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Dr. Gary Inman (left), the President of AAO (the American Association of Orthodontists) and Dr. Christopher Roberts (right), the President-Elect of AAO, together with Dr. Chris Chang in the 2019 ABOR Congress in Rio, Brazil.

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2020-21 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。

Damon Master

(Thu) 9:00-5:00 中文授課

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

Year 1 2020

Module 1 - **4/23**
Module 2 - **5/21**
Module 3 - **6/4**
Module 4 - **7/2**
Module 5 - **8/20**
Module 6 - **6/19-20**（擇一）

Year 2 2020-21

Module 1 - **9/24**
Module 2 - **10/15**
Module 3 - **11/19**
Module 4 - **12/17**
Module 5 - **1/7**/21'

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 XI

Module 1 - **8/27**
Module 2 - **9/10**
Module 3 - **10/22**
Module 4 - **11/12**
Module 5 - **12/10**
Module 6 - **1/14**/20'
Module 7 - **2/25**
Module 8 - **3/10**
Module 9 - **4/13**
Module 10 - **5/19**
Module 11 - **6/16**

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(Digital Orthodontics, OBS & VISTA)

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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2020

Class 1 - **May 12-15** Class 2 - **Dec 08-11**

2021

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

Damon + Bite Turbo + Early Light Short Elastic

每次上課請依最新一期 JDO 公告為主

報名專線
湧傑 Yong Chieh
北區 楊文君 02-27788315 #122
中區 張馨云 04-23058915
南區 蔡淑玲 07-2260030

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

Less is More

The question that has been in the back of my mind since the last issue has been how to ensure that a patient can be confident of a graduated student's skill proficiency after 3 years of training. I think that this question is relevant not only to our profession, but really to any skills that one pursues. Those of you who know me better can all now figure that playing the violin and golf are those which come into my mind!

Three years is not a long time. And, to further complicate matters, being in the medical profession, dealing with humans means we must work more carefully, gently, patiently and compassionately than, let's say, a computer programmer.

Obviously finding a good teacher is very important, but sometimes too many cooks can spoil the broth and some graduate programs promote their courses with ten or even fifteen teachers over three years. This may sound excellent for a freshman, but I think that sometimes **less is more**. As our profession started, it was very easy, follow Dr. Angle's teachings. Today, the choice is overwhelming.

If I were starting out on a graduate program today (**with more than 20 years of experience to lean on**), then I would stick to one master for three years following him technically and mentally. After graduating, I would hone my skills using his knowledge and techniques for a few years and then start to explore and find my own way. All of this before eventually returning to the master's tried and trusted ways, with a complete realization of how little I knew and how many mistakes I had made!

I sincerely believe that one well-selected master, as well as a communal sharing of mistakes, knowledge and experience, will ensure that graduating students have the best possible springboard to dive into our profession and can join us as we march along the path to glory.

Chris Chang PhD, ABO Certified, Publisher of JDO

Non-Extraction Treatment of a Class II Openbite with Amelogenesis Imperfecta

Abstract

Introduction: *A 15-year-7-month-old female with a history of amelogenesis imperfecta (AI) presented with chief complaints of poor dental esthetics and anterior openbite.*

History and Etiology: *AI is a hereditary disorder that is usually manifested as an autosomal dominate trait involving defective ENAM gene(s). For the present patient, deficient enamel resulted in decreased biologic width of the epithelial attachment, in addition to dental attrition that reduced the heights of clinical crowns. Selective crown lengthening and complete provisional restoration were required. Habitual interdental tongue posture, which may reflect a history of airway compromise, resulted in an anterior openbite that induced posterior mandibular rotation to produce a long face.*

Diagnosis: *AI-related enamel deficiency has compromised the periodontium and dentition. Facial form was convex (12°) with increased lower facial height (59.5%), and a steep mandibular plane angle (FMA 37.5°). Cephalometrics revealed a protrusive maxilla (SNA 84.5°), retrusive mandible (77.5°), and an intermaxillary discrepancy of ANB 7°. The bilateral Class II malocclusion was complicated with anterior openbite, canted occlusal plane, and mandibular deviation to the left. The Discrepancy Index (DI) was 62.*

Treatment: *Crown lengthening surgery and revised provisional restorations established a healthy periodontium in preparation for orthodontic treatment. A fixed passive self-ligating appliance, with high torque brackets in the upper anterior segment, was bonded on both arches. Anchorage to intrude upper molars was provided with bilateral infra-zygomatic crest (IZC) bone screws. After initial orthodontic alignment, interproximal space was increased as needed with elastic separators to prepare gingival margins, and a new set of optimized provisional restorations was fabricated. Orthodontic finishing was accomplished with the same fixed appliance.*

Results: *Crown lengthening produced healthy periodontium with proper biological width in preparation for full provisional restoration and orthodontic alignment. As upper molars were intruded, the mandible rotated anteriorly, and the lower facial height decreased as lip and chin protrusion increased. This challenging openbite malocclusion, with a Discrepancy Index (DI) of 62, was treated in 22 months to an excellent outcome: Cast-Radiography Evaluation (CRE) score of 11, and Pink & White dental esthetic score of 1. An upper removable retainer was provided for night-time wear.*

Conclusions: *A patient with AI and an anterior openbite malocclusion was treated to a stable occlusion with a passive self-ligating fixed appliance and IZC bone screw anchorage. Interdisciplinary treatment with periodontics and prosthodontics was required before and after orthodontic therapy to appropriately restore dentofacial esthetics and function. (J Digital Orthod 2020;57:4-23)*

Key words:
Class II, openbite, occlusal cant, bimaxillary protrusion, molar intrusion, infrazygomatic crest screw, amelogenesis imperfecta, therapeutic provisional restoration

Dr. Yu-Hsin Huang,
Diplomate, International Association of Orthodontists and Implantologists (Upper left)

Dr. Kim-Choy Low,
Prosthodontist, Dr. Lin and Partners Dental Office (Upper center)

Dr. Po-Jan Kuo,
Periodontist, Jing-Jong Lin Orthodontic Clinic (Upper right)

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

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

History and Etiology

A 15-year-7-month-old (*15y7m*) female with a history of amelogenesis imperfecta (*AI*) presented with a Class II malocclusion, crowding, asymmetric anterior openbite, enamel deficiency, periodontal impairment, and compromised provisional crowns (*Figs. 1-4*). Clinical and radiographic evaluation revealed a long face,

Fig. 1: Pre-treatment facial and intraoral photographs, 15y7m of age

Fig. 2: Facial and intraoral photographs after the initial periodontal and restorative treatment, 17y4m of age

protrusive lips, excessive mentalis strain, and excessive maxillary gingival exposure (*gummy smile*). An occlusal cant and mandibular deviation to the left were also noted (*Table 1; Figs. 2, 4 and 6*). The patient had additional concerns about tooth sensitivity, poor dental esthetics, and unclear pronunciation of the sounds [s] and [z]. Panoramic radiography was consistent with AI: reduced thickness and radio-opacity of enamel, as well as tight proximal contacts in the posterior region, pulpal calcification, and root anomalies.

Diagnosis

Clinical examination, photography, casts, radiographs and cephalometrics (*Figs. 1-6, Table 1*) documented the following:

Facial:

- Length: *Long face (LHF 59.5%), relatively short upper lip, and incompetent lips*
- Protrusion: *Facial convexity (12°), hypermentalis strain for lip closure, flat chin, and relatively protrusive lips (1mm U, 3mm L to the E-Line)*

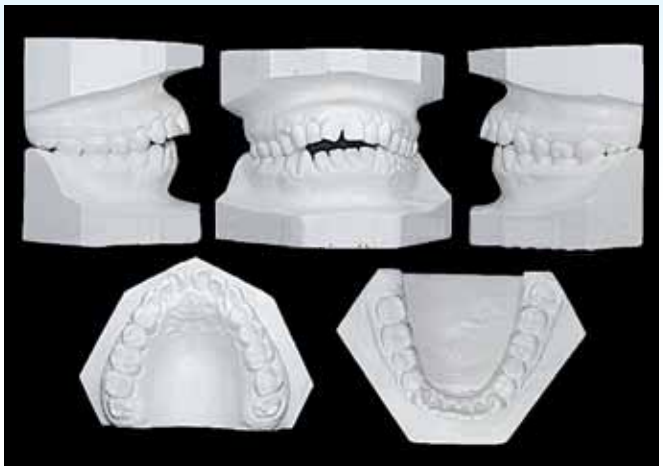

Fig. 3: Pre-treatment dental models (casts)

Fig. 4: Pre-treatment panoramic radiograph

- Symmetry: *Maxillary dental midline, canted occlusal plane, and mandibular deviation to the left (Fig. 2)*
- Smile: *Excessive gingival exposure with an anterior openbite*

Skeletal:

- Intermaxillary Relationship: *Protrusive maxilla (SNA 84.5°), retrusive mandible (SNB 77.5°), and intermaxillary skeletal discrepancy (ANB 7°)*
- Mandibular Plane: *Excessive (SN-MP 45°, FMA 37.5°)*
- Vertical Dimension of Occlusion (*VDO*): *Excessive ANS-Gn segment (59.5% of the Na-ANS-Gn dimension)*
- Symmetry: *Maxilla deviated to the left with a 4° counterclockwise occlusal cant*

CEPHALOMETRIC SUMMARY			
SKELETAL ANALYSIS			
	PRE-Tx	POST-Tx	DIFF.
SNA° (82°)	84.5°	84.5°	0°
SNB° (80°)	77.5°	78.5°	1°
ANB° (2°)	7°	6°	1°
SN-MP° (32°)	45°	44°	1°
FMA° (25°)	37.5°	36.5°	1°
DENTAL ANALYSIS			
U1 To NA mm (4 mm)	6.5 mm	4.5 mm	2 mm
U1 To SN° (110°)	108.5°	102°	6.5°
L1 To NB mm (4 mm)	10 mm	11 mm	1 mm
L1 To MP° (90°)	85.5°	86°	0.5°
FACIAL ANALYSIS			
E-LINE UL (-1 mm)	1 mm	-0.5 mm	1.5 mm
E-LINE LL (0 mm)	3 mm	2 mm	1 mm
%FH: Na-ANS-Gn (53%)	59.5%	59%	0.5%
Convexity: G-Sn-Pg' (13°)	12°	5°	7°

Table 1: Cephalometric summary

Fig. 5: Pre-treatment cephalometric radiograph

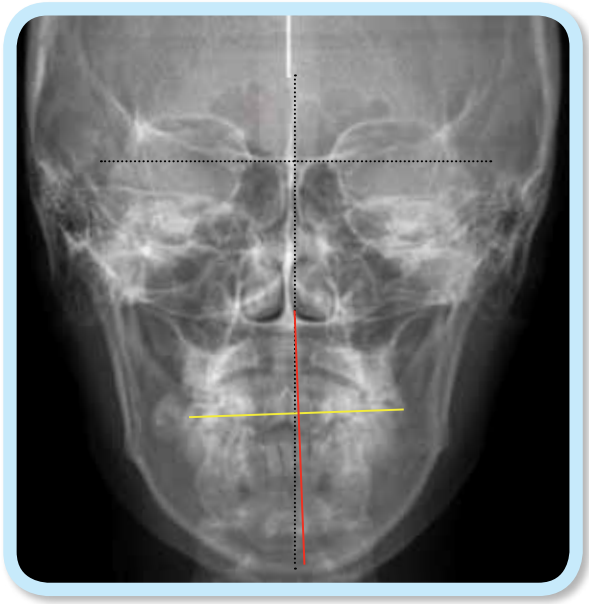

Fig. 6:
An anterior-posterior cephalometric radiograph documents facial asymmetry, occlusal canting and mandibular deviation.

Dental:

- Classification: *Class II buccal segments (6mm bilaterally)*
- Overbite: *-5mm*
- Overjet: *2mm*
- Missing/Unerupted/Impacted: *Impacted LR8 (Fig. 4)*
- Morphology: *Enamel hypoplasia and hypo-mineralization*
- Symmetry: *Upper midline deviated 1mm to the right with a 4° occlusal cant*
- ABO Discrepancy Index (*DI*) of 62, as documented in Worksheet 1

Facial Esthetics:

- Convex with incompetent lips
- Protrusive upper and lower lips (*1 and 3mm to the E-Line, respectively*)

Treatment Alternatives

Females over 15 years of age are usually skeletally mature, so treatment options are similar to other non-growing adults. The anterior openbite could be corrected with fixed appliances and two-jaw orthognathic surgery: (*1*) 3-piece Le Fort I maxillary advancement osteotomy for expansion of the posterior segments, (*2*) down-fracture of the maxillary anterior segment, and (*3*) bilateral sagittal split osteotomy for autorotation of the mandible. Another approach is orthodontic treatment with extraction of four premolars to upright maxillary incisors, close spaces, and retract anterior segments to close the anterior openbite and reduce protrusion.

An alternate form of camouflage treatment is a non-extraction orthodontic treatment combined with bone screws to intrude the posterior teeth, increase the overbite, and improve the openbite.[1,2] The treatment options as illustrated in Fig. 7 are summarized bellow:

- Option 1: Combine initial dental alignment, orthognathic surgical correction, and finishing.
- Option 2: Extract four first premolars, place fixed appliances, and close extraction spaces. Bone screws can be used as supplemental anchorage.[1,2]
- Option 3: Use infra-zygomatic crest (*IZC*) bone screws to intrude the posterior maxillary dentition and retract the anterior segment.[3]

The patient chose the third option because it was deemed the least invasive.

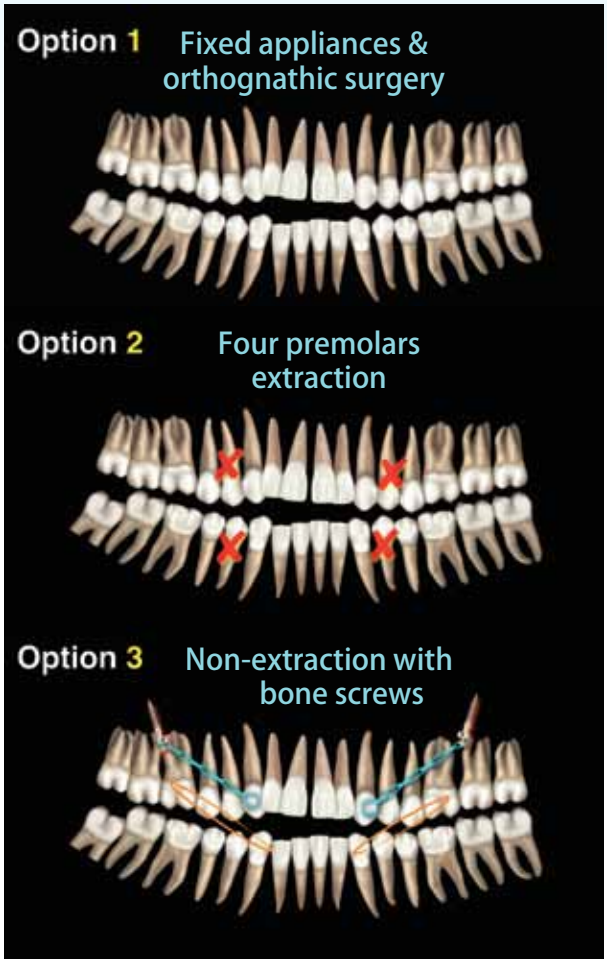

Fig. 7:
Three treatment options are illustrated in panoramic drawings.

Specific Objectives of Treatment

1. Expand both arches.
2. Align and level.
3. Correct the anterior openbite.
4. Improve facial and lip protrusion.

Treatment Progress

Prior to orthodontics, periodontal crown lengthening was performed to correct biologic width as needed. An optimal soft tissue response was achieved in 21 months by combining periodontal and prosthetic treatment, and then orthodontic therapy commenced. A 0.022-in slot Damon Q® fixed appliance system (*Ormco, Glendora, CA*) with passive self-ligating (*PSL*) brackets was bonded on both arches. A standard torque appliance was utilized except for high torque brackets in the maxillary anterior segment. The maxillary arch was bonded first, and a 0.013-in copper-nickel-titanium (*CuNiTi*) archwire was placed (*Figs. 8-9*). The lower molars

Fig. 8: A progressive sequence of occlusal photographs show treatment progress from 1-7 months (M).

were separated on the mesial and distal surfaces (*Fig. 10*) to provide space for banding. Ten days later, a standard torque appliance was bonded on the entire lower arch, and a 0.013-in CuNiTi archwire was placed (*Fig. 11*). One month later (*2M*), the brackets on UR1, UR3, UL1 and LL3 were repositioned, and a 0.016-in CuNiTi archwire was inserted in the lower arch. The following month (*3M*), the UR2 bracket was repositioned, and the patient was referred for third molar extraction. One month later (*4M*), an intra elastic (*Fox 1/4-in, 3.5-oz*) was placed from UR3 to UL3. Provisional restoration on LR3 was defective (*Fig. 12*), so the patient was referred for restorative care. Five months (*5M*) into treatment, a 0.014x0.025-in CuNiTi upper archwire was inserted, and IZC bone screws were placed to initiate retraction of the upper arch (*Fig. 13*).[4]

Two months later (*7M*), the upper archwire was increased to 0.018-in CuNiTi, and a 0.014x0.025-in CuNiTi was placed in the lower arch. To close anterior interproximal spaces, elastic chains were placed from canine to canine in both arches. In addition, anterior horizontal elastics (*Fox 1/4-in, 3.5-oz*) were utilized from canine to canine.

One month later (*8M*), archwires were changed to a 0.014x0.025-in and 0.018-in CuNiTi in the lower and upper arches, respectively. Interproximal reduction (*IPR*) of enamel thickness was performed in the lower anterior segment. Two months later (*10M*), the brackets on UR5, UR2, UR1 and LL2 were repositioned, and both arches were engaged with 0.014x0.025-in CuNiTi archwires. Elastic chains were utilized to consolidate both arches, and Class II elastics were placed. In the 14th month (*14M*) of treatment, anterior horizontal elastics (*Fox 1/4-in, 3.5-oz*) were applied to complete openbite correction.[5] Fifteen months (*15M*) into treatment, the provisional restorations were replaced and rebonded with similar PSL brackets (*Figs. 14 and 15*). Seven months later (*22M*), fixed appliances were removed, and an upper removable retainer was delivered. The archwires and treatment sequence are summarized in Table 2.

Results Achieved

After 22 months of active treatment, the periodontally and restoratively compromised malocclusion (*DI of 62, Worksheet 1*) was corrected to a near ideal result: cast-radiograph evaluation (*CRE*)

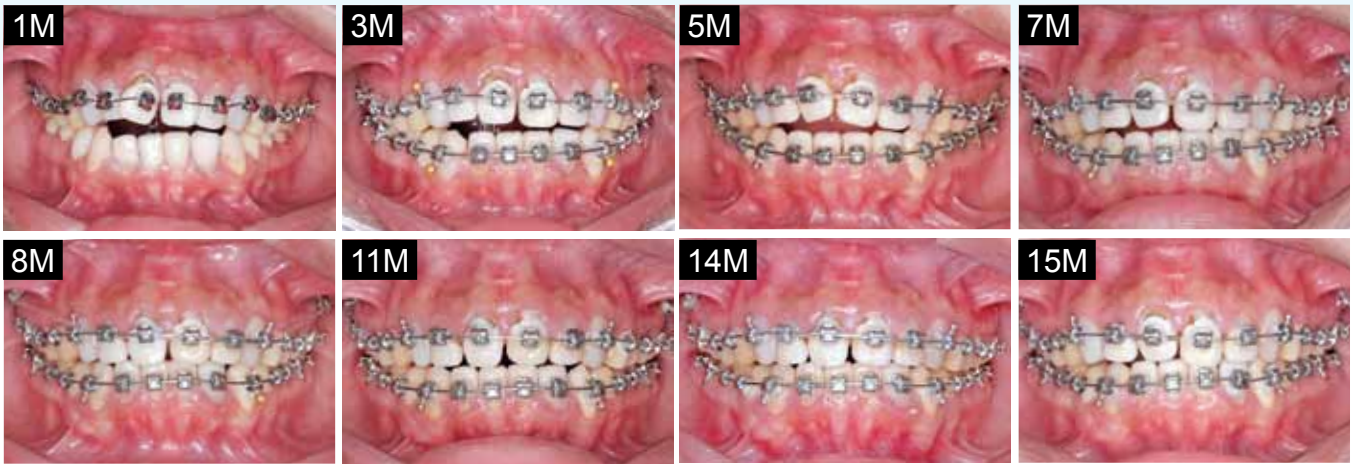

Fig. 9: A progressive sequence of frontal intraoral photographs document treatment progress from 1-15 months (M).

of 11 (*Worksheet 2*),[6] and a Pink & White esthetic score of 1 (*Worksheet 3*).[7] Non-extraction alignment and IZC bone screw anchorage reduced facial height (*0.5°*), convexity (*5°*), and the MPA (*1°*) (*Table 1*). Consistent with conservative correction of anterior openbite,[8,9] the axial inclination of maxillary incisors was decreased 6.5° to 102° (*Fig. 16*). Excessively upright upper incisors were masked with restorative veneers at the end of treatment (*Fig. 17*). As shown in Figs. 18-23 and Table 1, outcomes for specific treatment objectives[6] are outlined below:

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: *Incisors and molars retracted*
- Vertical: *Molars intruded/Incisors maintained*
- Inter-molar/Inter-canine Width: *Maintained/Expanded*

Fig. 10:
Blue elastic separators are placed mesial and distal to the lower first molars to prepare restorative margins for provisional restorations. Later bonding of lower first molars was successful. No bands were used.

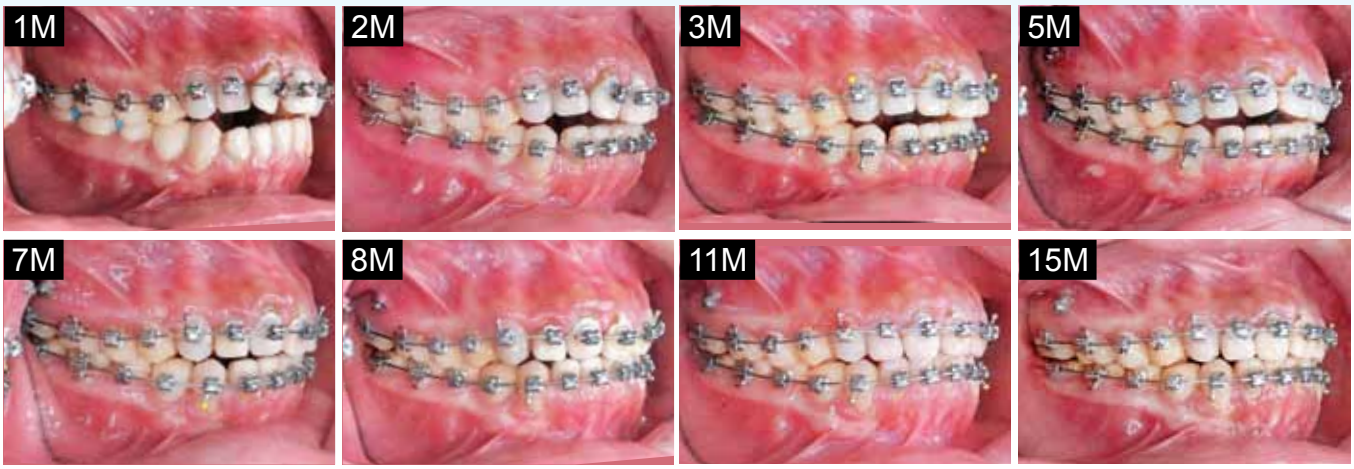

Fig. 11: A progressive sequence of right buccal photographs document treatment progress from 1-15 months (M).

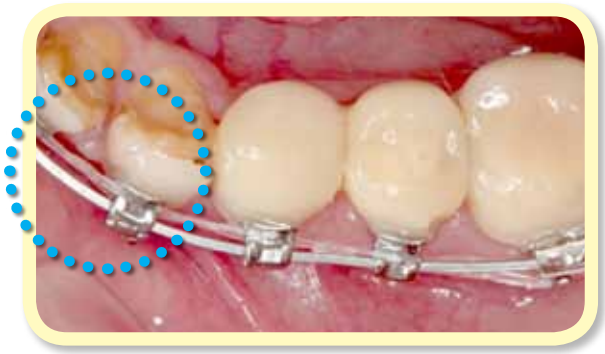

Fig. 12: The provisional veneer on LR3 was cracked and displaced.

Fig. 13: IZC bone screws were placed buccally to the upper molars.

