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熱愛學矯正

全新的貝多芬高效 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。此外，透過數位影片反覆觀看，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。

張慧男 博士

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美國 Angle 學會會員

Damon Master

(Thu) 9:00-5:00 中文授課

The new 2017 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 and result 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.

Year 1 2018

Module 1 - **5/17**/18' Module 4 - **8/2**
Module 2 - **6/21** Module 5 - **9/13**
Module 3 - **7/5** Module 6 - **6/27.29.30**（擇一）

Year 2 2018-19

Module 1 - **10/18** Module 4 - **1/3**/19'
Module 2 - **11/22** Module 5 - **2/14**
Module 3 - **12/20**

Damon + .014 Cu NiTi

Excellent Finishing

(Tue) 9:00-12:00 中文授課

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

Finishing IX

Module 1 - **8/15**/17' Module 6 - **1/9**/18'
Module 2 - **9/26** Module 7 - **3/6**
Module 3 - **10/17** Module 8 - **4/10**
Module 4 - **11/14** Module 9 - **5/15**
Module 5 - **12/19** Module 10 - **6/26**
Module 11 - **7/17**

Damon Clear

Damon, OBS & VISTA International Workshop

English Class

The Workshop provides a 2.5 day, advanced hands-on program to experienced Damon users. The program includes world-class lectures, model and surgical hands-on workshops and clinical observation on patient care and clinic management.

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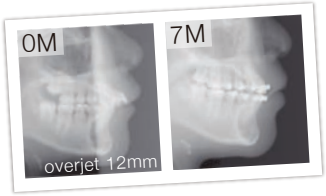
+886-3-573-5676 #218 Bella

2018

Class 1 - **5/22-25** Class 2 - **12/04-07**
Additional session - **3/13-16**

2019

Class 1 - **5/21-24** Class 2 - **12/03-06**



Damon + Bite Turbo +
Early Light Short Elastic

每次上課請依最新一期 IJOI 公告為主

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Why the Journal of Digital Orthodontics?

Everything must change...and as the year changes, I decided to change the name of our humble journal to the Journal of Digital Orthodontics (*JDO*). Many of you may be asking yourselves why and the answer is easy, I am convinced that digital orthodontics will be the mainstream for at least the next decade and we must move with the times.

Actually, digitally generated orthodontics has already entered the mainstream, it's just we're starting to notice it now. It all really started 20 years ago, as our diagnosis materials – slides and x-rays – changed from analogue to digital. The most obvious change has been in x-rays, from 2D to 3D, broadening our view of not only the oral cavity, but including every aspect of the skull. This has been followed by stone models, which after over a century of being used diagnostically are now fully digitalised. Suddenly, it is only necessary to do an intra-oral scan and then, 3 minutes later, a complete 3D model is ready for diagnosis, eliminating model construction as well as the inconvenience of retrieving and the expense of storing them.

3D for stone models in this instance could equal 3 disappearances– production, retrieval and storage and its replacement is a perfect digital 3D intraoral / skeletal image. This precise digital information can now be used to make customised orthodontic appliances, either fixed or removable based on the patients' demands. Dr. Angle is surely nodding his head in approval up in heaven!!

Thanks to today's high speed digital internet connection, this information can then be forwarded anywhere in the world, to allow the appliances to be fabricated and sent back to you. Using cloud technology, you can view them wherever you happen to be on this planet. Furthermore, we can also share our information with the rest of the world's orthodontists, creating a huge database of case experience, which enables us to make our treatments more effective, efficient and precise. This is artificial intelligence at its best!

In the technology adoption life cycle there are 5 distinct phases: innovators, early adopters, the early majority, the late majority and the laggards. As digital orthodontics is the future, I encourage you to join myself and many of my contemporaries in the early majority. I sincerely believe that our Journal of Digital Orthodontics will help you to become a force in the early majority of digital orthodontists and allow you to march together with us on the digital path to glory.

Chris Chang DDS, PhD, Publisher of IJOI.

Non-Extraction Treatment of Facial Asymmetry, Midline Deviation, Missing UR4 and TMD

Abstract

A 24 year 5 month female presented with chief complaints: facial asymmetry, missing upper right premolar (UR4), crowding, and left TMJ clicking.

***Diagnosis**: Assessment of the face revealed decreased convexity (8˚), increased lower facial height (57%), steep mandibular plane (FMA 30.5˚), as well as mandibular deviation and an occlusal cant to the right (4˚). An asymmetric Class II malocclusion (1mm left and 3mm right) was associated with a maxillary dental midline 3mm to the right, impinging deepbite (6mm, 70%), deep curve of Spee (3mm), wear facet on the UL3 (bruxism), and crowding in both arches (6mm/10mm). The Discrepancy Index (DI) was 30.*

***Etiology**: Constricted arches reflect inadequate masticatory loading, probably relating to the refined diet of most industrialized countries. Decreased arch length secondary to constricted jaws resulted in severe crowding of both arches. The UR4 was previously extracted to make room for the erupting UR3. The facial asymmetry, occlusal cant to the right, and TMJ clicking are probably related to a habitual sleep posture on the left side of the face.*

***Treatment Plan**: Avoid sleeping in the same habitual position, and refrain from wide opening of the jaws, that exceeds the requirement for normal function. Place a full fixed passive self-ligating (PSL) appliance for nonextraction alignment and leveling. Utilize expansion and bilateral infrazygomatic crest (IZC) bone screw anchorage to relieve crowding and correct asymmetry. Correct posterior crossbites with arch coordination and cross-elastics, as needed. Assess the need for more invasive treatment if the current camouflage approach fails to satisfy the esthetic and functional needs of the patient.*

***Results**: A severe malocclusion (DI 30) was corrected to a CRE score of 24 with 33 months of active treatment. Facial form was maintained, the asymmetry was improved ~3˚, and the maxillary dental midline was corrected. TMD symptoms were reduced by correcting sleep posture and establishing a coincident centric relation to centric occlusion relationship.*

***Conclusion**: Non-extraction camouflage treatment, utilizing a low force PSL appliance for arch expansion, and IZC bone screws for retraction, produced near ideal dental alignment (CRE 24). The facial asymmetry and the cant of the occlusal plane was reduced to an acceptable level (~1˚). The patient was well satisfied with the outcomes of the conservative treatment. (J Digital Orthod 2018;49:4-20)*

Key words:
Facial asymmetry, midline deviation, deepbite, early loss of a maxillary premolar, canting of the occlusal plane, TMJ clicking, passive self-ligation appliance, IZC bone screws, sleep posture, bruxism

History and Etiology

A 24 year 5 month female (*Figs. 1-6*) presented with decreased facial convexity (*8˚*), and lower facial deviation to the right (*4˚*), that was manifest as decreased length of the right ramus, maxillary midline 3mm to the right, and a canted occlusal plane (*4˚*). The upper right first premolar (*UR4*) was missing and both arches were crowded (*-8mm/-10mm*). The left TMJ clicked when opening wide, and there was a wear facet on the UL3. The etiology of the asymmetry was unknown,[1-3] but the signs and symptoms had a delayed onset in the growing years, consistent with a habitual sleep posture on the left side of the face.[4] The UR4 was extracted in adolescence to facilitate eruption of the UR3.

Dr. Yu-Hsin Huang,
Lecturer, Beethoven Orthodontic Course (Left)

Dr. John Jin-Jong Lin,
Examiner of JDO, Director of Jin-Jong Lin Orthodontic Clinic (Center)

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

Diagnosis

Facial:

- Length: *Long face (LFH 57.5%) with a relatively short upper lip*
- Protrusion: *Relatively straight profile (8˚) with retrusive lips (-2mm/-1mm to the E-Line)*
- Symmetry: *Maxillary dental midline deviated 3mm to the right, occlusal plane cant 5mm superior on the patient's right side, 5mm chin deviation to the right*
- Smile: *Full smile with more gingival exposure in the left anterior region*

Fig. 1: Pre-treatment facial and intraoral photographs at 24y5m of age

Skeletal:

- Intermaxillary Relationship: *Mild mandibular retrusion (SNA 82.5˚, SNB 79˚, ANB 3.5˚)*
- Mandibular Plane: *Excessive (SN-MP 37.5˚, FMA 30.5˚) (Fig. 5) (Table 1)*
- Vertical Dimension of Occlusion (*VDO*): *Excessive ANS-Gn segment (57.5%) of the Na-ANS-Gn dimension (Table 1).*
- Symmetry: *Lower face deviated to the right (Figs. 1 & 3)*

Dental:

- Classification: *Class II, right end-on (~3mm) and left slight (~1mm) (Fig. 2)*
- Overbite: *7mm*
- Overjet: *1mm*
- Missing Teeth: *UR4 previously extracted*
- Parafunction: *Bruxism evidenced by wear a facet on the UL3*
- Symmetry: *Upper midline deviated 3mm right with an occlusal cant (Figs. 1 & 3)*

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

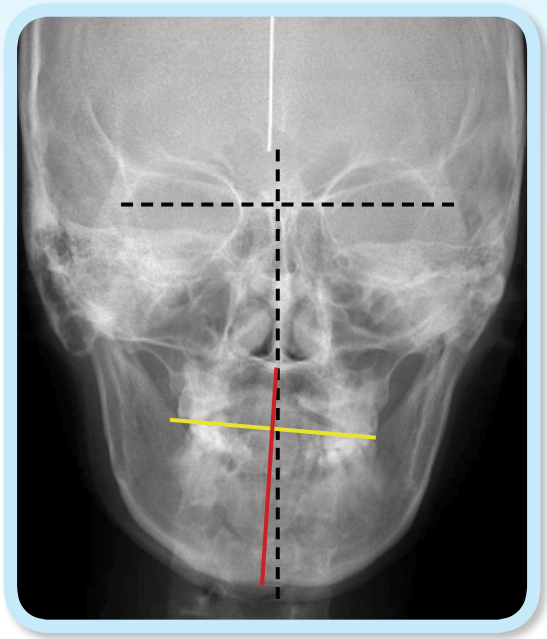

Fig. 3:
An anterior-posterior cephalometric radiograph documents facial asymmetry, occlusal canting and mandibular deviation.

The ABO Discrepancy Index (*DI*) was 30 as documented in to the subsequent worksheet.[5]

Specific Objectives of Treatment

1. Expand both arches
2. Align and level
3. Correct posterior crossbites
4. Asymmetric retraction of the upper left buccal segment to correct the midline

Maxilla (*all three planes*):

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

CEPHALOMETRIC SUMMARY			
SKELETAL ANALYSIS			
	PRE-Tx	POST-Tx	DIFF.
SNA° (82°)	82.5°	82.5°	0°
SNB° (80°)	79°	79°	0°
ANB° (2°)	3.5°	3.5°	0°
SN-MP° (32°)	37.5°	37.5°	0°
FMA° (25°)	30.5°	30.5°	0°
DENTAL ANALYSIS			
U1 To NA mm (4 mm)	2 mm	2 mm	0 mm
U1 To SN° (104°)	95°	102°	7°
L1 To NB mm (4 mm)	3.5 mm	5.5 mm	2 mm
L1 To MP° (90°)	78°	89°	1°
FACIAL ANALYSIS			
E-LINE UL (-1 mm)	-2 mm	-1.5 mm	0.5 mm
E-LINE LL (0 mm)	-1 mm	-1 mm	0 mm
%FH: Na-ANS-Gn (53%)	57.5%	57.5%	0%
Convexity: G-Sn-Pg' (13°)	8°	8.5°	0.5°

Table 1: Cephalometric summary

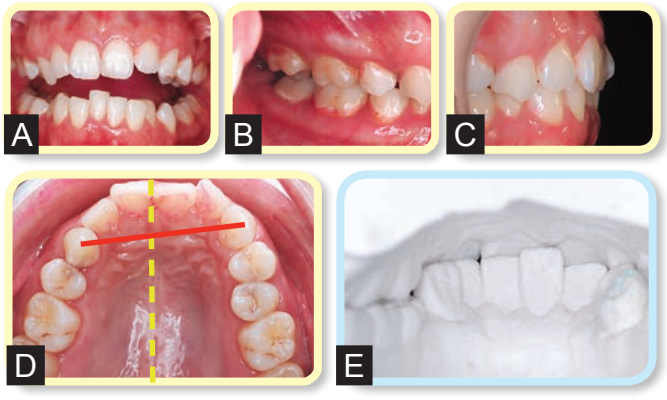

Fig. 4:
Major problems before orthodontic treatment:
A. occlusal plane canting and maxillary midline deviated to the right, B. UR7 are in posterior buccal crossbite, C. retroclined (upright) incisors in both arches. D. UL5 rotated 180 degrees and asymmetric buccal segments, and E. palatal impingement of lower incisors on maxillary palatal gingiva.

Fig. 5: Pre-treatment lateral cephalometric radiograph

Fig. 6: Pre-treatment panoramic radiograph

Mandible (*all three planes*):

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

Maxillary Dentition:

- A - P: *Maintain*
- Vertical: *Intrude slightly*
- Inter-molar / Inter-canine Width: *Expand*

Mandibular Dentition:

- A - P: *Retract*
- Vertical: *Intrude incisors*
- Inter-molar / Inter-canine Width: *Expand*

Facial Esthetics:

- Maintain the profile

Treatment Alternatives

As diagramed in Fig. 7, three alternative treatment plans were considered:

1. Extract three remaining 1st premolars, and use differential space closure in both arches to achieve Class I buccal segments with coincident midlines.

2. Extract upper left first premolar, and use differential space closure and Class III elastics as needed to correct the maxillary midline. Finish the canines in a Class I relationship, and mesially translate maxillary posterior segments to achieve bilateral Class II molar relationships.

3. Non-Extraction: Use bilateral IZC bone screws for asymmetric maxillary arch retraction to correct the midline and achieve Class I canines. The right molar occlusion will be Class II because of the missing UR4.[6] The patient desires to maintain lip protrusion. Both extraction options present the risk of excessive lip retraction, and opening space to restore the missing UR4 may result in undesirable lip protrusion. An additional concern in retracting the dentition is the possibility of incisal interferences to exacerbate bruxism and TMD symptoms.[7] The non-extraction alternative was the most conservative and esthetic option, but required asymmetric mechanics utilizing IZC bone screws, for differential retraction of the buccal segments to correct the maxillary midline.[8]

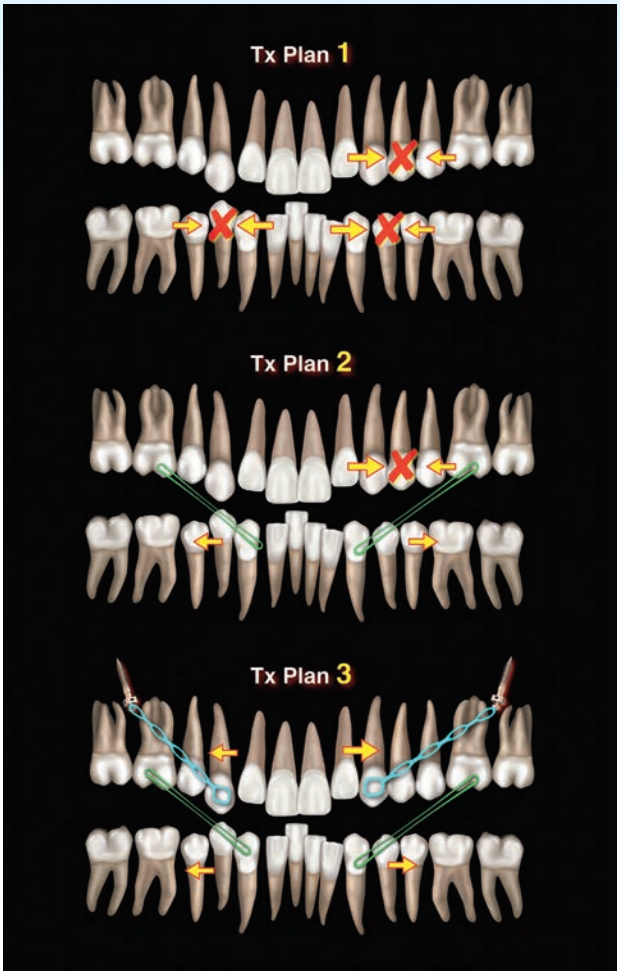

Fig. 7:
Three alternative treatment (Tx) plans are diagrammed. Red Xs mark extractions, and yellow arrows outlined in red show paths of tooth movement. Class III elastics are green, and elastomeric chains anchored by IZC bone screws are blue.

Treatment Progress

Before initiating orthodontic treatment, the health was confirmed for the dentition, periodontium and TMJs. A full fixed 0.022-in slot Damon Q® PSL appliance (*Ormco, Glendora, CA*) was installed in

both arches, utilizing standard-torque brackets on all teeth. All archwires and elastics were provided by the same manufacturer. Bite turbos were placed on the upper 1st molars to open the bite for crossbite correction (*Figs. 8 and 10*), and 0.014-in copper-nickel-titanium (*CuNiTi*) round archwires were installed in both arches. The archwires engaged all brackets, except the lower 1st premolars and the lower right central incisor (*LR1*), because of the extreme crowding. IZC-7 bone screws (*buccal to the U7s*) were inserted bilaterally on the mesial aspect of the U7s (*Fig. 9*), and power chains were used to retract the upper dentition.[9]

Fig. 8:
Close-up views of the initial mechanics: A. IZC-7 screw on the right side. B. IZC-7 screw on the left side. C. bite turbos and cross elastics for buccal-crossbite UR7. D. The LR2 is intruded and moved labially by ligation to the archwire with an 0.010-in SS ligature through the hole for dropping hook.

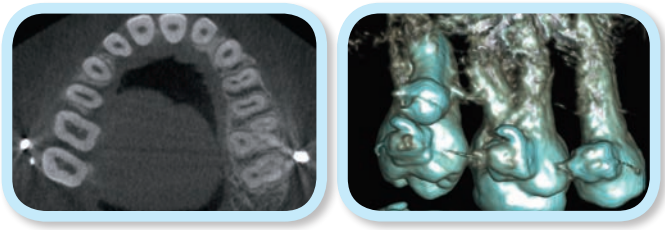

Fig. 9:
CBCT images document the location and orientation of the IZC-7 bone screws in the alveolar process buccal to the U7s.

In the third month of treatment, the crossbites were corrected and the bite turbos were removed. The lower archwire was changed to 0.014x0.025-in CuNiTi. The buccal crossbite relapsed 2 months later, so in the fifth month, bite turbos were reinstalled, and cross elastics were used. A section of open coil spring was placed between the upper right canine (*UR3*) and premolar (*UR4*) to help correct the midline (*Figs. 10 & 11*). Space that spontaneously opened in the maxillary anterior region, was closed with elastomeric chains placed on the facial and lingual surfaces (*Fig. 10*). An 0.018x0.025-in CuNiTi archwire was placed and one month later, a panoramic radiograph revealed several teeth required bracket repositioning. The lower right incisors (*LR1 and 2*) and second premolar (*LR4*) were rebonded, and a 0.014x0.025-in CuNiTi archwire was placed (*Fig. 12*). The strength of cross elastics was increased to Kangaroo® 13/16-in, 4.5-oz. Space was consolidated and closed with elastic chains. In the 14th month, the upper left second molar (*UL7*) developed pericoronitis after being retracted into the retromolar soft tissue. The UL7 bracket was removed to facilitate hygiene. The gingival inflammation was resolved in 2 months.

In the 16th month of treatment, the bracket was rebonded on the UL7, and an 0.018-in CuNiTi archwire was inserted for alignment. Class III elastics (*Fox® 1/4-in, 3.5-oz*) were initiated to correct the negative overjet. One month later, a loose IZC-7 bone screw was removed on the left side. During correction of the intermaxillary discrepancy with Class III elastics, the morphology of upper canines was restored with composite.

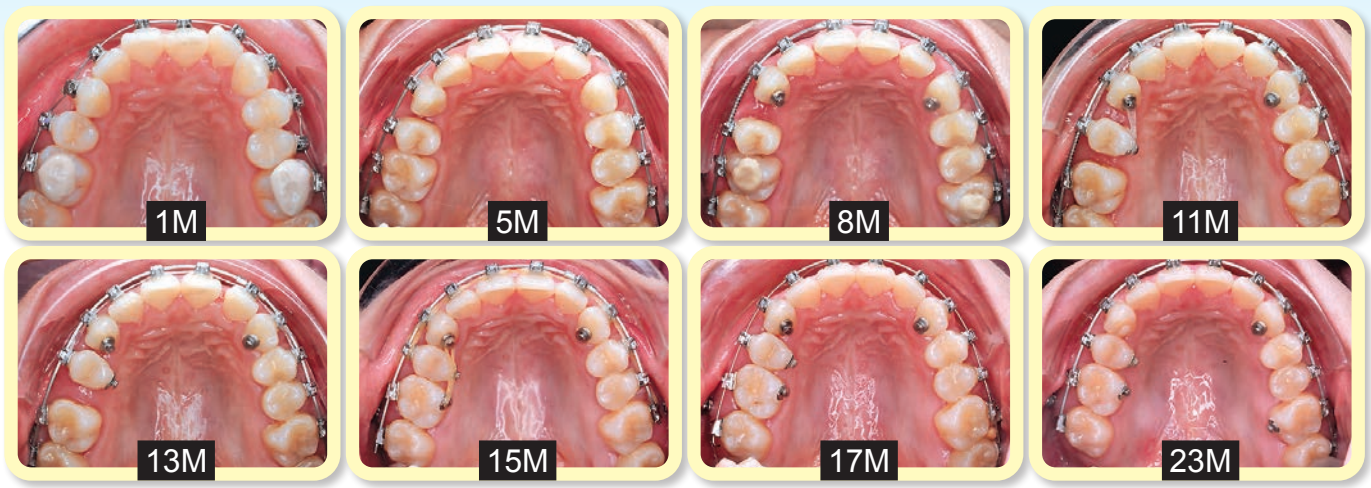

Fig. 10:
Maxillary occlusal views show a progression of progress from one (1M) to twenty-three months (23M). Correction of the midline required distal translation of the left buccal segment. Note space mesial to the UR6 at 13M in preparation for asymmetric retraction of the anterior segment.

Fig. 11:
A series right buccal views document progress from one (1M) to 29 months (29M). Note a bite turbo on the occlusal surface of the UR6 was used to facilitate correction of the UR7 buccal crossbite.

In the 21st month, diagonal and intra-arch elastics were placed to correct the diastema and midline discrepancy. One month later, the L6 bite turbos were removed, and 0.014x0.025-in CuNiTi archwires were placed in both arches. Brackets were rebonded as needed to correct second order problems, and both arches were leveled with 0.016-in CuNiTi archwires (*Fig. 12*). In the following month, the left IZC-7 screw was replaced and used as an anchor to correct midlines. Following detailing with bracket repositioning and archwire corrections, all fixed appliances were removed after 33 months of active treatment (*Figs. 13-15*). The progressive mechanics are summarized in Table 2.

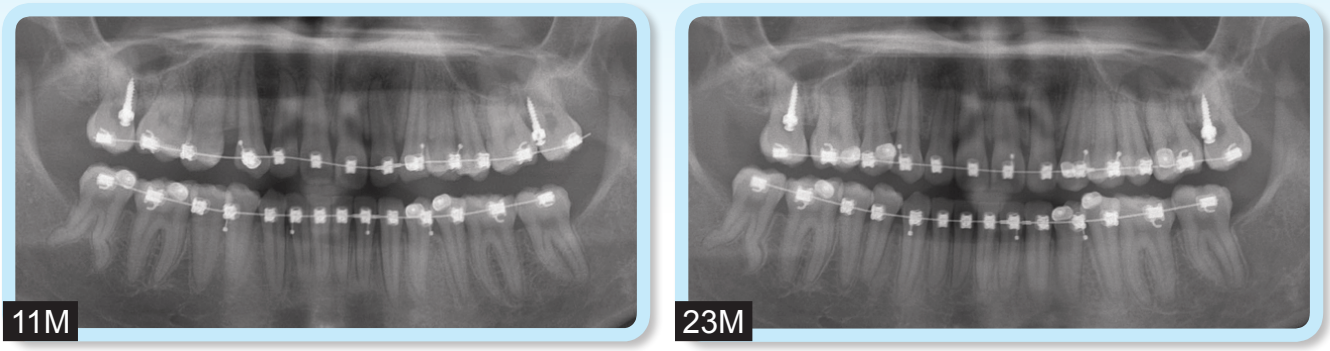

Fig. 12:
A panoramic radiograph in the 11th month (11M) revealed that brackets on LR1, LR2 and LR4 required rebonding. A similar radiograph at twenty-three months (23M) indicated that rebonding was needed for brackets UL3, UL6, LL5, LL6 and LR4.

Fig. 13: Post-treatment facial and intraoral photographs

Fig. 14: Post-treatment dental models (casts)

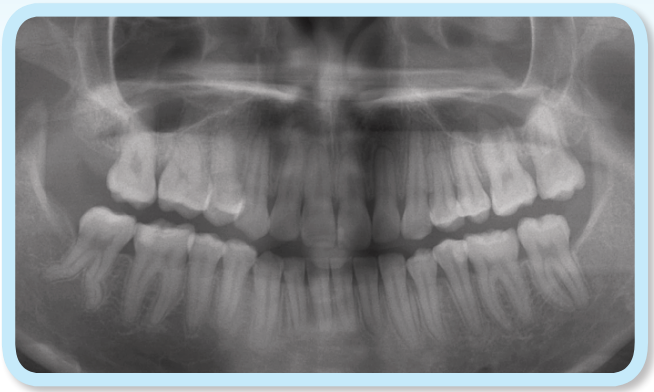

Fig. 15: Post-treatment panoramic radiograph

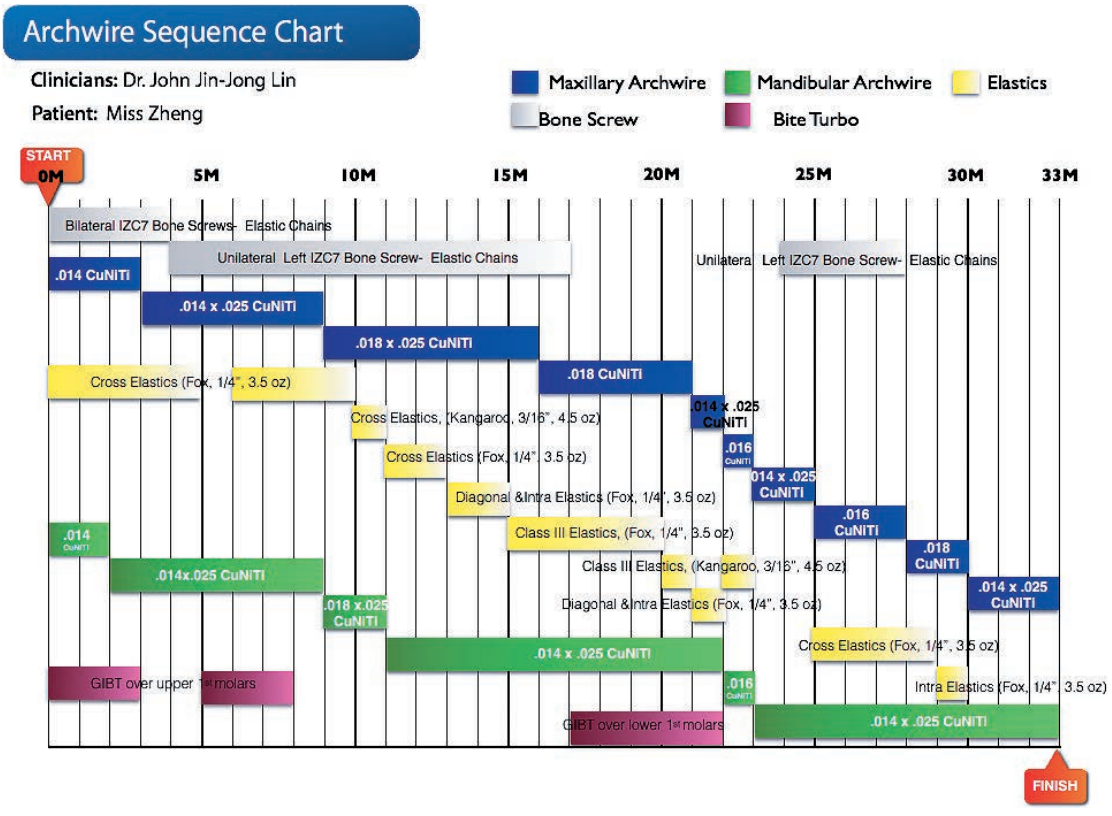

Table 2: Archwire Sequence Chart

Results achieved

This severe, asymmetric skeletal malocclusion (*DI 30*) was corrected, with 33 months of active treatment to a near ideal result (*CRE 24*), as documented in worksheet 2 at the end of this report. Despite the extensive dental correction, there were no facial or skeletal changes (*Figs. 16 & 17*). The VDO was maintained as evidenced by no change in the percent lower facial height (*Table 1*). The facial convexity remained relatively straight (*G-Sn-Pg' 8°*), compared to an ideal 13°,[10,11] and there was no functional shift of the mandible when closing into centric occlusion.

Fig. 16: Post-treatment lateral cephalometric radiograph

Specific treatment objectives (*Figs. 16 & 17, Table 1*) were:

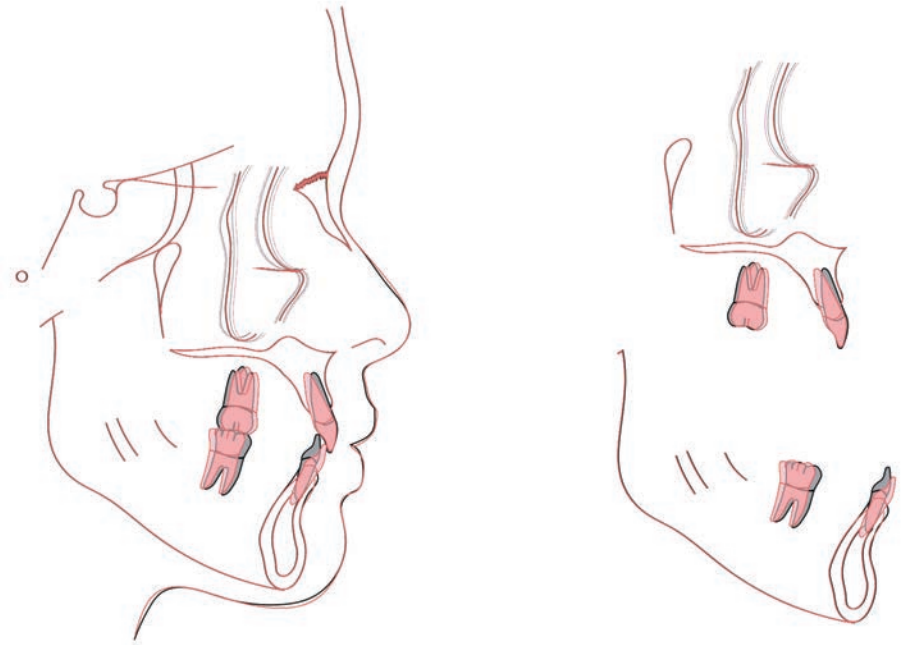

Fig. 17:
Superimposed cephalometric tracings form before (black) and after (red) treatment were superimposed on the anterior cranial base (left), the maxilla (upper right), and the mandible (lower right). See text for details.

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: *Retraction of incisor roots, slight protraction of the molars*
- Vertical: *Slight incisor intrusion*
- Inter-molar / Inter-canine Width: *Maintained / Increased*

Mandibular Dentition

- A - P: *Protraction of molars and incisors*
- Vertical: *Intrude incisors*
- Inter-molar / Inter-canine Width: *Increased / Increased*

Facial Esthetics

- Profile unchanged (*Figs. 16 & 17*), but slight skeletal asymmetry remained (*Fig. 18*)

Retention

Clear overlay retainers were fabricated for both arches. The patient was instructed in proper home hygiene and care for the retainers. Full time retainer wear was prescribed for the first 6 months and nights only thereafter.

Final Evaluation of Treatment

Facial form was maintained and the maxillary dental midline was corrected. The ABO Cast-Radiography Evaluation was 24 points (*Worksheet 2*). The most prominent alignment deficiencies were alignment/rotations (*6 points*) buccolingual inclinations (*6 points*), and occlusal contacts (*5 points*) (*Figs. 16 & 17*). The pink and white (*P&W*) dental esthetic score was 4.[12] See Worksheet 3 at the end of this report.

Discussion

Asymmetric malocclusions are often complex problems involving the dentition, skeletal base of bone, and functional shifts in occlusion (*Figs. 1-4*). Non-extraction correction of the occlusion is facilitated by extra-alveolar (*E-A*) bone screw anchorage. IZC bone screw anchorage is particularly well suited for resolving maxillary midline discrepancies (*Figs. 8-11*), but this approach is unlikely to completely resolve skeletal problems (*Fig. 3*). When there is unilateral loss of a premolar, the buccal occlusion is usually finished in an asymmetric molar relationship (*Class I/II*). For the current patient (*Fig. 1*), the missing UR4 required finishing the first molars on the right side in a full cusp Class II relationship (*Figs. 13 & 14*). This was deemed the most desirable outcome, but E-A bone screw anchorage was required. IZC bone screws can be placed mesial to the U6s (*IZC-6*) or mesial to the U7s (*IZC-7*). They are osseous anchorage for managing buccal asymmetry and midline correction, but skeletal problems may persist to a lesser extent: mandibular deviation and cant of the occlusal plane (*Fig. 13*). The residual asymmetry is less noticeable when the dentition is

well aligned, spaces are closed, and the midlines are coincident (*Figs. 13-16*).

