IJOI
International Journal of Orthodontics & Implantology
Vol. 42 Apr 1, 2016

David Sarver (center left, back) and Dan Gauer (center right, back) sneaked in the background and spoiled a supposed-to-be secret meeting of Kyoto Takemoto, Chris Chang, Giuseppe Scuzzo (from left to right, front) and Koichi Kobayashi during the Damon Forum on February 12, 2016.

International Journal of Orthodontics & Implantology is an experience sharing magazine for worldwide orthodontists and Implantologists. Download it at *http://iaoi.pro.*

《僅供牙科專業人士參閱》

2016 熱愛學矯正

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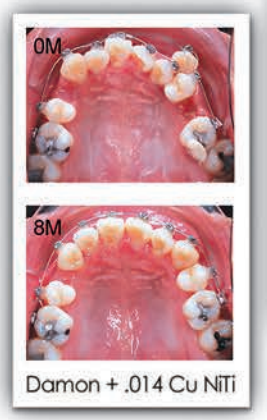
學會開始做矯正需多久?

39小時讓您入門矯正。本課程採高效學習法及高效矯正簡報法 - Keynote，在舒適、輕鬆的環境下，學會簡單有效的矯正方法，教室與診間結合，讓您現學現用，立即熟悉各種習得的技巧，而不需太多課後複習。全程以 In-Office Training 方式，用病例帶動分析、診斷，治療計畫與療程技巧，每一步驟皆以圖片及影片教學，讓您很難錯失任何環節，更沒有聽不清楚或無法理解的可能。為提高課後自我學習及臨床印證之效率，另備有教學電子檔，供學員家中研習。我們的終極目標是：用最短時間、最輕鬆的方式，讓每位學員 - *熱愛矯正學、熱愛學矯正。*



Damon + .014 Cu NiTi

Damon Clear

Damon Master Class

使用最新一代矯正器 Damon Q 進行課程，歡迎舊生報名參加。

【課程】9:00 - 12:00
【實習】另外安排

	台中 new (四)	台北 new (二)	LECTURE	LAB
1	5/5/16'	5/17/16'	理想入門病例+Damon Q黏著	Bonding (Damon Q) + BT
2	5/19	5/24	快速矯正療程四部曲	Ceph + Photo
3	5/26	6/21	簡捷有效的錨定系統	Damon + OrthoBoneScrew I
4	6/16	6/28	不拔牙與拔牙分析	Damon + OrthoBoneScrew II
5	6/23	7/5	Damon 診斷流程及微調	Finish Bending
6	6/30	7/19	完工檢測及報告示範	Fixed Retainer (FR)
7	7/7	7/26	維持及復發；病例示範	Presentation Demo
8	7/21	8/2	矯正力學及診斷分析 (1)	DDX + Case Reports I
9	7/28	8/16	軟硬組織及診斷分析 (2)	DDX + Case Reports II
10	8/11	8/23	兒童矯正及診斷分析 (3)	DDX + Case Reports III
11	8/25	8/30	成人矯正及診斷分析 (4)	DDX + Case Reports IV

矯正進階課程

【新竹】 9:00 - 12:00

以病例討論為主軸，培養學員如何正確診斷及快速排除臨床疑點，課程中亦訓練每位學員善用 Keynote。

	新竹 (二)	新竹 new (二)	Paper Reviews	Topics & Case Demo
1	9/15/15'	9/27/16'	Bracket Placement	Crowding: Ext. vs. Non-ext.
2	9/22	10/4	Impacted Canines	Upper Impacted Teeth
3	12/1	10/25	Canine Substitution	Lower Impacted Teeth
4	2/16/16'	11/1	Missing 2nd Premolar	Missing: Ant. vs. Post.
5	3/1	11/29	DI Workshop	Crossbite: Ant. vs. Post.
6	3/22	12/6	CRE Workshop	Open Bite High Angle
7	3/29	12/20	Excellence in Finishing (occlusion)	Deep Bite Low Angle
8	4/19	12/27	Excellence in Finishing (esthetics & perio)	Gummy Smile & Canting
9	4/26	1/3/17'	Ortho-Perio-Restore Connection	Esthetic Finishing (Transposition)
10	5/31	1/10	Adjunct to Perio	Implant-Ortho
11	7/12	1/17	Unhappy Patient	IDT - Adult Complex

矯正精修課程

【課程】9:00 - 12:00

協助每位學員了解由古典到現代之文獻，進而應用於實際病例；並藉由DI及CRE讓精緻完工（Excellent Finishing）變成易達到的目標。

新竹 (二)	精修VII	3/15/16'	4/12	5/10	6/14			
new 新竹 (二)	精修VIII	8/9/16'	9/20	10/18	11/22	12/13	2/14/17'	3/14
		4/11	5/9	6/13	7/18			

