchor loss was clinically acceptable, less than 1mm. Thus, indirect anchorage system can be a stable and versatile appliance under careful observation.

P-161

Comparison of Treatment Effects during Retraction of Upper-anterior-teeth using Mini-implants placed at Infrazygomatic-crest and Interradicular-sites

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Objectives : The objective of this prospective study was to examine the efficacy of posterior interradicular and infrazygomatic crest mini-implants for en-masse anterior retraction.
Material and Methods : The 22 patients were divided into two groups. In group 1(IZC, n=11), mini-implants were placed in the infrazygomatic crests and in group 2(IR, n=11), mini-implants were placed in the molar-premolar interradicular sites. Soft tissue, skeletal, and dental treatment effects between two groups were compared using lateral cephalometric measurements.
Results : The average angle between the cranial base and A point was 1.01 degrees (P = .004), and the linear distance between the upper incisor and A point was 2.67 to 5.2 millimetres (P = .00). In IZC group the maxillary incisor to the palatal plane moved upward by a mean of −5.20 mm (P = .059), whereas in IR group the incisor movement changed by −2.67 mm (P = .068). There was no significant difference between groups IZC and IR while comparing overall treatment changes on upper incisor position change, angle, and overjet.
Conclusion : Mini-implants placed in between the molar and premolar as well as the infrazygomatic crest can withstand the deepening of the bite during retraction. Mini-implants in IZC are capable of causing intrusion of the anterior teeth and preventing intrusion of the molars, thereby providing absolute anchoring in all planes. Placement of the mini- implants in the infrazygomatic crest resulted in more linear retraction.

P-162

Risk factors associated with failure of orthodontic mini-screws placed in the median palate

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Purpose : The purpose of this study was to investigate the risk factors associated with failure of orthodontic mini-screws.
Materials and methods : The subjects population consisted of 272 orthodontic patients (64 males and 208 females; mean age, 20 years 0 month). The patient records, intraoral photos, study models and lateral cephalograms were used for evaluation of following several variables; sex, age (below 16 years old; 16 years old or over), cervical vertebral maturation (CS4, 5 and 6), antero-posterior jaw base relationship (skeletal class I, II and III), vertical occlusal relationship, existence of Torus palatinus, purpose of use, type of auxiliary appliances and O'Leary's Plaque Control Record (PCR) score (below 20%; 20% or over). The patients were divided into two or three groups based on the above evaluation. The failure and success rate of mini-screws among each group was compared using Fisher's exact probability test. The significance of mean differences was set at the 0.05 level. Bonferroni correction was used for multiple comparison test among three groups.
Results : There were no significant differences in the failure rate of mini-screws among each variable group except for age and PCR score. The failure rate in the patients below 16 years old showed significantly higher than in the patients aged 16 years old or over. Patients with high PCR score showed higher failure rate than patients with low PCR score.
Conclusions : Patients below 16 years old can have risk factor for failure of orthodontic mini-screws placed in the median palate. In addition, poor oral hygiene can lead to the failure of mini-screws.

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Minimum required length of orthodontic microimplant: a numerical simulation and clinical validation

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Objectives : This study aimed to numerically identify the minimum implantation depth of MI into cancellous bone (ID_{cancel}) required to suppress MI micromotion below the threshold value (30 ㎛) during MI healing and clinically test the relevance of the numerically identified minimum ID_{cancel} value.

Material and Methods : To simulate the diverse conditions encountered in clinical settings, 20 MI and bone models were generated using computer-aided design by combining MIs of 4 different shaft lengths and bone specimens having 5 different cortical bone thickness (CBT). Assuming that the orthodontic forces applied to the MIs during their healing period are the principal cause of MI micromotion, a typical loading condition was simulated by applying a horizontal force of 1.5 N to the MI head. The relative displacement between the MI and the inner part of cortical bone was defined as MI micromotion, and data at the following 3 locations were recorded: the top surface, the midplane, and bottom surface of the inner part of cortical bone. The value obtained at the top surface, which was the largest of the 3, was defined as the peak micromotion, and the average of the data obtained at the 3 locations was defined as the average micromotion.

