Invisalign® Treatment for Bimaxillary Protrusion

Abstract

Clear aligners have been increasingly utilized by orthodontists in recent years; however, there are some limitations when treating complex malocclusions and extraction cases with this approach. When clear aligners are the exclusive treatment method, it can be difficult to achieve (1) space closure for four extracted premolars, (2) proper inclination of anterior teeth, and (3) adequate posterior anchorage. The Invisalign G6 solution with mini-screw anchorage has created more options for predictable tooth movement across a wider range of malocclusion types. A 24-year-old female presented with chief complaints of protrusion and crowding of the dentition. Treatment involved extraction of four first premolars followed by aligner treatment using two miniscrews for anchorage. The malocclusion was corrected with no adverse effects, and a normal occlusion was achieved. The patient was extremely satisfied with the treatment results. (J Digital Orthod 2021;63:20-36)

Key words:

Bimaxillary protrusion, premolar extraction, clear aligner treatment, Invisalign aligners, Invisalign G6, mini-screws, space closure, anchorage control, torque control

Introduction

In recent years, an increasing number of adult patients are seeking orthodontic treatment[1-3] and expressing a desire for more esthetic and comfortable alternatives to conventional fixed appliances.[2,4] The field of orthodontics has been revolutionized by technological advancements. In 1997, Align Technology , Inc. (*Santa Clara, California*) introduced Invisalign® as the pioneering clear aligner system for comprehensive orthodontic treatment.[5] The Invisalign appliance involves a series of plastic aligners made of 0.75mm polyurethane material, incorporating computer-aided design (*CAD*), computer-aided manufacturing (*CAM*) technology, and specialized laboratory techniques.[6] Patients are instructed to wear a pair of aligners for a period of 1-2 weeks and a minimum of 20 hours per day. Each aligner is programmed to produce a precise movement on a tooth of about 0.15-0.25mm.[5,7] With the development of dental materials and 3D technology, clear aligners have become an increasingly popular choice for patients, especially for those with high appearance or speech demands.

The primary focus of the Invisalign system when it was initially designed was to solve cases of mild to moderate crowding and to close small spaces. Invisalign has continued to evolve with the development of new aligner materials, attachments on teeth, staging of tooth movement, in addition to incorporation of inter-proximal reduction and interarch elastics, to address a wider range of malocclusions.[5,8,9] Thus, clinicians who plan to use clear aligners on their patients must rely on their clinical experience, the opinions of experts, and limited published evidence.[10] Despite its widespread use, clear aligners have limitations when it comes to producing tooth movements such as intrusion of posterior teeth, extrusion of anterior teeth, and root torquing.[8,11-13] Specifically, clinicians have

Chao Pan,
Director, Orthodontic Department, Jiangxi Bybo Dental Hospital
Lecturer, Beethoven Orthodontic Course (Left)

Sophia Shu,
Lecturer, Beethoven Orthodontic Course (Center left)

Chris H. Chang,
Founder, Beethoven Orthodontic Center
Publisher, Journal of Digital Orthodontics (Center Right)

W. Eugene Roberts,
Editor-in-Chief, Journal of Digital Orthodontics (Right)

encountered difficulties with bodily movement of teeth in extraction cases in which anterior torque loss and tipping of teeth into extraction sites have been problematic.[14,15] Therefore, both molar anchorage control and incisor torque control during space closure are vital for orthodontic treatment of patients requiring extractions.

Considering the complexity of extraction biomechanics with clear aligners, using the ClinCheck® program (*Align Technology Inc., Santa Clara, California*) allows clinicians to plan and design treatment with a predicable outcome. It provides an end-goal guided treatment plan that can be visualized not only at the beginning and the end, but also step by step (*aligner by aligner*)

Fig. 1: Pre-treatment extraoral and intraoral photographs

throughout the treatment.[16] In 2015, the Invisalign G6 approach introduced SmartForce (*optimized anchorage attachment on posterior teeth and optimized retraction attachment on the canine*) and SmartStage (*optimized tooth movement stage*) to provide maximum posterior anchorage while preventing unfavorable tipping of the teeth during space closure.[17,18] In addition, miniscrews can also provide indirect posterior anchorage by holding the molars in position while anterior segments are retracted with clear aligners.[15] By fixing the miniscrews to the attached molars, patients only need to wear the aligners regularly instead of using additional elastic bands for anchorage. This allows the spaces for the extracted first premolars to close effectively with a minimum of anchorage loss. With proper lingual root torque produced by the stiffness of the aligner, bodily retraction (*translation*) of the anterior teeth can be achieved.

The dental nomenclature for this report is a modified Palmer notation. Upper (*U*) and lower (*L*) arches, as well as the right (*R*) and left (*L*) sides, define the four oral quadrants: UR, UL, LR and LL. Teeth are numbered 1-8 from the midline in each quadrant, e.g., a lower right first molar is LR6.

Diagnosis

A 24-year-old female patient presented with a chief complaint of protrusive dental profile, which affected her confidence and willingness to smile. The patient's medical and dental histories were unremarkable. She demonstrated acceptable oral hygiene, and her motive for the consultation was to improve her smile with clear aligner treatment.

Pre-treatment facial photographs showed that the patient had balanced facial proportions and a low smile line (*Fig. 1*). Analysis of the pre-treatment diagnosis records revealed Class I molar relationship (*end-on Class I and Class II tendency*), with a bilateral Class II canine relationship (*Fig. 1*). The patient had bimaxillary protrusion with an overjet and overbite of 5mm and 3mm, respectively. She showed moderate crowding in both arches, and the anterior Bolton ratio was 74.2%. Her mandibular midline was deviated 1mm to the right. The panoramic radiograph showed both mandibular third molars were impacted with a mesial (*horizontal*) orientation (*Fig. 2*). The cephalometric analysis confirmed a normal skeletal relationship (*Fig. 2; Table 1*).

Treatment Objectives

The treatment objectives were to (*1*) reduce the patient's anterior protrusion to improve her lip profile; (*2*) achieve normal overjet and overbite; (*3*) maintain bilateral Class I molar relationship; (*4*) achieve bilateral Class I canine relationship; (*5*) coordinate the deviated dental midlines with the facial midline; and (*6*) align the arches.[18]

Treatment Alternatives

The focus of the current treatment plan was to address the principal concern: protrusion. A non-extraction treatment approach was considered, which involved development of a more rounded arch form with Invisalign aligners,[19] inter-proximal reduction (*IPR*) to relieve the crowding, and extraction of all third molars to enhance the potential for anterior retraction.[19] However, this

