JDO

Journal of **D**igital **O**rthodontics

International Journal for Orthodontists and Implantologists

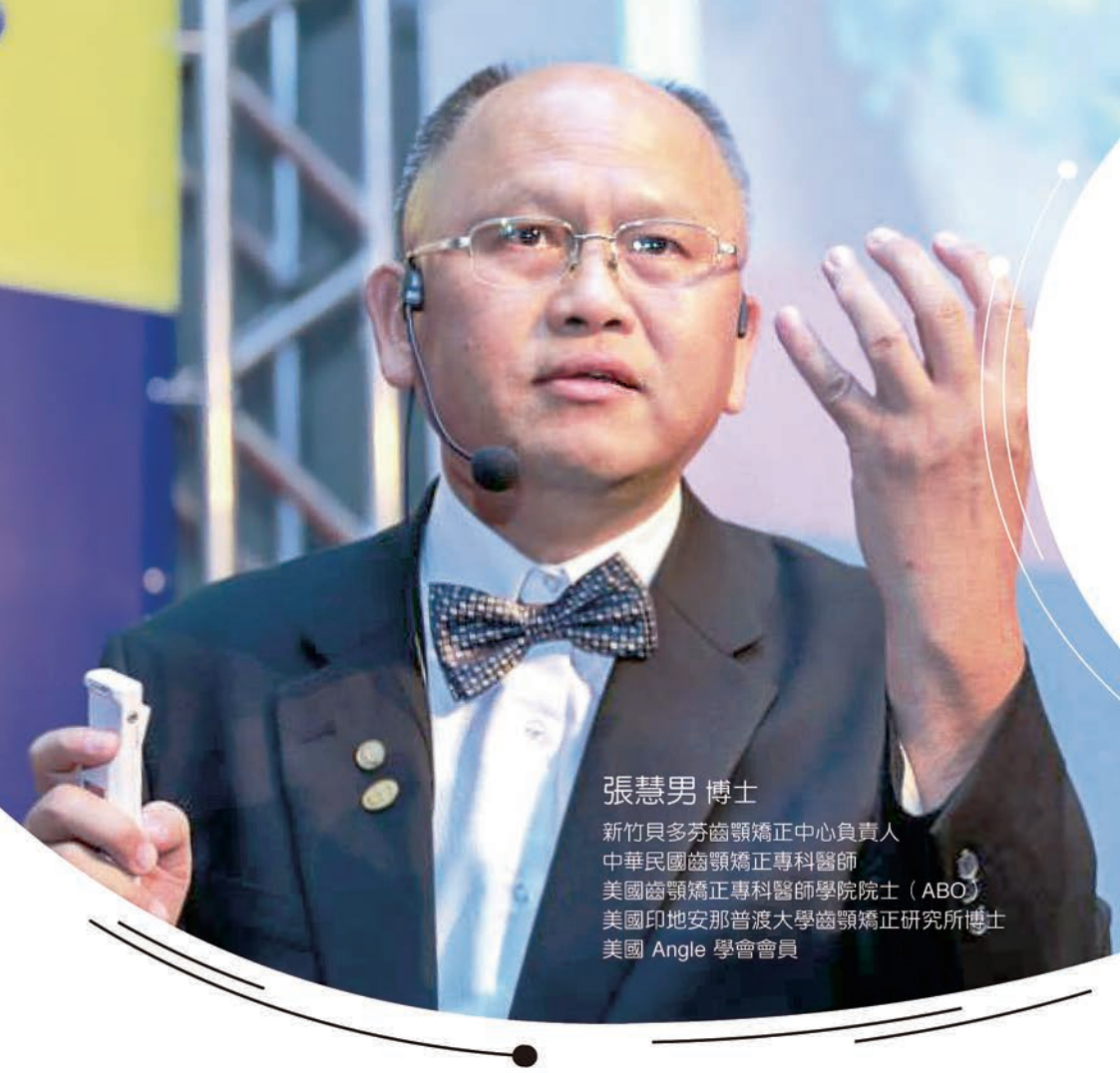
Vol. 62 Apr 1, 2021

Three ways to correct the posterior crossbite: 1. if the overbite is deep (left), pull crossbite intermaxillary elastics to produce rotation and extrusion force; 2. if the vertical dimension cannot be changed (center and right), install an OBS combined with elastomeric chains to rotate and intrude.

ISSN 2523-9392

977 2523939 006

This journal is available for free download at iJDO.pro.



2021-22
熱愛學矯正

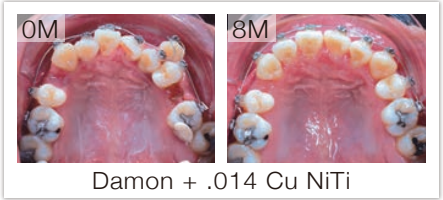
全新的貝多芬高效 Damon 矯正大師列課程是由國際知名講師張慧男醫親自規劃及授課，課程特色強調由臨病例帶動診斷、分析、治療計畫擬與執行技巧。此外，透過數位影片覆觀看，課堂助教協助操作，以及間臨床見習，讓學員在短時間能快上手，感染「熱愛矯正學，熱愛學正」的熱情。

Damon Master

(Thu) 9:00-5:00 中文授課

The Beethoven Damon Master Program, created by Dr. Chris Chang, is a two-year clinical program. Its hands-on orientation features case study-based diagnosis, analysis, treatment planning andresult evaluation. Combining in-class teaching assistants, after-class video review and chair-side observation, participants will learn to master the essential tips of the Damon System.

2021	A班	B班		A班	B班
Module 1 -	4/22	5/20	Module 7 -	9/9	10/14
Module 2 -	5/13	6/3	Module 8 -	9/16	11/4
Module 3 -	5/27	6/24	Module 9 -	10/21	11/25
Module 4 -	6/17	7/29	Module 10 -	11/11	12/9
Module 5 -	7/8	8/12	Module 11 -	12/23	12/30
Module 6 -	8/5	9/30			



Damon + .014 Cu NiTi

Excellent Finishing

(Tue) 9:00-12:00 中文授課

Critically reviewing classical literature and contempora papers and applying lessons learned to clinical work; utilising ABO's DI and CRE standards to turning excellent finishing into attainable goals.

Finishing XIII

Module 1 -	6/8	Module 7 -	12/14
Module 2 -	7/13	Module 8 -	1/11/22'
Module 3 -	8/24	Module 9 -	2/15
Module 4 -	9/14	Module 10 -	3/15
Module 5 -	10/19	Module 11 -	4/12
Module 6 -	11/9		

Damon Clear

International Workshop

(Digital Orthodontics, OBS & VISTA)

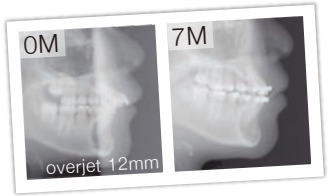
English Class

The workshop provides a 3 day, advance hands-on program to experienced Damo users. The program includes world-clas lectures, model and surgical hands-o workshops and clinical observation o patient care and clinic management.

course@newtonsa.com.tw
+886-3-573-5676 #218 Annie

2021

Class 1 - **May 18-21**
Class 2 - **Dec 07-10**



Damon + Bite Turbo + Early Light Short Elastic

每次上課請依最新一期 JDO 公告為主

(本文宣品僅供牙科診所及醫師參考，禁止張貼或擺置於公眾可瀏覽及取閱之處)

報名專線
湧傑 Yong Chieh

北區 楊文君
02-27788315 #122

中區 張馨云
04-23058915

南區 蔡淑玲
07-2260030

上課地點：新竹市建中一路25號2樓（金牛頓藝術科技）
2F, No. 25, Jianzhong 1st Rd., Hsinchu City, Taiwan (Newton's A)

Simple Solutions from Insanely Deep Thinking

Since time immemorial, human has always been looking for the simplest way to deal with their problems. Sometimes, a simple solution can be found with very little effort, sometimes by chance, but sometimes, we really have to rack our brains for it.

Steve Jobs had his 3 levels of pro philosophy: simple solutions from simple thinking, complex solutions from deep thinking, and simple solutions from insanely deep thinking. It is the last level which we follow in our case reports for this journal, finding a simple solution to our complex cases by by giving them a tremendous amount of thought! As we explore new horizons with newly developing mechanics, it is of utmost importance that we use them in the simplest manner possible.

In this issue we present 3 complex cases:

The first is a Brodie Bite case, with an additional lingual collapse of the lower posterior segment. Not the easiest case we have ever had. However, insanely deep thinking provided us with a simple solution. If you are thinking **BS**, you're right! The **B**uccal-shelf **S**crew!

The second is an ortho/implant treatment for multiple congenitally missing teeth.

The third case used a digital set-up to simplify the clinical procedure.

I hope you get as much enjoyment reading about them as we did in solving them.

Saving the best for last, we have our debut Taiwanese lifestyle report. Taiwanese love water- our island is surrounded by it, water is also an important part of Feng Shui, and, for many of us, having a pond is a dream. With today's awareness to be environmentally friendly, having an eco-pond is all the rage, so our last report will be taking an in-depth look at CC's eco-pond.

The key to a great eco-pond is similar to insanely deep thinking - filtration. For a pond, it is necessary to filter to provide clean water for human and aquatic life. For a simple solution, we need to consider all treatment options, filter all of the possible procedures, to leave us with a clear and simple solution.

I hope this journal will inspire you all to find a simple path to glory, with or without insanely deep thinking!

Chris Chang PhD, ABO Certified, Publisher of JDO

Simple Solution for Brodie Bite with Skeletal Class II Asymmetry

Abstract

Introduction: *A 30-year-old female presented with a chief complaint of difficulties in chewing due to a constricted lower arch and a unilateral full buccal crossbite (scissor-bite or Brodie bite). She requested a non-surgical treatment, but agreed to extra-radicular temporary anchorage devices and any required extraction of teeth.*

Diagnosis & Eitiology: *Her facial profile was convex, with protrusive lips. Lip incompetence was not obvious. Skeletally, the mandible was retrusive (SNB 75°) with an ANB of 7°, indicating skeletal Class II. There was 7mm of crowding in the upper arch and none in the lower arch. The buccal crossbite on the left side, as well as asymmetrical condylar heads and mandible, resulted in a 5mm deviation of the mandible to the right.*

Treatment: *A non-surgical approach was indicated using passive self-ligating brackets. Glass ionomer bite turbos (BTs) were bonded on the occlusal surfaces of the lower right molars at the beginning of the treatment. The extra-radicular temporary anchorage device (E-R TAD) that was indicated was a 2x12-mm OrthoBoneScrew® (OBS), which was inserted in the left mandibular buccal shelf (MBS). Elastomeric chains, anchored by the OBS, extended to lingual buttons bonded on the lingually inclined lower left molars. Cross elastics were added as secondary up-righting mechanics. The lower right BTs were removed in the third month when the posterior crossbite was corrected. In the nineteenth month, BTs were bonded on the lingual surfaces of the upper central incisors, and an OBS was inserted in each infrazygomatic crest (IZC) and pre-maxillary area. The Class II relationship was resolved with retraction of the maxillary arch using IZC anchorage and intermaxillary elastics. The gummy smile was corrected by intruding the upper anterior teeth with pre-maxillary anchorage.*

Results: *The scissor-bite and lingually inclined lower left posterior segment were sufficiently corrected after 3 months of treatment. The anterior BTs opened space to extrude the posterior teeth and level the lower arch, and the IZC and pre-maxillary bone screws anchored the retraction of the maxillary arch. In twenty-seven months, this difficult malocclusion, with a Discrepancy Index of 29, was treated to a Cast-Radiograph Evaluation of 8, and a Pink & White esthetic score of 3. (J Digital Orthod 2021;62:4-23)*

Key words:
Scissor-bite, Brodie bite, buccal crossbite, lingually inclined lower molars, maxillary protrusion, lip protrusion, cross elastics, occlusal bite turbo, extra-alveolar anchorage, mandibular buccal shelf, mandibular rotation, infra-zygomatic crest, inter-proximal reduction, bone screws, TADs

Introduction

The dental nomenclature used in this report is a modified Palmer notation with four oral quadrants: upper right (*UR*), upper left (*UL*), lower right (*LR*), and lower left (*LL*). From the midline, the permanent teeth are numbered 1-8. Brodie defined a malocclusion as a "*Brodie bite*" or "*Brodie syndrome*" when the mandibular jaw had "*telescoped*" within the upper arch, i.e., the mandibular teeth are completely contained within the maxillary arch. If the scissor-bite is bilateral, the patient's mandible may be functionally retruded, and if it is unilateral, then there is often a cant to the occlusal plane and a lateral deviation of the mandible, a so-called

Bear Chen,
Lecturer, Beethoven Orthodontic Course (Left)
Chris H. Chang,
Founder, Beethoven Orthodontic Center
Publisher, Journal of Digital Orthodontics (Center)
W. Eugene Roberts,
Editor-in-Chief, Journal of Digital Orthodontics (Right)

functional shift.[1,2] To treat a scissor-bite, intermaxillary traction is efficient in some cases, but extrusion of the posterior segments is a common iatrogenic effect.[3] Depending on the severity of the skeletal problem, it can also be corrected by distraction osteogenesis,[4–6] subapical mandibular surgery,[7,8] or othognathic surgery.[9] In some cases, non-surgical treatments such as maxillary contraction[10] and mandibular expansion[11] were used. Additionally, many adults with scissor-bites were treated with intraoral temporary anchorage devices.[12–14]

Fig. 1:
Pre-treatment facial and intraoral photographs. Left posterior buccal crossbite resulted in a 5mm deviation of the mandible to the right. UL5 was blocked out palatally.

This report describes the non-surgical treatment process of a Brodie bite with a Class II skeletal problem in an adult patient using extra-radicular temporary anchorage device (*E-R TAD*).

History and Etiology

A 30-year-old female sought orthodontic consultation for protrusive lips and an asymmetrical face. No contributing medical or dental histories were reported. A clinical examination revealed a convex facial profile and lip protrusion, both of which were greater than the ideal Taiwanese esthetic standard. From the frontal view, it was noted that the mandible deviated to the right and that the occlusal plane was lower on the left side. The extent of gummy smile was acceptable. The patient, however, hoped to reduce gingival exposure when smiling. The overbite and overjet of the anterior teeth were within normal limits. The buccal segment was Class II on the right side, but molar relationship on the left side cannot be observed due to a buccal posterior crossbite (*Figs. 1 and 5*).

The upper midline was coincident with the facial midline, but the lower midline was 5mm off to the right. There were two dominant factors. First, the condyle heads were shown to be uneven on

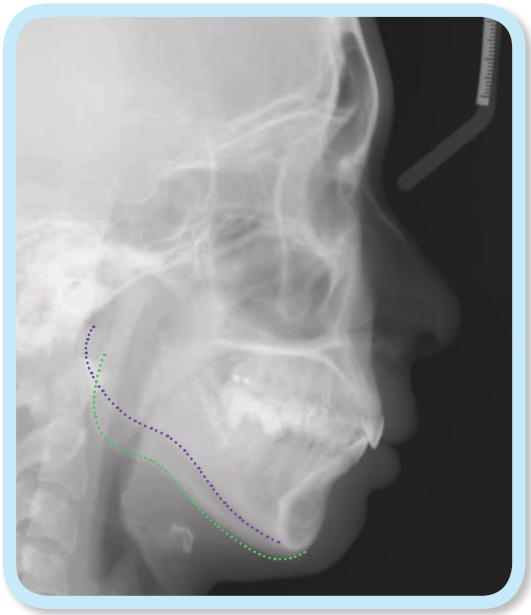


Fig. 3:
Pre-treatment cephalometric radiograph. The discrepancy between the lower border of the mandible correlated with the asymmetrical condyle heads (dotted lines).

Fig. 2:
(Left) When the patient smiled, about 5mm of midline discrepancy showed to the right, and there was over 2mm of gingival display in the upper arch. (Center) When the mouth was only slightly opened, the discrepancy decreased to 3mm. The evidence of a functional shift caused by scissor-bite was obvious. (Right) Transcranial radiographs of the TMJs prior to treatment showed asymmetrical condylar heads, which suggested that the upper and lower midlines may not be coincident after treatment.

the radiographic examination. Second, there was a buccal crossbite from UL4 to UL7, which contributed to the functional shift (*Figs. 2 and 4*).

The cephalometric analysis showed that the case was skeletal Class II (*ANB=7°*), and the angle of the upper incisors was flat. The discrepancy between the lower border of the mandible correlated with the asymmetrical condylar heads (*Fig. 3*).

Fig. 4:
Pre-treatment panoramic radiograph showed the overlap of the left posterior segments.

Fig. 5:
Pre-treatment study model showed dental Class II malocclusion and flat incisors. UL posterior teeth cusps nearly touched the LL posterior gingiva.

CEPHALOMETRIC SUMMARY			
SKELETAL ANALYSIS			
	PRE-Tx	POST-Tx	DIFF.
SNA° (82°)	82°	82°	0°
SNB° (80°)	75°	73°	2°
ANB° (2°)	7°	9°	2°
SN-MP° (32°)	47°	49°	2°
FMA° (25°)	40°	42°	2°
DENTAL ANALYSIS			
U1 To NAmm (4mm)	0	-4	4
U1 To SN° (104°)	88°	88°	0°
L1 To NBmm (4mm)	8	5	3
L1 To MP° (90°)	97°	90°	7°
FACIAL ANALYSIS			
E-LINE UL (-1mm)	1.5	-1.5	3
E-LINE LL (0mm)	2	-0.5	2.5
%FH: Na-ANS-Me (53±3%)	50%	51%	1%
Convexity: G-Sn-Pg' (13°)	21°	22°	1°

Table 1: Cephalometric summary

The patient's mouth opening was 40mm with a deviation to the right. Although the condyle shapes were asymmetrical, the TMJ clinical examination did not reveal any clicking, crepitation, or pain with palpation in the porus acusticus externus (*Fig. 2 right*).

Diagnosis

Skeletal:

- Sagittal Relationship: *Skeletal Class II, retruded mandible*
- Mandibular Plane Angle: *High*

Dental :

- Occlusion: *Class II on the right side*
- Overjet/overbite: *1mm/1mm*
- Buccal posterior crossbite: *from UL4 to UL7*

Facial:

- Convexity: *Convex*
- Lip protrusion: *Slightly protrusive (1.5mm/2mm)*

The American Board of Orthodontics (*ABO*) Discrepancy Index (*DI*) was 29, as shown in the supplementary Worksheet 1.

Treatment Objectives

The treatment objectives were to (*1*) correct the posterior crossbite, (*2*) establish a functional Class I molar and canine relationship, (*3*) improve the gummy smile, (*4*) coincide the upper midline with the lower one, and (*5*) improve the occlusal canting.

Treatment Plan

Correction of the posterior scissor bite was the top priority. Install an OrthoBoneScrew® (*2x12-mm, iNewton, Inc., Hsinchu, Taiwan*) (*OBS*) on the left buccal shelf combined with elastomeric chains to up-right LL6 and LL7. To accelerate the progress, join the upper left posterior segments with crossbite elastics. Extract the UR4, UL5, LL5, and LR5 to resolve the lip protrusion. As Class II intermaxillary elastics would be indicated, select high torque brackets to prevent any deterioration of the U1-SN angle (*88°*). Finally, insert OBSs in the infrazygomatic crests (*IZC*) and the premaxilla to correct the Class II malocclusion and gummy smile.

Treatment Alternatives

Option 1: Orthognathic surgery is the best approach for correcting skeletal asymmetry,[16] but the patient flatly refused this option.

Option 2: Using only cross-bite elastics could be another consideration. However, it would be very hard to control the vertical dimension, especially for an adult Class II malocclusion, as the risk of any unwanted extrusion of the posterior teeth must be prevented or lowered.[17]

Treatment Process

To resolve the lip protrusion, the UR4, UL5, LL5, LR5 were first extracted, and all the upper teeth were bonded with a 0.022-in slot Damon Q® fixed appliance (*Ormco, Glendora, California*) and passive self-ligating (*PSL*) brackets. Then, a 0.014-in CuNiTi archwire was engaged. Since correction of the posterior scissor-bite was the top priority, during her second appointment, an OBS was inserted in the left buccal shelf, combined with elastomeric chains connected from the screw to the two buttons on the lingual side of LL6 and LL7. [18-21] Two occlusal bite-turbos were constructed with Fuji II type II glass ionomer cement (*GIC*) (*GC America, Alsip IL*) on the LR molars to increase the intermaxillary space and allow the collapsed LL molars to upright without any resistance (*Fig. 6*). Also, the upper left posterior segments were joined with crossbite elastics

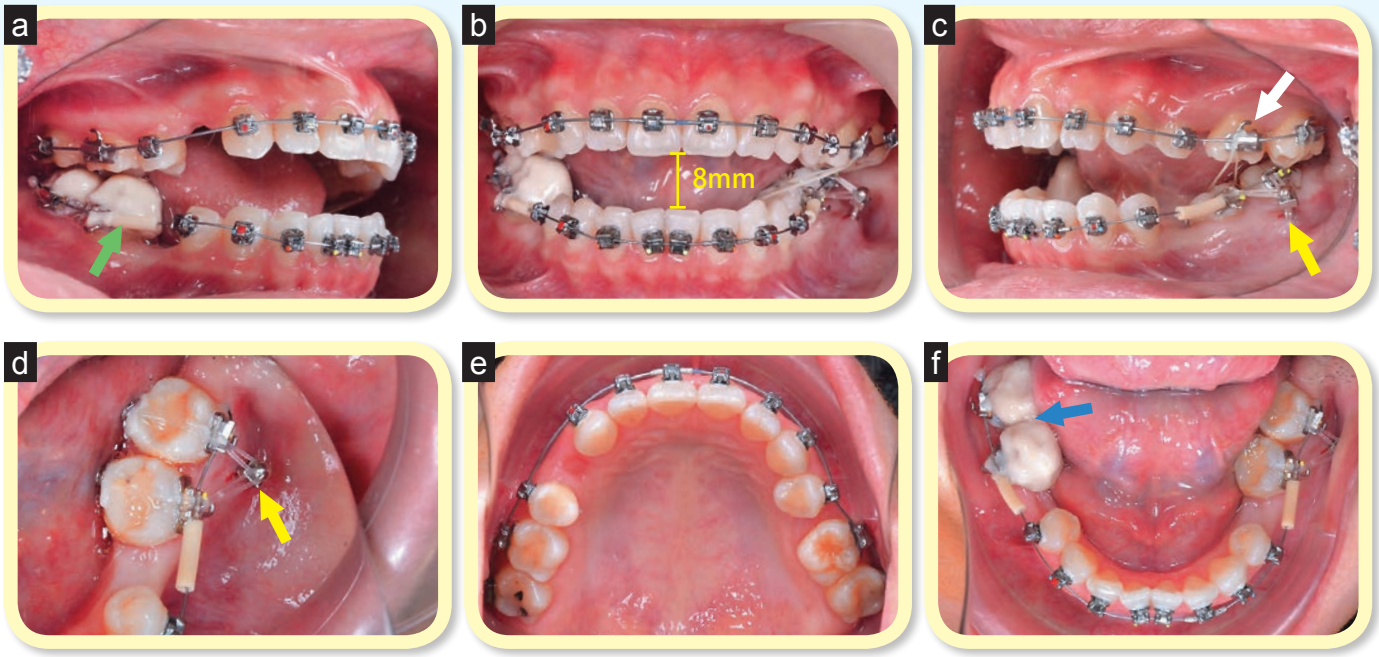


Fig. 6:

a. In the 1st month of treatment, 0.014-in CuNiTi archwires were placed in both arches. BTs were added to the occlusal surfaces of the LR molars (green arrow).

b. The bite was opened approximately 8mm.

c. Cross elastics supplemented the lateral force (white arrow) of the elastomeric chains attached to the MBS bone screw (yellow arrow).

d. Two buttons bonded on the lingual surface of LL6 and LL7 and elastomeric chains hooked to the MBS bone screw to provide buccal force (yellow arrow).

e. UR4 and UL5 were extracted to provide space for retraction.

f. BTs should not be connected, or else the archwire of the lower arch would not work (blue arrow).

(*Chipmunk, 1/8-in, 3.5-oz*) to accelerate the progress. At the same time, all the lower teeth were bonded with standard torque brackets.

By the third month, although the scissor-bite was corrected, a large openbite was created. To solve this, the brackets of the UL6 and UL7 were rebonded closer to the occlusal surface to produce an intrusion force (*Fig. 7 middle*). Meanwhile, the occlusal force also applied an intrusion force on the left posterior teeth. By the sixth month, the anterior openbite had improved a lot, so the archwires were changed to 0.016x0.025-in SS on the maxillary arch and 0.017x0.025-in TMA on the mandibular arch. By the ninth month, the overjet was resolved to a normal relationship. The intermaxillary elastics were changed to Class II elastics to correct the molar relationship, and the lower arch was changed to 0.016x0.025-in SS. The extraction spaces were closed by elastomeric chains.

In the nineteenth month, to improve the gummy

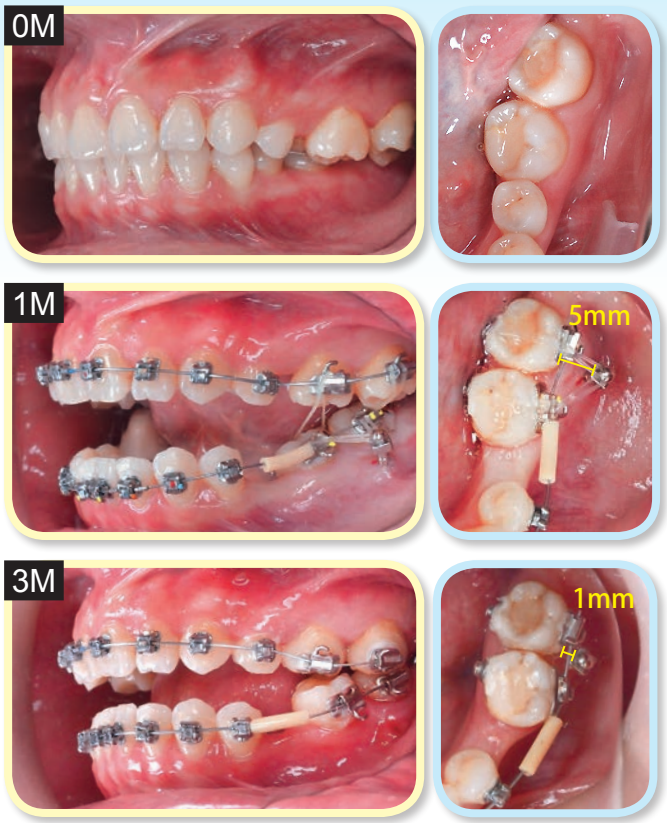


Fig. 7:
The scissor-bite is documented at the beginning of treatment (0M). The elastomeric chains activated by the MBS bone screw are shown at one month into treatment (1M). The yellow bar shows a 5mm distance from the bone screw to the 2nd molar (middle right view). At 3 months into treatment (3M), the molar had moved about 4mm to the buccal, and only 1mm remained between the molar and the bone screw (lower right view).

smile, three miniscrews (*two in the infrazygomatic crests and one on the anterior nasal spine*) were inserted into the maxilla to intrude the whole upper arch (*Figs. 8-10*).[22,23] At the same time, Class II intermaxillary elastics were hooked from U3 to L6 and L7 bilaterally to correct the molar relationship. By the twenty-fourth month, the gummy smile was improved. Thus, the miniscrews were removed, and the treatment entered the detailing phase.

It took another year to detail the occlusion. The brackets were repositioned to correct marginal ridge discrepancies. Inter-proximal reduction (*IPR*) reshaped the maxillary and mandibular incisors to eliminate the black triangles and to reduce flaring. Two weeks before the completion of active treatment, the maxillary archwire was sectioned distally to the canines, and multiple intermaxillary elastics (*Chipmunk, 1/8-in, 3.5-oz*) were utilized to settle the posterior occlusion.[24] After twenty-seven months of active treatment, all appliances were removed, and retention was accomplished with upper, and lower clear overlay retainers. Figs. 8-12

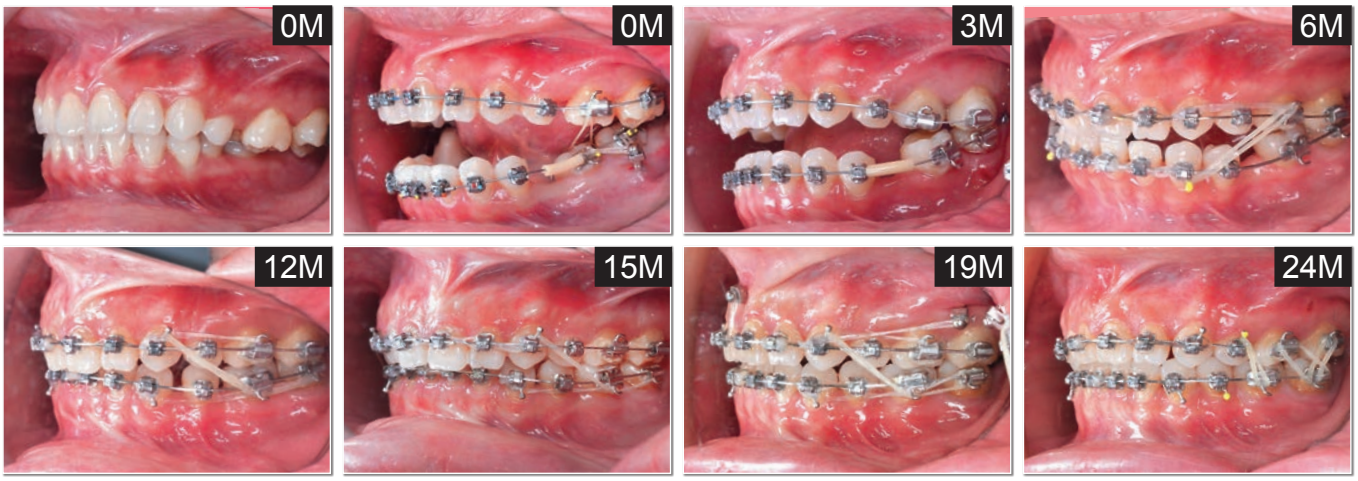


Fig. 8:
Treatment progression from the left buccal view is shown for 24 months (M) of active treatment. In the 3rd month, the brackets of UL6 and UL7 were moved closer to the occlusion to produce intrusion effect.

document the entire treatment sequence from the left buccal, frontal, right buccal, maxillary occlusal, and mandibular occlusal view, respectively.

Treatment Results

The scissor-bite was successfully solved by opening the bite, and up-righting the lingually inclined buccal segment. The deviation of the mandible has improved a lot. A functional Class I molar and canine relationships were successfully established (*Figs. 15 and 16*). The mandibular dental midline deviation was also corrected (*Fig. 13*). The gummy smile was improved tremendously (*Figs. 1 and 15*). A nearly ideal dental alignment was achieved as evidenced in the ABO CRE score of 5 points (*Worksheet 2*). [25]

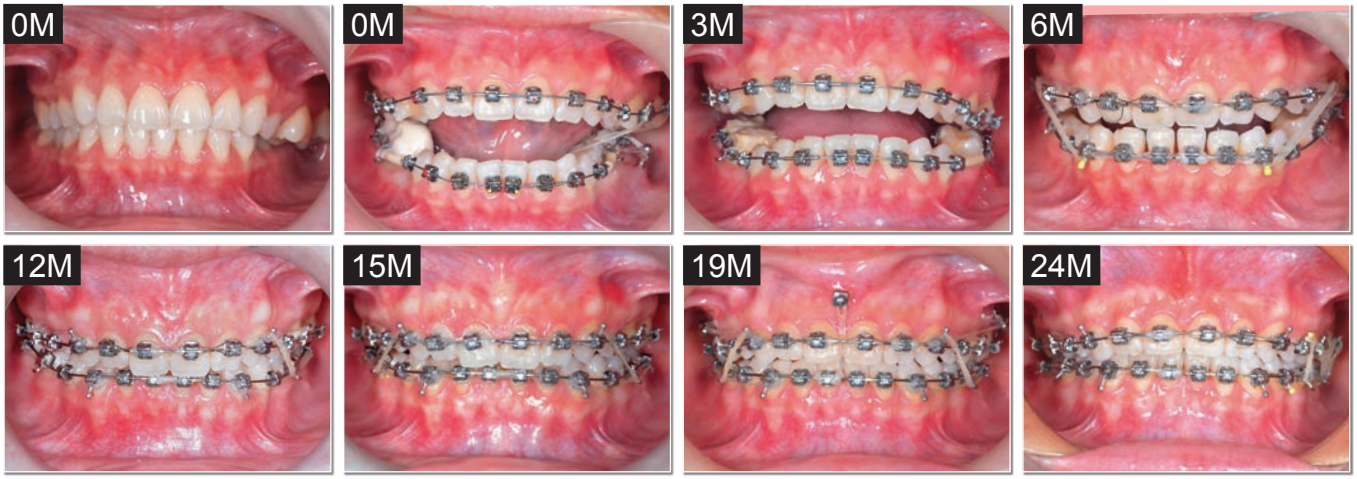


Fig. 9:
Treatment progression from the frontal view is shown for 24 months (M) of active treatment. The openbite was inevitable during the correction of the posterior crossbite (3M). Once the cusp-to-fossa relationship was established, it was resolved.