Mandibular Dentition:

- A-P: *Retracted*
- Vertical: *Intruded*
- Inter-Molar/Inter-Canine Width: *Expanded*

Facial Esthetics:

- Both upper and lower lips were retracted

Discussion

Etiology of anterior openbite is an interdental tongue posture that often reflects a past or present airway compromise. Swallowing requires a tongue thrust to seal the oral cavity. The tongue thrust is commonly thought to be the proximal cause of the openbite, but Proffit et al.[10] have clearly shown that the constant force of soft tissue posture is more efficient than the intermittent force of a tongue thrust for producing openbite malocclusion. Anterior openbite is often associated with increased FMA, reduced inter-incisal angle, increased lower facial

height, and incompetent lips.[8,9] This morphologic pattern compromises both dentofacial esthetics and functional occlusion. Affected individuals experience difficulty incising food and articulating the normal sounds of speech. Repetitive mechanical loading of a tongue thrust may contribute to periodontal compromise.[10]

There are many treatment options for correcting anterior openbite: fixed appliances with/without extractions, multi-loop edgewise archwires, functional appliances, high-pull headgear and/or bite blocks. Some malocclusions are exacerbated with growth. Severe openbite may require a combination of orthodontics and orthognathic surgery. The most common surgical procedure is a Le Fort I osteotomy with posterior maxillary impaction and/or bimaxillary osteotomy.[8,9] Orthognathic surgery for openbite correction may be unstable.

Fig. 14:
Progress cephalometric radiograph at 14 months shows dentofacial changes.

Fig. 15:
Progress panoramic radiograph at 14 months documents initial orthodontic alignment.

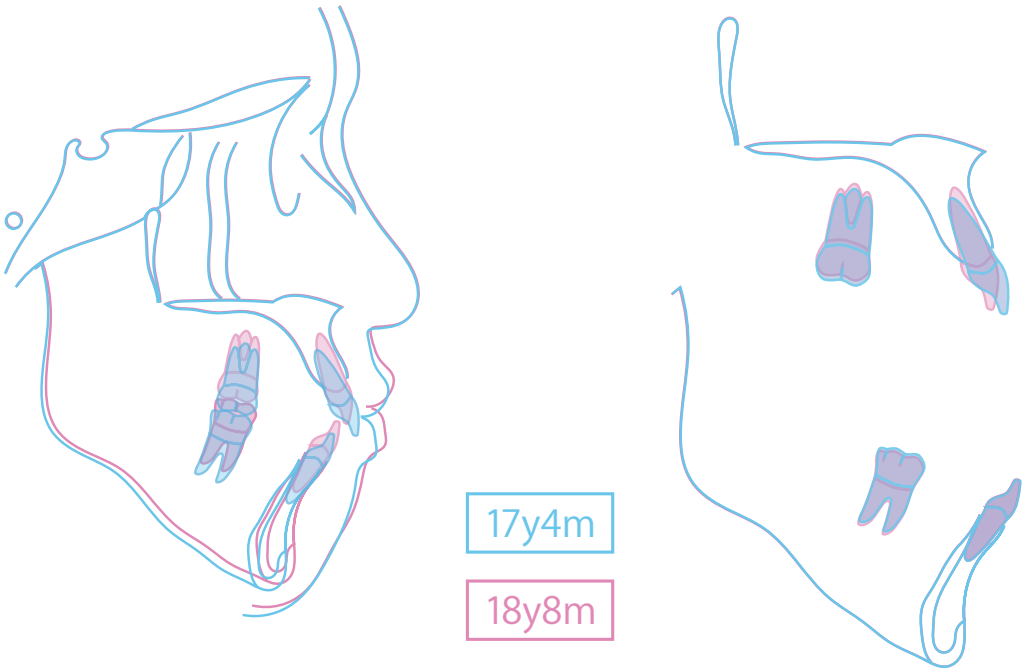

Fig. 16:
Superimposition of cephalometric tracings (17y4m and 18y8m) reveals 16 months of progress. Note that the mandible has rotated anteriorly (counter-clockwise). See text for details.

Fig. 17: Post-treatment facial and intraoral photographs

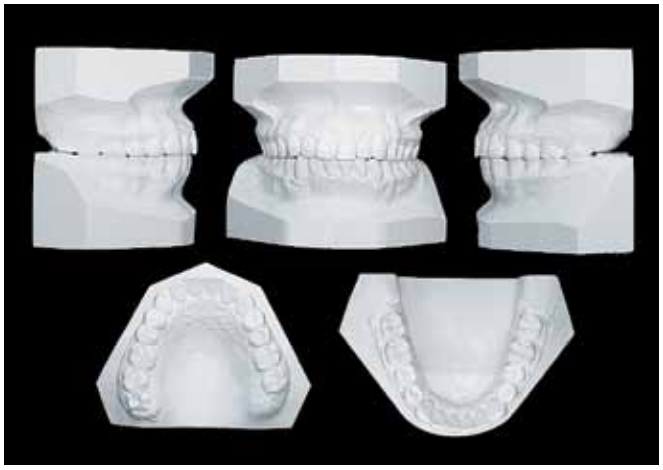

Fig. 18: Post-treatment dental models (casts)

Proffit et al.[10] found maxillary impaction was less prone to relapse (*7% overbite decrease*) compared to two-jaw surgeries (*12% overbite decrease*). Teittinen et al.[11] compared maxillary impaction and mandibular rotation to close anterior openbite. The maxilla tends to relapse vertically, but the mandible experienced both vertical and sagittal changes, particularly with two-jaw procedures. Furthermore, Frey et al.[12] described a greater relapse tendency for counter-clockwise rotation of the mandible. Overbite relapse is a statistically significant problem following orthognathic surgery.[13] In the past decade,

skeletal anchorage devices have evolved to intrude molars for achieving improvement in occlusion, facial height and lateral profile.[14-17] Bone screws and miniplates are stationary osseous anchorage for retraction and intrusion of the dentition. The surgical procedure for miniplate placement is more invasive and relatively complicated, compared to self-drilling screws that penetrate the soft tissue. The latter are inserted directly into cortical bone and have a very high rate of success.[17,18] No surgical flap or pilot drilling are necessary. Avoiding the trauma and pain of more extensive surgery is an attractive feature, and an additional advantage is the simple removal of the screw without anesthesia after treatment.

The extra-alveolar location of the bone screw permits selective retraction and intrusion of the dentition.[18,19] When combined with the Damon PSL appliance, a light force can expand (*develop*) a narrow arch without periodontal compromise.[20] Sequential or simultaneous correction in three planes of space with bone screw anchorage is more effective than routine fixed appliance therapy, and is much less traumatic compared to orthognathic surgery.[18-20]

Amelogenesis imperfecta (*AI*) is usually an autosomal dominant trait affecting all teeth.[10] Lack of enamel may result in dental attrition and compromise of the epithelial attachment. Crown lengthening and extensive restorative dentistry are often required prior to orthodontics (*Figs. 24 and 25*).[21,22] Periodontal and radiographic evaluation suggested that a passive eruption mechanism contributes to the compromised gingival and osseous relationships.[23] For the current patient, the periodontium presented

Fig. 19: Post-treatment panoramic radiograph

Fig. 20: Post-treatment cephalometric radiograph

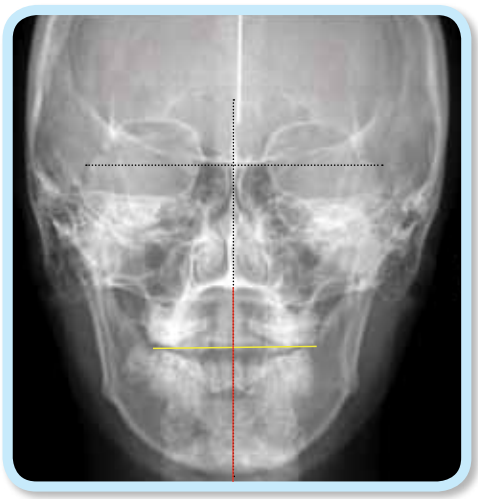

Fig. 21:
A post-treatment anterioposterior cephalometric radiograph with superimposed reference lines shows a near ideal dentofacial symmetry. Compare to Fig. 6, and see text for details.

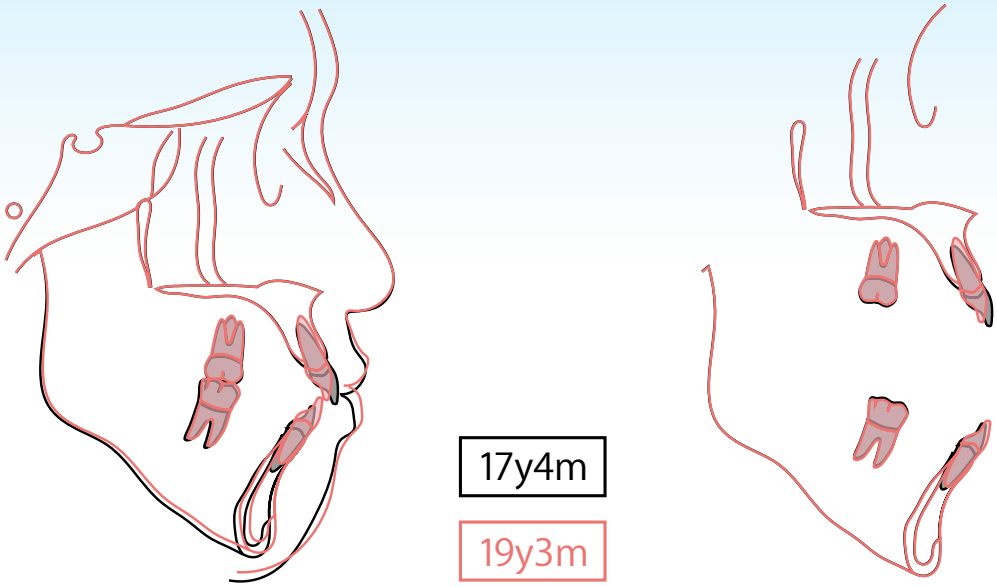

Fig. 22:
Cephalometric tracings superimposed on the anterior cranial base (left), maxilla (upper right), and mandible (lower right) show dentofacial changes during active orthodontic treatment. The black tracing at 17y4m is the start, and the red tracing at 19y3m is the finish. See text for details.

Fig. 23:
Orthodontic correction was maintained with an upper removable retainer. See text for details.

with a wider band of keratinized tissue and osseous crest at about the same level as the cementoenamel junction (*CEJ*). The periodontal surgical procedure included thinning of both soft and hard tissue to minimize rebound of the apically repositioned gingiva soft tissue. The improved periodontal contours facilitate oral hygiene and result in a more esthetic outcome prior to orthodontic treatment.[24]

The crown lengthening procedure apically repositioned the gingiva on an osseous base that was reduced to provide for adequate biologic width. Under local anesthesia, the location of the anatomical CEJ and alveolar bone crest were determined using a periodontal probe. Sub-marginal parabolic incisions corresponding to the anatomical CEJ reproduced the natural scalloping of a gingival

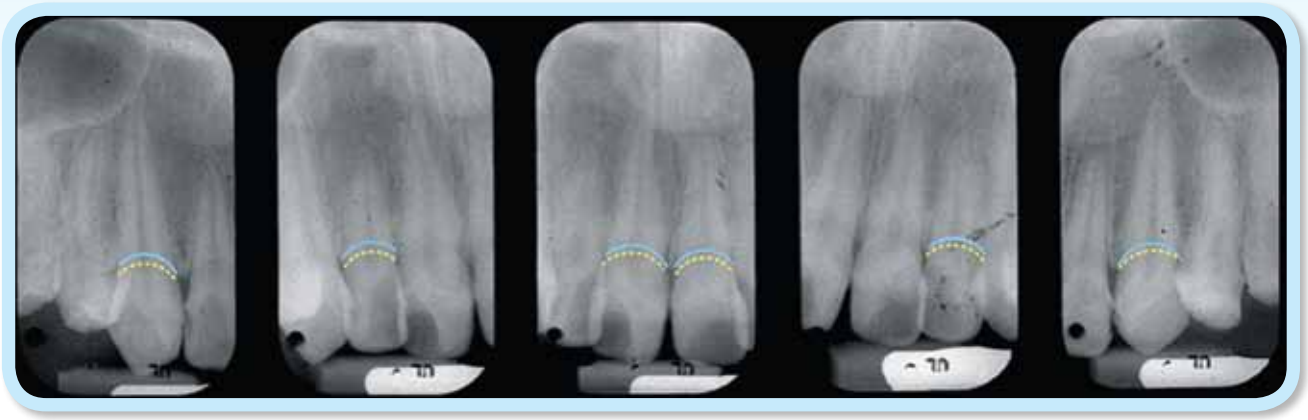

Fig. 24:
Intraoral radiographs prior to treatment were used to assess the morphology of the anatomical cementoenamel junction (aCEJ) and alveolar bone crest (ABC). The blue lines mark the ABC, and the yellow dotted lines mark the aCEJ. Note the distance (ABC-aCEJ) is less than 2mm, which is a biologic width violation that induces inflammation. See text for details.

margin (*Fig. 26*). After full-thickness gingival flap elevation, an osteotomy was performed to provide at least 3mm clearance between the bone crest and the desired level of gingival margin. Vertical grooving and radicular blending of bone created a physiological morphology with appropriate root prominence (*Fig. 27*). The flap was closed with dissolvable sutures and covered with a periodontal dressing.

Crown lengthening exposed the margins of defective restorations and rough enamel surfaces (*Fig. 28*). It is important to correct the biologic, functional, and esthetic deficits prior to initiating orthodontics (*Fig. 2*).[25] Health of the periodontium was maintained with provisional restorations that had physiologic contours and gingival embrasures.[26] Auto polymerized polymethyl methacrylate [PMMA] was the restorative material of choice because of adequate strength and good color stability. An indirect-direct technique with a provisional shell was used to produce the provisional prostheses.

A previously fabricated custom shell for each tooth was relined intra-orally immediately after tooth preparation was completed. The indirect-direct procedure reduced chair time. It is important to adequately seat the shell during the reline procedure to decease adjustments as well as to control heat generation and chemical irritation. The indirect approach with PMMA as a reline material reduces polymerization shrinkage compared with the direct technique. After the reline and adjustment procedures, the surface of the provisional crowns were polished to facilitate soft tissue healing along the desired cervical contours.[27] This method is well suited for helping resolve anterior openbite restoratively.[28] After fourteen months of orthodontic alignment, a second set of provisional restorations was constructed. Each tooth was restored as ideally

Fig. 25:
Initial photographs of the maxillary anterior segment show the swelling and inflamed gingiva that is characteristic of an inadequate biologic width. See text for details. (Courtesy of Dr. Po-Jan Kuo)

Fig. 27:
Reduction osteotomy of the alveolar crest in the maxillary anterior segment increases the distance from ABC to aCEJ to <3mm for each tooth. See text for details.

Fig. 26:
A surgical flap is raised with an internal bevel incision between the line angles of each tooth. See text for details.

Fig. 28:
Left view shows healing 2 weeks post-operatively, and the right view documents pink, healthy gingiva 4 weeks after surgery.

as possible to facilitate the final interdigitation, overjet, and overbite during orthodontic finishing (*Fig. 16*). The provisional restorations were adjusted as desired by the patient, so they could serve as the pattern for the permanent restorations. This approach fulfilled the patient's needs for a harmonious and healthy dentition.

In interpreting Fig. 22, it is important to understand that the mandible was rotated clockwise due to thick posterior provisional restorations to provide adequate strength. Future permanent crowns will have thinner occlusal surfaces, so the mandible will rotate anteriorly (*counter-clockwise*) to improve the facial profile.

Conclusions

An AI compromised dentition developed into a complex malocclusion that required interdisciplinary treatment to achieve an optimal esthetic and functional outcome. Provisional restorations supported by healthy periodontium were the prerequisite for orthodontic alignment. A passive self-ligating appliance with IZC bone screw anchorage achieved optimal dentofacial form and function. To facilitate optimal finishing, a new set of provisional restorations was constructed after 14 months of orthodontic alignment. Carefully coordinated periodontal, restorative and orthodontic treatments were required to achieve a near ideal outcome.

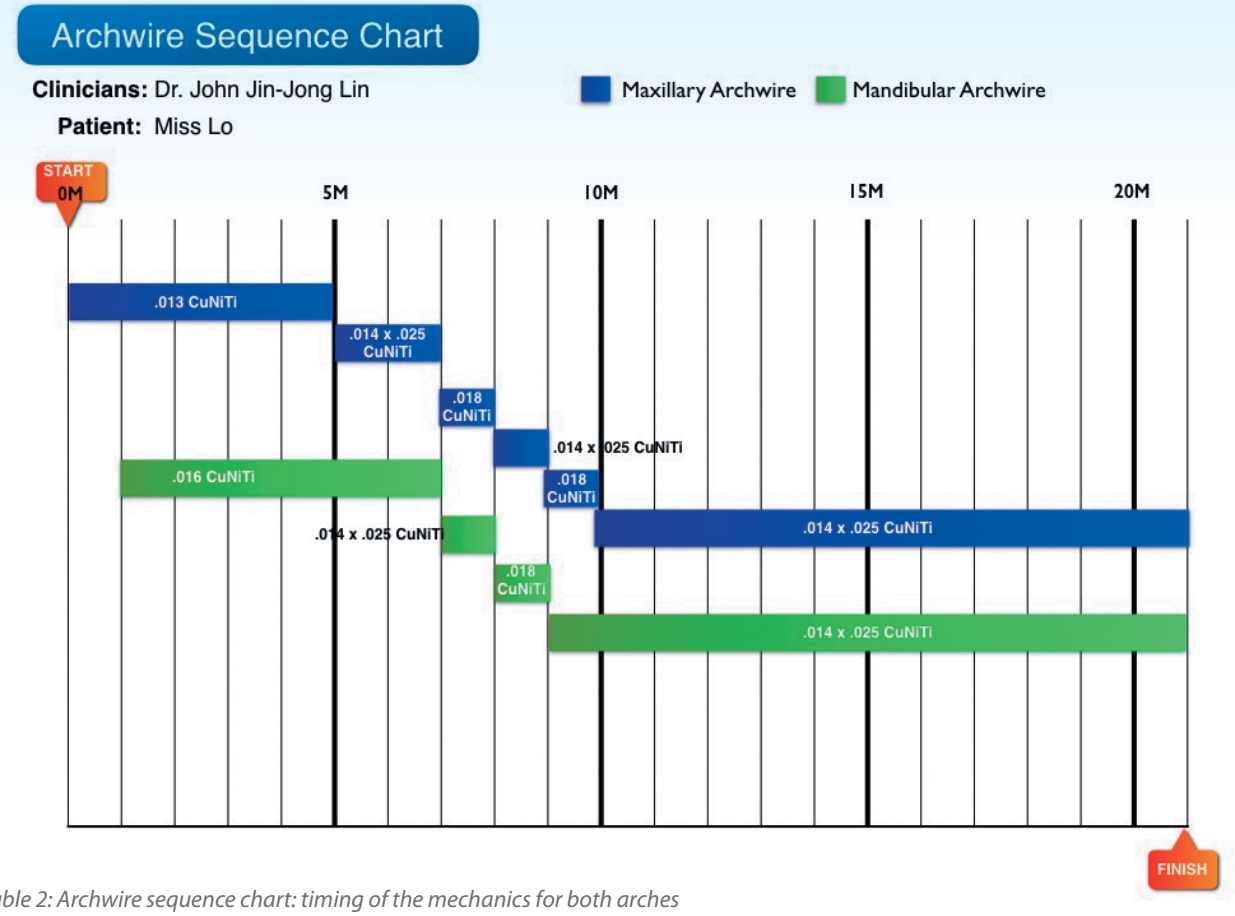

Table 2: Archwire sequence chart: timing of the mechanics for both arches

Acknowledgment

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

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Discrepancy Index Worksheet

TOTAL D.I. SCORE 62

OVERJET

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

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

Total = 3

OVERBITE

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

Total = 0

ANTERIOR OPEN BITE

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

Total = 21

LATERAL OPEN BITE

2 pts. per mm. per tooth

Total = 0

CROWDING (only one arch)

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

Total = 4

6 mm (upper)

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	8 pts.
Beyond Class II or III	=	1 pt. per mm. additional	____ pts.

Total = 8

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° 7° = 4 pts.

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

Each degree > 6° 1° x 1 pt. = 1

SN-MP 45°

≥ 38° = 2 pts.

Each degree > 38° 7 x 2 pts. = 14

≤ 26° = 1 pt.

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

1 to MP ≥ 99° = 1 pt.

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

Total = 21

OTHER (See Instructions)

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

Identify: Amelogenesis imperfecta

Total = 5

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

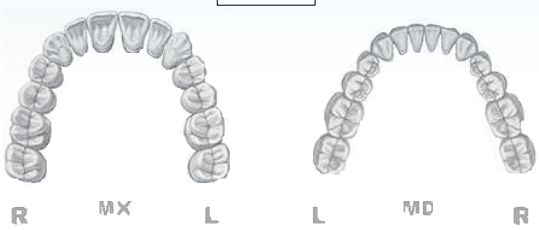
Cast-Radiograph Evaluation

Case # **Patient**

Total Score: 11

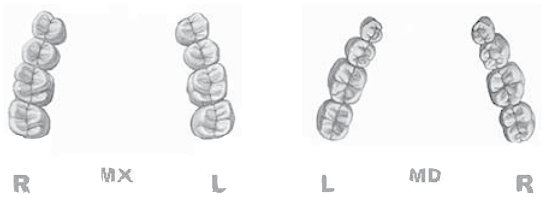
Alignment/Rotations

0



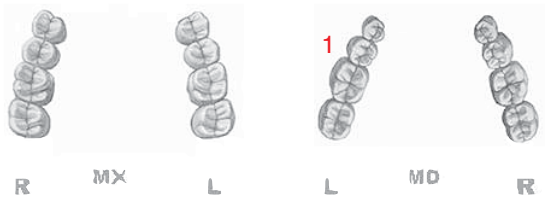
Marginal Ridges

0



Buccolingual Inclination

1

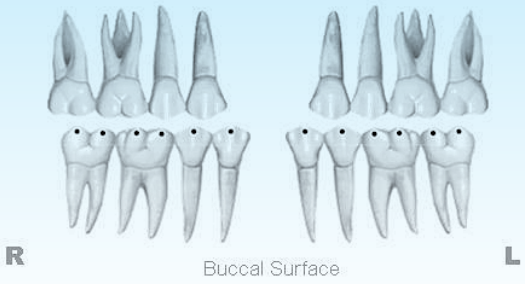


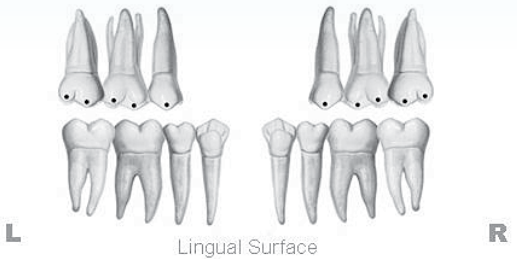
Overjet

0

Occlusal Contacts

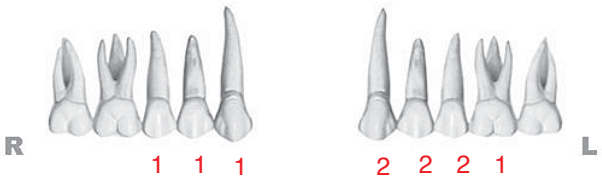
0





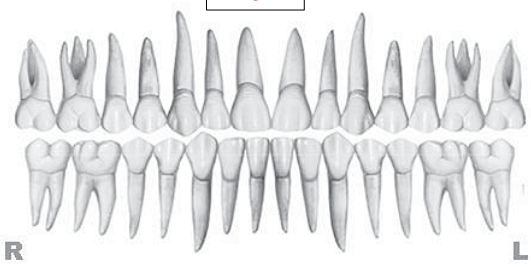
Occlusal Relationships

10



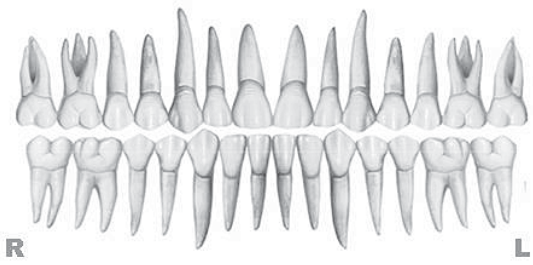
Interproximal Contacts

0



Root Angulation

0



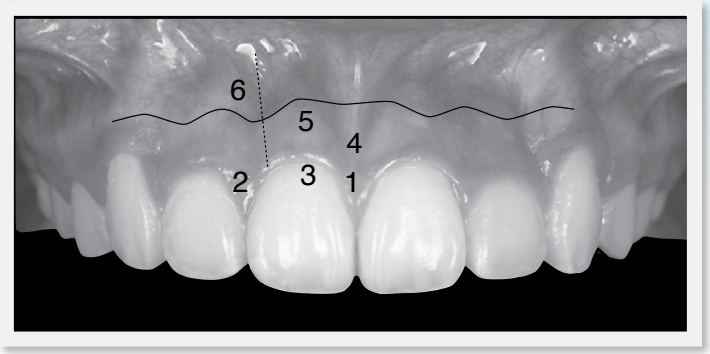
INSTRUCTIONS: Place score beside each deficient tooth and enter total score for each parameter in the white box. Mark extracted teeth with "X". Second molars should be in occlusion.