Arch width is directly related to biting strength. The constriction of the dental arches is a common acquired characteristic in industrialized countries because the diet tends to be more refined.[1] Constricted arches decrease arch length (*circumference*), but teeth are largely genetic structures, that are not affected by biomechanics. As the permanent incisors erupt in the transitional dentition, crowding occurs.[1-3] If a canine is blocked out of the arch particularly in the maxilla, dentists often recommend extracting the adjacent first premolar so the canine can erupt. If only one premolar is extracted, crowding is decreased but the maxillary midline tends to drift in the direction of the missing premolar. If the asymmetry is diagnosed in the early mixed dentition,[2,3] rapid palatal expansion and space opening for erupting teeth avoids the necessity to extract a first premolar to create room for an erupting canine. Unilateral extraction of a first premolar creates a subdivision malocclusion[13] that is impossible to treat to a Class I molar relationship bilaterally.

Anterior-posterior cephalometric radiography documents arch width as well as the axial inclinations of the teeth in the buccal segments. Orthognathic surgery[13] and/or additional premolar extractions[13] are common procedures for managing skeletal and dental asymmetry.[2,3] However, more conservative nonextraction approaches are a viable option if there is adequate supplemental anchorage, e.g. IZC bone screws. It is important to thoroughly diagnose all dental and skeletal problems, but

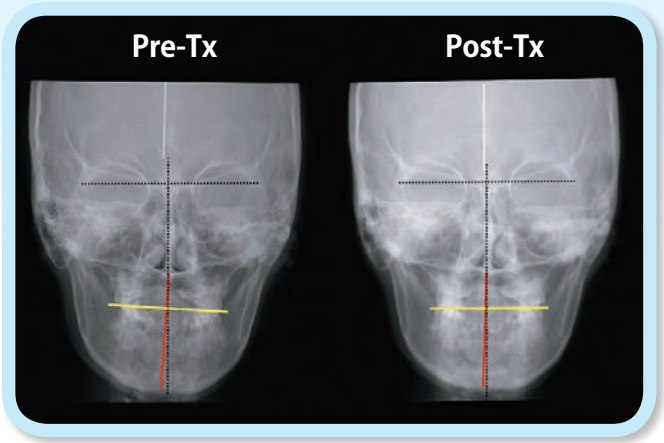

Fig. 18:
Dental alignment and retraction of the left buccal segment to correct the maxillary midline spontaneous decreased the facial asymmetry and occlusal plane cant from ~4° (Pre-Tx) to ~1° (Post-Tx).

camouflage treatment to achieve an acceptable compromise may be the most practical approach (*Figs. 17 & 18*).[4,9]

Intermaxillary elastics can improve the overjet and correct midlines, but they may not achieve a stable result.[15] Furthermore, excessive use of intermaxillary elastics may cause a dual bite and temporomandibular disorder.[16] Intermaxillary elastics were used sparingly for the current patient, and the major mechanics depended on IZC bone screw anchorage. Asymmetric treatment in the absence of E-A bone screw anchorage tends to result in distortion of the arch, as well as in occlusal prematurities that may exacerbate TMJ clicking and bruxism.

Bone is a dynamic tissue that is continuously adapting via the processes of remodeling and modeling.[17] Frankel[18] used his function regulator appliances to produce transverse alveolar modeling

in adolescent patients. The acrylic shields extending into the vestibule exerted a constant outward traction on connective tissue fibers and muscle attachments; the tension in the soft tissue is then transmitted to the alveolar bone by the fibers of the periosteum, increasing the apposition of buccal bone on the alveolar process.[19] It is hypothesized that the low expansion force delivered by the self-ligating appliance can expand the arch by alveolar bone forming ahead of the roots of the posterior teeth.[20,21] For this reason, the patient's orthodontic treatment is not limited by an immutable arch width. A narrow maxillary arch with crowded/asymmetrical dentition can be corrected by conservatively expanding the arch rather than with orthognathic surgery.[22] The posterior occlusal contacts are readily improved with vertical (*up and down*) elastics.[23]

For a rotated-180-degree upper premolar (*Fig. 4*), the UL5 bracket is bonded on what is normally the lingual surface of the tooth, so the usual -11 degrees of built-in torque is not appropriate (*Fig. 19*). The excessive torque results in more labial root prominence and an intruded palatal cusp which compromises occlusal contact. A customized bracket is indicated for a 180 degree rotated premolar,[24] to avoid occlusal interferences that may contribute to TMD and bruxism.[25]

Conclusion

Asymmetric malocclusion is manifest as abnormal form and function of the face, occlusion and TMJs. Nonextraction treatment, that levels and aligns the dentition with light forces and E-A anchorage, may produce a camouflage result which meets the needs of the patient, but it is unlikely to completely resolve skeletal asymmetry. More invasive approaches such as extractions and orthognathic surgery are indicated if conservative alignment is unsatisfactory to the patient.

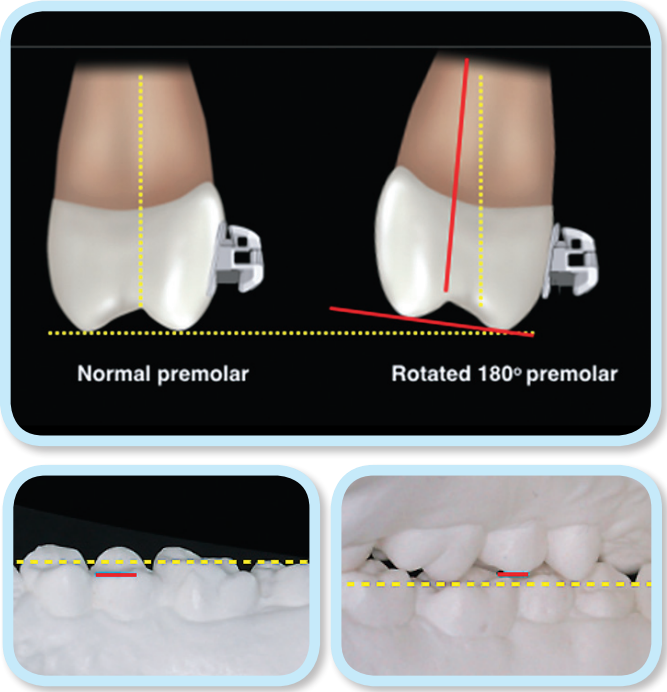

Fig. 19:
The 180˚ rotation of UL5 presented finishing problems with respect to ideal esthetic and functional alignment: 1. relative to normal axial inclination and occlusal plane, the rotated premolar with a pretorqued bracket requires excessive buccal root movement (red lines) for acceptable dental esthetics, 2. the palatal cusp (along the red line) is inferior to adjacent teeth (lower left view), 3. the palatal cusp is out of occlusion (red line) compared to the plane of the adjacent palatal cusps (lower right view), and 4. the mesial-distal dimension is less on the buccal compared to the lingual surface (See Fig. 4D).

Acknowledgment

Thanks to Mr. Paul Head for proofreading this article and Dr. Rugsi's beautiful diagrams.

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Discrepancy Index Worksheet

TOTAL D.I. SCORE 30

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 = 5

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

8 mm (lower)

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 = 4

CEPHALOMETRICS (See Instructions)

ANB ≥ 6° or ≤ -2° 3.5° = 4 pts.

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

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

SN-MP 37.5°
≥ 38° = 2 pts.
Each degree > 38° _____ x 2 pts. = _____

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

1 to MP ≥ 99° 78° = 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. =	2
Missing teeth (except 3rd molars)	1	x 1 pts. =	1
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	3	x 2 pts. =	6

Identify: Occlusal canting
TMJ Disorder
Deep curved of spee

Total = 12

IMPLANT SITE

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

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 = 0

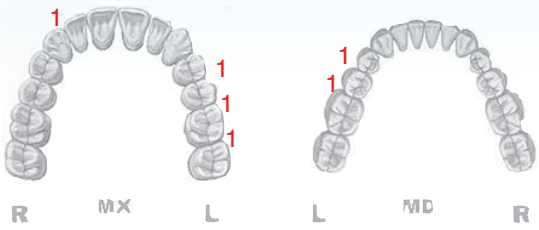
Cast-Radiograph Evaluation

Case # **Patient**

Total Score: 24

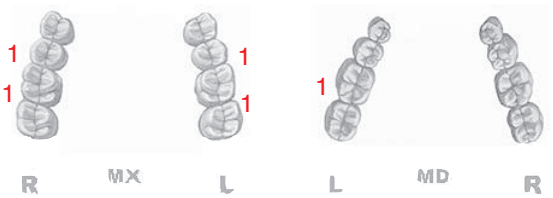
Alignment/Rotations

6



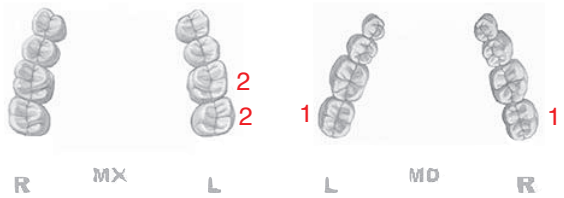
Marginal Ridges

5



Buccolingual Inclination

6

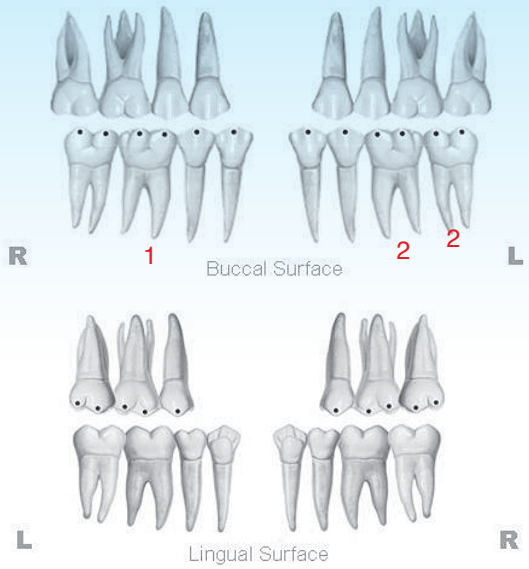


Overjet

1

Occlusal Contacts

5

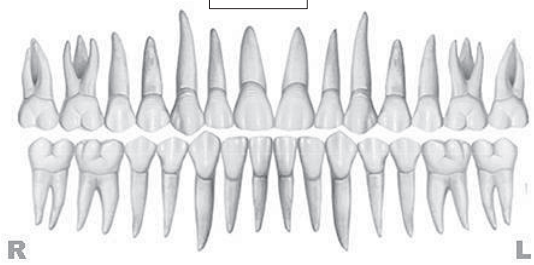


Occlusal Relationships

0

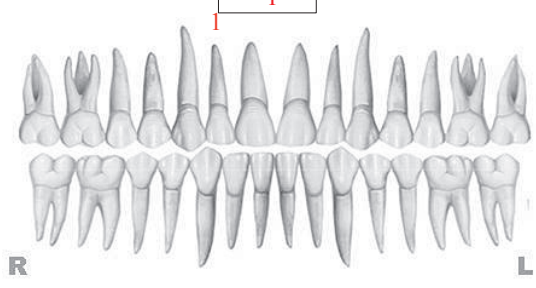
Interproximal Contacts

0



Root Angulation

1



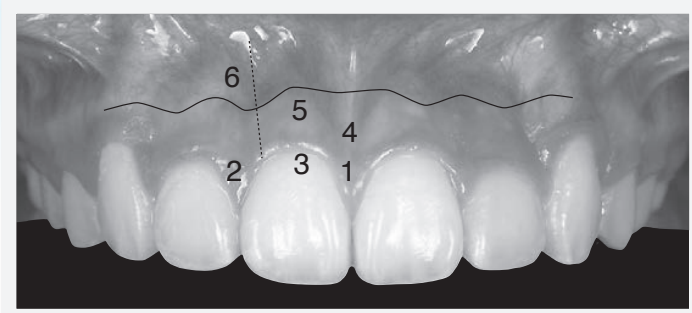
INSTRUCTIONS: Place score beside each deficient tooth and enter total score for each parameter in the white box. Mark extracted teeth with "X". Second molars should be in occlusion.

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

Total Score: = 4

1. Pink Esthetic Score

Total = 1

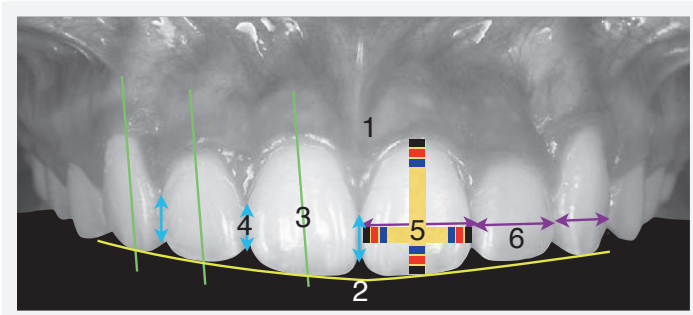


1. M & D Papillae	0	1	2
2. Keratinized Gingiva	0	1	2
3. Curvature of Gingival Margin	0	1	2
4. Level of Gingival Margin	0	1	2
5. Root Convexity (Torque)	0	1	2
6. Scar Formation	0	1	2

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 = 3



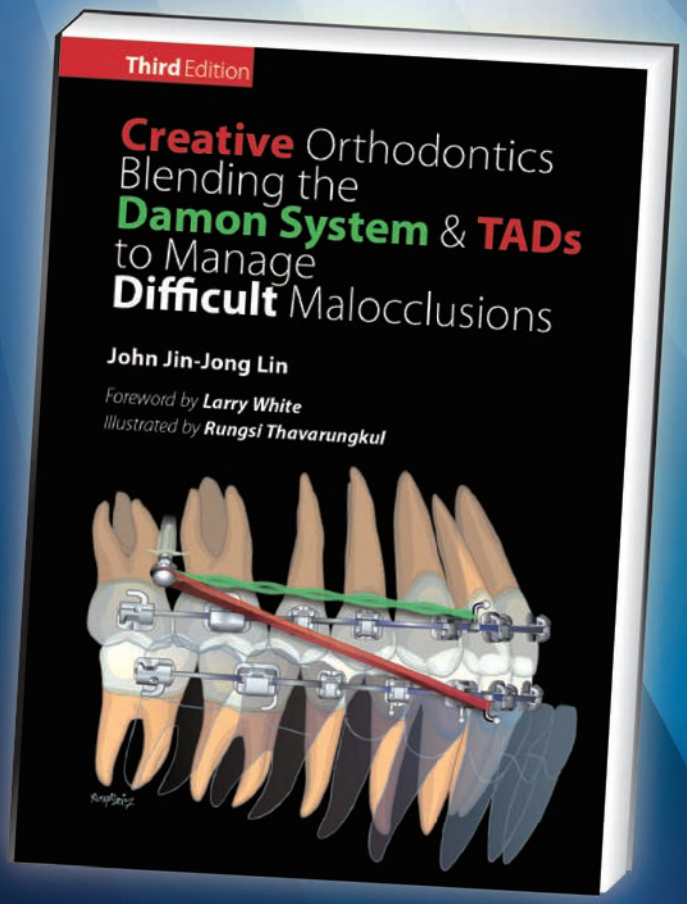
1. Midline	0	1	2
2. Incisor Curve	0	1	2
3. Axial Inclination (5°, 8°, 10°)	0	1	2
4. Contact Area (50%, 40%, 30%)	0	1	2
5. Tooth Proportion (1:0.8)	0	1	2
6. Tooth to Tooth Proportion	0	1	2

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

Dr. John Jin-Jong Lin

New Book
3rd Edition

New Book Launch

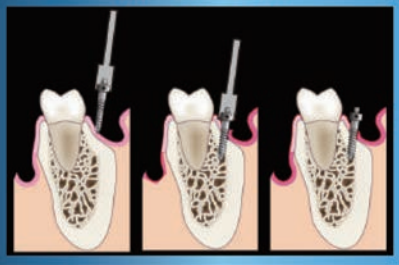


Creative Orthodontics
Blending the
Damon System & **TADs**
to Manage
Difficult Malocclusions

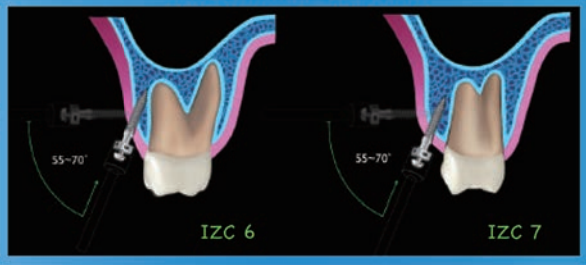
John Jin-Jong Lin

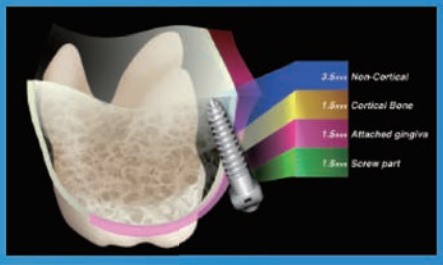
Foreword by ***Larry White***
Illustrated by ***Rungsi Thavarungkul***

Buccal Shelf Screw



Infrazygomatic Crest Screw



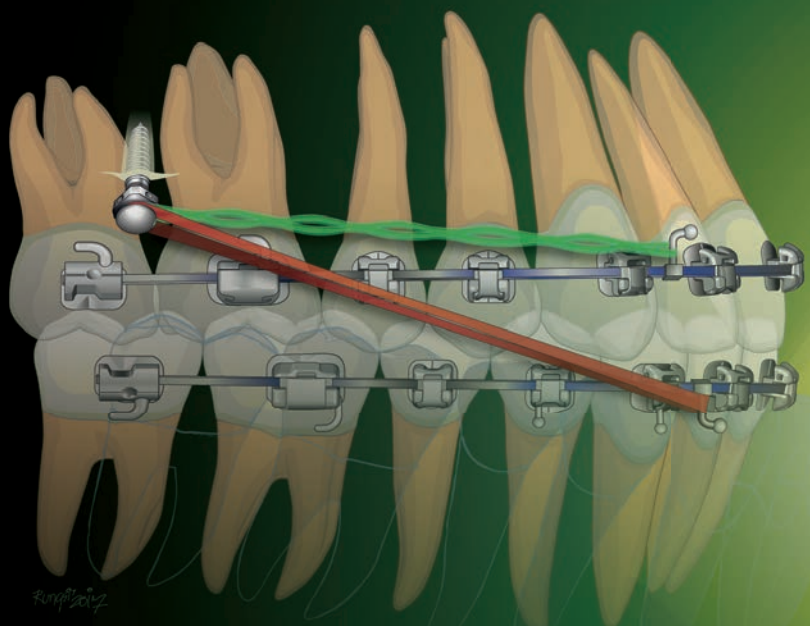


IZC + Class III Elastics
to treat Class II

IZC + Class III Elastics
to treat Class III

Buccal Shelf Screw + IZC +
Class III Elastics to treat Class III

IZC + Class III Elastics to treat
Class I Severe Crowding



打開錦囊

Dr. 林錦榮

探 妙方。

Class III 精英高鋒會

2018/04/15(Sun.)

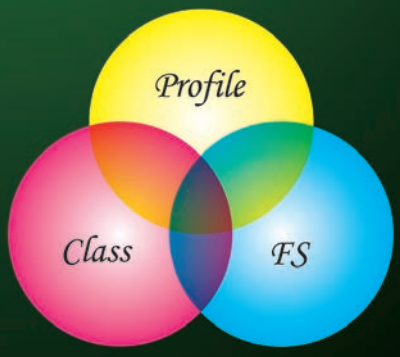
SPEAKER 林錦榮 醫師

中華民國齒顎矯正學會　顧問
台灣口腔矯正醫學會　顧問
林錦榮齒列矯正中心　主治醫師

Lecture Outline

Differential diagnosis and management of Class III malocclusion with PSL and TADs

1. Three Rings of Class III diagnosis
2. The Clinical meaning of the Class III growth
3. What we can learn from the long term follow up cases
4. Using PSL's MEAW effect
5. Using the buccal shelf screw
6. Using the IZC screw
7. Combination of the buccal shelf and IZC screws to treat severe Class III
8. Review of Class III literatures and it's clinical application
9. Management of Class III patients



- The 3 Rings Diagnosis
  Profile: orthognathic or prognathic in CR
  Class: canine and molar relationships
  FS: functional shift, Yes (CO≠CR), or No (CO=CR)

CASE1

DAMON + TADS

CASE2

DAMON ONLY

RECOMMEND

中華民國齒顎矯正學會理事長
台北醫學大學口腔醫學院副院長/教授
北醫大學附設醫院齒顎矯正科主任

鄭信忠 醫師

打開第三類咬合異常治療的「新錦囊妙方」！

國際齒顎矯正界素有盛名的第三類咬合異常專家林錦榮醫師，又有新作與新發表！筆者長期聆聽林醫師的演講，對他在第三類咬合異常的長期觀察與診斷精進、治療模式的精準與更有效率化，令人敬佩，尤其對其演講簡報畫面的精美，圖案變化的豐富，表達能力的清晰，各式病例之精采，聽其演講是一種享受與學習。

此次林醫師將以實證醫學的研究，用 CBCT Study，做 Clinical Application，同時也對第三類咬合異常的鑑別診斷與治療，做一新的論述與介紹，與過去不同的是，另邀五位齒顎矯正新秀報告第三類咬合異常病例，共同討論，現身說法。這種難得的發表及組合，增加學習成效，在此鄭重推薦，千萬不能錯失！

中華民國齒顎矯正學會專科醫師
美國齒顎矯正專科醫師學院院士(ABO)
新竹貝多芬齒顎矯正中心 負責人

張慧男 醫師

國內外公認在 Class III 治療上最具權威的專家，也是我們台灣之光的林錦榮老師即將舉行近年來少見，一整天的專場演講。這些年來林老師不僅累積了許多臨床案例，也持續關注國內外關於 Class III 治療的各項臨床治療方法和研究。近年來他提出了獨特簡潔的 3-Ring 診斷系統，也有效的協助醫師正確診斷 Class III 的各項類別以及對應的治療方式，讓許多臨床醫師視為難題，在亞洲患者卻很常見的 Class III 治療，變得更加容易處理。誠摯向大家推薦這場林老師集結近年來的研究和臨床心得所整理出的 Class III 武功秘笈發表會，會中還有他的新書發表簽名會，是臨床醫師最不能錯過的精實演講！

INFORMATION

演講報名資訊

主辦單位： 中華民國齒顎矯正學會

協辦單位： 湧傑企業股份有限公司

講　　師： 林錦榮醫師主講，以及
林昇進、林芝瑜、程文鐸、陳俊伊、
李雙安 醫師

時　　間： 2018/4/15(Sun.) 09:00-17:00

地　　點： 台灣金融研訓院菁業堂
台北市羅斯福路3段62號2F

費　　用： 107年3月21日前：
TAO/TOS 會員 3000元、非會員 4000元、
本會學生會員1500元、其他學生 2000元
107年3月22日起：
會員4000元、非會員5000元、
本會學生會員、其他學生2000元

報名方式： A 郵局劃撥戶名：社團法人中華民國齒顎矯正學會
劃撥帳號：14969234
B 線上刷卡
http://mbs.tao.org.tw/mbstao/amtao/amtao_reg.jsp
C 電洽：湧傑公司2778-8315 #122

學　　分： 參加者發給繼續教育學分

備　　註： 活動備茶點及午餐，素食請先告知
報名未出席者恕不退還即收款項

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Mutilated Pseudo-Class III Malocclusion with Anterior Crossbite, Knife-Edge Ridges and Periodontal Compromise: Alignment, Sinus Lift, Bone Graft, and Implant-Supported Crowns

Abstract

History: *A 25-year-old female presented for an orthodontic evaluation with a chief compliant of anterior crossbite. Medical history was noncontributory, and no records of previous dental treatment were available.*

Diagnosis and Etiology: *The prognathic facial profile was deviated 7mm to the right, and the occlusal plane was canted ~4º. Maxillary midline was deviated 2mm, and there was a 5mm functional shift to the right on closure. With the mandible in centric relation (C_R), the facial profile was acceptable. In centric occlusion (C_O), the mutilated molar relationships were asymmetric: Class II right and Class III left. The UR5 was missing, and UL6 was hopeless. Microdontia in the lower arch resulted in 2 and 7mm developmental knife-edge ridges distal to the right and left lower canines, respectively. The discrepancy index (DI) was 45 for this severe, complex malocclusion.*

Treatment: *Despite the risk factors of knife-edge ridges and compromised periodontium, the patient selected conservative, minimally invasive treatment. The occlusion was disarticulated with bite turbos to correct the crossbite with lower arch space closure and Class III elastics. The UL6 was extracted and space for an implant was opened in the UR5 area. Implants were placed to restore both missing teeth (UR5 and UL6). A sinus lift bone graft was required for the UL6. Preprosthetic alignment was completed in 23 mo, and the implant-supported prostheses (ISP) required an additional 8 mo for an overall treatment time of 31 mo.*

Outcomes: *Preprosthetic alignment and ISP corrected a severe skeletal malocclusion with a DI 45 to a pleasing facial result. Good dental alignment and esthetics were documented by a Cast-Radiograph Evaluation (CRE) score of 26, and a Pink & White dental esthetic score of 3. Consistent with the risk factors defined before treatment, moderate lateral root resorption was noted on the distal surface of the LL3, and ~1mm of bone loss occurred between the LL3 and LL4. No mobility or excessive pocket depth was noted.*

Conclusions: *A severe skeletal malocclusion with facial asymmetry, missing teeth and periodontal risk factors was treated to a pleasing camouflage result with minimal surgery. Facial asymmetry was improved without orthognathic surgery, but there was still a slight cant to the occlusal plane. Despite some root resorption, bone loss, and irregular gingival margins in the maxillary buccal segments, the patient was pleased with the result and declined further treatment. She was informed that regular follow-up care was essential to maintain her fragile periodontium. (J Digital Orthod 2018;49:26-49)*

Key words:
Adult treatment, mutilated malocclusion, interdisciplinary treatment, implant placement, functional shift, facial asymmetry, knife-edge ridge, space closure. Class II/III asymmetric malocclusion, sinus lift

Introduction

A functional shift due to dental interference may result in severe anterior crossbite and facial asymmetry.[1] This acquired anomaly may be misdiagnosed as a skeletal Class III malocclusion requiring orthognathic surgery.[2] Patients with an aversion to surgery may procrastinate and delay treatment, which contributes to the progressive severity of the malocclusion.[3,4] Contributing problems such as missing dentition, fractured

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teeth, periodontal compromise, and knife-edge atrophic ridges are best managed with comprehensive treatment. Predictable interdisciplinary care begins with a firm foundation comprised of a careful history review, comprehensive diagnosis, thorough periodontal evaluation, and assessment of the etiology.[2]

Fig. 1: Pre-treatment facial and intraoral photographs

Orthodontic patients tend to have a lower prevalence of periodontitis compared to the general population,[5] but comprehensive orthodontics can challenge the periodontium of adult patients 18 years of age or older. It is important to insure that the periodontium is healthy or at least stable prior to orthodontic treatment. In this regard, the American Board of Orthodontics (*ABO*) requires special periodontal screening for all adult patients, and also for younger patients if there are signs or symptoms of periodontal disease.[6]

The dental nomenclature for this report is a modified Palmer notation with upper (*U*) and lower (*L*) arches, right (*R*) and left (*L*) sides, and permanent teeth in each quadrant numbered from 1-8 relative to the midline.

Diagnosis and Etiology

A 25-year-old female presented for orthodontic evaluation with a chief compliant of an anterior crossbite (*Figs. 1-4*). The medical history was noncontributory, but the panoramic radiograph

Fig. 2: Smile evaluation photograph

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

Fig. 4: Pre-treatment lateral cephalometric radiograph

(*Fig. 5*) revealed a long history of restorative and periodontal problems. Facial examination revealed a prognathic profile with a 7mm deviation of the lower face to the right, and ~4° counterclockwise rotation of the frontal occlusal plane relative to the inter-pupillary line (*Fig. 1*). There was of a 2mm deviation of the maxillary midline to the facial

Fig. 5: Pre-treatment panoramic radiograph

midline. Closing into maximum intercuspation (C_O) required a 5mm functional shift to the right on closure (*Fig. 6*). The facial profile was flat (*0° G-SN-Pg'*) and there was markedly increase lip prominence (*-6.5mm/-5.5mm to the E-Line*). The patient's smile (*Fig. 2*) was unattractive due to the mandibular deviation, dental spaces, canted inter-commissure line (*occlusal plane*), and the absence of a smile arc.[7] There were no signs or symptoms of temporomandibular joint (*TMJ*) dysfunction (*Fig. 7*).

Analysis of the study casts (*Fig. 3*) showed mutilated molar relationships that were Class II end-on occlusion on the right side and Class III on the left. Both buccal segments were Class III in centric occlusion (C_O), with a deep anterior cross-bite (*4mm*) that was associated with negative overjet (*-3mm*). With the mandible positioned in centric relation (C_R), the incisors were in an end-to-end occlusion and the facial profile was acceptable, which indicates that conservative camouflage treatment was a viable option.

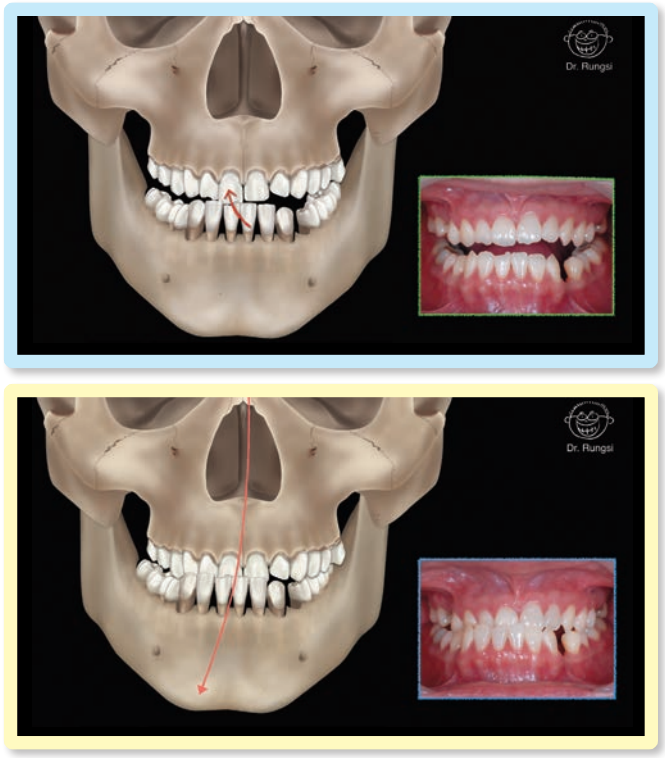


Fig. 6:
Functional shift evaluation photograph and dynamic illustration.
a. The mandible closes until the incisors contact in the C_R position. The curved red arrow shows the path of the incisal deviation on closure.
b. When closing into C_O the mandible deviates in the direction of the red curved arrow.

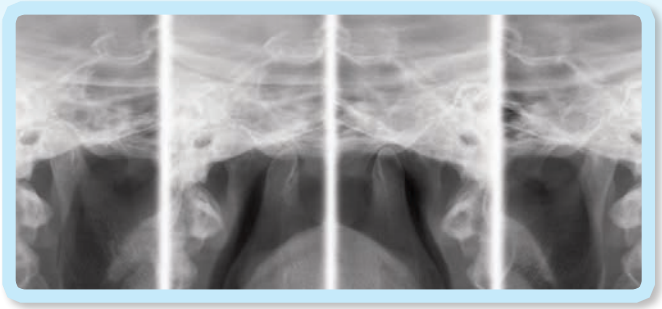


Fig. 7:
Transcranial radiographic images of the pre-treatment temporomandibular joints (TMJs) are shown from the left: R TMJ closed, R TMJ open, L TMJ open, and L TMJ closed.

Space analysis was complicated by multiple missing or severely compromised teeth, as well as an apparent microdontia in the mandibular arch. Assuming the UL6 is extracted and the LR6 is retained, there was excess space of 10mm in the upper arch and 9mm in the lower arch. The 7mm space between the LL3 and LL4 was a knife-edge ridge, probably resulting from the delayed loss of a retained primary tooth secondary to the microdontia in the lower arch (*Fig. 3*). A similar but smaller (*2mm*) knife-edge ridge was between the LR3 and LR4.

Cephalometric evaluation (*Fig. 4*) revealed decreased facial convexity (*0°*), decreased lower facial height (*LFH 49.6%*), and a negative intermaxillary relationship (*ANB -1°*), based on protrusive maxilla (*84.5°*) and mandible (*85.5°*). The mandibular plane angle was relatively flat (*SN-MP 28.5°, FMA 21.5°*), but within normal limits (*WNL*). All incisors had decreased axial inclination, 104° in the upper and 83° in the lower arch (*Table 1*). The panoramic radiograph (*Fig. 5*) showed an overall reduced bone level. The UL6 had an incomplete endodontic root fill and pulp cap, and the LR6 showed an irregular root canal filling and restoration with MTA (*Mineral Trioxide Aggregate*).