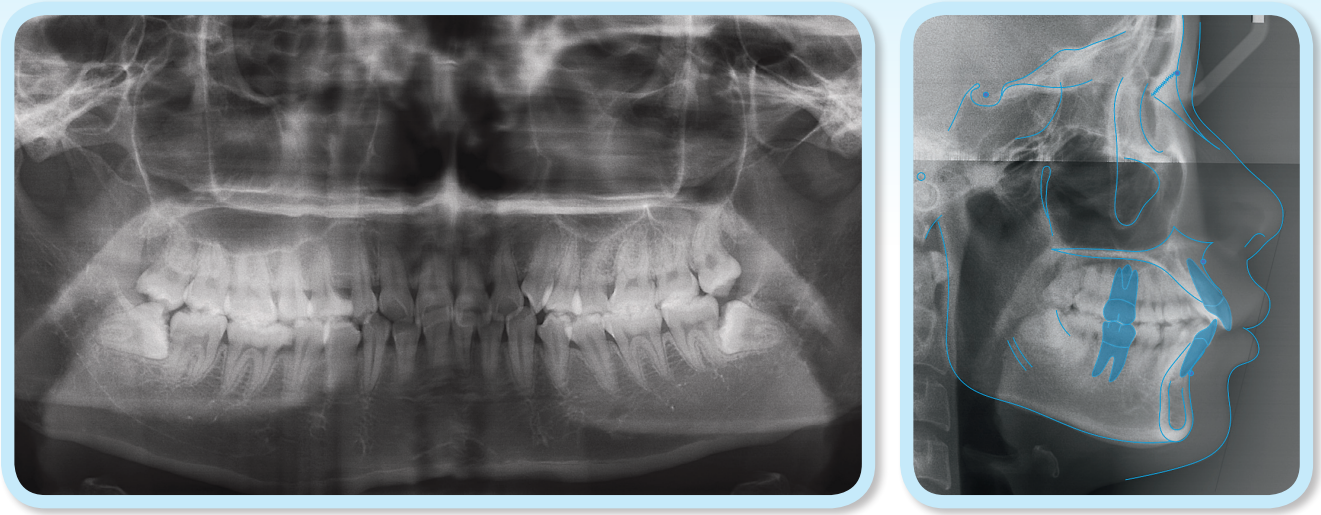


Fig. 2: Pretreatment panoramic radiograph (left) and lateral cephalometric radiograph with an overlay tracing (right)

approach was inadequate to effectively address the patient's anterior protrusion. Thus, an alternative approach involving extraction of four first premolars, followed by Invisalign treatment in conjunction with miniscrew anchorage, was chosen. Two 2x12-mm miniscrews were planned to be installed bilaterally in the infra-zygomatic crest (*IZC*) extra-alveolar (*E-A*) area. A stainless steel ligature wire with flowable resin to stabilize the connection between the molar and the miniscrews was used to enhance anchorage of the stabilized molars. Since maxillary wisdom teeth often have no occlussal contact, they may be extracted. However, for additional molar anchorage the upper third molars were included in the posterior anchorage unit.

Treatment Progress

The preparation included initial assessment, diagnosis, treatment planning and completion of the pre-treatment records (*e.g., panoramic and lateral cephalometric radiographs, bite registration, photos and polyvinyl siloxane impressions*), all of which had to be sent to Align Technology, where a simulated virtual treatment was formulated by proprietary 3-dimensional CAD-CAM technology. From the virtual treatment set-up, evaluation of the proposed final positioning of the teeth was shown on ClinCheck® (*Align Technology, Inc., Santa Clara, California*). Clinicians can modify and formulate a precise treatment plan by using auxiliary attachments or adjustments for sequential staging.[8] Managing anterior dental inclination and lingual root torque will be discussed later (*Fig. 3*).

This treatment was conducted in two phases, as detailed below. The patient was seen only during the vacations because she lived in a different city; however, a video link was used for conversation and to ensure satisfactory oral hygiene and aligner fit.

Initial Treatment Phase

The major goals of the treatment phase were to

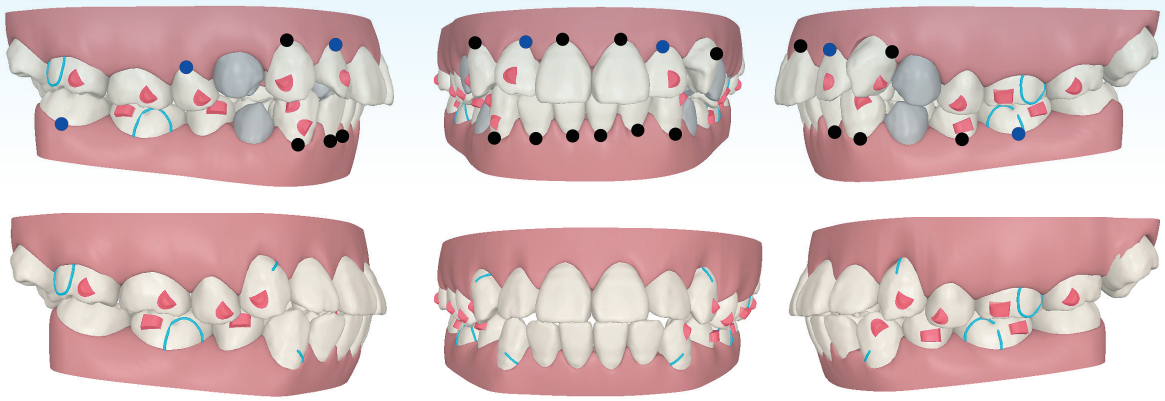


Fig. 3:
Initial treatment phase according to the ClinCheck® treatment plan. Blue dots indicated variably predictable tooth movement (UR5 and LR7 intrusion 0.5-1mm; UR2 rotation 30-40%; UL2 root intrusion >6mm; LL6 intrusion 0.5-1mm); black dots indicated less predictable tooth movement (intrusion for lower incisors >3 mm; root movement for upper right canine > 6 mm; UR1 and UL1 intrusion >3mm).

retract the anterior teeth in both arches (*Fig. 4*), and intrude the upper anterior segment. A total of 83 sets of aligners were used over 20 months. The patient was instructed to change the aligners every 7 days. Optimized Root Control Attachments were used on the canines, and Optimized Anchorage Attachments were placed on the posterior teeth (*Fig. 5*). Pontics replaced the missing teeth. IZC miniscrews were placed when the 23rd set of aligners was delivered, and a buccal button cutout was used on UR7 and UL6 to reserve space for button attachments. A 0.02 inch ligature wire was used to tightly connect the buttons and the miniscrews. The wire surface was covered with flowable resin and was light cured to prevent mucosa irritation (*Fig. 6*).

The tooth movement was similar to ClinCheck® simulations throughout the first series of aligners (*Fig. 7*). Facial and intraoral photographs taken at the completion of the initial treatment phase are shown in Fig. 8.

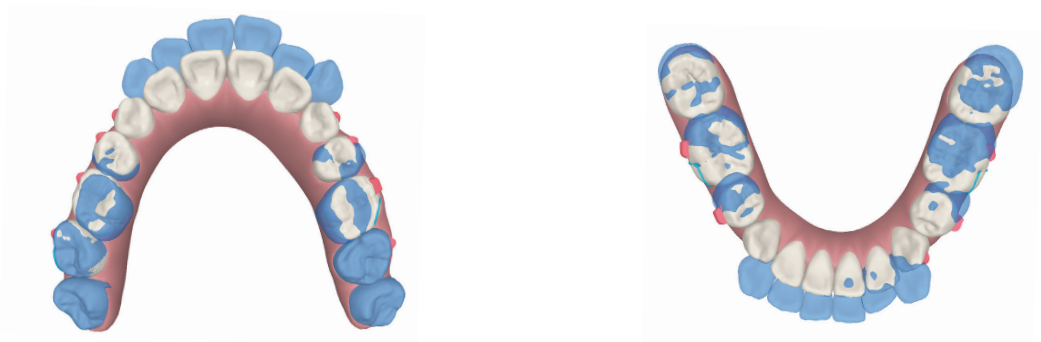


Fig. 4:
Initial treatment phase: ClinCheck treatment plan with superimposition (blue: initial arch form, white: simulated arch form after treatment). Maximum anchorage was planned using in the upper arch and moderate anchorage in the lower arch.