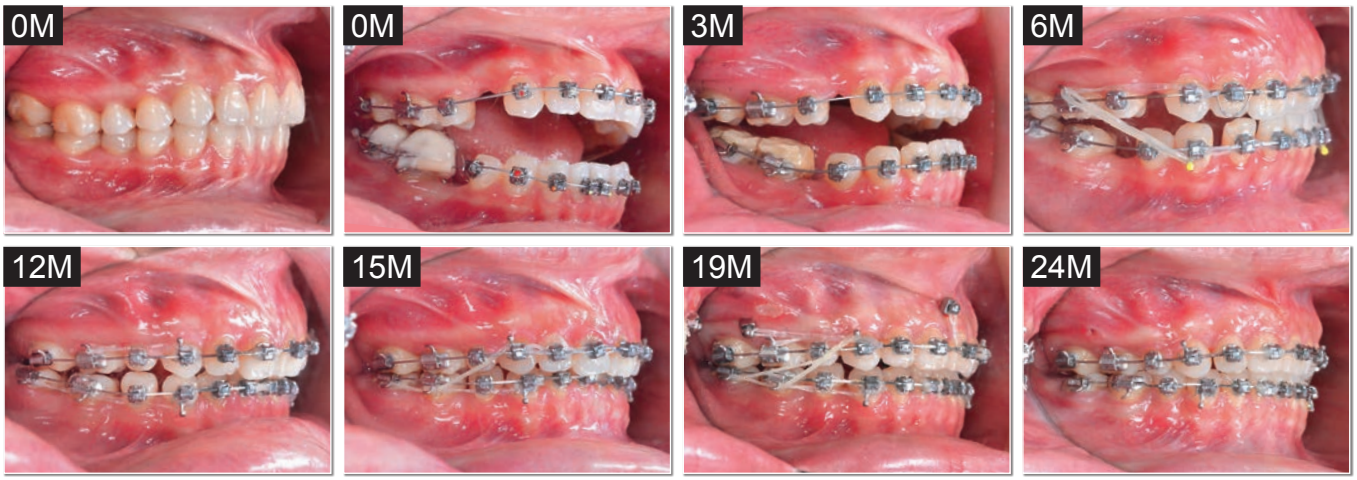


Fig. 10:
Treatment progression from the right buccal view is shown for 24 months (M) of active treatment. The BTs on the LL6 and LL7 were made of GIC type II. To avoid sectioning of the archwire, we suggest not connecting the BTs (3M).

Fig. 11:

Treatment progression of the maxillary arch is shown from the occlusal view. UL5 was extracted due to crowding and UR4 was extracted to correct the midline.

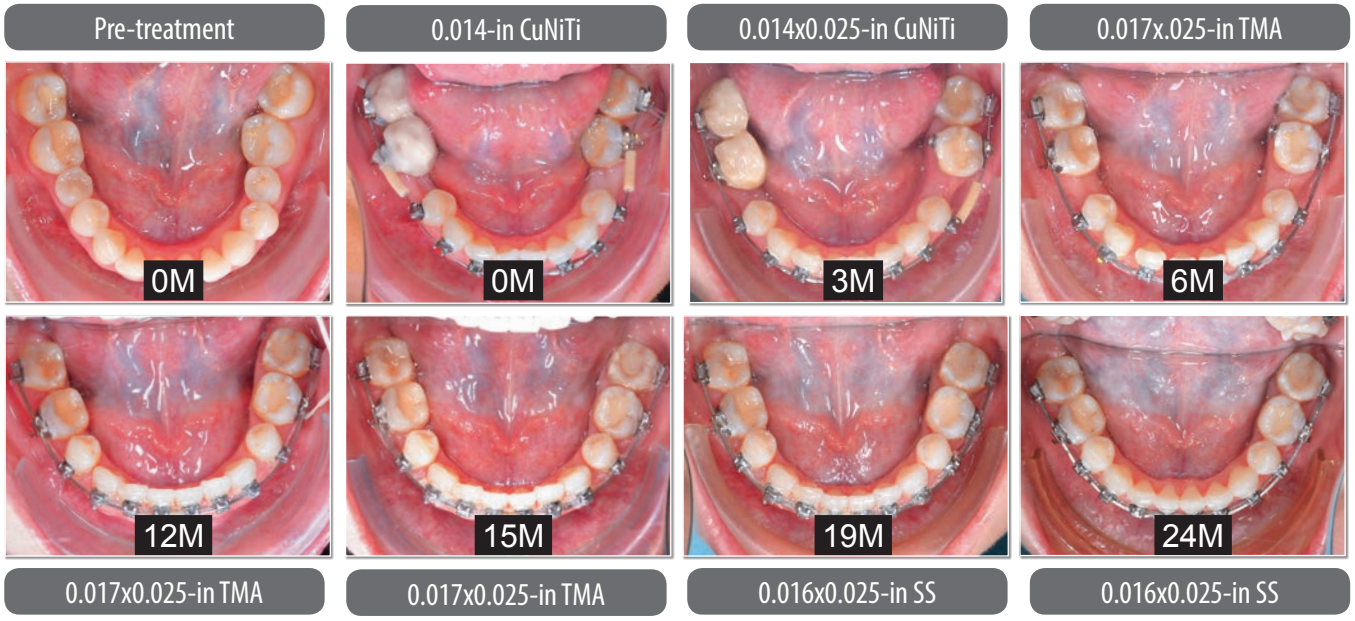


Fig. 12:

Treatment progression of the mandibular arch is shown from the occlusal view. Bilateral lower 2nd premolars were extracted to retract the lower teeth and correct the anterior crossbite. Dumping effect of the anterior teeth was overcome by using pre-torque wire and high-torque brackets.

Fig. 13:
Pre- and post-treatment photographs show that the midline discrepancy has been greatly improved, which implies that the major factor influencing the midline was functional shift.

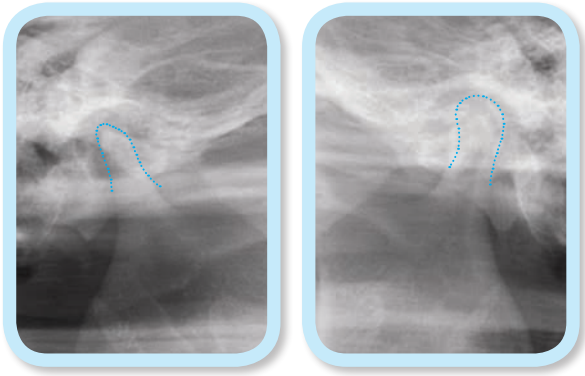


Fig. 14:
Post-treatment TMJ transcranial radiographs show that the condylar heads returned to symmetrical kinematics. There is no compression on the right side.

The post-treatment panoramic film shows good parallelism of all teeth (*Fig. 17*). The cephalometric film and superimposed tracings show that the whole upper arch was extensively retracted and intruded, resulting in the improvement of the protrusive lips (*Figs. 18 and 19*). The angulation of the upper incisors was maintained. The ANB increased from 7° to 9° due to the increase in the vertical dimension. Both SN-MP and FMA have a 2˚ increase due to clockwise mandibular rotation (*Table 1*). From the superimposed tracings of the cephalometric films, it can be observed that lower molars were extruded, while the upper molars were intruded. The maxillary incisors were retracted and intruded, while the mandibular incisors were retracted and extruded (*Fig. 19*). The post-treatment TMJ transcranial radiographs show that the condylar heads returned to a symmetrical morphology and kinematics (*Fig. 14*). The patient did not report any TMD signs or symptoms before, during, or after treatment.

The Pink and White dental esthetic score was 3 points, as shown in the supplementary Worksheet 3. The patient was satisfied with her esthetics and functional occlusion after treatment.

Discussion

Posterior X-bite

There are several case reports in which a segmented Le Fort I osteotomy and BSSO were successfully used to correct posterior crossbites, vertical excess, and maxillo-mandibular width discrepancies.[6,12,23,24] However, some patients, including the current case, refuse to undergo a surgical orthodontic treatment. Thus, other ways were sought. A wide variety of orthodontic mechanics have been proposed: intermaxillary cross elastics,[3,26] TAD anchorage,[12,13,26] removable plates with a NiTi wire,[27] transpalatal arch

Fig. 15:
Post-treatment facial and intraoral photographs document the result after 27 months of active treatment. The scissor-bite, occlusal canting, and protrusive facial profile were corrected to a satisfying result.

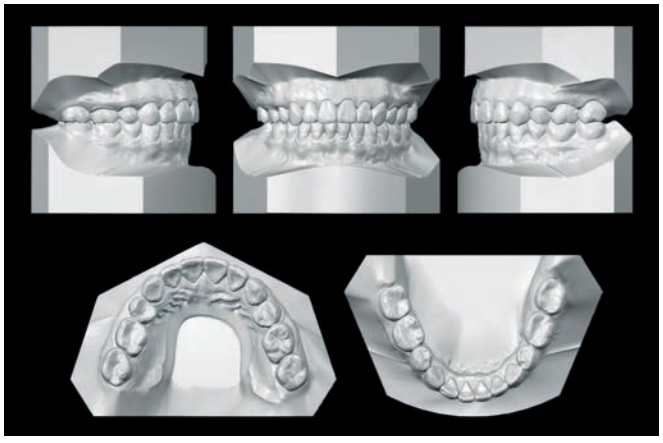


Fig. 16: Post-treatment dental models (cast)

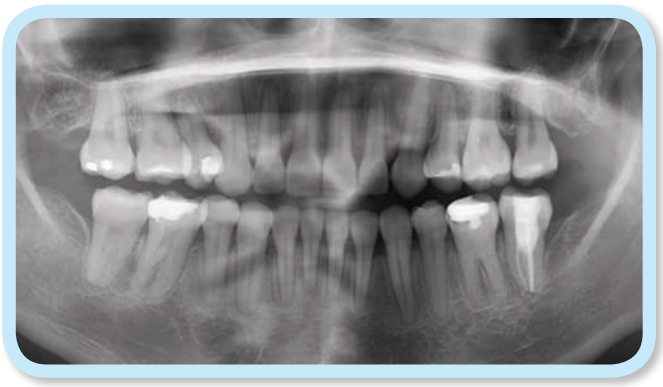


Fig. 17:
Post-treatment panoramic film shows good parallelism of all teeth except for UR5. Mild root resorption is observed. There is no overlap on the left side.

Fig. 18:
Post-treatment cephalometric radiograph shows an improved but still convex profile and Class I molar relationship.

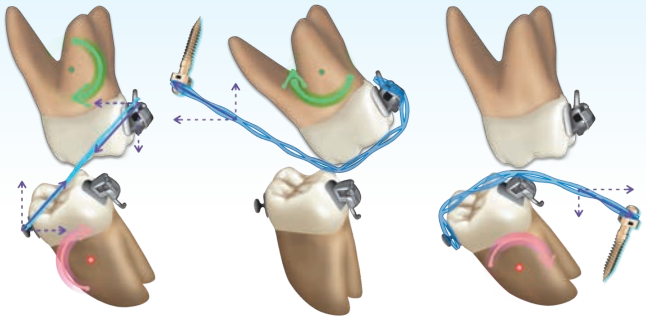


Fig. 20:
Three ways to correct the posterior crossbite: 1. If the overbite is deep (left), pull crossbite intermaxillary elastics to produce rotation and extrusion; 2. if the vertical dimension cannot be changed (center and right), install an OBS combined with elastomeric chains to rotate and intrude.

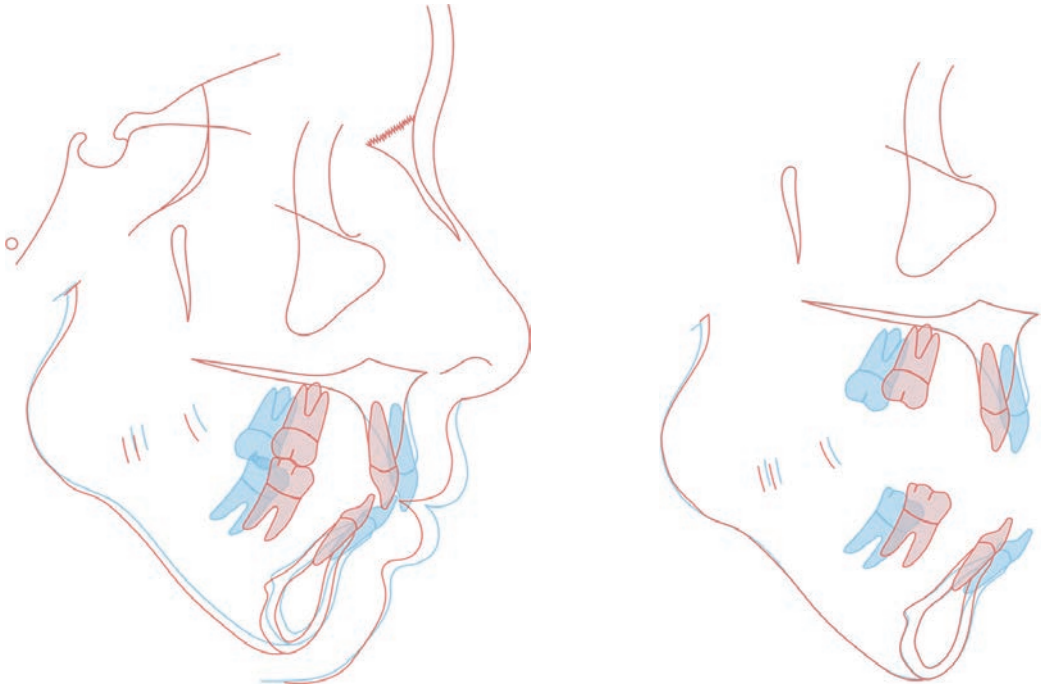


Fig. 19:
Superimposed tracings (Pre-tx: blue, Post-tx: red) indicate that the mandible was rotated clockwise, resulting in lower lip retrusion. The lower incisors was retracted almost a centimeter to correct the anterior crossbite. The mandibular molars was up-righted, which increased lower facial height (%FH: Pre-tx 50%, Post-tx 51%).

(*TPA*) with intramaxillary elastics,[28,29] quad-helix,[30] and lingual arch appliances with intramaxillary elastics.[31] The vertical overlap of a buccal crossbite requires dental intrusion or opening of the bite to correct the cusp in fossa discrepancy. For instance, unilateral cross elastics produce an extrusive force that may result in any of the following: clockwise rotation of the mandible, canting of the occlusal plane, occlusal prematurity, and/or an anterior openbite. In addition, patient cooperation/compliance is a critical factor when treating with a removable plate[27] or cross elastics.[3,26] Many case reports have shown successful corrections of a unilateral scissor bite using miniscrew anchorage.[13,14,32] The advantages of miniscrews are that they can intrude and tip teeth easily without unwanted side effects, and that patient compliance does not have an impact on its effectiveness (*Fig. 20*).

Inter-radicular (*I-R*) bone screws are commonly used as skeletal anchorage because they are relatively easy to insert, provide direct anchorage to intrude teeth, and do not require compliance.[13,26,32,33] However, a multiple-tooth scissor-bite with a large vertical overlap is very difficult to correct with orthodontic mechanics, even with bone screw anchorage, especially in an adult. Therefore, the most severe scissor-bite cases are best managed with surgical orthodontics.[6,8,9]

This patient presented with a scissor-bite of the UL buccal segment that was articulated with a lingually tipped LL buccal segment (*Figs. 1 and 2*). The extruded UL molars and premolars impinged on the lower gingiva. Orthognathic surgery is indicated for such a severe malocclusion.[6,12,23,24] However, extra-radicular (*E-R*) bone screws with contralateral bite turbos allowed the opportunity to reverse the etiology of the malocclusion by intruding the UL buccal segment and up-righting the LL buccal segment. There were three steps in the correction process:

1. **Adequate Bite Opening**: A 7mm posterior open-bite with BTs was created to allow the buccal cusps of the LL molars to pass the lingual cusps of the opposing upper buccal segment. As soon as the posterior overjet was corrected, the BTs were removed (*Fig. 2*).

2. **Simultaneous Intrusion and Buccal Tipping**: Elastomeric chains were attached to the lingual buttons on the LL molars, passed over the occlusal surfaces, and connected to the MBS bone screw. Since the archwire was connected to the teeth, these mechanics intruded and up-righted the entire buccal segment. Supplementary cross elastics provided an additional lateral force for the crossbite correction. The extrusive force on the lower segment from the cross elastics was offset by the intrusive force delivered by the elastomeric chains connected to the MBS bone screw. There are three benefits favoring a MBS bone screw compared to an I-R bone screw:

    a. Prominent Head: The OBS has a large head with deep undercuts to readily retain elastomeric chains, producing efficient up-righting of the LL segment.

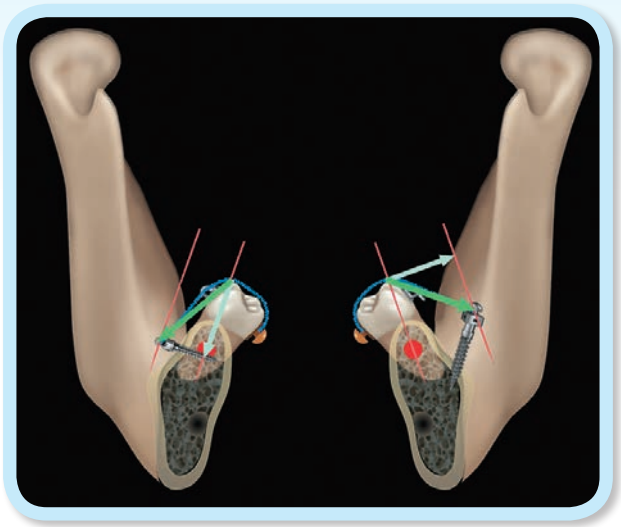


Fig. 21:
A comparison bewteen I-R bone screw (left) and contralateral E-R bone screw (right) evidently shows that the elevated head position and more buccal position of the E-R TAD, relative to the center of rotation of the molar root (pink lines), which provides a mechanical advantage for up-righting the molar (right).

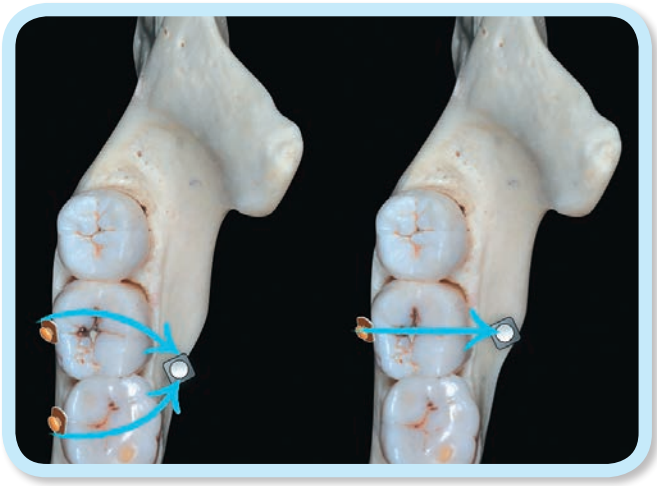


Fig. 22:
The E-R bone screw can be positioned buccal to the second molar or between the first and second molars. Either configuration is a viable alternative depending on the anatomy of the patient because there is an archwire present, which transfers an up-righting force to all teeth in the buccal segment.

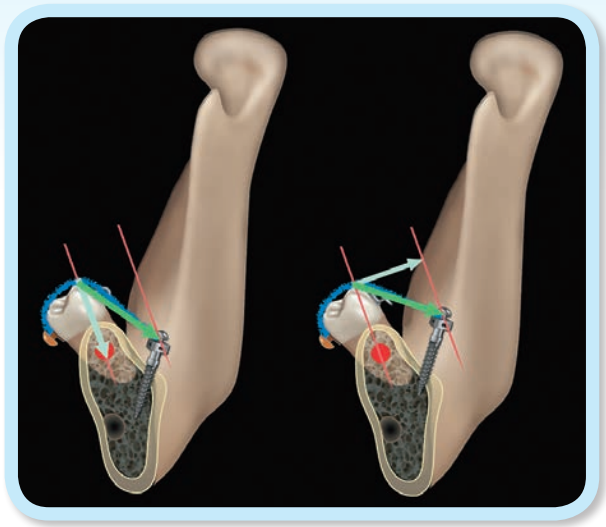


Fig. 23:
The head position height of the E-R bone screw can be controlled by the clinician. The force anchored by the higher (more superficial) bone screw head (right) delivers a more buccal and less intrusive force compared to a screw head positioned more closely to the soft tissue (left).

b. More Buccal Position: The E-R TAD can be positioned up to 10mm buccal of the lingually tipped molars. This is an adequate space to allow the entire buccal segment to be up-righted with only one bone screw. Elastic chains can be connected to both molars because they are connected with an archwire on the buccal surface. I-R TADs interfere with movement of the teeth, and frequent replacement would then be necessary (*Figs. 21 and 22*).

c. Variable Head Position: The OBS head can be positioned as close to the soft tissue as required. The clinician can screw it in deeper if a more intrusive force component is needed (*Fig. 23*).

3. **Position of the bracket**: There was no need to significantly rotate the UL6 and UL7; therefore, the UL6 and UL7 brackets were bonded near the occlusal surface for intrusion instead of combining with the OBS (*Fig. 24*). Furthermore, the LL6 and LL7 brackets were bonded close to the gingiva to prevent any dislodgement during the up-righting.

Torque Control

Bimaxillary protrusion was noted at the patient's first consultation. As closing space loses the torque of the anterior teeth, three strategies were prepared to solve it:

1. **High torque selection**: Class II intermaxillary elastics were used to correct the molar relationship. Dumping (*excessive posterior tipping*) of the upper incisors was expected, thus, high torque braces were selected for the upper anterior teeth. Besides, the retroclination of the lower anterior teeth would be compensated with the flaring effect caused by the CII intermaxillary brackets, so standard elastics were chosen for the lower anterior teeth instead of low torque ones.

2. **Pre-Q archwire**: Play has an important role in torque expression. When using the Damon Q system, the play for 0.019x0.025-in SS is 11.4° (*Fig. 25*). The major mechanism used in this

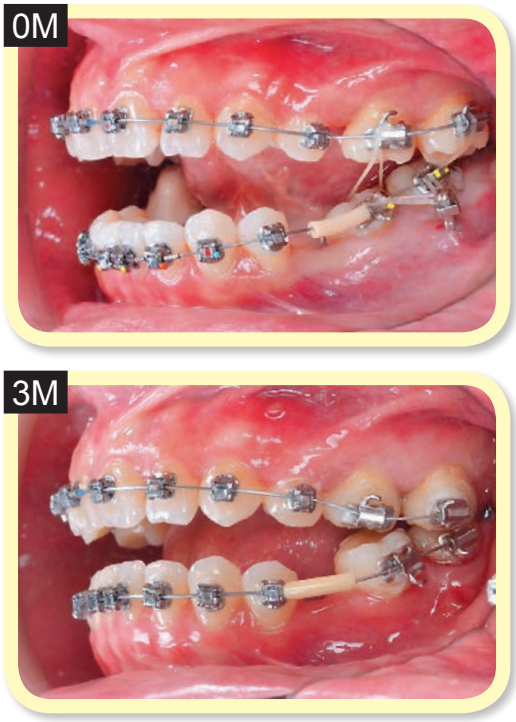


Fig. 24:
Upper - LL6 and LL7 brackets positioned closely to the gingiva to prevent interference during up-righting.
Lower - UL6 and UL7 brackets positioned closely to the occlusion for intrusion.

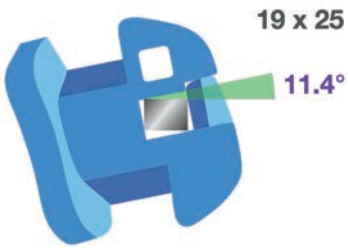


Fig. 25:
There was 11.4° play between the slot of Damon brackets and 0.019x0.025-in archwire, providing low resistance to sliding but loss in torque.

Fig. 26:
The OBS on the premaxilla provided flaring and intruding force to the upper anterior teeth. The mechanism was utilized to compensate the side effect of the Class II intermaxillary elastics.

case worked on the 0.016x0.025 SS-in SS wire as the play was larger than 11.4°. Thus, if the torque expression was found to be insufficient, a 0.019x0.025-in pre-Q CuNiTi archwire could be employed or the incisor segment could be bent 15° to provide more torque.

3. **Miniscrew on the Pre-maxilla**: The most powerful method is miniscrews, which provide a definite anchorage in the oral cavity. To flare the anterior teeth, one miniscrew was inserted in the pre-maxilla and hooked to the elastomeric chains, which corrected not only the incisor torque but also the gummy smile (*Fig. 26*). [22]

Conclusions

1. E-R bone screws are a minimally invasive approach for resolving severe scissor-bite malocclusion.

2. Uprighting the LL buccal segment with a MBS bone screw provided normal occlusion to intrude the extruded maxillary molars. However, it is important to ensure that there is adequate intrusion of upper and lower molars on the affected side to avoid opening the VDO (*clockwise rotation of the mandible*).

3. To correct Class II malocclusion with the flat upper incisors, clinicians should pay more attention to the torque control.

Acknowledgment

Thanks to Dr. Rungsi Thavarungkul for the beautiful illustrations. Thanks to Mr. Paul Head for proofreading.

References

1. Proffit WR, Fields HW, Sarver DM. Sarver. Special considerations in treatment for adults. In: Contemporary Orthodontics 4th ed. St. Louis: Mosby; 2007:639–44.
2. Moyers RE. Handbook of orthodontics. In: Handbook of orthodontics 4th ed. Chicago; 1988:392–6.
3. Harper DL. A case report of a Brodie bite. Am J Orthod Dentofac Orthop 1995;108(2):201–6.
4. Legan HL. Orthodontic planning and biomechanics for transverse distraction osteogenesis. Semin Orthod 2001;7(3):160–8.
5. King JW, Wallace JC. Unilateral Brodie bite treated with distraction osteogenesis. Am J Orthod Dentofacial Orthop 2004;125(4):500–9.
6. Ramsay DS, Wallen TR, Bloomquist DS. Case report MM. Surgical-orthodontic correction of bilateral buccal crossbite (Brodie syndrome). Angle Orthod 1990;60(4):305–11.
7. Kole H. Surgical operations on the alveolar ridge to correct occlusal abnormalities. Oral Surg Oral Med Oral Pathol 1959;12(5):515-29.
8. Suda N, Tominaga N, Niinaka Y, Amagasa T, Moriyama K. Orthognathic treatment for a patient with facial asymmetry associated with unilateral scissors-bite and a collapsed mandibular arch. Am J Orthod Dentofacial Orthop 2012;141(1):94–104.
9. Shimazaki K, Otsubo K, Yonemitsu I, Kimizuka S, Omura S, Ono T. Severe unilateral scissor bite and bimaxillary protrusion treated by horseshoe Le Fort I osteotomy combined with mid-alveolar osteotomy. Angle Orthod 2014;84(2):374–9.
10. Hua X, Xiong H, Han G, Cheng X. Correction of a dental arch-width asymmetric discrepancy with a slow maxillary contraction appliance. Am J Orthod Dentofacial Orthop 2012;142(6):842–53.
11. Ogihara K, Nakahara R, Koyanagi S, Suda M. Treatment of a Brodie bite by lower lateral expansion: a case report and fourth year follow-up. J Clin Pediatr Dent 1998;23(1):17–21.
12. Kim KA, Yu JJ, Chen Y, Kim SJ, Kim SH, Nelson G. Surgery Versus Nonsurgery Option for Scissors Bite Treatment. J Craniofac Surg 2015;26(8):e726–9.
13. Ishihara Y, Kuroda S, Sugawara Y, Kurosaka H, Takano-Yamamoto T, Yamashiro T. Long-term stability of implant-anchored orthodontics in an adult patient with a Class II Division 2 malocclusion and a unilateral molar scissors-bite. Am J Orthod Dentofac Orthop 2014;145(4 SUPPL):S100–13.

14. Lee SA, Chang CH, Roberts WE. Severe unilateral scissors-bite with a constricted mandibular arch: Bite turbos and extra-alveolar bone screws in the infrazygomatic crests and mandibular buccal shelf. Am J Orthod Dentofacial Orthop 2018;154(4):554–69.
15. Kokich VO, Kokich VG, Kiyak HA. Perceptions of dental professionals and laypersons to altered dental esthetics: asymmetric and symmetric situations. Am J Orthod Dentofacial Orthop 2006;130(2):141–51.
16. Shimazaki K, Otsubo K, Yonemitsu I, Kimizuka S, Omura S, Ono T. Severe unilateral scissor bite and bimaxillary protrusion treated by horseshoe Le Fort I osteotomy combined with mid-alveolar osteotomy. Angle Orthod 2014;84(2):374–9.
17. Yun SW, Lim WH, Chong DR, Chun YS. Scissors-bite correction on second molar with a dragon helix appliance. Am J Orthod Dentofacial Orthop 2007;132(6):842–7.
18. Huang C, Chang CH, Roberts WE. 3D cortical bone anatomy of the mandibular buccal shelf: a CBCT study to define sites for extra-alveolar bone screws to treat Class III malocclusion. Int J Orthod Implant 2016;41:74–82.
19. Chang CH, Roberts WE. Stability of mini-screws on buccal shelves: a retrospective study of 1680 mini-screw insertions by the same orthodontists. Int J Orthod Implant 2013;30:76–8.
20. Chang CH, Liu SS, Roberts WE. Primary failure rate for 1680 extra-alveolar mandibular buccal shelf mini-screws placed in movable mucosa or attached gingiva. Angle Orthod 2015;85(6):905–10.
21. Chang CH, Roberts WE. A Retrospective Study of the Extra-alveolar Screw Placement on Buccal Shelves. Int J Orthod Implant 2013;32:80–9.
22. Lin C, Wu Y, Chang CH, Roberts WE. Simplified Mechanics for Gummy Smile Correction. Int J Orthod Implantol 2017;47:72–91.
23. Cheng J, Lee A, Chang CH, Roberts WE. Skeletal Class II Malocclusion with Convex Profile, Horizontal Impaction and Gummy Smile: Substituting Third for Second Molars. J Digit Orthod 2018;52:50–66.
24. Steffen JM, Haltom FT. The five-cent tooth positioner. J Clin Orthod 1987;21(8):528–9.
25. Casko JS, Kokich VG, Cangialosi TJ. Objective grading system for dental casts and panoramic radiographs John. Am J Orthod Dentofacial Orthop 1998;114(5):589–99.
26. Nocini PF, Salgarelli A, Console U, Bertossi D, Faccini F. Brodie's syndrome. A report of 2 atypical cases. Minerva Stomatol 44(7–8):361–8.
27. Chugh VK, Sharma VP, Tandon P, Singh GP. Brodie bite with an extracted mandibular first molar in a young adult: A case report. Am J Orthod Dentofacial Orthop 2010;137(5):694–700.
28. Jung MH. Treatment of severe scissor bite in a middle-aged adult patient with orthodontic mini-implants. Am J Orthod Dentofacial Orthop 2011;139(4 SUPPL):S154–65.
29. Ohmori H, Ono T. Unilateral scissors bite treated with a removable plate that incorporates a Ti-Ni wire. Orthodontics: the art and practice of dentofacial enhancement 2013;14(1):e222-6.
30. Kucher G, Weiland FJ. Goal-oriented positioning of upper second molars using the palatal intrusion technique. Am J Orthod Dentofacial Orthop 1996;110:466–8.
31. Nakamura S, Miyajima K, Nagahara K, Yokoi Y. Correction of single-tooth crossbite. J Clin Orthod 1995;29(4):257–62.
32. Nojima K, Takaku S, Murase C, Nishii Y, Sueishi K. A case report of bilateral Brodie bite in early mixed dentition using bonded constriction quad-helix appliance. Bull Tokyo Dent Coll 2011;52(1):39–46.
33. Lim KF. Correction of posterior single-tooth crossbite. J Clin Orthod 1996;30(5):276.
34. Tamamura N, Kuroda S, Sugawara Y, Takano-Yamamoto T, Yamashiro T. Use of palatal miniscrew anchorage and lingual multi-bracket appliances to enhance efficiency of molar scissors-bite correction. Angle Orthod 2009;79(3):577–84.
35. Park HS, Kwon OW, Sung JH. Uprighting second molars with micro-implant anchorage. J Clin Orthod 2004;38(2):100–3; quiz 92.
36. Hulsey CM. An esthetic evaluation of lip-teeth relationships present in the smile. Am J Orthod 1970;57(2):132–44.