矯正植體課程

【課程】 9:00 - 12:00
【實習】13:30 - 20:00

矯正植體的操作時機、植法與實習、個案討論、臨床跟診及實作示範。

新竹(三) 9/21/16' (含午、晚餐)

International workshop

Keynote & managment
OrthoBoneScrew & Damon

2016
英文A班 4/26 -29
英文B班 10/18 -21
馬國A班 9/22 -24
馬國B班 12/8 -10

2017
英文A班 5/16 -19
英文B班 11/28 -12/1

助理訓練課程

【課程】10:00 - 14:30
【實習】15:00 - 20:00

每梯次共兩堂課程與技術操作，內含照相技術、Morph 與公關衛教之電腦資料處理；另安排一次診所見習。

新竹(五) 10/7/16'、11/4 (含午、晚餐)

課 程 資 訊

上課地點

【台北】
犇亞會議中心
/ 台北市復興北路99號15樓
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【台中】
中國文化大學台中教育中心
/ 台中市西屯區臺灣大道三段
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＊每次上課請依最新一期 IJOI 公告為主

Shocked by the *Shark* – The Remarkable Journey of New Lingual Appliances

In 1998, my good friend, Dr. Takemoto, told me about a new straight wire lingual bracket he was going to develop. At that time, I personally didn't think it was such a good idea. In fact, I thought it would be impossible to construct and additionally, would not provide a practical approach. How he has proved me wrong!

For those of you unfamiliar with these braces, you may think that they can only be used to solve very easy cases. If so, I think you will be 'shocked by the ***Shark***' and I suggest that you start reading this edition on p.108, to see just how effective this revolutionary design can be. For 18 years, Dr. Takemoto invested blood, sweat and tears in his design. Finally, after numerous clinical trials his appliance was launched in partnership with Dr. Scuzzo earlier this year. Whole new revolutionary straight wire lingual braces are now here!!

There are 3 reasons why his new brackets are so remarkable. Firstly, as the name suggests, the braces use a straight wire. Secondly, they are also self-ligating. Thirdly, the wire slot is square, not rectangular. With availability of new high-tech soft wires, full engagement of full size wires are now possible. This is a radical change, which I believe could replace the Edgewise, the orthodontic standard, designed by Dr. Angle way back in 1924.

To invent something like this can take so long, 18 years in fact! Hats off to Dr. Takemoto. He has achieved his goal! What makes it even more amazing are the three revolutionary features in one bracket, which make it so powerful, so easy to use and so comfortable for patients. I am amazed at how one man can be so innovative to create something which most people either dismiss or seriously doubt to be possible. I hope that when you use these braces in your practice, you will truly appreciate how much one man's passion can help you and your patients to enjoy the rewards of his endeavours. I encourage you to try them, and as like me, I feel you will be 'shocked' by the results.

I can only hope that some of us can aspire to emulate these remarkable lingual masters such as Drs. Takemoto and Scuzzo (*Inventor of digital setup for Alias*), and allow orthodontists to continue along this revolutionary path to glory. We should never give up on our aspirations. As the great golfer Arnold Palmer once said, "*The most rewarding things you do in life are often the ones that look like they can't be done.*"

Chris Chang DDS, PhD, Publisher of IJOI.

Retreatment of a Class II High Mandibular Plane Malocclusion Previously Treated with Extraction of Upper First Premolars

Abstract

An 18-year-5-month female presented with a Class II malocclusion, bimaxillary protrusion, convex profile, high mandibular plane angle (MPA) and chin retrusion. The Discrepancy Index (DI) was 25. History: full fixed orthodontics treatment with extraction of both upper first premolars at age 12 produced a good dental result, but the facial profile was disappointing, because of excessive lip protrusion. At the 5 year follow-up evaluation the patient requested retreatment. Intermaxillary posterior anchorage in two upper quadrants was established by extracting both lower second premolars and placing extra-alveolar (E-A) infrazygomatic crest (IZC) bone screws, bilaterally. After 25 months of active treatment, the buccal relationship was corrected to Class I and an excellent intermaxillary alignment was achieved, as evidenced by a score of 10 on the Cast-Radiograph Evaluation (CRE). Facial esthetics were significantly improved by reducing both lip protrusion and lower facial height, to establish lip competence with a balanced soft tissue profile. (Int J Orthod Implantol 2016;42:4-18)

Key words:

Class II high angle, retreatment, TADs (temporary anchorage devices), IZC (infrazygomatic crest) miniscrews, autorotation of the mandible, vertical dimension of occlusion, bimaxillary protrusion

History

A young female (*18y 5m*) presented with a convex profile, bimaxillary protrusion, lip incompetence, chin retrusion and increased lower facial height (*Figs. 1-3*). She had received 14 months of orthodontic treatment with upper first premolar extractions at the age of 12. At the 5 year follow up (*age 18*) she desired retreatment to improve facial esthetics. The treatment plan proposed was extraction of both lower 2nd premolars and the use of bilateral infrazygomatic (*IZC*) miniscrews for extra-alveolar (*E-A*) anchorage. After 25 months of active treatment, the patient was treated to a near ideal dental and facial result using a passive self-ligation appliance (*Figs. 4-6*). Radiographic documentation is provided (*Figs. 7 and 8*) along with the cephalometric tracings (*Fig. 9*).