IBOI Pink & White Esthetic Score

Total Score: = 1

1. Pink Esthetic Score

Total = 1

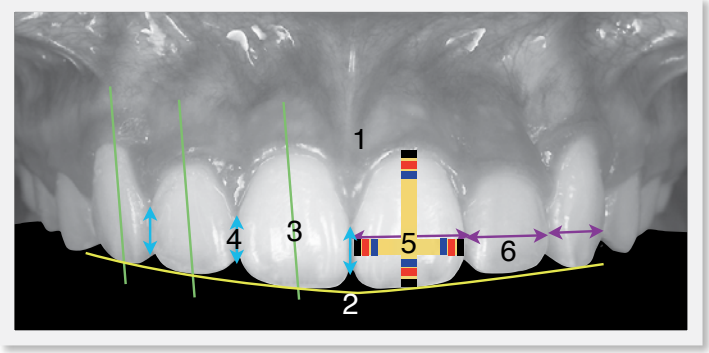


1. M & D Papillae	0	1	2
2. Keratinized Gingiva	0	1	2
3. Curvature of Gingival Margin	0	1	2
4. Level of Gingival Margin	0	1	2
5. Root Convexity (Torque)	0	1	2
6. Scar Formation	0	1	2

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 = 0



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

Beethoven Dental Clinic Established 1996

The Beethoven Orthodontic Team

has received the **2019** AJO-DO **Case Report** of the Year **Award**

Link to the video

https://goo.gl/Dnu94Z

The 1st Chinese Recipient

Shuang-An Lee

Chris H. Chang

W. Eugene Roberts

AJO-DO
American Journal of Orthodontics & Dentofacial Orthopedics

January 28, 2019

Shuang-An Lee
Chris CH. Chang
W. Eugene Roberts
[redacted]

RE: CDABO Case Report of the Year Award

Dear Drs. Lee, Chang, and Roberts:

It is with great pleasure that I write to inform you that your article, "Severe unilateral scissors-bite with a constricted mandibular arch: Bite turbos and extra-alveolar bone screws in the infrazygomatic crests and mandibular buccal shelf," has been selected to receive the 2019 CDABO Case Report of the Year Award. Congratulations.

The College of Diplomates of the American Board of Orthodontics (CDABO) is composed of orthodontic clinicians who have passed all phases of the American Board of Orthodontics examination. The award was established by the College to recognize excellence in clinical orthodontics. It is given annually to the authors of the best Case Report published during the previous year in the *American Journal of Orthodontics and Dentofacial Orthopedics*.

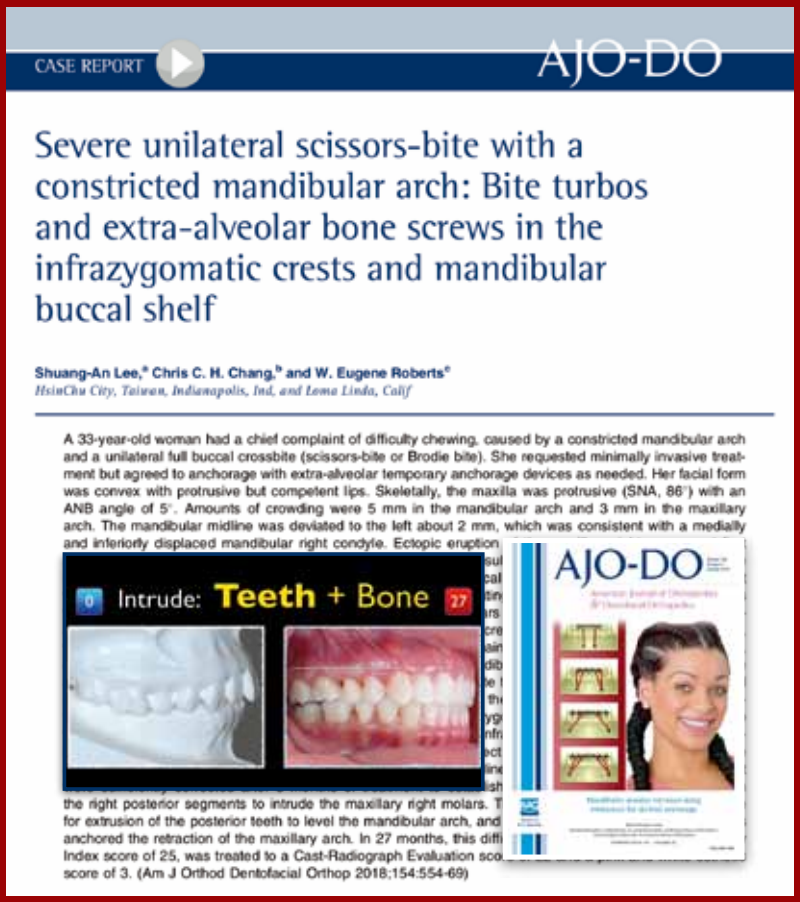
The CDABO award will be presented at the annual meeting of the *AJO-DO* editorial board, which is held in conjunction with the AAO Annual Session. This year, the editorial board will meet Sunday, May 5, from 7:00 to 9:00 am, in Los Angeles, Calif. You and your co-authors are invited to join the board for this breakfast meeting and be recognized by the *Journal*'s editors and associates.

I hope that you plan to attend the AAO Annual Session in Los Angeles and can receive your certificate and recognition in person. Please let me know if you will be able to attend the *AJO-DO* Editorial Board Meeting on Sunday, May 5.

Again, I offer my congratulations for receiving this prestigious award.

Sincerely,

Rolf G. Behrents, DDS, MS, PhD
Editor-in-Chief, *AJO-DO*



CASE REPORT

AJO-DO

Severe unilateral scissors-bite with a constricted mandibular arch: Bite turbos and extra-alveolar bone screws in the infrazygomatic crests and mandibular buccal shelf

Shuang-An Lee,[a] Chris C. H. Chang,[b] and W. Eugene Roberts[c]
HsinChu City, Taiwan, Indianapolis, Ind, and Loma Linda, Calif

A 33-year-old woman had a chief complaint of difficulty chewing, caused by a constricted mandibular arch and a unilateral full buccal crossbite (scissors-bite or Brodie bite). She requested minimally invasive treatment but agreed to anchorage with extra-alveolar temporary anchorage devices as needed. Her facial form was convex with protrusive but competent lips. Skeletally, the maxilla was protrusive (SNA, 86°) with an ANB angle of 5°. Amounts of crowding were 5 mm in the mandibular arch and 3 mm in the maxillary arch. The mandibular midline was deviated to the left about 2 mm, which was consistent with a medially and inferiorly displaced mandibular right condyle. Ectopic eruption

the right posterior segments to intrude the maxillary right molars. T
for extrusion of the posterior teeth to level the mandibular arch, and
anchored the retraction of the maxillary arch. In 27 months, this diffi
Index score of 25, was treated to a Cast-Radiograph Evaluation sco
score of 3. (Am J Orthod Dentofacial Orthop 2018;154:554-69)

AJO-DO, Volume 154, Issue 4, Pages 554–569

2019~2020 第十一年度

貝多芬 矯正精修班

時間：週二上午 9:00-12:00
地點：金牛頓教育中心（新竹市建中一路25號2樓）

上課日期：

2020

8/27、9/10、10/22、11/12、12/10
1/14、2/25、3/10、4/13、5/19、6/16

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

全新的第十一年度 2019-20 貝多芬精修班， 是由國際知名講師張慧男醫師主持，並偕同貝多芬牙醫團隊住院醫師群共同主講。

每月一次的課程之中，包含了：

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

2019-20 貝多芬精修班內容豐富精彩，讓您經由每個月一次的課程，在面對各式的臨床案例時，更能游刃有餘、得心應手。

學習目的：

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

報名專線：03-5735676＃201，蔡佳汶

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Maximize orthodontic learning value

2020

Beethoven International Damon Master Program

Dr. Chris Chang
DDS, PhD. ABO certified, Angle Midwest
Beethoven Orthodontic Center, Taiwan

Beethoven International Damon Master Program, led by the world-renowned Dr. Chris Chang, is a 10-module course tailored for clinicians who desire to master the Damon System's treatment protocols with the combined use of mini-screws. The versatile course structure, including on-site lectures and hands-on workshops, as well as live webinars, allows participants to receive maximum learning value without interruptions to their busy practice schedule. Sign up now to experience Dr. Chris Chang's renowned effective teaching style!

1. Hands-on workshop

The course covers practices on a typodont and computer training on Mac. You learn best when you can have real hands-on experiences.

2. Chairside learning

Participants will have a chance to conduct chairside learning and observe clinical treatment process in Beethoven Orthodontic Center.

3. Free course videos

Participants will be offered recorded course videos free of charge. You can learn in efficient way by reviewing the videos anywhere on an iPad.

- Fees include tuition, ABO Gauge, and workshop supplies, 5 nights of hotel (twin occupancy), e-handouts (iBooks), course videos (iPad format).
- Mac laptop installed with the latest OS and Keynote software is advised, but not required, for the Keynote workshop. No PC.

Course Schedule **Time:** 9AM-5PM (GMT +8)

Module 1 May 7 Thu (Webinar)

1. Selecting your ideal first case
2. Bonding position
3. Four stages of efficient orthodontic treatment

Module 2 June 11 Thu (Webinar)

1. Simple and effective anchorage system
2. Extraction analysis
3. Non-extraction analysis

Module 3 July 16-18 Thu-Sat

1. Lecture: Damon diagnosis & fine-tuning
2. Model practice & Ceph tracing
3. OBS model practice
4. Chairside observation & clinic management
5. Keynote workshop: Photo taking and editing (template), Ceph tracing

Module 4 Sep 17 Thu (Webinar)

1. Excellent finishing & case report demo
2. Retention & relapse: case demo
3. Case consultation & discussion

Module 5 Oct 29 Thu (Webinar)

1. Orthodontic biomechanics & diagnostic analysis
2. Soft & hard tissue diagnostic analysis
3. Children & adult orthodontics and diagnostic analysis
4. Case consultation & discussion

Module 6 Nov 26 Thu (Webinar)

1. Crowding: Extraction vs. Non-extraction
2. Upper impaction
3. Lower impaction
4. Case consultation & discussion

Module 7 Dec 24 Thu (Webinar)

1. Missing teeth: Anterior vs. Posterior
2. Crossbite: Anterior vs. Posterior
3. Open bite- High angle

Module 8 Jan 15-16 Fri-Sat (2021)

1. ABO DI, CRE workshop
2. Chair side observation,
3. Clinic management
4. Keynote workshop: Ceph tracing, demo case report

Module 9 Mar 11 Thu (Webinar)

1. Deep bite- Low angle
2. Gummy smile and canting
3. Esthetic finishing (transposition)

Module 10 Apr 15 Thu (Webinar)

1. Implant-ortho combined treatment
2. Interdisciplinary treatment-adult complex cases
3. Case consultation & discussion

Workshop in Taiwan (Newton's A & Beethoven Orthodontic Center)

Location: 2F, 25, Jianzhong First Rd., Hsinchu, Taiwan

+886-3-5735676 #201 michelle@newtonsa.com.tw Michelle Tsai

Retreatment of Skeletal Class III Malocclusion: Insignia™ CAD-CAM Custom Appliance for Orthodontics and Orthognathic Surgery

Abstract

***History**: Despite orthodontic treatment at age 12yr, a 17yr female presented with a severe skeletal Class III malocclusion.*

***Etiology**: Inadequate dental loading contributed to constricted arches, and airway insufficiency resulted in low tongue posture with mandibular protrusion.*

***Diagnosis**: In centric occlusion (Co), the facial profile was concave (-12˚), lips were retrusive to the E-line (-9mm/-3mm), and occlusal relationships were bilateral Class III with anterior and posterior crossbite. Skeletally, the maxilla was retrusive (SNA 78˚), mandible was protrusive (SNB 86˚), and the lower midline was deviated 4mm to the left. Crowding was severe in both arches (-13mm/-22mm), resulting in block-out of upper canines (U3s) and lower second premolars (L5s). The ABO Discrepancy index (DI) was 49.*

***Treatment**: A custom, stainless steel fixed appliance (Insignia™ System, Ormco, Brea, CA) was constructed to achieve ideal alignment with full-sized rectangular archwires. Digital set-up via computer-assisted design (CAD) specified custom brackets, produced with computer-assisted manufacturing (CAM). Treatment sequence was: 1) extraction of U4s and L5s, 2) progressive straight-wire alignment, 3) space closure, 4) two-jaw orthognathic surgery, 5) reduction genioplasty, and 6) finishing.*

***Outcomes**: Seventeen months of treatment resulted in an excellent ABO Cast-Radiograph Evaluation (CRE) score of 17 with near ideal dental esthetics (Pink & White Score 1).*

***Conclusions**: Surgical correction of severe skeletal Class III malocclusion was very efficient because precise presurgical alignment facilitated surgical correction of the intermaxillary skeletal discrepancy. (J Digital Orthod 2020;57:28-45)*

Key words:
Insignia™ system, passive self-ligating bracket, archwire sequence, custom bracket, high Le Fort I osteotomy, oblique ramus osteotomy, genioplasty

Introduction

Skeletal Class III malocclusion is a prognathic facial aberration in the sagittal plane that may involve maxillary retrusion, mandibular protrusion and/or abnormal facial height.[1] In addition, deviation of the maxilla and/or mandible in the frontal plane is common.[2] The typical facial morphology for Asians with a severe skeletal Class III malocclusion is midface deficiency, mandibular prognathism and a prominent chin (*Fig. 1*).[1,2] Particularly when associated with midline deviation, midface deficiency may require both orthodontics and orthognathic surgery. The Insignia™ system (*Ormco, Brea, CA*) produces a custom stainless steel (*SS*) fixed appliance that achieves precision alignment of each arch to facilitate optimal intermaxillary occlusion during

Dr. Hsin-Yin Yeh,
Editor, Journal of Digital Orthodontics (Upper left)

Dr. Edward Chen,
Attending Physician, Department of Oral and Maxillofacial Surgery Wan-Fang Hospital, Taipei Medical University (Upper center)

Dr. Kuan-Chou Lin,
Department Chief, Department of Oral and Maxillofacial Surgery Wan-Fang Hospital, Taipei Medical University (Upper right)

Dr. Chris H. Chang,
President, Beethoven Orthodontic Center
Publisher, Journal of Digital Orthodontics (Lower left)

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

and following orthognathic surgery.[3] Dental nomenclature for this report is a modified Palmer notation.[2-4] The four quadrants are upper right (*UR*), upper left (*UL*), lower left (*LL*), and lower right (*LR*). Permanent teeth are numbered 1-8 from the midline.

Fig. 1: Pre-treatment facial and intraoral photographs

Diagnosis, History and Etiology

A 17-year-old female was concerned about her dentofacial esthetics: profile, smile and prognathic chin (*Figs. 1-4*). Orthodontic treatment had been rendered at age 12 yr, and the alignment of the maxillary incisors was maintained with a fixed lingual retainer. Medical history was noncontributory. Etiology was deemed an abnormal adolescent growth pattern due to inadequate posterior occlusal loading and airway insufficiency that resulted in low tongue posture and mandibular protrusion.[2] Rather than being classified as a "*relapse,*" the present malocclusion reflects a continuing manifestation of abnormal development that continued into adolescence. Facial evaluation revealed a severely concave profile (*-13˚*) with a retrusive upper lip. Despite deficiency in maxillary height, lower facial height was excessive (*59%*) consistent with excessive growth of the mandible. In the frontal view, the face was asymmetric and the chin was deviated to the left ~5mm (*Fig. 2*). Intraoral examination revealed bilateral Class III buccal segments in centric occlusion (*Co*) (*Fig. 3*). Anterior crossbite (*-3mm*) extended into the maxillary first premolar (*U4*) area (*Fig. 3*). The lower midline was shifted 4mm to the left relative to the upper midline (*Fig. 4*). Both arches were severely crowded (*-13mm/-22mm*), resulting in block-out of maxillary canines (*U3s*) to the labial, and mandibular second premolars (*L5s*) to the lingual.

Panoramic radiography (*Fig. 5*) revealed three unerupted third molars (*UR8, UL8, and LR8*). The mandibular condyles were relatively symmetric (*Fig.*

Fig. 2:
Blue lines mark the midlines at initial occlusal contact for the maxilla, mandible and chin. Note the unattractive smile is associated with a progressive 3-5mm deviation to the left of the lower arch.

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

Fig. 4:
A superior view of the anterior crossbite (-3mm) reveals a lower midline that is deviated ~4mm to the left in Co.

Fig. 5:
Pre-treatment panoramic radiograph shows the fixed retainer for the previous maxillary.

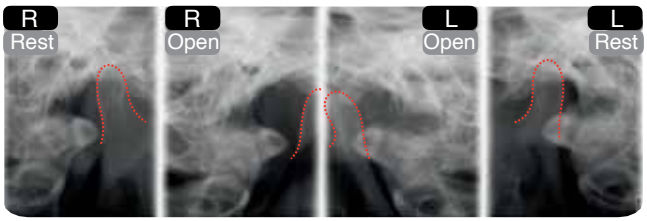

Fig. 6:
Pre-treatment TMJ transcranial radiographs show the right (R) and left (L) sides in the rest and open positions. The mandibular condyles are outlined in red.

Fig. 7: Pre-treatment lateral cephalometric radiograph in Co

6), consistent with a lack of signs and symptoms of temporomandibular joint dysfunction (*TMD*). Pre-treatment cephalometric analysis (*Fig. 7, Table 1*) documented a skeletal Class III relationship (*ANB -8˚*) due to both a retrusive maxilla (*SNA 78˚*) and a prognathic mandible (*SNB 86˚*). Upper incisors were labially inclined and protruded (*U1 to SN 110˚; U1 to NA 8mm*). Lower incisors were tipped posteriorly and retruded (*L1 to MP 68˚; L1 to NB 1mm*). The severe skeletal malocclusion had an ABO Discrepancy Index (*DI*) of 49 (*Worksheet 1*).

CEPHALOMETRIC SUMMARY				
SKELETAL ANALYSIS				
	PRE-Tx	PRE-Sur	POST-Tx	DIFF.
SNA˚ (82°)	78˚	78˚	78˚	0˚
SNB˚ (80°)	86˚	86˚	81˚	5˚
ANB˚ (2°)	-8˚	-8˚	-3˚	5˚
SN-MP˚ (32°)	35˚	35˚	37˚	2˚
FMA˚ (25°)	28˚	28˚	30˚	2˚
DENTAL ANALYSIS				
U1 To NA mm (4 mm)	8 mm	8 mm	10 mm	2 mm
U1 To SN˚ (104°)	108˚	11˚	11˚	3˚
L1 To NB mm (4 mm)	1 mm	4 mm	4 mm	3 mm
L1 To MP˚ (90°)	68˚	85˚	95˚	17˚
FACIAL ANALYSIS				
E-LINE UL (-1 mm)	-9 mm	-8 mm	-3 mm	6 mm
E-LINE LL (0 mm)	-3 mm	0 mm	-2 mm	1 mm
%FH: Na-ANS-Gn (53%)	59%	58%	58%	1%
Convexity: G-Sn-Pg' (13°)	-12˚	-15˚	-2˚	10˚

Table 1: Cephalometric summary

Fig. 8:
Digital alignment of each arch was coordinated for optimal intermaxillary digitation.

Fig. 9:
Simulation of the final alignment in intermaxillary occlusion is an ideal Class I relationship. See text for details.

Treatment Planning

Treatment objectives were: (*1*) increase facial convexity via upper lip protrusion, lower lip retraction, and posterior movement of the chin; (*2*) resolve crowding in both arches with premolar extraction; (*3*) correct anterior and posterior crossbites; (*4*) establish ideal overjet and overbite; and (*5*) achieve Class I molar and canine relationships bilaterally.

Skeletal Class III malocclusion in non-growing patients can be orthodontically masked with dentoalveolar camouflage or skeletally corrected with dentofacial alignment and orthognathic surgery. Instead of premolar extractions, mandibular arch crowding and anterior crossbite can be corrected by retracting the lower arch with mandibular buccal shelf bone screws,[2] but that approach would not correct the concave facial profile. After a thorough discussion of treatment options, the patient selected the following treatment plan: (*1*) extract U4s and L5s; (*2*) install a custom SS fixed appliance (*Insignia*™); (*3*) align both arches; (*4*) close space; (*5*) correct the intermaxillary discrepancy with orthognathic surgery; (*6*) decrease chin height with reduction genioplasty; and (*7*) finish.

Progress

Two months following the extractions, an intra-oral scan was performed to construct the digital appliance. After the U3s erupted into the extraction sites, the entire dentition was bonded with a 0.022-

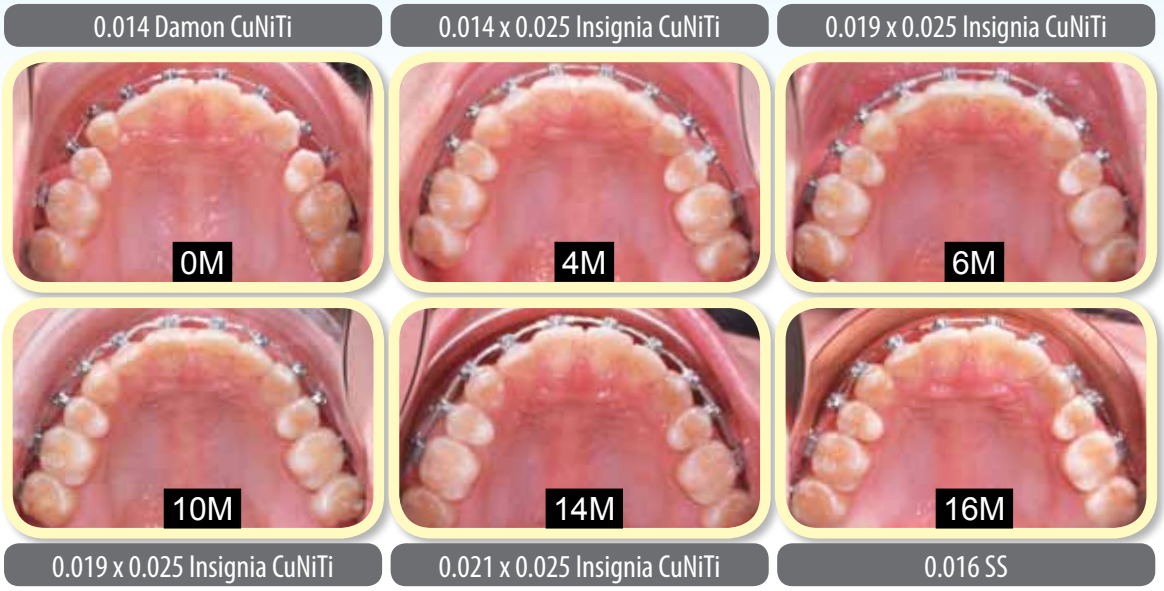

Fig. 10:
A progressive series of maxillary occlusal photographs show alignment progress in months (M) from the start (0M) until one month before the end of treatment (16M). The archwires are specified for each interval. See text for details.

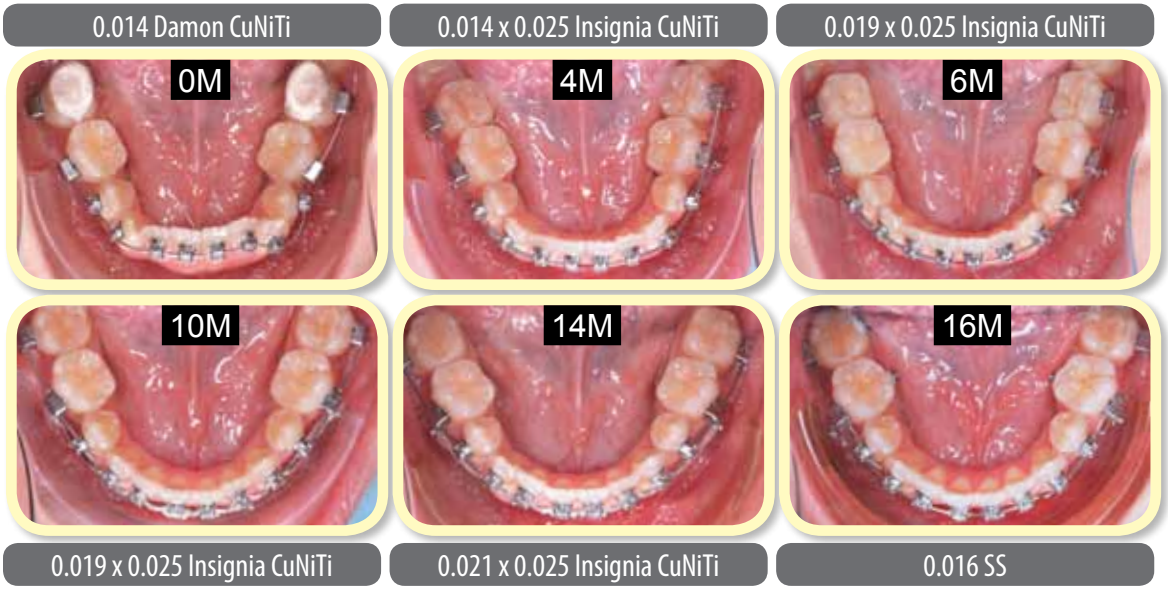

Fig. 11:
A corresponding series of mandibular occlusal photographs show alignment progress at sixteen months of active treatment. See text for details.