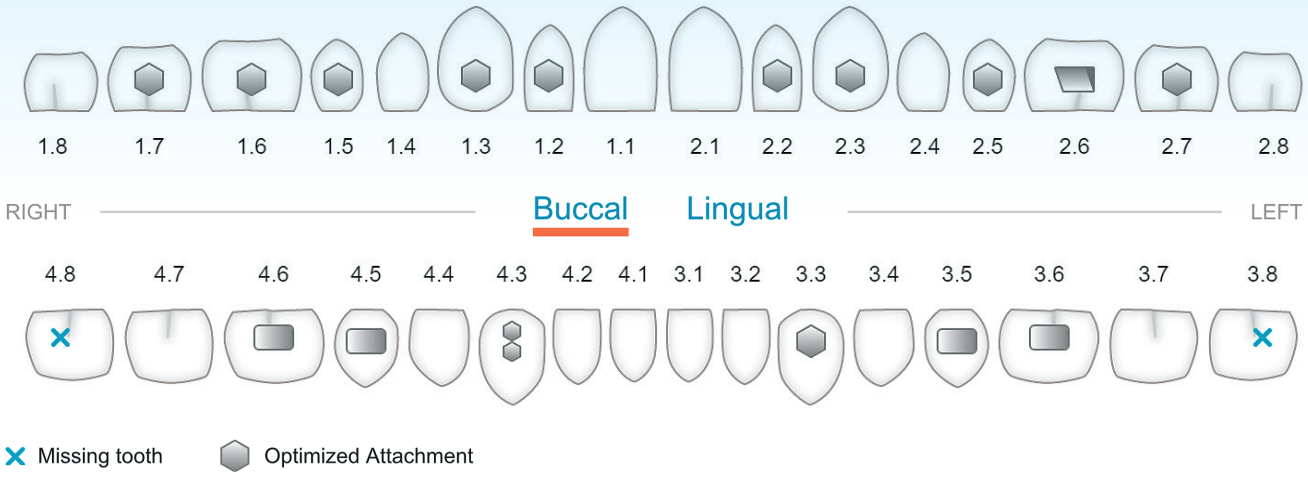


Fig. 5:
Initial treatment phase: Invisalign® treatment sheet. SmartForce® features (optimized attachments) of the Invisalign G6 solution to maximize posterior anchorage and for bodily movement during canine retraction.

Fig. 6:
Two 2x12-mm miniscrews were installed bilaterally in the infrazygomatic crest (IZC) extra-alveolar (E-A) area with the ligature wire covered with flowable resin to connect the molar and miniscrew together in order to enhance molar anchorage bilaterally.

Refinement Phase

Refinement was conducted for correction of the Class II canine relationship on the left side by retracting the upper right quadrant by 1mm (*Fig. 9*).

There were no visible black triangles, so IPR was not necessary. In the finishing stage, heavy occlusal contacts on posterior teeth were corrected. Since both upper canines required further retrusion, a buccal button cutout and Class II mechanics were implemented to attach the elastics from upper canine to mandibular first and second molars.

Retention

Essix retainers for both arches were delivered. The patient was instructed to wear them full time for the first 6 months after the treatment and nights only thereafter. Instructions were provided for home care, as well as for maintenance of the retainers.

Fig. 7:

A panel of progressive intraoral photographs from the left buccal view are shown in comparison with ClinCheck simulations (left: 5M, 23/83 aligner; center: 14M, 59/83 aligner; right:19M, 83/83 aligner). Lingual buttons were used on the first and second molars bilaterally for Class II elastic anchorage.

Fig. 8:

Extraoral and intraoral photographs document the results of the initial treatment phase. Neither canines were adequately protruded, and lack of occlusal contact on the molars was noted. Lingual buttons were used on the first and second molars bilaterally for Class II elastic anchorage.

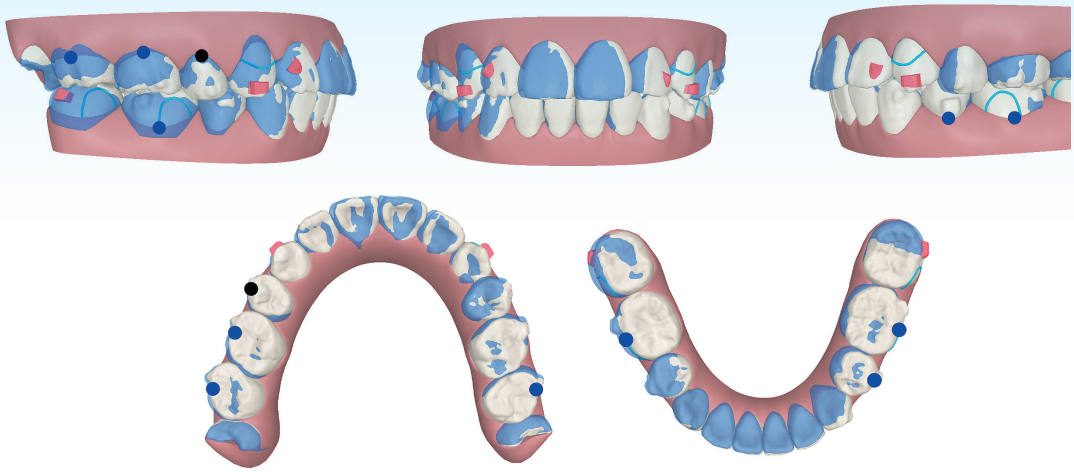


Fig. 9:
Refinement phase: ClinCheck® treatment plan with superimposition. Midline shifted 1mm to the left, both upper canines extruded 1mm, and molars with heavy occlusal contacts.

Treatment Results

The total treatment duration was 25 months with a total of 99 aligners (*83+16*). Post-treatment records showed that all treatment objectives were achieved, with good esthetics and occlusal results (*Fig. 10*). In addition, good root parallelism was maintained (*Fig. 11*). The upper and lower incisors were retracted and up-righted, improving the patient's lip profile and facial esthetics (*Table 1; Fig. 12*). Normal overjet and overbite were also achieved. Class I molar relationship, within end-on Class I, Class II tendency, and Class II canine relationship were all corrected to Class I. The upper and lower midlines are generally coincident with the facial midline. Overall, good alignment, angulation, and inclination of the dentition was achieved. The patient was highly motivated and compliant in wearing aligners and elastics. She was extremely happy with the treatment results. Arrangements will be made in the future for extraction of the upper third molars.

CEPHALOMETRIC SUMMARY			
SKELETAL ANALYSIS			
	PRE-Tx	POST-Tx	DIFF.
SNA° (82°)	90°	90°	0°
SNB° (80°)	85°	85°	0°
ANB° (2°)	5°	5°	0°
SN-MP° (32°)	22°	22°	0°
FMA° (25°)	20°	20°	0°
DENTAL ANALYSIS			
U1 To NAmm (4mm)	5	0	5
U1 To SN° (104°)	113°	110°	3°
L1 To NBmm (4mm)	9	5.5	3.5
L1 To MP° (90°)	108°	106°	2°
FACIAL ANALYSIS			
E-LINE UL (-1mm)	3	-1	4
E-LINE LL (0mm)	3	-1.5	4.5
Convexity: G-Sn-Pg' (13°)	15°	11°	4°
%FH: Na-ANS-Gn (53%)	56%	55%	1%

Table 1: Cephalometric summary

Fig. 10: Post-treatment extraoral and intraoral photographs

Fig. 11: Post-treatment panoramic radiograph (left) and lateral cephalometric tracing (right). Note the root parallelism.