Discrepancy Index Worksheet

TOTAL D.I. SCORE 29

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 = 0

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 = 7

OCCLUSION

Class I to end on = 0 pts.
End on Class II or III = 2 pts. per side ____ pts.
Full Class II or III = 4 pts. per side 4 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 = 8

CEPHALOMETRICS (See Instructions)

ANB ≥ 6° or ≤ -2° = 4 pts.

Each degree < -2° ____ x 1 pt. = ____

Each degree > 6° 1 x 1 pt. = 1

SN-MP

≥ 38° = 2 pts.

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

≤ 26° = 1 pt.

Each degree < 26° ____ x 1 pt. = ____

1 to MP ≥ 99° = 1 pt.

Each degree > 99° ____ x 1 pt. = ____

Total = 5

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. = 2
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. = 3
Addl. treatment complexities ____ x 2 pts. = ____

Identify:

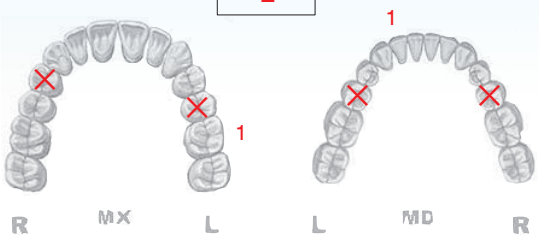
Total = 5

Cast-Radiograph Evaluation

Total Score: 8

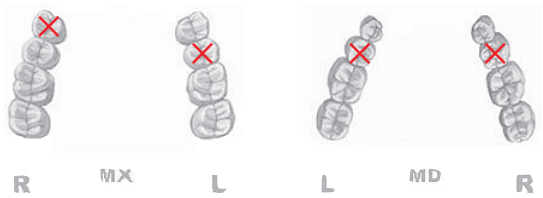
Alignment/Rotations

2



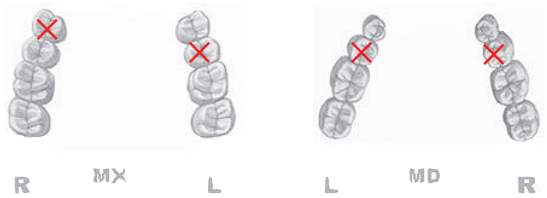
Marginal Ridges

0



Buccolingual Inclination

0

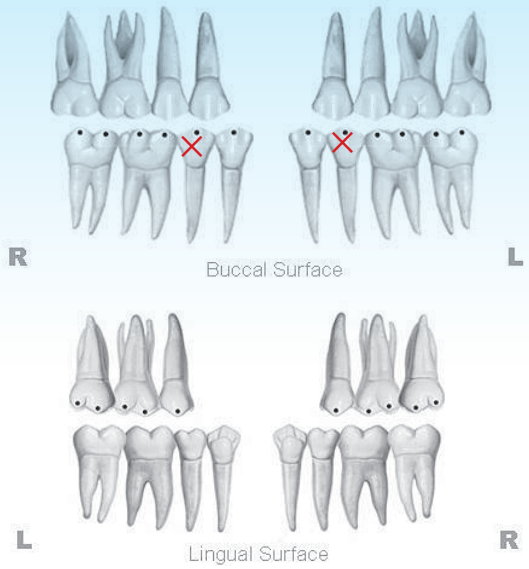


Overjet

0

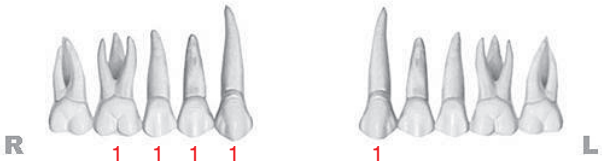
Occlusal Contacts

0



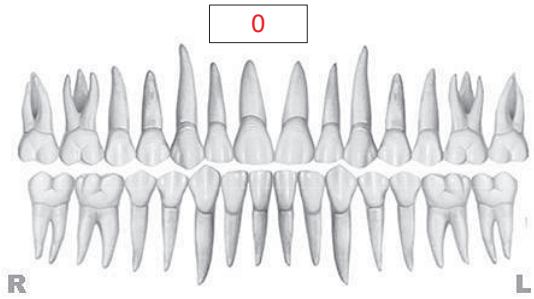
Occlusal Relationships

5



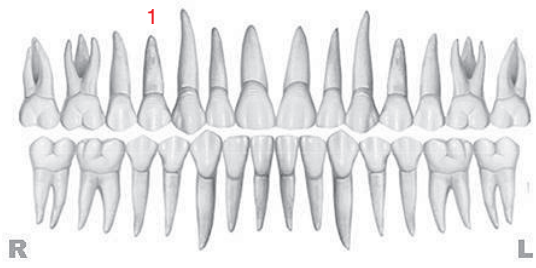
Interproximal Contacts

0



Root Angulation

1



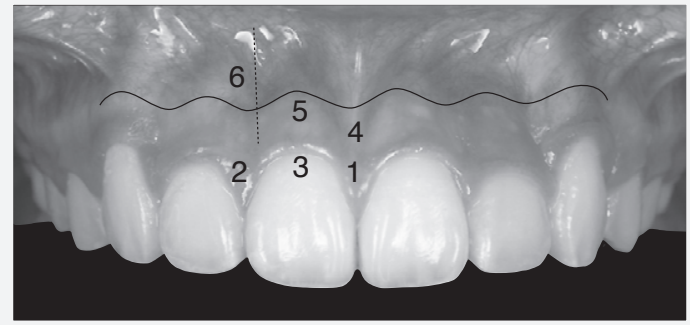
INSTRUCTIONS: Place score beside each deficient tooth and enter total score for each parameter in the white box. Mark extracted teeth with "X". Second molars should be in occlusion.

IBOI Pink & White Esthetic Score

Total Score: = 3

1. Pink Esthetic Score

Total = 1

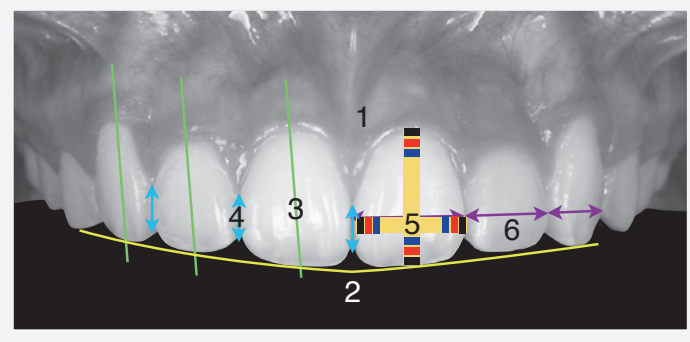


1. M & D Papillae	0	1	2
2. Keratinized Gingiva	0	1	2
3. Curvature of Gingival Margin	0	1	2
4. Level of Gingival Margin	0	1	2
5. Root Convexity (Torque)	0	1	2
6. Scar Formation	0	1	2

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

光聚機挑選指南

Part 1 -能量

Q：能量越強越好 ?!

高強度能量優缺點

優　點　短時間快速聚合樹脂

缺　點
- 機身容易發燙
- 高熱導致牙髓損傷
- 過熱當機

理想的光聚機

能　量　每秒光能量1100-1130mW/cm2變換

散　熱　良好散熱系統，持續輸出不發燙

黏　著　連續 Curing Case 全口矯正器黏著或 Veneer Cementation 也不過熱

Part 2 -波長

Q：全波長 vs 純藍光 LED光聚機差別

全波長光聚機優缺點

優　點

適用包含非CQ-based 的 Resin Composite

缺　點
- 市面上85%以上樹脂仍以CQ-based為主
- 紫光波長能量不足，須增加照射時間
- 紫光波長能量不足，須配合輔助工具
- 價格昂貴

理想的光聚機

能　量　460-480nm的波長配合超過1200mW/cm2的能量

C/P 值　具有良好的品質以及性價比

您知道嗎？

近年來光聚機所搭配使用的電池以鋰電池為主，不會有記憶效應的問題。因此 使用完畢後就放回基座上充電，除了不會造成電池壽命減少外，也可以讓光聚機穩定在基座上避免摔到。

Part 3 -電池

Q：續電力越久越好？？

高續電力光聚機

優　點　可連續使用3-5天不用充電

缺　點　搭配高電容量的光聚機會使整體重量上升，操作不方便

理想的光聚機

電　池　至少1個工作天使用不充電的蓄電量

重　量　良好散熱系統，持續輸出不發燙越輕巧＋方便使用

Demi Plus 舊換新方案

Kerr™

優惠期限：自2020/3/1 至 2021/6/30止

優惠價
＋
3,000元
等值商品

your best dental supplier
YONG CHIEH 湧傑

客服專線：北區 (02)2778-8315 · 中區 (04)2305-8915 · 南區 (07)226-0030

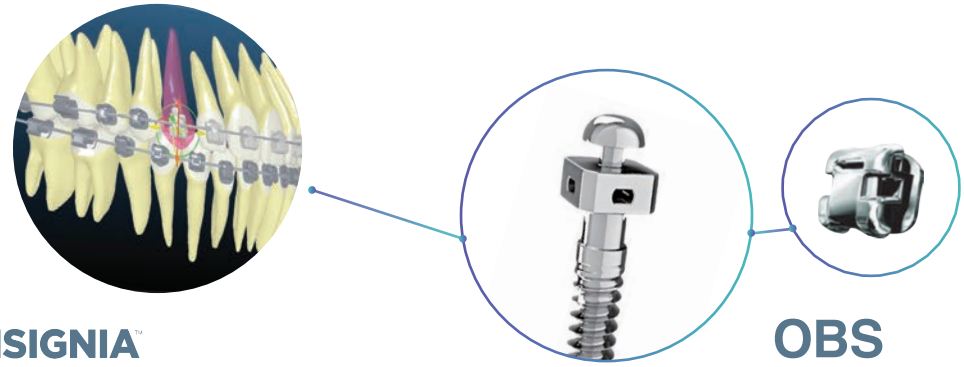
Dental Clinic Established 1996
Beethoven

International Workshop

Digital Orthodontics, OBS, VISTA

		Digital Orthodontics, OBS, VISTA	Keynote (optional)
2021	Session A	05/18–20	05/21
	Session B	12/07–09	12/10

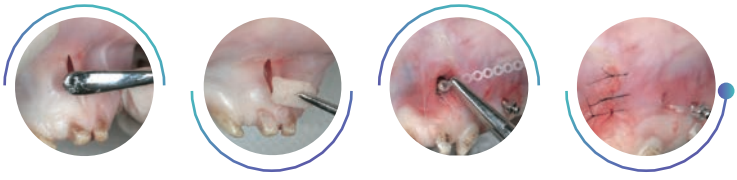
@Taiwan



INSIGNIA

OBS

Beethoven's International Workshop is designed for doctors who provide orthodontic treatment using the Damon and Insignia System. This workshop is consisted of lectures, hands-on workshops as well as chair-side observation sessions. Participants will have the opportunity to observe clinical treatment, didactic lectures, live demonstration and gain hands-on practice experiences involving TAD placement, indirect bonding, CBCT-enhanced digital treatment planning for Insignia.



VISTA Vertical Incision Subperiosteal Tunnel Access

Registration:

Day 123 USD 3,600 Early bird rate: $100 off (advanced registration two months prior to the course date)

Day 4 USD 600 Early bird rate: $100 off (advanced registration two months prior to the course date)

For more information and registration, visit

http://iworkshop.beethoven.tw

course@newtonsa.com.tw
+886-3-5735676 #218 Annie

Course Schedule

Day 1 **Chair–side observation**

Day 2 **Insignia Lecture, Chair–side observation**

Chris' Lecture:
Digital Orthodontics with TAD

Day 3 **VISTA Lecture & workshop**

Chris' Lecture:
VISTA for Impacted Cuspids

* The topics for VISTA workshop:

1. VISTA with screw placement
2. VISTA with connective tissue graft
3. Suture technique

Prof. Dr. Paulo Fernandes Retto, Portugal

"Dr. Angle would be glad to know that contemporary orthodontics has a professional as Chris Chang!"

Digital Orthodontics, OBS & VISTA

Day 4 **Keynote workshop** (Optional)

by Newton's A team

1. Patient clinical records management
2. Patient communication presentation
3. Basic animations and visual aids

Dr. Rungsi Thavarungkul, Thailand

"If you think this is a computer course that will show you step–by–step how to use the application, please reconsider. If you want to improve communication in your practice, and with patients, this 8–hour course is definitely worth it."

KEYNOTE

THE LECTURER

Dr. Chris Chang

CEO, Beethoven Orthodontic and Implant Group. He received his PhD in bone physiology and Certificate in Orthodontics from Indiana University in 1996. As publisher of Journal of Digital Orthodontics-*A journal for Interdisciplinary dental treatment*, he has been actively involved in the design and application of orthodontic bone screws.

Combining Orthodontics with an Implant-Supported Prosthesis to Replace Multiple Congenitally Missing Maxillary Teeth

Abstract

***History**: Congenitally missing maxillary lateral incisors are the second most common dental agenesis, exceeding only by third molars. The congenital absence of one or more maxillary lateral incisors usually compromises the esthetics and may also be associated with dental midline as well as functional occlusion problems.*

***Diagnosis**: A 21-year-1-month-old male presented with a chief complaint (CC) of an unattractive smile due to irregular teeth and spacing. The UR5, UL2, UL4, UL5 were all missing. The upper left lateral deciduous incisor was retained, but there were several edentulous spaces in the maxillary arch. A clinical examination revealed a Class I molar relationship on the right side, end-on Class III molar relationship on the left side, lingually tipped incisors (U1-SN 96˚, L1-MP 76˚), an upper left lateral deciduous incisor (ULb) in crossbite, as well as spaces mesial and distal to it. The discrepancy index (DI) was 21.*

***Treatment**: The dentition had to be aligned while maintaining enough space for an implant-supported prosthesis (ISP) to restore the upper left incisor (UL2). The cusp height of ULe had to be reduced to let the gingiva grow over it and regain space for a crown and bridge prosthesis to restore the UR5, UL4, and UL5. The pre-prosthetic orthodontic treatment duration was 18 months. In the 16th month, the ULb was extracted and the UL2 area implant was placed simultaneously. Soft tissue was formed with a healing abutment associated with simultaneous guided bone regeneration around the implant. After a 6-month healing phase, the prosthetic abutment was placed and adjusted to achieve 2mm of interocclusal clearance. The final crown was delivered 2 weeks later.*

***Results**: The dentition was aligned, and all spaces were closed except for the UR5, UL2, UL4, and UL5 edentulous sites. Following the completion of the ISP to restore the UL2 and a bridge prosthesis to restore the UR5, UL4, and UL5, the overall treatment was excellent, as evidenced by a Cast Radiograph Evaluation (CRE) score of 15, and Pink and White (P&W) dental esthetic score of 6. (J Digital Orthod 2021;62:28-45)*

Key words:
Congenitally missing, implant placement, 2B-3D rule, bone augmentation

Introduction

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. The teeth are numbered 1-8 from the midline in each quadrant, and deciduous teeth are marked a-e, e.g., a lower right first molar is LR6, and a lower right second deciduous molar is LRe.

Following third molars, the permanent maxillary lateral incisor is the second most commonly-seen missing tooth when only one or two teeth are congenitally absent,[1] whereas the second premolar is the most frequently-seen missing tooth when more than two teeth are missing congenitally. For patients with a cleft, the maxillary lateral incisor has the most frequent agenesis, followed by the maxillary second premolar, and then the mandibular second premolar.

Yen-Feng Lee,
Lecturer, Beethoven Orthodontic Course (Left)
Chris H. Chang,
Founder, Beethoven Orthodontic Center
Publisher, Journal of Digital Orthodontics (Center)
W. Eugene Roberts,
Editor-in-Chief, Journal of Digital Orthodontics (Right)

Danesh-Sani et al.[2] and Flores-Mir et al.[3] have all concluded that the congenital absence of teeth is a phylogenic degeneration phenomenon. Nakata[4] blamed missing teeth on genes by claiming the polygenetic theory. He further elaborated that microdontic teeth were a consequence of other missing teeth. On the other hand, Flores-Mir et al.[3] and Magdalena et al.[5] have reported that tooth formation was delayed in children who had missing incisors or premolars compared with healthy children, and suggested that a congenitally missing tooth was related to the time of formation of other teeth.

Fig. 1: Pre-treatment facial and intraoral photographs

Diagnosis and Etiology

A 21yr-1mo-old male sought orthodontic consultation for his irregular teeth and diastema (Figs. 1-4). An extraoral evaluation showed facial asymmetry and a straight profile. The intraoral buccal relationships were unilateral Class I molar relationship on the right side and end-on Class III molar relationship on the left side. The mandibular arch was narrow, but the maxillary arch was normal. There was a crossbite of the ULb, a retained deciduous upper left lateral incisor, a missing UL2 and spaces in the upper arch.[6,7]

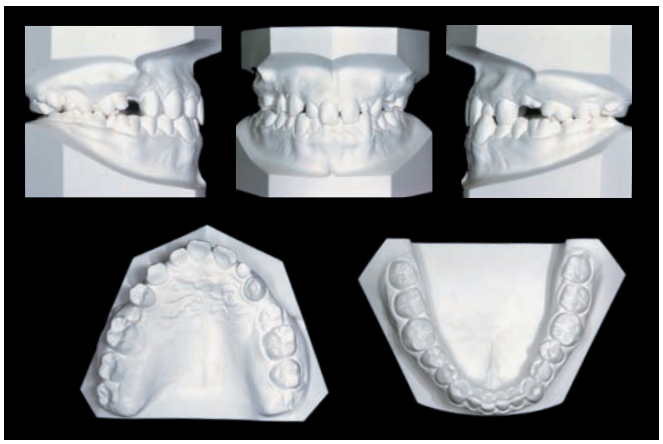


Fig. 2: Pre-treatment dental models (casts)

Fig. 3:
Smile evaluation from a frontal view shows excessive buccal corridors.

Fig. 4:
Left: *Decreased axial inclination is noted for upper and lower incisors.*
Right: *A frontal view of the lower anterior spacing and irregularities.*

The UR4 rotated distal-in and tipped into the edentulous UR5 space. The upper midline was shifted about 2mm to the left, and the lower midline was shifted about 1mm to the right. The pre-treatment cephalometric analysis revealed a skeletal Class I relationship (SNA 81˚ SNB 79˚, ANB 2˚), lingually- tipped maxillary and mandibular incisors (U1-SN 96, L1-MP 76 ˚), and retrusive upper and lower lips (-2mm/-2mm to the E-Line) (Fig. 5; Table 1). The panoramic radiograph (Fig. 6) showed multiple missing teeth: UR5, UL2, UL4 and UL5. The temporo- mandibular joint (TMJ) radiographs were within normal limits (WNL), and there were no signs or symptoms of temporomandibular disorder (TMD) (Fig. 7). The Discrepancy Index (DI) was 21 points, including 1 adjunctive points due to implant site complexity. For details, refer to Worksheet 1 at the end of this report.

Treatment Objectives

1. Increase the axial inclination of the incisors.

2. Relieve mandibular crowding.

CEPHALOMETRIC SUMMARY			
SKELETAL ANALYSIS			
	PRE-Tx	POST-Tx	DIFF.
SNA° (82°)	81°	81°	0°
SNB° (80°)	79°	79°	0°
ANB° (2°)	2°	2°	0°
SN-MP° (32°)	39°	38°	1°
FMA° (25°)	32°	31°	1°
DENTAL ANALYSIS			
U1 To NAmm (4mm)	2	2	0
U1 To SN° (104°)	96°	98°	2°
L1 To NBmm (4mm)	2	3	1
L1 To MP° (90°)	76°	80°	4°
FACIAL ANALYSIS			
E-LINE UL (-1mm)	2	1	1
E-LINE LL (0mm)	2	2	0
%FH: Na-ANS-Gn (53%)	53%	53%	0
Convexity: G-Sn-Pg' (13°)	5°	8°	3°

Table 1: Cephalometric summary

3. Correct Class III malocclusion over the left side.

4. Maintain a harmonious straight profile.

5. Prepare the UL2 area as an implant site.

6. Repair posterior missing teeth with fixed dental prostheses.

Treatment Alternatives

The ideal objective for this fully fixed appliance treatment was to resolve the malocclusion and align the dentition. Three options were considered (Fig. 8):

Fig. 5: Pre-treatment lateral cephalometric radiograph

Fig. 6: Pre-treatment panoramic radiograph

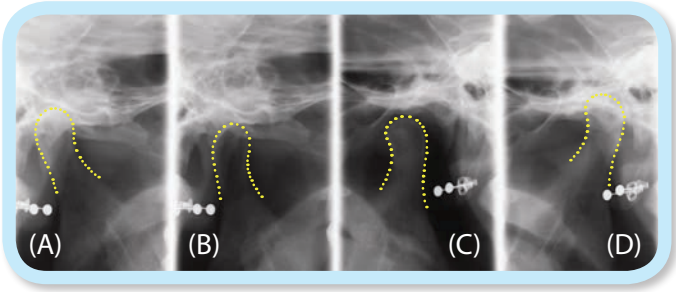


Fig. 7:
Pre-treatment TMJ radiographs - transcranial views of the right side open (A) and closed (B), as well as the left side open (C) and closed (D).

Option 1: Extract the retained primary tooth ULb and close the UR5, UL2, UL4, and UL5 spaces using orthodontic treatment and to substitute the UL2 space with the UL3.

The option has three disadvantages. First of all, the profile would not be improved. Second, as it would not be esthetically ideal to replace the UL2 with UL3, a full coverage restoration will be needed to achieve a desired appearance. Lastly, the Class III malocclusion on the left side would not be resolved, and it might not be possible to retain the Class I relationship on the right side. However, it would be a good choice if the patient has limited finances.

Option 2: Extract the ULb and reserve the space for an implant-supported prosthesis (ISP) to restore the upper left incisor (UL2). Open space from the UR5, UL4, and UL5 sites in preparation for fixed prostheses.

The bone ridge at the UR5, UL4, and UL5 sites is quite narrow, but the bone at UL2 site is thick. This method avoids sinus perforation, reducing both costs and discomfort during surgery. The time needed would be substantially reduced than having to restore all the spaces with dental implants. As the sinus floor is so thin, if the ULe were to be extracted, there could potentially be damage or fracturing of the sinus floor. Therefore, extraction was not considered, and instead only the upper half of the ULe cusp was reduced to let the gingiva grow over it. This is the main reason why a dental bridge prosthesis was considered. However, a major disadvantage of this treatment is the need for reduction of healthy teeth (UR4, UR6, UL3, and UL6) to accomodate the fixed prostheses. The design of the prothesis is shown in Fig. 8

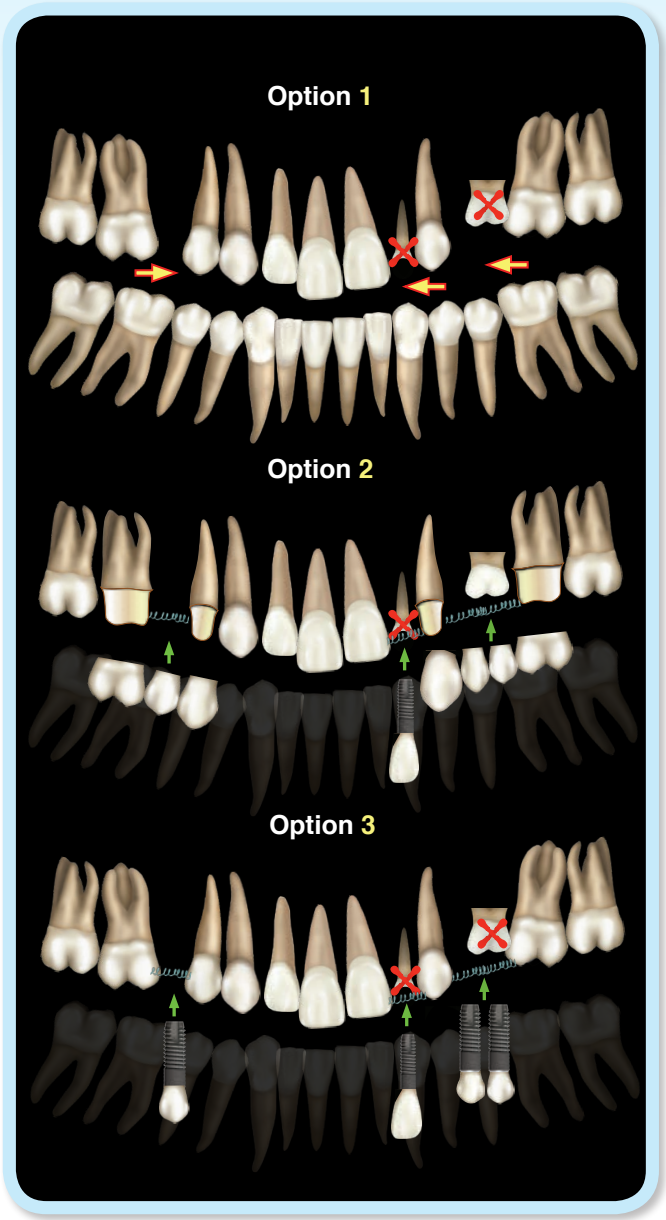


Fig. 8:
A three-part diagram shows three treatment approaches. See text for details.

Option 3: Extract ULb and reserve the space for an ISP to restore UL2. The UR5, UL4, and UL5 spaces would be regained for an ISP with an open window and large scale GBR.

This method achieves Class I occlusion on both sides without sacrificing any healthy teeth. However, the disadvantages are a larger scale of operation, more post-operative discomfort, and a higher cost.

After discussing the pros and cons of each option with the patient and his parents, they decided on Option 2. This treatment would be divided into two phases: (1) correct the alignment and (2) complete the final prosthesis.

Treatment Progress

A fixed 0.022-in slot Damon Q® bracket system (Ormco, Glendora, CA) was used with archwires and accessories produced by the same manufacturer (Fig. 9). The bracket torque selection for anterior teeth was standard for both arches. In the 1st month of treatment, the upper arch was bonded except for the ULe and ULb, both of which remained un-bonded throughout the treatment. Site development for the missing UR5, UL4, and UL5 was initiated using a compressed coil spring, and the UL2 implant site space was retained with an uncompressed coil spring between UL1 and UL3.

In the 3rd month of treatment, bite turbos composed of glass ionomer cement (GC America, Alsip IL) were bonded on the occlusal surfaces of the LR7 and LL7 to permit bonding of the lower incisor bracket, and a corresponding series of brackets were bonded on the lower arch, with an initial 0.014-in copper-nickel-titanium (CuNiTi) wire. L-type Class III elastics, from the upper 1st molars to the lower canines, were used bilaterally to correct the sagittal discrepancy. In the 6th month, after 3 months of leveling and

Fig. 9: A progressive series of maxillary frontal views show treatment progress from start to finish (18M)

alignment, the bite turbos were removed. The upper and lower archwires were changed to 0.017x0.025-in titanium-molybdenum-alloy (TMA) and 0.014x0.025-in CuNiTi, respectively.

In the 8th month of treatment, the maxillary archwire was changed to a 0.016x0.025-in stainless steel (SS) wire, and the lower archwire was changed to a 0.017x0.025-in TMA. In the 9th month, the LR3, LR1, LL1, LL3, and LL6 brackets were rebonded to correct the axis inclination. In the 10th month, a torquing spring was used to correct the torque of UL1. In the 12th month, both archwires were changed to 0.016x0.025-in SS. Unfortunately, the overjet of the UL molars (UL6, UL7) was not enough, so Chipmunk 1/8-in, 3.5-oz cross bite elastics were indicated to improve it. In the 16th month, an open-coil spring maintained the 7mm space at the ULb site in the mesiodistal dimension, and an ISP was installed to restore the UL2. The ULe height was reduced by

Fig. 10: Post-treatment facial and intraoral photographs

2mm so that the gingiva could grow over it. In the last month of treatment, a bilateral dental bridge was completed. The lower midline was shifted about 1mm to the left with an L-type Class II elastic (Fox 1/4-in, 3.5-oz) applied to the right side. After 18 months of active treatment, all fixed appliances were removed, and interim records were taken.

Treatment Results

After 18 months of active orthodontic treatment, all spaces were closed except for the UL2 implant site. The ULb crossbite and dental midline discrepancy were both resolved. The patient was satisfied with the result. Post-treatment photographs are documented in Fig. 10. Post-treatment panoramic film shows ideal axial inclination that was not clinically evident (Fig. 11). The post-treatment TMJ radiographs document both condylar heads as symmetrical and well positioned in the fossa (Fig. 12). The superimposed cephalometric tracings revealed that the upper and lower incisor torque (axial inclination) were acceptable (Fig. 13). The mandibular incisor inclination was increased by 4˚; the maxillary incisor inclination was increased by only 2˚ (Table 1). The mandibular plane angle was decreased by 1˚ (Fig. 14), which is consistent with Class III elastic application. The American Board of Orthodontics (ABO) Cast Radiograph Evaluation (CRE) score was 15 points, as shown in the supplementary Worksheet 2. The major residual

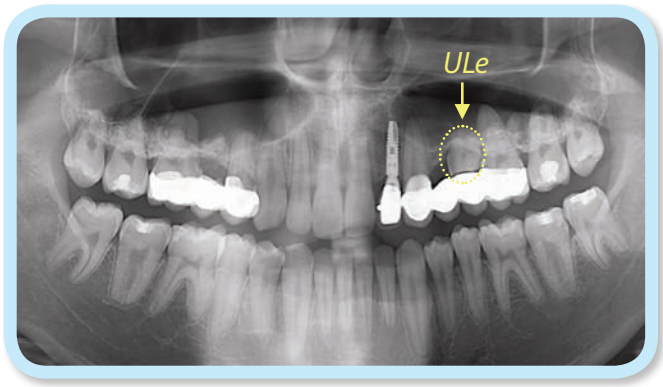


Fig. 11 :
Post-treatment panoramic radiograph. The ULe is marked marked in yellow.

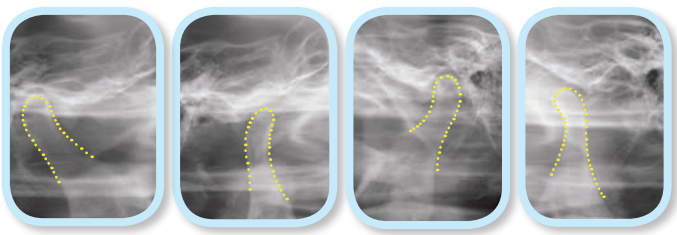


Fig. 12:
Post-treatment TMJ radiographs corresponding to the pretreatment TMJ views in Fig. 7. All morphology is WNL.