Results : 1. The shorter the MI length and the thicker the CBT, the greater the micromotion.
2. An ID_{cancel} of at least 2.5 mm is needed to suppress the peak micromotion below 30 ㎛, and 1.5 mm is needed to suppress the average micromotion <30 ㎛.

Conclusion : 1. ID_{cancel} should be at least 2.5 mm to suppress the peak micromotion of MI to below the threshold value of 30 ㎛.
2. The minimum required lengths of MI for use in the maxilla and mandible was estimated to be 5.2 mm and 6.5 mm, respectively.

P-164

Healing of the palatal bony hole after removal of MARPE

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Purpose : The purpose of this study was to evaluate healing of the palatal bony holes after miniscrews removal in patients treated by minisrew-assisted rapid palatal expander (MARPE) using cone beam computed tomography (CBCT) images and three dimensional (3D) segmented images.
Materials and methods : The participants consisted of 40 young adult patients who underwent MARPE treatment. A total 160 palatal bony holes (80 anterior holes and 80 posterior holes) were included in the study. To investigate the healing of the palatal bony holes, the following measurements were performed: miniscrew inclination, distance to the midpalatal suture (MPS), and palatal bone thickness from CBCT images; and width, depth, volume, total surface area of the holes, from 3D segmented images. Additionally, volume healing ratio and total surface healing ratio were analyzed. Pearson correlation coefficients were calculated to analyze the relationships between the healing ratio of the bony holes and the features of miniscrew's position.
Results : After removal of miniscrew, the dimension, volume, and total surface of the palatal bony hole formed by miniscrew decreased noticeably, indicating significant bone healing at the removal site. Pearson correlation coefficients indicated that greater healing occurred on younger patients with longer healing time, smaller maxillary expansion width, monocortical anchorage, greater palatal bone thickness (PBT) and closer position of the bony hole to the MPS.
Conclusions : The present study suggests that the palatal bony holes after MARPE removal recover significantly, which may be associated with age, healing time, maxillary expansion width, type of cortical anchorage, PBT, and distance from the miniscrew to the MPS.

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3-Dimensional changes in mandibular dentition following mandibular total arch distalization with TADs

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Objectives : The purpose of this study was to assess the 3-dimensional changes in the mandibular dentition as well as gingival level of the mandibular following total arch distalization in Skeletal Class III malocclusion.

Material and Methods : Skeletal Class III subjects treated with total arch distalization of the mandible using interradicular TADs were analysed (N=17). A stepwise 3D reorientation including regional mandibular superimposition of pre(T0) and post-treatment(T1) CBCTs, mandibular model segmentation, fusion of corresponding digital mandibular casts provided superimposed reoriented was to evaluation the precise 3D tooth movement, changes in arch dimension and the gingival margin.

Results : Mandibular teeth indicated significant posterior movement ranging from 1.86-2.59mm along with transverse change in the premolar region and extrusive movement of the whole dentition except second molar. First premolar (4-4) and second premolar (5-5) widths significantly increased by 1.61 ± 2.34 mm and 1.62 ± 1.74 mm, respectively($p<0.05$). Occlusal plane changes were noted in the order of extrusion (52.9%), clockwise rotation (23.5%), intrusion (11.8%), clockwise rotation (5.9%) and left and right rotation (5.9%). Second premolar indicated significant increase of clinical crown height suggesting gingival recession while significant decrease in clinical crown height in central incisor indicated gingival gain.

Conclusion : In addition to the expected distal displacement of the whole dentition, extrusive displacement of all mandible dentition except second molar, increase of premolar widths, mild gingival gain in central incisor, and mild gingival recession of the second premolar was accompanied indicating the complex 3D changes of the mandibular arch.