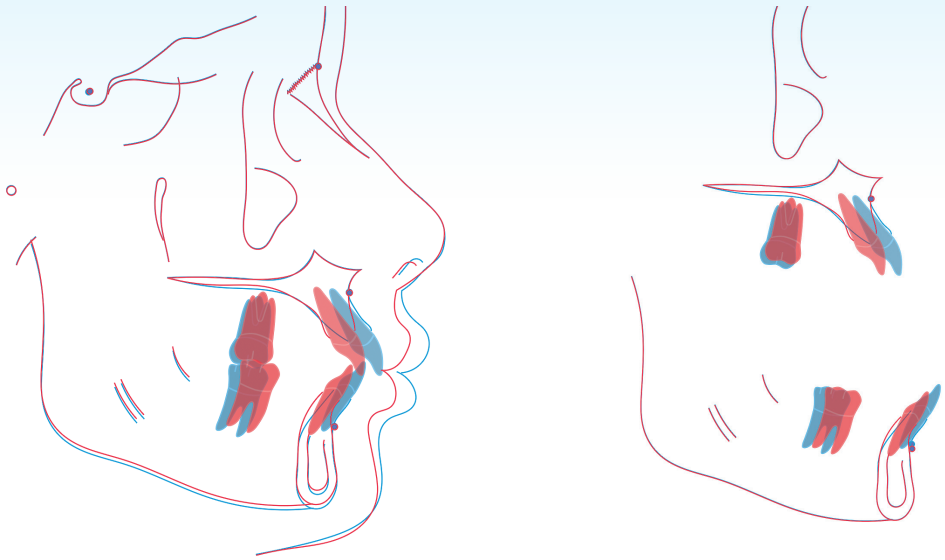


Fig. 12:
Superimposed tracings of the pretreatment (blue) and post-treatment (red) lateral cephalometric radiographs. Bimaxillary protrusion was resolved dramatically.

Discussion

Bimaxillary protrusion and dental crowding are orthodontic problems commonly observed among Asian populations.[20,21] Treatment for these complex issues often involves extraction of the four first premolars to correct bimaxillary protrusion and crowding in patients with Class I malocclusions. Retracting both maxillary and mandibular anterior teeth and closing the extraction spaces can improve lip protrusion and facial profile.[20,22] However, one concern with premolar extraction cases involves maintaining root parallelism of the teeth adjacent to the extraction spaces during space closure. Simon et al.[23] analyzed premolar rotations of >10 degrees, while Nguyen and Chen[24] reported 39% of the predicted rotation on canines and premolars. Uncontrolled tipping plus space closure results in tipping of canines, suggesting that there might be greater difficulties achieving mesiodistal movements for teeth with larger roots. In other words, aligners can easily tip crowns but cannot move roots because of the lack of control on the tipping movement. Using the Invisalign G6 solution with attachments on the tooth surface and timely-staged movements may reduce unwanted tipping and increase the predictability of tooth movement. If rotation control is not adequate, it is recommended to plan overcorrections beyond the ClinCheck program simulation to improve the accuracy of the movement.

The other most common side effects for extraction and retraction patients are lingual tipping and extrusion of the anterior teeth (*Drawstring/Pendulum Effect*). In order to avoid this problem on the Clincheck treatment plan, simply add more

lingual root torque and intrusion of the anterior teeth, as seen in Fig. 13. The image on the left displays a digital model of the final stage of the inital treatment plan. The image on the right shows the actual situation of the anterior teeth in which additional lingual root torque and intrusion was implemented. When using aligner treatment, increasing the lingual root inclination by 5°-10° is necessary when retracting the anterior teeth. This means the retraction distance is directly related to the lingual root torque required. Unfortunately, there is currently no specific formula for calculating the extent of increment. Instead, it can only be monitored and adjusted in a clinical settling. In this case, since the patient had a low smile line, slight exposure or extrusion of the anterior teeth would be acceptable. Therefore, no additional device was necessary for intrusion.

Another concern for premolar extraction cases is during the active retraction of the anterior teeth, which may cause mesial movement of the first molars and unwanted anchorage loss. Newton's third law of motion states that for every type of movement an equal and opposite reactive force is generated.[25] In order to increase anchorage resistance and avoid undesirable side effects on anchoring teeth, temporary skeletal anchorage devices (*TSADs*) such as miniscrews can be used as maximum anchorage to enhance appropriate tooth movement. There are two main methods of connecting miniscrews to the patient's dentition: "*direct anchorage*" (*Fig. 14*) and "*indirect anchorage*" (*Fig. 15*) approach.[26] Direct anchorage mechanics or the direct loading of the miniscrew is comprised by a setup, where an elastic module spans from the miniscrew to the tooth (*or a group of teeth*) that should be moved. With the indirect anchorage approach, the miniscrew serves as an indirect loading mechanism in which a non-elastic element spans from the anchorage screw to the tooth unit that ideally should remain stationary.[27,28] In other words, indirect anchorage utilizes a non-rigid, tightly wound steel ligature tie to keep the miniscrew and the tooth together, which allows resistance of the applied force and maintains the distance between the screw and the tooth in the plane of the force. In cases involving first premolar extraction, using the indirect anchorage mechanism maintains the molar position with an orthodontic miniscrew when performing anterior en-mass retraction.[26,29]

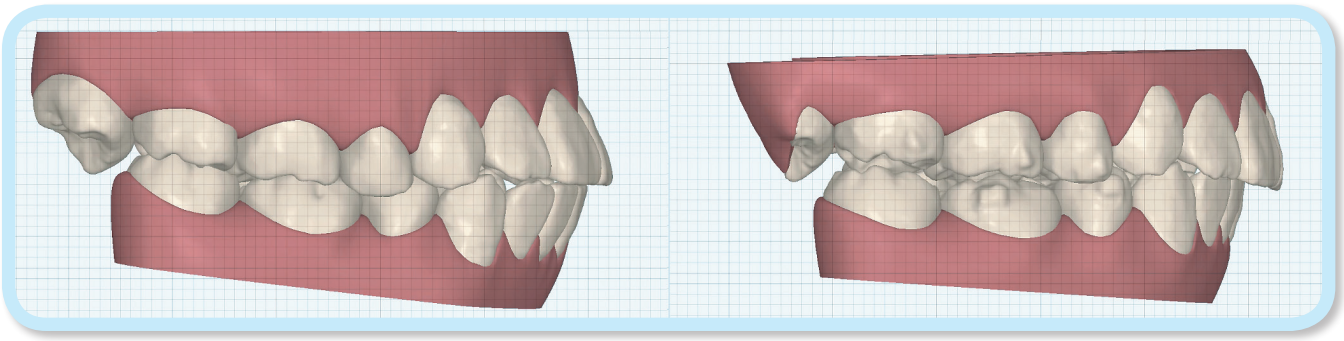


Fig. 13: The left image shows the simulated target position. The right image is the actual situation at the end of the initial stage treatment.