Despite evidence of an extensive history of dental problems (*Figs. 1-5*), no dental records were recovered and the patient had an incomplete recollection of previous dental treatment performed by multiple dentists. It was necessary to deduce the overall dental health and probable etiology of a malocclusion from the current records. Significant dental problems contributing to the current malocclusion were: 1. missing UR5, 2. microdontia from LL5-LR5 resulting in a 7mm atrophic knife-edge ridge between LL3 and LL4, 3. knife-edge edentulous ridge between the LL3 and LL4 , and 4. deep caries affecting at least three first permanent molars. The latter problem may be related to molar-incisor hypoplasia (*MIH*), a common

CEPHALOMETRIC SUMMARY			
SKELETAL ANALYSIS			
	PRE-Tx	POST-Tx	DIFF.
SNA° (82°)	84.5°	84.5°	0°
SNB° (80°)	85.5°	84.5°	1°
ANB° (2°)	-1°	0°	1°
SN-MP° (32°)	28.5°	27°	1.5°
FMA° (25°)	21.5°	20°	1.5°
DENTAL ANALYSIS			
U1 To NA mm (4 mm)	0 mm	2.5 mm	2.5 mm
U1 To SN° (104°)	104°	112°	8°
L1 To NB mm (4 mm)	3.5 mm	0 mm	3.5 mm
L1 To MP° (90°)	83°	85°	2°
FACIAL ANALYSIS			
E-LINE UL (2-3 mm)	-6.5 mm	-5.5 mm	1 mm
E-LINE LL (1-2 mm)	-1.5 mm	-3.5 mm	2 mm
Convexity: G-Sn-Pg' (13°)	0°	2.5°	2.5°
%FH: Na-ANS-Gn (53%)	49.6%	49.2%	-0.4%

Table 1: Cephalometric summary

enamel defect related to high fever at <3yrs of age.[8] The isolated loss or compromise of the permanent first molars were the principal restorative concerns for the present patient.

The panoramic radiograph (*Fig. 5*) revealed generalized minor to moderate loss of alveolar bone in the lower anterior to first premolar area, but there were no other periodontal signs or symptoms. Fig. 6 shows the deviated path of closure from centric relation to the initial occlusal contact (*upper view*), followed by the functional shift to the right when full intercuspation (*centric occlusion*) is achieved. The change in position of the mandibular condyles in the open and closed positions are shown in Fig. 7.

The ABO discrepancy index (*DI*) score was 45 points for this severe acquired malocclusion. Scoring details are shown in the supplementary worksheet 1.

Treatment Objectives

1. Align both arches with a fixed, self-ligating appliance.
2. Correct anterior cross-bite and resolve the functional shift.
3. Close knife-edge edentulous spaces in the lower arch.
4. Extract upper left fractured first molar (*UL6*) ~3 mo before implant placement.
5. Align sites as needed and place implants to replace the missing UR5 and UL6.
6. Monitor the alveolar bone height in implant sites and use a sinus lift procedure for the UL6 space if needed.
7. Optimize occlusion with finishing wire bends and posterior vertical elastics.

Treatment Alternatives

The patient adamantly refused orthognathic surgery which was previously suggested by multiple orthodontists. Despite her compromised periodontium and knife-edge ridges, the patient preferred conservative camouflage treatment with minimal surgical intervention. An interdisciplinary camouflage treatment was proposed: preprosthetic orthodontic alignment, lower arch space closure, and implants to replace missing teeth (*UR5, UL6*). After discussing all the options, the patient selected the latter alternative because it was the most conservative approach that offered the potential for the result she desired. She understood that space closure in the lower arch was a risky approach because of periodontal compromise and knife-edge ridges.

In centric relation (C_R) the patient could position the mandible with the incisors in an edge to edge relationship and the buccal segments were near Class I (*Figs. 6A and 8-0M*). Since the facial profile was acceptable in the retruded position, camouflage treatment was a viable option for retracting the labially positioned lower incisors (*Fig. 4*). The latter is an important diagnostic consideration because excessive retraction of mandibular incisors can result in severe periodontal compromise.[9,10]

Treatment Progress

The 0.022-in Damon Q® (*Ormco, Glendora, CA*) passive self ligating (*PSL*) fixed appliance was selected. The maxillary central incisors and canines were bonded with low torque brackets to resist flaring when the crossbite was corrected. For the lower arch, low torque brackets were bonded upside down to achieve very high torque on the lower incisors, and high torque brackets were placed on the lower canines. Both arches were leveled and aligned with the following archwire sequence: 0.014-in CuNiTi, 0.014x0.025-in CuNiTi, 0.017x0.025-in TMA and 0.016x0.025-in SS.

In the second month of active treatment, posterior bite turbos, made with Fuji II® type II Glass Ionomer cement (*GC America, Alsip IL*), were installed on the occlusal surfaces of the mandibular second molars to open the bite. Open coil springs were used to lengthen the implant sites in the upper arch, and light short Class III elastics (*2-oz*) were used to correct the anterior cross-bite (*Fig. 8*).

After 8 months of active treatment, the anterior cross-bite was corrected. Bite turbos were progressively removed to allow posterior contact at 15 months as the curve of Spee in the lower arch was corrected (*Fig. 8*). The space for the upper implants was corrected as the lower arch space was closed. After 23 months of treatment, the implant sites were prepared (*Figs. 9 and 10*) and the occlusion was interdigitated. A cone-beam computed tomography (*CBCT*) scan was used to evaluate the bone volume and distribution for each implant site (*Figs. 10, 11R & 11L*).

Fig. 8:
Anterior cross-bite correction is shown from zero (0M) to twenty-three months (23M) of active treatment. Note that the anterior crossbite was corrected at eight months (8M).

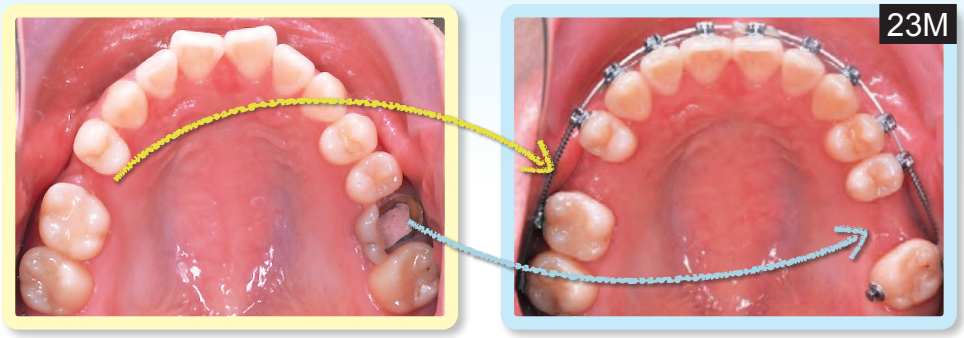


Fig. 9:
At 23 months (23M) of active treatment, the original malocclusion (left) was prepared for two implant sites: UR5 (yellow curved arrow) and UL6 (curved blue arrow).

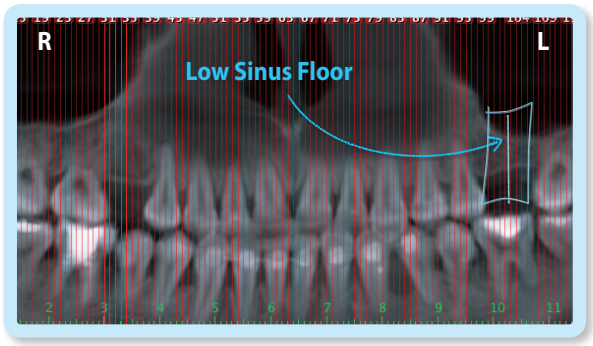


Fig. 10:
A CBCT was used to evaluate the bone volume over the implant site: the upper left with low sinus floor problem.

Implant Placement

A three-piece hardware set was used for each implant: 1. Astra OsseoSpeedTM® implant produced by Dentsply Implants, Mannheim, Germany, 2. Flared healing abutment (*HA*) marketed by the same manufacturer, and 3. Tony caps, used when implants were uncovered, were produced by Alliance Global Technology, Kaohsiung, Taiwan.

An open flap technique was used for both implants. For the UR5 implant, the drilling protocol resulted

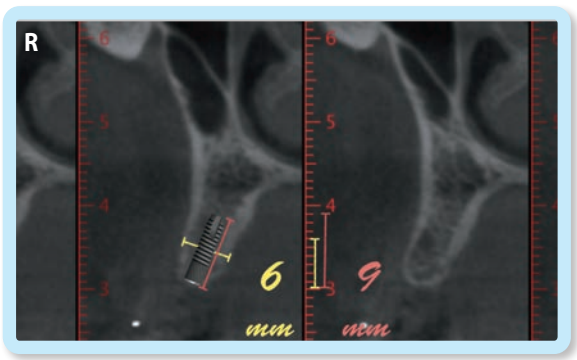


Fig. 11-R:
Slices from a CBCT show adequate bone depth (~18mm), but marginal bone width (6mm) in the UR5 site was prepared for a 4x9mm implant.

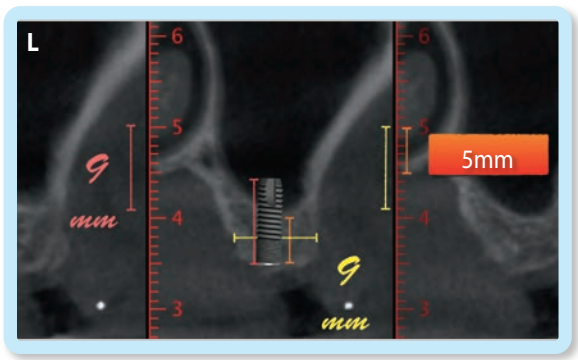


Fig. 11-L:
A CBCT slice through the UL6 site documents adequate width (9mm) but insufficient length (5mm) for a 4x9mm implant.

in only 1.5mm of buccal bone thickness, which is less than the ideal 2mm according to 2B-3D rule[11] (*2mm buccal bone thickness and 3mm apical to the crown margin*), but it was still acceptable. A 4x9mm fixture and a 4.5x4mm healing abutment (*HA*) were selected (*Figs. 12A, 12B & 12C*).

The sinus floor was low in the UL6 area (*Fig. 10*), so it was carefully evaluated with slice views from a CBCT. The ridge width was 9mm, but the vertical bone height was only 5mm (*Fig. 11-L*). Zadeh's[12] sinus lift decision making tree (*Fig. 13*) indicated the crestal approach with a standard length implant was appropriate (*Fig. 13A*). To prevent perforation into the sinus, all drills were fitted with rubber stop indicators to ensure that drill penetration was no more than 5mm. Platelet-rich fibrin (*PRF*)[13] was prepared as cushion material (*Fig. 13B*) for the sinus lift procedure.

Fig. 12A:
Pre-treatment occlusal view of the UR5 implant site.

Fig. 12B:
Post-operative view of the implant in the UR5 site shows a 4x9mm fixture with a 4.5x4mm healing abutment (HA).

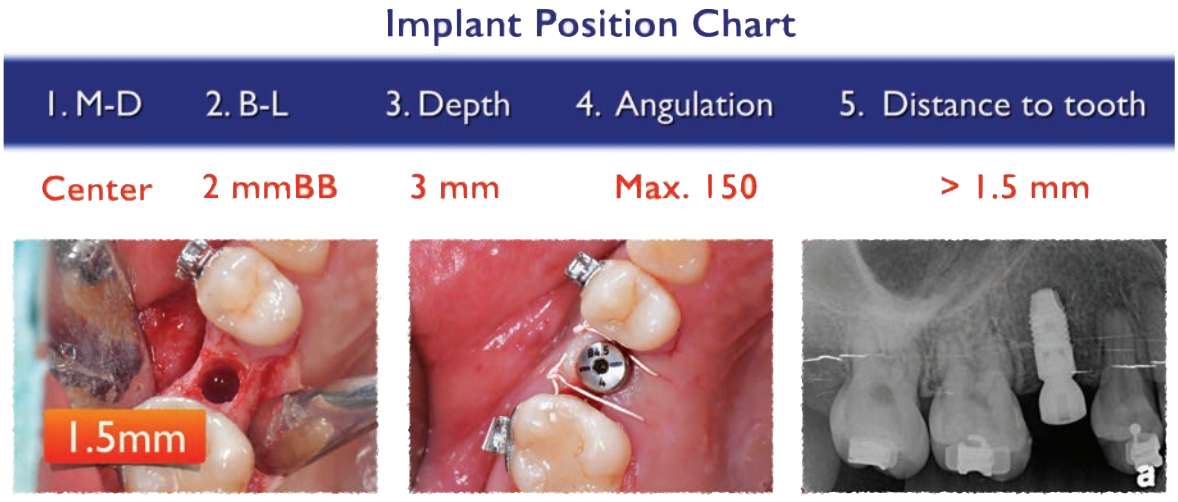


Fig. 12C:
Implant position chart for the UR5 implant: all planned parameters were met except the buccal bone thickness was only 1.5mm. See text for details.

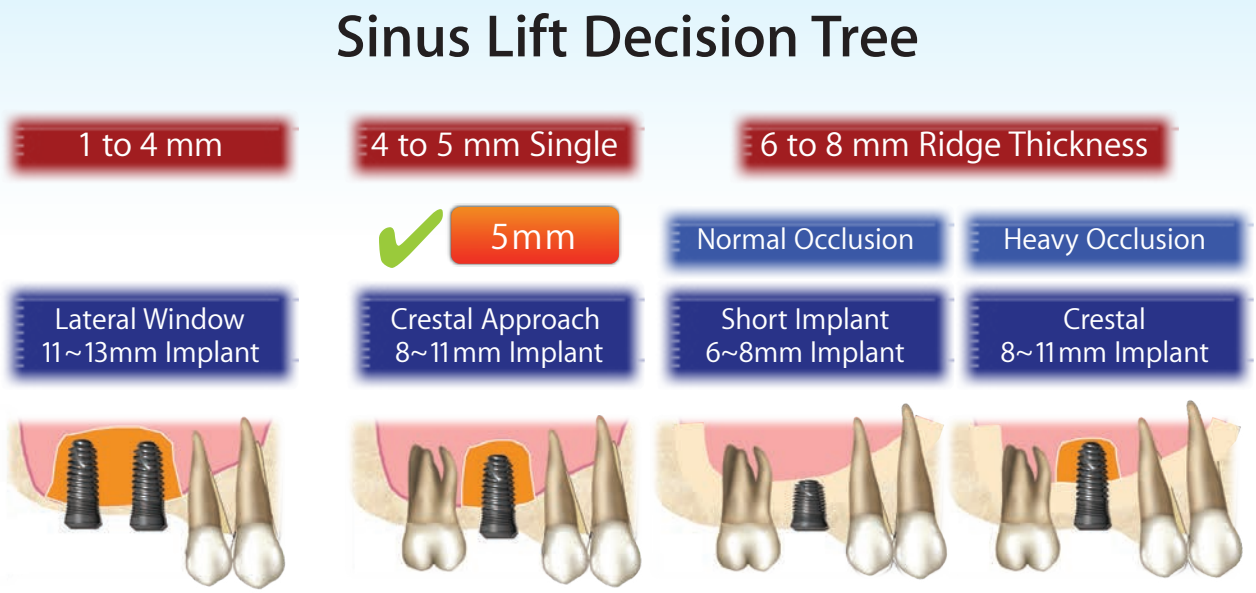


Fig. 13A:
Sinus lift decision making tree devised by Dr. Homa Zadeh shows the preferred surgical procedure and implant size according to alveolar bone thickness inferior to the sinus, and the expected occlusal load (Normal or Heavy).

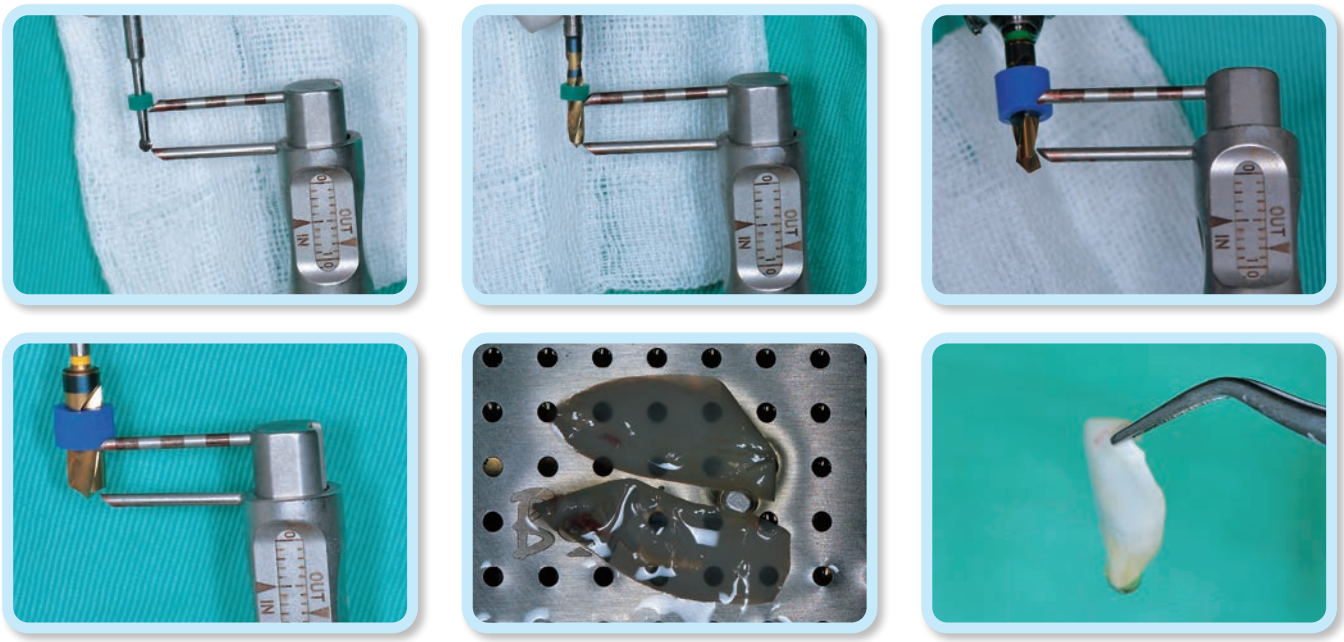
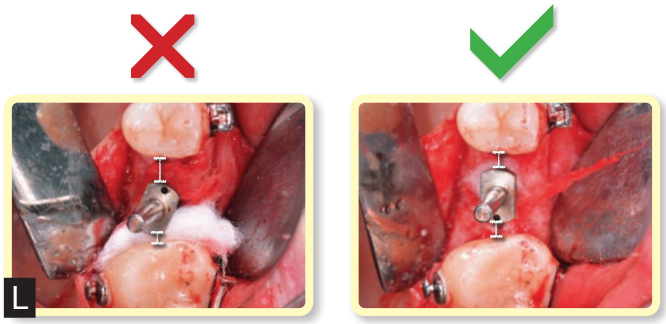


Fig. 13B:
All drill bits were fitted with a 5mm rubber stopper to prevent premature sinus violation (top 3 photographs). The maximum diameter drill was also marked at 5mm (lower left). Platelet-rich fibrin (PRF) material was prepared (lower center), into a finished specimen (lower right) to serve as a cushion material for the sinus elevation procedure. See text for details.

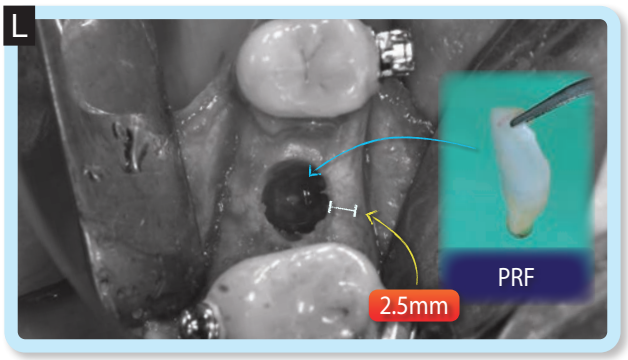
A radiograph with an osteotomy indicator in place showed that a slight correction was needed to achieve parallelism. A side cutting Lindemann drill (*Meisinger, Neuss, Germany*) was used to correct the direction and center the osteotomy (*Fig. 13C*).

A periapical radiograph confirmed that there was no apparent sinus perforation (*Fig. 13D*). After the osteotomy was completed, buccal bone thickness was 2.5mm. The previously prepared PRF cushion was placed in the osteotomy (*Fig. 13E*), and an osteotome was used to elevate the floor of the sinus with its adjacent Schneiderian membrane (*Fig. 13F*). Freeze-dried bone allograft (*FDBA*) produced by Maxxeus Dental, Kettering OH (*USA*) was selected as the bone augmentation material. The osteotome was then used to push the FDBA into the space created by the sinus elevation. The procedure was repeated 3 times to complete the grafting of the implant site (*Fig. 13G*), and a 5x9mm fixture was screwed to place (*Fig. 13H*). To protect the bone grafted site, a cover screw sealed the submerged

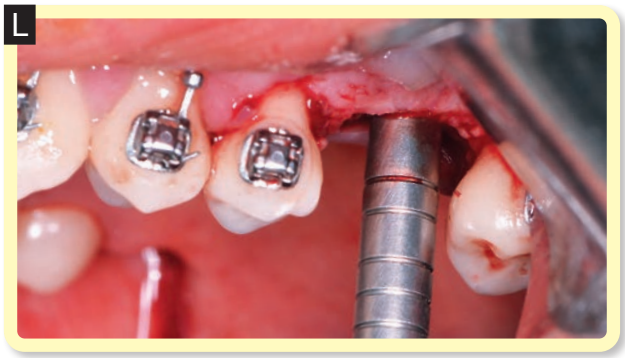


■ *Fig. 13C:*
Drilling protocols were followed and an indicator was placed to evaluate the direction of the osteotomy. The left photograph with asymmetric white bars shows that the osteotomy is not centered in the site (red X). A side cutting Lindemann drill was used to correct the direction and position (green check). See text for details.

■ *Fig. 13D:*
The initial radiograph (a) of the left (L) posterior maxilla shows an indicator inserted to the depth of the osteotomy. The sinus floor was not perforated.



■ *Fig. 13E:*
After the osteotomy width was prepared, there was 2.5mm buccal bone thickness (yellow curved arrow marking a white bar). PRF was placed into the osteotomy (blue curved arrow). See text for details.



■ *Fig. 13F:*
With PRF as cushion material in the bottom of the osteotomy, the sinus floor was fractured superiorly with an osteotome.

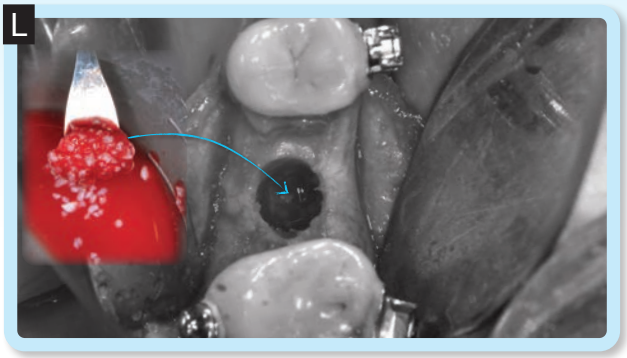


Fig. 13G:
Freeze-dried bone augmentation (FDBA) material was inserted into the osteotomy as a 4mm thick coagulum graft. The osteotome was used to compact the material into the floor of the sinus inferior to the sinus membrane. This procedure was repeated three times to complete the graft.

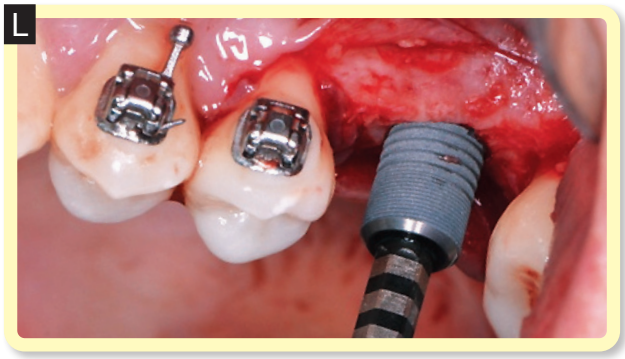


Fig. 13H:
A 5x9mm fixture was inserted into the bone-grafted osteotomy to restore the missing UL6.

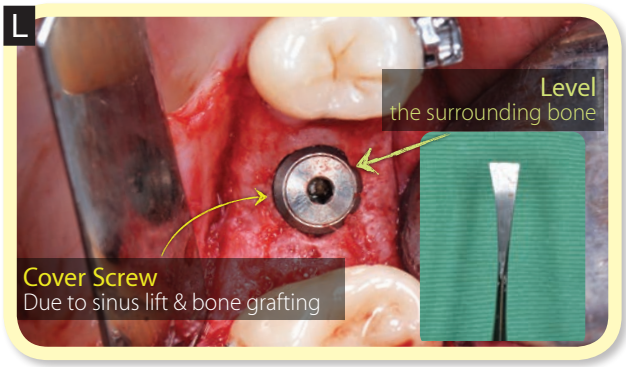


Fig. 13I:
A cover screw was used to seal the submerged UL6 fixture and a chisel was used to remove the irregular marginal bone that might interfere with the subsequent installation of the healing abutment. The soft tissue was closed over the fixture for a three month unloaded healing phase.

fixture prior to soft tissue closure (*Fig. 13I*). The bone peripheral to the implant was leveled with a chisel to assure that the healing abutment will seat firmly when the implant is uncovered (*Fig. 13I*).

Three months after surgical placement, both implants were uncovered, cover screws removed, and healing abutments were installed (*Fig. 13J*). The implant position chart (*Fig. 13K*) documents ideal placement of the UL6 implant according to the 2B-3D rule,[11] but the fixture was a little too close to the second molar (*~1.5mm*), but it was still acceptable.

One month later, 2.5mm high direct abutments with the same diameter as the respective implant were installed. A double cord gingival retraction technique was used to expose each abutment for a direct impression with polyvinyl siloxane. To prevent soft tissue overgrowth of the abutment, Tony Caps were used as substitutes for provisional crowns (*Fig. 13L*). Two weeks later, both crowns were delivered and the marginal fit was checked with an explorer and periapical radiographs (*Fig. 13M*).

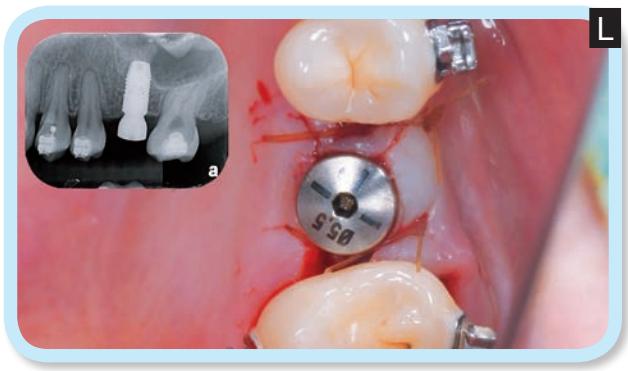


Fig. 13J:
After the three month healing phase, the cover screw on the UL6 fixture was exchanged for a 5.5x4mm healing abutment.

Implant Position Chart

1. M-D	2. B-L	3. Depth	4. Angulation	5. Distance to tooth
Center	2mmBB	3mm	Max. 15°	> 1.5mm

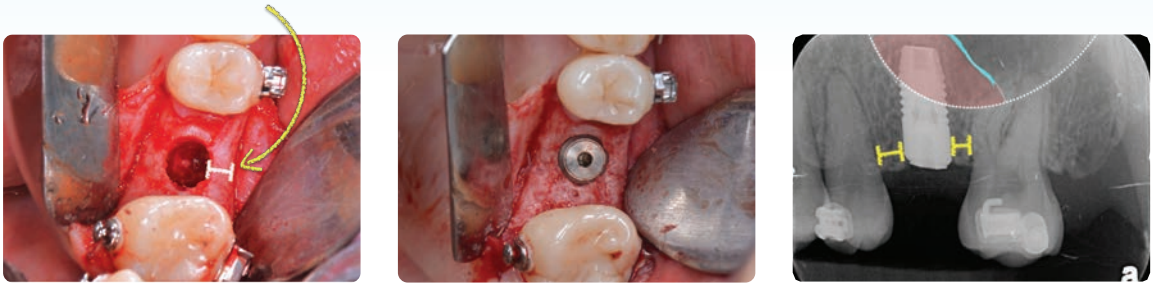


Fig. 13K:
Implant position chart for the UL6 implant shows the assessment after the fixture was placed. The yellow curved arrow and yellow bar show the buccal bone thickness was 2mm (left image). Depth and angulation were as planned (middle image). The UL6 fixture was closer than planned to the adjacent second molar (yellow bars), but the outcome was deemed acceptable (right image).

Fig. 13L:
One month after placing the healing abutments, direct abutments with 2.5mm marginal height were installed. A double cord gingival retraction technique was used to make a direct impression with polyvinyl siloxane. To prevent soft tissue overgrowth, "Tony Caps" were used as substitutes for provisional crowns.

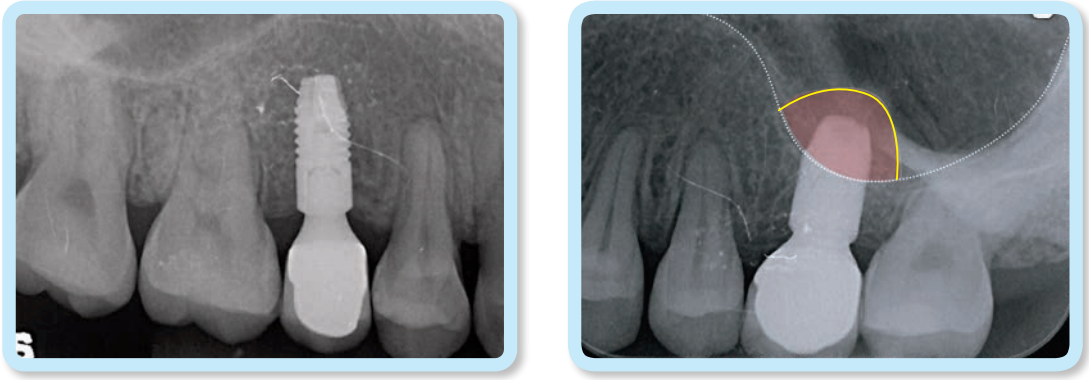


Fig. 13M:
Two weeks later, both crowns were delivered and the marginal fit was checked with periapical radiographs: UR5 on the left and UL6 on the right. The bone grafted area superior to the sinus floor (yellow line) is shaded in pink (right image).

Following 31 months of interdisciplinary treatment, maxillary and mandibular clear overlay retainers were delivered for full-time wear for the six months and nights only thereafter.

Treatment Results

The post-treatment photographs documented an improved profile and more harmonious facial esthetics. The functional shift and mandibular asymmetry were resolved. Although there was still an upward cant of the occlusal plane on the left side, the smile arc was pleasing with a more youthful facial appearance (*Fig. 14*).

The post-treatment panoramic film (*Fig. 15*) was carefully examined because of the pretreatment periodontal root resorption risk factors. Alveolar bone height for the maxillary arch was maintained and the osseous support for both maxillary posterior implants was optimal. Overall the bone support in the mandibular arch was maintained except where the knife-edge ridges were closed distal to the lower canines. There was a 1-2mm

Fig. 14: Post-treatment facial and intraoral photographs

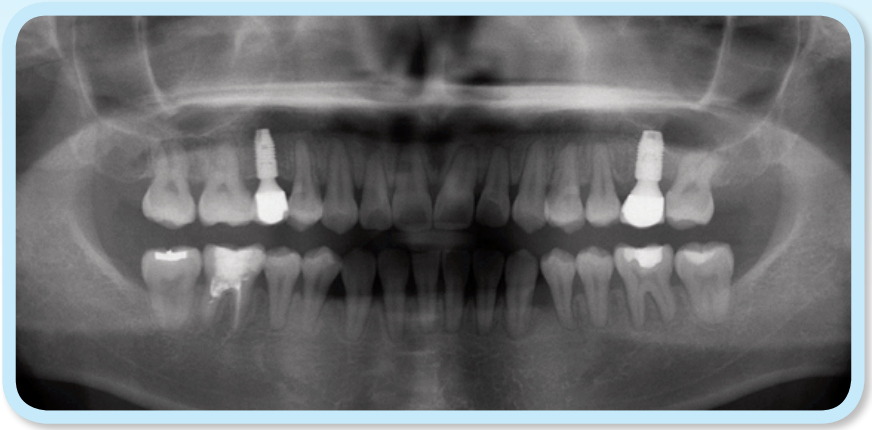


Fig. 15:
Post-treatment panoramic radiograph shows lateral root resorption on the distal of the LL3 and bone loss between the LL3 and LL4. These problems are risk factors when a knife-edge ridge is closed in a periodontally compromised patient. See text for details.

loss of bone height where the spaces were closed, and root resorption was noted along the distal root surface of the LL3 (*Fig. 15*). Clinically the affected teeth (*lower canines and first premolars*) were vital, mobility was WNL, and pocket depth was acceptable (≤*3mm*). Since the bone width was only 1.5mm on the buccal surface of the UR5 implant, long term follow-up is required.

The superimposed cephalometric tracings revealed that the axial inclination of the maxillary incisors was increased, and the maxillary molars were retracted slightly. In the mandibular arch, the molars were protracted and the incisors were retracted. The mandible was retracted about 2mm after the anterior crossbite was resolved. Ramus length and the MPA were unchanged. Cephalometric tracings documented that the lower lips were retracted to improve the concave Class III profile (*Figs. 16 &18*).