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Evaluation of treatment effects of ramal plates on severe Class III malocclusion

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Objectives : Previous studies on the use of ramal plates in mandibular distalization movement to correct Class III malocclusion have been limited to mild to moderate Class III patients. Therefore, this study aims to evaluate the dentoskeletal and soft tissue changes after distalization of the mandibular dentition using the ramal plates in nonextraction camouflage treatment of severe Class III malocclusion with a full cusp discrepancy or more at the first molars.
Material and Methods : The sample consisted of pre- and post-treatment lateral cephalograms from 25 adult patients (19 males and 6 females; mean age: 25.0±7.9 years old) who were treated with ramal plates in the mandibular arch for total distalization. The sagittal and vertical changes in mandibular molars and incisors and skeletal and soft tissue variables were analyzed for statistical significance of $p < 0.05$.
Results : The mandibular first molars distalized 3.65 mm at the crown and 1.81 mm at the root ($p < 0.001$ for both). Similarly, the mandibular incisors retracted 3.32 mm at the crown and 0.81 mm at the root ($p < 0.001$ and $p = 0.002$, respectively). Skeletally, the Wits appraisal displayed a significant increase of 1.56 mm ($p < 0.001$). On the other hand, soft tissue changes showed a significant lower lip retraction of 1.26 mm ($p = 0.003$).
Conclusion : The ramal plates exhibited effective mandibular distalization in treating severe Class III malocclusion, which may be considered a viable alternative to the orthognathic surgical approach.

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Evaluation of Osseointegration and Clinical Application of a Newly Developed Bone-Surface Anchored Orthodontic Device

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Objectives : Securing efficient anchorage is essential in orthodontic treatment. Traditional screw-type miniscrews and orthodontic miniplates have been effectively used but present limitations such as potential root damage, weakening of anchorage, risk of screw fracture, and high invasiveness during implantation. This study aimed to address these issues by developing a novel concept of a 'bone-surface anchored orthodontic device' and evaluating its effectiveness.

In this experiment, the bone-surface anchored anchorage screws were implanted on the cranial bone surface of rabbits and observed over intervals of 4, 8, and 9 weeks. Surface treatment methods were applied to assess new bone formation. The degree of new bone formation was analyzed using HE staining and Masson Trichrome staining.

The results indicated that the degree of new bone formation followed the order of SLA > RBM > Machined surface. More significant new bone tissue was observed after 8 weeks, indicating that a minimum 8-week healing period is necessary. The lateral traction force after 8 weeks ranged from 23.71 to 36.6 N.cm. The removal torque required was 10 N.cm, confirming the ease of clinical use.

The 'bone-surface anchored orthodontic device' developed through this study addresses the problems associated with conventional skeletal anchorage devices, demonstrating new bone formation and anchorage strength. This device is expected to facilitate the design and treatment of orthodontic appliances for not only orthodontic tooth movement but also for treating Class II or III malocclusions in growing patients who require stronger orthopedic forces. Additionally, this device could potentially be applied to orthodontic appliances for sleep apnea patients.

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Prevalence and Characteristics of Sleep-Related Breathing Disorders in Pediatric Orthodontic Patients

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Objectives : To investigate the prevalence of sleep-related breathing disorders (SRBD) in pediatric orthodontic patients and analyze characteristics between high-risk and low-risk groups.
Material and Methods : This prospective study included 641 pediatric patients (322 males, 319 females, mean age 9.56±2.45). Patients completed the Pediatric Sleep Questionnaire (PSQ) and initial medical records before treatment (T0). They were categorized into high-risk (PSQ score > 0.33) and low-risk groups. Independent t-tests and Chi-square tests analyzed demographic, clinical, and dental differences.
Results : The prevalence of high-risk was 5.3% (25 males, 9 females, mean age 10.32±2.66). Males under 12 showed a significantly higher risk, though no significant difference was found between genders over 12. No significant differences in overjet and overbite were observed between high-risk and low-risk groups. However, high-risk patients had significantly higher rates of mouth breathing, nail-biting, tongue thrust, bruxism, and snoring ($P < 0.05$). No significant differences were found in upper respiratory diseases or surgery history, but there were significant differences in lower respiratory diseases ($P < 0.05$).
Conclusion : This study demonstrates a notable prevalence of SRBD in pediatric orthodontic patients. Specifically, Male proportion was higher in the under-12 age group and high-risk patients had higher incidences of mouth breathing, nail-biting, tongue thrust, bruxism, and snoring. Additionally, significant differences in lower respiratory diseases were observed in high-risk patients. These findings highlight the need for routine SRBD screening in pediatric orthodontic evaluations and comprehensive management of identified habits and conditions.