Using indirect anchorage approach, a 0.02 inch ligature wire was covered with light-cured flowable resin as a rigid attachment to connect the miniscrew and the button attachment on the molar as seen in Fig. 15. This treatment has the advantage of allowing the patient to eliminate the complication of wearing elastics; however, there are several disadvantages, which are listed below:

1. Having multiple devices in the mouth simultaneously is a hygiene problem which may elicit gingival inflammation around the miniscrew which results in bone resorption and miniscrew failure.

Fig. 14:
Direct anchorage approach uses an elastic to connect the miniscrew to the aligner at the canine incision cut.

Fig. 15:
Indirect anchorage approach using a 0.02 inch ligature wire covered with light-cured flowable resin is used as a rigid attachment to connect the miniscrew and the button attachment on the molar.

2. Even though the connected tooth is expected to be stabilized by the miniscrew, in reality, tooth movement does occur due to routine chewing, which may cause the miniscrew to loosen and fail.

3. Since the fixed tooth is closely connected to the miniscrew, if the miniscrew becomes loose it is difficult to detect mobility until the anchorage is completely lost.

4. When using an aligner to retract the anterior teeth, the reaction force is transmitted to the molars, and subsequently to the miniscrew, which may result in loss of anchorage.

In summary, the best method for enhancing anchorage is to connect an elastic from the aligner through the incision cut to the miniscrew (*Fig. 14*).

Conclusions

Closing extraction space with Invisalign appliances alone can be challenging. However, it is important for the clinician to evaluate the patient carefully to prescribe an appropriate therapy. A thorough understanding of the principles of the applied mechanics and anchorage for each tooth movement is necessary in order to achieve a predictable clinical outcome and to avoid unnecessary side effects.

Declaration of Patient Consent

The authors certify that they have obtained all appropriate patient consent forms. The patient has provided consent for her images and other clinical information to be reported in the journal. The patient

understands that her name and initials will not be published and due efforts will be made to conceal identity, but anonymity cannot be guaranteed.

Acknowledgements

Special thanks to Mr. Paul Head and Dr. Joshua Shih Yong Lin for proofreading this article, and to Dr. Lexie Lin for providing helpful information and references. Their kind assistance is much appreciated.

References

1. Bowman S, Celenza F, Sparaga J, Papadopoulos M, Ojima K, Lin J. Creative Adjuncts for Clear Aligners: Part 1 Class II Treatment. Journal of Clinical Orthodontic 2015;49(2):83-94.
2. Rossini G, Parrini S, Castroflorio T, Deregibus, Devernardi C. Efficacy of clear aligners in controlling orthodontic tooth movement: A systematic Review. Angle Orthod 2015;85(5):881-889.
3. Northcroft M. Lecture: how has the spectrum of orthodontics changed over the past decades? J Orthod 2011;38:134-145.
4. Rosvall MD, Fields HW, Ziuchkovski J, Rosenstiel SF, Johnston WM. Attractiveness, acceptability, and value of orthodontic appliances. Am J Orthod Dentofac Orthop 2009;135:276.e12; discussion 276-277.
5. Grunheld T, Loh C, Larson B. How accurate is Invisalign in non extraction cases? Are predicted tooth positions achieved? Angle Orthod 2017;87(6) 809-815.
6. Houle JP, Piedade L, Todescan R, Pinheiro F. The predictability of transverse changes with Invisalign. Angle Orthod 2017;87(1)19-24.
7. Viaskalic B, Boyd R. Orthondontic treatment of a mildly crowded malocclusion using the Invisalign System. Aust Orthod J 2001;17:41-46.
8. Phan X, Ling P. Clinical Limitation of Invisalign. JCDA.www.cda.adc.ca/jcda. 2007;73(3)263-266.
9. Simon M, Keilig L, Schwarze J, Jung BA, Bourauel C. Treatment outcome and efficacy of an aligner technique-regarding incisor torque, premolar derogation and molar distalization. BMC Oral Health 2014;14:1-7.
10. Lagravere MO, Flores-Mir C. The treatment effects of Invisalign orthodontic aligners: a systematic review. J Am Dent Assoc 2005;136:1724-1729.
11. Clements KM, Bollen AM, Huang G, King G, Hujoel P, Ma T. Activation time and material stiffness of sequential removable orthodontic appliances, Part 2: Dental Improvements. Am J Orthod 2003;124:502-508.
12. Dje G, Shelton C, Maganizini A. Outcome assessment of Invisalign and traditional orthodontic treatment compared with the American Board of Orthodontics objective grading system. Am J Orthod 2005;128:292-298.
13. Phan X, Ling PH. Clinical limitations of Invisalign. J Can Dent Assoc 2007;73:263-266.
14. Bollen AM, Huang G, King G, Hujoel P, Ma T. Activation time and material stiffness of sequential removable orthodontic appliances, Part 1: Ability to complete treatment. Am J Orthod 2003;124:496-501.
15. Bowman S, Celenza F, Sparaga J, Papadopoulos M, Ojima K, Lin J. Creative Adjuncts for Clear Aligners: Part 3 Extraction and Interdisciplinary Treatment. Journal of Clinical Orthod 2015;49(4):249-262.
16. Morton J, Derakhshan Mitra, Kaza S, Li C, Chen V. Design of the Invisalign system performance. Seminars in Orthodontics, http://dx.doi.ort/10.1053/j.sodo.2016.10.001
17. Dai FF, Xu TM, Shu G. Comparison of achieved and predicted tooth movement of maxillary first molars and central incisors: First premolar extraction treatment with Invisalign. Angle Orthod 2019;89:679-87
18. Lie Ken Jie RK. Treating bimaxillary profusion and crowding with the Invisalign G6 first premolar extraction solution and Invisalign aligners. APOS Trend Orthod 2018;8:219-24.
19. Houle JP, Piedade L, Todescan R Jr., Pinheiro FH. The predictability of transverse changes with Invisalign. Angle Orthd 2017;87:19-24.
20. Chu YM, Bergeron L, Chen YR. Bimaxillary protrusion: An overview of the surgical-orthodontic treatment. Semin Last Surg 2009;23:32-9.

21. Tanne K. Current status of orthodontic Professionals in the Asian Pacific region. APOS Trends Orthod 2016;6:58-77.
22. Kim TK, Kim JT, Mah J, Yang WS, Baek SH. First or second premolar extraction effects on facial vertical dimension. Angle Orthod 2005;75:177-182.
23. Simon M, Keilig L, Schwarze J, Jung BA, Bourauel C. Treatment outcome and efficacy of an aligner technique-regarding incisor torque, premolar derotation and molar distalization. BMC Oral Health 2014;14:68.
24. Nguyen CV, Chen J. Chapter 14. In: Tuncay OC, ed. The Invisalign System. New Malden, UK: Quintessence Publishing Company, Ltd;2006;12-32.
25. Cousley RR, Sandler PJ. Advances in orthodontic anchorage with the use of mini-implant techniques. British Dental J 2015;218:1-6.
26. Baumgaertel S, Clark J, Unal M. Miniscrew biomechanics: Guidelines for the use of rigid indirect anchorage mechanics. Am J Orthod and Dentofac Orthop 2017;152(3):413-9.
27. Rossouw PE, Buschang PH, Carrillo R. The Baylor experience with using mini-implants for orthodontic anchorage: clinical and experimental evidence. In: McNamara JA, editor. Microimplants as temporary orthodontic anchorage. Volume 45. Craniofacial Growth Series. Ann Arbor: University of Michigan. 2008. p. 407-59.
28. Rossouw PE, Buschang PH. Temporary orthodontic anchorage devices to improve occlusion. Orthod Craniofac Res 2009;12:195-205.
29. Monga N, Kharbanda OP, Samirit V. Quantitative and quantitative assessment of anchorage loss during en-mass retraction with indirectly loaded mini screws in patients with bimaxillary protrusion. Am J Orthod Dentofac Orthod 2016;150;274-82.