The ABO Cast-Radiograph Evaluation (*CRE*) score was 26 points (*Worksheet 2*). The major CRE discrepancies were bucco-lingual inclination (*6 points*) and occlusal

Fig. 16: Post-treatment cephalometric radiograph

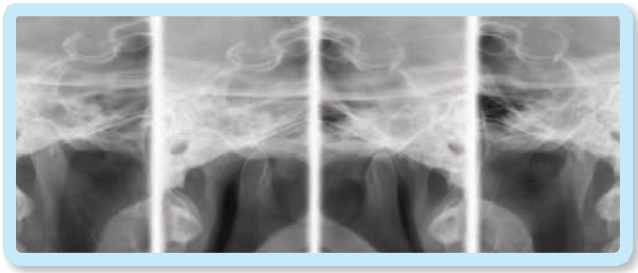


Fig. 17:
Post-treatment temporomandibular joint radiography shows four views of the TMJs: R TMJ closed, R TMJ open, L TMJ open, and L TMJ closed. Note that the condylar heads are more distally positioned in each fossa compared to pre-treatment (Fig. 7), which is consistent with correction of the functional shift in the sagittal plane (Fig. 1).

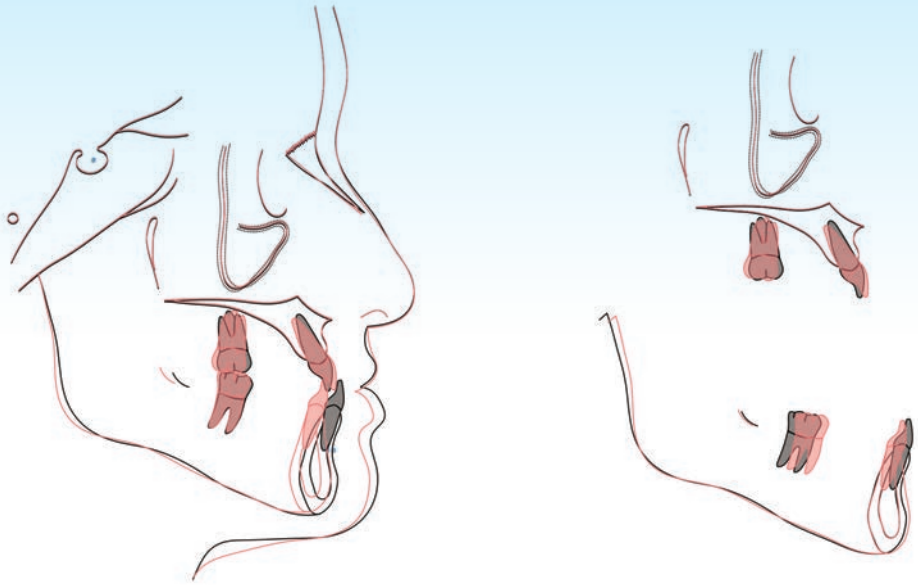


Fig. 18:
Cephalometric tracings before (black) and after (red) treatment are superimposed on the anterior cranial base (left), maxilla (upper right) and mandible (lower right). See text for details.

Fig. 19: Post-treatment study models (casts).

(*intermaxillary relationships*) scored at 8 points. For details see the CRE worksheet at the end of this report.

Discussion

The 3-Ring Diagnosis, developed by Dr. John Lin,[2] is an effective method for identifying Class III malocclusions that are amenable to conservative therapy:

1. **Profile**: Most pseudo Class III profiles in C_R are orthognathic. So if the facial profile is acceptable in the retruded position, the malocclusion is suitable for camouflage treatment (*Fig. 20*).

2. **Class**: Evaluate both the canine and first molar occlusal relationships in centric occlusion (C_O). An anterior crossbite is easier to treat when the molars are Class I in C_R (*pseudo Class III*) compared to when molars are in Class III in C_R (*true Class III*). For the present patient the bilateral molar relationships were not a full-cusp Class III (*Fig. 3*), which was favorable for conservative treatment.

3. **Functional Shift**: Diagnosing the presence or absence of a functional shift is crucial for efficient management of a skeletal malocclusion. Functional interference on closure in C_R results in an anterior shift to occlude the posterior

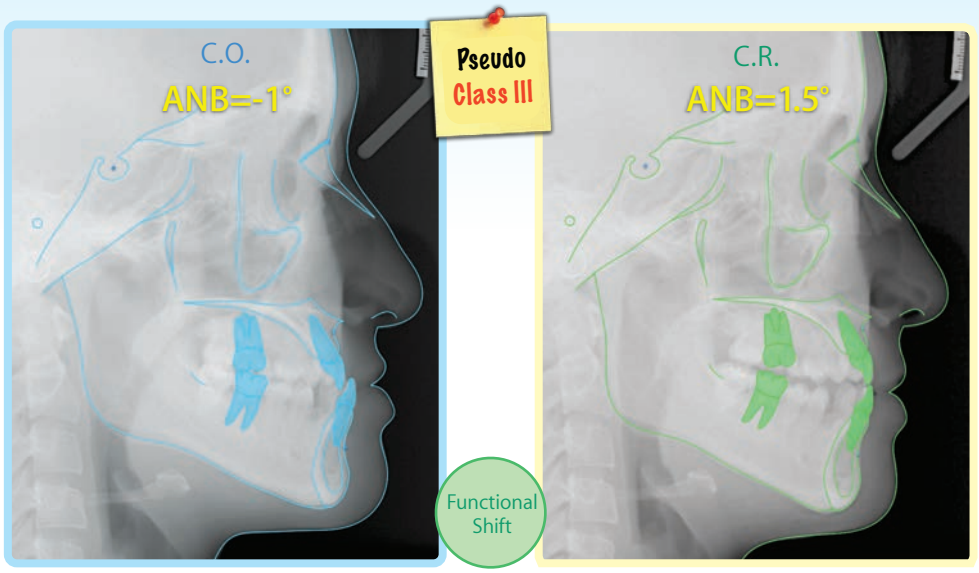


Fig. 20:
Tracings superimposed on cephalometric films in centric occlusion (C.O.) and centric relation (C.R.) are shown on the left and right, respectively. The C.O. (C_O) tracing in blue reveals an ANB -1 when the patient is in maximum intercuspation. The C.R. (C_R) tracing in green documents that ANB increases to 1.5 by eliminating the functional shift.

segments for mastication, i.e. centric occlusion (C_O). Diagnosing the sagittal discrepancy of a malocclusion in C_O may result in an incorrect appraisal that favors orthognathic surgery (*Fig. 6*). If the facial profile is acceptable in C_R, conservative camouflage treatment is indicated (*Fig. 20*).

For the present patient, conservative camouflage treatment was a viable alternative.[2] Appropriate orthodontic treatment for anterior cross-bite includes proper torque selection, bite turbos, light-force Class III elastics and open coil springs. With 8 months of active treatment, the patient's anterior cross-bite was corrected (*Fig. 8*). With a proper diagnosis and appropriate treatment plan, complex skeletal malocclusions are efficiently resolved with conservative mechanics.[3] Orthognathic surgery is unnecessary.

The etiology of the LL knife-edge ridge (*Figs. 1-3*) was deemed a developmental defect associated with microdontia, which resulted in >7mm of excess space in the lower arch. It appears that some permanent teeth in the lower anterior segment erupted into adjacent spaces rather causing the exfoliation of their primary predecessors. After the retained primary canines were lost, the edentulous areas atrophied into knife-edge ridges (*Figs. 3 and 5*). Teeth can be moved into knife-edge edentulous areas but loss of alveolar bone height and lateral root resorption on adjacent teeth are common complications.[14]

Functional interference may have contributed to alveolar bone loss in the lower anterior segment (*Fig. 5*). Clearly light force as well as careful torque control of the lower incisors and canines is

always important, but a thorough pre-treatment periodontal examination was indicated, because treatment of periodontally compromised patients is unpredictable.[7] In retrospect, the current treatment was a relatively good result for a patient with a compromised periodontium. It is unlikely that orthognathic surgery would have yielded a better periodontal result because alignment of the dentition and space closure was still necessary. Periodontal compromise and knife-edge ridges are risk factors for dental alignment and space closure.[3,14]

Twenty-three months of conservative orthodontic treatment efficiently resolved the patient's chief complaint. Correcting the functional interference and aligning the dentition improved the facial esthetics dramatically (*Fig. 21*). Restoration of the maxillary posterior dentition was best accomplished with implant supported prostheses (*crowns*). Space closure would have shortened the length of the arch complicating the crossbite correction and eliminating the occlusal antagonists for the lower second molars. Extracting the hopeless UL6 and opening space for the missing UR5 to prepare sites for implants was clearly the best option.

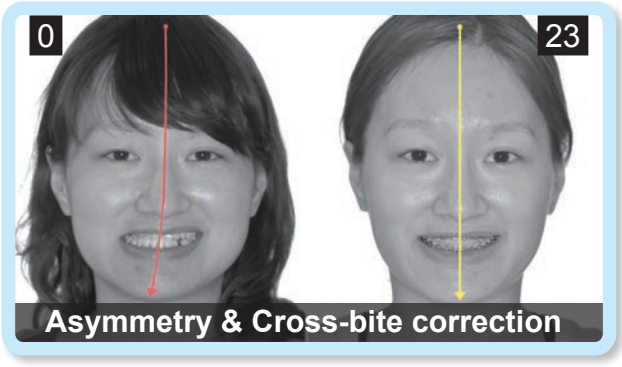


Fig. 21:
Twenty-three months (23M) of treatment corrected the facial asymmetry by eliminating the functional interference and aligning the dentition. However the occlusal plane, canted superiorly on the patient's left side, has persisted.

For the UR5 implant, 2mm of buccal bone thickness was the target to provide sufficient blood supply and bone stability.[15-19] However, there was only 1.5mm of buccal bone thickness after the implant was placed (*Fig. 12C*). Although this compromise was deemed acceptable at the time of the surgery, bone augmentation with GBR (*guided bone regeneration*) during the healing phase may have enhanced the buccal bone thickness to enhance stability, and decrease the chance of post-operative bone resorption.[11,12,14]

After the crowns for the maxillary implants were delivered, the dental and soft tissue appearance were carefully assessed with a Pink & White dental esthetics evaluation (*worksheet at the end of this care report*). The buccal tissue on both implants was deficient because the implant sites were relatively atrophic prior to fixture placement (*Fig. 9*). Consistent with patient's concern about additional surgery, the implants were placed without a previous bone and soft tissue augmentation procedures.[12,15] The gingival margins for the implant-supported crowns (*UR5, UL6*) were not consistent with the adjacent or contralateral teeth, some of which showed gingival recession.[18,20] The crown margins of UR5 and UL6 conformed to the CEJ outline, but gingival recession was evident on the UR4, UL4 and UR6 (*Figs. 22 and 23*). There are two methods for enhancing this white esthetic problem: 1. gingival grafts for the teeth with recession, and/or 2. place the implant fixtures 1mm

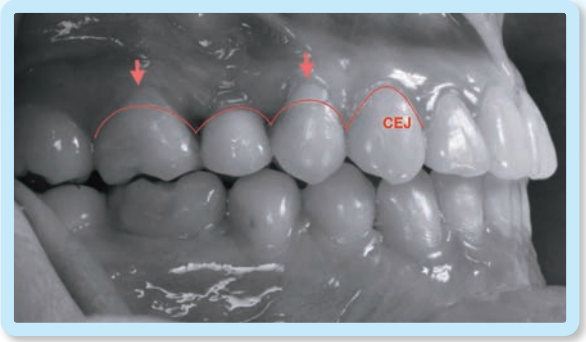


Fig. 22:
After delivery of the UR5 crown, the gingival margins for the right buccal segment were irregular relative to the CEJ contours (red line). The UR5 crown was consistent with the CEJ heights but there was gingival recession for UR4 and UR6 (red arrows), See text for details.

Fig. 23:
The upper gingival margins (labeled orange line) for the upper left buccal segment are irregular because the inferior margin of the UL6 crown is about 1mm more occlusal than ideal. See text for details.

deeper to decrease gingival height,[18,21] but care must be exercised to avoid a biologic width problem.[22] For the UL6 implant, intruding the fixture would be a difficult adjustment because of the sinus lift bone augmentation procedure (*Fig. 10*). However, these minor esthetic issues were of no consequence to the patient because she was satisfied with the result and preferred to avoid any additional surgery.

A major concern with the current patient was longterm followup of the pleasing result supported by compromised periodontal tissues. She was informed that careful oral hygiene and regular professional care were essential for the maintenance of the implants, and the compromised lower anterior segment, where the knife-edge ridge was closed. Unfortunately the patient failed to return for follow-up evaluation after the completion of treatment (*Figs. 14-19*), and reportedly has moved overseas. The patient was very pleased with the final esthetics, but may have failed to adequately understand that the conservative treatment she demanded was stressful for her compromised periodontium. Follow-up care is critically important for longterm maintenance. Hopefully she will pursue the followup program prescribed wherever she has chosen to live.

Clinicians are often challenged by patient preferences that conflict with the most ideal approach to managing a compromised dentition. Potential periodontal problems in adult orthodontic patients is a serious concern. The ABO noted that periodontal deterioration of patients, who appear to be stable based on routine pretreatment records, was a frequent problem for case reports presented for the clinical examination. A precedence was set by alerting the orthodontic profession that special periodontal screening is necessary for all adult patients (*18 years or older*) seeking comprehensive treatment, and any patients <18 years old with signs or symptoms of periodontal disease (*not simple gingivitis*). Periodontal pretreatment records should be taken within 6 months prior to treatment and

within 12 months following appliance removal. Post-treatment periodontal records are required on patients that start treatment as an adolescent but finish treatment at 18 years or older.

To properly evaluate patients at risk of periodontal compromise the ABO[6] requires one or more of the following methodologies for all case reports:

1. Full mouth periodontal probing prior to initiating orthodontic treatment
2. Written documentation of periodontal status, including a full periodontal charting, received from a periodontist, general or pediatric dentist.
3. Panoramic radiograph, in conjunction with vertical or conventional bitewings, and maxillary and mandibular anterior periapical radiographs
4. Full mouth series of periapical and bitewing radiographs
5. High resolution CBCT images that represent requirement #3 above

The present case report is a good example of the excellent results attainable with the coordinated interdisciplinary care afforded by orthodontics and implant dentistry. However, comprehensive treatment of patients with a compromised periodontium is unpredictable, particularly if there are episodes of active periodontitis. A healthy or at least stable periodontium is an important prerequisite for orthodontic care. The ABO method for periodontal documentation before treatment[6] is critical for determining if the patient is a good candidate for any form of comprehensive treatment. In addition, periodontally compromised patients should be carefully maintained during and after treatment.

Conclusions

A functional ($C_R \rightarrow C_O$) shift is commonly associated with crossbites. Clinical evaluation of the potential for conservative treatment of a skeletal malocclusion must be performed in C_R. If a pseudo-Class III patient has an acceptable profile in the most retruded position, there is good potential for conservative treatment. An orthodontic and implant treatment plan was the most conservative solution for this mutilated Class III patient. However, the periodontium was compromised, there were knife-edge edentulous ridges to close, and one of the implant sites was atrophic. Despite these problems the patient insisted on conservative treatment with a minimum of surgery. Camouflage treatment meets the patient's needs but there were problems with lateral root resorption and localized loss of alveolar height. A severe malocclusion (*DI 45*) was treated to a satisfying result (*CRE 26, P&W 3*) in 23 months. However, the compromised periodontium requires longterm maintenance.

Acknowledgment

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Discrepancy Index Worksheet

TOTAL D.I. SCORE 45

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 = 21

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 = 4

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 = 0

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 = 4

LINGUAL POSTERIOR X-BITE

1 pt. per tooth Total = 2

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. =	2
Missing teeth (except 3rd molars)		x 1 pts. =	2
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	3	x 2 pts. =	6

Identify: Close 7mm knife edge.

Total = 10

IMPLANT SITE

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

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) =_ 2

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

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

Total = 2

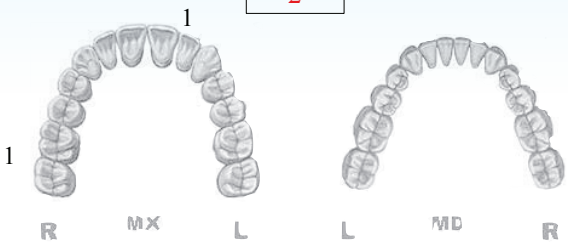
Cast-Radiograph Evaluation

Case # **Patient**

Total Score: 26

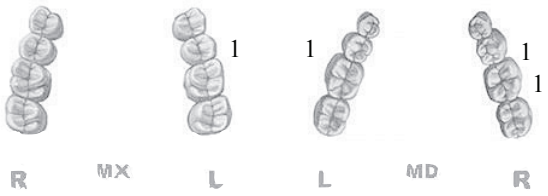
Alignment/Rotations

2



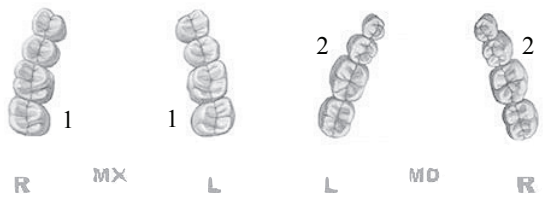
Marginal Ridges

4



Buccolingual Inclination

6

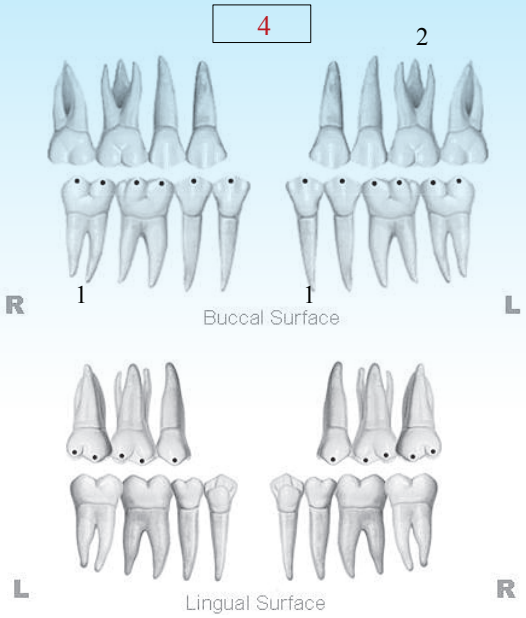


Overjet

2

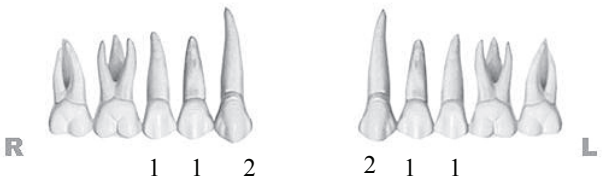
Occlusal Contacts

4



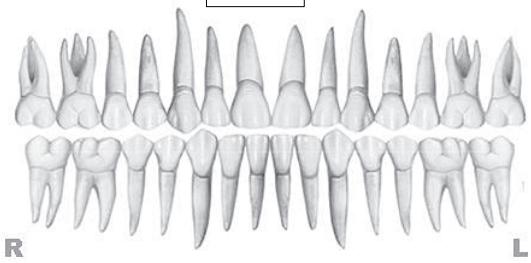
Occlusal Relationships

8



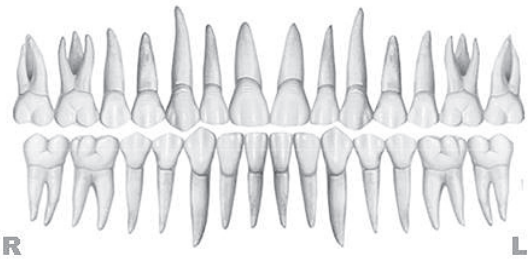
Interproximal Contacts

0



Root Angulation

0



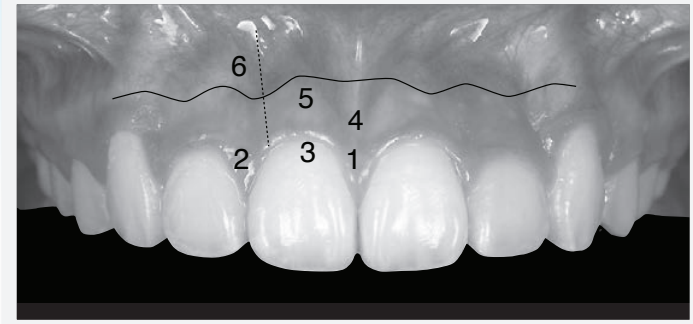
INSTRUCTIONS: Place score beside each deficient tooth and enter total score for each parameter in the white box. Mark extracted teeth with "X". Second molars should be in occlusion.

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

Total Score: = 3

1. Pink Esthetic Score

Total = 1

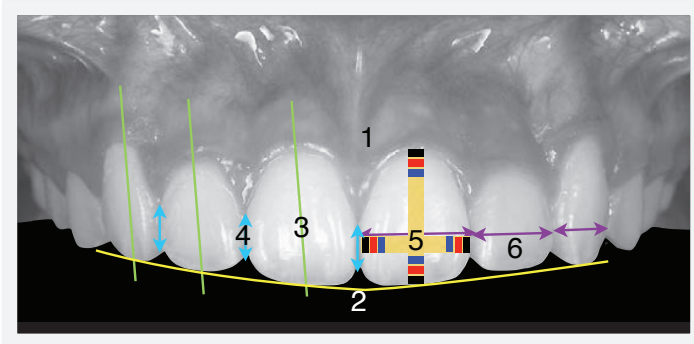


1. M & D Papillae	0	1	2
2. Keratinized Gingiva	0	1	2
3. Curvature of Gingival Margin	0	1	2
4. Level of Gingival Margin	0	1	2
5. Root Convexity (Torque)	0	1	2
6. Scar Formation	0	1	2

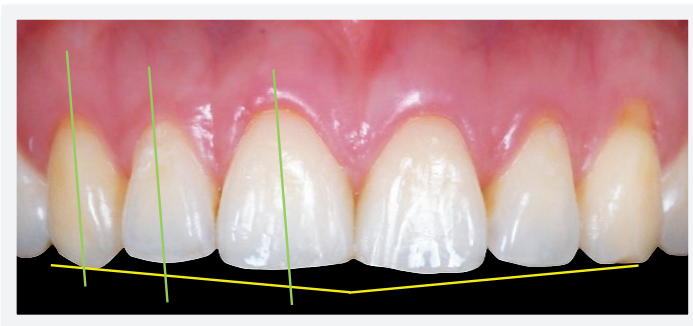
1. M & D Papilla	(0)	1	2
2. Keratinized Gingiva	(0)	1	2
3. Curvature of Gingival Margin	(0)	1	2
4. Level of Gingival Margin	0	(1)	2
5. Root Convexity (Torque)	(0)	1	2
6. Scar Formation	(0)	1	2

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

2018

iAOI Symposium 年中大會

Dr. Diego Peydro

05 / 27（日）

地點：國立清華大學校本部 台達館 B1 璟德講堂
（新竹市東區光復路二段101號）

ALIGNER ORTHODONTICS:
全新典範與挑戰

Dr. Diego Peydro Herrero 為西班牙的矯正專科醫師，並於馬德里和瓦倫西亞大學開設矯正專業課程。此外，他也是隱適美系統的專家，在歐洲和中東地區開設隱適美系統的國際繼續教育課程-Clear Ortho Inter-national Program (COIP)。本次演講將針對醫師在開始提供 Aligner 治療後會遇到的常見問題，包含與技師的溝通，如何快速有效的確立治療計畫，進行 Clincheck，選擇 Attachments 等等，提出他建議的 Protocols。

9:00-10:30 ▶ **矯正的新視野**

適用於 Aligner 的矯正力學

致勝方程式：思考＋計畫＋執行

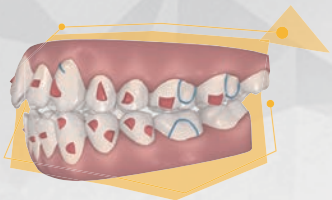
立基於治療計畫的 Attachment 選擇

11:00-12:30 ▶ **處理 Transversal 面向的新典範**

數位化設計理想的牙弓形狀

計畫關鍵牙齒的整體性移動

迷你螺絲和橡皮筋：如何超越移動的限制？



13:30-15:00 ▶ **如何處理 Vertical 問題？**

在計畫擬定時考量「臉」的重要性

如何避免在計畫擬定時的重大錯誤

Attachments 和牙齒移動的順序，何者比較重要？

15:30-17:00 ▶ **利用迷你螺絲治療嚴重開咬和錯咬**

G5 protocol 的修訂，BT 及其他

報名專線：03-5711377　報名網址：iaoi.pro　聯絡方式：蔡小姐 contact@iaoi.pro

ALIGNER ORTHODONTICS - Workshop

ALIGNER x MINISCREW

Diego Peydro x 張慧男

Dr. Diego Peydro

地點：新竹市東區建中一路25號2樓
（金牛頓藝術科技）

05 / 28 (一)

張慧男 博士

- 新竹貝多芬齒顎矯正中心負責人
- 中華民國齒顎矯正專科醫師
- 美國齒顎矯正專科醫師學院院士（ABO）
- 美國印地安那普渡大學齒顎矯正研究所博士
- 美國 Angle 學會會員

09:00-11:00 **Class II and III, extraction or not? Dr. Peydro's protocols**
Hands on: Excel in the Clincheck Software

11:30-12:30 **如何處理 Sagittal 問題以及嚴重案例？**

13:30-15:00 **Miniscrews in the tuberosity. A new paradigm**
Hands on: Miniscrews application

特別演講：Diego Peydro x 張慧男醫師

15:30-17:00 **如何利用 Aligner 輕鬆有效地處理阻生齒？**

	2018/03/01前		2018/03/01後	
	會員	非會員	會員	非會員
大會單場報名	$5,000	$6,600	$6,600	$8,000
大會＋Workshop（含年費 3,000）	$25,000	–	$28,000	–

- Workshop 不開放非會員報名

▲學分：依衛福部醫事人員繼教育積分管理辦法登錄授與專科醫師認證學分。

▲匯款資訊：日盛國際商業銀行815光復分行0347　帳號：105-27376210-000　戶名：國際矯正植牙學會
2018/4/27前因故退費，需扣除10%行政費用；4/27後因故退費，需扣除30%行政費用。

主辦單位：iAOI 國際矯正植牙學會

Impacted Maxillary Canines: Facilitating Eruption or Surgical Uncovering

Abstract

A 11y10m female presented in the late mixed dentition stage, as the premolars were beginning to erupt. There was severe anterior crowding in both arches, and the maxillary canines were impacted. One year later the right maxillary canine erupted in a high, blocked out position. After extracting the deciduous canines and opening space as needed, the right canine spontaneously erupted into an acceptable alignment, but the left canine remained impacted. Cone-beam computed tomography (CBCT) accurately displayed the position of the impaction, and the overlying tissue was surgically removed to allow the upper left canine to erupt. The Discrepancy Index (DI) for this complex malocclusion was 15, and the Impaction Specific Assessment System (iSAS) score was an additional 15 points, for a total DI of 30.

A passive self-ligating appliance, supplemented with bite turbos on the lower first molars, was used to alleviate the cross-bite of both upper lateral incisors. After 40 months of active treatment, the cast-radiograph evaluation (CRE) score was a marginal 31 points, primarily due to buccolingual inclinations and lack of intermaxillary occlusal contacts. Superimposition of cephalometric tracings showed that the ANB was reduced 1° but the mandibular plane angle increased ~1.5°. The latter resulted in a more feminine facial pattern. Follow-up photographs 1 year and 10 months after treatment revealed that both facial esthetics and occlusion were stable. (J Digital Orthod 2018;49:52-71)

Key words:
Impacted upper canine, open window surgery, impaction's Specific Assessment System (iSAS) , iDI, iCRE

History and Etiology

An 11-year-10-month-old female presented with a severely crowded dentition (*Figs. 1-3*). Intraoral examination revealed a recently erupted upper left first premolar, but the other primary maxillary molars and a left canine were retained. The anterior dentition was severely crowded, both upper lateral incisors were in cross-bite, and the upper canines were unerupted. In the absence of obvious anomalies and pathology in the maxillary arch, the assumed etiology for the impactions was crowding and abnormal paths of eruption. There was no evidence of contributing oral habits or temporomandibular dysfunction. A pleasing alignment was achieved, as shown in Figs. 4-9.

Diagnosis

Skeletal:

- Skeletal Class I: *SNA 80°, SNB 76°, ANB 4°*
- Mandibular Plane Angle: *SN-MP 37.5°, FMA 30.5°*

Dental:

- Molar Relationships: *End-on Class II on both sides*

Dr. Linda Tseng,
Lecturer, Beethoven Orthodontic Course (Left)

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

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

Fig. 1: Pre-treatment facial photographs

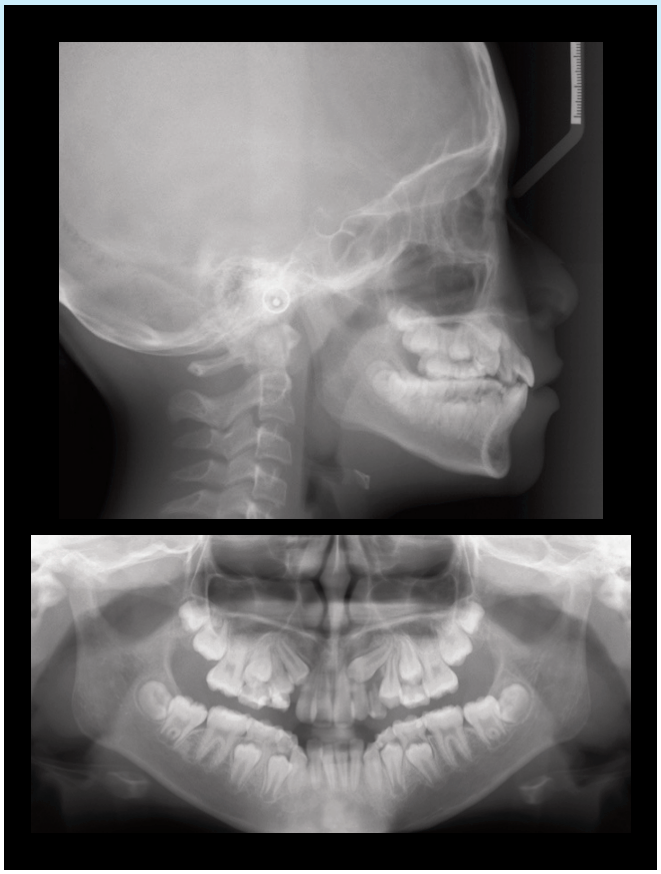
Fig. 4: Post-treatment facial photographs

Fig. 2: Pre-treatment intraoral photographs

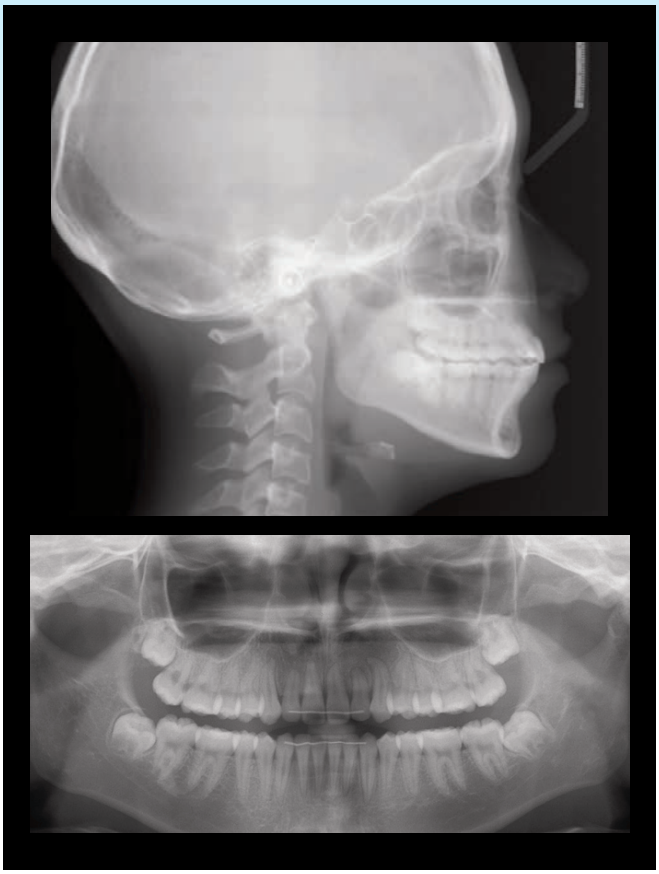
Fig. 5: Post-treatment intraoral photographs

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

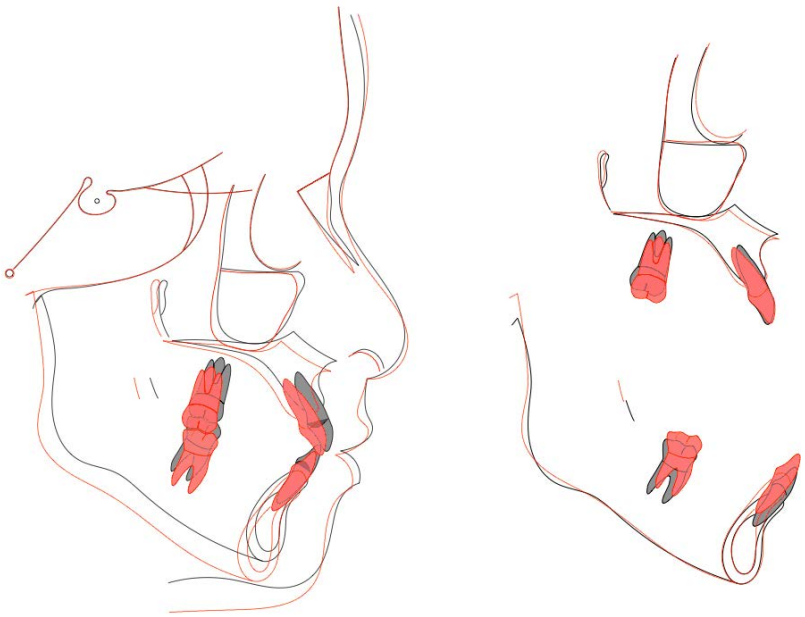
Fig. 6: Post-treatment study models (casts)



■ *Fig. 7:*
Pre-treatment cephalometric (above) and panoramic (below) radiographs



■ *Fig. 8:*
Post-treatment cephalometric (above) and panoramic (below) radiographs



■ *Fig. 9:*
Superimposed tracings of the pre-treatment (black) and post-treatment (red) cephalometric radiographs show the dental and skeletal changes during treatment. See text for details.