Fig. 13: Post-treatment lateral cephalometric radiograph

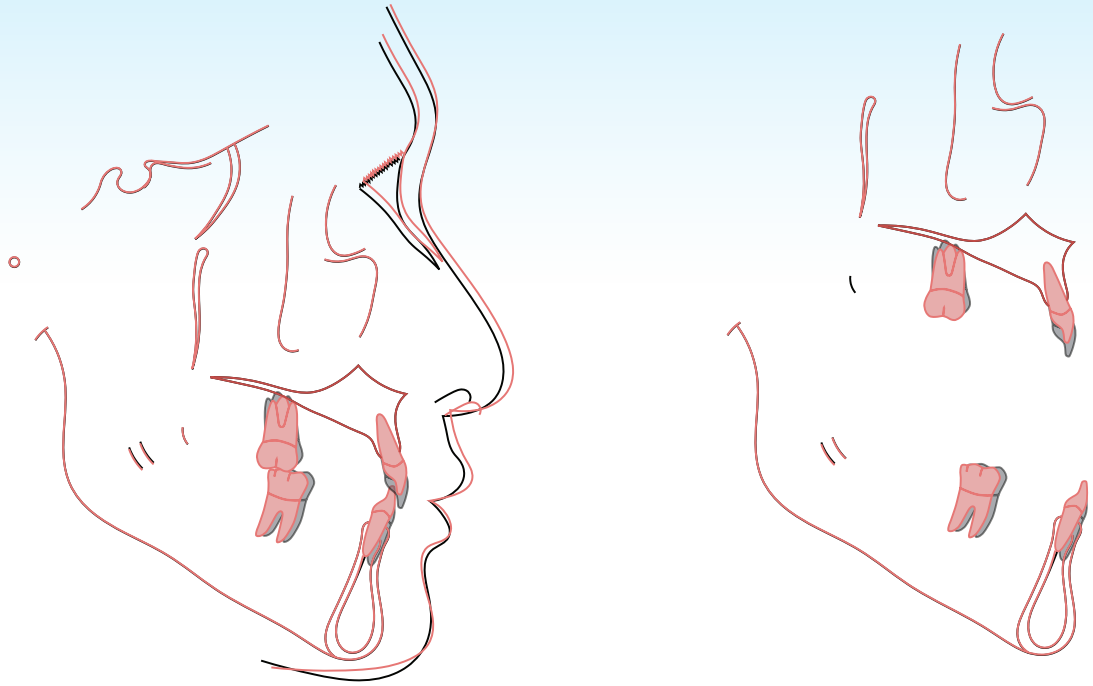


Fig. 14:
Superimposed cephalometric tracings show the dentofacial changes after 18 months of treatment (red) compared to the pre-treatment position (black). The tracings reveal that post-treatment upper and lower incisor torque (axial inclinations) were acceptable (Fig. 13). Mandibular incisor inclination was increased 4˚, but the maxillary incisor inclination was increased by 2°. The greatest improvement is the intrusion of the upper incisors, and the flaring and extrusion of the lower incisors. The upper and lower posterior teeth were slightly retracted. The profile has been well maintained

discrepancies were occlusal contacts (5 points), overjet (3), and buccolingual inclination (3). The Pink and White dental esthetic score was 6 points as detailed in Worksheet 3 at the end of this case report. Discrepancies were axial inclination, contact areas, tooth proportion, tooth-to-tooth proportion, root convexity and midlines.

Implant-Supported Prosthesis

The pre-operative CBCT imaging assessed the alveolar bone volume at the UL2 site. The edentulous ridge was 6.5mm wide, and the vertical bone height (depth) was over 10mm (Fig. 15). Under local anesthesia, the ULb was slowly and cautiously

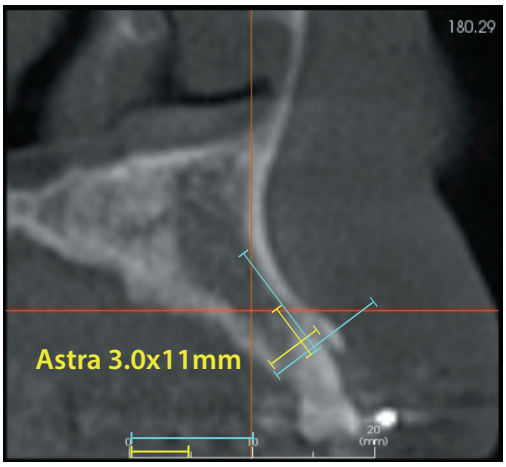


Fig. 15:
A sagittal CBCT cut through the UL2 implant site shows adequate ridge width (6.5mm, yellow line) and sufficient depth (11mm, blue line) for a 3.0x11-mm implant.

extracted in order to avoid bone loss. A crestal incision was performed lingual to the center of the edentulous ridge, and a full thickness mucoperiosteal flap was reflected. After that, the first lancer drill was positioned lingual of the center of the edentulous ridge and 2mm palatal to the buccal plate, and drilled to a depth of 11mm, where a surgical guide pin was placed. A periapical X-ray was exposed to check the mesiodistal angulation and ensure there had been no penetration. An implant fixture (3.0x11-mm OsseoSpeed™ TX,

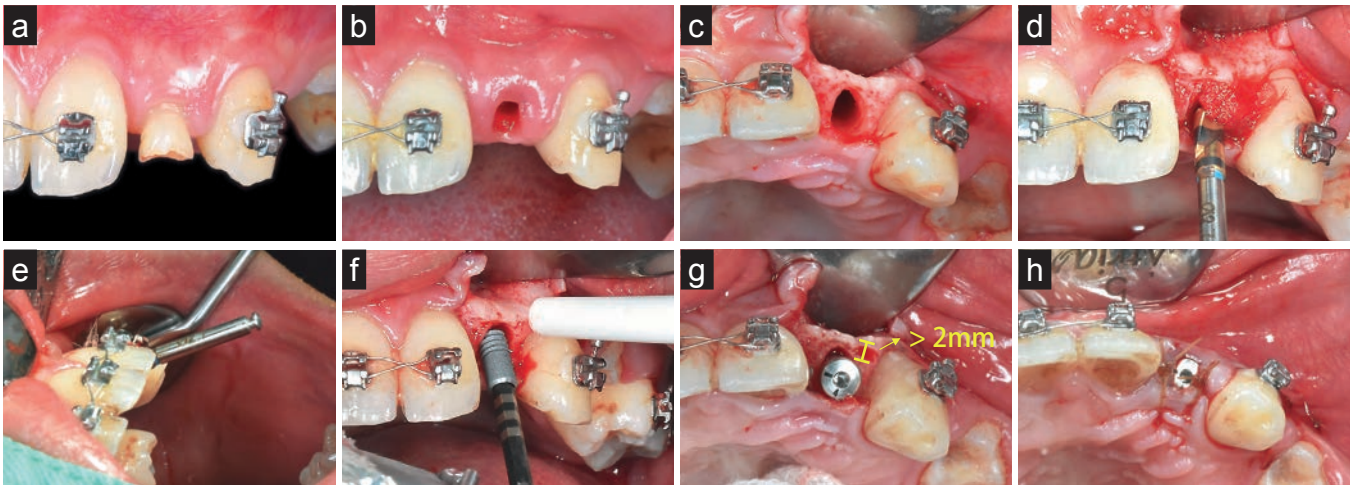


Fig. 16:

Steps involved in the placement of the implant are illustrated as follows. (a) UL2 edentulous site was prepared as a 6.5mm long implant space. (b) ULb extraction. (c) Incisions lingual to the mid-crestal and sulcular were performed for flap reflection. (d)&(e) A guide pin was placed to check axial direction and depth. (f) A 3.0x11-mm implant fixture was inserted. (g) Occlusal view of implant fixture and osseous ridge with a yellow bar showing the buccal bone thickness is >2mm. The healing abutment was placed. (h) Flaps were repositioned and sutured with direct loop interrupted 4-0 sutures. See text for details.

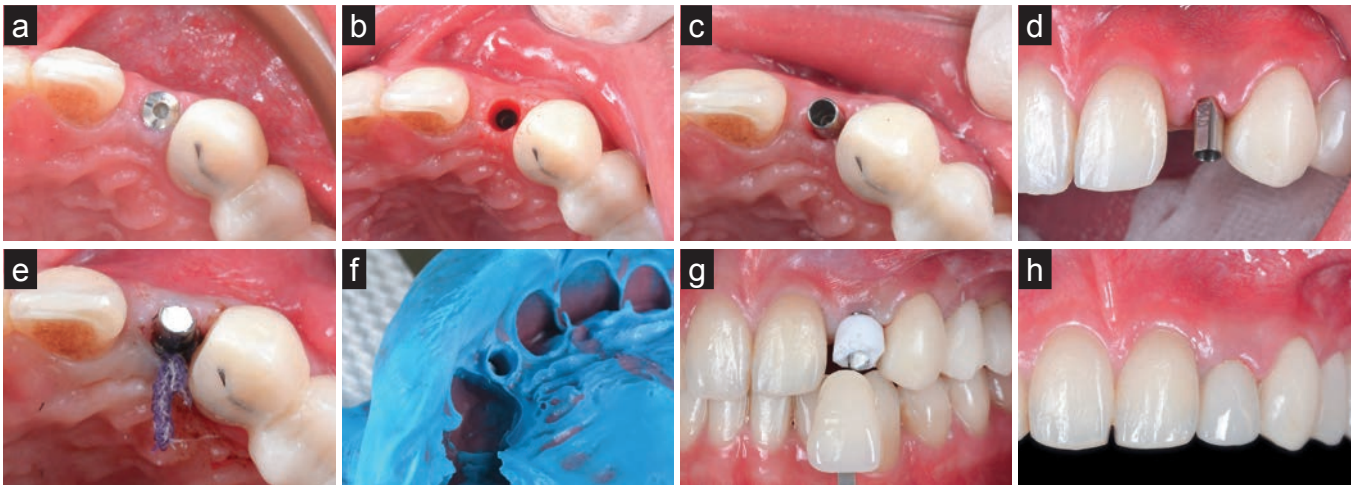


Fig. 17:

A panel of photographs showing the prosthesis fabrication procedure 6 months after implant placement. (a) Healing abutment exposure was noted. (b) Ideal soft tissue modeling. (c)&(d) Direct abutment was installed. (e)&(f) A double cord gingival retraction technique was used to make a direct impression. (g) A Tony Cap was used as a substitute for provisional crowns and for soft tissue modeling. (h) A porcelain crown delivered and luted with temporary cement. See text for details.

Dentsply International, York, PA) was installed according to the manufacturer's instructions, and a healing abutment (Ø4.0x H2.0-mm) was placed. The soft tissue flap was repositioned and closed with interrupted 4-0 sutures (Fig. 16). Fig. 16g shows that the buccal bone thickness was >2mm, which is ideal for the long-term success of an implant-supported prosthesis.[7] The prosthetic sequence of soft tissue formation and the implant-retained crown delivery is illustrated in Fig. 17. The post-surgical panoramic radiograph confirmed the accuracy of the implant position (Fig. 11). After a 6-month osseointegrated healing period, the healing abutment was replaced with a direct abutment (Ø4.0mm, 2.0mm height). A torque ratchet was applied at 15N-cm to seat and secure the abutment in the planned position. The inter-occlusal clearance for the post was increased to ~1.5mm for the porcelain crown fabrication.[8] A double cord gingival retraction technique compressed the soft tissue to expose the abutment margin. A direct impression was made with polyvinyl siloxane impression material while the thin compression cord was left in the gingival sulcus. The prepared abutment was then covered by a Tony Cap (Alliance, Taiwan), a device that substitutes for a temporary crown to allow for soft tissue modeling. The impression was poured in type IV dental stone, and the cast was mounted on an articulator with a silicon bite record. A porcelain crown was fabricated and delivered 1 week later. After checking the tightness of the contact area with dental floss and the margin integrity with a dental explorer, the permanent crown was luted with temporary cement (Fig. 17h). New upper and lower clear retainers were prepared after the delivery of the prothesis. Post-treatment records document the final result (Figs. 10, 11, and 18).

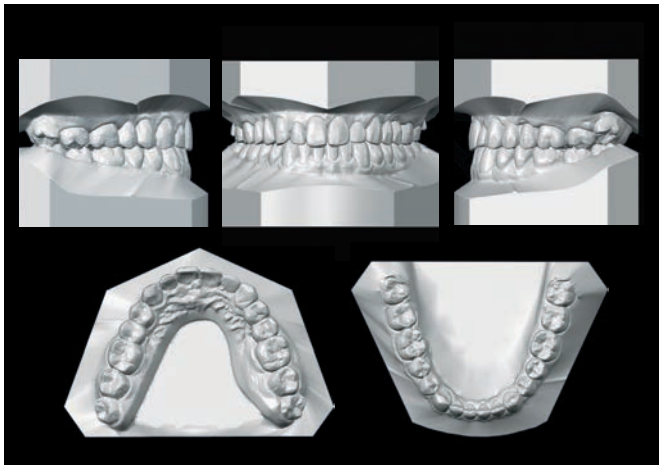


Fig. 18: Post-treatment dental models (casts)

Discussion

Open Coil Spring

In treating the current case, the open coil spring played a very important role, as it could be employed to apply or maintain force. In the alignment stage prior to placing the implant, the space between the posterior teeth on both sides of the upper

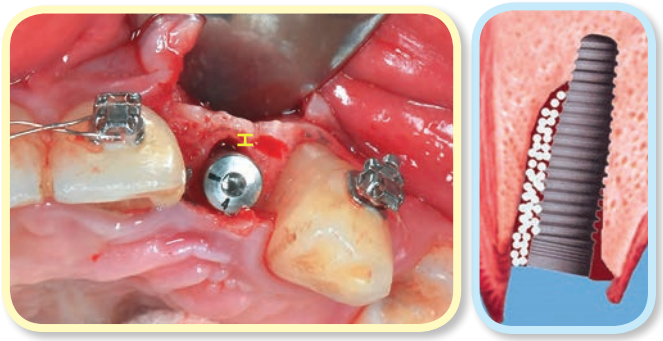


Fig. 19: Implant position and jumping distance (yellow bar)

jaw needed to be increased.[9] An open coil spring, measuring the width of 1-1.5 brackets longer than the original space was utilized, and subsequently the UL2 space was just right. As the purpose here was to maintain the space, by simply placing a spring of the appropriate size, the space could be maintained without applying any unwanted or excess force. The open coil spring was used throughout the entire treatment until it was removed at the debonding stage. Without it, it would not have been possible to have effectively controlled the space.[8]

Reduction of the ULe Cusp

Another major factor was that the ULe cusp was shortened in the 16th month of treatment. The purpose of the shortening was to allow the gingiva to grow over it, following the shape of the temporary crown to achieve an ideal morphology, after which the final prostheses could be delivered. If the ULe had been extracted, potential sinus perforation may have complicated the treatment.[6,7]

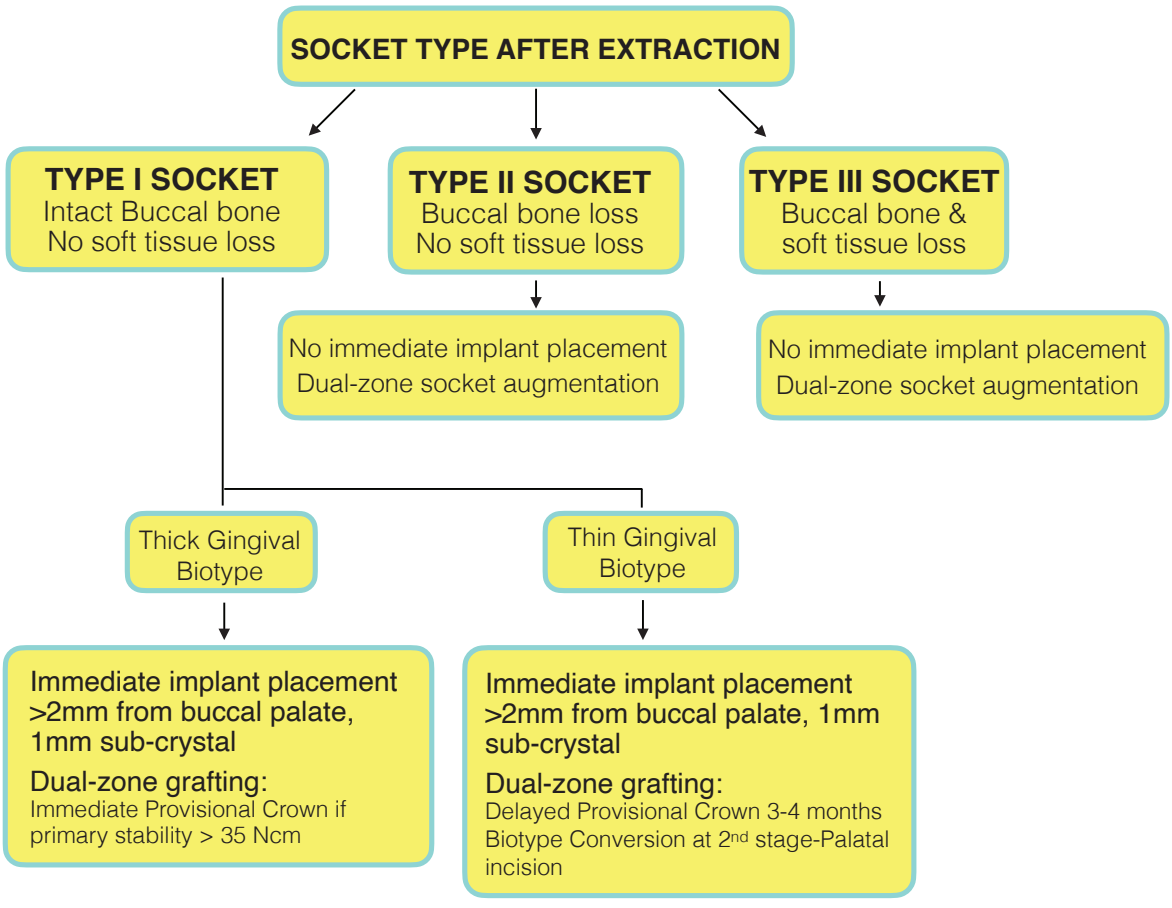


Fig. 20: Flow chart for immediate implant placement in esthetic zone

Immediate Implant Placement

The decision to place immediate implants after tooth extraction is dependent on numerous factors. The major debate of whether or not to perform immediate implants arises from individual bias, philosophy, as well as where the clinician was trained and their previous experience. In the era of evidence-based dentistry, there is adequate long-term evidence that indicates immediate implants not only reduce the overall treatment time and the number of surgeries for the patient, but also help preserve more bone and soft tissue. Both of these factors are very critical for good and stable results in the esthetic zone.[10-12]

The five critical factors that determine whether an immediate placement is the best option for the patient are:

1. Socket Type *(Fig. 20)*

Only a Type I socket is an ideal socket for immediate placement in the esthetic zone. Sometimes, acceptable results are obtained with Type II and Type III sockets, which otherwise are unpredictable in the esthetic zone. The risk of soft tissue and bone recession in a patient with a thin gingival biotype is compounded if the buccal plate of bone is missing. This patient was at low risk for long-term esthetic problems (Figs. 16a & b). Recognizing that a Type I socket was the correct choice, without staging the implant procedure by only grafting the socket at the time of extraction, increased the ability to regenerate the lost bone in the buccal plate. The implant could then be placed immediately in an adequate volume of bone, having ensured that there was at least 2mm of buccal bone for the implant.[13,14]

2. Soft Tissue Biotype *(Figs. 16a and 16b)*

A patient's gingival biotype is probably the most important aspect in planning an immediate implant. A thick gingival biotype almost always has a thick buccal plate. The implant position and dual zone grafting described in the following sections ensures adequate buccal bone thickness and soft tissue volume around the implant. Also, delaying the fabrication of the provisional crown until the second stage is advisable. However, if the thickness of the gingival biotype is not as thick as the one in this case, a simple yet effective technique is to push extra gingiva towards the facial aspect by making a palatal incision during the second stage. This biotype conversion technique allows the clinician to convert a thin biotype into a thick biotype. There is a high risk of recession with a thin biotype, which needs to be managed properly, whereas a thick biotype is safe and forgiving.[15]

3. Implant Position *(Fig. 19)*

More bone and soft tissue around an implant is essential for long-term success. The previously accepted guidelines of 1mm of bone around implants is not sufficient in the esthetic zone. Placing an implant >2mm from the buccal bone and 1mm sub-crestally results in greater preservation of the crestal bone. Placing an implant one size narrower than what is commonly accepted provides more chance of maintaining the papilla height. In thin biotype cases, whenever possible, a tooth-to-implant distance of 2-2.5mm is essential.[6,12]

4. Dual Zone Grafting

Previously, clinicians only grafted if the "jumping gap" between the implant and bone was

>1.5mm.[9,16] Today, it is recognized that adding a bone graft regardless of the distance between the implant and bone has tremendous esthetic benefits in maintaining soft tissue height. Grafting in conjunction with immediate implant placement has helped not only in preventing horizontal bone loss, but also in maintaining crestal bone, hence leading to better soft tissue volume around implants. The key is to graft not just the "bone zone", but also the "soft-tissue zone." In the anterior region of this case, the existing papilla height was always higher than the facial gingival height, so overbuilding the site with the grafting material allowed some extra bone height to be gained, which brought about extra soft tissue height.[17]

5. Immediate or Delayed Provisional Restoration

The timing of the provisional is not critical for the long term survival of the implant. Recognizing the patient's soft tissue volume and biotype helps clinicians to plan accordingly: whether to make an immediate provisional or to delay the fabrication of the provisional for 3-4 months in order to gain more soft tissue thickness. This biotype modification procedure is the key for better long-term results. The flow chart in Fig. 20 highlights some of the key points discussed, and will help guide the clinician in determining which protocol is appropriate to follow, based on the clinical scenario.

Conclusions

Interdisciplinary treatments require a thorough understanding of all aspects of dentistry, such as orthodontics, implantology, prosthodontics, etc. Orthodontists should be the leaders of interdisciplinary teams since they lay down the foundations for the rest of the team to build on.

When an orthodontist opens the space, the papilla heights are adversely affected, and some patients have altered passive eruption after treatment , which affects the level of gingival margins.

Immediate implants are commonly used to replace congenitally missing lateral incisors in orthodontic patients, but the restorations are often challenging because the anterior esthetics is quite demanding.

This difficult malocclusion (DI=21) was treated to a very good alignment (CRE=15), and both the patient and the clinician were pleased with the results.

Acknowledgments

Thanks to Mr. Paul Head for proofreading this article.

References

1. End T, Ozoe R, Kubota M, Akiyama M, Shimooka S. A survey of hypodontia in Japanese orthodontic patients. Am J Orthod Dentofacial Orthop 2006;129(1):29-35.
2. Danesh-Sani SA, Lomer PM, Wallace SS. A comprehensive clinical review of maxillary sinus floor elevation: anatomy, techniques, biomaterials and complications. Br J Oral Maxillofac Surg 2016;54(7):724-30.
3. Flores-Mir C, Nebbe B, Major PW. Use of skeletal maturation based on hand-wrist radiographic analysis as a predictor of facial growth: a systematic review. Angle Orthod 2004;74(1):118-124.
4. Nakata M. A consideration on genetic factors in congenital missing of teeth [in Japanese]. J Stomatol Soc Jpn 1979;46:131–139.
5. Magdalena DZ, Maria MK. Radiological indicators of bone age assessment in cephalometric images. Review. J Radiology 2016;81:347-353.

6. Huang C, Su B, Chang CH, Roberts WE. Mutilated psduso-Class III malocclusion with anterior crossbite, knife-edge ridges and periodontal compromise: Alignment, sinus lift, bone graft and implant-supported crowns. J Digital Orthod 2018;49:26- 49.
7. Lin SL, Chang CH, Roberts WE. Mutilated Class II division 2 malocclusion: implant-orthodontic treatment utilizing flapless implant surgery and platelet-rich fibrin. Int J Orthod Implantol 2014;33:22–47.
8. Brahmin JS. Dental Implants in Children. Oral Maxillofacial Surg Clin N Am 2005;17:375-81.
9. Op Heij DG, Opdebeeck H, van Steenberghe D, Kokich VG. Facial development, continuous tooth eruption, and mesial drift as compromising factors for implant placement. Int J Oral Maxillofac Implants 2006;21:867-878.
10. Cangialosi TJ, Riolo ML, Owens SE Jr, Dykhouse VJ, Moffitt AH, Grubb JE, Greco PM, English JD, James RD. The ABO discrepancy index: a measure of case complexity. Am J Orthod Dentofacial Orthop 2004;125(3):270-8.
11. Casko JS, Vaden JL, Kokich VG, Damone J, James RD. American board of orthodontics: Objective grading system for dental casts and panoramic radiographs. Am J Orthod Dentofacial Orthop 1998;114(5):589–99.
12. Su B. IBOI Pink & White esthetic score. Int J Orthod Implantol 2013;28:80-85.
13. Fowler PV. Long-term treatment planning for single tooth implants: an orthodontic perspective. Ann R Australas Coll Dent Surg 2000;15:120-121.
14. Kokich VG, Kokich VO. Congenitally missing mandibular second premolars: clinical options. Am J Orthod Dentofacial Orthop 2006;130:437-444.
15. Spyridon V, Anthony R, Dennis PT. Prevalence of interproximal open contacts between single-implant restorations and adjacent teeth. Int J Oral Maxillofac Implants 2016;31:1089-1092.
16. Fudalej P, Kokich VG, Leroux B. Determining the cessation of vertical growth of the craniofacial structures to facilitate placement of single-tooth implants. Am J Orthod Dentofacial Orthop 2007;131:59-67.
17. Spear F, Mathews D, Kokich V. Interdisciplinary management of single tooth implants. Sem Orthod 1997;3:45-72.

Discrepancy Index Worksheet

TOTAL D.I. SCORE 21

OVERJET

0 mm. (edge-to-edge)	=	1 pt.
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 = 0

OVERBITE

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

Total = 3

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

Total = 1

OCCLUSION

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

Total = 2

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.

SN-MP

≥ 38° 39° = 2 pts.

Each degree > 38° _____ x 2 pts. = 2

≤ 26° = 1 pt.

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

Each degree > 6° _____ x 1 pt. = 1

Each degree < 26° _____ x 1 pt. = _____

1 to MP ≥ 99° = 1 pt.

Each degree > 99° _____ x 1 pt. = _____

Total = 4

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	4	x 2 pts. =	8
Spacing (4 or more, per arch)	1	x 2 pts. =	2
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: 10

IMPLANT SITE

Lip line : Low (0 pt), Medium (1 pt), High (2 pts) = 1

Gingival biotype : Low-scalloped, thick (0 pt), Medium-scalloped, medium-thick (1 pt), High-scalloped, thin (2 pts) =

Shape of tooth crowns : Rectangular (0 pt), Triangular (2 pts) =

Bone level at adjacent teeth : ≤ 5 mm to contact point (0 pt), 5.5 to 6.5 mm to contact point (1 pt), ≥ 7mm to contact point (2 pts) =

Bone anatomy of alveolar crest : H&V sufficient (0 pt), Deficient H, allow simultaneous augment (1 pt), Deficient H, require prior grafting (2 pts), Deficient V or Both H&V (3 pts) =

Soft tissue anatomy : Intact (0 pt), Defective (2 pts) =

Infection at implant site : None (0 pt), Chronic (1 pt), Acute(2 pts) =

Total = 1

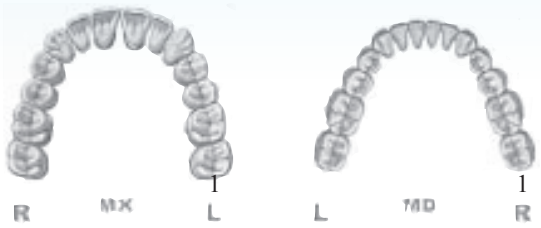
Cast-Radiograph Evaluation

Case # **Patient**

Total Score: 15

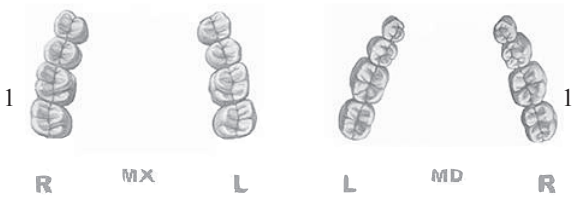
Alignment/Rotations

2



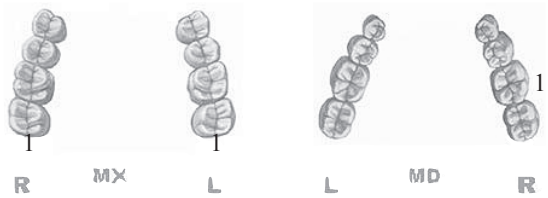
Marginal Ridges

2



Buccolingual Inclination

3

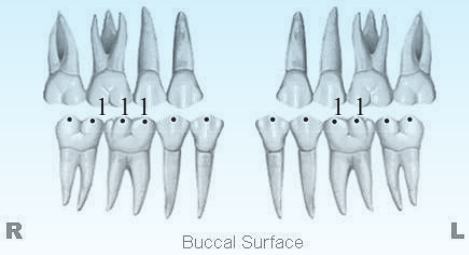


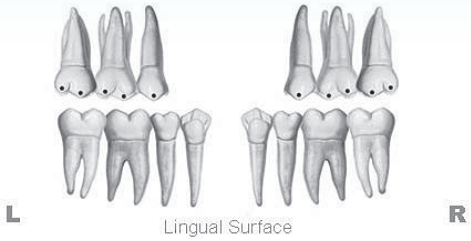
Overjet

3

Occlusal Contacts

5



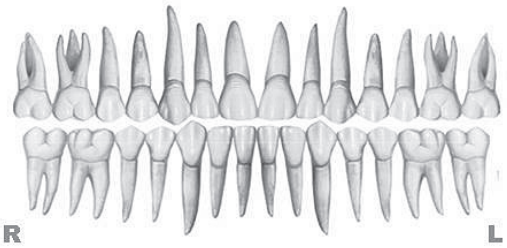


Occlusal Relationships

0

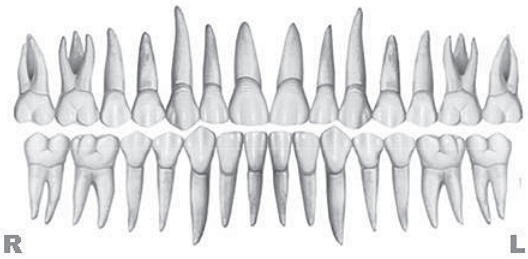
Interproximal Contacts

0



Root Angulation

0



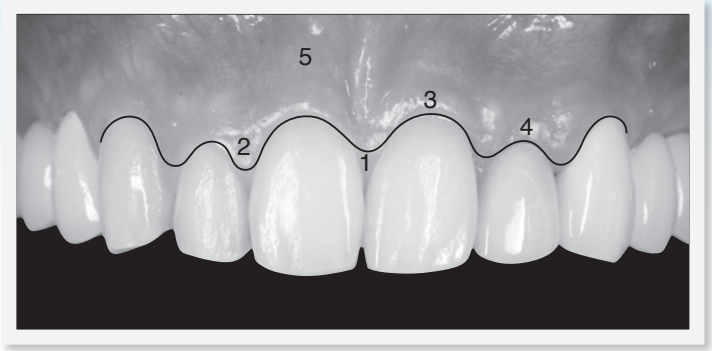
INSTRUCTIONS: Place score beside each deficient tooth and enter total score for each parameter in the white box. Mark extracted teeth with "X". Second molars should be in occlusion.