Discrepancy Index Worksheet

TOTAL D.I. SCORE 24

OVERJET

0 mm. (edge-to-edge)	=	
1 – 3 mm.	=	0 pts.
3.1 – 5 mm.	=	2 pts.
5.1 – 7 mm.	=	3 pts.
7.1 – 9 mm.	=	4 pts.
> 9 mm.	=	5 pts.

Negative OJ (x-bite) 1 pt. per mm. per tooth =

Total = 3

OVERBITE

0 – 3 mm.	=	0 pts.
3.1 – 5 mm.	=	2 pts.
5.1 – 7 mm.	=	3 pts.
Impinging (100%)	=	5 pts.

Total = 0

ANTERIOR OPEN BITE

0 mm. (edge-to-edge), 1 pt. per tooth
then 1 pt. per additional full mm. per tooth

Total = 0

LATERAL OPEN BITE

2 pts. per mm. per tooth

Total = 0

CROWDING (only one arch)

1 – 3 mm.	=	1 pt.
3.1 – 5 mm.	=	2 pts.
5.1 – 7 mm.	=	4 pts.
> 7 mm.	=	7 pts.

Total = 2

OCCLUSION

Class I to end on	=	0 pts.
End on Class II or III	=	2 pts. per side 4 pts.
Full Class II or III	=	4 pts. per side ____ pts.
Beyond Class II or III	=	1 pt. per mm. additional ____ pts.

Total = 4

LINGUAL POSTERIOR X-BITE

1 pt. per tooth Total = 0

BUCCAL POSTERIOR X-BITE

2 pts. per tooth Total = 0

CEPHALOMETRICS (See Instructions)

ANB ≥ 6° or ≤ -2° = 4 pts.

Each degree < -2° _____ x 1 pt. = _____

Each degree > 6° _____ x 1 pt. = _____

SN-MP

≥ 38° = 2 pts.

Each degree > 38° _____ x 2 pts. = _____

≤ 26° = 1 pt.

Each degree < 26° _____ x 1 pt. = 4

1 to MP ≥ 99° = 1 pt.

Each degree > 99° 9 x 1 pt. = 9

Total = 15

OTHER (See Instructions)

Supernumerary teeth	_____ x 1 pt. =	_____
Ankylosis of perm. teeth	_____ x 2 pts. =	_____
Anomalous morphology	_____ x 2 pts. =	_____
Impaction (except 3rd molars)	_____ x 2 pts. =	_____
Midline discrepancy (≥3mm)	@ 2 pts. =	_____
Missing teeth (except 3rd molars)	_____ x 1 pts. =	_____
Missing teeth, congenital	_____ x 2 pts. =	_____
Spacing (4 or more, per arch)	_____ x 2 pts. =	_____
Spacing (Mx cent. diastema ≥ 2mm)	@ 2 pts. =	_____
Tooth transposition	_____ x 2 pts. =	_____
Skeletal asymmetry (nonsurgical tx)	@ 3 pts. =	_____
Addl. treatment complexities	_____ x 2 pts. =	_____

Identify:

Total =

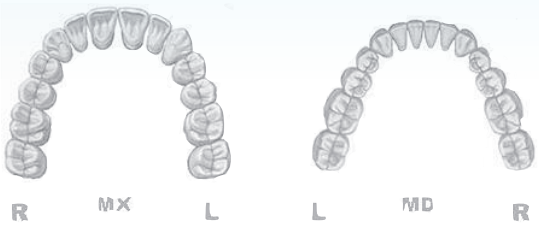
Cast-Radiograph Evaluation

Case # **Patient**

Total Score: 20

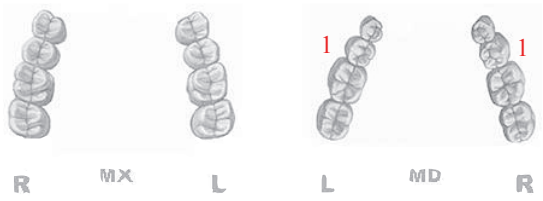
Alignment/Rotations

0



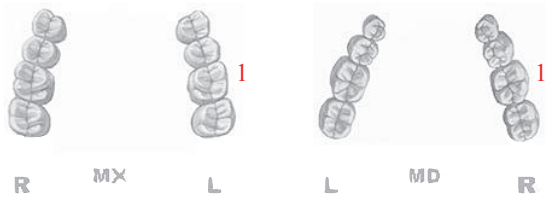
Marginal Ridges

2



Buccolingual Inclination

2

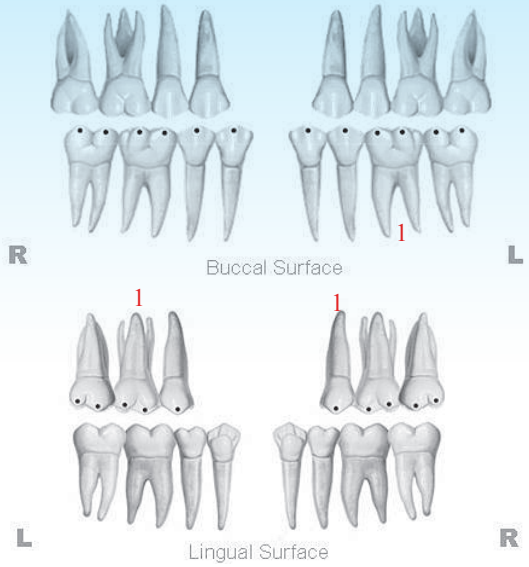


Overjet

5

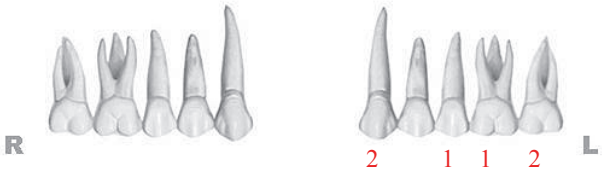
Occlusal Contacts

3



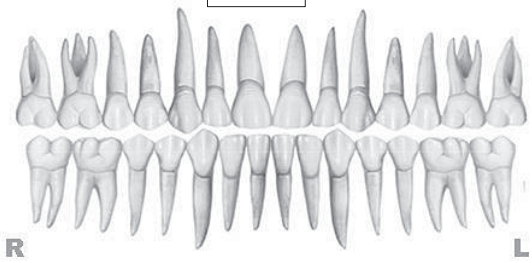
Occlusal Relationships

6



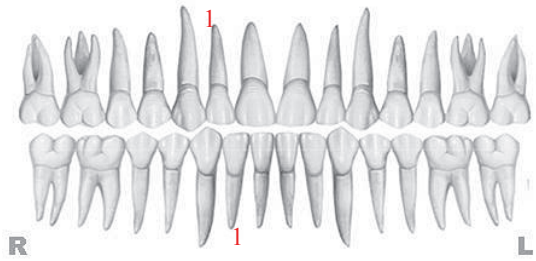
Interproximal Contacts

0



Root Angulation

2



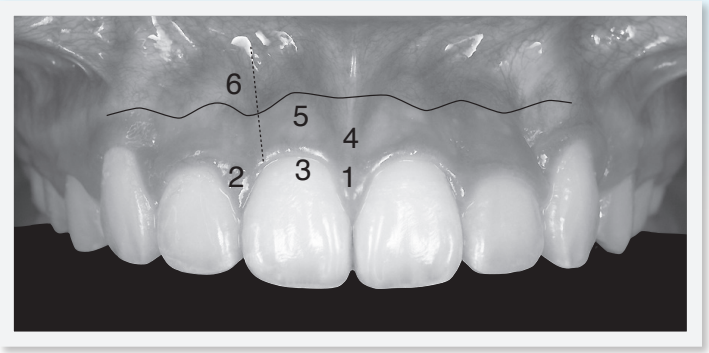
INSTRUCTIONS: Place score beside each deficient tooth and enter total score for each parameter in the white box. Mark extracted teeth with "X". Second molars should be in occlusion.