- Crowding: *>10mm space deficiency for the upper arch, ~7mm in the lower arch.*
- Cross-Bite: *Both maxillary lateral incisors*
- Impactions: *Both maxillary canines*

Facial:

- Profile: *Convex but within normal limits (WNL)*
- Summary: *Symmetry*
- Incisal Exposure: *WNL when smiling*

The ABO Discrepancy Index (*DI*) was 15, and an additional 15 points were scored for the difficult position of the canine impaction, so the total DI was 30 as shown in the subsequent worksheet.

CEPHALOMETRIC SUMMARY			
SKELETAL ANALYSIS			
	PRE-Tx	POST-Tx	DIFF.
SNA° (82°)	80°	78°	2°
SNB° (80°)	76°	75°	1°
ANB° (2°)	4°	3°	1°
SN-MP° (32°)	37.5°	39°	1.5°
FMA° (25°)	30.5°	32°	1.5°
DENTAL ANALYSIS			
U1 To NA mm (4 mm)	3 mm	4 mm	1 mm
U1 To SN° (104°)	104°	109°	5°
L1 To NB mm (4 mm)	6 mm	6 mm	0 mm
L1 To MP° (90°)	95°	95°	0°
FACIAL ANALYSIS			
E-LINE UL (2-3 mm)	0 mm	-1 mm	1 mm
E-LINE LL (1-2 mm)	1.5 mm	0 mm	1.5 mm

■ Table 1: Cephalometric summary

Specific Objectives of Treatment

The principal treatment objectives were: 1. Correct intermaxillary anterior crowding, 2. Open space for the impacted maxillary canines, 3. Expose and align the impactions, and 4. Achieve an ideal intermaxillary alignment.

Maxilla (*all three planes*):

- A - P: *Allow for normal expression of growth*
- Vertical: *Allow for normal expression of growth*
- Transverse: *Maintain*

Mandible (*all three planes*):

- A - P: *Allow for normal expression of growth*
- Vertical: *Allow for normal expression of growth*
- Transverse: *Maintain*

Maxillary Dentition:

- A - P: *Retract incisors to correct overjet*
- Vertical: *Maintain*
- Inter-molar / Inter-canine Width: *Expand as needed to relieve crowding*

Mandibular Dentition:

- A - P: *Maintain*
- Vertical: *Extrude*
- Inter-molar / Inter-canine Width: *Expand as needed to relieve crowding*

Facial Aesthetics:

- Maintain

Treatment Plan

Serial extraction was recommended, but the patient and her parents declined the procedure, so she was placed on recall and orthodontic treatment was postponed until the permanent premolars erupted. A non-extraction strategy with a full fixed orthodontic appliance was planned to align and level both arches. Low torque brackets were selected for the anterior segments of both arches to prevent incisal flaring (*Fig. 10*). Bite turbos (*BTs*) were constructed on the lower first molars to open the bite for correction of the anterior crossbite of the maxillary lateral incisors. An open window surgical procedure was planned to expose the impacted canine. Cone Beam Computed Tomography (*CBCT*) images were used to precisely assess the position and orientation of the impacted left canine.

Fig. 10:

***Upper Left**: The right maxillary cuspid erupted spontaneously, but was blocked out due to inadequate space (arrow).*

***Upper Center**: Low torque brackets were bonded on the maxillary anterior teeth to resist the tendency for flaring as the crowding was corrected. The arch wire was 0.014-in CuNiTi.*

***Upper Right**: Left buccal view at the start of treatment.*

***Lower Left**: The occlusal view of the maxillary arch is shown at the start of treatment (0M).*

***Lower Right**: Bite turbos (BT) were constructed on the lower first permanent molars (arrows) to open the bite for correction of the anterior crossbite involving both maxillary lateral incisors.*

Appliances and Treatment Progress

A 0.022-in slot Damon D3MX® bracket system (*Ormco, Glendale, CA*) was selected. Low torque brackets were bonded on the maxillary anterior teeth to resist the tendency for flaring as the crowding was corrected. To correct the crossbite of the maxillary lateral incisors, bite turbos were constructed with Fuji II type II glass ionomer cement (*GC America, Alsip IL*), on the occlusal surfaces of both mandibular 1st molars to open the bite and reduce the occlusal interference (*Fig. 10*). Opening the bite with bite turbos facilitated crossbite correction, and may have contributed to increasing the vertical dimension of occlusion (*VDO*) as noted in Fig. 9.

One month later, open coil springs were inserted between lateral incisors and first premolars bilaterally to open space for the impacted canines (*Fig. 11*). In the 4th month, the arch wire was changed

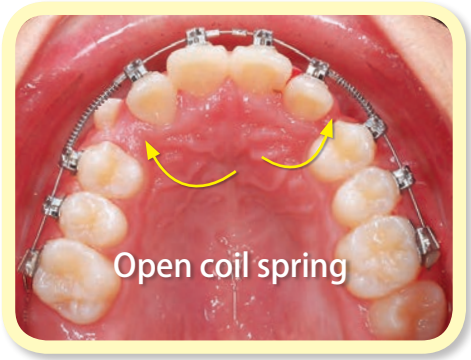


Fig. 11:

Two segments of open coil spring (arrows) were inserted between the lateral incisors and first premolars bilaterally, to open space for the impacted canines.

to 0.014x0.025-in NiTi. After 8 months of treatment, the blocked out right canine gradually erupted to a normal position, and the crossbite was corrected (*Fig. 12*).

In the 13th month, the lower arch was bonded with low torque brackets to prevent incisal flaring. Adequate space was available for the impacted left canine (*Fig. 13*). CBCT imaging was scheduled to evaluate the impaction.

In the 18th month, a panoramic radiograph and CBCT scan were taken to assess progress and identify the position of the impaction. The 3D image with bone density tuned out was evaluated prior to surgery to accurately confirm the location of the impaction relative to adjacent teeth (*Figs. 14 and 15*). Surgical exposure of the impacted canine was

■ *Fig. 12:*
After 8 months (8M) of active treatment, progress is shown in three intraoral maxillary views:

***Upper**: Arch form reveals inadequate space for the upper left canine.*

***Center**: The cusp tip of the canine has erupted past the archwire.*

***Lower**: The crossbite of the upper lateral incisors was corrected (arrows).*

■ *Fig. 13:*
After 13 months (13M) of active treatment:

***Upper**: Frontal view*

***Center**: Upper arch-form shows space opening for the impacted canine.*

***Lower**: The lower arch was bonded with low torque brackets in the anterior segment to prevent incisal flaring.*

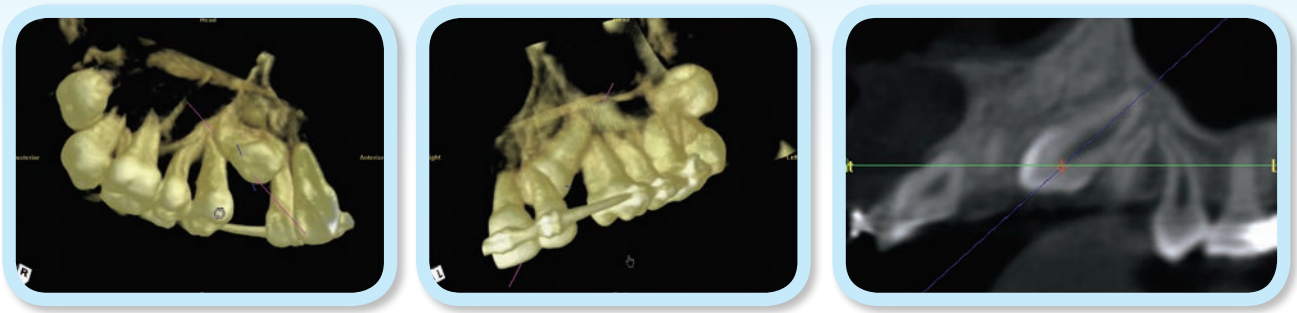


Fig. 14:
***Left and Center**: 3D imaging with bone density tuned-out documents the position of the impaction to adjacent teeth.*
***Right**: Slice views are useful for determining the thickness of the bone covering the impaction.*

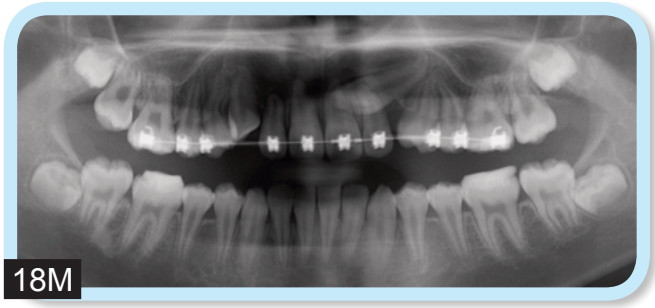


Fig. 15:
At 18 months (18M) a panoramic radiograph documents progress prior to uncovering the impaction.

performed by removing the overlying soft tissue, and the wound was covered with surgical dressing (*Fig. 16*). Three months after surgery, the upper left canine erupted spontaneously, and an eyelet was bonded onto the labial surface. A 0.013-in NiTi arch wire aligned the previously impacted tooth (*Fig. 17*), and the movement was documented with a series of intraoral photographs (*Fig. 18*). After seven months of traction, soft tissue accumulated on the buccal surface of the canine, and a gingivectomy was performed with a diode laser. One month later, a low torque bracket was bonded on the maxillary left canine (*Fig. 19*). In the 33rd month, the upper

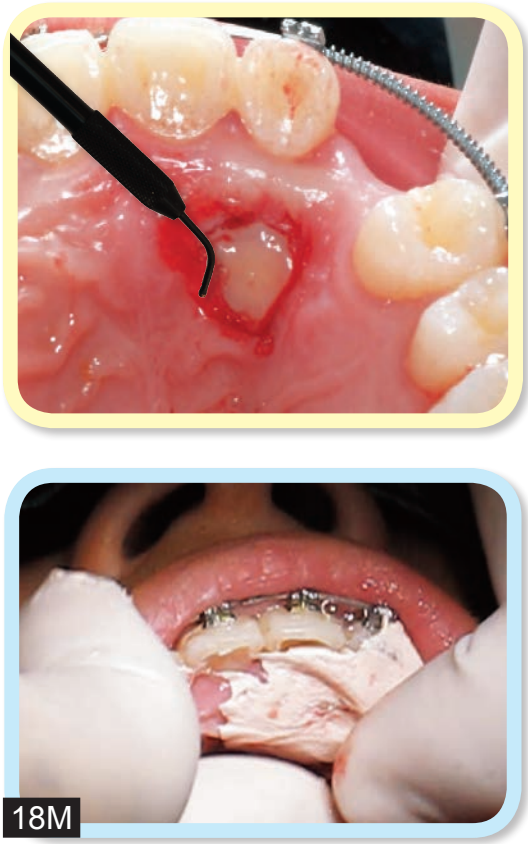


Fig. 16:
At 18 months (18M) soft tissue covering the impaction was removed with electrosurgery (upper). The wound was covered with surgical dressing (lower).

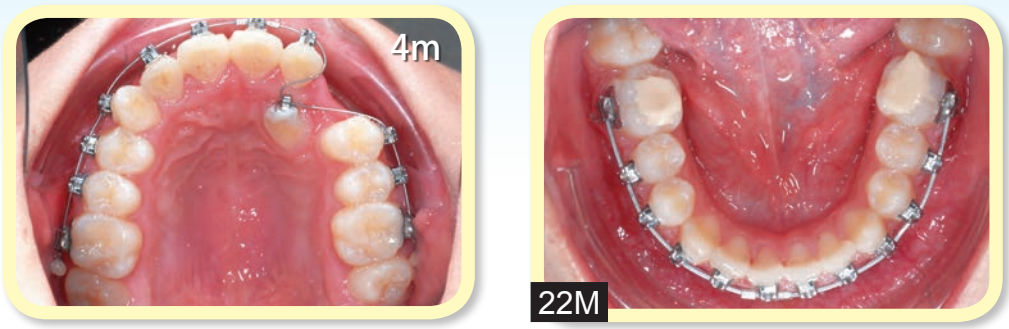


Fig. 17:
At 22 months (22M) into treatment and 4 months (4M) after surgical uncovering, an eyelet was bonded on the erupted canine and traction was applied with an 0.013-in NiTi arch wire (left). Arch alignment is near complete and bite turbos were bonded on the lower first molars (right).

Fig. 18:
***Left**: At 23 months (23M) and 1 month (1M) after initiation traction*
***Middle**: At 24 months (24M) the canine is uprighting into its proper position in the arch.*
***Right**: At 29 months (29M) and 7 months (7M) after initiation of traction the previously impacted canine is entering the arch-form (arrow).*

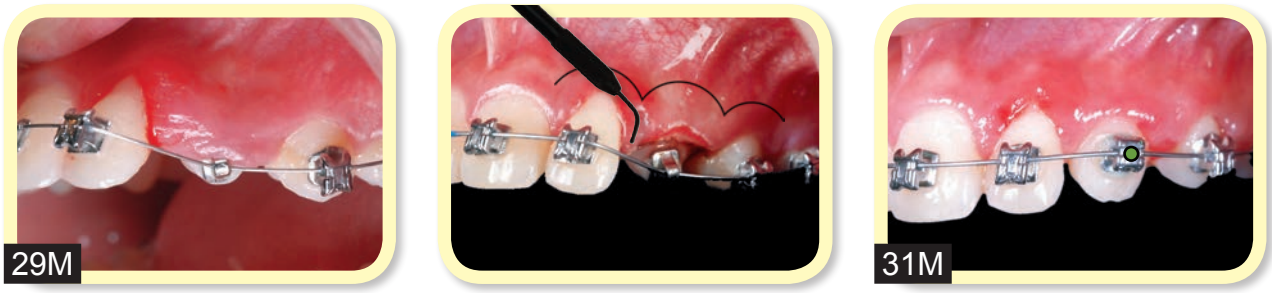


Fig. 19:
At 29 months (29M) of treatment and seven months of buccal traction on the upper left canine, soft tissue accumulated on the buccal side of the tooth (left). A diode laser was used to remove excessive gingiva relative to the mucogingival junction (black line, center). One month later, a low torque bracket was bonded on the maxillary left canine (right).

arch wire was changed to 0.014x0.025-in NiTi. A panoramic radiograph was exposed to evaluate bracket positions relative to axial inclinations of all teeth, and they were repositioned as needed. In the 37th month, a 0.017x0.025-in TMA archwire was placed in the upper arch. An elastic (*Bear 1/4-in, 4.5-oz*) was applied from the upper left canine to the lower left canine and the adjacent first premolar to close the open contact (*Fig. 20*). One month later, wire bending and palatal reduction was performed on the maxillary left canine for detailing the occlusion during the final stage of treatment (*Fig. 21*). After 40 months of active treatment, all appliances were removed. Fixed anterior retainers and clear overlays were delivered for both arches (*Fig. 22*).

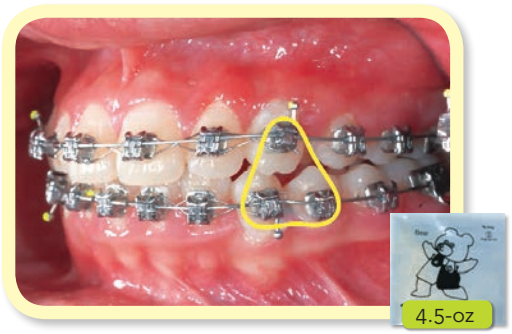


Fig. 20:
A triangular elastic (Bear ¼-in, 4.5-oz) was used to close the open contact in the left canine area.

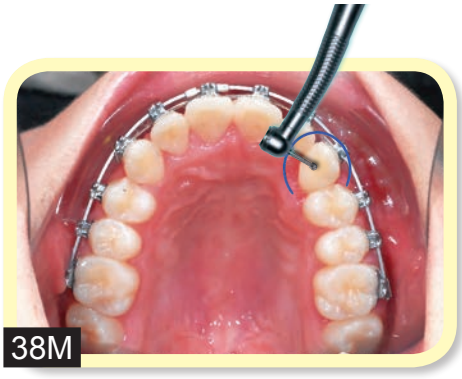


Fig. 21:
Palatal reduction of the palatal enamel surface was performed on the upper left canine. Archwire adjustment was utilized to finish the intermaxillary detailing.

Fig. 22:
After 40 months (40M) of active treatment, all appliances were removed, fixed anterior retainers were bonded on the lingual surfaces of individual teeth in both arches.

Results Achieved

Maxilla (*all three planes*):

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

Mandible (*all three planes*):

- A - P: *Retracted*
- Vertical: *Increased (posterior rotation)*
- Transverse: *Maintained*

Maxillary Dentition

- A - P: *Anterior incisors retracted and slightly flared*
- Vertical: *Molars extruded*
- Inter-molar / Inter-canine Width: *Crowding corrected with arch expansion*

Mandibular Dentition

- A - P: *Maintained*
- Vertical: *Molars and incisors were extruded*
- Inter-molar / Inter-canine Width: *Maintained*

Facial Aesthetics:

- Facial convexity and lip protrusion WNL

Retention

Fixed lingual retainers were bonded on all maxillary incisors, and from canine to canine in the mandibular arch. Clear overlays were delivered for each arch. The patient was instructed to wear them full time for the first month and nights only thereafter. Instructions were provided for the home hygiene as well as for maintenance of the retainers.

Final Evaluation of the Treatment

Cephalometric superimpositions (*Fig. 9*) and analysis (*Table 1*) document vertical growth and posterior rotation of the mandible. The mandible increased in length about 10mm (*Fig. 9*), and the upper dentition was retracted. The upper incisor to SN angle increased from 104° to 109°. That flaring effect resulted from correction of the crowding and the space-opening effect of the coil springs. Extruded molars in both arches and the lower incisors were related to expression of mandibular growth, and possibly due to the posterior bite turbos. Posterior rotation of mandible resulted in a 1.5° increase in the mandibular plane angle. Although lower facial height increased, photographs after treatment (*Fig. 4*) show lip competence, as well as similar facial convexity and lip protrusion, compared to the pre-treatment records. Overall, the posterior rotation of the mandible was advantageous for maintaining a more feminine profile.

The ABO Cast-Radiograph Evaluation (*CRE*) score was 30 points, which slightly exceeds the ideal range (*upper limit of 26 points*). The major discrepancies were occlusal contacts (*10 points*), buccolingual inclination (*7 points*), marginal ridges (*4 points*), alignment/rotations (*3 points*), and distal tipping of the upper second molars (*Fig. 23*). If these discrepancies had been discovered with prefinish records,[1] the finish CRE score could have been substantially improved with bracket repositioning and archwire adjustments. Overall, the dentition was well aligned, and the patient was satisfied with the result.

Fig. 23:
Distal tipping of the upper second molars were noted after debonding. This problem could be corrected by repositioning the brackets as shown.

Discussion

1. Impacted Maxillary Canine

Other than the mandibular third molar, the maxillary canine is the most commonly impacted tooth with an incidence from 1-2.5%.[2] Conventional radiography in 2D requires two or three conventional intraoral films, exposed at different projections, to reliably assess the position and eruption pathway of impacted canines in most children. The optimal age for radiologic investigation is 10 to 13 years.[3] Genetics is thought to be the primary factor, but delayed exfoliation of the primary canine, lack of space and ectopic path of eruption may also contribute. The prevalence of labial or palatal impaction is 15% and 85% respectively. The incidence rate in females is 3.2 times that of males. Palatally impacted canines are five times more common in Europeans compared to Asians.[2-5]

Root resorption of permanent incisors may be related to ectopic eruption of the maxillary canines[4] and cysts have also been reported for untreated impactions. Extraction of the primary canine may favorably influence the path of eruption. The success rate differs according to the impacted canine position at the start of treatment, mesial or distal to the midline of the lateral incisor in the panoramic radiograph (*Fig. 24*). With late diagnosis, crowding, root resorption and/or horizontal path of eruption, surgical exposure with active orthodontic extrusion is the treatment of choice.[5] For the patient in the present study (*Figs. 10 and 25*), the right upper canine was positioned distal to the midline of the lateral incisor. It erupted spontaneously, but was subsequently blocked out. The left upper canine was

Fig. 24:
The success rate for normalization for the maxillary permanent canine eruption by extracting the deciduous canine and opening space for the impaction is related to the overlap of the unerupted canine relative to the incisor roots at the start of treatment: 91% if the overlap involves only the distal aspect of the lateral incisor root, and drops to 64% if the overlap is more than half of the central incisor root.

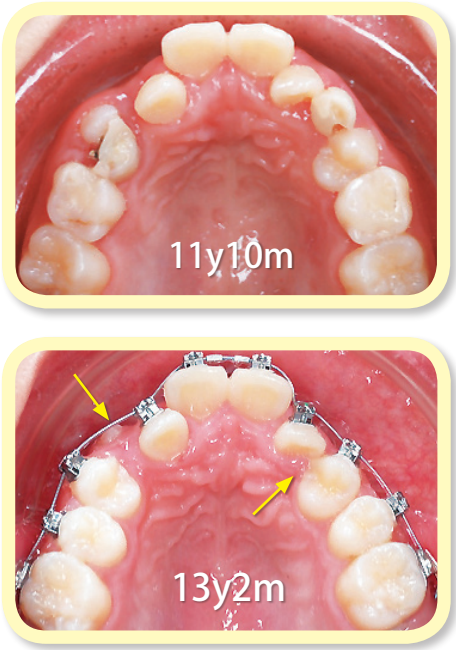


Fig. 25:
Relative to the pretreatment view of the maxillary arch pretreatment (11y10m), the right canine erupts in a high position because it is blocked-out, but the left canine is impacted and its space is closed.

positioned mesial to the midline of the lateral incisor, and thus deeply imbedded in the palate. After the primary canine was lost, the space closed due to distal shift of the lateral incisor and mesial shift of the posterior teeth. Fixed orthodontic appliances were the optimal option.[5,6]

2. Leeway Space

Leeway space is the arch-length difference between the combined mesiodistal width of the deciduous cuspid and molars and their successors.[7] Usually the total width of these three primary teeth is greater than that of their permanent successors by ~1.6-2.5mm per side in the lower arch and ~0.7-1.5mm per side in the upper arch. Girls usually have larger Leeway spaces than boys, probably because males usually have larger crown dimensions for all teeth.[7] Preserving Leeway space helps relieve crowding.[8] During late mixed dentition, a 5mm space deficiency was measured in the lower anteriors of the present patient. The crowding was relieved spontaneously after the lower permanent premolars erupted, but this phenomenon was not observed in maxillary dentition (*Figs. 25 and 26*). The space for the maxillary left canine was probably lost due to a mesial shift of maxilla buccal segment. Baccetti et al.[9] found significant mesial movement of the upper first molars (*about 2.5mm*) occurred both in untreated and primary canine extraction patients when the canines were palatally displaced.

3. Bracket Selection

Non-extraction leveling and aligning of a crowded dentition usually results in incisal flaring, which is intensified by the use of open coil springs to regain space for impacted canines.[10] Bonding low torque brackets in the anterior segments of both arches decreases the flaring tendency. Lateral force to move a palatally impacted canine into the arch is likely to tip the crown labially, so a low torque bracket is indicated to upright the canine once it is aligned in the arch.

Fig. 26:
Crowding in lower anterior region corrected spontaneously after the permanent premolars erupted (circle), apparently due to favorable utilization of Leeway space.

4. Surgical Exposure

Another approach to facilitate autonomous eruption of the ectopically positioned maxillary cuspid is to open space orthodontically by separating the lateral incisor and premolar.[10] If the impacted canine does not begin to erupt (*Fig. 13*), surgical exposure is needed. There are three important issues to

guarantee a successful result: accurate diagnosis, proper surgery and precise mechanics.

Accurate Diagnosis

With conventional apical films, the buccal object rule is used to identify the labiolingual position of the impaction,[2,3] but 3D imaging with a CBCT scan is the only common procedure for precisely locating the impaction relative to the adjacent teeth. The slice views are useful for determining the thickness of the bone covering the impaction (*Fig. 14*). These useful insights can help avert injury to adjacent structures.

Proper Surgery

A well defined surgical procedure produces efficient alignment of a previously impacted tooth.[11] The precise location of the impaction was identified on the CBCT image. Crown position was marked with a sharp explorer that penetrated the soft tissue. Instead of a scalpel, a dental electrosurgical unit (*ESU*) was used to remove the covering soft tissue (*Fig. 16*) to control bleeding and provide a more clear surgical field. The most expedient way to align a previously impacted canine is to remove bone in the planned path of traction.[11] The "*osteo-bur*" is more efficient than osteoclasts. However, for the present patient, bone was not removed in the path of traction. Nine months was required to align the left maxillary canine. Removing bone in the path of traction would have saved time.

Precise Mechanics

If the soft tissue and bone covering the crown of an upper canine impaction are carefully removed, the tooth will spontaneously erupt into the oral cavity.[6] Furthermore, the bone level and periodontal attachment of the adjacent teeth are more healthy compared with the closed eruption technique. However, spontaneous eruption of an impaction in adults may take more than one year. To control treatment time, the present authors prefer active traction with a palatal screw to erupt the impaction into the palate, and then apply lateral force to move the tooth into the arch. It is important to initiate traction before the canine crown passes the level

	Open Window Chang		Pre-ortho. Uncovering Tech Kokich
Flap elevation	N		Y
Tooth uncovering	cut a hole over the crown		cut a hole on the flap
Suture	N		Y
surgical dressing	3 days		3 months

■ Table 2:
Comparison of the Chang and Kokich methods for uncovering impactions. The crown signifies the superior procedure at each step.

of the occlusal plane to avoid excessive tipping of the root in the opposite direction which may result in a cross-bite and/or enhance the chance of root resorption.[12]

Conclusions

If a palatal impaction is diagnosed at an early age (*10-13 years*), and the crown of the ectopic cuspid is not past the root of the lateral incisor, extraction of the primary canine is an effective approach for redirecting the path of eruption. Extracting the primary canine and opening the space orthodontically may also facilitate autonomous eruption of palatally impacted maxillary canines. If these two methods fail, surgery exposure is necessary. With accurate diagnosis, proper surgical procedures and precise mechanics, esthetic and satisfying periodontal outcomes of impacted maxillary canines can be achieved.

Fig. 27:
Follow-up photographs 1 year and 10 months after treatment document the stability of the result.

Acknowledgment

Thanks to Mr. Seth T. Pankhurst for proofreading this article.

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Discrepancy Index Worksheet

TOTAL D.I. SCORE 15+15=30

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	4 pts.
Full Class II or III	=	4 pts. per side	pts.
Beyond Class II or III	=	1 pt. per mm. additional	pts.

Total = 4

LINGUAL POSTERIOR X-BITE

1 pt. per tooth Total = 0

BUCCAL POSTERIOR X-BITE

2 pts. per tooth Total = 0

CEPHALOMETRICS (See Instructions)

ANB ≥ 6° or ≤ -2° = 4 pts.

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

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

SN-MP

≥ 38° = 2 pts.

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

≤ 26° = 1 pt.

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

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)	1	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. =	15

Identify:

iDI =15

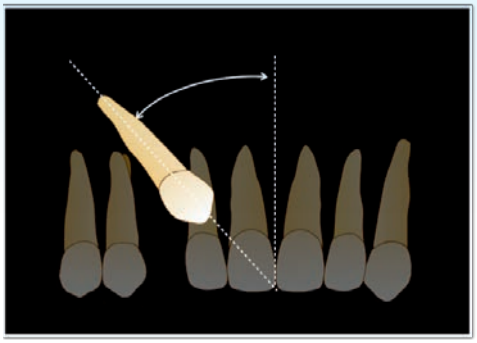
Total = 15

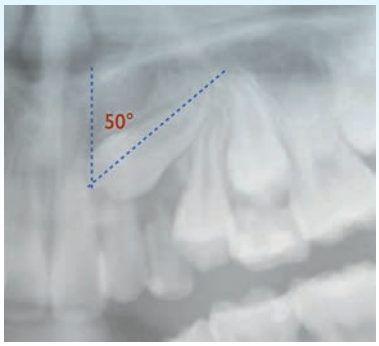
iDI impaction Discrepancy Index

Total Score: = 15

1. Angulation of the impaction to the midline in degree

Total = 3

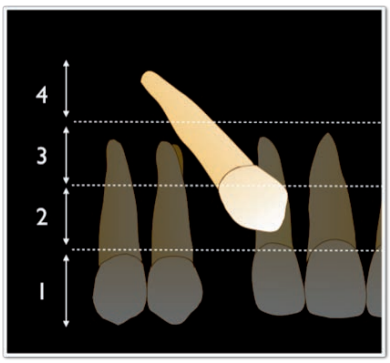


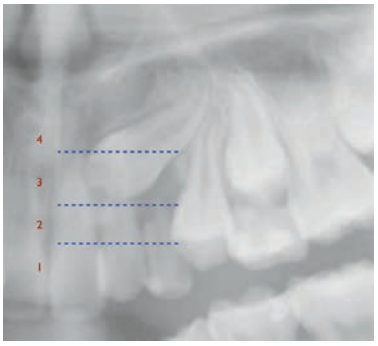


Grade 1 : 0° ~ 15° = 1 pt.
Grade 2 : 16° ~ 30° = 2 pts.
Grade 3 : ≥30° = 3 pts.

2. Vertical distance from the occlusal plane

Total = 3

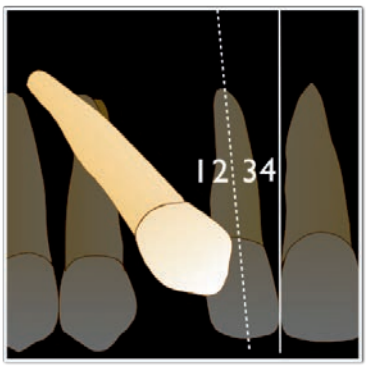


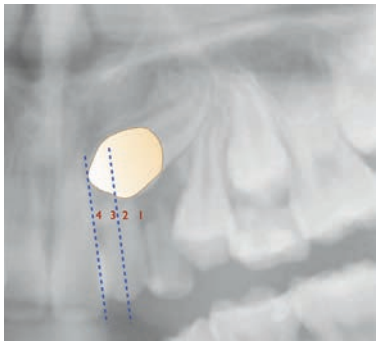


Grade 1 : Below the level of the CEJ = 1 pt.
Grade 2 : Above the CEJ, but less than halfway up the root = 2 pts.
Grade 3 : More than halfway up the root, but less than the full root length = 3 pts.
Grade 4 : Above the full length of the root = 4 pts.

3. Mesiodistal position of the impaction tip

Total = 4



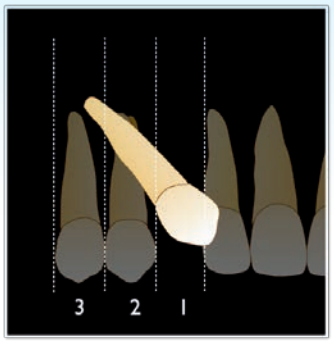


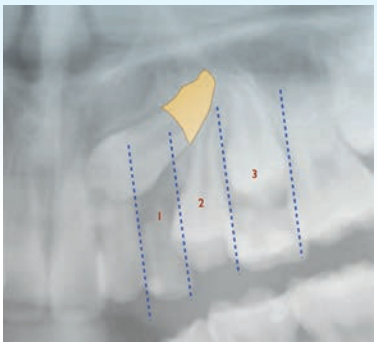
Grade 1 : No horizontal overlap = 1 pt.
Grade 2 : Less than half the root width = 2 pts.
Grade 3 : More than half, but less than the whole root width = 3 pts.
Grade 4 : Complete overlap of root width or more = 4 pts.

iDI impaction Discrepancy Index

4. Anterior-posterior position of the impaction root apex

Total = 2

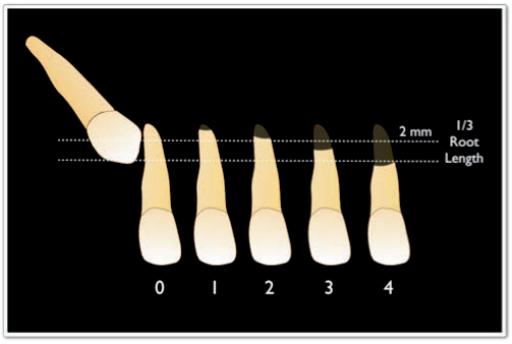


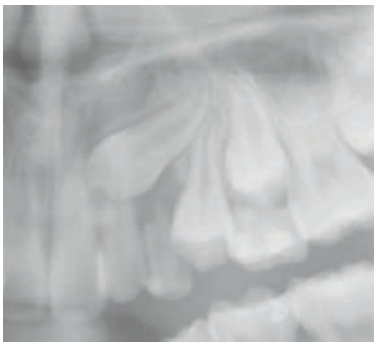


Grade 1 : Above the region of the canine position = 1 pt.
Grade 2 : Above the upper first premolar region = 2 pts.
Grade 3 : Above the upper second premolar region = 3 pts.