Fig. 12: Pre-surgical alignment is shown after ten months of active treatment.

Fig. 13: Pre-surgery panoramic radiograph

in slot, passive self-ligating appliance. All archwires, auxiliaries and elastics were supplied by the same manufacturer (*Ormco Corporation, Brea CA*). To disarticulate the arches during initial alignment, posterior bite turbos were constructed on the occlusal surfaces of the L7s with Fuji II® Type II glass Ionomer cement (*GC America, Alsip IL*). Treatment progress and sequencing details are shown in Figs. 10-16 and Table 2. After 17 months of active treatment, all fixed appliances were removed, and

lingual fixed retainers were constructed on maxillary incisors and from canine to canine in the lower arch.

Results

The patient was satisfied with the harmonious facial profile and optimal lip protrusion (*Fig. 17*). Class I buccal relationships and a near ideal functional occlusion were achieved (*Figs. 18 and 19*). The panoramic radiograph documented adequate root parallelism (*Fig. 20*). TMJ imaging was within normal limits (*Fig. 21*). Slight to moderate apical root resorption was noted on maxillary incisors both before (*Fig. 6*) and after treatment (*Fig. 20*). Thus, loss of root structure was associated with the initial treatment at age 12yr, but there was no appreciable exacerbation during retreatment at age 17yr.

Fig. 14: Pre-surgery lateral cephalometric radiograph

Fig. 15:
A progressive series of right buccal photographs reveal alignment from the start (0M) to the end (17M) of treatment. See text for details.

Appointment	Archwire	Notes
1 (0 month)	U/L: 0.014-in Damon CuNiTi	Disarticulation with posterior bite-turbos constructed with Fuji II Type II Glass Ionomer cement (GC America, Alsip IL) on the occlusal surfaces of the L7s.
2 (2 months)	U/L: 0.018-in Damon CuNiTi	
3 (4 months)	U/L: 0.014x0.025-in Insignia CuNiTi	
4 (6 months)	U/L: 0.019x0.025-in Insignia CuNiTi	
5 (8 months)	U/L: 0.021x0.025-in Insignia CuNiTi	Pre-surgery records were taken.
6 (10 months)	U: 0.019x0.025-in Insignia SS L: 0.021x0.025-in Insignia CuNiTi	Pre-surgery records were taken: intra- and extra-oral photos, ceph, panoramic x-ray, and impression (Figs. 12-14). Drop-in hooks were placed in each bracket.
Surgery (11 months)	U: 0.019x0.025-in Insignia SS L: 0.021x0.025-in Insignia CuNiTi	Bimaxillary surgery (Fig. 16): 1. High Le Fort I osteotomy to advance the maxilla 3mm. 2. Bilateral oblique ramus osteotomy for mandible setback. 3. Genioplasty: reduce the chin 5mm in height.
7 (12 months)	U: 0.019x0.025-in Insignia SS L: 0.021x0.025-in Insignia CuNiTi	Post-surgery records were taken: Extra-oral photos, ceph, and panoramic x-ray.
8 (13 months)	U/L: 0.014x0.025-in Insignia CuNiTi	Rebonded the U2s and UR7
9 (14 months)	U/L: 0.021x0.025-in Insignia CuNiTi	3D alignment
10 (16 months)	U/L: 0.016 SS	Finishing bends and up & down elastics
11 (17 months)		Debonding

Table 2: Treatment sequence.

Fig. 16:
Post-operative cephalometric radiograph shows the facial profile following genioplasty and surgical repositioning of the jaws.

Cephalometric superimposition before treatment compared to that immediately before orthographic surgery (*Fig. 22*) showed both arches were aligned over the apical base of bone. The lower incisor and lip were ~4mm more protrusive. Cephalometric superimposition after surgical treatment (*Fig. 23*) documented: 1) maxilla was moved anteriorly and superiorly; 2) mandible was moved posteriorly; and 3) symphyseal height was decreased. The concave facial profile was corrected to a slightly convex (*-2˚*) relationship consistent with less chin prominence (*Table 1*). The ABO Cast-Radiograph Evaluation (*CRE*) score was 17 points (*Worksheet 2*). Residual CRE discrepancies were primarily individual tooth

alignment and occlusal contacts. The Pink and White dental esthetic score was a near ideal 1 point (*Worksheet 3*). The patient was well satisfied with the esthetic and functional correction of her severe malocclusion (*Fig. 17*).

Discussion

Insignia™ is a CAD/CAM process for producing a custom SS fixed appliance system. A virtual set-up of the final occlusion specifies the manufacture a fixed appliance to achieve ideal final alignment at the end of treatment with the final (*full-sized*) archwires.[2-9] Torque compensations are applied to resist applied mechanics to align the arches.[3-5] Precise presurgical alignment of coordinated arches is particularly advantageous for orthognathic surgery because the coordinated arches are surgically positioned in an ideal intermaxillary occlusion. The surgeon is guided by the final occlusion rather than an interocclusal orthotic. Furthermore, minimal if any detailing is required to achieve the fine outcome.

Fig. 17:
Post-treatment facial and intraoral photographs document the final alignment with fixed retention bonded on the maxillary incisors and from cuspid to cuspid in the lower arch.

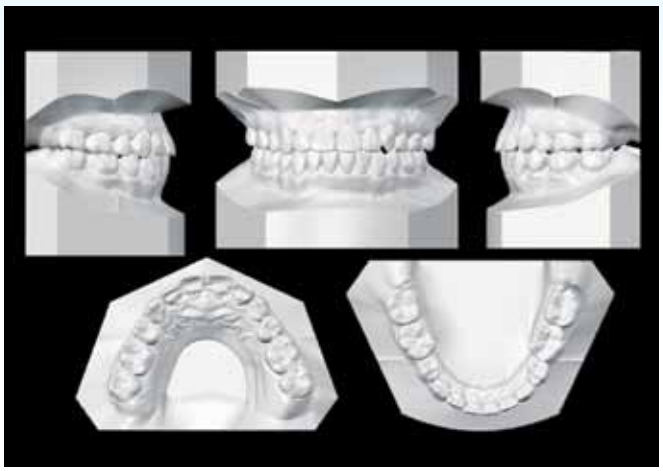

Fig. 18: Post-treatment dental model (casts)

Fig. 19: Post-treatment cephalometric radiograph

Digital set-up of an ideal 3D alignment for each arch was based on leveling and aligning the dentition over supporting bone. Torque compensations were necessary to compensate for unusual dental anatomy and/or planned alignment mechanics. The final set-up was finished and detailed as a digital simulation of the post-surgical result. Clinician approval of the Insignia™ set-up was based on an optimal intermaxillary occlusion.[3-5] Presurgical orthodontic treatment followed the steps specified by Insignia™ to achieve an ideal alignment of each arch over the apical base of bone (*Figs. 10 and 11, Table 2*).

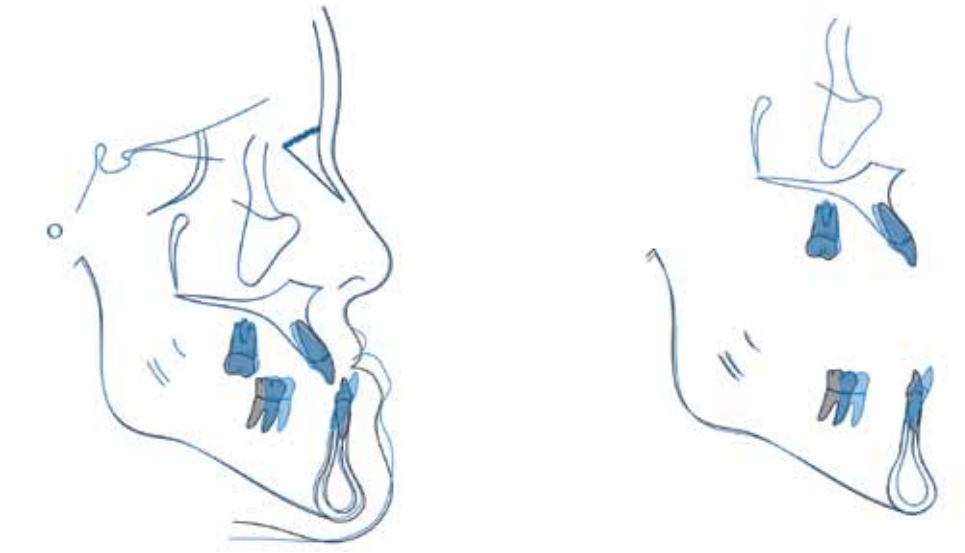

Fig. 22: Superimposed cephalometric tracings before treatment (black) and prior orthographic surgery (blue). See text for details.

Surgical treatment of midface deficiency may require malar process augmentation via advancement of the maxilla with conventional Le Fort I, high Le Fort I, Le Fort II, or Le Fort III osteotomy (*Fig. 24*).[7-10] The surgical procedure depends on the diagnosed anomaly and the desired outcome. Patients with a midface deficiency and flat malar eminences tend to have a gaunt appearance consistent with advanced age and sad (*depressed*) emotions.[11] Conventional Le Fort I osteotomy changes the soft tissue labial to the maxilla but does not correct midface hypoplasia. High Le Fort I osteotomy improves zygomatic prominence and soft tissue changes in the rectangular areas between the infraorbital foramen and the upper lip. This technique advances the infraorbital area and maxilla in an anterior direction (*Fig. 24*).[12,13] For the present patient, the high LeFort I was indicated to correct severe midface

Fig. 20: Post-treatment panoramic radiograph

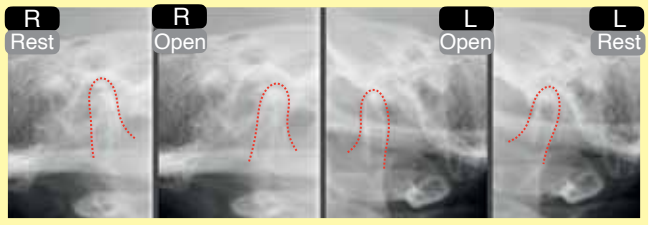

Fig. 21:
Post-treatment TMJ transcranial radiographs show the right (R) and left (L) sides in the rest and open positions. The contours and articular relationships are comparable to the start of treatment (Fig. 6).

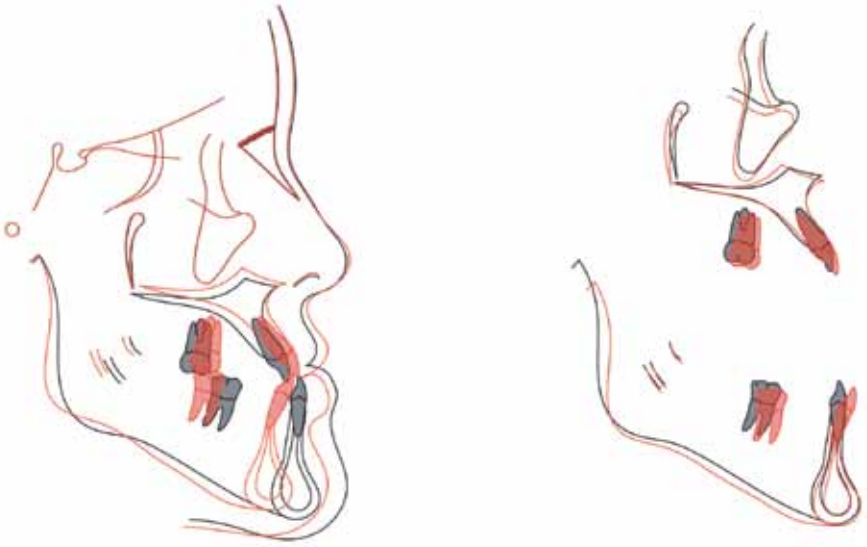

Fig. 23:
Superimposed cephalometric tracings show dentofacial changes resulting from 17 months of active treatment (red) compared to the pre-treatment position (black). See text for details.

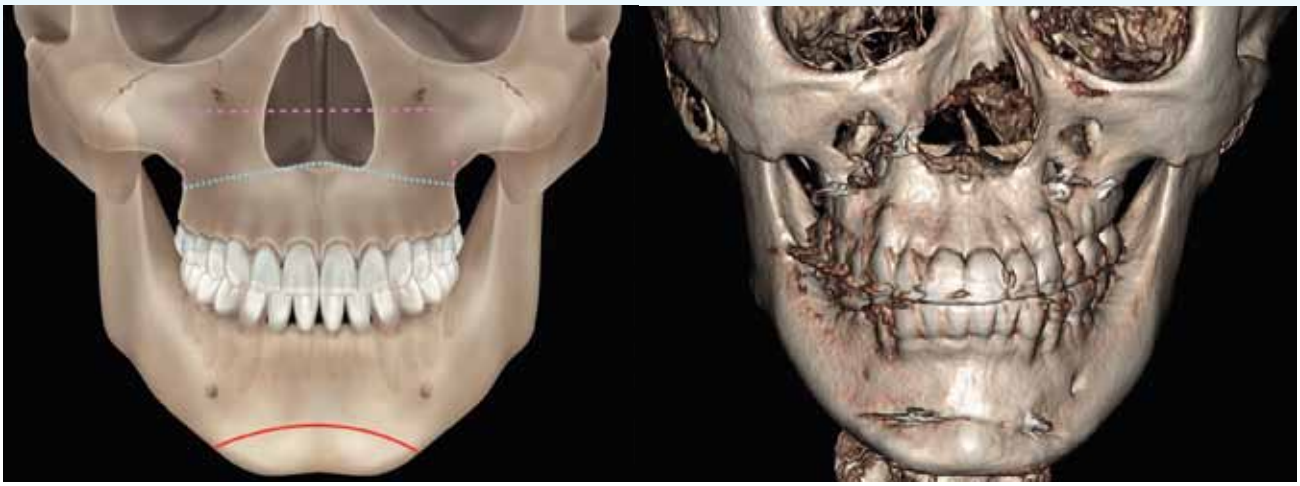

Fig. 24:
***Left**: Le Fort I osteotomy (blue dotted line) is compared to a high Le Fort I osteotomy (pink dotted line). The osteotomy for a reduction genioplasty procedure is shown with a red line.*
***Right**: Post-operative 3D (CBCT) radiograph shows the frontal view following high Le Fort I and genioplasty osteotomies.*

retrusion. As defined in previous reports,[12-14] the surgical correction of the present patient produced enhanced zygomatic prominence bilaterally to improve midface esthetics (*Fig. 25*).

Intraoral vertical ramus osteotomy (*IVRO*) is widely used to correct mandibular prognathism. The advantages of IVRO include a less complex surgical procedure and lower incidence of inferior alveolar nerve injury. However, IVRO has some disadvantages compared with sagittal split ramus osteotomy (*SSRO*). Condylar displacement and bony interference can be a major IVRO complication.[15-19] Kawase-Koga et al.[19] reported that an oblique osteotomy from the mandibular notch to mandibular angle avoids condylar displacement complications with IVRO. For the present patient, condylar position was monitored with manual manipulation of the mandible during surgery as well as with TMJ imaging (*Figs. 6 and 21*). No complications were noted or reported.

Orthognathic surgical procedures are facilitated by ideal presurgical alignment of the arches over the apical base of bone. Optimal occlusion is achieved when the arches are surgically positioned in the prescribed intermaxillary position. It is not necessary to use a plastic orthotic to surgically position the jaws. Direct visualization of the final result guides the surgeon in refining the osteotomy and fixation procedures. Furthermore, little if any detailing is needed postoperatively. A CAD-CAM arch alignment appliance is a cost effective approach for facilitating the surgical-orthodontic correction of a severe skeletal malocclusion.

Fig. 25:
Pre-treatment (left) and post-treatment (right) oblique facial photos reveal the improved facial esthetics following repositioning of the jaws and augmentation of the zygomatic prominences bilaterally.

Conclusions

1. Incisal torque compensations prevent third order alignment problems during presurgical alignment.
2. Digital set-up of the desired final alignment is advantageous for orthognathic surgery cases because intermaxillary occlusion guides the optimal repositioning of the arches.
3. High Le Fort I osteotomy improves zygomatic prominence for patients with anteroposterior deficiency in the infraorbital and maxillary area.
4. Precise presurgical alignment facilitates both the surgical procedure(s) and postoperative finishing.

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Discrepancy Index Worksheet

TOTAL D.I. SCORE 49

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 = 8

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 = 2

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	8 pts.
Beyond Class II or III	=	1 pt. per mm. additional	10 pts.

Total = 18

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. = 6

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 = 10

OTHER (See Instructions)

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

Identify:

Total = 2

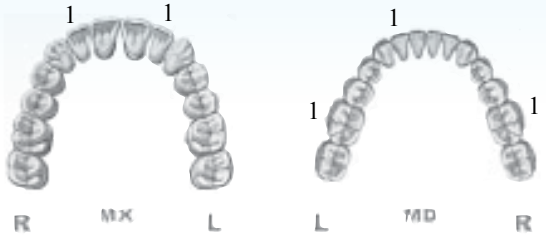
Cast-Radiograph Evaluation

Case # **Patient**

Total Score: 17

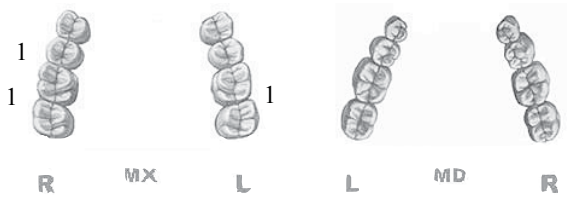
Alignment/Rotations

5



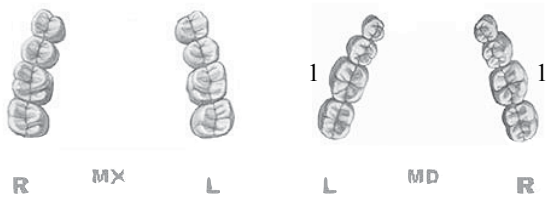
Marginal Ridges

3



Buccolingual Inclination

2

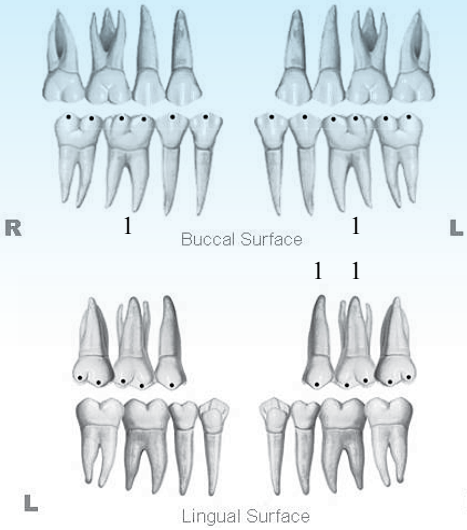


Overjet

0

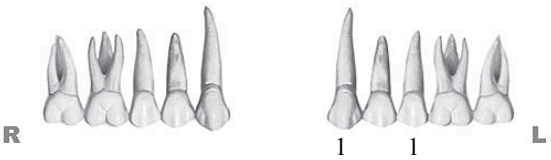
Occlusal Contacts

4



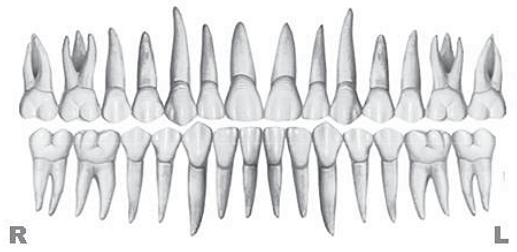
Occlusal Relationships

2



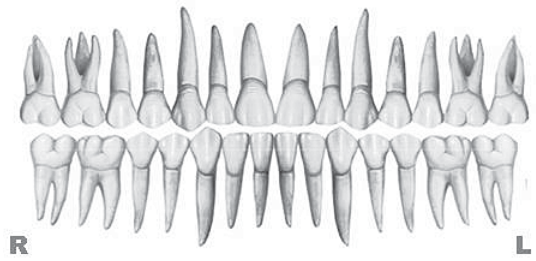
Interproximal Contacts

0



Root Angulation

1



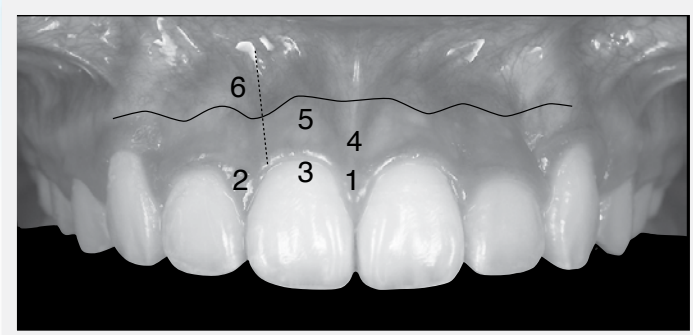
INSTRUCTIONS: Place score beside each deficient tooth and enter total score for each parameter in the white box. Mark extracted teeth with "X". Second molars should be in occlusion.

IBOI Pink & White Esthetic Score

Total Score: = 1

1. Pink Esthetic Score

Total = 0

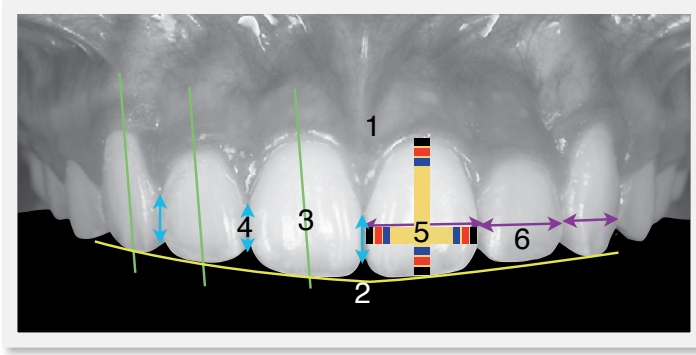


1. M & D Papillae	0	1	2
2. Keratinized Gingiva	0	1	2
3. Curvature of Gingival Margin	0	1	2
4. Level of Gingival Margin	0	1	2
5. Root Convexity (Torque)	0	1	2
6. Scar Formation	0	1	2

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 = 1



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

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

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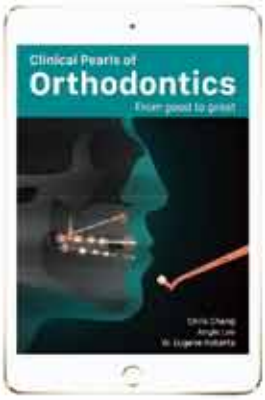

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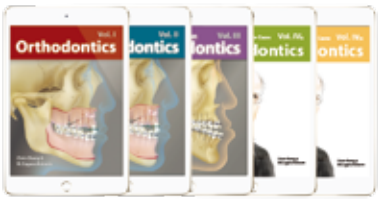

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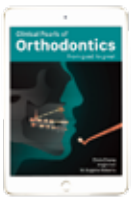

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Canine Substitution Treatment of Class III Malocclusion, Crossbite with a Congenitally Missing Upper Incisor and a Peg Lateral Incisor

***History**: Upper right lateral incisor (UR2) is congenitally missing, and upper left lateral incisor (UL2) is peg-shaped.*

***Diagnosis:** A 30-year-old male presented with increased facial height (58.5%), and a markedly increased mandibular plane (SN-MP 49°), but a normal facial profile (13°). Intraoral examination revealed an asymmetric Class III malocclusion, lingual crossbite of the upper right first molar (UR6), anterior crossbite from canine to canine (UR3-UL3), missing UR2, peg-shaped UL2, and upper midline deviation 4mm to the left. The ABO Discrepancy Index (DI) was 50 points.*

***Treatment**: The peg-shaped UL2, and both lower first premolars (LR4, LL4) were extracted. A full fixed passive self-ligation (PSL) Damon Q® appliance was bonded on all permanent teeth. Four bite turbos were bonded on lower arch: LR6, LR3, LR1, and LL6. The anterior crossbite was corrected with Class III elastics, and the maxillary anterior spaces were closed in the upper arch to achieve bilateral canine substitution. Torque control of the U3s was accomplished with specific bracket selection and torquing auxiliary springs. Increasing the lower facial height to correct the anterior crossbite increased the facial convexity, but the patient maintained lip competence.*

***Outcome**: This very difficult malocclusion (DI 50) was treated in 34 months to an acceptable result: ABO Cast-Radiograph Evaluation (CRE) 29 points, and Pink & White Esthetic Score 4. (J Digital Orthod 2020;57:52-67)*

Key words:
Canine substitution, missing lateral incisor, crossbite, bite turbos, early light short elastics (ELSE), torquing auxiliary spring, peg lateral incisor

Diagnosis and Etiology

A 30-year-old male presented for orthodontic consultation to evaluate his "*protrusive chin,*" but the problem appeared to be a protrusive lower lip. There were no contributing medical history nor known habits. Facial evaluation showed a long convex face (*Fig. 1*), and the occlusion was Class III with an anterior crossbite (*Fig. 2*). Radiographic evaluation documented a very steep mandibular plane, and impacted lower third molars (*Fig. 3*). In the frontal plane, facial structures were relatively symmetric, but the occlusal plane was canted inferiorly on the right side. There was asymmetric condylar translation (*Fig. 4*), but were no signs nor symptoms of temporomandibular joint dysfunction. Intraoral examination revealed an asymmetric Class III malocclusion (*more severe on the left*) with a maxillary midline that was deviated 4mm to the left. The right maxillary lateral incisor (*UR2*) was peg-shaped, and the contralateral lateral incisor (*UL2*) was congenitally missing. In addition, crossbites were noted for the upper right first molar and the entire maxillary anterior segment (*Fig. 1*).