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Three-dimensional skeletal and upper airway predispositions to craniofacial skeletal phenotype of adults obstructive sleep apnea

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Objectives : To analyze three-dimensional craniofacial characteristics influencing the severity of obstructive sleep apnea (OSA) and to investigate the differences in craniofacial features and various polysomnography (PSG) indices indicating OSA severity between craniofacial skeletal phenotype (CSP) and non-craniofacial skeletal phenotype (N_CSP).
Material and Methods : The frequency distribution of three-dimensional skeletal patterns was analyzed based on Sex, BMI, and OSA severity using CBCT of 142 adult OSA patients. Among them, demographic, PSG, and CBCT characteristics of the final 100 patients were classified by sex, OSA severity, and skeletal pattern, and comparisons were made between groups. Multiple linear regression analysis was performed to characterize the three-dimensional craniofacial features of CSP.
Results : Sagittally, patients with skeletal Class II pattern exhibited more severe OSA severity compared to those with Class I, despite being younger. Vertically, patients with hyperdivergent pattern showed higher OSA severity than those with normodivergent pattern, despite being younger and less obese. Transversely, the group with Transverse Skeletal Discrepancy (TSD) showed more severe OSA severity. After adjusting for age, sex, and obesity, multiple linear regression analysis revealed that ANB, Pharyngeal Minimal Cross-Sectional Area (PMCA), and Transverse Discrepancy Index (TDI) were craniofacial predictors of OSA severity. CSP2D group exhibited higher OSA severity in all PSG variables except the hypopnea index compared to N_CSP group, despite being younger and less obese. CSP3D group, which included TSD, showed more severe OSA severity than CSP2D group, with smaller nasal airway volume and PMCA, and longer pharyngeal airway length.
Conclusion : This study is the first attempt to comprehensively analyze TSD and to characterize CSP2D and CSP3D OSA groups by incorporating three-dimensional information of both the nasal / pharyngeal airways and relating upper airway features to PSG variables. This provides evidence for a phenotype-based precision approach, which should be the foundation for the diagnosis and treatment of OSA patients.

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Orthodontic treatment of an open bite for a patient with idiopathic condylar resorption

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Introduction : Idiopathic condylar resorption (ICR) is one of the most aggressive degenerative musculoskeletal diseases associated with morphological and functional deformities of the temporomandibular joint (TMJ) structures. Positional instability of the mandibular condyles in ICR patients often causes a continuous change of occlusion, which makes orthodontic evaluation significantly difficult and confusing.
Case Summary : It was determined that the mandibular position of the patient was not in a stable position based on the diagnostic data. To relieve TMJ symptoms and to achieve and maintain a stable position of the mandible, a stabilization splint was applied to the patient. The splint therapy resulted in an anterior open bite, a dramatically larger overjet, and a more severe skeletal Class II pattern, as the patient's condyles were seated into the most forward and uppermost positions of the articular fossa and the mandible had rotated clockwise. For some ICR patients, orthognathic surgery can cause further resorption on the vulnerable condyles of the mandible; thus, effective orthodontic camouflage treatment after joint stabilization were considered. During the orthodontic camouflage treatment, adverse loads on the TMJ structures, which could change the position of condyles, were strictly avoided, and TMJ-friendly mechanics were applied.
Conclusion : When treating patients with ICR, TMJ structures should be stabilized with stabilization splints before active orthodontic treatment commences to establish a reliable treatment plan and maintain the stability of the condylar position.