5. Root resorption of the adjacent tooth

Total = 0





Normal apical contour = 0 pt.
Apical irregularity, same length as pretreatment = 1 pt.
Apical root resorption of less than 2 mm = 2 pts.
Apical root resorption more than 2 mm, less than one third original root length = 3 pts.
Apical root resorption more than one third original root length = 4 pts.

6. Age relative to the completion of root formation

Total = 2

< 9 y/o (Before Central incisor root completed) = 0 pt.
9 ~ 11 y/o (Before Lateral incisor root completed) = 1 pt.
12~13 y/o (Before 1st premolar root completed) = 2 pts.
> 13 y/o (Canine root completed) = 3 pts.

7. Labial or palatal position of the impaction

Total = 1

Palatal impaction = 1 pt.
Labial impaction = 2 pts.

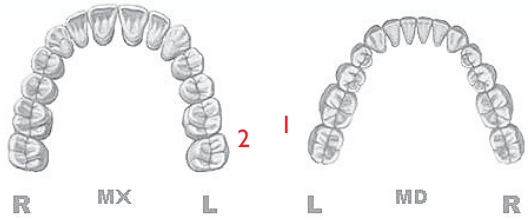
Cast-Radiograph Evaluation

Total CRE Score 30+1=31

iCRE=1

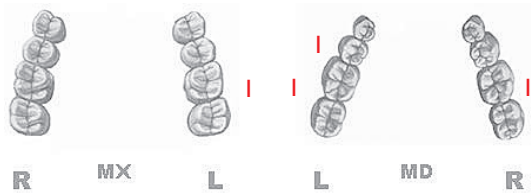
Alignment/Rotations

3



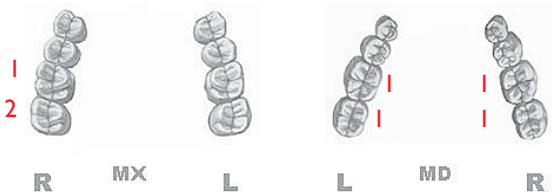
Marginal Ridges

4



Buccolingual Inclination

7

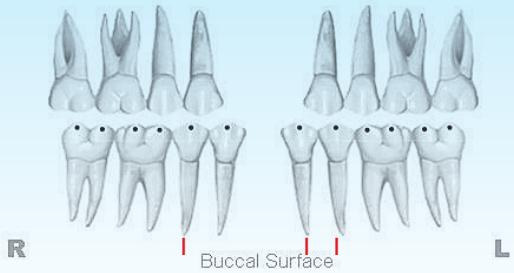


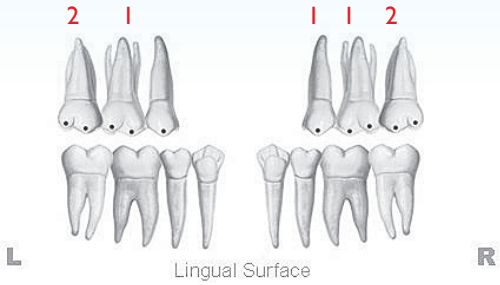
Overjet

3

Occlusal Contacts

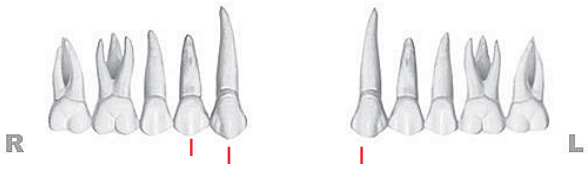
10





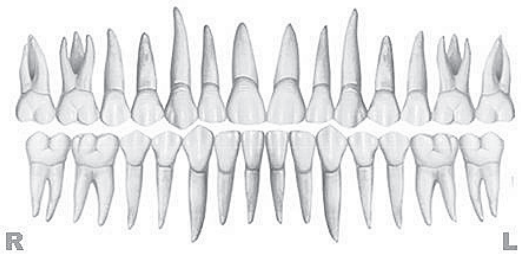
Occlusal Relationships

3



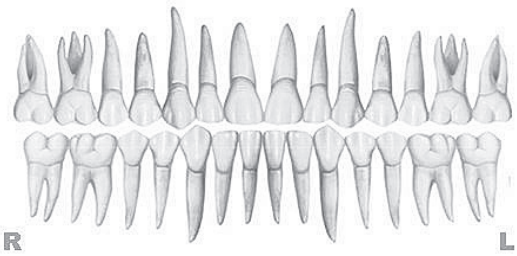
Interproximal Contacts

0



Root Angulation

0



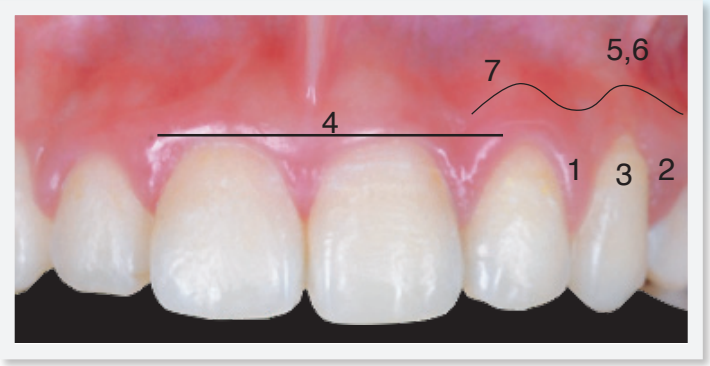
INSTRUCTIONS: Place score beside each deficient tooth and enter total score for each parameter in the white box. Mark extracted teeth with "X". Second molars should be in occlusion.

iCRE impaction Cast-Radiograph Evaluation

Total Score: = 1

1. Gingival esthetic score

Total = 1

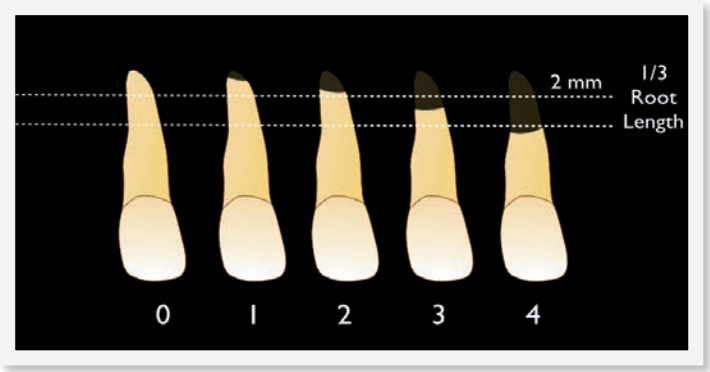


1. M & D Papillae	0	1	2
2. Keratinized Gingiva	0	1	2
3. Curvature of Gingival Margin	0	1	2
4. Level of Gingival Margin	0	1	2
5. Root Convexity (Torque)	0	1	2
6. Scar Formation	0	1	2
7. Keratinized Gingival Exists	0	1	2

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
7. Keratinized Gingival Exists	(0)	1	2

2. Root resorption of the recovered and adjacent teeth

Total = 0



Normal apical contour	0
Apical irregularity, same length as pretreatment	1
Apical root resorption of less than 2 mm	2
Apical root resorption more than 2 mm, less than one third original root length	3
Apical root resorption more than one third original root length	4

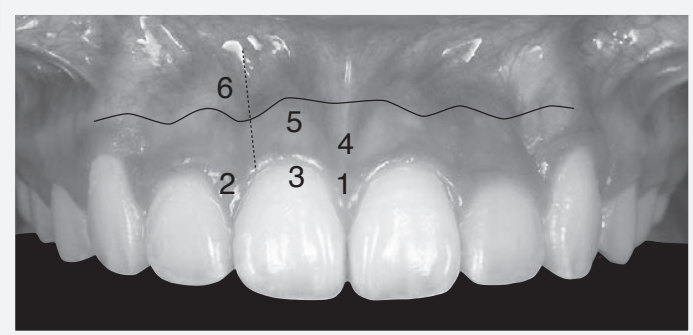
Normal apical contour	0
Apical irregularity, same length as pretreatment	1
Apical root resorption of less than 2 mm	2
Apical root resorption more than 2 mm, less than one third original root length	3
Apical root resorption more than one third original root length	4

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

Total Score: = 5

1. Pink Esthetic Score

Total = 2

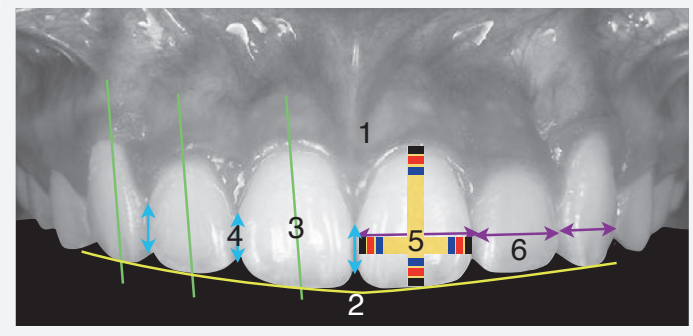


1. M & D Papillae	0	1	2
2. Keratinized Gingiva	0	1	2
3. Curvature of Gingival Margin	0	1	2
4. Level of Gingival Margin	0	1	2
5. Root Convexity (Torque)	0	1	2
6. Scar Formation	0	1	2

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 = 3



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

2018

iAOI Symposium

Dr. Diego Peydro

05 / 27 (Sun)

Location:
National Tsing Hua University, Delta Building
B1 Conference Hall
(No. 101, Section 2, Kuang-Fu Road, Hsinchu, Taiwan)

ALIGNER ORTHODONTICS: New Paradigm and challenges

Dr. Peydro Diego is the Associate Professor of the Master program in Orthodontics at the European University of Madrid and Master Collaborator Professor of Orthodontics at the University of Valencia, Spain. Dr. Peydro is the co-director of two continuing training programs focusing on the Invisalign system and teaches globally on Invisalign. His lecture will address some of most common problems that clinicians face as they begin to offer aligner therapy, including effective communication with technicians, setting up treatment plan using Clincheck, attachment selection and offer his recommended protocols.

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Planning for critical simultaneous movement

Miniscrews and elastics: Exceeding the limits of the expansion

How to Deal with Vertical Malocclusions?

Big mistakes to avoid in Clincheck planification

Attachments vs sequence of movements. Which is more important?

Treating Severe Open Bite and Deep Bite with Miniscrews

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Beneficiary Name	IAOI
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2018

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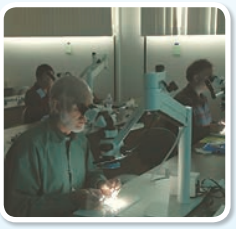
11/10~12, 2018 (六，一 - 演講與實作 workshop)
1/23, 2019 (三 - 美國可選修的 cadaver workshop)
1/25~26, 2019 (五，六 - 美國演講，畢業典禮)

9/8~10, 2018 (六，一 - 演講與實作 workshop)
1/21~22, 2019 (一 ，二 - 美國演講)
1/24, 2019 (四 - 美國可選修的 cadaver workshop)
1/27, 2019 (日 - 美國可選修的cadaver workshop)

地點：

金牛頓藝術科技中心：新竹市建中一路 25 號 2 樓 (2018 年 7 月到 11 月)
Millennium Biltmore Hotel Los Angeles. 506 South Grand Avenue. Los Angeles, CA 90071-2607 (2018年1月)

講 員 陣 容





Alexandre-Amir Aalam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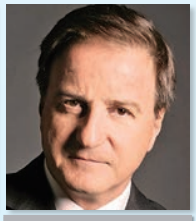
Tiziano Testori


Pascal Valentini


Stephen Wallace


Homa Zadeh




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KEYNOTE

Dr. Rungsi Thavarungkul, Thailand
Lecturer, Advanced Keynote Workshop

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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 ***International Journal of Orthodontics & Implantology,*** he has been actively involved in the design and application of orthodontic bone screws.

Dr. John Lin

President of the Jin-Jong Lin Orthodontic Clinic. Dr. Lin received his MS. from Marquette University and is an internationally renowned lecturer. He's also the author of Creative Orthodontics and consultant to ***International Journal of Orthodontics & Implantology.***

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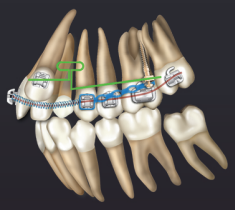

Topics:

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2. Showcase your own drawing with stunning animation in Keynote.
3. Animation composition.

Lecturer:
Dr. Rungsi Thavarungkul,
Thailand

Early Bird

by 2018/10/01

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Requirements: MacBook with the lastest system and Keynote version

Insignia® System and IZC Bone Screws for Asymmetric Class II Malocclusion with Root Transposition of Maxillary Canine and Premolar

Abstract

An 18-year-old female sought consultation with a chief complaint: poor maxillary anterior esthetics.

***Diagnosis & Etiology**: Clinical examination revealed facial asymmetry: 1. nasal deviation to the right, 2. occlusal plane canted up on the left side, 3. maxillary midline 1mm left, and 4. mandibular midline 3mm left. Complex malocclusion had: 1. unilateral Class II malocclusion (subdivision left), 2. severe upper arch crowding, 3. blocked-out upper right canine (UR3), 4. mesial root transposition of the upper right first premolar (UR4), 5. lingual crossbite of the upper left lateral incisor (UL2), 6. buccal crossbite of the upper right 2nd molar (UR7), 7. retained upper right deciduous canine and 2nd molar, and 8. an impacted 2nd bicuspid (UR5). The etiology was deemed deviated path(s) of eruption, and habitual sleep posture on the right side of the face. The Discrepancy Index (DI) was 25.*

***Treatment Plan**: 1. extract the retired deciduous teeth and instruct the patient to vary nocturnal sleep positions, 2. use the Insignia® system to produce a digital set-up of the final occlusion and reverse engineer a full fixed passive self-ligating (PSL) appliance to conform to the finishing archwires, 3. place posterior bite turbos on L6s to open the occlusion for correction the UL2 and UL7 crossbites, 4. use bilateral infrazygomatic crest (IZC) bone screws to differentially retract both arches to correct the unilateral Class II malocclusion with midline deviations, 5. move the UR3 mesially with a coil spring, 6. retract the UR4 with an elastomeric chain, and 7. finish with intermaxillary elastics.*

***Outcomes**: This challenging malocclusion (DI 25) was treated in 20 months to a board quality result, as documented with a Cast-Radiograph Evaluation (CRE) of 24 and a Pink & White Esthetic Score of 2. The only significant deficiency was Class II buccal interdigitation on the right side. The patient was very satisfied with the outcome and was pleased with her "charming smile."*

***Conclusion**: The Insignia® system is very precise and eliminates bracket positioning errors, so few detailing adjustments are required for alignment and finishing. This approach minimizes the repetitive PDL necrosis due to large number of active archwire segments, thereby resulting in a shorter treatment time. However, enamel stripping of the lower incisors and/or increased torque on the maxillary incisors was needed to completely correct the Class II buccal segment on the right side. (J Digital Orthod 2018;49:76-95)*

Key words:
Insignia® system, passive self-ligating bracket, archwire sequence, custom bracket, canted occlusal plane, root transposition, IZC bone screws, miniscrew, Class II malocclusion, tooth size discrepancy, digital set-up.

Introduction

Insignia® (*Ormco, Glendora, CA*) was introduced by Dr. Craig Andreiko in 1987. It is a three dimensional (*3D*) reverse-engineered fixed appliance for the comprehensive treatment of all malocclusions.[1] Bracket placement is extremely accurate, so the initial digital set-up requires very careful attention; problems in the set-up are reflected in the finish. A precision fixed appliance produces a highly efficient, more continuous tooth movement process. Few if any detailing adjustments are required for aligning and finishing the final occlusion. Less repetitive periodontal ligament (*PDL*) necrosis occurs because fewer active archwires

Dr. Ashley Huang,
Lecturer, Beethoven Orthodontic Course (Left)

Dr. Angle Lee,
Director, Beethoven Orthodontic CourseEditor, Editor, Journal of Digital Orthodontics (Center left)

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

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

are engaged.[1,2] The Insignia® system offers the potential for enhancing the rate of tooth movement and decreasing the incidence of root resorption.

Transposition of teeth is a challenging problem for orthodontists. There can be a complete interchange or tipping of two adjacent teeth so that their crowns and/or roots are transposed. For this present patient (*Figs. 1-2*) the crown of an UR3 was immediately labial to the UR4, but the roots of the adjacent teeth are transposed (*Fig. 3*).

Fig. 1: Pre-treatment facial and intraoral photographs

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

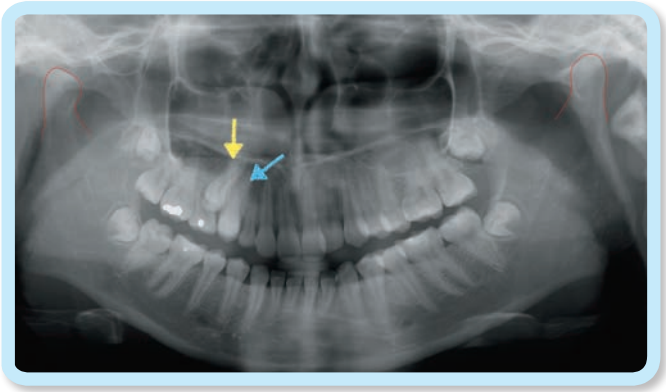


Fig. 3:
Pre-treatment panoramic radiograph. R and L condyles (red outline) are symmetrical. The upper right second premolar (UR5) is impacted (yellow arrow). The upper right canine (UR3) and the first premolar (UR4) had transposed roots (blue arrow).

Transposition is defined as a positional interchange of two teeth in the dental arch, and its prevalence is relatively rare (*0.38%*).[3] The maxillary canine is the most prevalent transposed tooth. The problem is more commonly associated with the lateral incisor (*1.64/1000*) compared to the first premolar (*0.91/1000*).[3] Dental transposition is primarily a genetic problem because it is more common in inbred groups.[4] The treatment of dental transposition is controversial. Factors such as gingival esthetics, canine eruption, caries risk, and duration of treatment are important considerations.[5] The current case report presents the successful non-extraction treatment of dental root transposition, complicated by posterior buccal cross bite.[6] Self-ligating brackets positioned with the Insignia® system[1,2] are a good option for enhancing the efficiency of the mechanics.

Diagnosis and Etiology

An 18 year-old female sought consultation for an unattractive smile. There was no contributing medical history. Facial evaluation showed nasal deviation to the right, an occlusal plane that was canted superiorly on the left side, a convex profile (*16˚*), and relatively retrusive upper lip (*-3mm to the E-Line*). The intraoral examination revealed a Class I molar relationship on the right and Class II on the left side. Overbite was 4mm, and overjet was 3mm. The left lateral incisor (*UL2*) was in lingual crossbite, and the UR7 was in buccal crossbite. Two retained deciduous teeth were noted in the upper left quadrant: canine and 2nd molar. There was a root transposition of the UR 3 and 4 (*Figs. 1-3*). The panoramic radiograph also revealed an impacted UR5. The etiology was probably a deviated path(*s*) of eruption. Mandibular condyles were relatively symmetric (*Fig. 3*). There were no signs or symptoms of temporomandibular joint dysfunction (*TMD*). Pre-treatment cephalometrics revealed bimaxillary protrusion (*SNA 87.5˚, SNB 83.5˚, ANB 4˚*) with flared mandibular incisors (*LI-MP 103.5˚*), while other values were within the normal limits (*Fig. 4 and Table 1*). The discrepancy index (*DI*) was 25 as shown in the subsequent worksheet.[7]

Fig. 4: Pre-treatment lateral cephalometric radiograph

CEPHALOMETRIC SUMMARY			
SKELETAL ANALYSIS			
	PRE-Tx	POST-Tx	DIFF.
SNA° (82°)	87.5°	87.5°	0°
SNB° (80°)	83.5°	83°	0.5°
ANB° (2°)	4°	4.5°	0.5°
SN-MP° (32°)	26.5°	27°	0.5°
FMA° (25°)	19.5°	20°	0.5°
DENTAL ANALYSIS			
U1 To NA mm (4 mm)	2 mm	0 mm	2 mm
U1 To SN° (104°)	107.5°	104.5°	3°
L1 To NB mm (4 mm)	5.5 mm	4 mm	1.5 mm
L1 To MP° (90°)	103.5°	99°	4.5°
FACIAL ANALYSIS			
E-LINE UL (2-3 mm)	-3 mm	-3 mm	0 mm
E-LINE LL (1-2 mm)	0 mm	0 mm	0 mm
%FH: Na-ANS-Gn (53%)	53.7%	53%	0.7%
Convexity: G-Sn-Pg' (13°)	16°	16.5°	0.5°

Table 1: Cephalometric summary

Treatment Objectives

1. Correct the transposition and relieve the crowding
2. Correct the anterior and posterior crossbites
3. Class I canine and molar occlusion with coincident midlines
4. Correct occlusal cant, but maintain facial profile and lip position

Digital Set-Up

The occlusal views of the digital set-up are shown in Fig. 5, and the anterior perspective is documented in Fig. 6. Note that the maxillary midline is corrected 1mm to the right and the lower arch articulates with the upper arch in a Class I relationship with coincident midlines. Details of the set-up are:

- Vertical movement:

  Upper: *Maintain upper incisors, extrude left buccal segment*

  Lower: *Intrude incisors 2mm*

- Anterior overbite: *1.5mm*
- Incisor axial inclinations:

  Upper: *Decrease torque 5 degrees*

  Lower: *Decrease torque 5 degrees*

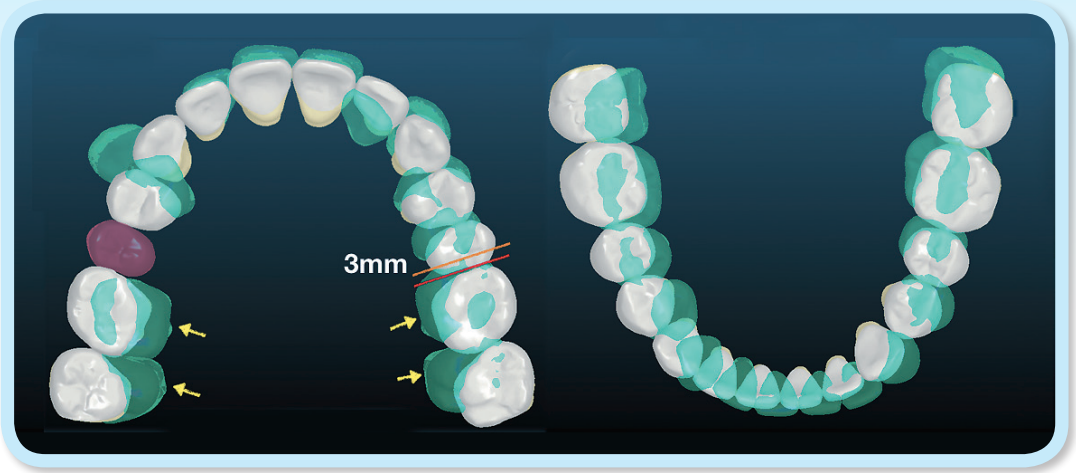


Fig. 5:
Occlusal views of the digital set-up show the post-treatment dentition (white) relative to the pretreatment morphology (green). Left: Orange line marks the mesial surfaces of the UL6 pre-treatment, and the red line is the mesial of the UL6 after 3mm of retraction. The purple tooth is the impacted UR5 moved into the arch. Yellow arrows show the directions of upper arch expansion. Right: The lower arch was expanded and roared clockwise to coordinate with upper arch.

- Extraction of only the two retained deciduous teeth
- A/P movement (*Fig. 5*): *Move UL6 distally 4mm*
- Midline correction (*Fig. 6*): *Upper midline 1mm right, lower midline 3mm right*
- Archwire plane: *Center of upper and lower central incisors*
- Supplemental anchorage: *Bilateral IZC miniscrews*

Treatment Progress

Before bonding the brackets, both retained upper right deciduous teeth were extracted. An Insignia® 0.022-in slot fixed appliance with passive self-ligating (*PSL*) brackets was bonded on all teeth in both arches except for the UR4 and UR5. The mechanics and wire sequence are documented in Table 2. Before the appliances were removed, at the end of active treatment, fixed lingual retainers were bonded on upper 2-2 and lower 3-3. Upper and lower clear overlays were fabricated. The patient was instructed to wear the overlays full time for the first 6 months, and nights only thereafter. Home care and retainer maintenance instructions were provided. After the

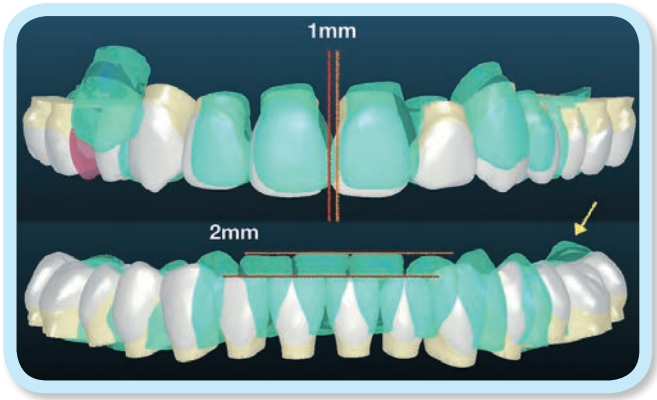


Fig. 6:
Frontal view of the digital set-up for the post-treatment dental alignment (white) is shown relative to the original occlusion (green).

***Upper**: Orange line marks pre-treatment midline and the red line shows its post-treatment position 1mm to patient's right.*

***Lower**: Orange line marks pre-treatment incisal edges, and the red line marks the 2mm of planned intrusion for the incisors. The yellow arrow points to intrusion of the LL molars to flatten the Curve of Spee.*

orthodontic treatment was completed, a gingivectomy was performed with a diode laser to establish proper crown height and proportions. The total active treatment time was 20 months. Figs. 7-13 document the treatment progress as defined by the mechanics sequence outlined in Table 2.

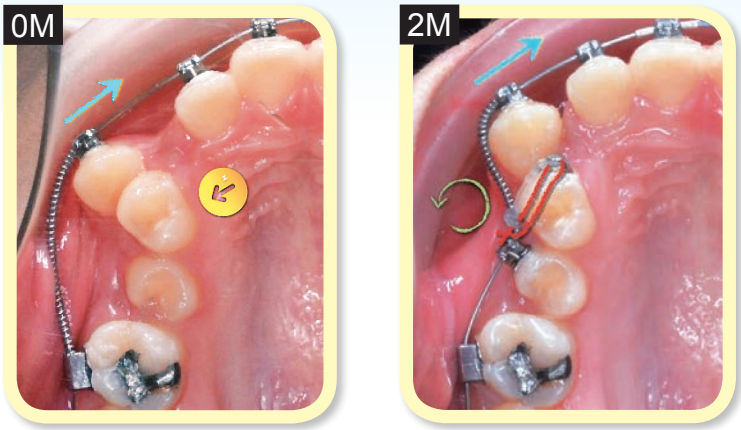


Fig. 7:
Left: At the start of treatment (0M), an open coil spring between the UR3 and UR6 was used to move the UR3 mesially (blue arrow). There is no bracket on the UR4, so it can move out of the way if contacted by the UR3 root (yellow circle with an arrow). Right: Two months into treatment (2M) the UR5 was bonded with a bracket, and a button was bonded on the labial surface of the UR4. A coil spring was activated to increase the space between the UR3 and UR5. An elastomeric ligature from the UR4 to the UR5 was used to rotate the UR4 mesial out (green curved arrow).

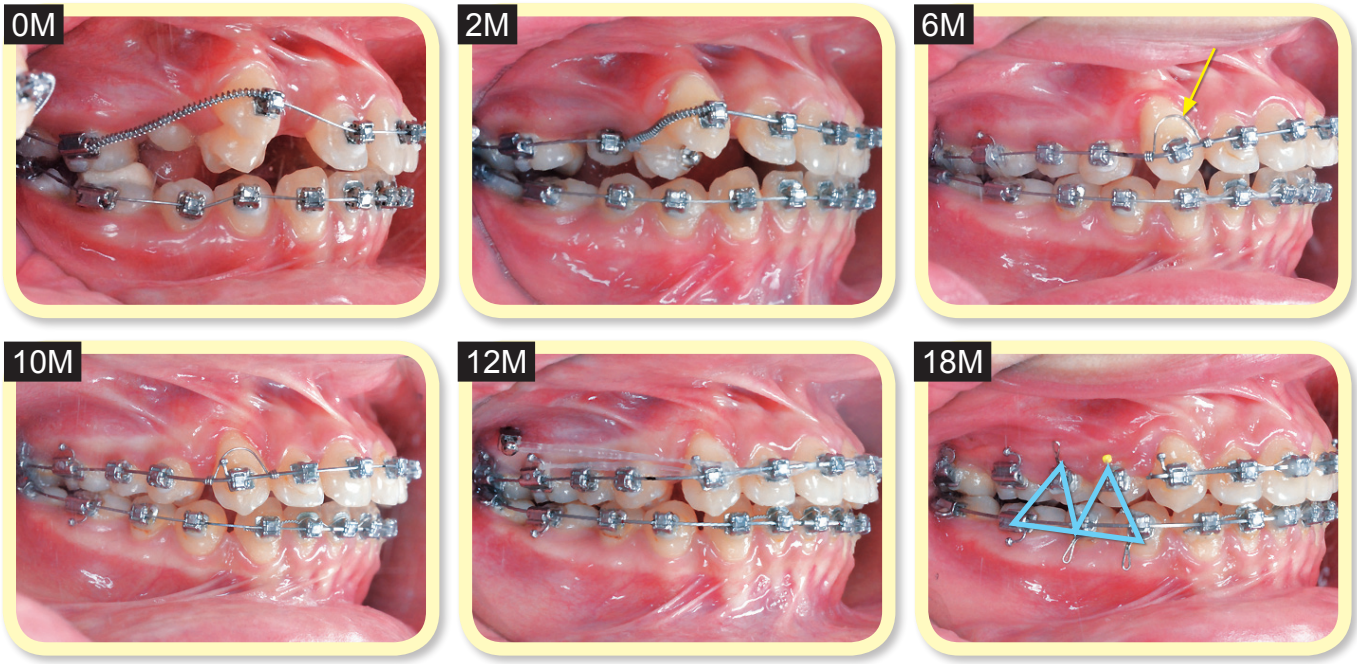


Fig. 8:
A series of right buccal photographs shows the progressive progress from the start of treatment (0M), during correction of the transposition at two months (2M), lingual root torquing spring (yellow arrow) on the UR3 at six months (6M), alignment prior to space closure at ten months (10M), upper arch space closure at twelve months (12M), and settling of the posterior occlusion with triangular elastics (blue). See text for details.

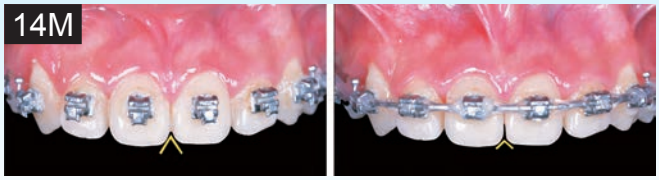


Fig. 9:
Enamel interproximal reduction (IPR) was performed on the mesial surfaces of the maxillary central incisors to reduce the occlusal embrasure (yellow inverted V). Note that this procedure contributed to failure to correct the Class II buccal segment on the left side. See text for details.
Left: Pre-treatment
Right: Post-treatment

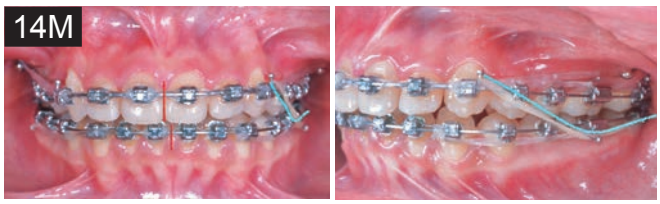


Fig. 10:
A unilateral left L-type Class II elastic (Fox ¼-in, 3.5-oz) (blue lines) was utilized from UL3 via the LL6 to the LL7 to achieve midline correction by asymmetrically advancing the LL buccal segment. Elastomeric chains anchored by the IZC bone screws were attached to the U3s to retract the entire upper arch. See text for details.