IBOI Pink & White Esthetic Score (Before Surgical Crown Lengthening)

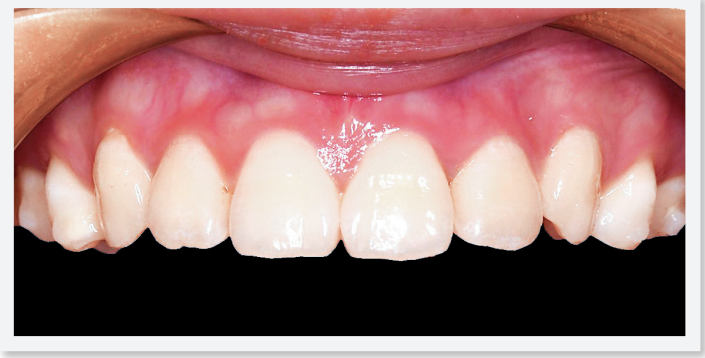
Total Score: = 2

1. Pink Esthetic Score

Total = 0



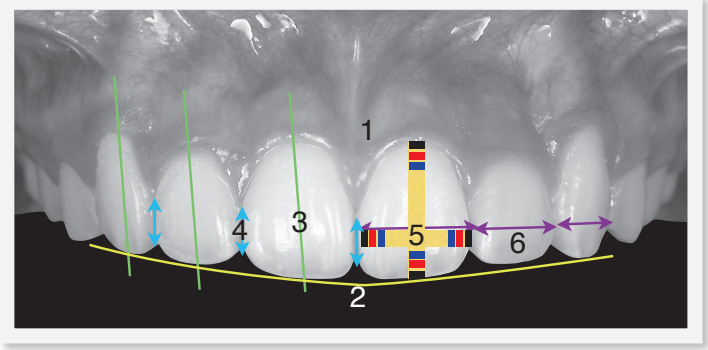
1. M & D Papillae	0	1	2
2. Keratinized Gingiva	0	1	2
3. Curvature of Gingival Margin	0	1	2
4. Level of Gingival Margin	0	1	2
5. Root Convexity (Torque)	0	1	2
6. Scar Formation	0	1	2



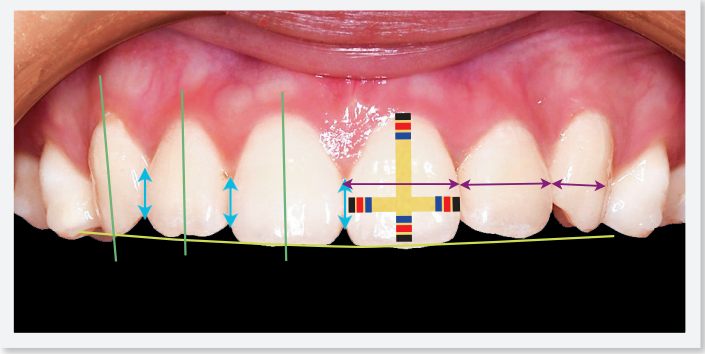
1. M & D Papilla	(0)	1	2
2. Keratinized Gingiva	(0)	1	2
3. Curvature of Gingival Margin	(0)	1	2
4. Level of Gingival Margin	(0)	1	2
5. Root Convexity (Torque)	(0)	1	2
6. Scar Formation	(0)	1	2

2. White Esthetic Score (for Micro-esthetics)

Total = 2



1. Midline	0	1	2
2. Incisor Curve	0	1	2
3. Axial Inclination (5°, 8°, 10°)	0	1	2
4. Contact Area (50%, 40%, 30%)	0	1	2
5. Tooth Proportion (1:0.8)	0	1	2
6. Tooth to Tooth Proportion	0	1	2



1. Midline	(0)	1	2
2. Incisor Curve	0	(1)	2
3. Axial Inclination (5°, 8°, 10°)	0	(1)	2
4. Contact Area (50%, 40%, 30%)	(0)	1	2
5. Tooth Proportion (1:0.8)	(0)	1	2
6. Tooth to Tooth Proportion	(0)	1	2

OBS Super Set

Created by Dr. Chris Chang, OBS is made of medical grade, stainless steel and titanium, and is highly praised by doctors for its simplistic design, low failure rate and excellent quality. OBS is your must-have secret weapon for maximum, reliable anchorage.

Smooth Mushroom Head

For comfort & retention of elastic chain

4-way Rectangular Holes

For lever arm to solve impacted tooth

Double Neck Design

Easy hygiene control & extra attachment

FDA

ISO 9001 SGS

ISO 13485 SGS

Directive 93/42/EEC

G.M.P. MEDICAL DEVICE

Made in Taiwan

New

Titanium Higher biocompatibility*

1.5 | **1.5X8mm**

Stainless Steel**

2.0 | **2.0x12mm**

2.7 | **2.0x14mm (with holes)**

Buy a Super Set, get ***OBS Clinical Guide*** **(ebook on iPad)** for free.

* TADs made of Ti alloy have a lower failure rate compared to SS when placed in thin cortical bone. These results are consistent with a biocompatibility-related tendency for less bone resorption at the bone screw interface.
Reference: Failure Rates for SS and Ti-Alloy Incisal Anchorage Screws: Single-Center, Double Blind, Randomized Clinical Trial (J Digital Orthod 2018;52:70-79)

** The overall success rate of 93.7% indicates that both SS and TiA are clinically acceptable for IZC BSs.
Reference: Failure rates for stainless steel versus titanium alloy infrazygomatic crest bone screws: A single-center, randomized double-blind clinical trial (Angle Orthod 2019;89(1):40-46)

iNewton +886-3-573-5676 orthobonescrew.com inewton.dental@gmail.com

International Association for Orthodontists & Implantologists

Join the *iAOI* the future of dentistry!

About our association-iAOI

International Association of Orthodontists and Implantologists (iAOI) is the world's first professional association dedicated specifically for orthodontists and implantologists. The Association aims to promote the collaboration between these two specialties and encourage the combined treatment of orthodontic and implant therapy in order to provide better care for our patients.

How to join iAOI?

Certified members of the Association are expected to complete the following three stages of requirements.

1. Member

Doctors can go to http://iaoi.pro to apply for membership to join iAOI. Registered members will have the right to purchase a workbook in preparation for the entry exam.