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Correlation of masticatory muscle activity and occlusal function with craniofacial morphology: a prospective cohort study

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Objectives : Masticatory function, including masticatory muscle activity and occlusal function, can be affected by craniofacial morphology. This study aimed to investigate the relationship between craniofacial morphology and masticatory function in participants who had completed orthodontic treatment at least two years before and had stable occlusion.
Material and Methods : Fourty-two healthy participants were prospectively enrolled and divided into three vertical cephalometric groups according to the mandibular plane angle. Masticatory muscle activity (MMA) in the masseter and anterior temporalis muscles was assessed using surface electromyography. The occlusal contact area (OCA) and occlusal force (OF), defined as occlusal function in this study, were evaluated using occlusal pressure mapping system. Masticatory muscle efficiency (MME) was calculated by dividing MMA by OF. The craniofacial morphology was analyzed using a lateral cephalogram. The masticatory function was compared using one-way analysis of variance. Pearson correlations were used to assess relationships between craniofacial morphology and masticatory function.
Results : The hypodivergent group had the lowest MMA and the highest MME in the masseter (167.32 ± 74.92 μV and 0.14 ± 0.06 μV/N, respectively) and anterior temporalis muscles (0.18 ± 0.08 μV/N, $p < 0.05$). MMA in the masseter showed a positive relationship with mandibular plane angle ($r = 0.358$), whereas OCA ($r = -0.422$) and OF ($r = -0.383$) demonstrated a negative relationship ($p < 0.05$). The anterior temporalis muscle activity negatively correlated with ramus height ($r = -0.364$, $p < 0.05$).
Conclusion : Vertical craniofacial morphology was related to masticatory function. Hypodivergent individuals may have low MMA and high occlusal function, resulting in good masticatory muscle efficiency.

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Morphological features in patients having TMD depending on overbite

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Objectives : This study aimed to evaluate the age, temporomandibular joint (TMJ) and cephalometric measurements in patients with bilateral temporomandibular disorders (TMDs) characterized by both disc displacement without reduction (DD w/out R) and osteoarthritis (OA).
Material and Methods : This study retrospectively enrolled 104 bilateral TMD patients. Among them, we classified the patients into the two distinct groups: the normal overbite (OB) group (2<OB<4 mm, 26 patients) and the open bite group (OB<0 mm, 19 patients), in order to evaluate the impact of TMD on OB. The cephalometric parameters and TMJ measurements such as condyle and fossa dimensions were compared between the two groups. Additionally, the correlation between OB and other variables were analyzed.
Results : Patients diagnosed with bilateral TMDs exhibit skeletal Class II malocclusion with hyperdivergent profile. In terms of OB, 18.3% (19 out of 104) of patients showed open bite, while 67.3% (70 out of 104) of patients showed shallow overbite (OB<2mm).
The open bite group demonstrated significantly larger superior joint space (P<0.05) and posterior joint space (P<0.01) compared to the normal overbite group. In addition, the open bite group exhibited younger age, larger ANB, larger gonial angle, larger SN-MP, and smaller facial height ratio compared to the normal overbite group (P<0.05).
Conclusion : The findings of this study suggest that patients having bilateral TMDs likely have a skeletal Class II malocclusion with hyperdivergent profile. Moreover, there is a greater probability of developing an open bite in patients with young age and a high gonial angle. Therefore, clinicians need to consider the possibility of TMD when patients exhibit the distinct skeletal patterns.

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Changes in morphologies of the articular eminence and fossa according to disk displacement and sex

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Objectives : The aim of this study was to evaluate differences in the size and shape of the articular eminence and glenoid fossa according to disk displacement of the temporomandibular joint (TMJ) and sex using computed tomography (CT) and magnetic resonance imaging (MRI).
Material and Methods : Based on TMJ MRI findings, disk displacement status was classified into the following three groups: normal disk position (NR), anterior disk displacement with reduction (DDR), and anterior disk displacement without reduction (DDNR). After the size and shape of the articular eminence and glenoid fossa were measured on CT scans, a factorial analysis of variance was used to analyze differences in the size and shape of the articular eminence and glenoid fossa according to TMJ disk displacement and sex.
Results : The joints with DDNR had a longer fossa length and larger fossa volume than those with NR (NR < DDNR). In addition, the joints with DDNR had a higher eminence height than those with NR (NR < DDNR) but had a smaller eminence inclination than those with NR or DDR (NR = DDR > DDNR). Differences in all dimensions of the articular eminence and glenoid fossa according to disk displacement status were not significantly affected by sex.
Conclusion : Disk displacement significantly influence the size and shape of the articular eminence and glenoid fossa, regardless of sex. In particular, the joints with DDNR had increased length and volume of the glenoid fossa, increased eminence height, and decreased inclination of the eminence slope compared to those with NR.