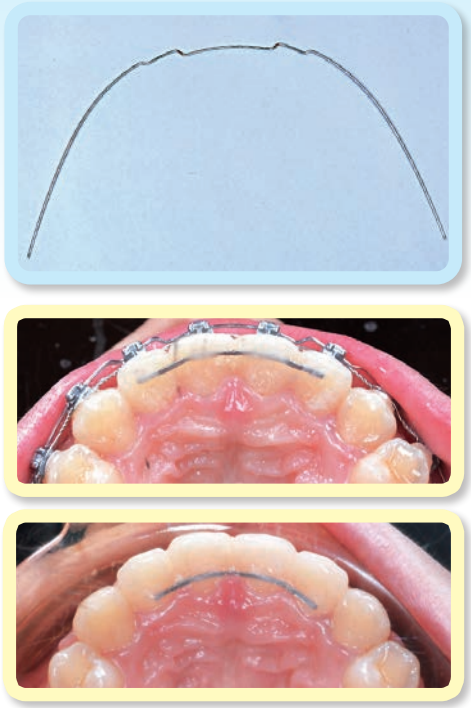


Fig. 11:
Prior to debonding, a 0.018-in stainless steel wire was adjusted to rotate the upper lateral incisors mesial out (upper image). The maxillary incisors were ideally positioned prior to bonding a fixed lingual retainer (center image). Because of occlusal interference on closing, the fixed retainer was repositioned more gingivally prior to removing the brackets (lower image). See text for details.

Fig. 12:
A progressive series of upper occlusal photographs shows the archwire inserted at given intervals in months as shown in the posterior palate. Eight treatment intervals are illustrated: 0, 2, 4, 6, 10, 12, 14 and 18 months.

Appointment	Archwire	Notes
1 (*0 months*)	U/L: 0.014-in Damon CuNiTi	An open coil spring between UR3 to UR6. No brackets were bonded on UR4 to allow it the freedom to move out of the path of tooth movement (*Fig. 7*). Bite turbos were constructed with Fuji II type II glass ionomer cement (*GCAmerica, Alsip IL*) on the occlusal surfaces of the mandibular first molars in order to facilitate correction of UL2 and LL7 crossbites in addition to LR7 uprighting.
2 (*1 month*)	L: 0.014x0.025-in Insignia CuNiTi	
3 (*2 months*)	U: 0.018-in Damon CuNiTi	The UR5 had adequate crown exposure to bond the bracket. A button was bonded on the mesio-labial surface of the UR4 to receive an elastomeric chain with elastomeric ligature from UR4-UR5 to rotate the UR4 mesial out. The bite turbos were removed after the UL2 crossbite was corrected.
4 (*4 months*)		Bite turbos were replaced on the L6s to open the occlusion so that cross elastics (*Chipmunk 1/8-in, 3.5-oz*), from the buccal hooks on the U7s to the lingual buttons of the lower 7s to upright the L7s.
5 (*6 months*)	U: 0.014x0.025-in Insignia CuNiTi	After preliminary alignment was achieved, torque control began with the rectangular archwire and a torquing spring to move the root lingually was applied on the UR3 (*Fig. 8*).
6 (*8 months*)	L: 0.018x0.025-in Insignia CuNiTi	With torque control established in the lower arch, bilateral Class II elastics(*Parrot 5/16-in, 2-oz*) were worn from the upper canines to the lower first molars were used to reduce overjet.
7 (*12 months*)	U: 0.018x0.025-in Insignia CuNiTi	Two OrthoBoneScrews® (*Newton's A Ltd, Hsinchu, Taiwan*) were inserted bilaterally into the IZC area as anchorage to correct the maxillary dentition. The torquing spring on UR3 was removed.
8 (*13 months*)	U/L: 0.019x0.025-in Insignia TMA	Upper archwire expansion.
9 (*14 months*)		UR3 bracket was repositioned. IPR was performed on the upper dental incisors to reduce the mesial incisal embrasures (*Fig. 9*). The upper archwire was expanded to correct posterior overjet. A unilateral L-type Class II elastic (*Fox 1/4-in, 3.5-oz*) was utilized from UL3 via LL6 to LL7 for midline correction (*Fig. 10*). A cross-elastic (*Kangaroo 3/16-in, 4.5-oz*) from the UR bone screw to the LR7 lingual button uprighted the LR7.
10 (*15 months*)	L: 0.021x0.025-in Insignia TMA	Upper archwire expansion.
11 (*17months*)	U: 0.021x0.025-in Insignia TMA L: 0.019x0.025-in Insignia TMA	First order bends were applied for mesial-out rotation of the U2s.
12 (*18 months*)		The IZC bone screws were removed. To detail the occlusion, the upper archwire was cut distally to UR3, and triangle elastics (*Kangaroo 3/16-in, 4.5-oz*) were attached to seat the maxillary teeth on the mandibular dentition, which was stabilized with an archwire (*Fig. 8*).[6] A first order bend was applied for LL6 mesial-out rotation.
13 (*19 months*)	U: 0.018-in SS	Canine off-set bends were placed in the upper archwire.
14 (*20months*)		Detailed finishing of upper incisors prior to placing upper and lower fixed lingual retainers (*Fig. 11*). All fixed appliances were removed.

■ Table 2: Treatment Sequence.

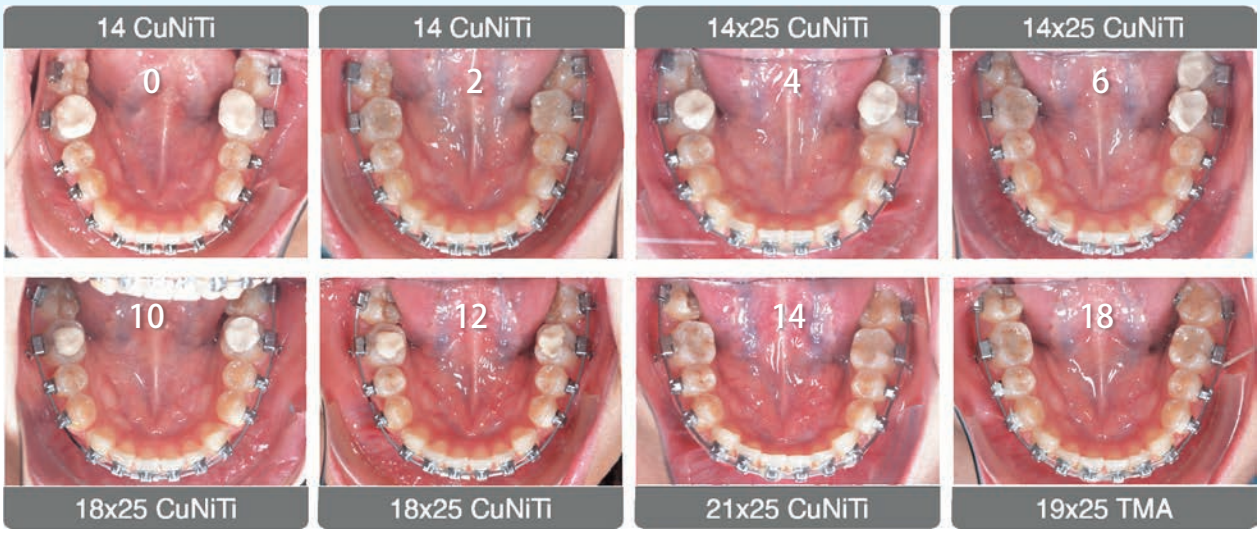


Fig. 13: A corresponding series of lower occlusal views shows the same treatment progression as Fig. 12.

Treatment Results

Facial esthetics were maintained. Good dental alignment and intermaxillary occlusion was achieved (*Figs. 14 and 15*). No periodontal problems were noted. The post-treatment panoramic radiograph documented acceptable root parallelism, except for the UL4 and LR7 (*Fig. 16*). The facial profile and vertical dimension of occlusion were maintained (*Figs. 17 and 18*). Superimposed cephalometric tracings showed the maxillary arch was retracted about 2mm with IZC bone screw anchorage, and torque control of the upper incisor was moderately decreased 3˚ (*U1-SN 104.5˚*). The increased axial inclination of the lower incisors was improved 4.5˚(*L1-MP 99˚*). Correction of the posterior crossbite increased the mandibular plane angle 0.5˚ (*SN-MP 27˚*). The patient was well satisfied with the result. Intraoral photos at one and four months follow-up demonstrate a stable occlusion and healthy periodontium (*Figs. 19 & 20*). The ABO CRE score was 24 points, as shown in the supplementary CRE chart.[8] The principal deficit in the final alignment was a Class II left buccal interdigitation. The Pink and White dental esthetic score was 2 points.[9]

Discussion

Insignia®: a Custom Bracket System

Insignia® is a 3D reverse-engineered fixed appliance for the comprehensive treatment of all malocclusions. It is extremely accurate and efficient, but requires very careful detail to the digital set-up, from which the appliance is constructed.[1,2] For the present patient, crowding and transposition correction was accomplished in only 6 months (*Fig. 12*) with no detailing bends or bracket repositioning. These mechanics control PDL stress to enhance the rate of tooth movement and minimize the risk of root resorption.[1,2] The recommended archwire sequence is summarized in Table 3.

Fig. 14: Post-treatment facial and intraoral photographs

Fig. 15: Post-treatment dental models (casts)

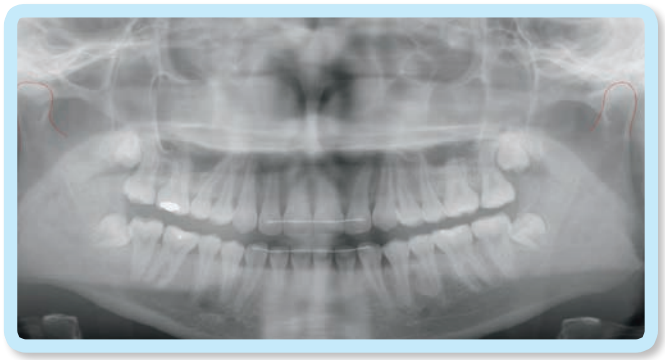


Fig. 16: Post-treatment panoramic radiograph

Fig. 17: Post-treatment lateral cephalometric radiograph

Phase I: Stock light round wires

As detailed in Table 3, the initial treatment objectives were: (*1*) place bilateral bite turbos on the occlusal surfaces of the lower first molars to open the articulation for crossbite correction, (2) level and align, (3) initiate arch development as needed, and (*4*) resolve 90% of the rotations. The management of the root transposition of the UR4 began with space opening, bonding a bracket on the erupting UR5, and continuing space opening between the UR5 and UR3 (*Fig. 7*) while the UR4 was rotated distal in. The flexibility of the initial round archwire (*0.014-in CuNiTi*) minimized friction and binding, so the initial alignment of the UR buccal segment was accomplished in <6 months (*Fig. 8*).

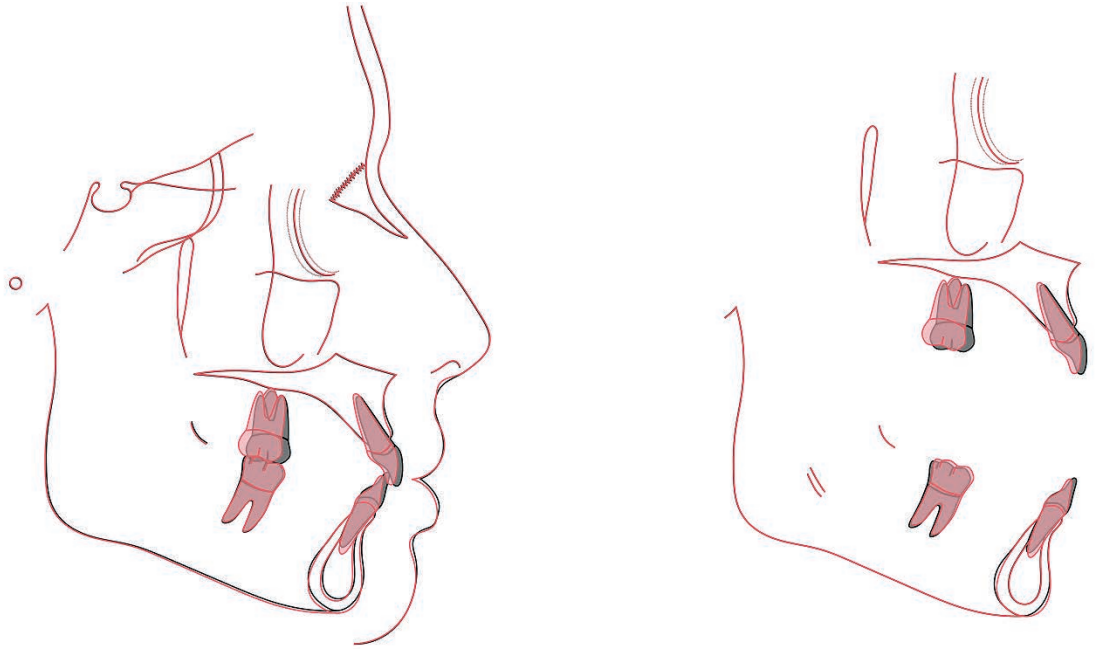


Fig. 18:
Tracings of the pre-treatment (black) and post-treatment (red) cephalometric radiographs are superimposed on the anterior cranial base (left), maxilla (upper right) and mandible (lower right). See text for interpretation.

Phase II: Insignia® rectangular CuNiTi wires

The objectives of the second phase were to: (*1*) begin resolving torque and root angulation problems, (*2*) complete leveling and alignment, (*3*) finish rotation corrections, and (*4*) continue arch form development, as needed. In this stage, the UR3 received a torque spring to increase its axial inclination. Early control of the axial inclination of the UR3 contributed to good torque expression in the middle of treatment (*Fig. 8*).[10]

Phase III: Major mechanics

The objectives of the third phase (*12-18 months*) were to close spaces and correct intermaxillary relationships. IZC bone screws were inserted bilaterally to retract the entire maxillary dentition for Class II correction.[11] Interdental spaces were closed with elastomeric chains (*Fig. 8*). At 14 months, interproximal enamel reduction (*IPR*) was performed to correct the wide embrasure between the maxillary central incisors (*Fig. 9*). At the same appointment, a L-type Class II elastic was applied on the left side to align the mandibular midline (*Fig. 10*).

Phase IV: Finishing

The objectives for the final phase of treatment were to complete torque expression and arch coordination to achieve ideal intra-arch and intermaxillary alignment. Midline elastics were applied and maxillary arch expansion was completed. The lingually-inclined LR7 was uprighted by engaging full-sized wires and applying cross elastics anchored by the UR IZC bone screw. The posterior occlusion was settled with two triangle elastics bilaterally (*Fig. 8*). At the conclusion of active treatment, first order (*in-and-out*) bends were applied for final detailing and finishing at the same debonding visit (*Fig. 11*). Occlusal views of progress related to the archwire sequence are shown for the

Insignia Archwire Sequencing

I	Stock light round wires	0.014 0.016 / 0.018 (alternative)	Stock Damon CuNiTi
II	Insignia edgewise CuNiTi wires	0.014 x 0.025 0.018 x 0.025 0.021 x 0.025	Insignia CuNiTi
III	Major mechanics	0.019 x 0.025	Stock SS
IV	Finishing	0.021 x 0.025 0.021 x 0.025 0.019 x 0.025 (backup)	Insignia CuNiTi Insignia TMA Insignia TMA

■ Table 3: The recommended archwire sequence is summarized for progressive archwire therapy utilizing the Insignia bracket system.

maxillary (*Fig. 12*) and mandibular (*Fig. 13*) arches. The finished occlusion is documented at 20 months, after the brackets were removed and fixed retainers were placed (*Figs. 14-18*), and after 1-5 months of follow-up (*Figs. 19 and 20*) when restorative care was completed.

Extra-Alveolar Bone Screw Anchorage

Extra-alveolar (*E-A*) skeletal anchorage is well suited for asymmetric sagittal discrepancies because the bone screws are buccal to the molars rather than between the roots. For the present patient, the Class II

Fig. 19:
The upper three images show the treatment outcome at twenty months (20M) . The corresponding lower three views document the stable and healthy result at one-month follow up (1m-F/u).

Fig. 20:
Right buccal views compare the immediate post-treatment result at twenty months (20M) (left) to one month follow-up (1m-F/u) (center), and five month follow-up (5m-F/u). See text for details.

malocclusion on the left side was partially corrected by retracting the buccal segment with an elastic chain anchored by an IZC bone screw. The Class II relationship on the left side was not completely corrected because of inadequate overjet to retract the left maxillary quadrant to Class I. The lack of overjet was due to: 1. lingually tipped upper incisors, 2. labially tipped lower incisors, 3. tooth size discrepancy between the upper and lower incisors, and 4. the enamel stripping performed on the medial surface of the maxillary central incisors to correct the embrasure (*Fig. 9*). Near the end of treatment this problem was still correctable by adjusting incisor torque or IPR and retraction of the lower incisors. However, maintaining the midline correction (*Fig. 21*) required limiting the enamel stripping to the LL quadrant (*teeth LL1-4*).

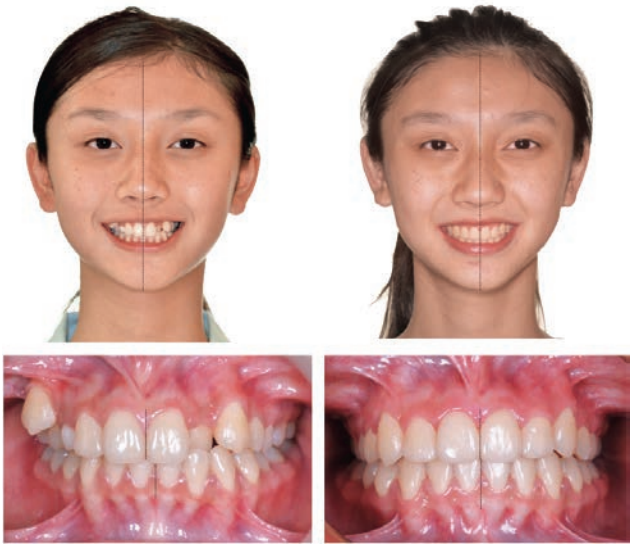


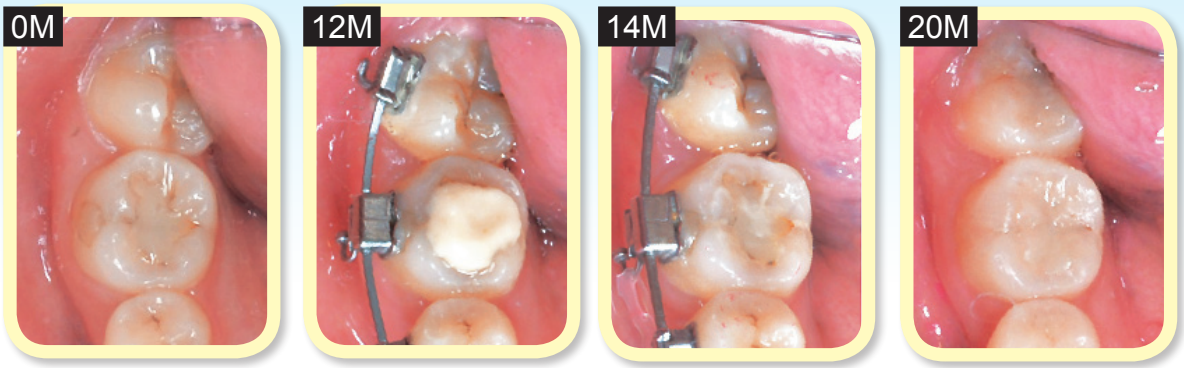
Fig. 21:
***Left**: Compared to the facial midline (black line), the pre-treatment maxillary midline is deviated to the patient's left 1mm, and the lower midline is 3mm to the left.*
***Right**: Post-treatment, the upper and lower midlines are coincident with the facial midline (black line). See text for details.*

Class II malocclusions with moderate crowding treated non-extraction with passive self-ligating brackets can be well aligned, but the outcome is often accompanied with incisal flaring and lip protrusion.[11] E-A IZC miniscrews provide osseous anchorage to easily prevent those problems. Furthermore, the right IZC bone screws are effective anchorage for uprighting lingually-tilted lower second molars with cross-elastics (*Fig. 22*). Low profile tubes are particularly effective for buccal crossbite correction because they are less likely to interfere occlusion, which often results in bond failures (*Fig. 23*).

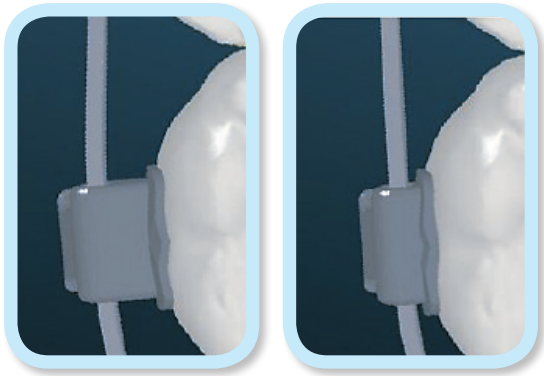
CBCT images reveal that the IZC bone screw on the left side penetrated the maxillary sinus (*Fig. 24*), but there were no negative consequences for the patient.[12] Both IZC bone screws were stable throughout the treatment and there were no problems with soft tissue irritation.

Transposition

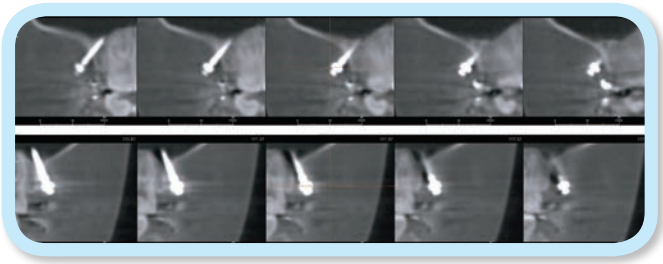
Transposition is a rare anomaly defined as two teeth exchanging positions.[13,14] Etiology is predominately genetic,[15-17] and the problem may occur bilaterally. Maxillary canines (*U3s*) are the common transposed teeth, probably because they are the last succedaneous teeth to emerge in the mouth. The most common transposition locations are distal to the U4 and mesial to the U2. Both variations may be affected by crowding, crossbite or a deviated path of eruption. If transposed with the adjacent U4, the canine is usually rotated mesial out, while the first premolar is tipped distally, and rotated



■ *Fig. 22:*
The LR7 is tipped lingually prior to treatment (0M). Twelve months (12M) into treatment the LR7 has failed to upright with a rectangular archwire and bite turbo on the LR6. At fourteen months (14M) a cross elastic was applied from a lingual button on the LR7 to the IZC bone screw. The LR7 was well corrected by the end of treatment at 20 months (20M). See text for details.



■ *Fig. 23:*
***Left**: Original version of the TIB tube has a prominent buccal profile that is susceptible to occlusal interference and debonding.*
***Right**: New low profile TIB tube has an improved design to resist debonding due to occlusal interference.*



■ *Fig. 24:*
A strip of CBCT coronal views shows the left bone screw was within bone (upper). However, the bone screw installed on the right side penetrated the maxillary sinus, but there were no adverse signs or symptoms. See text for details

mesial in. The maxillary deciduous canine may be retained creating a transient arch space deficiency.[18] Transposition may be complete or incomplete. In a complete transposition, both the crown and the entire root are in their transposed position. In an incomplete transposition, the crowns may be transposed, but the root apices still remain in their normal positions.[19] Alternately the roots but not the crowns of the teeth may be transposed (*Figs. 2 and 3*). The treatment of dental transposition is controversial and depends on the severity of the problem. Treatment alternatives include alignment in the normal or transposed position, or extraction of one of the transposed teeth, followed by space closure.[20] Common treatment options are:

1. Non-extraction Treatment: Maintaining the transposed tooth order. When transposed teeth are fully erupted and well aligned in the transposed position, maintaining the transposition order is a viable option.[21-22] However, esthetic and functional problems are common, such as atypical root prominence and gingival margin contours can be expected.

If the palatal cusp of a transposed premolar produces occlusal problems, such as a balancing interference, occlusal adjustment is indicated to control the risk of pulpitis or TMD. Furthermore, the buccal cusp of the first premolar is smaller than the canine and the gingival margin is more occlusal, so a restorative build-up procedure may be needed. For more ideal esthetics, a transposed upper premolar can be intruded to simulate the gingival contour of a canine, and then restored with a full coverage restoration.

2. Non-extraction Treatment: Correcting the transposed tooth order. The drawbacks for orthodontic correction are complex mechanics, long treatment time, root resorption, and periodontal clefting or dehiscence.[18]

3. Extraction of the Transposed First Premolar: This is usually the best option for crowded cases that require extraction,[19] but it may still be the treatment of choice if the buccal segment(s) can be moved mesially to close the space. Mesial space closure in the upper arch is readily accomplished if there is a relatively deep overbite.[23] Otherwise, E-A bone screws may be needed for osseous anchorage.

For the present patient, the second treatment option was deemed appropriate because the UR3 and UR4 transposition was incomplete, she was young (*18y/o*), and the facial profile was acceptable. The risk of root damage as the transposed roots are moved past each other is minimized by only bonding a bracket on the tooth that is directly exposed to mechanics (*UR3*). For instance, no bracket was attached to the adjacent UR4, so the latter could act as a free body, and physiologically move out of the path of tooth movement if its root is engaged by the root of the UR3. With the aid of the Insignia® system, the transposed teeth were corrected in only 4 months, and the entire comprehensive treatment only required 20 months.

Conclusions

1. Dental transposition is a complex functional and esthetic problem that is a treatment challenge because correcting the natural tooth order is time consuming, and risks both hard and soft tissue damage.

2. Maintaining the transposed tooth order and restoring esthetics and function may be a viable option. Preprosthetic orthodontics to align gingival margins can greatly enhance the final result.

3. Insignia® is a powerful weapon for managing complex orthodontic problems. Optimal bracket positions that require few if any detailing adjustments are particularly important for complex, time consuming treatment plans.

4. IZC bone screws are E-A osseous anchorage that are particularly effective for non-extraction treatment of asymmetric malocclusions, such as unilateral transpositions.

Acknowledgment

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Discrepancy Index Worksheet

TOTAL D.I. SCORE 25

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 = 1

Total = 1

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 = 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 = 2

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° 5 x 1 pt. = 5

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)	1 x 2 pts. =	2
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	1 x 2 pts. =	2
Skeletal asymmetry (nonsurgical tx)	@ 3 pts. =	_____
Addl. treatment complexities	_____ x 2 pts. =	_____

Identify:

Total = 4

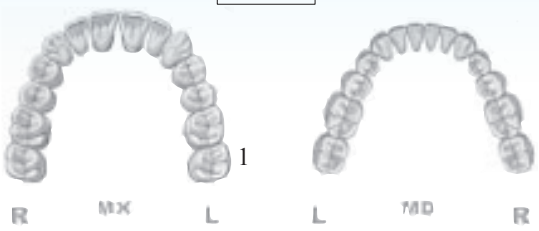
Cast-Radiograph Evaluation

Case # **Patient**

Total Score: 24

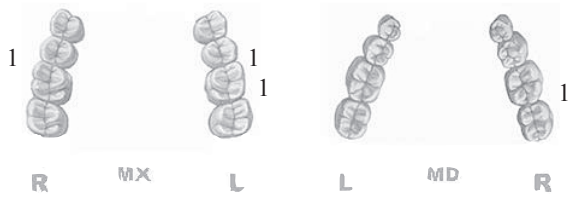
Alignment/Rotations

1



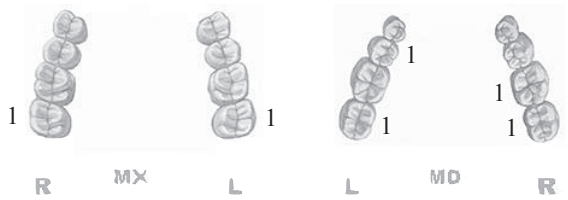
Marginal Ridges

4



Buccolingual Inclination

6

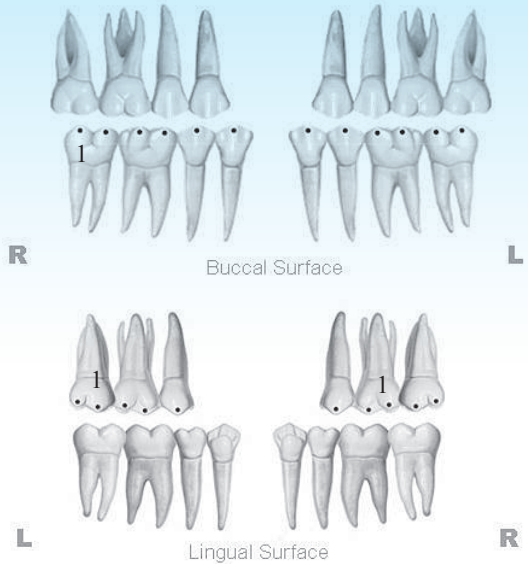


Overjet

0

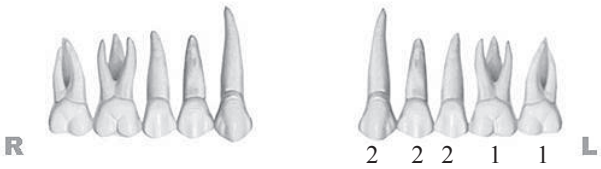
Occlusal Contacts

3



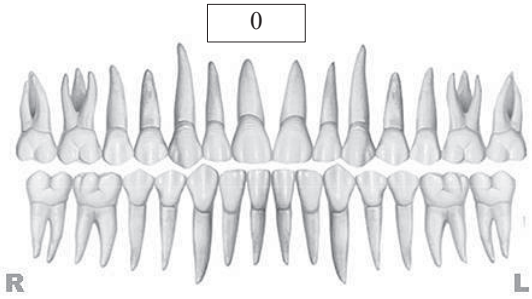
Occlusal Relationships

8



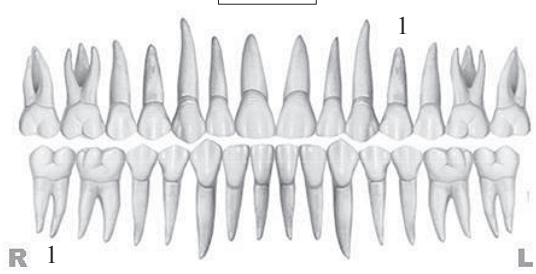
Interproximal Contacts

0



Root Angulation

2



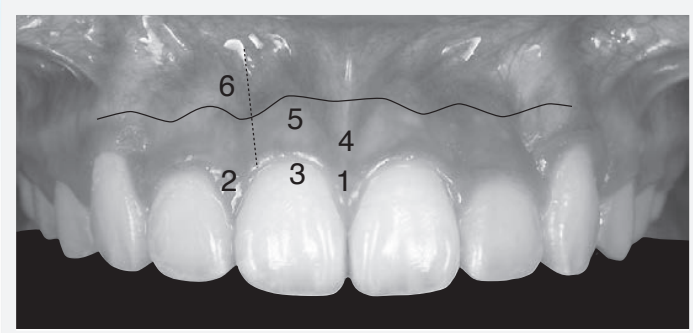
INSTRUCTIONS: Place score beside each deficient tooth and enter total score for each parameter in the white box. Mark extracted teeth with "X". Second molars should be in occlusion.