2. Board eligible

All registered members can take the entry exam. Members will have an exclusive right to purchase a copy of iAOI workbook containing preparation materials for the certification exam. The examinees are expected to answer 100 randomly selected questions out of the 400 ones from the iAOI workbook. Those who score 70 points or above can become board eligible.

3. Diplomate

Board eligible members are required to present three written case reports, one of which has to be deliberated verbally. Members successfully passing both written and verbal examination will then be certified as Diplomate of iAOI.

4. Ambassador

Diplomates will have the opportunity to be invited to present six ortho-implant combined cases in the iAOI annual meeting. Afterwards, they become Ambassador of iAOI and will be awarded with a special golden plaque as the highest level of recognition in appreciation for their special contribution.

For more information on benefits and requirements of iAOI members, please visit our official website: http://iaoi.pro.

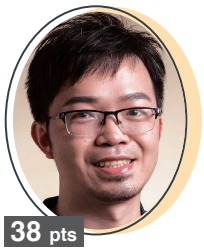
iAOI Ambassador & Diplomate

國際矯正植牙大使與院士

Ambassadors

Dr. Kenji Ojima◆

Dr. 林詩詠 Joshua Lin*▲



Dr. Diego Peydro Herrero◆

Dr. 張銘珍 Ming-Jen Chang*

Dr. 曾令怡 Linda Tseng*▲

Ambassador（大使）：

- * *One who has published 9+ case reports in JDO.*
- ◆ *Keynote speakers for iAOI annual workshops*
- ▲ *Case report(s) published at least once in referral journals.*
- ● *Referral journals/Research paper - 3 points*
  ABO case report - 2 points
  Clinical tip - 1 point

Diplomates

Dr. 徐玉玲 Lynn Hsu▲

Dr. 李雙安 Angle Lee▲

Dr. 蘇筌瑋 Bill Su

Dr. 葉信吟 Hsin-Yin Yeh▲

Dr. 徐重興 Eric Hsu▲

Dr. 黃育新 Yu-Hsin Huang

Dr. 黃祈 Richie Huang

Dr. 邱上珍 Grace Chiu▲

Dr. 黃瓊嬋 Sabrina Huang

Dr. 曾淑萍 Shu-Ping Tseng

Dr. 鄭惠文 Joy Cheng

Dr. 林曉鈴 Sheau-Ling Lin

Dr. 張倩瑜 Charlene Chang

Dr. 陳俊宏 Chun-Hung Chen

Dr. 林佳宏 Alex Lin▲

Dr. 林彥君 Lexie Lin▲

Dr. 林森田 Chris Lin

Dr. 黃登楷 Kevin Huang

Dr. 張馨文 Sara Chang

Dr. 李名振 Major Lee

Dr. 陳惠華 Judy Chen

Dr. 魏明偉 Ming-Wei Wei

Dr. 黃荷薰 Ashley Huang

Dr. 張銘津 Ariel Chang

Dr. 彭緯綸 Wei-Lun Peng

Dr. 呂詩薇 Julie Lu

Dr. 李彥峰 Yen-Feng Lee

補綴手冊

From Isolation to Polish

Kerr™

優惠期限自 2021/04/01~2021/9/25止

1. ISOLATION

Danville 圍合系統

買一送一

Contact Matrix
特價 NT$4,100

MEGA V
特價 NT$4,900 /盒

MEGA V Rings Refill
特價 NT$5,500 /4個

2. BONDING SYSTEM

OptiBond 黏著劑系列

Total etch

第4代	第5代
FL	*S* (不含此etchant Gel)

特價 NT$4,999 /組

特價 NT$5,000 / **5**瓶

Self etch

第6代	第7代
Versa	*All In One*

特價 NT$3,999 /組

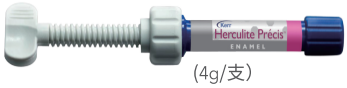
特價 NT$5,000 / **5**瓶

Universal

第8代
Universal

特價 NT$7,500 / **5**瓶

3.COMPOSITE SERIES



(4g/支)

Herculite Precis Syringe
特價 NT$5,000 **x10**支

(2gx2支/盒)

Dyad Flow
特價 NT$4,500 **x4**支

(2gx2支/盒)

Herculite Precis Flow
特價 NT$9,000 **x10**盒

4.LIGHT CURE

NEW

Demi Plus

買兩台再送一顆電池

特價 NT$28,000/1台

・衛部醫器輸壹字第018525號 Manufactured by DANVILLE MATERIALS, A ZEST ANCHORS, LLC COMPANY(add. 2875 LOKER AVENUE EAST CARLSBAD, CA 92010, U.S.A.)・衛署醫器輸字第010932、018552、022166、022545、022220號・衛部醫器輸字第029022號 Manufactured by KERR CORPORATION (add. 1717 WEST COLLINS AVENUE, ORANGE, CA 92867, U.S.A.)・衛署醫器輸字第023384號 Manufactured by SDS de Mexico S. de R.L. de C.V.(add. CIRCUITO SUR NUM.31 PARQUE IND. NELSON MEXICALI, B.C.C.P., MEXICO 21395)for KERR CORPORATION(add. 1717 WEST COLLINS AVENUE, ORANGE, CA 92867, U.S.A.)・衛部醫器輸字第028594、032992號 Manufactured by Kerr Corporation (add. 1717 W Collins Ave, ORANGE, CA 92867 USA)

贋復指南

From Impression To Cementation

Kerr

優惠期限自 2021/04/01~2021/9/25止

IMPRESSION

激省

01 方案 Take 1 Advanced

Cartridge Wash (Light body) ***x1*** 箱(24支裝)
(50mlx24)

Volume Tray (380mlx2) ***x2*** 盒

特價NT$20,000 /組

02 方案 Take 1 Advanced

Volume Mixer Machine ***x1*** 台
Volume Tray (380mlx2) ***x5*** 盒
Cartridge Wash (Light body) ***x6*** 盒
(50mlx2)

特價NT$57,900 /組

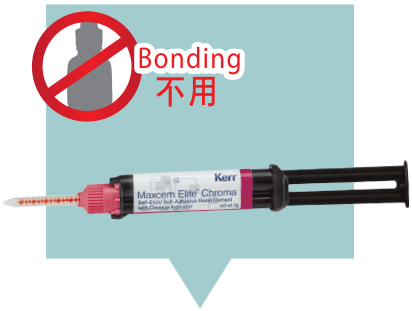
CEMENTATION

處理劑

Silane Primer

特價NT$2,200 /瓶

In/Onlay/Crown



一支會變色的 RESIN CEMENT
UNIQUE COLOR INDICATOR
讓您精確掌握多餘Cement的移除時機！

Maxcem Elite™ Chroma
(5gx2支/盒)

特價NT$12,500/5盒

Optibond Versa ***x1***組
(1組/2罐/各6ml)

NX3 Dual Cure ***x1***支
(5g/支)

特價NT$4,999/套

Veneer

Optibond Versa ***x1***組
(1組/2罐/各6ml)

NX3 Light Cure ***x1***支
(5g/支)

特價NT$4,999/套

・衛署醫器輸字第011601、020145、022545號，衛部醫器輸字第030574號 Manufactured by KERR CORPORATION (add. 1717 WEST COLLINS AVENUE, ORANGE, CA 92867, U.S.A.)
・衛署醫器輸字第021479號 Manufactured by KERR CORPORATION(add. 28200 WICK ROAD ROMULUS, MICHIGAN 48174, U.S.A.)