IBOI Pink & White Esthetic Score

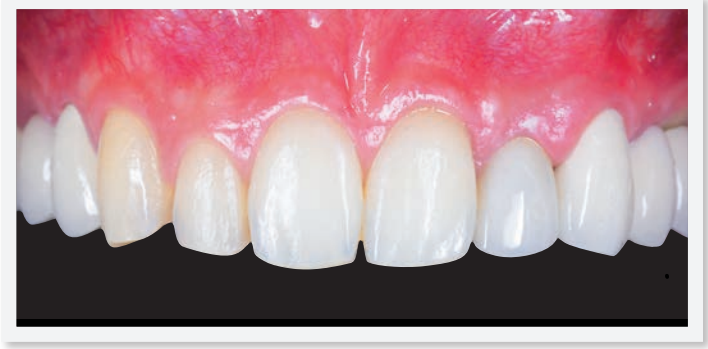
Total Score: = 6

1. Pink Esthetic Score

Total = 1



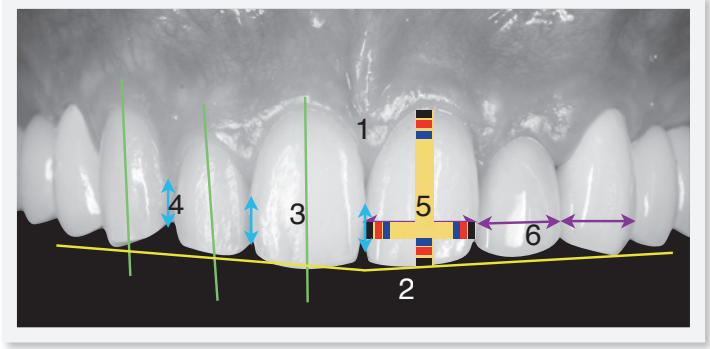
1. M & D Papillae	0	1	2
2. Keratinized Gingiva	0	1	2
3. Curvature of Gingival Margin	0	1	2
4. Level of Gingival Margin	0	1	2
5. Root Convexity (Torque)	0	1	2
6. Scar Formation	0	1	2



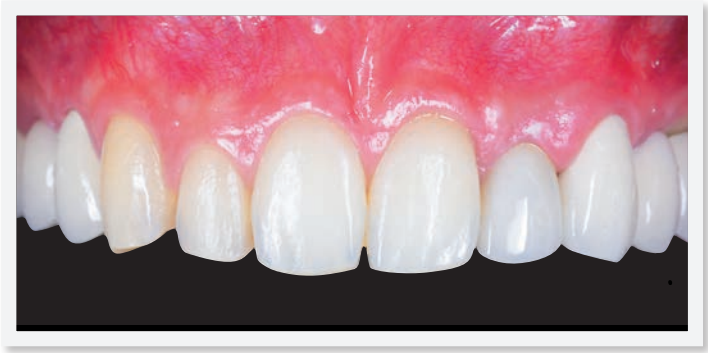
1. M & D Papilla	(0)	1	2
2. Keratinized Gingiva	(0)	1	2
3. Curvature of Gingival Margin	(0)	1	2
4. Level of Gingival Margin	(0)	1	2
5. Root Convexity (Torque)	0	(1)	2
6. Scar Formation	(0)	1	2

2. White Esthetic Score (for Micro-esthetics)

Total = 5



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

iAOI

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. 黃瓊嫥 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. 林佳宏▲ Alex Lin

Dr. 陳俊宏 Chun-Hung Chen

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

2021 Keynote Workshop

講師 —— 金牛頓工程師

技巧班 7/15 (四)

強化你的 Keynote 簡報力

無論是 Keynote 新手或是略有經驗的使用者，在一天的簡報課程中，將精選介紹 Keynote 的重要工具，幫助你設計合適的動畫，分享設計資料視覺化的秘訣，並搭配 Mac 內建常用的影音工具來編修圖片和影像剪輯，金牛頓的教學團隊將教你如何使用 Keynote 創造出動人的專業簡報。

講師 —— 張慧男醫師

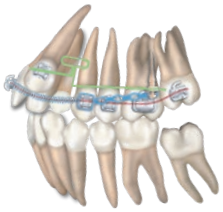
大師班 8/19 (四)

賈伯斯的簡報秘訣與設計要素

由國際知名的牙科講師張慧男醫師、主講的一天課程，將以他幽默風趣的演講風格來剖析賈柏斯的美學概念以及演講秘訣，利用實例來說明如何設計出視覺優且知識性豐富的專業演講。

● 名額有限，以繳費順序為依據。　● 舊生享特惠優惠價，限額 4 名。

●● 若取消報名：開課 30 天前退款將扣除 10% 行政手續費；開課 30 天內退款將扣除 30% 行政手續費。
●● 若請假延課：開課 30 天前提出，可免費延課一次；開課 30 天內提出，下次補課則以「舊生重溫價」計費。



Newton's A　03-573-5676　info@newtonsa.com.tw　新竹市建中一路 25 號 2 樓

戴蒙系統鉅作 感恩回饋

Ormco™
YOUR PRACTICE. OUR PRIORITY.

國際大師推薦，愛用好評如潮 Damon Q × Damon Clear

優惠期限：2021/4/1~2021/12/31止

特惠組1

DAMON Q™

(共200顆)

⊕ 6|6 7|7 / 6|6 7|7 *Bondable Tube* x 10* 人份

特價 **NT$124,999** /組

* 以上販售及贈品品項皆不含 SnapLink Tubes, Accent Mini Tubes, A+

特惠組2

DAMON CLEAR® DAMON CLEAR2™

(Clear/Clear2 共200顆)

⊕ 6|6 7|7 / 6|6 7|7 *Bondable Tube* x 10* 人份

特價 **NT$164,999** /組

回饋贈禮！ 選購特惠組1或2，即贈送以下矯正線

- ***.014 Damon Copper Ni-Ti x 20*** 條
  感溫性鎳鈦合金線 - Level and Align
- ***.014 x .025 Damon Copper Ni-Ti x 20*** 條
  感溫性鎳鈦合金線 - Begin Torque Control
- ***.016 x .025 Damon SS x 20*** 條
  不鏽鋼合金線 - Space Closure
- ***.017 x .025 Damon Low-Friction TMA Wire x 20*** 條
  低摩擦力鈦鉬合金線 - Finishing and Detailing

配件加購專區

- ***Zoo Pack Elastics***
  動物圈
  特價 **NT$1,800** /盒

- ***Power Chain***
  矯正專用彈力鏈
  特價 **NT$1,500** /卷

- ***Drop-in Hook***
  DQ插入式掛鉤
  特價 **NT$1,700** /盒

- ***Sample Kit***：
  Enlight Syringe x 1 支 + ***Ortho Solo x 1*** 瓶
  光照含氟矯正專用黏著劑+多功能光照基底劑
  特價 **NT$2,500** /組

- ***SMARTARCH CuNiTi***
  雷射科技感溫性鎳鈦合金線
  (.016 / .018x.025 Upper/Lower 任選)
  特價 **NT$3,600** /盒

*限與訂單同時加購，訂單成立後恕無法再行追加。

your best dental supplier YONG CHIEH 湧傑 客服專線：北區 (02)2778-8315・中區 (04)2305-8915・南區 (07)226-0030

2021 Implant Forum

地點：

新竹市建中一路25號2樓
（金牛頓藝術科技）

時間：

星期五上午 9:00-12:00
（每月一次）

報名專線：

03-5735676#203
clinton@newtonsa.com.tw
陳建名

	日期	專題演講 9:00 - 10:30	植牙案例報告 10:45 - 12:00（30 分鐘 / 人）	
1	3/19	**陳明時 醫師**（美國 Ohio State University 牙醫學院．碩士、美國德州 M.D. Anderson Cancer Hospital 專科醫師） 主題：Part I：“Occlusal Scheme” ? “Organic Occlusion”! Part II：Comprehensive Treatment Plan Part III：Treatment Planning、Design、Option、Execution Part IV：Claspless RPD replacing Conventional Clasp RPD		
2	4/9	**黃裕新 醫師**（裕見美牙醫診所院長．台灣大學牙醫學系第一名畢業、美國賓州大學學術交流、美國南加大植牙美學專科訓練、美國華盛頓大學全口重建訓練、「裕見．新美學」瓷牙美學講師、2016 Dentsply 牙體復形競賽全球第三、2015 Dentsply 牙體復形競賽台灣冠軍、Nobel Biocare 產品發表會客座講師、台灣植體醫學會會員） 主題：前牙美學 軟組織的究極進化		
3	5/28	**邱上珍 醫師**（美國明尼蘇達大學牙周病學碩士、美國牙周病學會院士） 題目： Implants in Esthetic Zone	**蕭浩宜 醫師**（美國南加州大學植牙研究所進修、新綠牙醫診所院長）	**張慧男 醫師**（美國印第安那普渡大學齒顎矯正研究所博士）
4	6/18	**王巍穆 醫師**（基督教安息會台安醫院贋復牙科主任、台北醫學大學牙醫學院兼任講師暨牙科部主治醫師、佛教慈濟綜合醫院台北分院牙科部贋復科主治醫師、德國法蘭克福大學牙醫學院口腔植體學碩士、國立陽明大學口腔贋復碩士、台北榮民總醫院牙科部兼任主治醫師） 題目：Prosthetic Driven Concept to Create Zero Bone Loss		
5	7/23	**蘇筌瑋 醫師**（高雄醫學大學牙周病學碩士、國際矯正植牙學會理事長） 主題：垂直前庭切線骨膜下隧道法		
6	8/20	**林涵威 醫師**（台大醫學院臨床牙醫研究所碩士、台北醫學大學牙醫學士、衛福部定口腔顎面外科專科醫師、德國 Steigmann Institute 進階植牙訓練、第58屆日本口腔顎面外科大會傑出論文獎） 題目：All-on-4 Basic Concept		
7	9/17	**陳健誌 醫師**（台北醫學大學牙醫學士、臺大牙醫專業學院臨床牙醫學研究所碩士暨博士、臺大牙醫專業學院牙醫學系兼任講師、台北醫學大學牙醫學院牙醫學系兼任助理教授） 題目：The Modern Concept of Implant Location and Occlusion in Digital Dentistry	**林森田 醫師**（中山醫學大學學士、國際矯正植牙學會院士、美國南加州大學植牙研究所進修）	**翁蔚任 醫師**（中華民國植牙醫學會專科醫師、中華民國家庭牙醫學會專科醫師、高雄醫學大學牙醫學士）
8	10/22	**郭博仁 醫師**（臺灣牙周病醫學會專科醫師、中華審美牙醫學會專科醫師、中華植體美學醫學會專科醫師、日本審美牙科學會認定醫師、高雄醫學大學牙醫學士、國防醫學院牙科臨床研究所牙周病學碩士、國防醫學院醫學科學研究所博士、國防醫學院牙醫學系兼任助理教授、林錦榮齒列矯正中心牙周病醫師） 題目：Another Tool in Your Toolbox: Alveolar Ridge Preservation （巧取補骨先機：齒槽嵴保存術）		
9	11/19	**李頌平 醫師**（台北醫學大學牙醫學系畢業、中華民國植體學會學員、台灣口腔矯正學會學員、中華民國口腔植體學會學員） 題目：Daily Practice with Total Digital Dental Solution		
10	12/24	**蘇裕隆 醫師**（陽明大學牙醫學士、FB 前牙美學達人） 題目：前牙美學	**黃育新 醫師**（國際矯正植牙學會院士、台北醫學大學牙醫學系、台灣植牙醫學會專科醫師）	**張慧男 醫師**（美國印第安那普渡大學齒顎矯正研究所博士）

本課表僅供參考，植牙論壇保留課程變動之權利

2021 Implant Forum

“作為一個現在的牙醫師你不可能不學 Implant，當你學了 Implant，會急速地擴大你牙科的操作範圍，而植牙論壇就是最好的訓練。”

-Dr. 張慧男-

“歡迎大家和我們一起藉由每月一次的持續進修，保持對臨床的熱情和敏感度；並期許能提供給病人最佳的治療。”

-Dr. 邱上珍-

“歡迎與我們一起精進學習，分享傳承彼此的經驗。”

-Dr. 蘇筌瑋-

“數位科技的進步，讓牙科日新月異，適合已經有基礎的牙醫師持續進修。”

-Dr. 林森田-

Anterior Crossbite Treated with Four-Bicuspids Extraction and Insignia® System without Manual Adjustments or TADs

Abstract

An 18-year-old girl reported with chief complaints of crooked teeth, prominent chin, and depression of mouth corners. She was diagnosed with a unilateral end-on Class III (Super Class I) with anterior crossbite, and severe crowding (20mm) in the upper arch. The orthodontic treatment was accomplished in 19 months with extraction of the four first premolars and the application of a custom-made self-ligating orthodontic appliance, Insignia® (Ormco, Brea, CA). There was no bracket repositioning nor archwire adjustments. At the one- and two-year follow-up, the improved functional occlusion and esthetics were stable . (J Digital Orthod 2021;62:52-70)

Key words:

Insignia® system, customized passive self-ligating bracket, digital set-up, bite turbos, anterior crossbite

History and Etiology

An 18-year-old girl presented with chief complaints of crooked teeth, prominent chin, and depression of the mouth corners. The patient had no history of systemic diseases.

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 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 clinical extraoral examination showed a straight profile, prominent chin, facial symmetry, and smile line with normal gingival exposure. The intraoral examination exhibited coincident upper and lower dental midlines, unilateral end-on Class III (*Super Class I*)[1] and an incisor crossbite. Severe crowding (*20mm*) was found in the upper arch, and there was mild crowding (*5mm*) in the lower arch. The overbite measured 1mm, and the overjet was -0.5mm. The pink and white esthetic analysis showed good oral hygiene and sound soft tissues with no gingival recession nor non-carious cervical lesions. The height of the gingival margins in the esthetic zone of the maxillary anterior region exhibited a natural high-low-high pattern. The size, shape, and proportion of the teeth were good. Four impacted wisdom teeth were revealed by the panoramic radiograph. The temporo-mandibular joint image demonstrated bilateral condyles with similar sizes and no obvious defects. The cephalometric radiograph revealed

Connie Huang,
Lecturer, Beethoven Orthodontic Course (Left)
Chris H. Chang,
Founder, Beethoven Orthodontic Center
Publisher, Journal of Digital Orthodontics (Center)
W. Eugene Roberts,
Editor-in-Chief, Journal of Digital Orthodontics (Right)

a skeletal Class I relationship, proclined upper incisors (*U1 to SN=111°*), and retroclined lower incisors (*L1 to MP=80.5°*). The mandible was protrusive (*Figs. 1-5; Table 1*). As shown in the subsequent worksheet, the American Board of Orthodontics (*ABO*) Discrepancy Index (*DI*) was 13[2] (*Worksheet 1*).

Fig. 1: Pre-treatment facial and intraoral photographs

Fig. 2: Pre-treatment study models (casts)

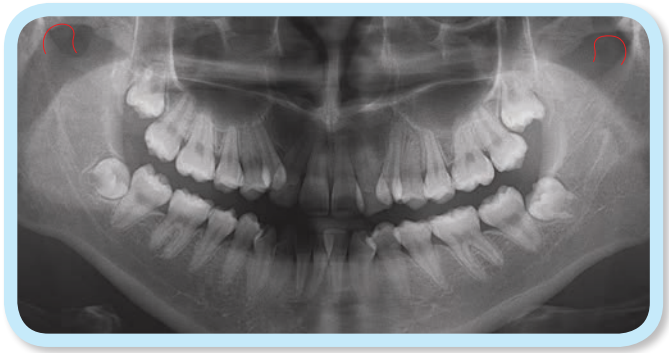


Fig. 3:
Pre-treatment panoramic radiograph shows the impacted 3rd molars.

Fig. 4: Pre-treatment cephalometric radiograph

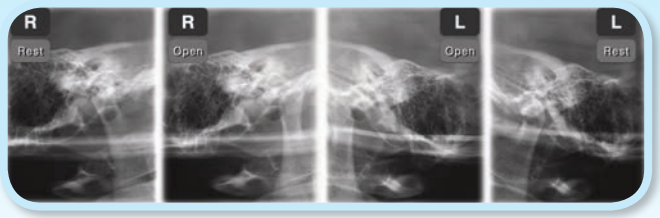


Fig. 5:
Pre-treatment TMJ transcranial radiographs show bilateral condyles with similar sizes and no obvious defects.

CEPHALOMETRIC SUMMARY			
SKELETAL ANALYSIS			
	PRE-Tx	POST-Tx	DIFF.
SNA° (82°)	84.5°	85°	0.5°
SNB° (80°)	85°	84.5°	0.5°
ANB° (2°)	-0.5°	0.5°	1°
SN-MP° (32°)	36.5°	37°	1.5°
FMA° (25°)	28.5°	30°	1.5°
DENTAL ANALYSIS			
U1 To NAmm (4mm)	3.5	3	0.5
U1 To SN° (104°)	111°	116.5°	5.5°
L1 To NBmm (4mm)	4.5	2	2.5
L1 To MP° (90°)	80.5°	72°	7.5°
FACIAL ANALYSIS			
E-LINE UL (-1mm)	3	0	2
E-LINE LL (0mm)	5	1	1.5
Convexity: G-Sn-Pg' (13°)	2°	3.5°	1.5°
%FH: Na-ANS-Gn (53%)	59%	59%	0%

Table 1: Cephalometric summary

Treatment Objectives

Maxilla (all three planes)**:**

- A-P: *Maintain*
- Vertical: *Maintain*
- Transverse: *Maintain*

Mandible (all three planes)**:**

- A-P: *Maintain*
- Vertical: *Maintain*
- Transverse: *Maintain*

Maxillary dentition:

- A-P: *Correct the unilateral end-on Class III by protracting the UL6.*
- Vertical: *Maintain*
- Inter-molar/Inter-canine width: *Decrease the inter-canine width by aligning the blocked-out canines, and increase the inter-molar width for to correct buccal overjet.*

Mandibular dentition:

- A-P: *Retract the lower anterior teeth for anterior crossbite correction.*
- Vertical: *Maintain*
- Inter-molar / Inter-canine width: *Increase*

Facial esthetics: Correct the depression of mouth corners by correcting the anterior crossbite.

Treatment Plan

1. Extract the two upper first premolars to relieve the severe crowding of 20mm in the maxillary arch and to maintain the good upper facial profile.

2. Protract UL6 to correct the end-on Class III molar relationship on the left side.

3. Extract the two mandibular first premolars and retract the lower anterior teeth to correct the anterior crossbite.

Digital Set-Up

(1) Overbite and overjet: Set to 1.5mm (*Fig. 6*)

(2) Extract upper and lower first premolars.

(3) Torque compensation by the system: On

(4) Set the archwire plane to the center of the upper and lower central incisors.

Insignia® is a highly efficient leveling, aligning, and torque expressing tool. While brackets and wires are digitally customized, the anchorage is managed clinically with elastics, TADs, and ligature wires. Consequently, it is unnecessary to tell the technicians how the doctor would like to close the extraction spaces. The digital set-up should be as simple as the example above.

Sometimes it is impossible to achieve good crown and root alignment at the same time given that the tooth morphology has been modified by either attrition or previous dental restorations. With TruRoot® data integration of Insignia®, the decision of whether to align the roots or crowns is left to the doctor's discretion. In this case, the decision was made to align the marginal ridges instead of the roots considering that there were no caries nor any ill-fitting restorations (*Fig. 6*)

Appliance and Treatment Progress

The treatment was initiated with bonding of a 0.022-in slot Insignia® fixed appliance (*Ormco, Brea, CA*). Subsequently, all four premolars were extracted. The study cast was a useful tool for the assistant to make sure that the jigs fitted well and were seated into a

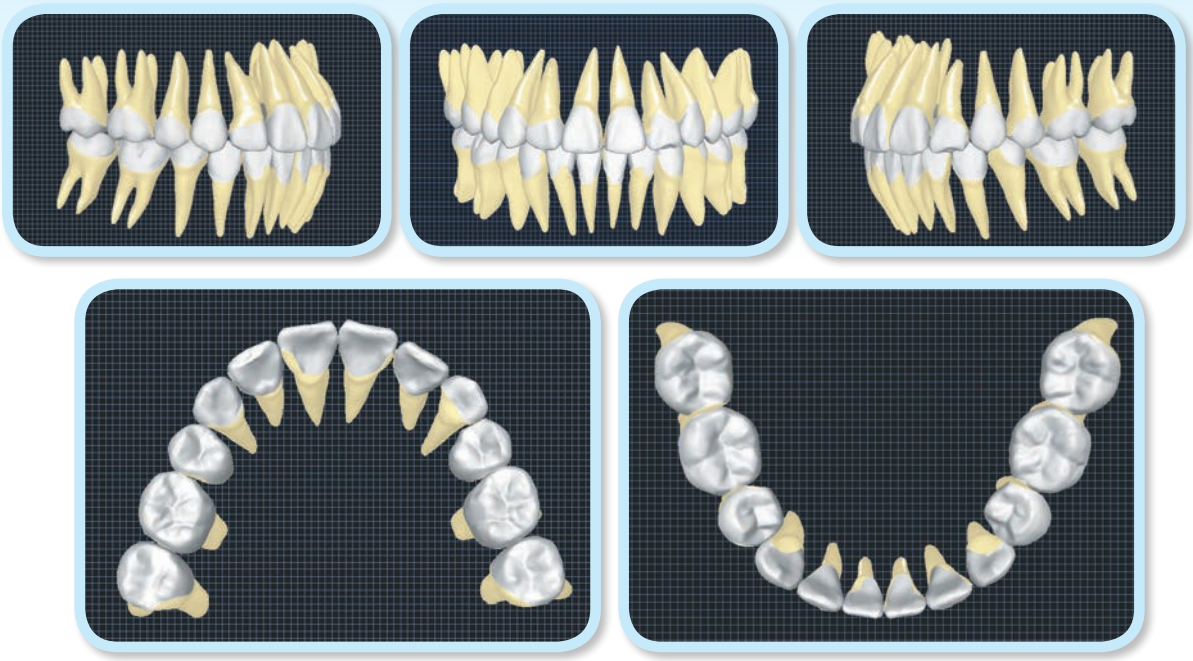


Fig. 6:
Different from aligners, for customized braces, only the end result and bracket position need to be checked in the digital set-up. Especially in an interdisciplinary treatment, with TruRoot®[9] data integration of Insignia®, the doctors and specialists can specifically and efficiently decide whether to align the crowns or the roots via online communication.

stable position.[6] It could also be used as a guide to cut the first archwire extraorally to the proper length. Self-curing Type II glass ionomer cement (*GIC*) Fuji II® (*GC America, Alsip IL*) was applied on the occlusal surfaces of both L6s for the purpose of opening the bite. Open coil springs were placed between the central incisors and canines, which led to the distalization of the canines and the flaring out of the central incisors, thereby relieving the crowding and correcting the anterior crossbite. Since there was much more severe crowding in the upper arch (*20mm*) than the lower (*5mm*), the upper incisors are more susceptible to flaring. Consequently, the central incisor crossbite was corrected within the first month of the treatment. The remaining height of the bite turbos and the amount of lateral incisor crossbite were checked at every visit to ensure there was sufficient vertical clearance for the blocked UR2 and UL2 to move out labially (*Figs. 7-9, 3M*). The patient was trained to use a tongue blade to squeeze out the blocked-in upper lateral incisors. In the fifth month of treatment, the lower dental midline shifted to the right due to light premature contact between UL2 and LL3. With the gradual alignment of UL2, the mandibular functional shift diminished accordingly (*Figs. 8-9, 5M*). Despite that the UR2, UR1, UL1, and UL2 were bound together with a power chain, UR2 flared out in the 11th month of treatment due to a premature contact with LR3. This, however, was only temporary since the distalization process of LR3 was still under way (*Figs. 7-8, 11M*). In the 14th month of treatment, interproximal reduction was performed on the upper incisors to enhance the anterior Bolton ratio. In the 16th month, the upper

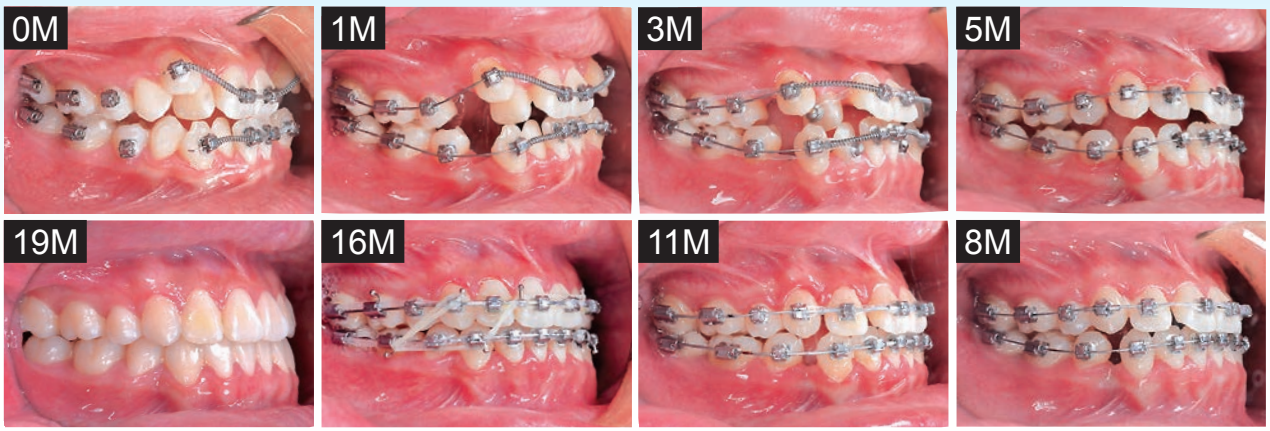


Fig. 7: Treatment progression from the right buccal view is shown for 19 months (M) of active treatment in a clockwise order. See text for details.

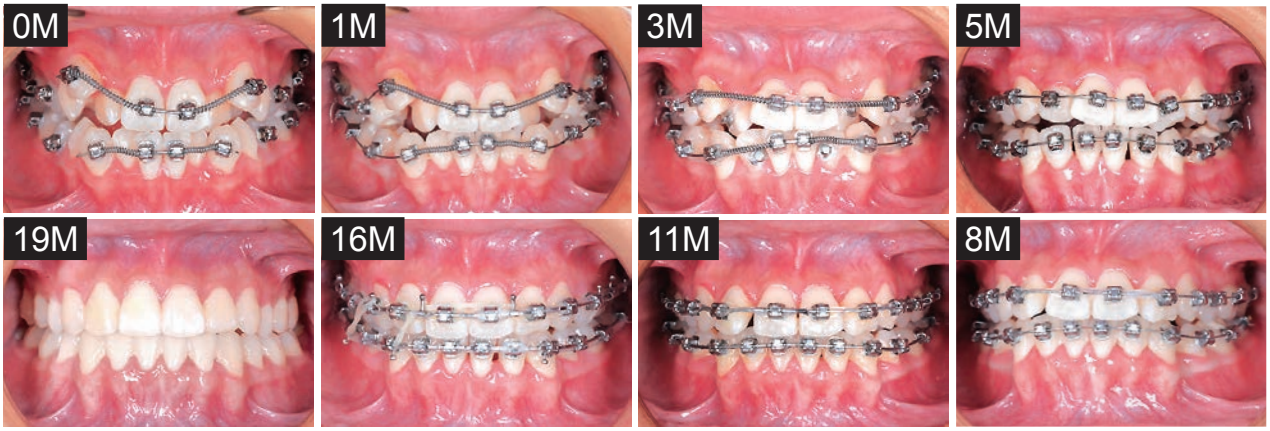


Fig. 8: Treatment progression from the frontal view is shown for 19 months (M) of active treatment in a clockwise order. See text for details.

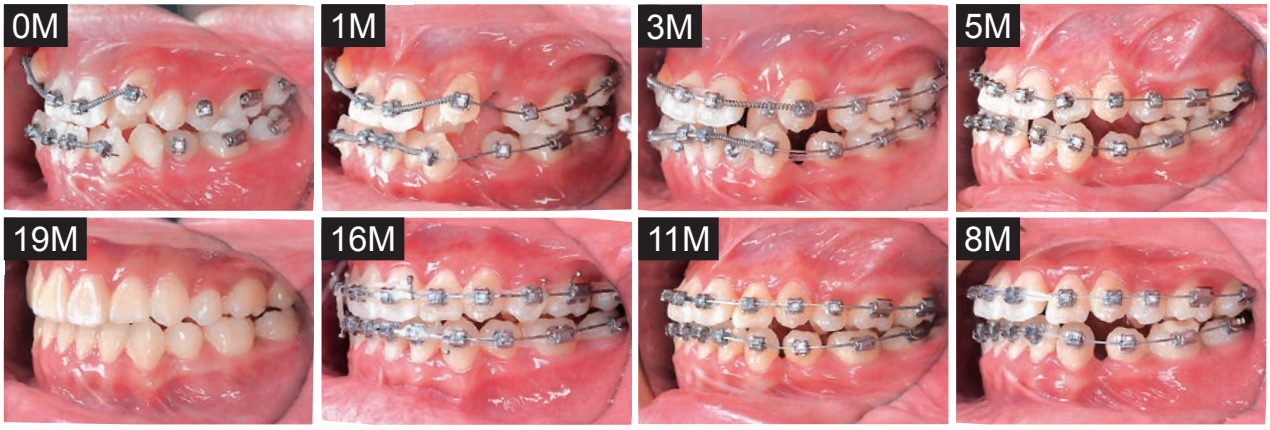


Fig. 9: Treatment progression from the left buccal view is shown for 19 months (M) of active treatment. See text for details.

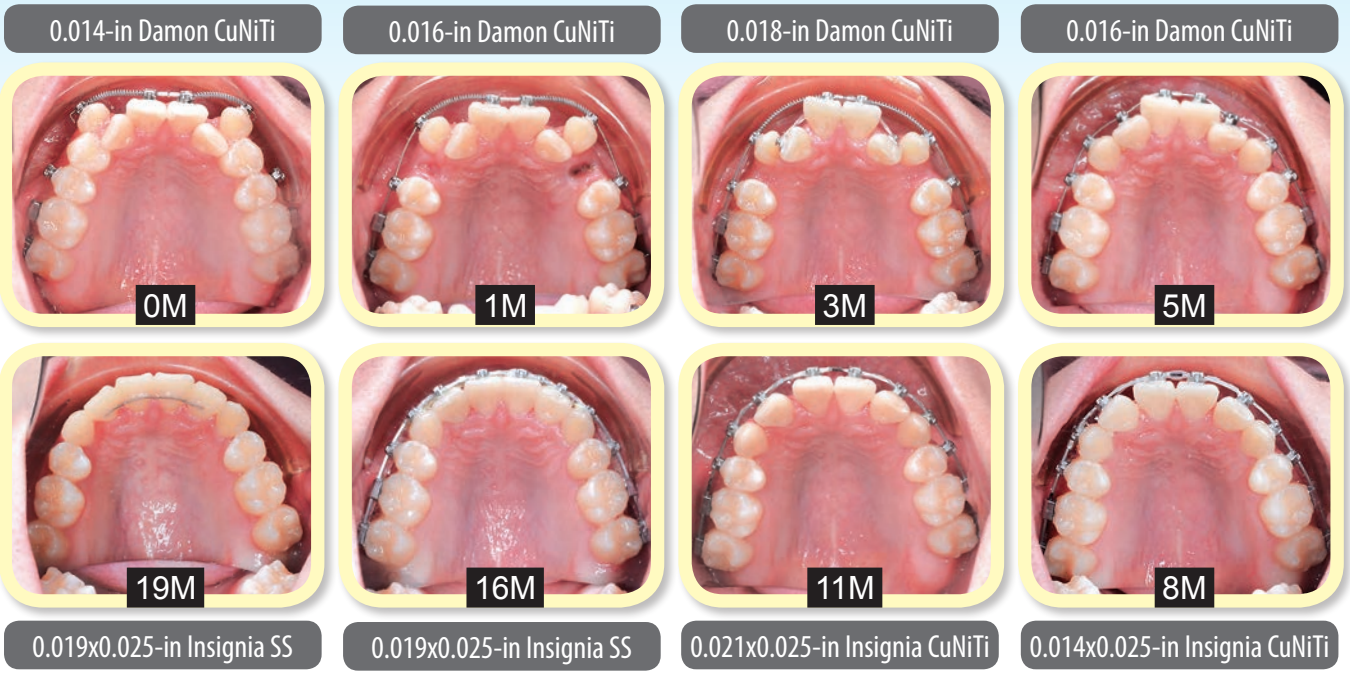


Fig. 10:
Treatment progression of the maxillary arch is shown from the occlusal view for 19 months (M) in a clockwise order. Open coil springs were placed between the central incisors and canines for canine distalization and flaring of the central incisors. See text for details.