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

Total Score: = 2

1. Pink Esthetic Score

Total = 0

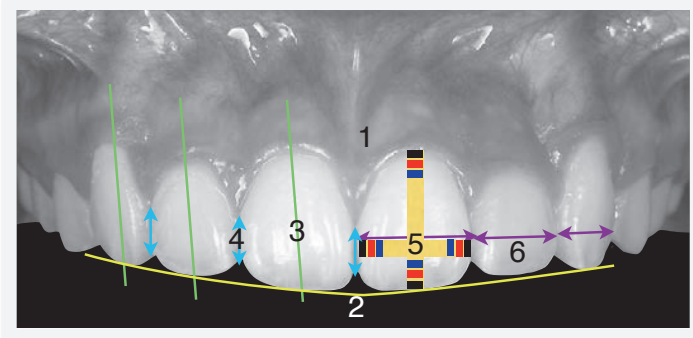


1. M & D Papillae	0	1	2
2. Keratinized Gingiva	0	1	2
3. Curvature of Gingival Margin	0	1	2
4. Level of Gingival Margin	0	1	2
5. Root Convexity (Torque)	0	1	2
6. Scar Formation	0	1	2

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

2. White Esthetic Score (for Micro-esthetics)

Total = 2



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

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

Dental Clinic Established 1996
Beethoven

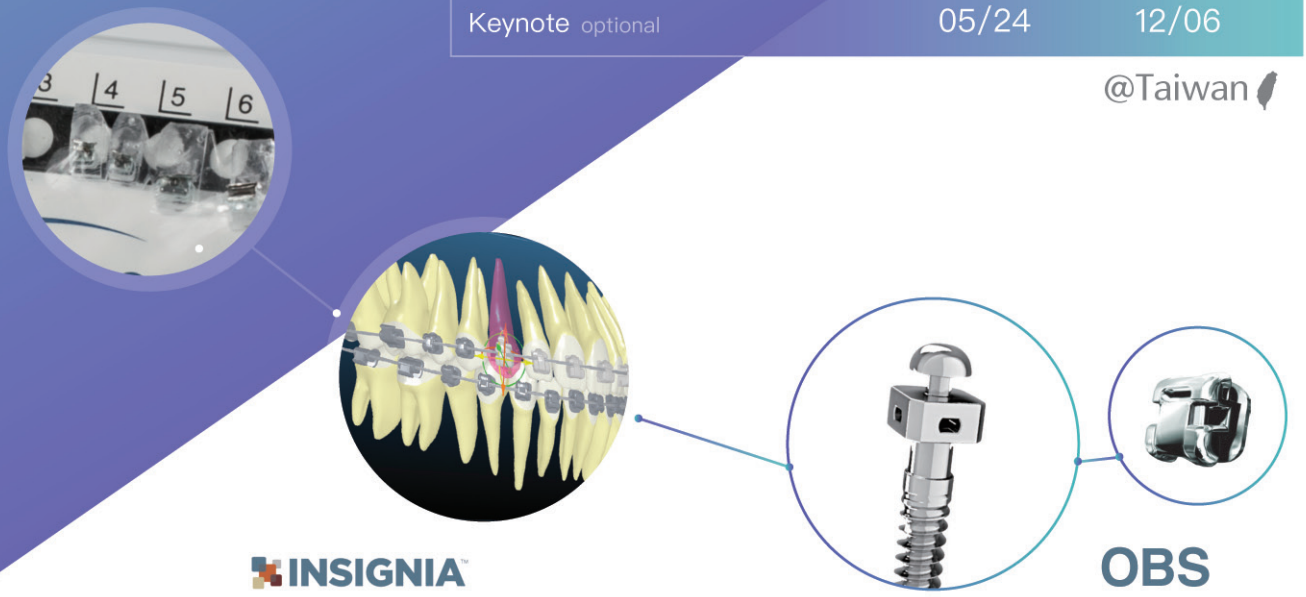
International Workshop

Damon, Insignia, OBS & VISTA

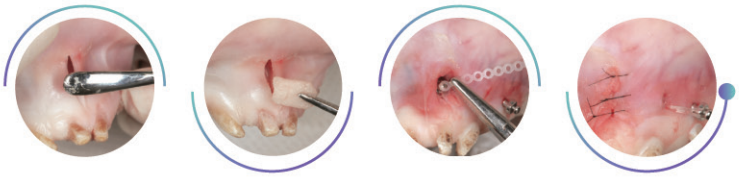
2019

	Session A	Session B
Damon, Insignia, OBS & VISTA	05/21–23	12/03–05
Keynote optional	05/24	12/06

@Taiwan



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

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Course Schedule

Day 1

Damon Lecture, OBS model workshop, chair-side observation

Chris' Lecture:
Optimized Orthodontic Treatment with Damon system

Day 2

Insignia Lecture, Insignia Chair-side observation

Chris' Lecture:
CBCT-enhanced treatment plannning for Insignia

Day 3

CI III Lecture by Dr. John Lin, VISTA Lecture & workshop

* 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!"

Damon, OBS & VISTA

Day 4

Keynote workshop (Optional)

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

Dr. Rungsi Thavarungkul, Thailand
Lecturer, Advanced Keynote Workshop

"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 LECTURERS

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.

Dr. John Lin

President of the Jin-Jong Lin Orthodontic Clinic. Dr. Lin received his MS. from Marquette University and is an internationally renowned lecturer. He's also the author of Creative Orthodontics and consultant to Journal of Digital Orthodontics-*A journal for Interdisciplinary dental treatment*.

2018 Implant Forum 植牙論壇

Implant Technique + Fundamentals

第九期

時間：每兩個月一次，
上午 9:00～12:00

地點：金牛頓藝術科技
（新竹市建中一路25號2樓）

	日期	USC 課程精選，期刊導讀與特別演講 9:00 - 10:30		植牙案例報告 10:45 - 12:00（ 30 分鐘/人）	
0	1/12	**特別演講**：張燕清 主任（原定2017 / 11月） 題目：Socket grafting and sinus grafting			
1	3/9	**特別演講**：張迺旭 醫師			
2	5/11	**特別演講**：蕭家輝 醫師		邱上珍 醫師	
3	6/15	USC課程精選：林森田、黃育新 醫師		蘇筌瑋 醫師	
4	8/24	USC課程精選：蕭浩宜	案例報告：顧傑 醫師	蘇筌瑋 醫師	張慧男 醫師
5	10/19	**特別演講**：葉信圻 醫師 題目：2018年最新臨床植牙贋復實證醫學趨勢		黃育新 醫師	蕭浩宜 醫師
6	12/14	**特別演講**：陳昶愷 醫師 題目：Diagnosis, Etiology, Treatment and Prevention of Peri-implantitis		邱上珍 醫師	張慧男 醫師

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2.本課表僅供參考，主辦方保留課程變動之權利。

1/31前早鳥優惠15,000元。

隱適美大師課程

課程日期：

3月11日 / 5月20日 / 7月1日 / 7月29日

週日下午2:00-7:00（共四次）

上課地點：

新竹市建中一路25號2樓（金牛頓藝術科技）

還在觀望是否要投入學習隱適美的行列嗎？來自西班牙的隱適美專家 Dr. Diego 認為，只要掌握了正確的使用技巧，隱適美可以適用在任何一種咬合異常 (malocclusion) 的治療。成功的關鍵即在於對牙齒移動的力學原理有深入的了解，加上設定正確的治療計畫，以及規劃未來的治療進程，要達到理想的治療結果絕對非夢事。針對讓大家苦惱的 ClinCheck，以及治療中途的修訂調整，Dr. Diego 也會分享他的獨門秘訣。

「隱適美大師課程」（Invisalign Master Course）以數位遠距教學的方式，讓學員在四次課程中即可掌握 Dr. Diego 累積超過 1000 名成功案例的治療技巧和心得，是讓您兼顧忙碌工作與繼續進修的完美課程。

Dr. Diego Peydro Herrero

- 於西班牙馬德里和瓦倫西亞大學開設矯正專業課程。
- 開設隱適美系統的國際繼續教育課程－Clear Ortho International Program（COIP），是歐洲公認的隱適美系統專家。

Topics:

1. First steps with Invisalign. Learn the most important things to succeed. Attachments selection. Case Demo.
2. Expansion and arch shape development.. Sequence of movement. Case Demo.
3. IPR, proclination and expansion. What are the limits? Tooth limit concept.
4. Vertical malocclusions. Deepbite and Openbites. Biomechanics and Tips. Case Demo.
5. Biomechanics and protocols to solve Class II malocclusion.
6. TADS and aligners. How to use them to get the most demanding goals
7. Multidisciplinary cases and extraction cases.
8: Digital Planification. Smile design and aligners

學員限額 35 名

- 包含 Clincheck 力學合理性分析
- 每堂課邀請張慧男醫師重點摘要

(03)-573-5676　新竹市建中一路25號2樓　余承勳 yuebucy@newtonsa.com.tw

Efficient Bonding Protocol for the Insignia® Custom Bracket System

Abstract

The Insignia® appliance is reverse-engineered from a digital set-up of the prescribed dental alignment. Each bracket configuration, and position on the tooth, is specified by the ideal alignment of each tooth engaged on the full-size finishing archwire. Precise bonding of a custom bracket in its designated position is vital for achieving the prescribed intermaxillary alignment without the necessity for detailing adjustments. The recommended bonding procedure for Insignia® is: 1. dry fit jig groups to the appropriate teeth on casts, 2. acid etch, rinse and seal enamel surfaces with primer, 3. coat bracket pads with a thin layer of adhesive, 4. position jigs on the lingual cusp or incisal edge of the tooth, and then roll the coated pad into the proper position on the facial surface, 5. maintain finger pressure on the jigs at about a 45-degree angle to the enamel surface(s), 6. light-cure the resin for half of the recommended time, 7. release the finger pressure and apply the last half of the light cure passively, 8. gently spray the bracket and jig assembly with water to dissolve the soluble glue connecting them, and 9. remove the jig from each bracket, by loosening it with a Weingart utility plier in a mesiodistal direction, and then rotating it to the lingual. Repeat this procedure until all brackets are bonded in the ideal position. (J Digital Orthod 2018;49:100-106)

Key words:

Insignia® system, passive self-ligating bracket, bonding procedure, custom bracket, digital set-up

Introduction

Insignia® (*Ormco, Glendora, CA*), is a computer-assisted design and manufacturing (*CAD/CAM*) process for producing a specific fixed appliance system to treat a malocclusion. Custom brackets and archwires to achieve the prescribed alignment are produced by a reverse engineering process, based on the digital set-up of final intermaxillary occlusion. Precise placement of each bracket is critical for producing a three-dimensional (*3D*) alignment to efficiently accommodate the final rectangular finishing wire, with no need for detailing adjustments. Positioning jigs for each bracket are fabricated to assist the clinician in accurately bonding or rebonding the prescribed custom attachment on each tooth.[1-3] The purpose of this report is to describe a standardized protocol for efficiently placing the custom appliance in the prescribed position. All orthodontic supplies and auxiliaries described in this article were produced by the same manufacturer (*Ormco, Glendora, CA*), unless otherwise stated.

Preparation for Bonding

Prior to the installation appointment, the clinician and assistant(*s*) should inspect the following items in the patient's kit box (*Fig. 1*):

Dr. Angle Lee,
Director, Beethoven Orthodontic CourseEditor,
Editor, Journal of Digital Orthodontics (Left)

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

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

Fig. 1:
The patient's kit box shown (a and b) contains custom prescription brackets fitted to placement jigs (c), six upper and six lower custom archwires with labels (d), replacement jigs for each tooth if rebonding is required (e and f), and case paperwork describing special treatment procedures (g).

1. **Custom prescription brackets with well fitted application jigs** (*Fig. 1c*): The brackets for each quadrant are packed together.

2. **Six upper and six lower custom archwires with labels** (*Fig. 1d*).

3. **A setup of individual replacement jigs for each tooth** (*Figs. 1e-f*): The first and second molars have brackets already loaded.

4. **Case paperwork** (*Fig. 1g*): Clinicians are alerted to anticipated bracket interference with occlusion, that requires bite turbos or other composite buildup on the occlusal surface to open the bite. If there is substantial crowding some brackets may be designated for placement later in treatment.

Clinical tip: The custom-fit group jigs should be dry fitted to dental casts of the malocclusion for two reasons: (*1*) check the bonding positions, (*2*) determine if there is any jig interference when adjacent brackets are properly positioned (*Fig. 2*)

Bonding Process

1. Tray Arrangement:

Place the jigs and bonding instruments in the desired order, usually in the progression that they are used (*Fig. 3*). The arrangement may vary according to the desired tray position relative to the patient, and the handedness of the clinician and assistant.

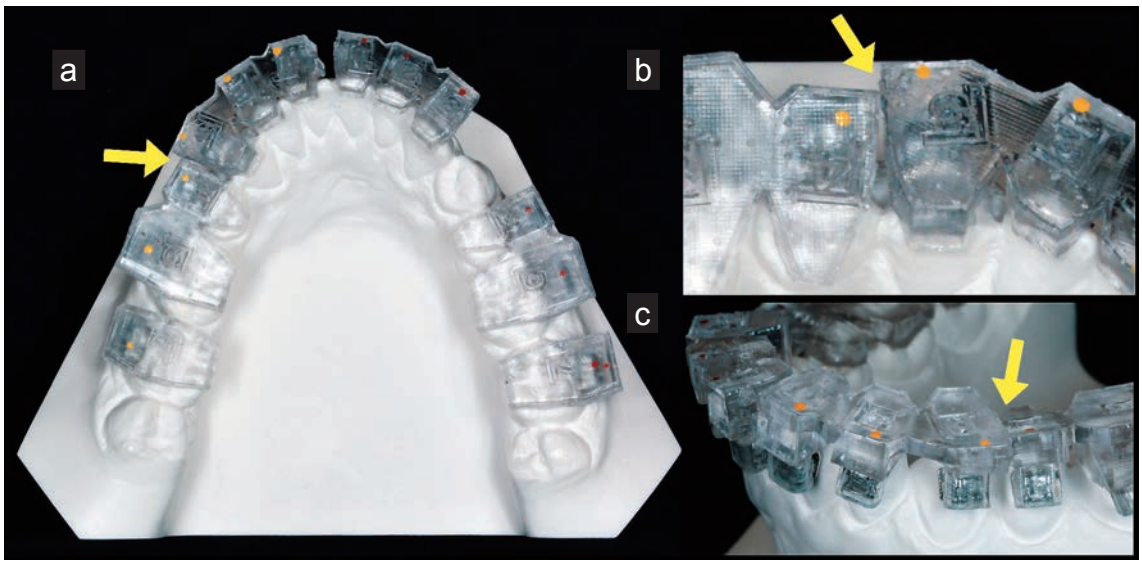

Fig. 2:
Group jigs are placed on dental casts to check the fit. Jig interference (yellow arrows) is noted between the lower left canine and 1st premolar, during the prescribed bonding procedure. Both occlusal (a and b) and the left lateral perspectives (c) are shown. It follows that the lower left 1st premolar and 1st molar group jig must be removed before applying the group jig to bond the lower left canine and adjacent incisors.

2. Isolation Procedure:

Begin moisture control by placing dry aids on the cheek mucosa to block the parotid gland orifice and isolate the soft tissue. Super absorbent pads are used between lower molars and the tongue to control saliva secretion by the sublingual glands. An OptiView® lip and cheek retractor is positioned to provide a clear view of the entire oral cavity including the buccal surfaces of the molars (*Fig. 4*).

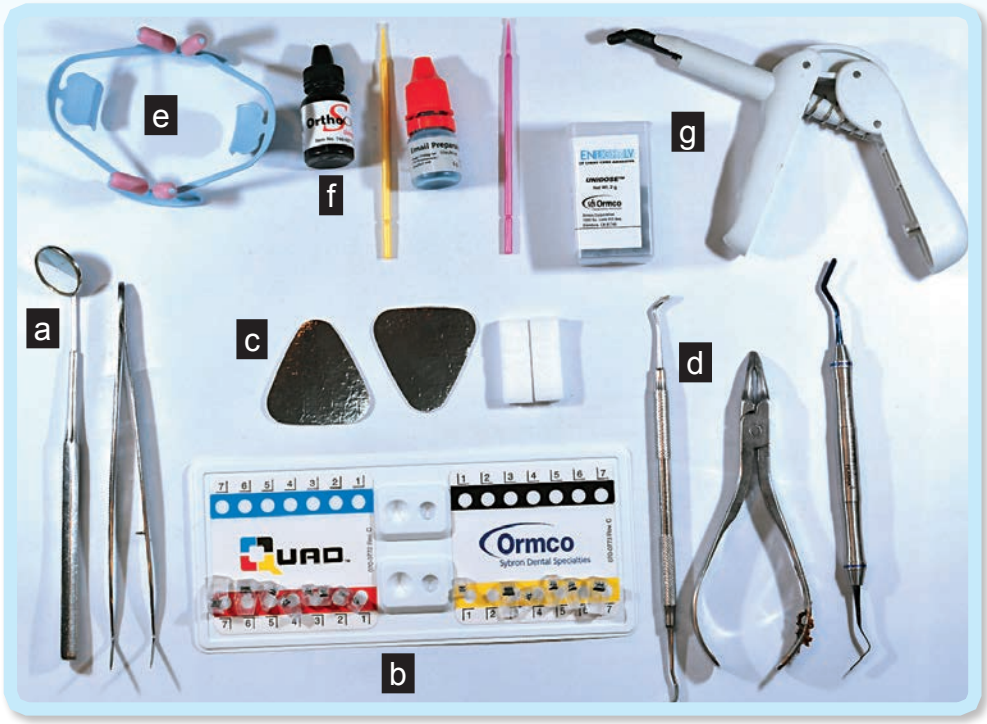

Fig. 3:
Ensure bonding instruments are laid out in the desired order: (a) mirror and cotton tweezers, (b) custom prescription brackets with custom fit placement jigs, (c) dry aids and super absorbent pads, (d) scaler, Weingart plier and filling instrument, (e) lip and cheek retractor, (f) bonding agent, etching-gel, microbrushes, (g) adhesives and uni-dose applicator. See text for details.

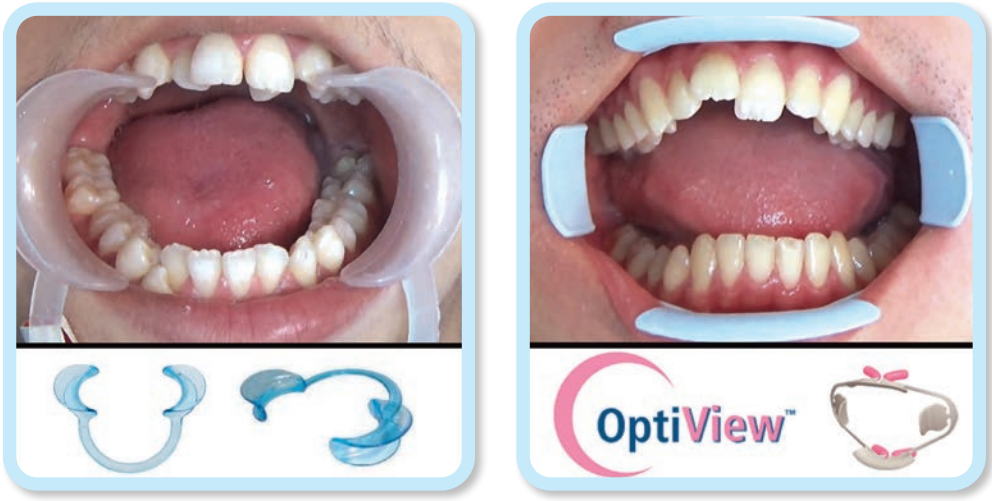

Fig. 4:
Compared to conventional retraction (left), an Optiview® lip and cheek retractor (right) is more comfortable for the patient, and improves intra-oral visibility.

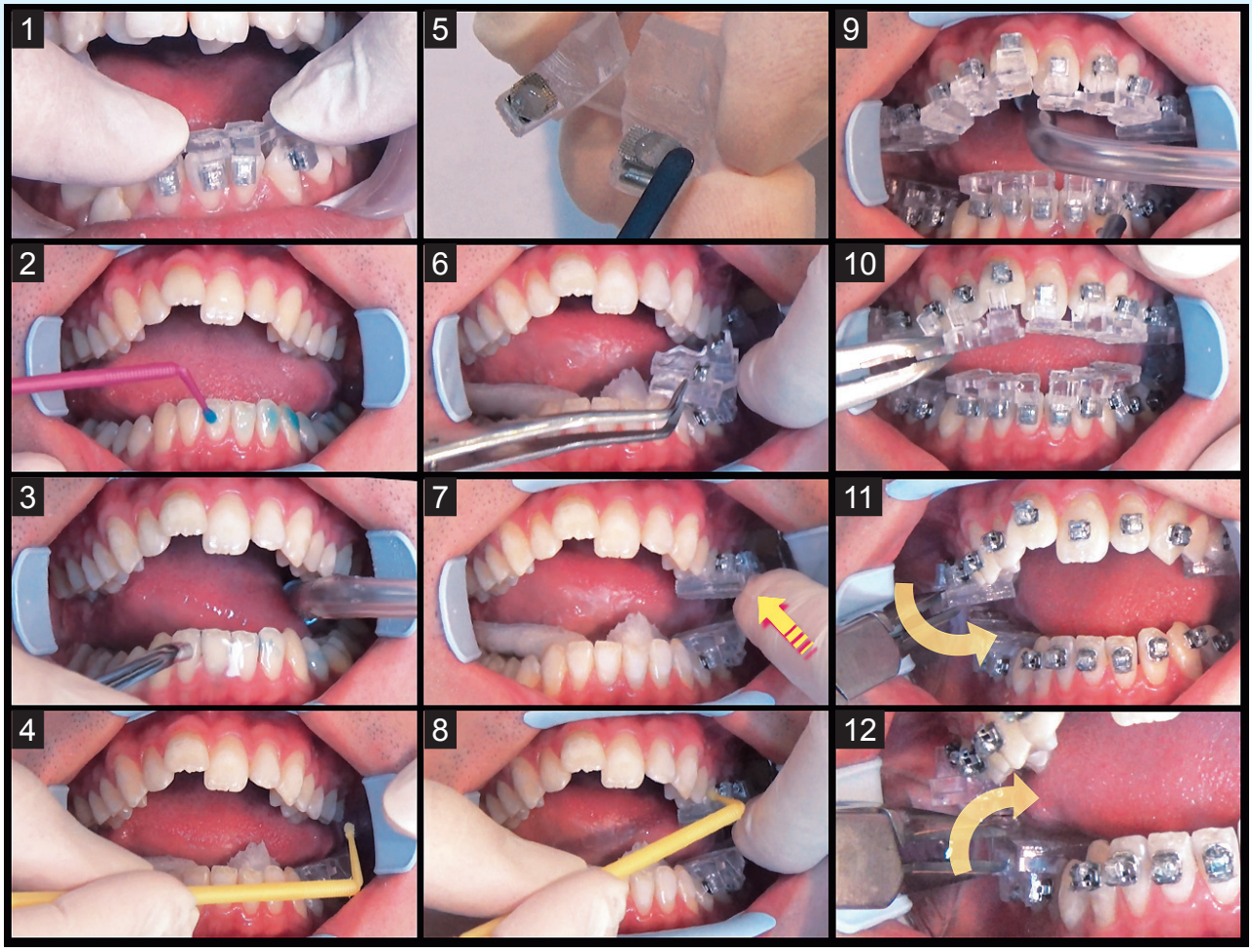

Fig. 5:
Insignia® bonding procedures are organized into a step-by-step protocol: (1) dry fit the group jigs, (2) apply etching-gel, (3) rinse, spray, and dry, (4) coat etched surfaces with the bonding agent (primer), (5) apply a thin layer of adhesive resin to each bonding pad with a filling instrument, (6) use cotton tweezers to grip the jigs, (7) rotate the pad and jig from the lingual cusp or incisal edge to the facial surface, and apply pressure from a 45-degree angle (yellow arrow), (8) use a microbrush dipped with bonding agent to clean off excess adhesive, (9) spray the jig-bracket assembly with water, (10) use a Weingart plier to release the jig from the brackets on the mesial and the distal surfaces, and then by rolling it gently to the lingual (yellow curved arrows) to remove the jig(s) from the upper (11) and lower (12) arches.

3. Step-by-Step Protocol:

(1) Dry fit the group jigs to the initial casts to identify any problems in sequentially positioning the bondable pads on each tooth.

(2) Apply etching-gel for 30 seconds to the facial surface of each tooth.

(3) Rinse throughly with water spray for a minimum of 5 seconds per tooth and air dry.

Fig. 6:
For the premolar extraction case shown, teeth with red Xs will be extracted. Place segmental 0.014-in CuNiTi archwires that terminate distal to the canines and mesial to the extraction sites. At the terminal ends of the segments, leave about 4mm of wire to curve lingually to ensure patient comfort.

(4) Apply the bonding agent (*Ortho Solo*®) onto all teeth to be bonded. No air-drying or light curing step is required.

(5) Apply a thin coat of adhesive to each bracket pad with an application instrument such as LiquidSteel PolyFill Plasma+® (*Carl Martin, Solingen, Germany*).

(6) Use cotton tweezers to grip the jigs.

(7) Roll the jigs, from the lingual cusp or incisal edge, to the facial surface to prevent disturbing the adhesive layer by sliding the pad along the tooth surface. Once firmly seated, maintain pressure on the jigs with finger force, applied 45-degrees to the enamel surface. This procedure ensures uniform contact between each pad and the respective tooth.[4]

(8) Assuming the correct amount of adhesive was applied to the pad, there will be no excess when the pad is pressed onto the tooth surface. If adhesive extrudes from between the tooth and pad, use a microbrush dipped in the bonding agent to remove the excess.

(9) Maintaining firm finger pressure as previously described, use the curing light for half the time specified, then release the finger pressure and complete the second half of the curing process in a passive manner.

(10) Lightly spray the bonded bracket and attached jig with water for several seconds to dissolve the adhesive holding them together.

(11) Use a Weingart utility plier to gently remove the jigs from the brackets. Begin by loosening the attachment in a mesiodistal direction. Then remove the jig by rolling it to the lingual, in a reversal of the path used to seat the pad on the surface of each tooth. Make sure the bond is broken on all surfaces of the bracket before completely removing the jig.

(12) Insert the first prescribed archwire, usually a stock 0.014-in CuNiTi, to begin alignment (*Fig. 6*).[5]

Conclusion

The recommended bonding procedure is extremely important for Insignia® custom brackets. Properly installing the precise, digital device is readily accomplished in a relatively brief appointment by adhering to the standardized bonding protocol.

Acknowledgment

Thanks to Mr. Paul Head for proofreading this article.

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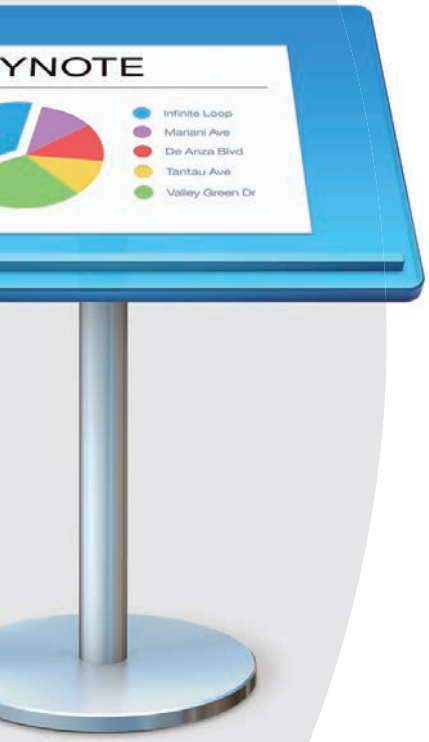

技巧班 強化你的 Keynote 簡報力

(四) 7/26

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講師：金牛頓工程師

大師班 賈伯斯的簡報秘訣與設計要素

(四) 8/9

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美且知識性豐富的專業演講。

講師：張慧男醫師

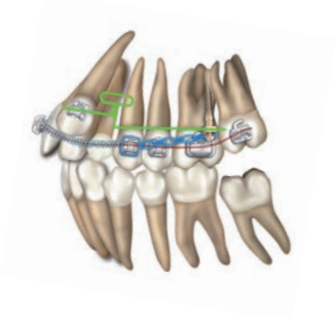
動畫班 精修繪圖及動畫技巧

(六～一) 12/1-3

數位化潮流下的牙科簡報，不僅需要清晰的臨床照片，也需要精確的圖表和流暢的動畫來吸引觀眾，而優秀的視覺化工具更使您的演講獨樹一格且令人難忘。

Keynote 456 課程中，Dr. Rungsi 將分享他利用 Keynote 軟體繪製精美牙科插圖的經驗，並一步步教會您如何從構想和草圖創建出令人驚艷的成果。跟隨簡報美學大師的腳步，您也可以秀出創意、站上世界舞台！

講師：Dr. Rungsi Thavarungkul



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Feedback from the World

I had first learned about Dr. Chang's buccal shelf TAD technique at a Damon Forum in 2014. I remembered sitting there thinking, "I could never do that" and I would never have a need to provide my patients with this technology. I then invited Dr. Chang to the North Carolina meeting and again was exposed to this technology. He demonstrated the technique again through video. I then made a decision to begin using this technology. I carefully studied all of Dr. Chang's material on Youtube and began providing my patients with the amazing technology. I have been impressed with the results we have accomplished so far and I love having this option to present to my patients.

Todd Bovenizer
DAMON EDUCATOR AND MENTOR, USA

Feedback from the Damon Master Program

I would like to thank Dr. Chris with heartfelt gratitude for conducting the Damon Master Courses. His knowledge is world-class, and more importantly, he makes Orthodontics fun to learn and you can tell that he does not hold back any information when he teaches. As someone who actively goes to many expensive CPD courses throughout the years, there isn't any other course that I recommend as much as this one for those that would like to start their orthodontic journey. Start the journey right, and start with the best. You can really feel the passion in Dr. Chris' heart when he teaches, and you can also tell that he's not doing it to earn the money or get famous (he's already too rich and famous!). Dentistry in my opinion should be structured like an apprenticeship; experienced doctors should teach junior doctors like myself all their mistakes and findings so that we can all provide better care for our patients.

Unfortunately, in many places, that simply isn't the culture; some speakers can be competitive or secretive and do not like to share everything they know. Therefore, I want to once again thank Dr. Chris for his genuine passion for wanting to pass on his knowledge so that the wider societies can benefit, and for leading by example the kind of dentist/person that I aspire to become.

Warmest Gratitude,

Austin Chan Hong Chun,
SINGAPORE

Feedback from the Beethoven International Workshop, Nov, 2017

Other than Chris' huge wealth of knowledge and impeccable presentation of cases, I found the hands on clinical component most useful and enjoyable. I enjoyed putting into practice the concepts and techniques discussed. I would have liked more time practice placing TADs and perhaps case discussions. I also enjoyed reviewing a couple of the cases that we had seen in clinic for eg. the tricky canine exposure cases. I also thought the refresher coarsen suturing was helpful and loved the idea of practicing on bananas! Dr. Chang and Dr. Lin are both exceptional speakers and I found them both engaging and interesting to listen to. I also found the staff at the clinics and Newton's A to be very friendly and helpful. I often felt that we were in the way of the assistants but they were always so polite and friendly. It was also great being able to socialize with them at the dinners after each day.

Sara Stockham,
AUSTRALIA

Chair side was very impressive, the opportunity to observe Dr. Chang placing live the mini screws, to me it was the most important part in these three days. The chair-side observation was the most interesting part since this is what I was trying to gain from this course to improve my technique which I have been using for the last couple of years in my office.

Kareem Akleh,
GREECE

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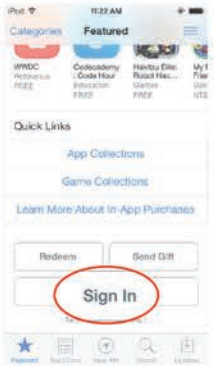

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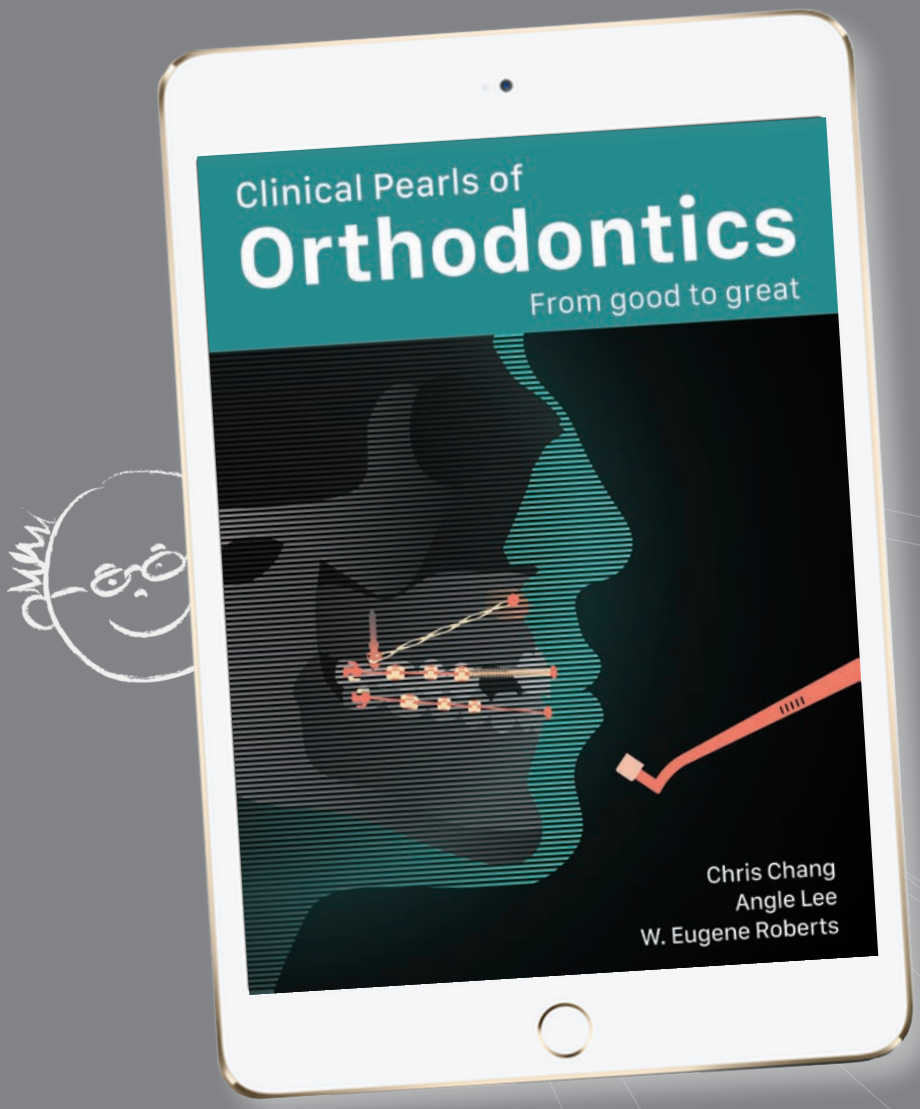

Clinical Pearls of Orthodontics:
From good to great

We all know "the devil is in the details" and it's the details that distinguish real pros from the mediocre ones. This book is Dr. Chris Chang's collection of practical tips that will simplify and improve you clinical care.

All tips come with a text-based explanation as well as a video summary and high-quality graphics so it's easy for personal reading as well as for internal staff training.

Chris Chang, Angle Lee, and W. Eugene Roberts

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"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

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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

The 28th Beethoven international workshop, Nov. 28-30, 2017. Participants took photos with Drs. John Lin (second row, center right) and Chris Chang (second row, center left) in front of the Angle library in Newton's A, Hsinchu, Taiwan.