Dr. Claire JY Chen,
Lecturer, Beethoven Orthodontic Course (Left)

Dr. Angle Lee,
Editor, Journal of Digital Orthodontics (Center left)

Dr. Chris H. Chang,
President, Beethoven Orthodontic Center
Publisher, Journal of Digital Orthodontics (Center right)

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

Cephalometric analysis (*Table 1*) revealed excessive facial height (*Na-ANS-Gn 58.5%*) with a normal facial profile, but lower lip protrusion was excessive to the E-Line (*5mm*). Bimaxillary retrusion (*SNA 79°, SNB 75°*), high mandibular plane angle (*SN-MP 49°, FMA 41°*), and retrusive maxillary incisors (*97°*) were associated with a skeletally retrusive mandible (*ANB 4°*). The panoramic radiograph showed that the mandibular 3rd molars were impacted (*Fig. 3*). The American Board of Orthodontics (*ABO*) Discrepancy Index (*DI*) was 50 points, as shown in the supplementary Discrepancy Index (*Worksheet 1*).

Fig. 1: Pre-treatment facial and intraoral photographs

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

Fig. 4:
Radiographs of the mandibular condyles in the closed position are shown bilaterally in the left and right images, respectively. The corresponding open mouth positions are shown in the center left and center right images, respectively. Although the excursions are asymmetric, there were no signs or symptoms of temporomandibular disorder.

Fig. 3: Pre-treatment panoramic and cephalometric radiographs

CEPHALOMETRIC SUMMARY			
SKELETAL ANALYSIS			
	PRE-Tx	POST-Tx	DIFF.
SNA° (82°)	79°	79°	0°
SNB° (80°)	75°	74°	1°
ANB° (2°)	4°	5°	1°
SN-MP° (32°)	49°	51°	2°
FMA° (25°)	41°	43°	2°
DENTAL ANALYSIS			
U1 To NA mm (4 mm)	2 mm	0 mm	2 mm
U1 To SN° (110°)	97°	95.5°	1.5°
L1 To NB mm (4 mm)	11 mm	6 mm	5 mm
L1 To MP° (90°)	87°	82°	5°
FACIAL ANALYSIS			
E-LINE UL (2-3 mm)	-1 mm	0 mm	1 mm
E-LINE LL (1-2 mm)	5 mm	1 mm	4 mm
Convexity: G-Sn-Pg' (13°)	13°	16°	3°
%FH: Na-ANS-Gn (53%)	58.5%	58%	0.5%

Table 1: Cephalometric summary

Specific Objectives of Treatment

1. Retract the lower dentition to correct the anterior crossbite.
2. Extract the UR2 and close edentulous spaces to achieve bilateral canine substitution.
3. Achieve ideal overjet and overbite relationships.
4. Correct intermaxillary sagittal and frontal discrepancies.
5. Finish with a cast radiograph score of no more than 30 points.

Treatment Plan

Plan A: (*Fig. 5*)

- Optimize upper lateral incisor spaces with preprosthetic orthodontics.
- Extract the upper left peg-shaped lateral incisor.
- Restore both upper lateral incisors with implant-supported prostheses.
- Restore the lower left central incisor with composite resin.

Plan B: (*Fig. 6*)

- Extract the upper right peg lateral incisor and both lower first premolars.
- Reshape upper canines to simulate lateral incisors.
- Restore the lower left central incisor with composite resin.

Fig. 5: Treatment Plan A
Extract the peg-shaped lateral incisor, correct the anterior crossbite, open space for implants, and restore both maxillary lateral incisors with implant-supported prostheses. Restore the fractured lower left central incisor with composite resin.

Fig. 6: Treatment Plan B
Extract upper right peg lateral incisor, extract both lower first premolars, and substitute the upper canines for the lateral incisors. Restore lower left central incisor with composite resin. See text for details.

After carefully considering both options, the patient chose canine substitution instead of implant-supported prostheses.

Appliances and Treatment Progress

After the peg lateral (*UR2*) and lower first premolars (*LR4, LR5*) were extracted, a 0.022-in slot, passive self-ligating (*PSL*) Damon Q® bracket system (*Ormco, Glendora, CA*) was installed on both arches. Standard torque brackets were used except for high torque brackets on the lower incisors. The archwire

sequence for both the upper and lower archwires was: 0.014-in CuNiTi, 0.014x0.025-in CuNiTi, 0.017x0.025-in TMA, and 0.016x0.025-in SS.

Fuji II® Type II glass Ionomer cement (*GC America, Alsip, IL*) was used to build bite turbos on the lingual surfaces of the LR3 and LR1, as well as the occlusal surfaces of both lower first molars (*Fig. 7*) to facilitate anterior crossbite correction. A tongue depressor was provided with instructions to apply light and steady pressure in a labial direction to move the upper central incisors out of crossbite. Early light short elastics (*Parrot 5/16" 2-oz.*) were applied bilaterally from the upper first molars to the lower canines to correct the Class III molar relationship (*Fig. 7*).

In the 6th month of treatment, a progress panoramic radiograph revealed axial inclination problems for the UR3, UR2 and UR1 (*Fig. 8*). Brackets were rebonded accordingly.

In the 9th month, an expanded 0.017x0.025-in TMA archwire was placed on the upper arch and a 0.014x0.025-in CuNiTi was inserted in the lower arch. Power chains and power tubes were used for closing

Fig. 8:
A progress panoramic film revealed second order axial inclination problems: UR4, UR3, and UR1. Brackets were repositioned. See text for details.

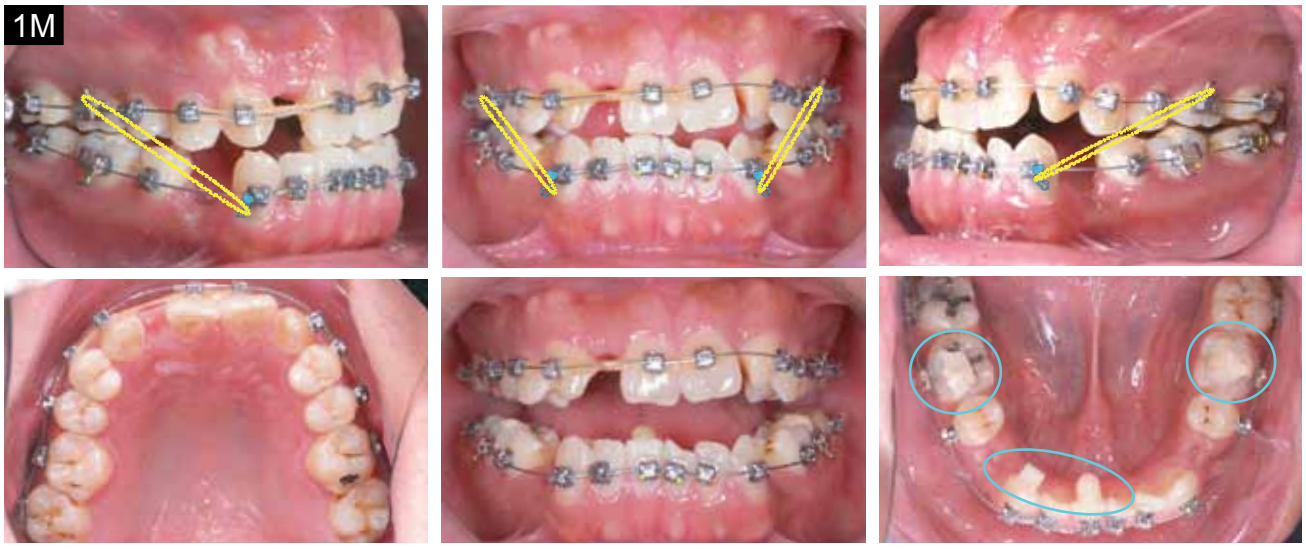

Fig. 7:
Crossbite correction - resin bite turbos (blue ovals) were bonded on the lingual surface of the LR3 and LR1 and on the occlusal surfaces of the LR6 and LL6 (lower right image). Early light short elastics (yellow) were applied bilaterally from upper first molars to lower canines. See text for details.

the upper anterior spaces. In the 10th month, the Class III elastics were stopped once the overjet was corrected.

In the 12th month, the lower archwire was changed to 0.016x0.022-in SS to stabilize the arch-form as the premolar extraction spaces were closed. A figure-eight ligature maintained firm contact between the six lower anterior teeth. The bracket on the lower right second molar was rebonded. Seventeen months (*17M*) into treatment, torquing springs were applied to the substituted canines to deliver lingual root torque (*Fig. 9*). They were removed at 18-27 months when adequate axial inclinations were achieved. From 23-28 months, detailing was performed with progressive wire-bending. Brackets were repositioned on the maxillary central incisors. Both substituted canines were reshaped to simulate lateral incisors.

After 34 months of active treatment, all appliances were removed and teeth in the maxillary anterior segment were restored with composite resin to optimize dental esthetics.

Retention

After the fixed appliances were removed, upper and lower clear overlay retainers were delivered with directions specifying full-time wear for the first six months, and then nights only afterwards. Instructions on home care and maintenance of the retainers were also provided.

Treatment Results

Facial esthetics were substantially improved by correction of the lower lip protrusion, and the smile line was optimized by improving the cant of the occlusal plane (*Fig. 10*). ABO Cast-Radiograph Evaluation (*CRE*) score was 29 points. The major CRE discrepancy were marginal ridges, buccal-lingual

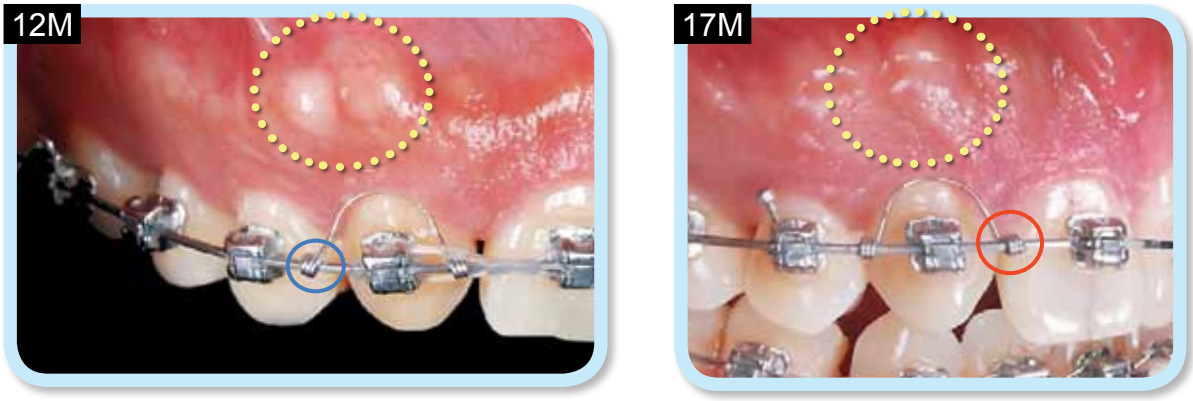

Fig. 9:
At twelve months (12M) into treatment, a torquing spring was placed on canines bilaterally to decrease root prominence (yellow dotted oval on the left). Note the spring was incorrectly positioned (blue oval). At seventeen months (17) into treatment, note the corrected position of the torquing spring with the arm under the main archwire (red oval). After five months of torque application, root prominence is improved (yellow dotted oval on the right). See text for details.

Fig. 10: Post-treatment facial and intraoral photographs

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

molar relationships, and overjet (*Worksheet 2*). Both anterior and posterior crossbites were resolved, and the molar relationships were Class I (*Fig. 11*). The post-treatment panoramic and cephalometric radiographs are shown in Fig. 12. Lip balance was improved, and lip competence was maintained despite a 3° increase in facial convexity (*Fig. 13, Table 1*).

The post-treatment cephalometric analysis was consistent with a Class II skeletal pattern (*ANB 5°*), high mandibular plane angle (*SN-MP 51°, FMA 44°*), and increased lower facial height (*58%*) (*Table 1*). Superimposed cephalometric tracings showed retraction of the upper and lower incisors, as well

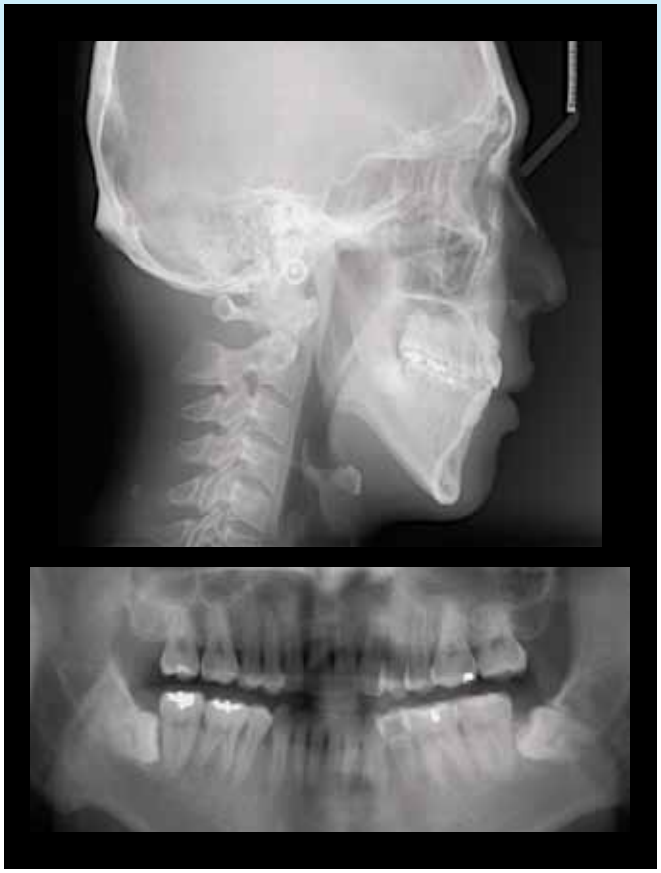

Fig. 12: Post-treatment panoramic and cephalometric radiographs

as anterior movement and extrusion of the lower molars. The mandible was rotated clockwise (*posteriorly*), and the lower lip was retracted (*Fig. 13*). The patient was quite satisfied with the result.

Discussion

According to epidemiological studies,[1] maxillary lateral incisors show the highest genetic variance in the dentition. The most common anomaly is a unilateral undersized (*often peg-shaped*) maxillary lateral incisor. Less commonly the condition is bilateral and may be associated with a contralateral congenitally absent lateral.[2] Agenesis prevalence for maxillary laterals is 2-9% over a variety of different ethnic groups; the data is similar for the mandibular second premolars (~3%). However, the congenital absence of third molars is much more prevalent (25-35%).[3]

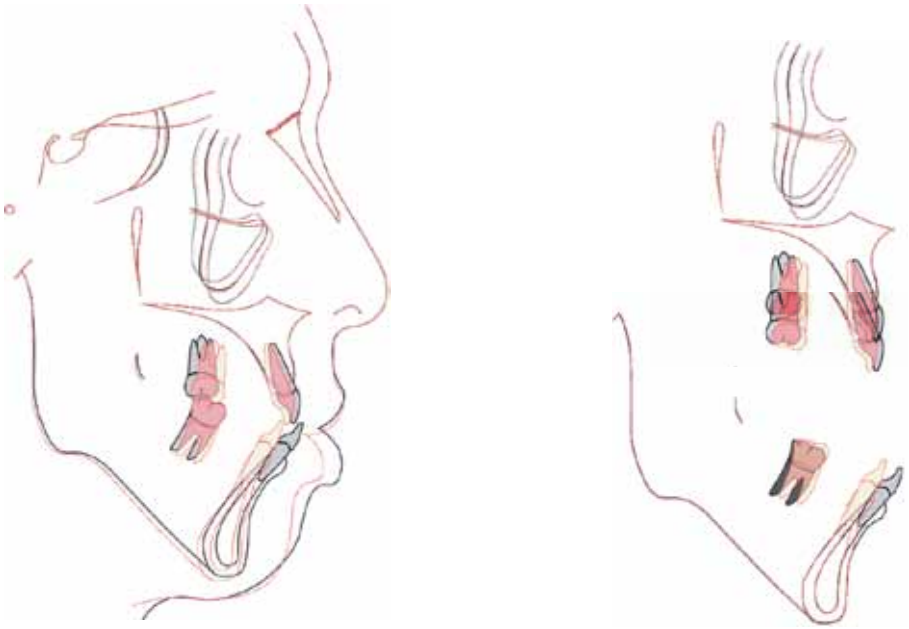

Fig. 13:
Pre-treatment (black) and post-treatment (red) cephalometric tracings are superimposed on the anterior cranial base (left) to show an improved facial profile. Maxillary superimposition (upper right) documents protraction and extrusion of upper molars. Mandibular superimposition (lower right) shows incisor retraction and molar protraction.

Treatment of Peg Lateral Incisors

If the root is well formed, a peg lateral incisor can be restored with a porcelain crown or sometimes a veneer. Porcelain restorations are the most common treatment for peg lateral incisors because they require little or no restorative preparation of the tooth. If interproximal space is adequate, a porcelain restoration is bonded over a tapered peg lateral to restore normal form and function.[4]

Treatment of Missing Lateral Incisors

In achieving optimal esthetics and function, a coordinated, interdisciplinary approach is often necessary.[5] Treatment may involve canine substitution, a tooth-supported restoration or an implant-supported prosthesis.[2-6] The present malocclusion with maxillary lateral incisor deficiencies (*Fig. 14*) was complicated by an anterior crossbite and Class III molar relationship (*Fig. 2*).

Fig. 14:
A periapical radiograph shows the peg lateral (UR2) and the missing UL2. There was inadequate space for the prosthetic restoration of the maxillary lateral incisors. See text for details.

Canine substitution was deemed the best and comprehensive treatment option for the patient.[2]

Canine Substitution

When restoring the esthetic zone (*maxillary anterior segment when smiling*),[3-5] it is important to consider the type of malocclusion, crowding/spacing, intermaxillary tooth size relationships, canine positions, shape/color of canines, and maxillary lip length.[4] Furthermore, a detailed assessment of tooth form and the supporting gingiva is indicated: worn incisal edges, shape of individual teeth, incisal contact relationship, contours of gingival margins, and probability of black triangles when the dentition is ideally aligned. The correction of all applicable factors should be simulated with a wax or digital set-up prior to initiating orthodontic treatment. The decision to reshape teeth and/or to add tooth structure should be carefully evaluated in relation to the ideal width-to-length ratios of the Golden Proportion.[5]

1. Indications for Canine Substitution

a. Malocclusion:

Two malocclusion patterns are particularly amenable to canine substitution: 1. Angle Class II with no crowding in the mandibular arch which can be finished in a Class II occlusion; and 2. Angle Class I with crowding in the mandibular arch that requires extraction of premolars (*Fig. 15*). For these situations, canine-protected occlusion is not usually a priority, so anterior group function in all excursions is a good

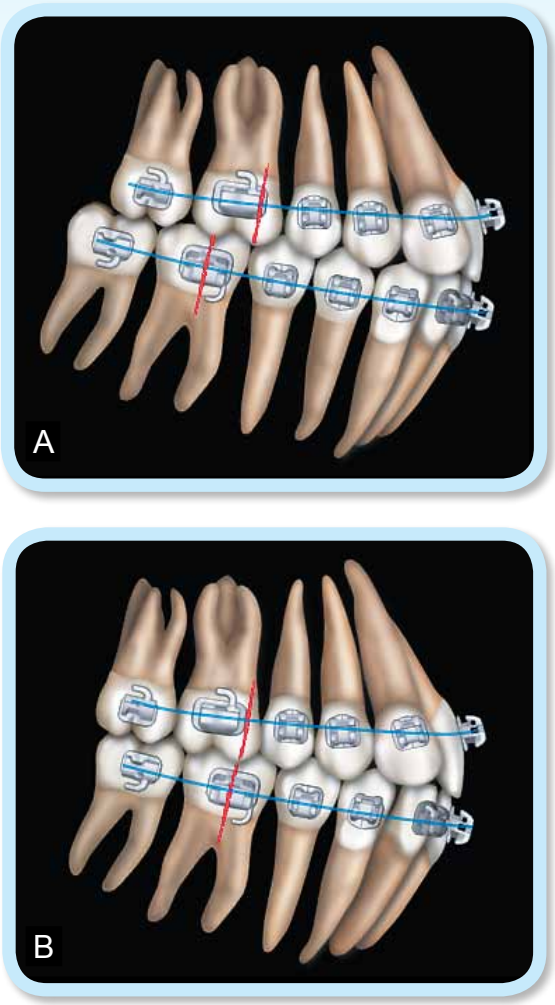

Fig. 15:
(A) Angle Class II malocclusion with no crowding in the mandibular arch
(B) Angle Class I malocclusion with crowding in the lower arch that requires extractions.

option. Nordquist and McNeill[7] found no difference in occlusal function or periodontal status between canine-protected and group function occlusion.

b. Profile:

Kokich[5] feels a straight profile is the most favorable for canine substitution in Caucasians, but a mildly convex profile is also acceptable. The protrusive profile and less prominent nose that is typical of Asians are favorable factors for canine substitution because retraction results in a more ideal lip protrusion.[8] On the other hand, a convex profile, retrusive mandible, and deficient chin prominence are unfavorable characteristics for canine substitution (*Fig. 3*). Correcting the anterior crossbite by opening the bite with bite turbos is usually a risky procedure for patients with a long face, but fortunately the patient was able to maintain lip competence despite a 3° increase in facial convexity (*Figs. 12 and 13, Table 1*).

c. Canine size and shape:

In comparison to the adjacent canine, the lateral incisor has a flat labial surface, and narrower dimensions at the cementoenamel junction (*CEJ*) for both mesio-distal and bucco-lingual width.[7] To simulate a maxillary lateral incisor, the outline form of the crown must be reduced at the cusp tip, as well as in mesio-distal width and facio-lingual depth. Furthermore, resin restoration of the outline extensions is required for the mesio-incisal and disto-incisal line angles (*Fig. 16*). According to Thordarson and Zachrisson,[6] tooth sensitivity may persist for 1-3 days after crown reduction, but there is no long-term sensitivity if the high-speed reduction is performed with copious water spray.[9,10]

d. Soft issue (lip level):

Patients with a high lip line when smiling are challenging for effective management of the

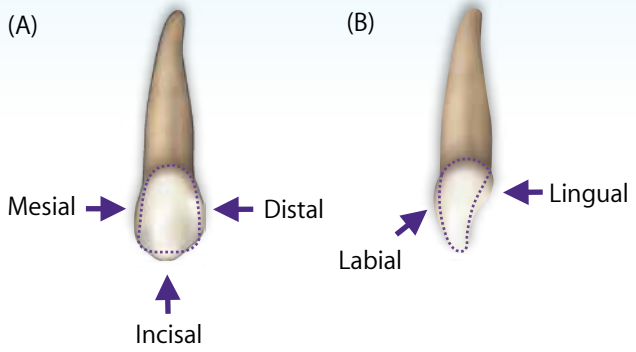

Fig. 16:
The suggested outline form for a canine substituting for a lateral incisors is shown by the purple dotted line in the frontal (A) and profile (B) views. See text for details.