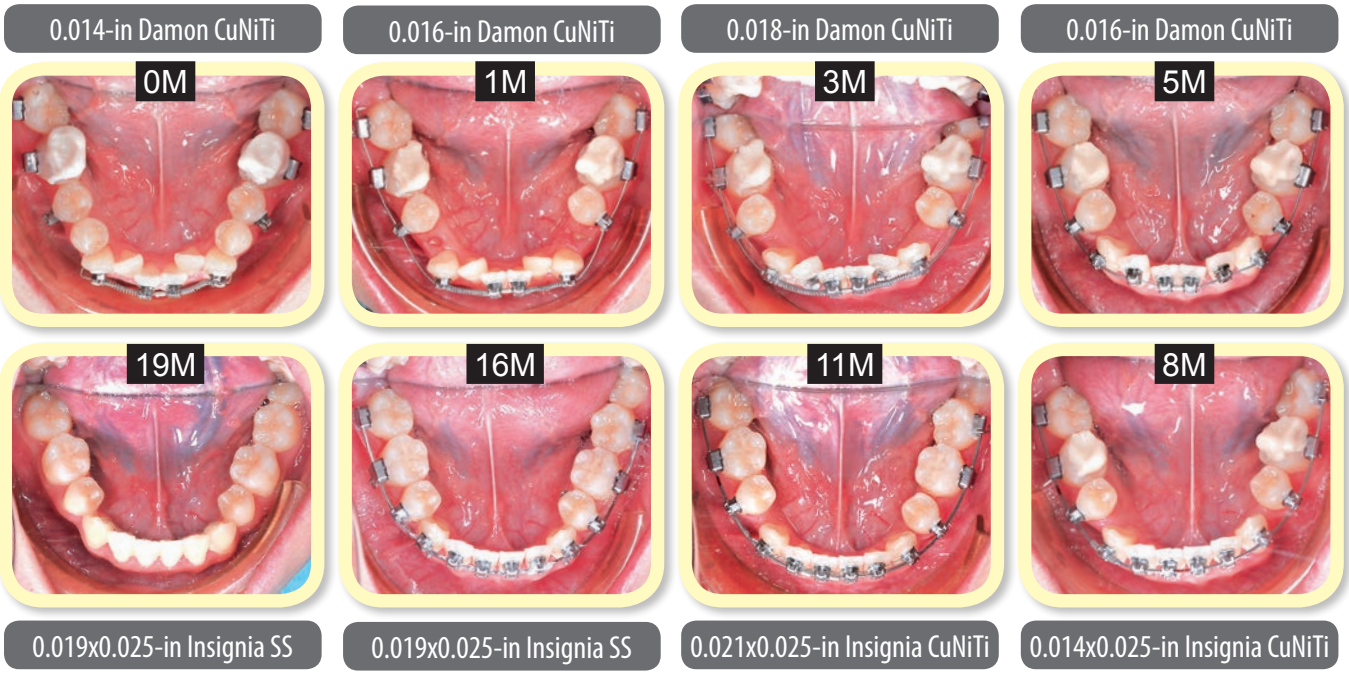


Fig. 11:
Treatment progression of the mandibular arch is shown from the occlusal view for 19 months (M) in a clockwise order. Placement of open coil springs in the third month was the active mechanics to correct lower arch crowding. Since the premolars were extracted, the additional use of a power chain during the 0.018-in NiTi archwire phase was not necessary.

and lower midlines became coincident. This was achieved by the application of Class II elastics (*3.5-oz Fox, Ormco*) on the right side, and a short crossbite elastic (*3.5-oz Chipmunk, Ormco*) on the left side to keep the occlusion settled (*Figs. 8-9, 16M*). Asymmetry of the gingival margin in the upper anterior teeth was noticed. Considering that the gingival line could not be seen at all even with the broadest smile, the patient refused the recommendation of gingivoplasty with a diode laser (*Fig. 12*). After 19 months of active treatment, all appliances were removed. There was no manual adjustment of the bracket bonding positions nor wire bending throughout the entire treatment period.

Result Achieved

Maxilla (all three planes)**:**

- A-P: *Maintained*
- Vertical: *Maintained*
- Transverse: *Maintained*

Mandible (all three planes)**:**

- A-P: *Maintained*
- Vertical: *Maintained*
- Transverse: *Maintained*

Maxillary dentition:

- A-P: *UL6 was protracted to correct the end-on Class III. The upper incisors were flared 5.5° to achieve a positive overjet, and to maintain the good upper facial profile (Fig. 16).*
- Vertical: *Maintained*
- Inter-molar / Inter-canine width: *The inter-canine width was decreased by aligning the blocked-out canines, and the inter-molar width was slightly increased to achieve a positive buccal overjet.*

Mandibular dentition:

- A-P: *The lower anterior teeth were retracted and retroclined by 7.5° to correct the anterior crossbite (Fig. 16).*
- Vertical: *Maintained*
- Inter-molar / Inter-canine width: *Increased*

Facial esthetics:

The depression of mouth corners was corrected. The chin is less prominent in appearance and the facial profile has become more pleasing (*Fig. 12*).

Maintenance

Fixed lingual retainers (*Maxillary 2-2 and Mandibular 2-3*) were bonded, and clear overlay retainers for both arches were delivered. The patient was instructed to wear the overlay retainers full time for the first month and nights only thereafter. Instructions were given for both oral hygiene and retainer maintenance.

Final Evaluation of the Treatment

An ABO Cast-Radiograph Evaluation score of 7 points[4] was achieved. The major discrepancies were the mild end-on Class III molar relationship on the left side (*2 points*), the occlusal contacts on the left side (*2 points*), and the root angulation of UR2, LL5, and LR5 (*3 points*) (*Worksheet 2*).

Superimposition of the pre and post-treatment cephalometric tracings confirmed the slight flaring

Appointment	Archwire	Notes
1 (0 mo)	U/L: 0.014-in Damon CuNiTi	Disarticulation with posterior bite-turbos constructed with Fuji II® Type II Glass Ionomer cement (GC America, Alsip IL) on the occlusal surfaces of the L6s. The blocked-in lateral incisors were not bonded.
2 (1 mo)	U/L: 0.016-in Damon CuNiTi	After extraction of U4s and L4s, open coil springs were used to decrowd the anterior teeth.
3 (3 mo)	U/L: 0.018-in Damon CuNiTi	Buttons were bonded to the U2s and L2s in order to rotate the the blocked-in teeth outwardly with power chains.
4 (5 mo)	U/L: 0.016-in Damon CuNiTi	U2s and L2s were bonded and engaged to the main wire. Patient was instructed to use a tongue blade to accelerate pushing the U2s out.
5 (7 mo)	U/L: 0.018-in Damon CuNiTi	A new customized Insignia® bracket was bonded to LL7 with the supplied jig, due to dislodgment and loss of the original bracket.
6 (8 mo)	U/L: 0.014x0.025-in Insignia CuNiTi	A new Damon Q® bracket was bonded to LL7 due to dislodgment and loss of the Insignia® bracket.
7 (9 mo)	U/L: 0.018x0.025-in Insignia CuNiTi	Preparing for the En-Masse retraction, the mandibular anterior teeth were tied together with an 0.010-in stainless steel ligature wire, since they were already well aligned. The posterior bite turbos were removed, because there was neither a crossbite problem nor bracket biting risk.
8 (11 mo)	U/L: 0.021x0.025-in Insignia CuNiTi	Power chains were used to retract the lower arch En-Masse, and to close all tiny spaces in the upper arch.
9 (13 mo)	U/L: 0.019x0.025-in Insignia SS	
10 (14 mo)		Inter-proximal reduction (IPR) was performed on the upper incisors to optimize the anterior Bolton ratio. 90° dropping hooks were inserted at the L3s, and the Class III elastics (Fox, 1/4-in, 3.5-oz) from L3s to U6s to retract mandibular anteriors were placed.
11 (16 mo)		IPR was performed on the lower incisors to alleviate the dark triangles. To coincide the upper and lower dental midlines, Class II elastics (Fox, 1/4-in, 3.5-oz) from UR3 to LR6, and from UL1, UR1, LR3, to LR6 were placed. A crossbite elastic (Chipmunk, 1/8-in, 3.5-oz) from UL5 to the lingual button of LL5 was applied to enhance the occlusion.
12 (17 mo)		Crossbite elastics (Chipmunk, 1/8-in, 3.5-oz) from UL6 and UL7 lingual buttons to the LL6 and LL7 buccal sides were used to settle the occlusion.
13 (19 mo)		All appliances were removed. Anterior fixed retainers were bonded on the anterior teeth. Removable clear overlay retainers were delivered for both arches, and the patient was instructed to wear them full time for the first month and nights only thereafter. Instructions were provided for oral hygiene and maintenance of the retainers.

Table 2: Treatment Sequence

Fig. 12: Post-treatment facial and intraoral photographs

Fig. 13: Post-treatment study models (casts)

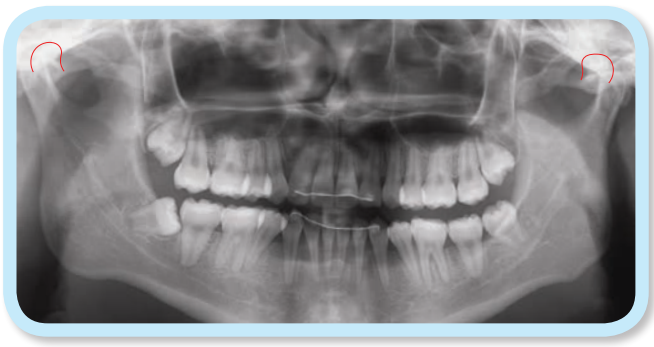


Fig. 14:
Post-treatment panoramic radiograph shows both condylar heads outlined in red.

Fig. 15: Post-treatment cephalometric radiograph

out of the upper incisors. This aided the correction of the negative overjet and the maintenance of a good upper lip profile, while the lower incisors were retracted and retroclined. The lower incisor roots were kept in the alveolar process over the bony housing of the mandibular symphysis. There was intentional slight anchorage loss on the upper left molars, which helped to correct the end-on Class III on the left side. The mandible angle was well maintained (*Fig. 16*).

The IBOI Pink & White dental esthetic score was 2. The gingival margin of UR2 was higher than that of UL2, producing an asymmetry. The size of the UR2 was slightly larger than the UL2. However, since the dental midlines were coincident, the overbite and overjet were normal, and the canines were in a Class

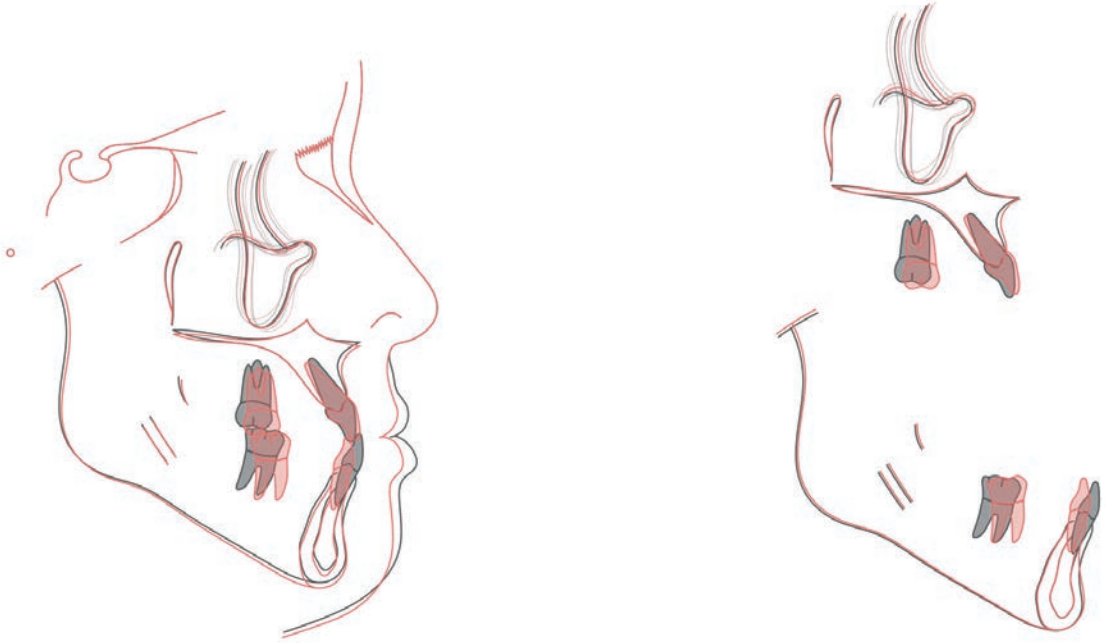


Fig. 16:
Superimposed cephalometric tracings (Pre-tx: grey, Post-tx: red) show the dento-facial changes during treatment. The tracings superimposed on the anterior cranial base (left) show the improvement of the profile and a well-maintained mandible position. The superimposed maxillary (upper right) and mandibular (lower right) tracings show that the UL6 was protracted to correct the end-on Class III. The upper incisors were labially flared by 5.5°, and the lower anterior teeth were retracted and retroclined by 7.5° to correct the anterior crossbite. See text for details.

I relationship, there was no need to adjust the size of UR2. The patient was satisfied with her new bright smile (*Fig. 12*) (*Worksheet 3*).

At the one-year and two-year follow-up, the dentition displayed stable esthetics and an enhanced functional occlusion with the left molars having gradually settled down. Extraction of all third molars was recommended to prevent caries and periodontitis (*Figs. 17 and 20*).

Discussion

The advantages of customized braces

The precise bracket positioning firstly eliminates the excessive reactivations associated with repositioning procedures. Secondly, a thicker wire can be placed, to fill up more of the 0.022-in slot and decrease the play value.[7,8] This leads to less bowing effect, and promotes more expression of the three-dimensional

Fig. 17: One year follow-up facial and intraoral photographs

control of the brackets' built-in prescriptions. For instance, in an extraction case, the main working wire would be a 0.016x0.025-in stainless steel archwire for Damon Q®, and a 0.019x0.025-in stainless steel archwire for Insignia®. Therefore, if used appropriately, Insignia® is expected to cause less mechanical side effects. This means less time spent on adjustments.

Thirdly, due to the manufactured pre-curved Cu-NiTi archwire (*Fig. 18*), dentition alignment can be greatly improved in the early treatment stages with flexible wires. This not only promotes easier wire changing, but also reduces the amount of patient discomfort.

Furthermore, TruRoot®[9] eliminates the need for doctors to speculate the root axis direction of a tooth with crowns or extensive restorations. According to the patients' needs and the prosthodontists' suggestions, the doctor can accurately determine whether to align the crown or the root, thereby facilitating communication and treatment planning.

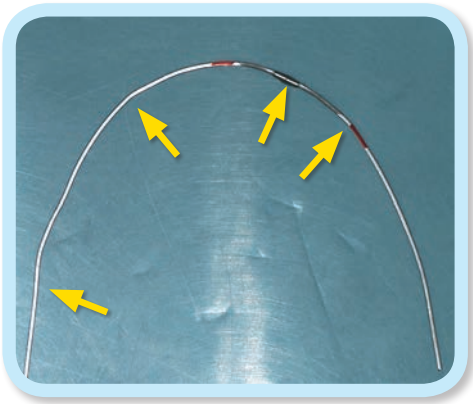


Fig. 18:
The customized precurved (arrows) 0.014x0.025-in CuNiTi archwire of Insignia®.

The differences between customized braces and aligners

The digital designs of customized braces such as Insignia® have minimal mechanical implications (*Fig. 19*). It can therefore be referred to as a highly efficient leveling, aligning, and torque expressing tool. With these devices, the anchorage is completely controlled by the doctor. The doctor can choose to apply a power chain to exert forces on both ends to achieve slight anchorage loss in the molars, or utilize a bone screw to obtain absolute anchorage. Accordingly, it would make little sense to appoint a program such as "*closing the extraction space 80% by the posterior movement of anterior teeth and 20% by the anterior movement of posterior teeth*" to the Insignia Approver software. When reviewing cases with the Approver software, the animated transformation from T1 (*pre-treatment*) to T2 (*post-treatment*) can be neglected. The focus should be on the quality of dental alignment in T2, and the justification of the relative movements of the roots and crowns with the superimposition of T1 and T2. Conversely, the digital design of aligners (*e.g., Invisalign®*) has great mechanical implications. The concept can be thought of as built-in power chains in the plastic with staging (*sequential movements of teeth*). Consequently, different designs will result in different anchorage expression, highlighting the importance of the animation during analysis with the ClinCheck® software.

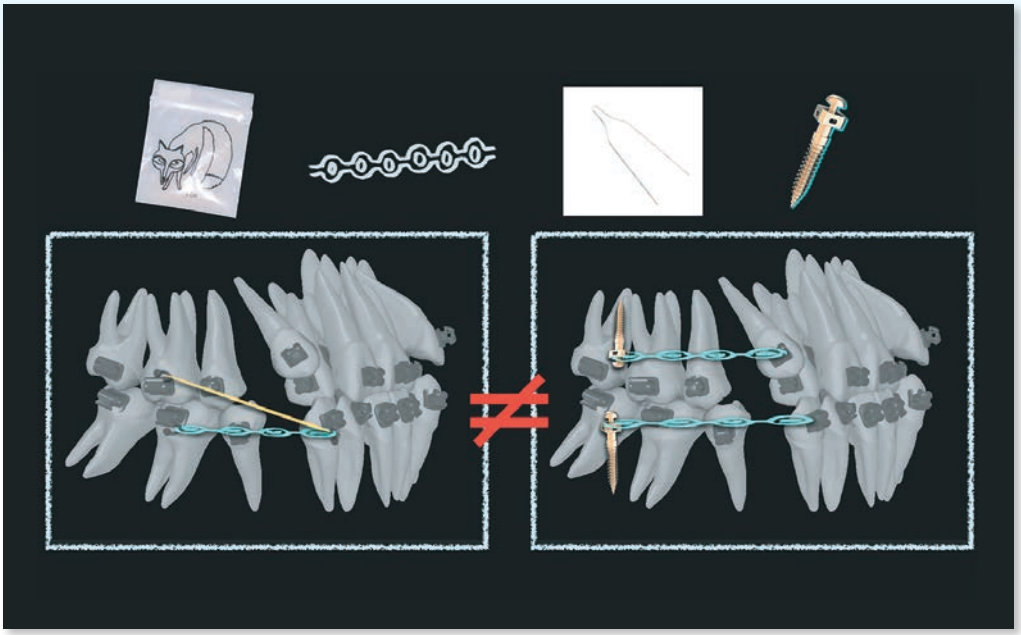


Fig. 19:
The anchorage is managed clinically with elastics, TADs, and ligature wires, not digitally with the customized brackets and wires. See text for details.

A new work flow for braces treatment

The course of treatment is divided into two stages, the active stage and the refining stage.[10] The objective of the active stage is to achieve 80% of the treatment goals, including the obtaining of a normal overbite and overjet, the regulation of midline deviation to within 3mm, and the reduction of the extraction space(s) to less than or equal to 1mm. Adjustment of bracket positions and wire-bending should not be undertaken unless a major premature contact or occlusal interference arises. Once the above was attained, the treatment can move on to the refining stage. Photographs, panoramic radiographs, and oral scans (*or study casts*) are acquired and analyzed for the planning of treatment finalization. The procedure includes adjustment of the bracket positions, and the course of archwire placement starting from thin flexible wires to thick rigid ones. Since there will be no more drastic tooth movements, which implies less wire deformation, the time interval can be reduced. The material choice of the finishing archwire should not be limited to stainless steel, TMA can be used instead. This approach diminishes the need for repeated changes to the bracket positions and archwires. Higher efficiency and less material waste can be attained.

Fig. 20: Facial and intraoral photographs 2 years post-treatment document the current condition of the patient.

The concept of handling the braces should be followed when using Insignia®

The difference between the predicted and the actual treatment outcome in an Insignia® extraction case is usually the torque of the anterior teeth. Such a deviation is common with fixed mechanics, for example, the exertion of heavy forces on a round flexible archwire. Another deviation is lack of retraction of the upper anterior teeth in cases with overbite but no overjet. All in all, the recommended concepts for all fixed appliances should be followed when using Insignia® in order to prevent the occurrence of side effects.

If this case were to be retreated, placement of open

coil springs in the third month would implement decrowding of the arch. Since the premolars were extracted, the additional use of a power chain during the 0.018-in NiTi archwire phase was not necessary. That would increase the risk of bowing effect, and also complicate the patient's oral hygiene practice.

Conclusions

Insignia® is a highly efficient leveling, aligning, and torque expressing tool without mechanical implications such as anchorage. Consequently the digital set-up should be as simple as possible, and only the T2 (*post-treatment simulation*) alignment should be checked.

Additional use of power chains or wire bending increases the friction in the system and PDL necrosis associated with frequent reactivations. Both problems slow down the treatment progress.

Adjust the bracket positions only after completing 80% of the treatment course according to the newly gathered information (*photographs, panoramic radiograph, study casts*). Execute wire bending for individual teeth in the final phase under the condition that none of the brackets require further rebonding.

Acknowledgements

Thanks to Mr. Paul Head for proofreading this article.

References

1. Staley RN, Rreske NT. Essentials of Orthodontics: Diagnosis and Treatment. Oxford: Wiley-Blackwell; 2011. p. 8-9.
2. Cangialosi TJ, Riolo ML, Owens SE Jr, Dykhouse VJ, Moffitt AH, Grubb JE, Greco PM, English JD, James RD. The ABO discrepancy index: a measure of case complexity. Am J Orthod Dentofacial Orthop 2004;125:270–8.
3. Wehrein H, Bauer W, Diedrich P. Mandibular incisors, alveolar bone, and symphysis after orthodontic treatment. A retrospective study. Am J Orthod 1996;110(3):239-246.
4. Casko JS, Vaden JL, Kokich VG, Damone J, James RD. American board of orthodontics: objecting grading system for dental casts and panoramic radiographs. Am J Orthod Dentofacial Orthop 1998;114(5):589–99.
5. Su B. IBOI Pink & White esthetic score. Int J Orthod Implantol 2013;28:80-85.
6. Lee A, Chang CH, Roberts WE. Efficient Bonding Protocol for the Insignia® custom bracket system. Int J Orthod Implantol 2018;49:100-106.
7. Lin JJ. Creative orthodontics: Blending the Damon system and TADs to manage difficult malocclusions. Taipei: Yong Chieh Ltd; 2010.
8. Lee WH, Lee A, Chang CH, Roberts WE. Insignia® system with bone screw anchorage: Class I crowded malocclusion with severe maxillary protrusion. Int J Orthod Implantol 2018;51:22-39.
9. Lee A, Chang CH, Roberts WE. TruRoot®: Increasing simulation accuracy of Insignia® by CBCT. Int J Orthod Implantol 2017;48:98-99.
10. Herrero PD, Chang CH, Roberts WE. Severe malocclusion with openbite, incompetent lips and gummy smile (DI 29) treated in 16 months with clear aligners to a board quality result (CRE 18). Int J Orthod Implantol 2017;48:74-94.

Discrepancy Index Worksheet

TOTAL D.I. SCORE 13

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 = 4

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 = 7

OCCLUSION

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

Total = 2

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. = _____

1 to MP ≥ 99° = 1 pt.

Each degree > 99° _____ x 1 pt. = _____

Total = 0

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 = 0

Cast-Radiograph Evaluation

Case # **Patient**

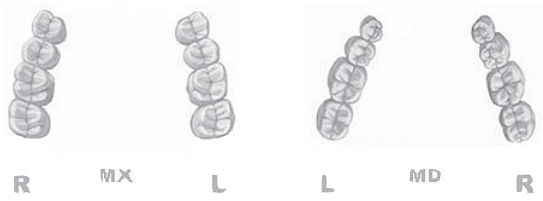
Total Score: 7

Alignment/Rotations

0

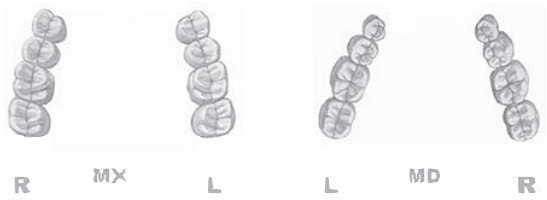
Marginal Ridges

0



Buccolingual Inclination

0

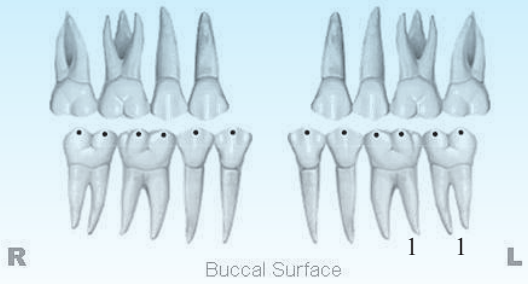


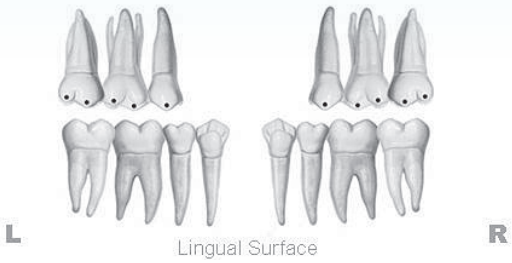
Overjet

0

Occlusal Contacts

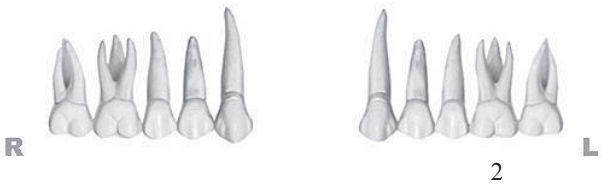
2





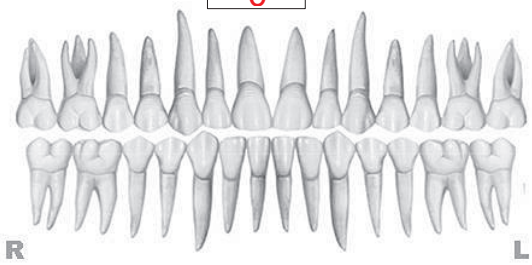
Occlusal Relationships

2



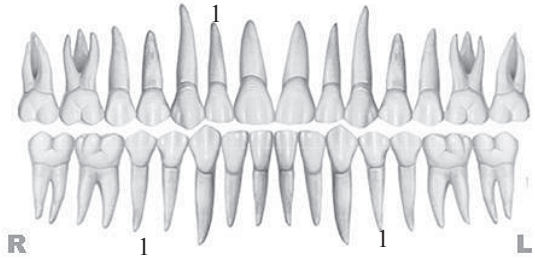
Interproximal Contacts

0



Root Angulation

3



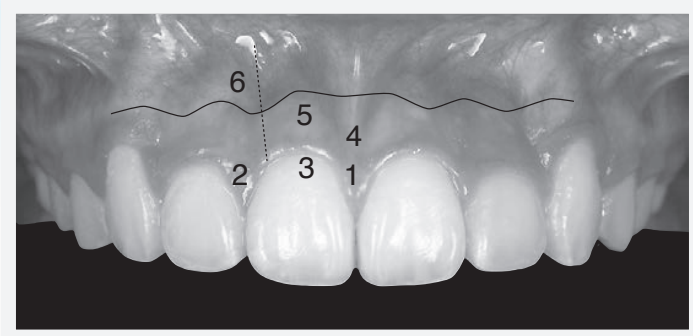
INSTRUCTIONS: Place score beside each deficient tooth and enter total score for each parameter in the white box. Mark extracted teeth with "X". Second molars should be in occlusion.

IBOI Pink & White Esthetic Score

Total Score: = 2

1. Pink Esthetic Score

Total = 1

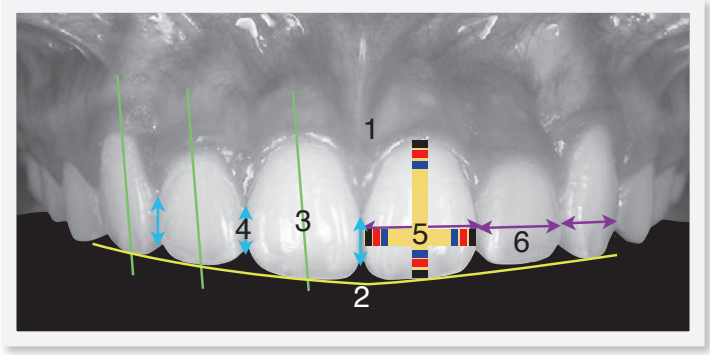


1. M & D Papillae	0	1	2
2. Keratinized Gingiva	0	1	2
3. Curvature of Gingival Margin	0	1	2
4. Level of Gingival Margin	0	1	2
5. Root Convexity (Torque)	0	1	2
6. Scar Formation	0	1	2

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 = 1



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

Products

Dental Products Essential Kit

NEW

Double Retractors 2.0 Autoclavable!

Double Retractors x2, Black Board x2

While keeping the same lip & cheek two-way design, the new Double Retractors 2.0 is upgraded to medical grade PPSU. This new material is more durable, resilient and most importantly, autoclavable. Its smooth edges and translucent quality make it the best aid to perfect intra-oral photography.

Stainless Steel Mirror

Strong, durable stainless steel, autoclave-proof, the specially designed size, shape and thickness ensure maximum intra-oral view without sacrificing patient comfort.

Bite Turbo 2.0

Handle x1, BT molds x6, BT extended molds x6, Button molds x6

A simple but power set of tools to correct severe deep bite and cross efficiently. The bite turbos and lingual button molds, made with silicon and filled with flowable resin, can be reused and adjusted depending on treatment progress. The longer one allows you to solve all kinds of deep bite and large horizontal overjet.

HARMONY™

Ergonomic Instrument

Designed with TrueFit™ Technology

HuFriedyGroup

The Best In Practice

全新代理

NEW AGENCY

Euronda® x your best dental supplier YONG CHIEH 湧 傑

義大利最專業的消毒滅菌品牌
給您最完整的保護系統

限時優惠
最低8折

優惠期限：2021/4/1~2021/12/31止

your best dental supplier YONG CHIEH 湧 傑 客服專線：北區 (02)2778-8315・中區 (04)2305-8915・南區 (07)226-0030

Efficient Correction of Crowded Anterior Crossbite: Passive Self-Ligating Brackets and Anterior Bite Turbos

Abstract

***Etiology**: A 16-year-5-month-old female presented with chief complaints of anterior crossbite and crowding. Past medical history was non-contributory, but dental history revealed that the upper left second premolar was extracted because of a blocked-in position.*

***Diagnosis**: Extra-oral examination revealed a symmetric, but long tapered face in the frontal view, with a SN-MP angle of 39˚. The facial profile was convex with competent lips, and the lower lip was protrusive. There was an asymmetric Class III (right) and Class II (left) molar relationship, anterior crossbite, intermaxillary crowding, and a missing upper left (UL) second premolar. The Discrepancy Index (DI) was 27.*

***Treatment**: This challenging malocclusion was efficiently corrected with a passive self-ligating fixed appliance, anterior bite turbos, progressive archwires, and intermaxillary elastics. After only 16 months of active treatment, the patient was satisfied with the result, and requested appliance removal prior to the planned completion of treatment.*

***Results**: Lip profile was improved, and there was no lip strain when the patient smiled naturally. After 16 months of active treatment, the dental outcomes were acceptable, with a Cast Radiograph Evaluation (CRE) score of 24 and a Pink & White dental esthetic score of 7, but the result could have been improved with more detailed finishing. (J Digital Orthod 2021;62:74-90)*

Key words:
Anterior cross bite, extraction, asymmetric Class II and III, passive self-ligating appliance, crowding

Introduction

Class III malocclusion among Taiwanese, Japanese, Chinese, and Korean is relatively common, with a prevalence rate of 15-23%,[1] compared to a 2-6% rate among European caucasians.[2,3] Etiology of Class III malocclusion may reflect deficient maxillary growth, and/or overgrowth of the mandible. Maxillary deficiency may be due to deficient sutural growth or stenosis, but overgrowth of the mandible has less physiologic basis as a primary mechanism.[4] Mandibular prognathism may have a secondary etiology such as anterior posturing of the mandible due to a functional problem like maintaining airway patency.[4] Efficient conservative treatment for Class III malocclusion depends on a valid differential diagnosis. Despite a large negative overjet and sagittal discrepancy, Class III patients, with an orthognathic profile in the centric relation (C_R) position of the mandible, can usually be treated with a non-surgical approach. The 3-ring diagnosis proposed by John Lin[5] is a useful diagnostic method for identifying patients with a good prognosis for conservative treatment.