[출입증 명찰지 출력 및 수령방법, 출결관리 공지사항]

1. 금번 보수교육은 **대한치과의사협회 보수교육 4점(4시간 이상 참여시 인정), 학회 인정의의 경우 일반보수교육 10점(5시간 이상 참여시 인정)**이 부여됩니다.
   ※ 윤리강연 수강 시 윤리강연 입장 시 1회, 윤리강연 종료 후 20분 이내에 1회 등 총 2회를 반드시 체크해야 윤리강연 점수가 인정됩니다.
   - 보수교육점수 인정은 10월 10일과 11일 강연에 참석한 경우에만 해당합니다.

2. **모든 출결관리는 등록부스에서 본인 확인을 거쳐 배부하는 네임택 수령 후 네임택을 태그하는 시점부터 출결관리 데이터가 집계됩니다.**
   ※ 등록부스에서 본인 확인 후 네임택을 수령하지 않고 모바일 바코드를 가지고 출결관리 진행 시 보수교육점수에 반영되지 않으므로 반드시 등록절차를 진행해 주시기 바랍니다.

3. **바코드 출결관리 태그는 학술대회 기간에 매일 최소 2회 이상 정상적으로 태그**가 되어야 '출결데이터 확인 및 보수교육점수가 부여'됩니다. 바코드 스캐너기 옆에 비치된 화면을 통해 확인해 주시고 핸드폰으로 학술대회 홈페이지 MyKAO를 통해서도 이수시간 확인이 가능합니다. **네임택은 학술대회 등록여부 및 치과의사 여부 등을 확인하기 위해 필요하므로 학술대회 기간에 반드시 목에 패용하고 입장**해 주시기 바랍니다.
   ※ 네임택을 패용하지 않을 경우, 입장이 제한되므로 협조를 요청드립니다.

4. 대리출석 등 부정한 방법으로 출결관리를 진행할 경우 보수교육점수는 부여되지 않습니다. **대리출석 방지를 위해 네임택 발급 전에 모바일 접속 후 MyKAO에서 발급한 바코드 등을 통해 본인 여부를 확인**하므로 협조해 주시기 바랍니다.

5. 학술대회 기간 중 수령한 네임택을 분실할 경우에는 재발급 부스에서 신분증을 가지고 방문하시면 재발급해 드릴 예정이며, 재발급비용은 5천원입니다.

6. **출결 데이터는 행사종료일로부터 4주 후에 대한치과의사협회로 보고할 예정**이며, 치협의 보수교육점수 부여확인은 협회로 문의하시기 바라고 학회 보수교육점수는 홈페이지 로그인 후 MY PAGE 내 '자격갱신/학회참석' 메뉴에서 확인이 가능합니다.
   ※ 보수교육 이의 신청은 행사종료 후 안내한 기간(2주 이내)까지만 가능합니다.

7. 등록시 면허번호, 핸드폰, 이메일 등 필수정보 입력사항은 반드시 정확하게 자신의 정보를 입력해 주셔야 향후 데이터 확인 및 중요내용 전달이 가능하며, 미기재, 부정확한 정보 기재로 인한 불이익은 본인이 감수하셔야 하므로 착오 없으시기 바랍니다.

8. 그밖에 보수교육과 관련 내용은 학술대회 홈페이지 [학술대회 안내 →보수교육안내] 공지사항을 숙지하시기 바라며, 문의사항이 있을 경우 학회 전화 또는 이메일로 문의바랍니다.
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