Fig. 17:
Bracket position adjustments are shown to assist in achieving the preferred high-low-high gingival margin profile that mimics natural soft tissue margins. See text for details.

maxillary anterior esthetic zone. The periodontal support is especially important: control of gingivitis, soft tissue contours, and root prominence. The present patient (*Fig. 10*) has the opposite problem: a relatively low lip line. Thus, detailed coordination of upper to lower arch alignment is a high priority, because inadequate maxillary incisor exposure is an increasingly important issue for aging adults, particularly men.[11]

2. Bonding Position

Restoring the natural contours of the gingival margins is particularly important for maxillary canine substitution (*Fig. 16*). Optimal esthetics requires a more incisive gingival margin compared to the adjacent central incisor and first premolar. The incisor to canine high-low-high gingival margin principle is best achieved with coordinated orthodontics and restorative procedures. The canine can be intruded by a more incisal bracket position (*Fig. 17*). Crown length is decreased, while the buccolingual surfaces are recontoured with crown reshaping, and the line angles are restored with composite resin (*Fig. 16*). In addition, the adjacent premolar is masked to simulate a canine by intrusion to improve the gingival emersion profile. An additional important step is to lengthen the labial surface with composite resin to achieve group function.

3. Bracket/Torque Selection

A high torque bracket (*Table 2*) is recommended for lingual root torque to simulate the natural labial inclination of a lateral incisor.[9] A torquing spring is also helpful if additional lingual root torque is needed to decrease the root prominence of the canine. In contrast, buccal root torque is needed to increase the first premolar root prominence.[7] However, these mechanics must be applied judiciously to avoid alveolar dehiscence and gingival recession. For mesially substituted first

Torque	U1	U2	U3	U4	U5
High	22	13	11		
Std	15	6	7	-11	-11
Low	2	-5	-9		

Table 2: Torque value of Damon Q® brackets.

premolars, the preferred buccal crown torque is relatively perpendicular. A standard first premolar bracket is preferred because it has more negative torque (*-11°*). Furthermore, the buccal crown torque compensates for the intrusion of 1st premolars (*Table 2*).[8] If additional torque compensation is required for a specific tooth, it is best achieved with a torquing auxiliary (*Fig. 9*).

4. Interdisciplinary Treatment

When the canine is darker in comparison to the adjacent central incisor and first premolar, a selective tooth whitening procedure is indicated. If that conservative approach is inadequate, it may be necessary to place porcelain veneer or crown restorations to achieve harmonious esthetics.

Conclusions

Canine substitution is an effective long-term solution for selected patients. The initial examination and the follow-up diagnosis are critical for the success of this comprehensive interdisciplinary treatment. Important considerations include:

(1) Straight or mildly convex facial profile for Caucasians, or a protrusive profile in Asians.

(2) Angle Class I or II malocclusion with crowding in the lower arch.

(3) Mimic natural esthetics with careful attention to dental and soft tissue morphology.

(4) Torquing spring auxiliaries are helpful for correction of labial contour and/or root prominence.

(5) Veneer prostheses may be necessary to achieve optimal results for demanding patients.

Acknowledgment

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Discrepancy Index Worksheet

TOTAL D.I. SCORE 50

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 = 16

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 = 1

OCCLUSION

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

Total = 2

LINGUAL POSTERIOR X-BITE

1 pt. per tooth Total = 1

BUCCAL POSTERIOR X-BITE

2 pts. per tooth Total = 0

CEPHALOMETRICS (See Instructions)

ANB ≥ 6° or ≤ -2° = 4 pts.

Each degree < -2° ____ x 1 pt. = ____

Each degree > 6° ____ x 1 pt. = ____

SN-MP

≥ 38° = 2 pts.

Each degree > 38° 11 x 2 pts. = 22

≤ 26° = 1 pt.

Each degree < 26° ____ x 1 pt. = ____

1 to MP ≥ 99° = 1 pt.

Each degree > 99° ____ x 1 pt. = ____

Total = 24

OTHER (See Instructions)

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

Identify: Anomalous morphology UR peg lateral

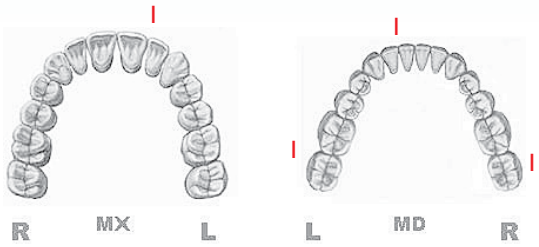
Total = 6

Cast-Radiograph Evaluation

Total CRE Score 29

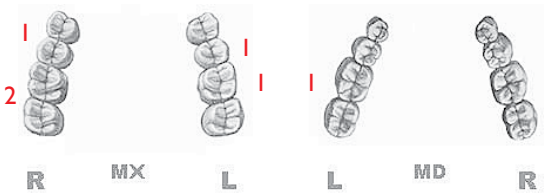
Alignment/Rotations

4



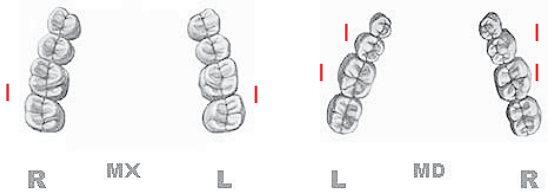
Marginal Ridges

6



Buccolingual Inclination

6

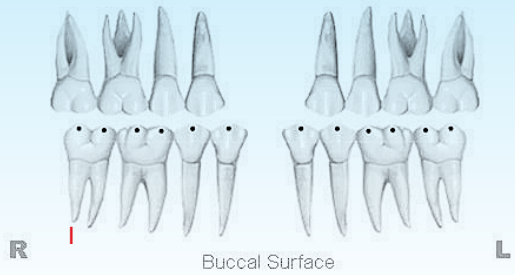


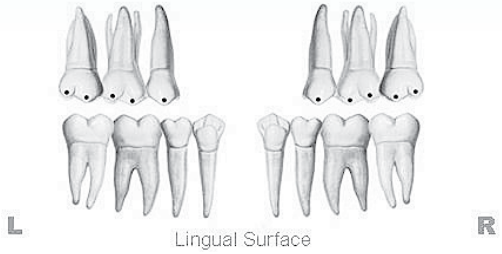
Overjet

6

Occlusal Contacts

1



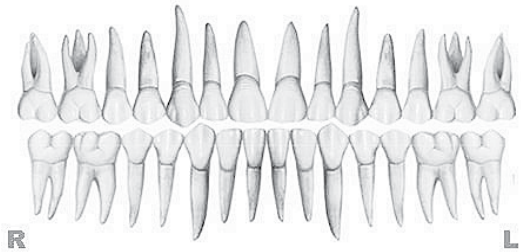


Occlusal Relationships

4

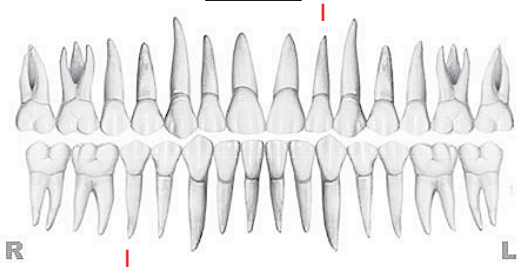
Interproximal Contacts

0



Root Angulation

2



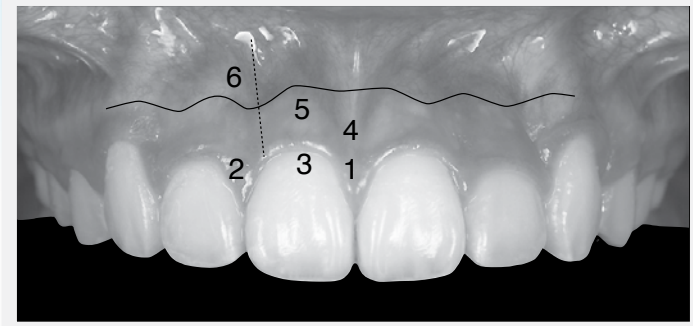
INSTRUCTIONS: Place score beside each deficient tooth and enter total score for each parameter in the white box. Mark extracted teeth with "X". Second molars should be in occlusion.

IBOI Pink & White Esthetic Score

Total Score: = 4

1. Pink Esthetic Score

Total = 1

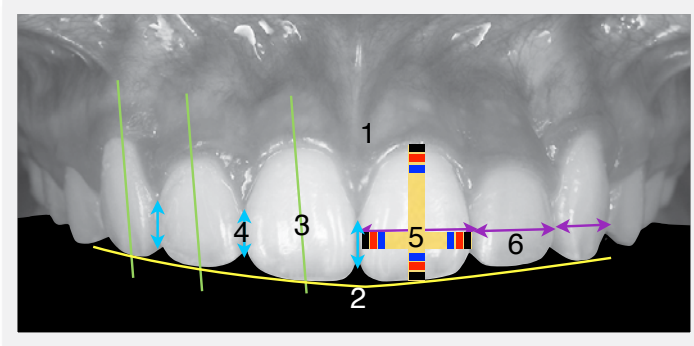


1. M & D Papillae	0	1	2
2. Keratinized Gingiva	0	1	2
3. Curvature of Gingival Margin	0	1	2
4. Level of Gingival Margin	0	1	2
5. Root Convexity (Torque)	0	1	2
6. Scar Formation	0	1	2

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)

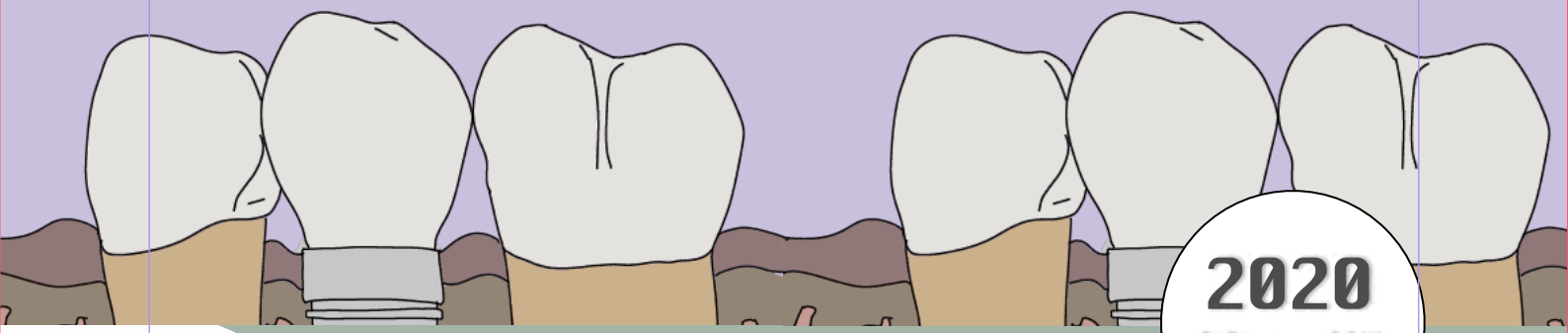
Total = 3



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

2020 Implant Forum
植牙論壇



2020
第11期

超強陣容

邀請超過十五位優秀講師分享植牙資訊

絕佳課程規劃

帶領學員進行最新臨床案例及期刊文章討論分析

2020 Implant Forum

本課表僅供參考，植牙論壇保留課程變動之權利

均可單堂報名

	日期（週五）	專題演講 9:00 - 10:30		植牙案例報告 10:45 - 12:00（30 分鐘 / 人）
1	3/13	陳明時 醫師（台灣假牙牙醫學會長、美國俄亥俄州立大學牙醫學院助理教授、美國加州州立大學舊金山牙醫學院副教授、台北醫學大學假牙研究所臨床教授） 主題：如何在自然牙根或者人工牙根建立穩定又平衡的咬合		
2	4/24	陳禮凡 醫師（長庚紀念醫院牙周病科兼任臨床指導主治醫師、美國波士頓塔夫茲大學牙周病專科醫師及牙周病碩士、美國牙周病專科醫學會專科醫師、中華民國植牙醫學會秘書長及專科醫師、禮凡牙醫診所院長） 主題：Advanced surgical techniques in implant dentistry	蕭浩宜 醫師（美國南加州大學植牙研究所進修、新綠牙醫診所院長）	張慧男 醫師（美國印第安那普渡大學齒顎矯正研究所博士）
3	5/22	吳尚霖 醫師（臺大醫院補綴科兼任主治醫師、耕莘醫院湖口仁慈分院主治醫師、尚霖牙醫診所負責人） 黃冠傑 技師（富緻牙體技術所牙技師、臺北科技大學經營管理EMBA、中臺科技大學牙體技術科學士） 主題：DTX Studio™ 數位化軟體應用 & 手術導板設計與生產		
4	6/12	胡剛碩 主任（新光醫院一般牙科主任、臺灣牙周病醫學會學術副主委、中華民國家庭牙醫學會學術副主委、台北市牙醫師公會學術委員） 主題：如何治療及避免植體周圍炎		
5	7/24	蘇筌瑋 醫師（高雄醫學大學牙周病學碩士、國際矯正植牙學會理事長） 主題：垂直前庭切線骨膜下隧道法 **下午另有 Hands-on 課程，可參考隔頁（費用另計）**		
6	8/28	謝清堯 醫師（台大牙醫系學士、台大臨床牙醫研究所補綴碩士、台大補綴科總醫師、台大補綴科兼任主治醫師） 主題：數位牙科的整合與應用		
7	9/25	林森田 醫師（中山醫學大學學士、國際矯正植牙學會院士、美國南加州大學植牙研究所進修） 翁蔚任 醫師（中華民國植牙醫學會專科醫師、中華民國家庭牙醫學會專科醫師、高雄醫學大學牙醫學士） 主題：From A to Z：完成你的第一個全口重建案例		
8	10/16	柯秋賢 醫師（竹北柯牙醫院長、高雄醫學大學牙醫學士、牙醫學研究所碩士、亞洲齒列再生研究會會員、中華植體美學醫師學專科醫師） 主題：Case report using the X-Guide dynamic navigation: From single tooth replacement to full mouth rehabilitation	黃育新 醫師（國際矯正植牙學會院士、台北醫學大學牙醫學系學士、台灣植牙醫學會專科醫師）	張慧男 醫師（美國印第安那普渡大學齒顎矯正研究所博士）
9	11/27	邱上珍 醫師（美國明尼蘇達大學牙周病學碩士、美國牙周病學會院士） 題目：Osseodensification and Densah Bur 的臨床運用 **下午另有 Hands-on 課程，可參考隔頁（費用另計）**		
10	12/18	黃怡豪 醫師（美國密西根大學牙周病專科認證、美國天普大學口腔生物學碩士、台灣大學附設醫院牙周病科兼任主治醫師、台北市牙科植體學學會副理事長） 主題：即拔即種與前牙美學究極		

地點：新竹市建中一路25號2樓（金牛頓藝術科技）

時間：每月一次、星期五上午 9:00-12:00

報名專線：03-5735676 #203

clinton@newtonsa.com.tw 陳建名

2020/07/24 (五)

蘇筌瑋 醫師

主題：垂直前庭切線骨膜下隧道法

課程時間：09:00～16:00

Modified VISTA: Crosslink between ortho., perio. and implant

Dr. Homa Zadeh 在 2011 年發表 VISTA，更簡單有效率的處理牙齦萎縮的問題，張慧男醫師跟著 Dr. Homa 老師學習後更改良為 modified VISTA 並廣泛應用在矯正與科技合作的案例，同時將成果發表在期刊與美國矯正年會中得到國際的肯定，我們利用案例一步步解析如何應用 VISTA 來處理各類的問題。

課程人數僅限 20 人，報名請趁早喔！

報名資訊

聯絡人: 3a Amy

連絡電話: 03-2209722#20 (8:30-17:30)

官方LINE ID: @3aonline

匯款資訊

ATM轉帳

玉山銀行 (808)-南桃園分行

帳號: 0842940022756

戶名: 三業股份有限公司

2020/11/27 (五)

邱上珍 醫師

主題：Osseodensification and Densah Bur 的臨床運用

課程時間：11/27 09:00～16:00

2014 年 Dr. Huwais 發明 Densah® Bur，應用 Osseodensification 自體骨緻密術的觀念，經由特殊設計的 Bur，在鑽骨的同時，利用反向切削與水壓動力，保留骨屑，並將骨屑往兩側的骨小樑間隙推擠，使植體周圍的骨質更加緻密；同時也利用骨頭本身的彈性體特性，使切削下的骨屑在骨頭回彈時，填入植體螺紋間隙，增加植體和骨頭的接觸面積比例，幫助癒合。此外，Densah® Bur 也可運用在齒脊擴張與上顎竇增高術，是您臨床有利的幫手。

2019 年 10 月，Dr. Huwais 本人來台灣授課，講師邱上珍醫師參與其中。這次課程邱醫師將清楚闡釋 Dr. Huwais 上課的重點，並分享她個人的使用經驗。下午的 Hand-on 課程，將讓您實際體驗 Densah® Bur 的魅力，並了解操作的細節。有興趣的醫師千萬不要錯過！

課程人數僅限 20 人，報名請趁早喔！

報名資訊

聯絡人: 3a Amy

連絡電話: 03-2209722#20 (8:30-17:30)

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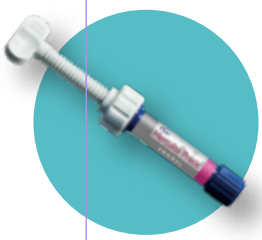

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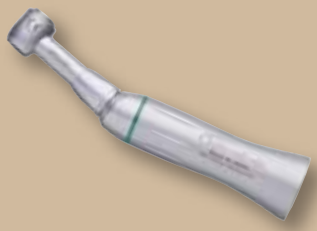

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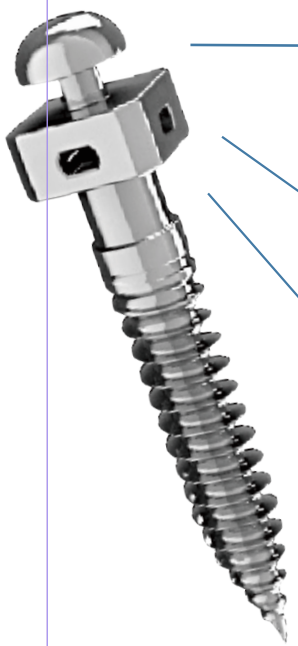

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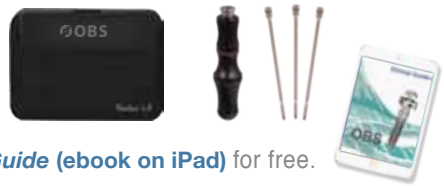

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* TADs made of Ti alloy have a lower failure rate compared to SS when placed in thin cortical bone. These results are consistent with a biocompatibility-related tendency for less bone resorption at the bone screw interface.
Reference: Failure Rates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

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

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張慧男醫師榮獲美國矯正學會期刊最佳案例獎

獲北美地區最大中文報紙-世界日報 World Journal 報導

記者王全秀子/橙縣報導

貝多芬團隊負責人張慧男醫師的臨床案例，月前獲得美國矯正學會期刊（American Journal of Orthodontics and Dentofacial Orthopedics）年度最佳案例。他和共同作者之一，也是張慧男的指導教授 Eugene. W.Roberts 同台領獎。

華人團隊首獲殊榮

美國矯正學會出版的矯正專刊，為公認的世界級的矯正專業期刊，每年學會在前一年該期刊所出版的案例中，評選出最具原創性和臨床治療結果優異的出版案例，在隔年的矯正年會上頒發最佳臨床案例（Case of the Year）獎，表揚作者對於臨床研究與治療上的卓越貢獻。

張慧男所領導的貝多芬團隊為華人首次獲選的治療團隊，獲得該項殊榮受到肯定。

張慧男在印地安那大學取得矯正博士學位後，一直致力臨床治療和專業教學的工作。他熱愛分享，寫作和演講，不僅將實務案例出版在英文的專業期刊上，也領導貝多芬團隊的醫師們，將案例製作成簡報影片發表在各大社群媒體上，與來自世界各地的專業人士交流。

從 2009 年開始，他徵選台灣牙醫系四升五年級學生，提供獎學金和臨床診所實習的機會，幫助學生在畢業選擇專科前，能有機會到診所環境實地考察。

除了熱愛矯正和教學外，張慧男還擁有專業的高爾夫球教練資格，工作之餘把高球作為休閒娛樂活動，還致力培育台灣青少年高球選手。

張慧男還曾自發創辦「貝多芬業餘高爾夫球邀請賽」，培養許多青年高球好手。

▲ 華裔醫師張慧男（前排左二）與專業人士交流。

B3 | 美西要聞(二)　世界日報　worldjournal.com　2019年6月9日 星期日 SUNDAY, JUNE 9, 2019

張慧男獲美國矯正學會期刊最佳案例獎

記者王全秀子／橙縣報導

貝多芬團隊負責人張慧男醫師的臨床案例，月前獲得美國矯正學會期刊（American Journal of Orthodontics and Dentofacial Orthopedics）年度最佳案例。他和共同作者之一，也是張慧男的指導教授Eugene. W. Roberts同台領獎。

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▲華裔醫師張慧男（前排左二）與專業人士交流。（Florence提供）

華裔醫師張慧男獲得美國矯正學會期刊年度最佳案例。（Florence提供）

http://ep.worldjournal.com/LA/2019-06-09/B03

A Minimally Invasive Approach for Anterior Crossbite Correction without Surgery and Screws

Abstract

***History**: A 17yr male presented with a chief compliant of anterior crossbite. The probable etiology of the malocclusion was ectopic eruption of the maxillary central incisors at ~6yr of age. There was no other contributing medical or dental history.*

***Diagnosis**: In centric occlusion (C_O), the buccal segments were Class I but all the maxillary incisors were in crossbite. In centric relation (C_R), the incisors were end-to-end consistent with ~1.5mm $C_R \rightarrow C_O$ discrepancy. Cephalometrics in C_O revealed bimaxillary protrusion (SNA 86.5°, SNB 86°, ANB 0.5°), relatively flat FMA (17°), and an everted lower lip. The ABO discrepancy Index (DI) was 24.*

***Treatment**: A passive self-ligating appliance was installed, along with bite turbos on the lower incisors and second molars. Class III elastics, bite turbos, and torque-specific brackets were used to correct the anterior crossbite. Molars were extruded to open the bite and increase facial convexity. Progressive archwire therapy aligned and detailed the dentition. After 19 months of treatment, near ideal dentofacial esthetics and function were achieved.*

***Outcome**: The Cast-Radiograph-Evaluation (CRE) score was 27, and the Pink & White esthetic score was 4. (J Digital Orthod 2020;57:76-92)*

Key words:
Anterior crossbite, deep bite, minimally invasive approach

Introduction

Anterior crossbite is a major esthetic and functional concern. In diagnosing an anterior crossbite, it is essential to perform a differential diagnosis to distinguish skeletal from pseudo Class III malocclusions. Many adult patients with anterior crossbites are assumed to have skeletal Class III malocclusions that require orthognathic surgery. However, that is over-treatment for Class III patients with an acceptable profile and a functional shift.[1-17] Cephalometric analysis in centric occlusion (C_O)[1-3] may be inadequate. Clinical assessment of the occlusion in centric relation (C_R) and C_O is essential for distinguishing between a skeletal and pseudo Class III malocclusion.[4] Pseudo Class III patients with an acceptable orthognathic profile in C_R usually have a good prognosis following conservative treatment to resolve the anterior crossbite.[3,5] The aim of this case report is to present a minimally invasive approach to treat a Class III malocclusion with anterior crossbite and deep bite.

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

Dr. Chris H. Chang,
President, 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 and intraoral photographs show dentofacial relationships with the mandible in CR and CO.

Diagnosis and Etiology

A 17-year-old male (*Figs. 1-5*) presented for orthodontic consultation with a chief complaint: poor dental esthetics and function due to anterior crossbite. There was no contributing medical or dental history. Facial examination revealed symmetric structures, a straight profile and protrusive lower lip compared to the upper lip. The facial profile was improved in C_R (*Figs. 1 and 4*).

Intraoral examination revealed generalized marginal gingivitis that was more prominent in the maxillary anterior. Mandibular dental and facial midlines were coincident, but the facial midline was deviated 3mm to the right, which was associated with a blocked upper right lateral incisor (*UR2*). All four maxillary incisors (*UR2-UL2*) were in a deep anterior crossbite (*Figs. 1-3*). Overjet was negative 1-2mm, and overbite was 6mm. Molar relationships were Class I on the right and Class III on the left in C_O (*Fig. 2*), but Class I bilaterally in C_R (*Figs. 1 and 4*). Crowding was ~10mm in the upper arch and 3mm in the lower arch.