Chia-Wei Liu,
Orthodontist, Ming-Hao Dental Clinic (Left)
Chris H. Chang,
Founder, Beethoven Orthodontic Center
Publisher, Journal of Digital Orthodontics (Center)
W. Eugene Roberts,
Editor-in-Chief, Journal of Digital Orthodontics (Right)

Anterior crossbite is a common dental trait in Asian patients with a prevalence of 18.6% in Japanese adolescents (*age 12-15 years*).[6] An unpublished study by the authors had a similar result (*17.9%*) for Taiwanese adolescents (*age 15-16 years*). Anterior crossbite is an easily perceived, negative trait that is frequently the chief complaint which leads parents to seek early orthodontic correction for young patients.[7] Orthodontic literature advocates early treatment of anterior crossbite to avoid restriction of maxillary growth,[8,9] but Sugawara et al.[10] failed to show an advantage for early treatment with a chin-cup started at age 7 years because the patients demonstrated catch-up growth. Excessive mandibular growth in adolescents is a well-known problem for skeletal Class III patients.[9] Clinicians considering early treatment are advised to use the Lin's[5] 3-ring method for a reliable differential diagnosis to identify patients with a good prognosis.

Fig. 1: Pre-treatment facial and intraoral photographs

There are multiple approaches to treating asymmetric anterior crossbite with crowding. Huang, Chang, and Roberts[11] proposed 6 methods for the correction of anterior crossbite, depending on dental factors and skeletal diagnosis. Removable bite-plates with lingual springs and tongue-blade exercises are advocated by some clinicians,[12] but the current authors prefer a more efficient correction with a Damon passive self-ligating (*PSL*) fixed appliance (*Ormco, Glendora, CA*), and anterior bite turbos.

Diagnosis and Etiology

A 16yr-5mo-old female presented for orthodontic evaluation with chief complaints of anterior crossbite and crowding (*Fig. 1*). Past medical history was non-contributory, but the upper left second premolar was extracted because of a blocked-in position. Extra-oral examination revealed a symmetrical, long tapered face in the frontal view. The facial profile was convex but within normal limits (*WNL*). The patient resisted smiling with her teeth exposure due to crowding and inclination of incisors in the maxillary arch (*Figs. 1-3*).

There were no signs or symptoms of temporo-mandibular disorder (*TMD*), and no mandibular deviation on opening was noted. Intraoral examination revealed an anterior crossbite of -2mm, and an asymmetric molar relationship: 7mm Class III on the right and end-on Class II on the left (*Figs. 1 and 2*). The maxillary dental midline was oblique because the central incisors were tipped to the right (*Fig. 2*), and the mandibular midline was 2mm to the left. The upper left first premolar and lower left second premolar were in lingual crossbite, and the upper left second premolar was missing (*Fig. 1*). Crowding was 5mm in the upper arch and 7mm in the lower arch. The pre-treatment cephalometric analysis (*Fig. 4; Table 1*) showed a 1˚ ANB and a 39˚ SN-MP angle. There were no dental or pathological abnormalities noted in the pre-treatment panoramic radiograph (*Fig. 5*). Four developing third molars were present, and both lower third molars were impacted. The American Board of Orthodontic (*ABO*) Discrepancy Index (*DI*) was 27 points, as shown in the supplementary Worksheet 1.[13]

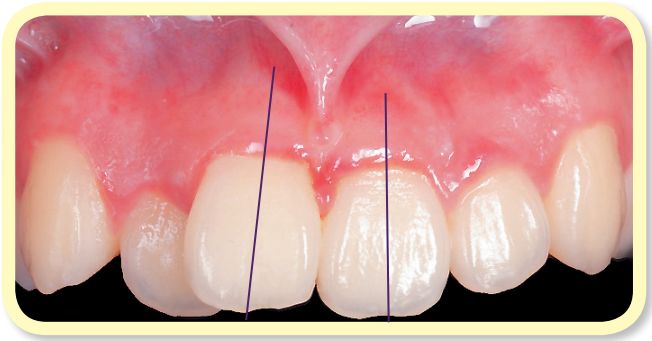


Fig. 2: The maxillary midline is oblique due to the abnormal inclination of the incisors.

Fig. 3: Pre-treatment study models (casts)

Fig. 4: Pre-treatment lateral cephalometric radiograph

Fig. 5: Pre-treatment panoramic radiograph

CEPHALOMETRIC SUMMARY			
SKELETAL ANALYSIS			
	PRE-Tx	POST-Tx	DIFF.
SNA° (82°)	82.5°	82.5°	0°
SNB° (80°)	81°	81°	0°
ANB° (2°)	1°	1°	0°
SN-MP° (32°)	39°	40°	1°
FMA° (25°)	32°	33°	1°
DENTAL ANALYSIS			
U1 To NAmm (4mm)	5	5	0
U1 To SN° (110°)	105.5°	102°	3.5°
L1 To NBmm (4mm)	8.5	4	4.5
L1 To MP° (90°)	85°	75.5°	9.5°
FACIAL ANALYSIS			
E-LINE UL (-1mm)	-2	-1.5	0.5
E-LINE LL (0mm)	2	-1.5	3.5
%FH: Na-ANS-Gn (53±3%)	56.5%	56%	0.5%
Convexity: G-Sn-Pg' (13°)	19°	21°	2°

Table 1: Cephalometric summary

Treatment Objectives

The following treatment objectives were specified for the preferred approach, **Option 1**:

1. Maintain the skeletal pattern in all three skeletal planes for both jaws.
2. Extract the upper right second premolar and both lower first premolars to: a. relieve crowding, b. help correct the molar relationship, and c. facilitate anterior crossbite correction.
3. Use a full fixed PSL appliance to level and align both arches.
4. Use anterior bite turbos to unlock the maxillary anterior teeth; correct the anterior crossbite with archwire configuration and Class III intermaxillary elastics.
5. Correct posterior crossbites with archwire alignment, supplemented with cross-elastics as needed.

6. Midline correction with intermaxillary elastics.

7. Optimize occlusion with finishing bends and up-and-down elastics.

Treatment Alternatives

Option 2: Impacted lower third molars may cause problems in the future, but extraction prior to treatment requires flap surgery, and there could be periodontal problems distal to the second molars. Extraction of both lower second molars instead of first premolars might be a wise choice because the third molars in the radiographs appear to be good substitutes for the second molars. However, that approach would result in Class II buccal segments, and possibly a longer treatment time. In the maxillary arch, extraction of the upper right second premolar remains the best option for relieving crowding and correcting the midline.

Option 3: Extraction of only the maxillary second premolar is a viable approach if there was no interference with the correction of the anterior crossbite. With this option, brackets are bonded to the upper arch first, and an inclined plane or inclined anterior bite turbos are bonded to the lower anterior teeth. The anterior crossbite should be corrected prior to the extraction. If the crowding in the lower arch is still present after alignment, interproximal reduction (*IPR*) of the lower anterior teeth and intermaxillary elastics are indicated. The disadvantage of this option is a more convex face with a protrusive upper lip after treatment.

The patient considered all the options, but was concerned about lip protrusion and an extended treatment time. She opted for option 1, and agreed to extraction of the three premolars.

Treatment Progress

The maxillary right second premolar and the lower first premolars were extracted prior to active treatment. The Damon D3MX 0.022-in PSL bracket system (*Ormco, Glendora, CA*) was used for both arches. All elastics, archwires, and auxiliaries were provided by the same manufacturer. PSL brackets were bonded on the maxillary arch with low-torque brackets on the upper anterior teeth. At the same appointment, the anterior bite turbos were bonded to the lingual surface of the lower right lateral incisor, and the lower left central incisor to open the bite for anterior crossbite correction (*Fig. 6*). The patient was also instructed to use a tongue blade as often as possible to manually correct the anterior crossbite. One month later (*1M*), brackets were bonded to the lower dentition, and standard-torque brackets were used for the lower anterior teeth. The

Fig. 6: Lower anterior bite turbos were used to open the bite.

lower second molars were not bonded to avoid mucosal irritation at the distal end of the archwire (*Fig. 7*). Within 8 months (*8M*), the anterior crossbite was corrected, and the bite turbos were removed (*Fig. 8*). The extraction space on the upper right closed spontaneously due to correction of crowding and mesial drift of the adjacent molar (*Fig. 8*). In the 9th month, 0.016x0.025-in stainless steel (*SS*) archwires were placed, and elastomeric chains were used to retain space closure. Bilateral Class II elastics (*Bear, 4.5-oz, Ormco, Glendora, California*) were stretched between the upper canine and lower first molar to facilitate space closure and achieve a better molar relationship.[14] In the 11th month (*11M*), a hook was installed on the bracket of upper left central incisor, and an intermaxillary elastic was applied from the upper left central incisor to the lower left canine to correct the 2mm midline discrepancy (*Fig. 9*). In the 12th month, the midline problem was not resolved, so a frenectomy of the hypertrophic upper labial frenum was suggested, which was rejected by the patient. In the 14th month, bilateral N-shape up-and-down elastics (*Ostrich, 2-oz*) were applied between the posterior teeth bilaterally to enhance maximum intercuspation. In the 16th month, the patient was satisfied with the progress and preferred to end treatment. All the fixed appliance were removed, and fixed retainers were bonded on the lingual surfaces of all incisors in the maxillary arch, as well as from canine to canine in the lower arch. Upper and lower clear overlay retainers were delivered.

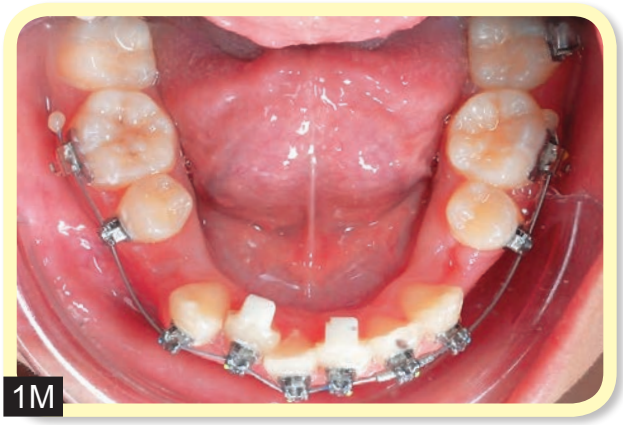


Fig. 7:
Extension of the 0.014x0.025-in CuNiTi archwire through the 2nd molars is not essential if it is expected that the subsequent archwire can engage the molar tubes of the 2nd molars easily. This approach helps to avoid discomfort to the patient.

Fig. 8:
The upper right extraction space closed spontaneously during initial alignment.

Fig. 9:
An intermaxillary elastic from the upper left central incisor to the lower left canine was used to correct the midline.

The patient was instructed to wear them full-time for 6 months and nights only thereafter. Instructions were provided for home dental care, as well as for maintenance of the retainers.

Treatment Results

Lip profile was improved, there was no lip strain, and the patient was able to smile naturally (*Fig. 10*). The teeth were well aligned, with Class I buccal segments on the right side, but there was a Class II buccal relationship on the left side (*Fig. 11*). The patient was satisfied with the progress at this stage and requested that the brackets be removed prior to completion of treatment. The ABO Cast-Radiograph Evaluation (*CRE*)[15] score is 24 as shown in Worksheet 2. This is an adequate finish for a patient with a DI score of 27, particularly since treatment was terminated with only 16 months of active treatment. However, two additional months of treatment would probably decrease the CRE considerably. The major unresolved alignment problems were mild rotations

Fig. 10: Post-treatment facial and intraoral photographs

(*6 points*), marginal ridge discrepancies (*8 points*), and occlusal relationships (*4 Points*). Many of these deficiencies could have been corrected by detailing bends in an 0.018-in SS wire. The post-treatment panoramic radiograph (*Fig. 12*) reveals that the root of upper left second premolar and first molar converge apically; therefore, 1 point was deducted. The post-treatment cephalometric radiograph and the superimposition of cephalometric tracings document the dentofacial changes achieved during treatment (*Figs. 13 and 14*).

Fig. 11: Post-treatment study models (casts)

Fig. 12: Post-treatment panoramic radiograph

Discussion

Treatment for Anterior Crossbite

There are several methods for treating anterior crossbite with either fixed or removable appliances.[7-12] A tongue blade is an easy and inexpensive device for correcting anterior crossbite of one or two teeth. The patient was instructed to use the device during leisure time. The tongue blade is placed between the anterior teeth in crossbite and deflected inferiorly so that the lower dentition serves as a fulcrum. The mechanics exerts labial force against the lingually-inclined maxillary anterior teeth and lingual force against the lower teeth (*Fig. 15*). This simple appliance corrects anterior crossbite ver effectively if the patient is compliant. Unlike other removable appliances, a tongue blade

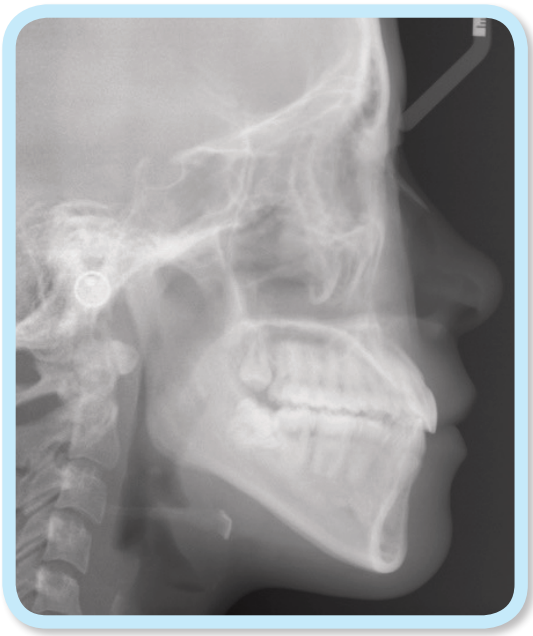


Fig. 13: Post-treatment cephalometric radiograph

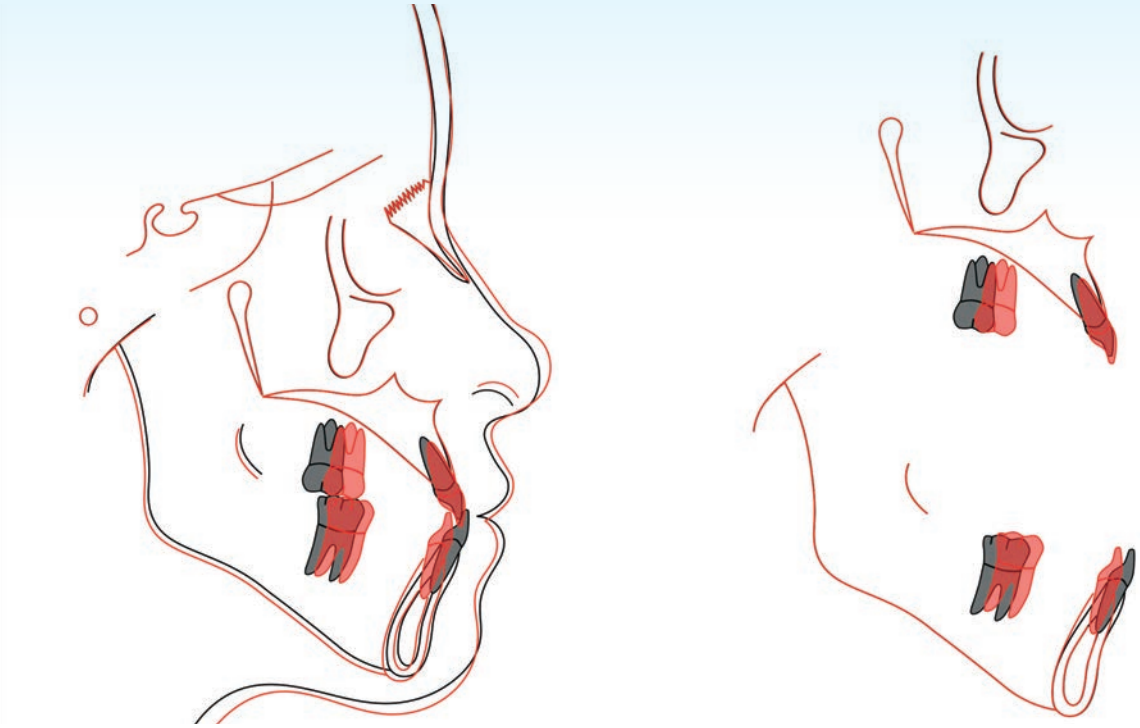


Fig. 14: Superimposed pre-treatment (black) and post-treatment (red) cephalometric tracings document the dental and facial changes.

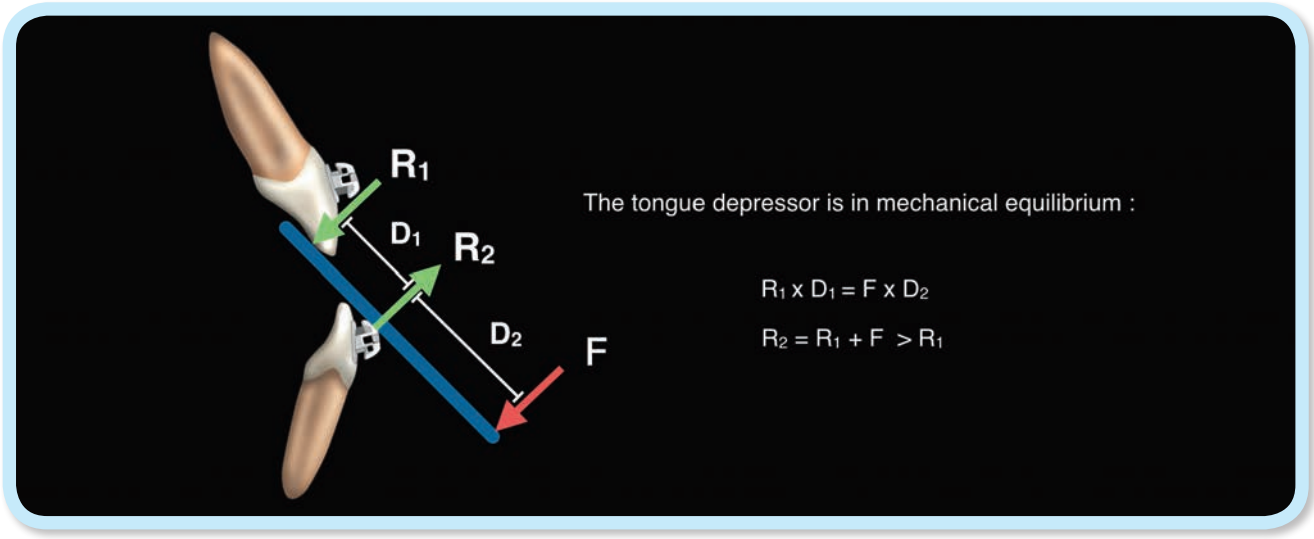


Fig. 15:
For anterior crossbite correction, a tongue blade (blue line) is placed between the upper and lower anterior teeth to exert labial force (the reactive force of R1) to the upper incisor and lingual force (the reactive force of R2) to the lower incisor when force (F) is applied by pressing a finger down at the end of the tongue blade. This device is a Class I lever with the lower teeth serving as the fulcrum. Note that the force exerted to the lower teeth is greater than that exerted to the upper teeth.

requires manual activation by the patient. The same result can be accomplished with tongue pressure, but that approach is less likely to achieve adequate compliance, compared to a more obvious device such as a tongue blade used at a planned frequency and duration.

Fixed appliances are usually more predictable, and are particularly effective if tipping of the maxillary dentition is the primary problem. However, archwire activation produces occlusal trauma unless the bite is opened with a removable orthotic or bite turbos. Anterior bite turbos have two important effects: 1. removing the occlusal interference, and 2. rotating the mandible posteriorly, which decreases the negative overjet. For severe negative overjet, early light short Class III elastics are an effective adjunct to the crossbite mechanics.

Torque Selection

A finishing archwire (*0.016x0.025-in SS*) has about ±20˚ play between the bracket lumen and the archwire.[16] Bracket torque selection is important to control dental axial inclinations during treatment. The axial inclination of the incisors is a particular concern when they are moved in the sagittal plane. Low-torque brackets are used for the upper arch because of the Class III intermaxillary elastics tend to flare the incisors. The expression of low torque offsets this flaring effect.[8,11] However, the current patient required supplemental mechanics because she had an asymmetric Class II/III malocclusion with minimal negative overjet. The anterior crossbite was corrected before placing the first rectangular archwire: 0.017x0.025-inch TMA. Furthermore, Class II elastics were used during mandibular posterior space closure to protract the molars, and prevent lingual tipping of the lower incisors. In retrospect, standard-torque brackets were indicated for the maxillary incisors to increase the U1 to SN angle (*105.5˚ pretreatment, see Table 1*), and high-torque brackets were a better choice for the lower arch to increase the L1 to MP angle (*85˚ compared to norm 90˚*).[17]

Space Closure Without Elastics

The extraction site for the upper right second premolar closed spontaneously during the initial alignment phase. More than half of the space closure appeared to be due to mesial movement of the upper right first molar (*Fig. 16*). Low bone density and the tripod configuration of the roots are conducive factors for mesial drift of maxillary molars into edentulous spaces.[18-19] The actual forces exerted on the maxillary right first molar to produce mesial migration are unknown, but it is well established that first molars move mesially into edentulous spaces as the second and third molars erupt.[16,18,19]

Frenum and Tooth Position

Soft tissue posture is an important etiologic factor in malocclusion and longterm stability,[20] because light continuous forces are effective for eliciting tooth movement.[21] Resting posture of the lips, tongue and cheeks exert constant light forces on the dentition.[20,21] Net forces on the buccal and lingual surfaces result in an equilibrium zone where

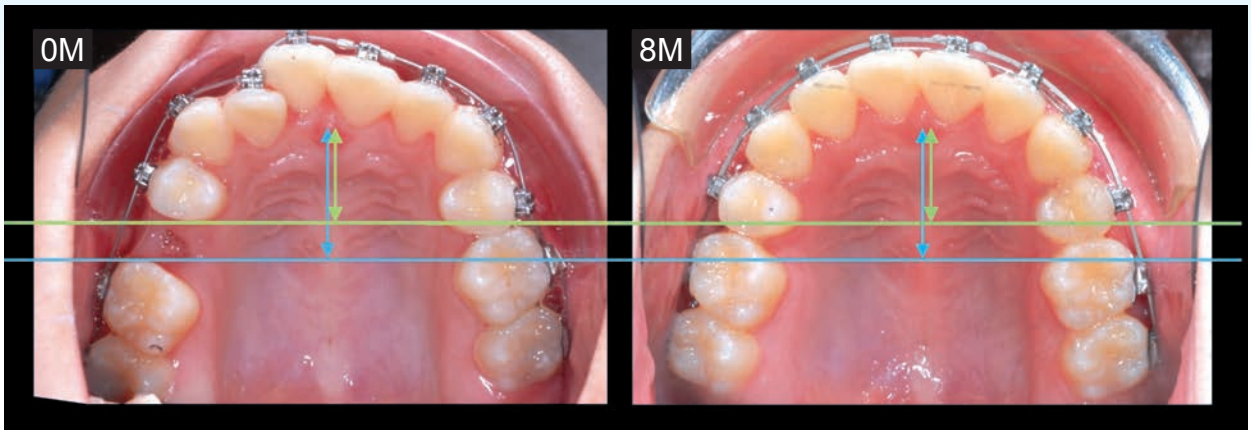


Fig. 16:
The position of the upper right first molar is compared in standardized intraoral photographs immediately after bracket bonding (0M) and eight months (8M) later, respectively. Utilizing the incisive papilla as landmark, the mesial drift of the upper right 1st molar is shown by a blue and green lines that define the length of the extraction site at the start of treatment. Although there was some distal drift of the first premolar, the extraction site was closed in 8 months primarily by mesial drift of the molar.

tooth position is stable. Orthodontic therapy moving teeth outside the boundaries of the equilibrium zone is subject to relapse unless there is permanent retention.[22,23] The etiology of some malocclusions are attributed to the constant force of tongue posture, but not to short duration tongue thrusting.[16,20,21] Evaluating all functional forces is important for establishing the etiology of a malocclusion, and effectively correcting it. For instance, open bites are typically tongue posture problems, and the abnormal posture must be corrected to achieve a stable result.[16,20]

A hypertrophic maxillary frenum may be the etiologic factor in some midline diastemas.[24,25] Sometimes the diastema closes spontaneously after frenectomy,[26] but it is more predictable to combine frenectomy with concomitant orthodontic treatment to close the space.[24] Proffit[16] recommends frenectomy after the orthodontic treatment, and only if there's a tendency for the diastema to reopen, due to excessive soft tissue mass in the midline area. The asymmetric midline problem for the current patient (*Figs. 2 and 3*) is associated with tipping of the maxillary central incisors. If crossbite correction does not solve the problem, unilateral intermaxillary elastics are indicated.

Distal Tipping of Mandibular Second Molar During Retention Period

At the four-year recall after active treatment, the mandibular second molar roots were displaced mesially, apparently due to pressure associated with development of the adjacent third molars (*Figs. 17 and 18*). There is no clear consensus that developing third molars have any influence on crowding of lower incisors,[27] but a direct effect on

the axial inclination of the adjacent second molar is highly probable (*Fig. 17*). It is not justified to extract lower third molars for prevention of lower incisor crowding, but when the impactions are mesially inclined, orthodontic alignment or extraction is indicated to prevent localized problems (*Figs. 17 and 18*). Extraction of both mandibular third molars was suggested to avoid further alignment problems, as well as to control the risk of periodontal disease and caries.

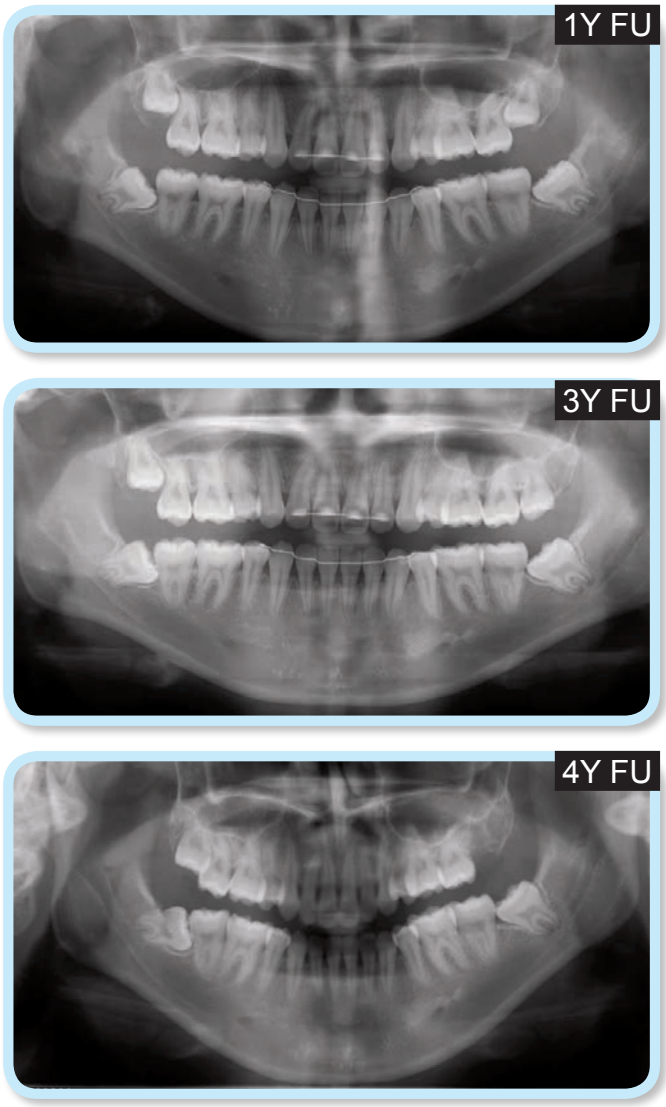


Fig. 17:
Panoramic radiographs at one-year (1Y FU), three-year (3Y FU), and four-year (4Y FU) follow-up show mesial movement of the lower second molar roots, apparently due to pressure from the impacted lower third molars. Note that root movement was greatest on the side with the most horizontal orientation of the impaction.

Relationship Between Relapse and Treatment Time

Over a century ago, Angle[28] suggested that relapse was related to how rapidly a malocclusion was corrected. Theoretically, slow tooth movement allows for more physiologic reorganization of the supporting tissues as the malocclusion is corrected.[23] Since the present severe malocclusion (*DI=27*) was corrected in only 16 months, it was wise to plan a rigorous retention phase to provide adequate time for remodeling of supporting bone[18] and soft tissue reorganization.[23] It is unclear if prolonged wear of retainers increases longterm stability, so continuing the night-time wear of the clear overlay retainers was recommended indefinitely. The patient should be educated that it is wise to retain acquired desirable traits to avoid the necessity for retreatment.

For Class III patients, late mandibular growth is a significant concern,[5,8] which cannot be controlled with intraoral retainers. It is important to follow up Class III treatment until the adult years. The occlusal and facial results were well-maintained during four years of follow-up until the patient reached about 22 years of age. Significant late mandibular growth was not observed.

Conclusions

1. Uncomplicated anterior crossbite with moderate crowding can be effectively treated with posterior bite turbos and light archwires in PSL brackets. For more severe sagittal discrepancies, the addition of early light short Class III elastics may be indicated.

2. Bracket torque selection depends on a careful assessment of the original malocclusion relative to the treatment plan. Low torque brackets in the maxillary anterior are indicated if substantial use of Class III elastics is anticipated.

3. Post-treatment retention is an integral part of comprehensive treatment.

4. Soft tissue posture and unerupted third molars are important factors in the etiology of malocclusion.

Fig. 18:
In the right buccal photograph taken at four-year follow-up (4Y FU), the second molar is tipped distally, consistent with the radiographic image shown in Fig. 17.

References

1. Chang HP, Tseng YC, Chang HF. Treatment of mandibular prognathism. J Formosan Med Assoc 2006;105(1):781-90
2. Burgersdijk R, Truin GJ, Frakenmolen F, Kalsbeek H, van't Hof M, Mulder J. Malocclusion and orthodontic treatment need of 15-74-year-old Dutch adults. Community Dentistry and Oral Epidemiology 1991;19:64-67.
3. Willems G, De Bruyne I, Verdonck A, Fieuws S, Carels C. Prevalence of dentofacial characteristics in a Belgian orthodontic population. Clin Oral Investig 2001;5,:220-226.
4. Chang MJ, Lin JJ, Roberts WE. Probable airway etiology for a severe Class III openbite malocclusion: conservative treatment with extra-alveolar bone screws and intermaxillary elastics. Int J Orthod Implantol 2017;45:4-20.
5. Lin JJ. Creative Orthodontics Blending the Damon System & TADs to Manage Difficult Malocclusions. 2nd ed. Taipei: Yong Chieh; 2010. p.263-271.
6. Komazaki Y, Fujiwara T, Ogawa T, Sato M, Suzuki K, Yamagata Z, Moriyama K. Prevalence and gender comparison of malocclusion among Japanese adolescents: a population-based study. J World Fed Orthod 2012;1(2):67-72.
7. Shih YH, Lin JJ, Roberts WE. Treatment of a Class III Malocclusion with anterior crossbite and deepbite, utilizing infrazygomatic crest (IZC) bone screw as anchorage. Int J Orthod Implantol 2015;40:2-14.
8. Tseng SP, Chang CH, Roberts WE. Early treatment of anterior crossbite complicated by maxillary posterior crowding. Int J Orthod Implantol 2013;30:62-72.
9. Lin JJ. Mandibular growth and Class III treatment. Int J Orthod Implantol 2013;32:4-13.
10. Sugawara J, Asano T, Endo N, Mitani H. Long-term effects of chin-up therapy on skeletal profile in mandibular prognathism. Am J Orthod Dentofacial Orthop 1990;98(2):127-33.
11. Huang YH, Chang CH, Roberts WE. Correction of anterior crossbite complicated with two supernumerary teeth. Int J Orthod Implantol 2013;31:44-60.
12. Ulusoy AT, Bodrumlu EH. Management of anterior dental crossbite with removable appliances. Contemp Clin Dent 2013;4(2):223-226.
13. Cangialosi TJ, Riolo ML, Owens SE, Dykhouse VJ, Moffitt AH, Grubb JE, Greco PM, JD English, RD James. The ABO discrepancy index: a measure of case complexity. Am J Orthod Dentofacial Orthop 2004;125(3):270–278.
14. Steffen JM, Haltom FT. The five-cent tooth positioner. J Clin Orthod 1987;21:528-529.

15. Casko JS, Vaden JL, Kokich VG, Joseph Damone, James RD, Cangialosi TJ, Riolo ML, Owens SE, Bills ED. Objective grading system for dental casts and panoramic radiographs. American Board of Orthodontics. Am J Orthod Dentofacial Orthop 1998;114(5):589–599.
16. Profit WR, Fields HW, Sarver DM. Contemporary Orthodontics. 4th ed. St. Louis: Mosby; 2007.
17. Kozlowski J. Honing Damon system mechanics for the ultimate in efficiency and excellence. Clinical Impression 2008;16:23-28.
18. Roberts WE. Bone physiology, metabolism and biomechanics in orthodontic practice. In: Orthodontics: Current Principles and Techniques, Chapter 10, 5th ed. Graber LW, Vanarsdall RL Jr, Vig KWL (Eds). St. Louis: Elsevier Mosby; 2012. pp. 287-343.
19. Roberts WE, Nelson CL, Goodacre CJ. Rigid implant anchorage to close a mandibular first molar extraction site. J Clin Orthod 1994;28(12):693-704.
20. Proffit RW. Equilibrium theory revisited: Factors influencing position of the teeth. Angle Orthod 1978;48:175-186.
21. Weinstein S, Haack DC, Morris LY, Snyder BB, Attaway HE. On an equilibrium theory of tooth position. Angle Orthod 1963;33(1):1-26.
22. Ackerman JL, Proffit RW. Soft Tissue Limitations in Orthodontics: Treatment planning guidelines. Angle Orthod 1997;67(5):327-336
23. Graber LW, Vanarsdall RL, Vig KW. Orthodontics: Current principles and techniques. 5th ed. Philadelphia: Mosby; 2012. p. 991-1022.
24. Suter VGA, Heinzmann AE, Grossen J, Sculean A, Bernstein MM. Does the maxillary midline diastema close after frenectomy? Quintessence Int 2014;45(1):57-66.
25. Delli K, Livas C, Sculean A, Katsaros C, Bornstein MM. Facts and myths regarding the maxillary midline frenum and its treatment: a systematic review of the literature. Quintessence Int 2013;44(2):177-87.
26. Koora K, Muthu MS, Rathna PV. Spontaneous closure of midline diastema following frenectomy. J Indian Soc Pedod Prev Dent 2007;25(1):23-6.
27. Zawawi KH, Melis M. The role of mandibular third molars on lower anterior teeth crowding and relapse after orthodontic treatment: A systematic review. Scientific World Journal 2014;2014:615429.
28. Angle EH. Malocclusion of the teeth, 7th ed. Philadelphia: SS white Dental Manufacturing; 1907.

Discrepancy Index Worksheet

TOTAL D.I. SCORE 27

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 = 8

Total = 8

OVERBITE

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

Total = 2

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 = 4

OCCLUSION

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

Total = 6

LINGUAL POSTERIOR X-BITE

1 pt. per tooth Total = 1

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° 1 x 2 pts. = 2

≤ 26° = 1 pt.

Each degree < 26° _____ x 1 pt. = _____

1 to MP ≥ 99° = 1 pt.

Each degree > 99° _____ x 1 pt. = _____

Total = 4

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	1 x 2 pts. =	2

Identify: Oblique midline

Total = 2

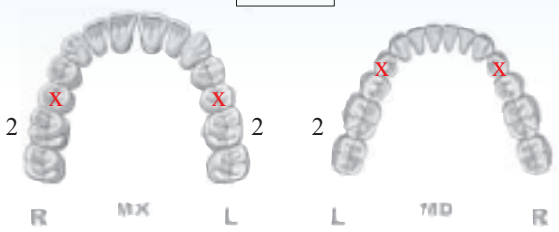
Cast-Radiograph Evaluation

Case # **Patient**

Total Score: 24

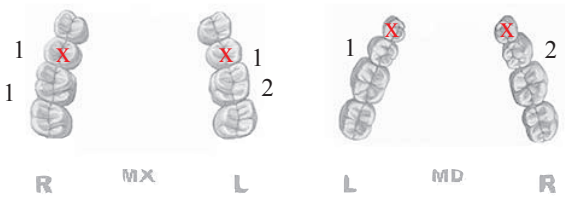
Alignment/Rotations

6



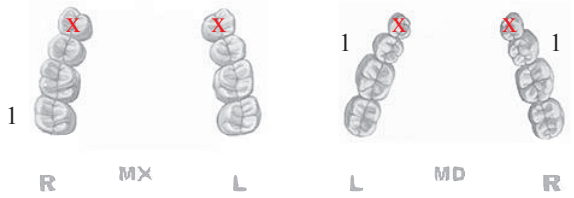
Marginal Ridges

8



Buccolingual Inclination

3

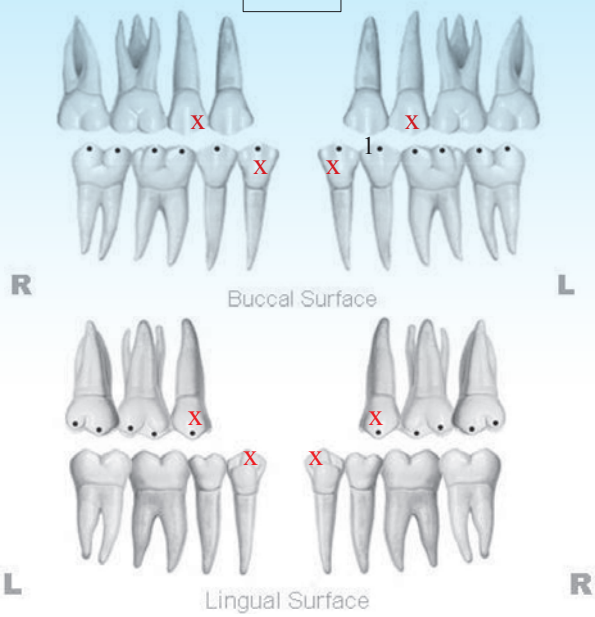


Overjet

1

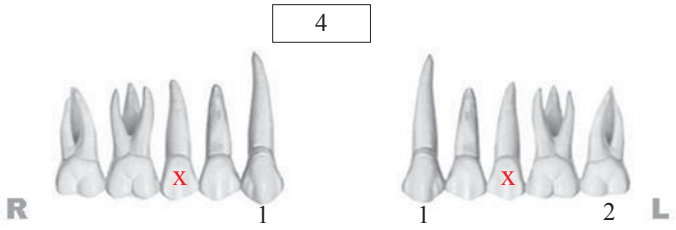
Occlusal Contacts

1



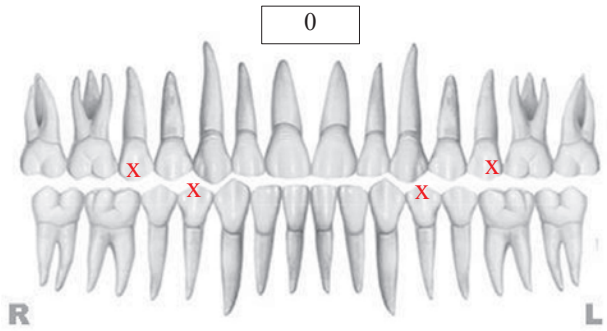
Occlusal Relationships

4



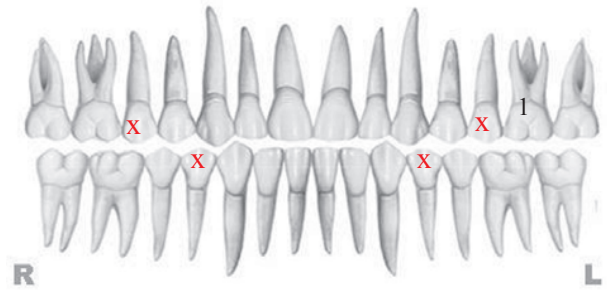
Interproximal Contacts

0



Root Angulation

1



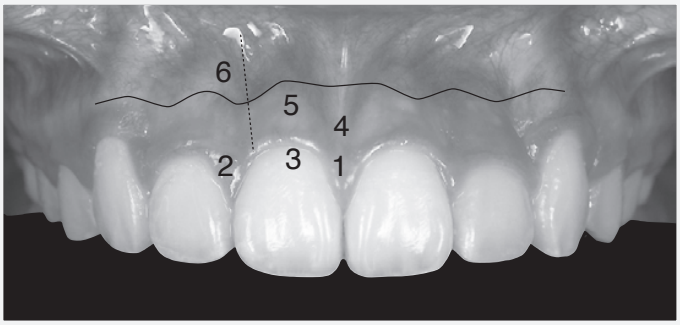
INSTRUCTIONS: Place score beside each deficient tooth and enter total score for each parameter in the white box. Mark extracted teeth with "X". Second molars should be in occlusion.

IBOI Pink & White Esthetic Score

Total Score: = 7

1. Pink Esthetic Score

Total = 3

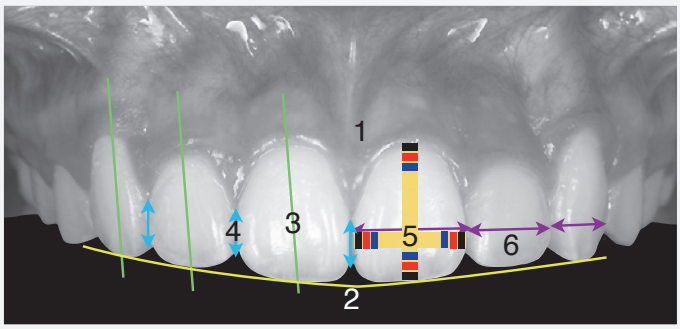


1. M & D Papillae	0	1	2
2. Keratinized Gingiva	0	1	2
3. Curvature of Gingival Margin	0	1	2
4. Level of Gingival Margin	0	1	2
5. Root Convexity (Torque)	0	1	2
6. Scar Formation	0	1	2

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 = 4



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

Kerr™
ENDODONTICS

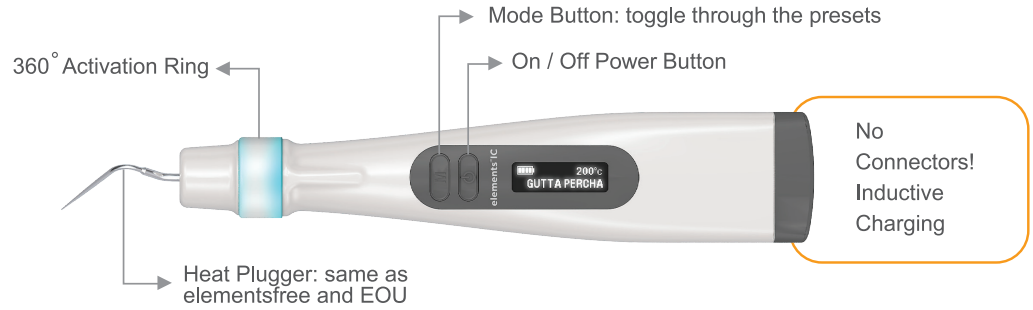
NEW ARRIVAL

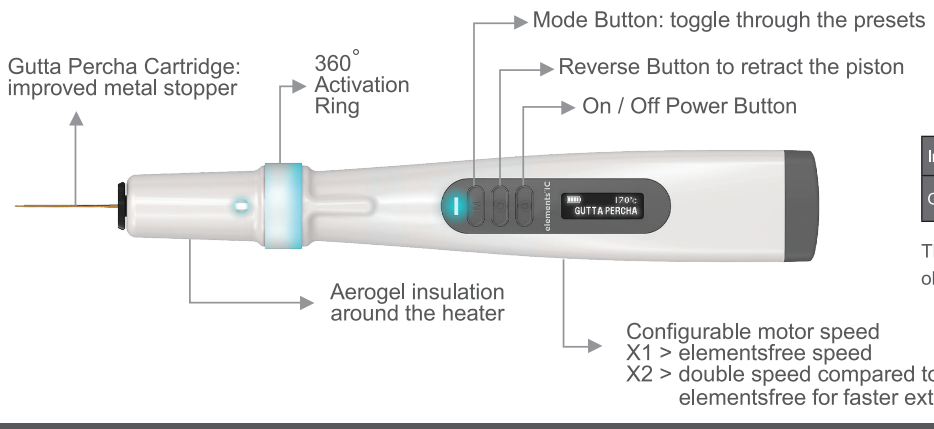
2020 TOP AWARD WINNER

DENTAL ADVISOR

榮獲 2020 Dental Advisor
Continous Wave Obturation
TOP AWARD WINNER

elements™ IC



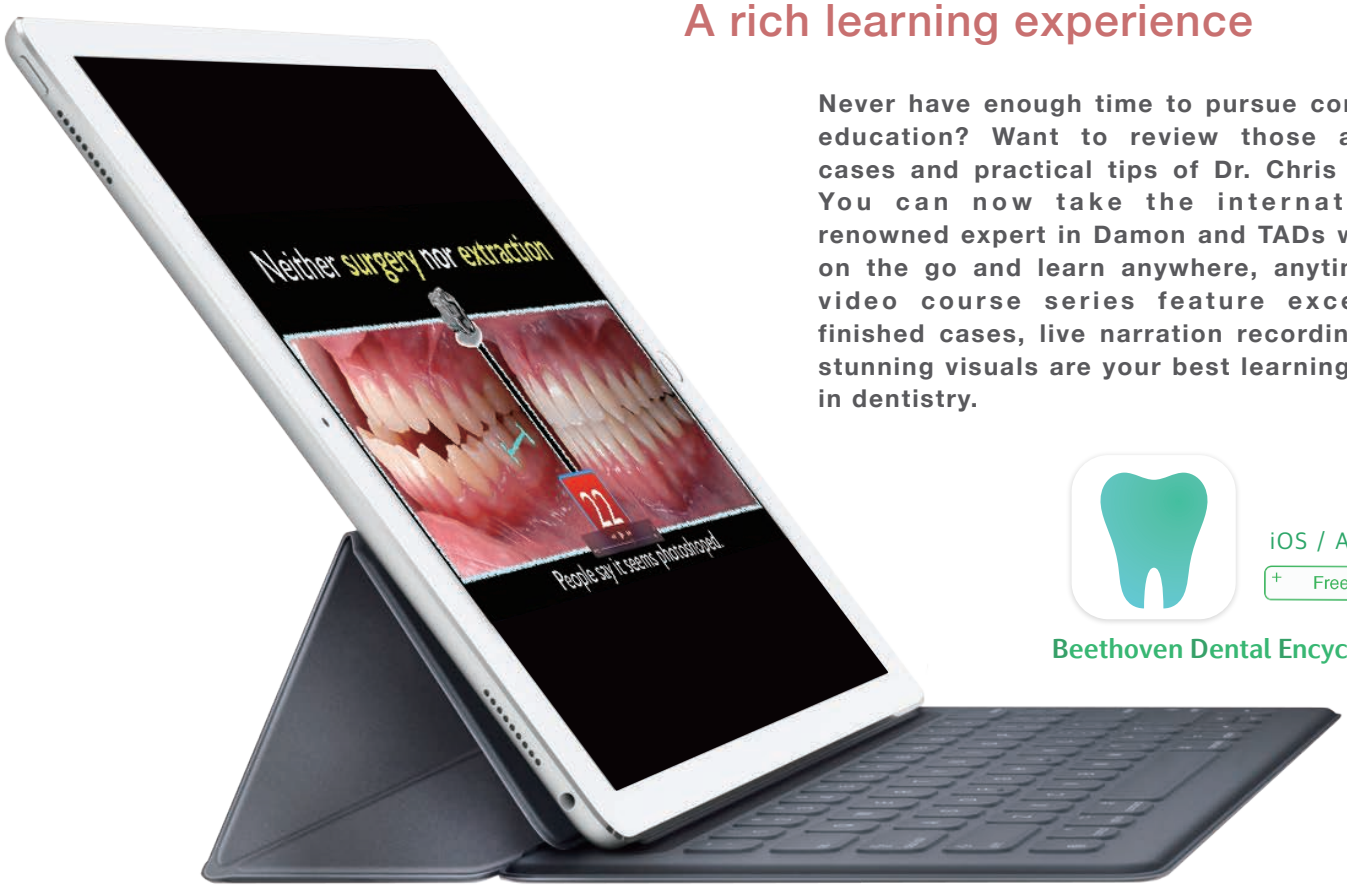


Indicator	4	3	2	1	0
Gutta Percha Level	Full	75%	50%	25%	Empty

The indicator estimates how many canals you can obturate with the material left in the GP cartridge.

e-Courses

A rich learning experience



Never have enough time to pursue continuing education? Want to review those amazing cases and practical tips of Dr. Chris Chang? You can now take the internationally renowned expert in Damon and TADs with you on the go and learn anywhere, anytime. The video course series feature excellently finished cases, live narration recordings, and stunning visuals are your best learning source in dentistry.

iOS / Android

+ Free App

Beethoven Dental Encyclopedia

Series

narrated

Damon Master

Damon Master

narrated

Lecture

E-Lecture

narrated

OBS TAD

OBS (TAD)

non-narrated

Finishing

Finishing
(12 seasons)

non-narrated

Implant Forum

Implant Forum
(9 seasons)

non-narrated

Assistant

Assistant

non-narrated

E Ortho

E-Ortho

non-narrated

E Implant

E-Implant

non-narrated

E Pedo

E-Pedo

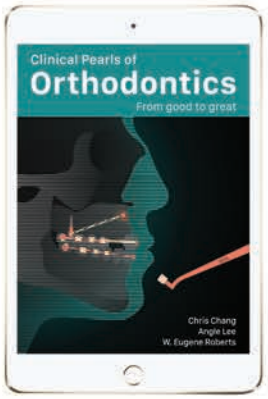
Note:

1. Most video courses are available in both English and Chinese and are sold separately.
2. Damon Master and OBS (TAD) are renewed annually and each renewal is to be purchased separately with a 50% discount.

e-BooK

Learn it your favorite way!

Best of all



+ BUY BOOK

This book requires iBooks 3.0 or later and iOS 5.0 or later.

The World's Best e-Textbook

Beethoven Dental Encyclopedia

e-Books collection

Beethoven Orthodontic and Implant Group has been publishing the International Journal of Orthodontics and Implantology since 2007. This Journal features excellently finished case reports evaluated by objective grading systems. **The Orthodontics and Implant Dentistry eBook series** is a special selection of exciting cases with interactive functions and multimedia resource. Once opening this book, your understanding of dentistry will never be the same!

Now available in iBooks Store in 51 countries:

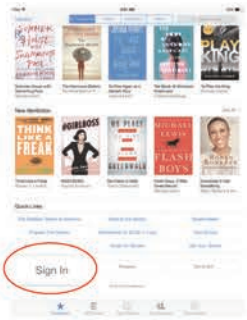
Argentina, Australia, Austria, Belgium, Bolivia, Brazil, Bulgaria, Canada, Chile, Colombia, Costa Rica, Cyprus, Czech Republic, Denmark, Dominican Republic, Ecuador, El Salvador, Estonia, Finland, France, Germany, Greece, Guatemala, Honduras, Hungary, Ireland, Italy, Japan, Latvia, Lithuania, Luxembourg, Malta, Mexico, Netherlands, New Zealand, Nicaragua, Norway, Panama, Paraguay, Peru, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, United Kingdom, United States, and Venezuela.

Get it on iBooks

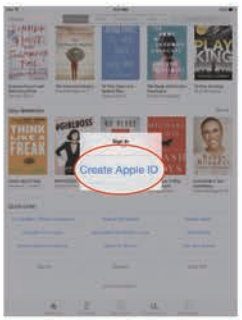
Step-by-step Instructions

1. Launch "iBooks" app on your iPad.

2. Click "Store."



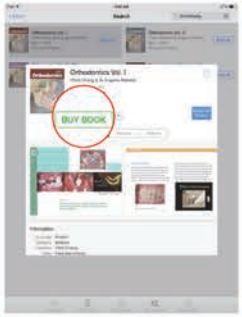
3. "Sign in" with your Apple ID.



4. "Create Apple ID" if you don't have one.

5. Search for "chrischang."

6. Click the book's icon.



7. Check the price and click "BUY BOOK."

8. Once downloaded, click the book's icon to launch the e-book and enjoy.

If you are interested in our paid video or medical products, contact **inewton.dental@gmail.com** for more information.

+886-3-573-5676

orthobonescrew.com

iNewton

Chapter 1. Eco-Pond Filtration System

Be a filter, not a sponge.

— The Perks of Being a Wallflower

During the ongoing global pandemic, Dr. Chris Chang has had the opportunity to stay in Taiwan and complete his ideal home for his future retirement. Attempting not only to create a haven for his family, but also to accommodate Taiwanese wildlife, he turned to the US National Wildlife Federation for their guidance in creating a wildlife habitat. In order to be recognized as a Certified Wildlife Habitat, a property has to be able to sustainably provide essential elements such as food, water, cover, and places to raise young. Among these essentials, water is of the greatest importance to life - not only how it maintains life, but also in the creation thereof.

As an artist, Dr. Chris has always been fascinated by the interplay of the gleams and shadows which are constantly reflected on the surface of moving water. Therefore, it came as no surprise that a pond would have to be integrated as a main feature of his garden.

The eco-pond has been designed with a specific filtration system to ensure that the water is constantly flowing and that unwanted debris can be easily removed. The filtration system is four-fold, including a skimmer, a bio-fall filter, Aqua Blox under gravel, and water plants. The skimmer has to be installed at a low point of the pond, with an opening at water level, allowing water to naturally flow into it. As the water passes through the skimmer, larger objects floating in the pond, such as leaves and twigs, can be trapped and collected for easy disposal. The

Fig. 1: Camouflaged by a faux-stone covering, the skimmer performs its duties unnoticed. Have you spotted it yet? Bottom left corner, under the potted plant!

water is then pumped from the skimmer to the bottom tank of a bio-fall filter, which has been installed at the most elevated point of the pond. In addition to filtering smaller debris from the water, the bio-fall filter also serves as a bed for essential life-generating bacteria to flourish. As the water rises in the bio-fall filter, it is cleansed and loaded with bacteria before it emerges in the form of a water spring, following the downwardly-arranged rocks, and finally re-entering the pond in the form of a cascade. For the untrained eye, a cascade may only add visual and auditory esthetics to the pond. However, it is of major importance for oxygenating the water, allowing aquatic plants and animals to thrive.

The third part of the filtration mechanism is at the bottom of the pond. Strong skeleton boxes called Aqua Blox are paved at the base of the pond to create a void under a layer of gravel. With natural circulation, water is once again filtered as it passes through the tiny gaps between the stones and sand grains. Last but not least, water plants play an indispensable part in an eco-pond, especially one that has been created to accommodate aquatic animals. Animals produce nitrogenous wastes, such as ammonia, which not only cause odour and contamination but can also be toxic. Water plants help to absorb and remove these substances, keeping the water fresh, while simultaneously benefiting from them.

Dr. Chris always encourages others to be curious and observant, and his school of thought behind these two qualities is very much in line with a filtration system: curiosity opens doors for new possibilities, but observation is required to help

Fig. 2: A blend of beauty and practicality: the cascade oxygenates th

us stay on the right track! The movie line "Try to be a filter, not a sponge" is a perfect reminder. Do not absorb everything like a sponge; instead, take in only what is important and allow those things that might distract you to flow on their natural path.

Let's be filters!

Desk editor of JDO & a wildlife enthusiast*

Annie Chen

* Title bestowed by Dr. Chris Chang

Special thanks to Mr. Paul Head for refining this article.

e water, allowing plant life to thrive.

Fig. 3: Koi (Japanese Carp) ripple the surface, creating an ever-changing feeling in the pond.

Fig. 4: Aquatic plants and gravel (nature's cleansing mechanism), in conjunction with a man-made system, create a robust filtration system to keep the water clean and fresh.

Hasta un 30% de descuento

Ortodoncia Vol. I~III

¡El mejor Ebook de ortodoncia del mundo en español!

Aprendiendo de casos de ortodoncia de Chris Chang EN ESPAÑOL!

"Ortodoncia" es una colección completa de reporte de casos finalizados de acuerdo a los estándares de evaluación de la American Board of Orthodontics. Toda la serie de libros electrónicos son una selección especial de casos interesantes con funciones interactivas y recursos multimedia, que presentan un proceso de tratamiento detallado y consejos clínicos prácticos. ¡Todo en español!

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

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

Made in Taiwan

New

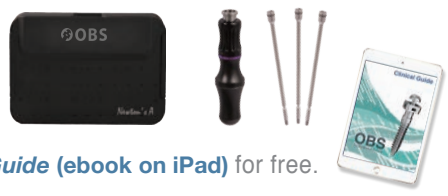
Titanium Higher biocompatibility*

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

2021-2022 第十三年度

貝多芬 矯正精修班

時間：週二上午 09:00-12:00

地點：金牛頓教育中心（新竹市建中一路 25 號 2 樓）

上課日期：

2021 6/8、7/13、8/24、9/14、10/19、11/9、12/14

2022 1/11、2/15、3/15、4/12

- 09:00 ~ 10:00　精選文獻分析
- 10:00 ~ 10:30　精緻完工案例
- 10:50 ~ 12:00　臨床技巧及常犯錯誤分享

全新的第十三年度 2021-22 貝多芬精修班，是由國際知名講師張慧男醫師主持，並偕同貝多芬牙醫團隊住院醫師群共同主講。

每月一次的課程之中，包含了：

1. 精選矯正權威期刊 AJODO 的文章做文獻分析與評讀。
2. 精緻完工 ABO 案例報告，其中因應數位矯正的世界趨勢，Insignia 與 Invisalign 病例為課程探討的主要內容之一。
3. 分享臨床上常犯的錯誤以及解決方法。

2021-22 貝多芬精修班內容豐富精彩，讓您經由每個月一次的課程，在面對各式的臨床案例時，更能游刃有餘、得心應手。

學習目的：

研讀最新趨勢文章可以窺知世界文獻公認的治療方式，而藉由評論文章的優缺點不僅能夠訓練判斷與思考能力，更可以清楚比較作法上的不同，達到完整理解治療方向、內容與穩定性的目標。

報名專線：03-5735676 #201　蔡佳汶

2021 一年一度 預報享優惠價 Damon Master Program

全新改版的 2021 貝多芬高效 Damon 矯正大師系列課程，是由**國際知名講師張慧男醫師親自規劃及授課**，課程特色強調由臨床病例帶動診斷、分析、治療計畫擬定與執行技巧，本年度亦特別加入最新的**數位矯正與隱形牙套**的內容，並邀請了貝多芬牙科集團各院院長演講**特別矯正專題**。

此外，透過數位影片反覆觀看，結合矯正與電腦教學，課堂助教協助操作，以及診間臨床見習，讓學員在短時間能快速上手，感染**「熱愛矯正學，熱愛學矯正」**的熱情。

名額有限，一年僅有一次機會在台完整體驗 Damon 矯正大師課程，錯過只能等明年囉！

Module 1 - 4/22 (A班) | 5/20 (B班*)

1. Selecting your ideal first case
2. Bonding position
3. Bonding + BT + Ceph tracing
4. TADs + space closing + hook + spring
5. Finishing bending & fixed retainer

Practice: Clinical photography

Module 2 - 5/13 (A班) | 6/3 (B班)

1. Four stages of efficient orthodontic treatment
2. Simple and effective anchorage system
3. Extraction vs. Non-extraction analysis

Practice: Patient photo management

Module 3 - 5/27 (A班) | 6/24 (B班)

1. Soft & hard tissue diagnostic analysis
2. Big overjet correction
3. Damon diagnosis & fine-tuning

Practice: Ceph tracing

Module 4 - 6/17 (A班) | 7/29 (B班)

1. Excellent finishing
2. Retention & relapse

Practice: Ceph superimposition & measurement

Module 5 - 7/8 (A班) | 8/12 (B班)

1. Simplify your system
2. Extraction vs. non-extraction

Practice: Case report demo

▲ **Computer training (Mac): 1:30-2:30 pm**

★B班為特別加開班

Module 6 - 8/5 (A班) | 9/30 (B班)

1. Class III correction
2. Class II correction

Topic: Early orthodontic treatment (曾淑萍醫師)

Module 7 - 9/9 (A班) | 10/14 (B班)

1. Upper impaction
2. Lower impaction
3. Gummy smile correction

Topic: Modfied VISTA (蘇筌瑋醫師)

Module 8 - 9/16 (A班) | 11/4 (B班)

1. ABO DI, CRE workshop
2. Open bite

Topic: Modified 2X4 appliance in ortho treatment (徐玉玲醫師)

Module 9 - 10/21 (A班) | 11/25 (B班)

1. Asymmetry
2. Implant-ortho combined treatment
3. Interdisciplinary treatment-adult complex cases

Topic: Interdisciplinary approach (邱上珍醫師)

Module 10 - 11/11 (A班) | 12/9 (B班)

1. Minor surgeries in orthodontics
2. Digital orthodontics

Topic: Ortho-viewed interdisciplinary treatment (徐重興醫師)

Module 11 - 12/23 (A班) | 12/30 (B班)

1. Aligner & TADs
2. Keys to aligner learning

Topic: Pre-aligner treatment (林詩詠醫師)

▲ **Special lecture: 1:30-2:30 pm**

時間：週四全天（9 am - 5 pm）
地點：金牛頓藝術科技（新竹市建中一路 25 號 2 樓）
費用含課程視訊、iPad、課程電子書與材料。

報名專線 湧傑 Yong Chieh

北區 楊文君	中區 張馨云	南區 蔡淑玲
02-27788315 #122	04-23058915	07-2260030

LINE@ 官方帳號

Facebook 官方帳號

"From this book we can gain a detailed understanding of how to utilize this ABO system for case review and these challenging clinical cases from start to finish."

Dr. John JJ Lin, Taipei, Taiwan

"I'm very excited about it. I hope I can contribute to this e-book in someway."

Dr. Tom Pitts, Reno, Nevadav, USA

"A great idea! The future of textbooks will go this way."

Dr. Javier Prieto, Segovia, Spain

"No other book has orthodontic information with the latest techniques in treatment that can be seen in 3D format using iBooks Author. It's by far the best ever."

Dr. Don Drake, South Dakota, USA

"Chris Chang's genius and inspiration challenges all of us in the profession to strive for excellence, as we see him routinely achieve the impossible."

Dr. Ron Bellohusen, New York, USA

"This method of learning is quantum leap forward. My students at Oklahoma University will benefit greatly from Chris Chang's genius. "

Dr. Mike Steffen, Oklahoma, USA

"Dr. Chris Chang's innovation eBook is at the cutting edge of Orthodontic Technology... very exciting! "

Dr. Doraida Abramowitz, Florida, USA

"Dr. Chang's technique is absolutely amazing and cutting-edge. Anybody who wants to be a top-tiered orthodontist MUST incorporate Dr. Chris Chang's technique into his/her practice."

Dr. Robert S Chen, California, USA

"Dr. Chris Chang's first interactive digital textbook is ground breaking and truly brilliant! "

Dr. John Freeman, California, USA

"Tremendous educational innovation by a great orthodontist, teacher and friend."

Dr. Keyes Townsend Jr, Colorado, USA

"I am awed by your brilliance in simplifying a complex problem."

Dr. Jerry Watanabe, California, USA

"Just brilliant, amazing! Thank you for the contribution."

Dr. Errol Yim, Hawaii, USA

"Beyond incredible! A more effective way of learning."

Dr. James Morrish Jr, Florida, USA

New Release!

On the first weekend of April, Dr. Chris Chang talked in a live webinar with Ormco Middle East. The topic was on 12 extraction variations treated with self-ligating system.