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

Fig. 3: Pre-treatment cephalometric radiograph

Fig. 4:
Pretreatment facial profile photograph and a cephalometric radiograph are in C_R. See text for details.

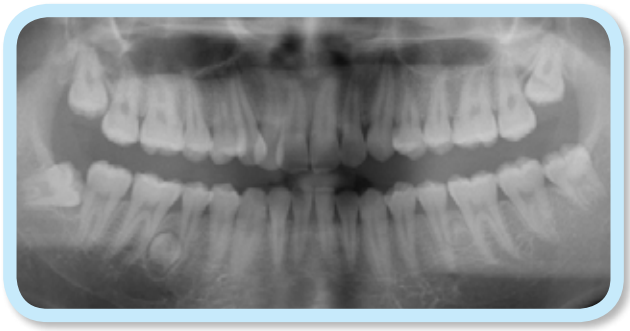

Fig. 5: Pre-treatment panoramic radiograph

CEPHALOMETRIC SUMMARY			
SKELETAL ANALYSIS			
	PRE-Tx	POST-Tx	DIFF.
SNA° (82°)	86.5°	86.5°	0°
SNB° (80°)	86°	85°	1°
ANB° (2°)	0.5°	1.5°	1°
SN-MP° (32°)	24°	25°	1°
FMA° (25°)	17°	18°	1°
DENTAL ANALYSIS			
U1 To NA mm (4 mm)	2 mm	4.5 mm	2.5 mm
U1 To SN° (104°)	107°	1 5°	8°
L1 To NB mm (4 mm)	5.5 mm	5 mm	0.5 mm
L1 To MP° (90°)	90°	94.5°	4.5°
FACIAL ANALYSIS			
E-LINE UL (-1 mm)	-2 mm	-1 mm	1 mm
E-LINE LL (0 mm)	0.5 mm	2 mm	1.5 mm
%FH: Na-ANS-Gn (53%)	54%	54.5%	0.5%
Convexity: G-Sn-Pg' (13°)	9.5°	11.5°	2°

Table 1: Cephalometric summary

Pre-treatment cephalometric analysis in C_0 showed a 0.5° ANB angle and a 17° mandibular plane angle (*FMA*) (*Fig. 3, Table 1*). The panoramic radiograph (*Fig. 5*) showed that there were two supernumerary teeth in the alveolar process of the mandibular premolar areas: one was at the root apex of the right second premolar (*LR5*), and the other was at the middle third of the left second premolar (*LL5*). The lower right third molar (*LR8*) and both upper third molars (*UR8, UL8*) were impacted (*Fig. 5*). The American Board of Orthodontics (*ABO*) discrepancy index (*DI*) was 24 points, as shown in the supplementary Worksheet 1.

Treatment Objectives

1. A full fixed passive self-ligating (*PSL*) appliance to level and align both arches.
2. Bite turbos, Class III elastics, and torque-specific brackets on the incisors to correct the anterior crossbite.
3. Extrude maxillary molars to open the bite and rotate the mandible posteriorly to improve the facial profile and the incisor display when smiling.
4. Correct the midline with cross-arch elastics.
5. Optimize occlusion with bracket repositioning and detailing bends.

Treatment Alternatives

Extracting both lower second premolars (*LR5, LL5*) was considered to facilitate the removal of the supernumerary premolars. Asymmetric extraction of upper premolars (*UR5, UL4*) would also help correct the midline discrepancy (*Fig. 6*). However,

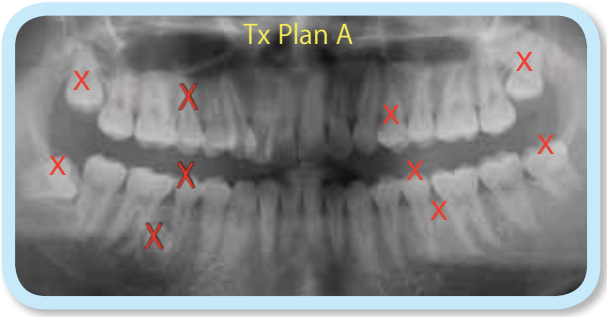

Fig. 6:
Treatment Plan A is to extract UR8, UR4, UL4, UL8, LR8, LR5, LL5 and both supernumerary mandibular premolars. All teeth to be removed are marked with a red X. See text for details.

there was an acceptable profile in C_R (*Fig. 4*), so closing extraction spaces would probably decrease lip protrusion. In addition, the patient preferred to avoid extraction other than the supernumerary teeth and third molars. Therefore, a minimally invasive protocol was adopted, but the patient did agree to the use of mandibular buccal shelf bone screws (*MBS BSs*) if needed (*Fig. 7*).

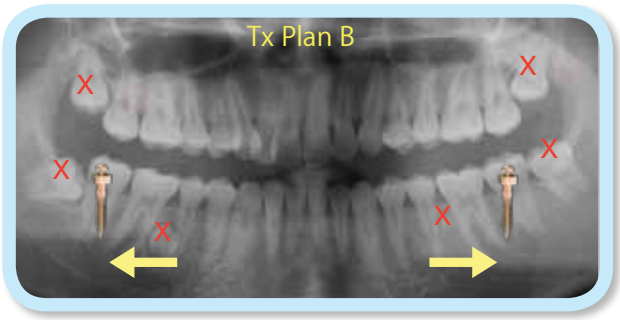

Fig.7:
Treatment Plan B is to extract only four third molars and supernumerary premolars as marked with a red X. MBS BSs are used as needed to retract the lower arch (yellow arrows). See text for details.

Treatment Progress

All four third molars and both supernumerary lower premolars were extracted before treatment. A .022-in slot, passive self-ligating (*PSL*) appliance (*Damon Q®, Ormco, Glendora, CA*) was bonded on all permanent teeth. All archwires and auxiliaries were produced by the same supplier. Except for the blocked-in UR2, the maxillary arch was bonded with low torque brackets. An open coil spring was placed between the UR1 and UR3 to open space for the UR2. Posterior bite turbos constructed with glass ionomer cement were constructed on the lower second molars (*L7s*) to facilitate anterior crossbite correction and upper arch alignment (*Fig. 8*). For the lower arch, low torque brackets were bonded upside down on the lower incisors for enhanced axial inclination (*positive torque*), and high torque brackets were bonded on the canines (*Fig. 9*). An anterior bite turbo was bonded on the mandibular central incisors to produce an inclined bite plane for anterior movement of upper incisors. Two early light Class III elastics (*Parrot 2 oz.*) were prescribed from the upper first molars to the lower canines to assist in anterior crossbite correction. Three months later, the anterior crossbite was improved so the lower anterior bite turbo was removed (*Fig. 10*). Once space was opened, a button was bonded on the labial surface of the UR2, and a power chain was tied to

Fig. 8:
One month (1M) into treatment, the maxillary arch was bonded with a PSL appliance, and an open coil spring was used to open space for the blocked-in UR2. Posterior bite turbos were constructed on lower first molars to open the bite for crossbite correction. See text for details.

Fig. 9:
Two months (2M) into treatment, low torque brackets were bonded upside down on lower incisors. An anterior bite turbo (inclined plane) was bonded on the mandibular central incisors. Early light elastics (Parrot 2 oz.) were applied to assist with anterior crossbite correction. See text for details.

the archwire to accelerate anterior alignment (*Fig. 11*).

In the tenth month, the UR2 was aligned, .014x.025 NiTi archwires were placed on both arches, and Class III elastics were stopped (*Fig. 12*). At the 13th month, a panoramic radiograph revealed axial inclination problems for the UR4 and UL5, and both were rebonded (*Fig. 13*). In the 14th month, Class II elastics (*Fox 3.5 oz.*) were applied from the mandibular LL5 via the canine (*LL3*) to the UR1 for dental midline correction (*Fig. 14*). A mesial-out bend on the UR3 and a step-up bend on the UL2 were placed to refine alignment (*Fig. 14*). The next month, a torque spring

Fig. 10:
Five months (5M) into treatment, the anterior crossbite was corrected, so the anterior bite turbo was removed.

Fig. 11:
Five months (5M) into treatment, a button is bonded on the labial surface of the UR2 and traction is applied with the archwire. See text for details

Fig. 12:
Ten months (10M) into treatment, the UR2 is aligned (upper) and Class III elastics were stopped. The provisionally aligned upper and lower arches are shown in the middle and lower occlusal views, respectively.

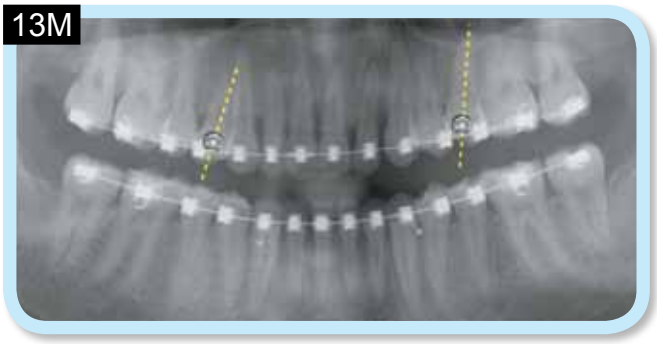

Fig. 13:
Thirteen months (13M) into treatment, a progress panoramic radiograph shows the axial inclination (yellow dotted lines) of two premolars (UR4 and UL5) requiring rebonding. See text for details.

Fig. 14:
Fourteen months (14M) into treatment, a Class II crossarch elastic (Fox 3.5 oz.) was used for dental midline correction (blue line). Yellow circles indicate a mesial-out bend on the UR3 and a step-up bend on the UL2. The archwires were 0.017x0.025-in TMA. See text for details.

Fig. 15:
A torque spring (auxiliary) was placed on the crown of the UR2 to provide a labial root torque force. See text for details.

Fig. 16: Post-treatment facial and intraoral photographs show a fixed retainer was bonded from 2-2 in the maxillary arch.

was applied to the UR2 crown to apply labial root torque (*Fig. 15*). After 19 months of active treatment, all brackets were removed. A fixed retainer was bonded on the lingual surface between the maxillary lateral incisors, and clear overlay retainers were delivered for both arches. The patient was instructed to wear the retainers full time for the first month and nights only thereafter.

Treatment Results

Dentofacial esthetics were substantially improved (*Fig. 1 vs. Fig. 17*). Both arches were well aligned and articulated in a Class I molar relationship (*Fig. 16*). Negative overjet and deep overbite relationships were corrected. The post-treatment cephalometric radiograph shows near ideal facial profile (*Fig. 18*), but the panoramic radiograph reveals an axial inclination problem for the UR5 (*Fig. 19*). The ABO Cast-Radiograph Evaluation (*CRE*) score was 27 points (*Worksheet 2*). The major residual problems were lack of occlusal contacts (*7 points*), marginal ridges (*6 points*), and buccolingual inclination (*6 points*). Superimposed cephalometric tracings (*Fig. 20*) show a relative increase in the axial inclinations of the upper incisors from 107° to 115°. Molars were extruded, consistent with an increase in lower facial hight, and the mandibular incisors were intruded. Leveling of the occlusal planes

Fig. 17: Post-treatment study models (casts)

Fig. 18:
Post-treatment cephalometric radiograph shows the E-Line in yellow.

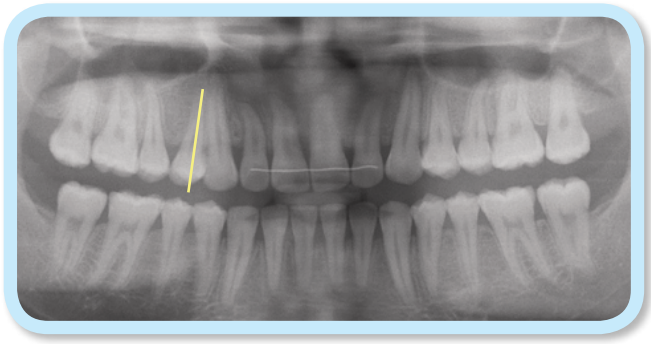

Fig. 19:
Post-treatment panoramic radiograph reveals the axial inclination of the UR4 is too far from the mesial (yellow line).

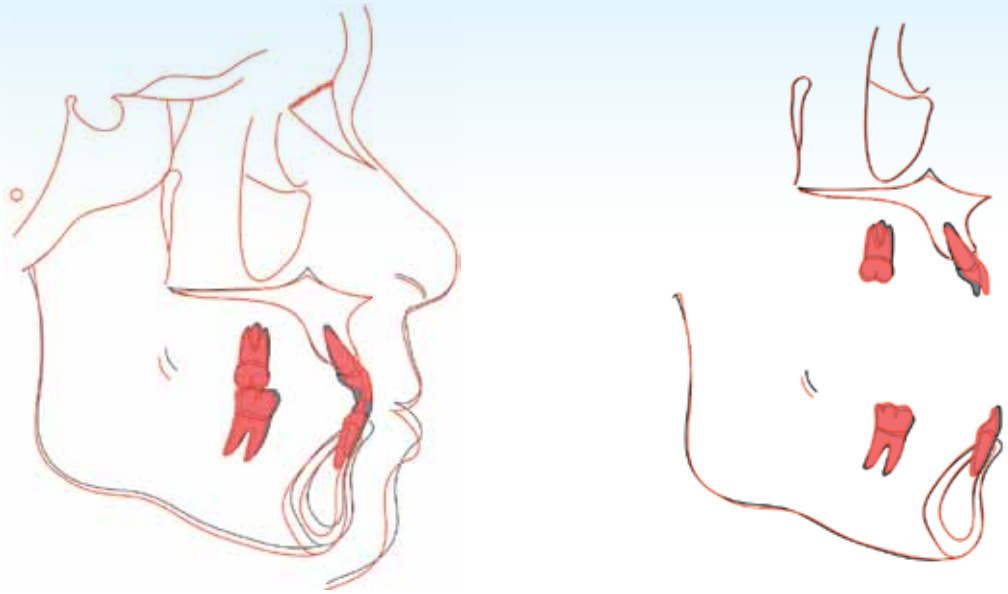

Fig. 20:
Superimposed cephalometric tracings before (black) and after (red) treatment show more labial orientation of the maxillary incisors. The upper and lower molars are sufficiently extruded to increase the vertical dimension of occlusion to increase facial height. See text for details.

resulted in clockwise rotation of the mandible which increased the ANB angle by 1°. The patient was quite satisfied with the results.

Discussion

The treatment of Class III malocclusion is often challenging because of an inadequate diagnosis. Lin's 3-ring diagnosis is an effective guide to distinguishing pseudo from true skeletal Class III malocclusion:[6,7]

- **Profile**: The majority of pseudo Class III patients with a functional shift have facial profiles that are orthognathic in C_R, even if the ANB exceeds -2°. These patients typically respond well to dentoalveolar treatment.
- **Class**: Class I occlusion in C_R is a positive indicator for the prognosis of conservative treatment.
- **Functional Shift**: Occlusal interference of the incisors requires anterior movement of the mandible to occlude in C_O. An occurrence of an anterior $C_R \rightarrow C_O$ shift is also a positive indicator for the prognosis of conservative treatment. Measuring the ANB angle on a cephalometric radiograph taken with the mandible in C_R is a more realistic assessment of the skeletal problem. A Class III malocclusion with an anterior functional shift is more likely to respond positively to conservative therapy (*Fig. 21*).

When evaluated in C_R the present patient had an acceptable profile, near Class I molar relationship and a mandibular functional shift to C_O. These are all

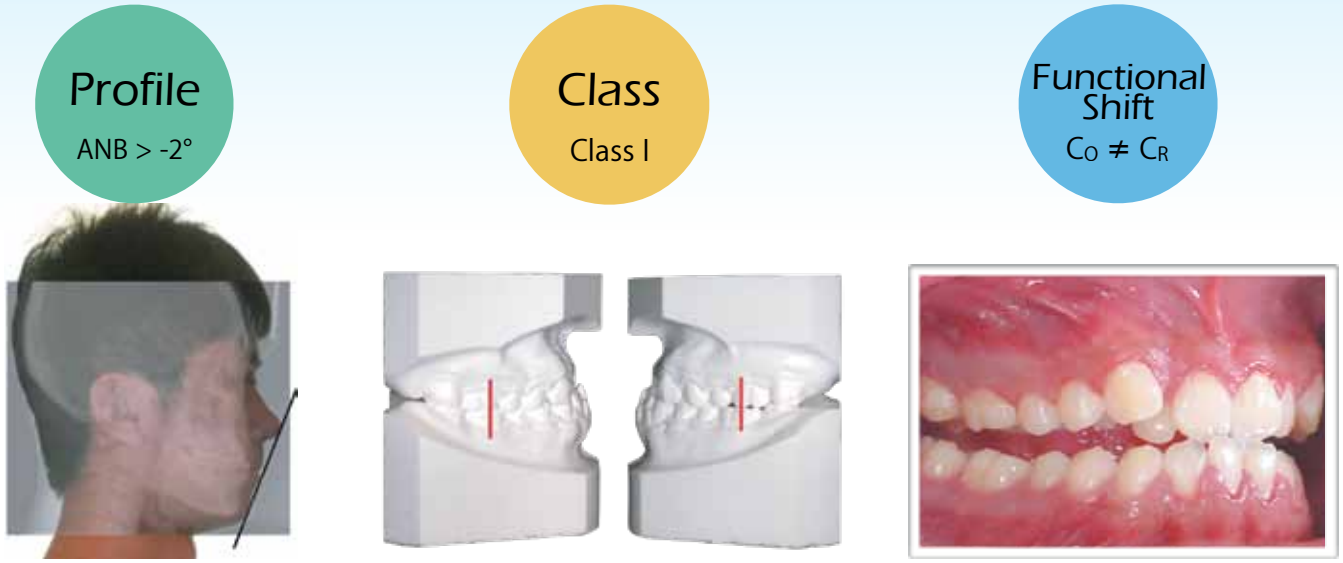

Fig. 21:
Use the 3-ring diagnosis to distinguish pseudo from skeletal Class III malocclusion. The three diagnostic criteria in CR are facial profile and ANB (left), Class I molar relationship (center), and functional shift CR → Co (Right).

positive factors favoring conservative dentoalveolar treatment. Bite turbos and light force Class III elastics facilitated anterior crossbite correction in five months.

Class III Mechanism

When Class III elastics are applied to the lower canines, upward and backward force on the mandibular arch retracts the incisors (*Fig. 22*).[8] When a lower rectangular archwire is engaged in high torque brackets, it delivers lingual root torque.[9-11] The combined force system retracts the entire mandibular arch as it is aligned. Equal and opposite force from the Class III elastics is applied to the upper first molars, resulting in a tendency of extrusion and mesial movement (*Fig. 22, yellow arrows in the upper posterior*). The anterior force tips the

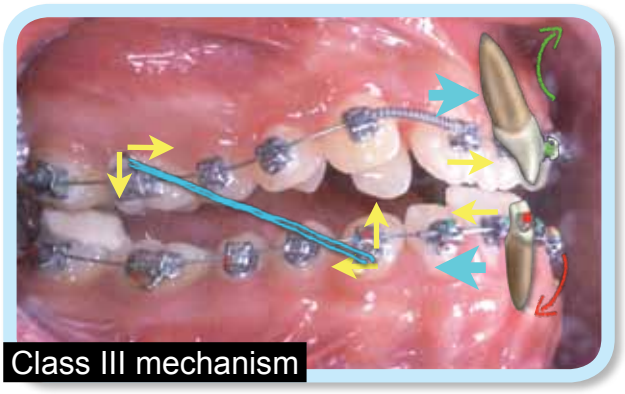

Fig. 22:
The Class III mechanism for anterior crossbite correction involves five elements:

1. *Class III elastic (blue line) applies vertical and horizontal force components (yellow arrows) that tip upper incisors labially (upper blue arrow), and lower incisors lingually (lower blue arrow);*
2. *Low torque brackets on upper incisors apply labial root torque (green curved arrow) to resist incisal tipping;*
3. *Low torque brackets bonded upside down on lower incisors apply lingual root torque (red curved arrow) to resist incisal tipping;*
4. *Bite turbos on lower first molars open the bite to avoid incisal interference; and*
5. *Another bite turbo on lower incisors serves as a bite plate to assist in crossbite correction. See text for details.*

upper anteriors labially, and the rectangular archwire in low torque brackets resists incisal flaring (*green arrow*). The resulting force system tends to translate the upper incisors anteriorly (*upper blue arrow*). The posterior bite turbo supports the occlusion while the bite turbo on the lower incisors acts as an inclined plane to tip the upper incisors labially to correct the crossbite (*Figs. 22-25*).The axial inclination of the upper incisors to the SN plane increased from 107° to 115° (*Table 1, Fig. 20*). This is a combined effect of the anterior bite turbo, open coil spring, and Class III elastics. All of these mechanisms tend to flare the maxillary incisors despite that the upper archwire is tied to the UR2 with a power chain (*Fig. 11*), and that the maxillary incisors are bonded with low torque brackets. This outcome emphasizes the importance of these measures in preventing excessive incisal flaring.[12-15]

Torque	High	Std	Low
U1	22	15	2
U2	13	6	-5
U3	11	7	-7
L1	11	-3	-11
L2	11	-3	-11
L3	13	7	0

Fig. 23:
The table shows the torque combinations (High, Standard and Low) for upper (U1-3) and lower (L1-3) incisors.

Clinical Tips

Stops:

On Damon light-force archwires, stops are usually crimped on either side of a center incisor to prevent the wire from sliding. In this patient, whose maxillary mid-line shifted to the right, it is best to avoid placing stops in areas where coil springs will be placed (*Fig. 24*). A better position for the stops is on either side of the bracket of the UL3 on the archwire.

Lower Anterior Bite Turbo:

The bite turbo on the lower incisors is used to assist anterior crossbite correction. Flowable resin is ideal for constructing lower anterior bite turbos because it can be easily added or removed to achieve the bite opening desired. The vertical dimension of the bite turbo was constructed at a height to permit the upper incisors to clear their antagonists (*Figs. 22 and 25*) .

Fig. 24:
Archwire stops are usually crimped on either side of the UL1 bracket. A better position for stops (blue) are around the bracket of the UL3 (yellow arrow).

Fig. 25:
Flowable resin is used to construct lower anterior bite turbo that will serve as as an inclined plane to help correct the anterior crossbite. See text for details.

Torque Spring:

A torque spring is an auxiliary used to change the axial inclination of a tooth.[16,17] When applied to the crown edge, its force combined with that of the restrained bracket, resulting in a root-labial moment. When the force is applied from the gingiva to the bracket, a root-lingual moment is produced. Note that the arm should be engaged on the tooth under the archwire to exert compressive force at the incisal edge (*Fig. 15*).

Anterior Crossbite Correction

The anterior crossbite case reports published in the International Journal of Orthodontics and Implantology (*IJOI*) over a 4-year period (*2012-16*) were sampled as a cohort group to examine the effectiveness of the Class III mechanism (*Fig. 22*). For efficient correction of anterior crossbite, the lower anteriors are bonded with super high torque brackets (*low torque bracket turned upside down*) (*Fig. 23*), a lower anterior bite turbo is constructed, and early light Class III elastics are applied (*Fig. 22*). "*Chris's Formula for Anterior Crossbite Correction*" is confirmed by the collection of IJOI case reports. Favorable conditions for these mechanics include an ANB angle of -2° or more and crowding of the anterior maxillary dentition (*Table 2*).

Conclusions

A differential diagnosis of Class III malocclusion with anterior crossbite requires a careful evaluation of the facial profile, molar classification and functional shift in C_R. With an accurate diagnosis of pseudo rather than skeletal Class III malocclusion, patients can be treated successfully with a minimally invasive approach utilizing bracket torque selection, bite turbos and intermaxillary elastics.

Acknowledgment

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

Gender	Age	Pro-file	Molar relationship	Crowd-ing	Ext	OJ mm	OB mm	MP	ANB	Bracket	Auxiliary	★	DI
F	12y	C	Class I	U	Ext	-2	3	H	1°	U:S, L:S	BT	3M	37 [6]
F	23y	S	L(III) R(I)	U&L	Ext	-3	3	H	0°	U:S, L:H	Tongue depressor	3M	24 [7]
F	24y	S	L(III) R(I)	L	Ext	-3	5	H	-1°	U:L, L:S	BT, ELSE, Op	4M	39 [8]
F	24y	C	L(I) R(III)	U&L	Non	-2	3	N	-2°	U:S, L:S	BT, MBS	4.5M	26 [9]
M	14y	C	L(III) R(I)	U	Non	-3.5	7	L	-5.8°	U:L, L:sH	BT, ELSE, IZC	2M	24 [10]
F	28y	C	Class III	U	Non	-3	3	L	-4°	U:sL, L:sH	BT, ELSE	3M	50 [11]
F	29y	C	Class I	U	Ext	-2	6	L	-4°	U:L, L:sH	BT, ELSE	6M	30 [12]
F	26y	C	Class III	U	Ext	0	0	H	-4°	U:S, L:H	ELSE	9M	49 [13]
M	13y	Bi	L(I) R(III)	U&L	Ext	-3	3	H	-5°	U:S, L:sH	BT, ELSE	7M	46 [14]
F	31y	Bi	Class I	Space	Non	-2	-2	O	2°	U:S, L:S	ELSE, IZC	10M	34 [15]
F	18y	Bi	Class III		Non	-3	-3	O	1°	U:L, L:S	MBS	15M	55 [16]
F	24y	S	Class III	U&L	Ext	-2	-3	O	-1°	U:L, L:sH	LSE	13M	60 [17]

★	anterior cross bite corrected in () months
Profile	C: concave, S: straight, Bi: bimaxillary protrusion
OJ	overjet
OB	overbite
MP	mandibular plane angle. H: high, N: normal, L: low, O: openbite
Bracket	U: upper, L: lower, S: standerd Q, H: high Q (standard bracket up-side-down), L: low Q, sH: super high Q (low torque bracket up-side-down), sL: super low Q (standard bracket up-side-down)
Auxiliary	BT: bite turbo, ELSE: early light short elastics, Op: open coil spring, MBS: mini screws at mandibular buccal shelf, IZC: mini screws at infra zygomatic crest. LSE: light short elastics
DI	discrepancy index

Table 2: Twelve anterior crossbite cases collected from IJOI from 2012 to 2016. The legend for abbreviations is below the table.

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Discrepancy Index Worksheet

TOTAL D.I. SCORE 24

OVERJET

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

Negative OJ (x-bite) 1 pt. per mm. per tooth = 1+1+1+2

Total = 5

OVERBITE

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

Total = 3

ANTERIOR OPEN BITE

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

Total = 0

LATERAL OPEN BITE

2 pts. per mm. per tooth

Total = 0

CROWDING (only one arch)

1 – 3 mm.	=	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	2 pts.
Full Class II or III	=	4 pts. per side	____ pts.
Beyond Class II or III	=	1 pt. per mm. additional	____ pts.

Total = 2

LINGUAL POSTERIOR X-BITE

1 pt. per tooth Total = 0

BUCCAL POSTERIOR X-BITE

2 pts. per tooth Total = 0

CEPHALOMETRICS (See Instructions)

ANB ≥ 6° or ≤ -2° = 4 pts.

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° 2 x 1 pt. = 2

1 to MP ≥ 99° = 1 pt.

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

Total = 3

OTHER (See Instructions)

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

Identify:

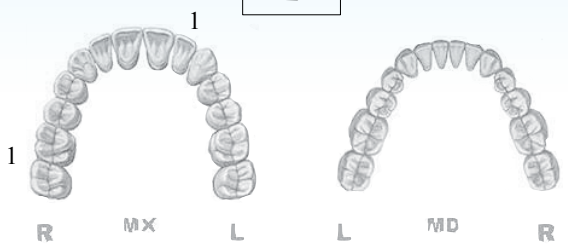
Total = 4

Cast-Radiograph Evaluation

Total Score: 27

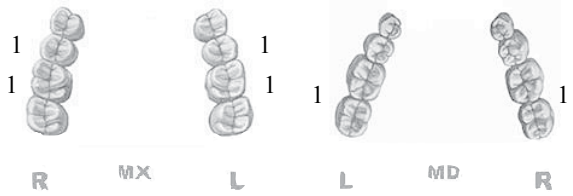
Alignment/Rotations

2



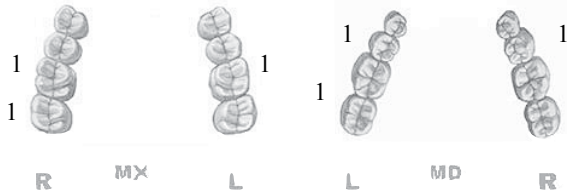
Marginal Ridges

6



Buccolingual Inclination

6

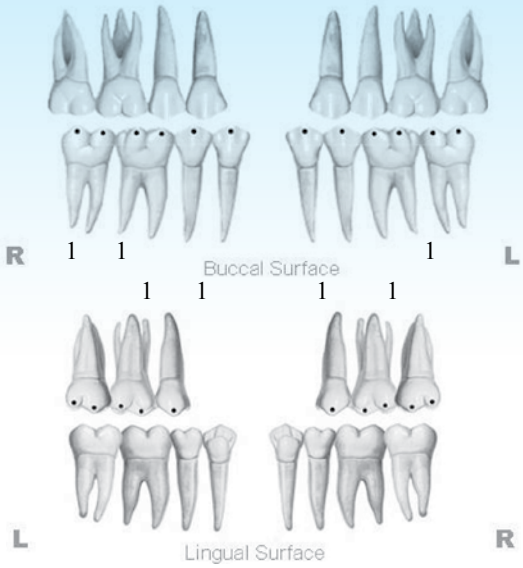


Overjet

0

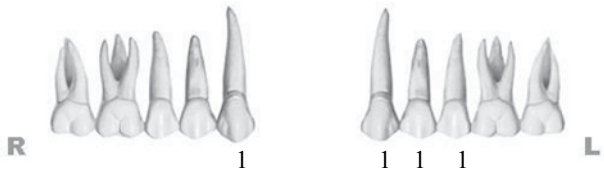
Occlusal Contacts

7



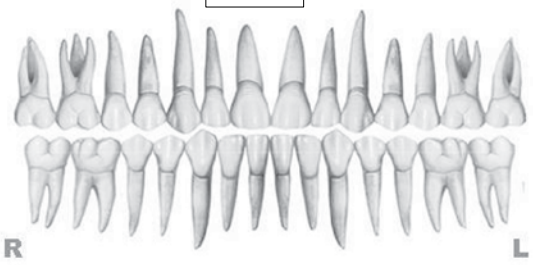
Occlusal Relationships

4



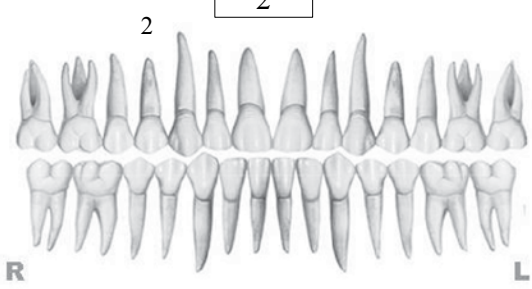
Interproximal Contacts

0



Root Angulation

2



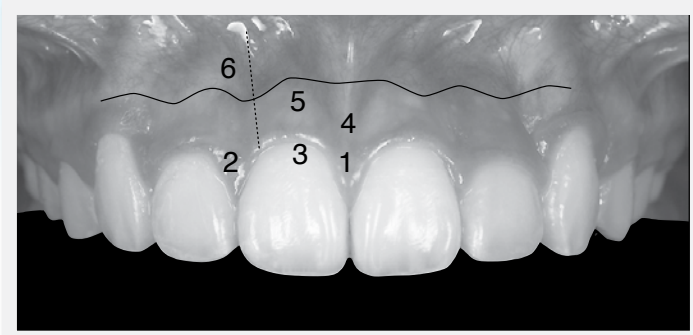
INSTRUCTIONS: Place score beside each deficient tooth and enter total score for each parameter in the white box. Mark extracted teeth with "X". Second molars should be in occlusion.

IBOI Pink & White Esthetic Score

Total Score: = 4

1. Pink Esthetic Score

Total = 2

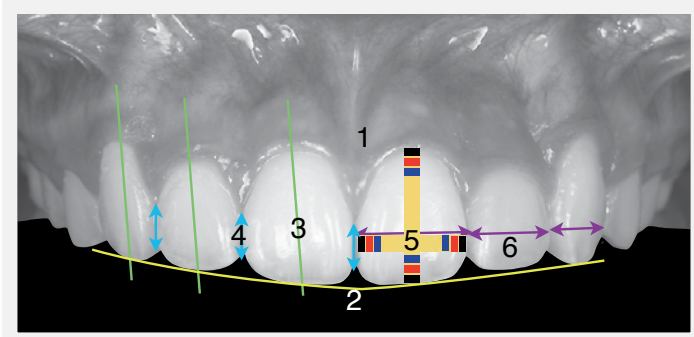


1. M & D Papillae	0	1	2
2. Keratinized Gingiva	0	1	2
3. Curvature of Gingival Margin	0	1	2
4. Level of Gingival Margin	0	1	2
5. Root Convexity (Torque)	0	1	2
6. Scar Formation	0	1	2

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 = 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

iNewton

BDE

Now available on Google Play!

Beethoven Dental Encyclopedia

Free download now
and get complete access of JDO

INSTALL

iOS / Android

All new design

-Add search by category, more friendly UI

Auto-resumed

-Automatically resume play from last view

My favorite

-Tab and add favorite videos,
support background download

Direct registration

-Register directly and access instantly

Ortho Learning

- Comprehensive Damon
- Advanced Damon
- OBS (TAD)
- Finishing — 1-10 seasons
- E-Lecture

E-Clinic

- E-Ortho
- E-Pedo
- E-Implant
- Assistant

Implant Forum

- Implant Forum — 1-9 seasons

1. Now Beethoven video courses will only be available on Apple App Store or Google Play store.
2. A fee of NTD1000 or USD35 is required to upgrade to the iOS or Android version.
3. INewton retains all rights to interpret, amend or terminate this promotion program.

orthobonescrew.com
inewton.dental@gmail.com
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Products

Dental Products Essential Kit

NEW

Double Retractors 2.0 Autoclavable!

Double Retractors x2, Black Board x2

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

Stainless Steel Mirror

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

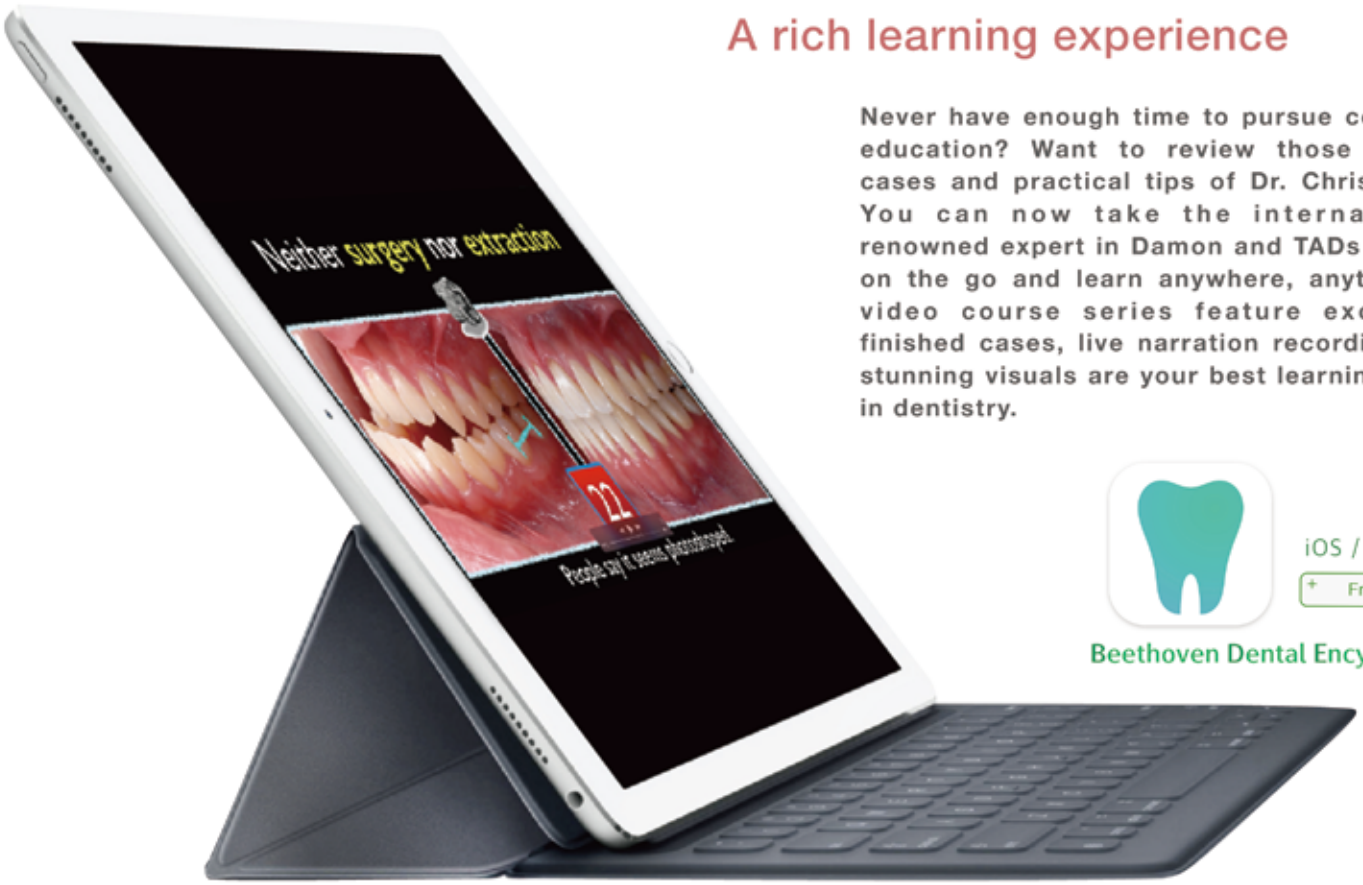
Bite Turbo 2.0

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

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

e-Courses

A rich learning experience



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

iOS / Android

+ Free App

Beethoven Dental Encyclopedia

Series

narrated — C Damon Comprehensive — Comprehensive Damon

narrated — A Damon Advanced — Advanced Damon

narrated — OBS TAD — OBS (TAD)

narrated — E Lecture — E-Lecture

non-narrated — F inishing — Finishing (10 Seasons)

non-narrated — E Ortho — E-Ortho

non-narrated — E Implant — E-Implant

non-narrated — E Pedo — E-Pedo

non-narrated — A ssistant — Assistant

Note:

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

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

2020 iAOI SYMPOSIUM

SPARK ALIGNERS:
A new paradigm in clear orthodontics

SUN Nov 15

Newton's A
2F, 25, Jianzhong 1st Rd.,
Hsinchu City, Taiwan

Dr. Diego Peydro Herrero

In this one-day course, doctors will learn how to use aligners in any situation to achieve the most demanding goals and results. They will also learn differences between different alinger systems in the market and the best options in each clinical situation.

09:00-10:30 The 3 BASICS in aligner therapy and transversal malocclusions

- How to solve severe transversal problems?
- How to plan the perfect expansion?
- How to select passive and active attachments?

11:00-12:30 Winning protocols for challenging situations

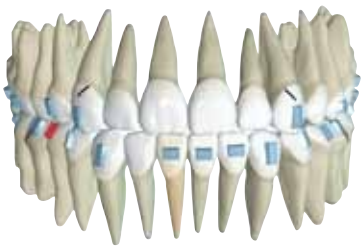
- Protocols to solve severe rotations
- How to avoid cracking aligners?

13:30-15:00 Vertical malocclusions. Introducing aligners and screws

- How to differently plan the perfect intrusion for the upper and lower arch?
- How to solve severe open bite using molar intrusion?
- How to conduct a smile design
- Use of aligners and screws to intrude molars

15:30-17:00 Sagittal malocclusions. Strategies to avoid extraction

- Upper molar distalization protocols
- Lower Molar distalization protocols
- Maximum anchorage using aligners and screws
- Protocols of elastics and sequence of movement



Phone: +886-3-5711377 Registration: iaoi.pro Contact: Michelle Tsai contact@iaoi.pro

2020 iAOI SYMPOSIUM

Workshop
Spark Alingers with Screws

MON **Nov 16** Newton's A
2F, 25, Jianzhong 1st Rd.,
Hsinchu City, Taiwan

Dr. Diego Peydro Herrero
Ormco advisory board and consultant
CEO, Peydro Herrero Odontología Avanzada
CEO, InviOrthoPro and Diego Peydro Academy

Doctors will learn how to use the Spark™ Approver™ 3D Software to properly plan sequences of movements and methods to use TADs in combination with aligners to get the best results.

SPARK™

	By 2020/10/15		After 2020/10/15	
	Member	Non-Member	Member	Non-Member
Lecture	USD 200	USD 250	USD 250	USD 300
Lecture + Workshop	USD 1,000	USD 1,035	USD 1,250	USD 1,285

(iAOI Enrollment Fees USD 35 included)

The fee of lecture+workshop includes consumables.

Payment: wire transfer (no credit card)

Beneficiary Bank: JIH SUN INTERNATIONAL BANK (SWIFT CODE: JSIBTWTP)
Beneficiary Bank Address: NO. 10, SEC. 1, CHONGQING S. RD., TAIPEI CITY, TAIWAN R.O.C.
Beneficiary Name: IAOI
Beneficiary A/C NO.: 326-2737621-00

Cancellation policy: Cancellation before December 1 is subject to 10% of cancellation fees or 30% after.

Phone: +886-3-5711377 Registration: iaoi.pro Contact: Michelle Tsai contact@iaoi.pro

Feedback from the Beethoven Int'l Workshop, Dec, 2019

Chair-side observation was really helpful to me. It made me feel more confident when I put the IZC and BS screws in my patients. And in the very near future, I believe I will not refer my challenging cases to other clinics; I will do it by myself.

Big thanks to Dr. Chris Chang and your team: Annie Chen, Chester Yu, Dawson, etc. Everything was amazing. I am hoping Dr. Chris' Invisalign course will open soon next year, I definitely will join the course. My warm respect to Dr. Chris, Shufen & your amazing team.

Dr. Bui Tuan Anh,
VIETNAM

Chair-side sessions were the best part of the entire course; I learned a lot from this part. And demo of obs was really good. Course is a great insight into how much you have expanded the boundaries of orthodontic treatment. Accommodation was really great and arrangements (transportation / meals, etc.) also more than sufficient.

Would not want to change anything if I had to do it all again. Fully appreciate the effort put into such a 3-day course , and would never complain at all. The fact that you are teaching us at your clinic is by far a great experience to keep.

Dr. Jal James Kunjappu,
INDIA

2020 熱愛學矯正

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

Damon + .014 Cu NiTi

全新的 2020 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。名額有限，一年僅有一次機會在台完整體驗 Damon 矯正大師課程，錯過只能等明年囉！

Damon Master Program

最完整的矯正訓練課程

Module 1 - **4/23**
理想入門病例 + Damon Q 黏著
高效矯正治療四階段
Hands-on : Bonding + BT + Ceph tracing
Practice: Clinical photography

Module 2 - **5/21**
簡捷有效的錨定系統
不拔牙與拔牙分析
Hands-on: TADs + Space Closing + Hook + Spring
Practice: Ceph tracing;
Filing patient photo records (template)

Module 3 - **6/4**
Damon 診斷流程及微調
醫病溝通及協調
Hands-on: Finish bending & fixed retainer
Practice: Editing patient photo records (use own data);
Morph

Module 4 - **7/2**
完工檢測及報告示範
維持及復發；病例示範
Hands-on: Presentation demo
Practice: Demo case report

Module 5 - **8/20**
矯正力學及診斷分析
軟硬組織及診斷分析
兒童及成人矯正診斷分析
Practice: Case report

臨床見習 - **6/19,20(擇一)**
跟診實習及診間管理
Practice: Clinical photography

Practice Time: 1:00-2:30pm

* 每次上課請依最新一期JDO公告為主

Module 6 - **9/24**
擁擠牙：拔牙與不拔牙討論分析
阻生齒討論分析
Literature review: Bracket placement;
Impacted canines

Module 7 - **10/15**
缺牙、錯咬討論分析
Literature review: Canine substitution;
Missing 2nd premolar

Module 8 - **11/19**
開咬、深咬、臉型討論分析
ABO DI, CRE 實作
Literature review: DI & CRE review

Module 9 - **12/17**
齒齦外露與咬合平面偏斜／錯位
Literature review: Excellence in finishing
(occlusion, esthetics, perio)

Module 10 - **2021/1/7**
植牙及矯正合併治療討論分析
成人複雜病例協同治療
Literature review: IDT

Computer training (Mac): 1:00-2:30pm

費用含課程視訊、iPad、課程電子書、模型及材料。

時間：週四全天（9 am - 5 pm），每月一次。
上課地點：金牛頓藝術科技（新竹市建中一路25號2樓）

報名專線 湧傑 Yong Chieh
北區：02-27788315 #122 楊文君
中區：04-23058915 張馨云
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SHDPV 顯微手術刀柄

SPV 顯微組織剪(直)，18公分

TPDAPV 顯微組織鑷(直)，18公分

NHDPV 顯微持針器(直)，18公分 (適用於6/0-8/0)

SCORTSC Cortellini 線剪(彎), 12公分

NH5024CORT 顯微持針器(直), 18公分 (適用於5/0-8/0)

手術入門推薦套組

還在苦惱第一套手術器械該買什麼嗎？
我們為您挑選經典常賣單品，不用煩惱該挑選哪一隻！ 整包帶走就對了！！

10-130-03 刀柄 (圓柄)

10-130-05 刀柄 (扁柄)

PCPUNC156 UNC15牙周探針，#6柄，刻度1-2-3...14-15

P96 9 Molt 骨膜剝離器

KO1/26 Orban 1/2 牙齦刀

TPG1 Gerald組織鑷，18公分

S18SC Iris 線剪，11.5公分

NH5024 Castroviejo持針器，18公分

IM1000 剪刀夾 (2入)(不含剪刀)

IM416X 16支入器械盒 (8色可選)(不含器械)

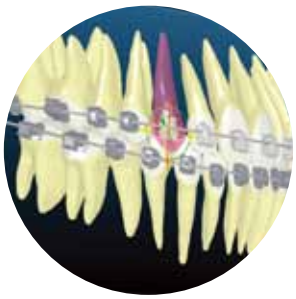
Dental Clinic Established 1996
Beethoven

International Workshop

Digital Orthodontics, OBS, VISTA

		Digital Orthodontics, OBS, VISTA	Keynote optional
2020	Session A	05/12–14	05/15
	Session B	12/08–10	12/11

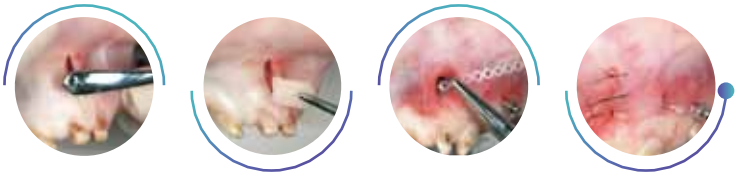
@Taiwan



INSIGNIA

OBS

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



VISTA Vertical Incision Subperiosteal Tunnel Access

Registration:

Day 123	USD	3,600	Early bird rate: $100 off (advanced registration two months prior to the course date)
Day 4	USD	600	Early bird rate: $100 off (advanced registration two months prior to the course date)

For more information and registration, visit

http://iworkshop.beethoven.tw

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

Course Schedule

Day 1 **Chair–side observation**

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

Chris' Lecture:
Digital Orthodontics with TAD

Day 3 **VISTA Lecture & workshop**

Chris' Lecture:
VISTA for Impacted Cuspids

* The topics for VISTA workshop:

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

Prof. Dr. Paulo Fernandes Retto, Portugal

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

Digital Orthodontics, OBS & VISTA

Day 4 **Keynote workshop** (Optional)

by Newton's A team

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

Dr. Rungsi Thavarungkul, Thailand

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

KEYNOTE

THE LECTURER

Dr. Chris Chang

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

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

Dr. John JJ Lin, Taipei, Taiwan

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

Dr. Tom Pitts, Reno, Nevadav, USA

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

Dr. Javier. Prieto, Segovia, Spain

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

Dr. Don Drake, South Dakota, USA

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

Dr. Ron Bellohusen, New York, USA

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

Dr. Mike Steffen, Oklahoma, USA

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

Dr. Doraida Abramowitz, Florida, USA

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

Dr. Robert S Chen, California, USA

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

Dr. John Freeman, California, USA

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

Dr. Keyes Townsend Jr, Colorado, USA

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

Dr. Jerry Watanabe, California, USA

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

Dr. Errol Yim, Hawaii, USA

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

Dr. James Morrish Jr, Florida, USA

New Release!

2019 iAOI symposium with keynote speaker, Dr. Kenji Ojima (center right), the Chairman, Dr. Bill Su (right to Dr. Kenji Ojima in gray suit), and Dr. Chris Chang (center left) in Hsinchu, Taiwan.