Diagnosis and Etiology

Pre-treatment facial photographs from the original treatment and follow-up (*Fig. 10*) showed little improvement in the convex profile, lip protrusion, chin retrusion, increased lower facial height and mentalis

Dr. Irene Yi-Hung Shih,
Visiting Staff, Beauty Forever Dental Clinic (Left)

Dr. John Jin-Jong Lin,
Examiner of IJOI, Director of Jing-Jong Lin Orthodontic Clinic (Middle)

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

Fig. 1: Pre-treatment facial photographs

Fig. 2: Pre-treatment intraoral photographs

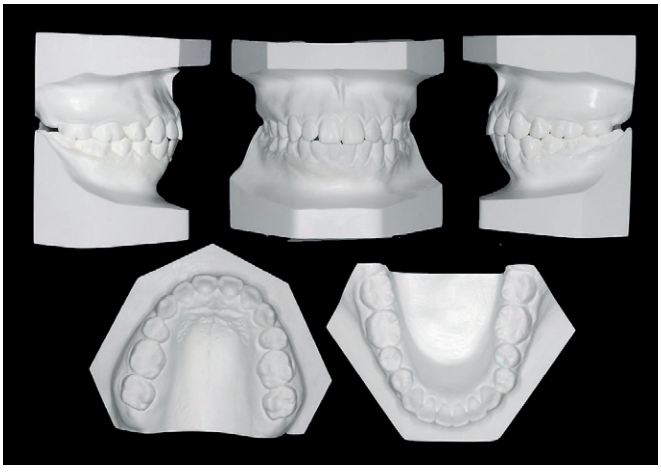


Fig. 3: Pre-treatment study models (casts)

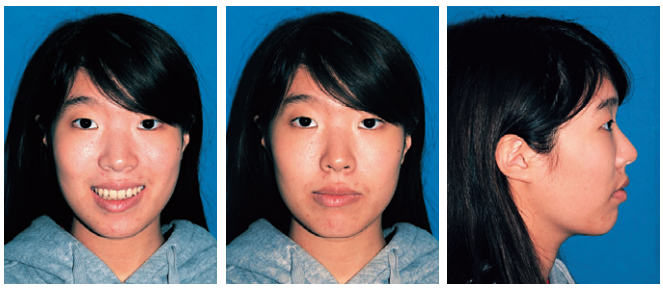


Fig. 4: Post-treatment facial photographs

Fig. 5: Post-treatment intraoral photographs

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

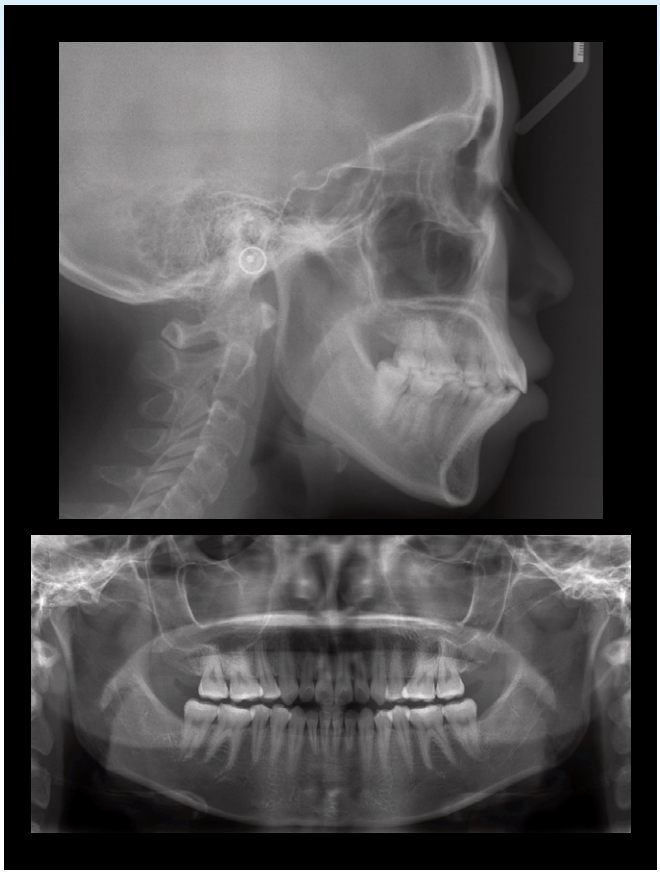


Fig. 7:
Pre-treatment panoramic and cephalometric radiographs

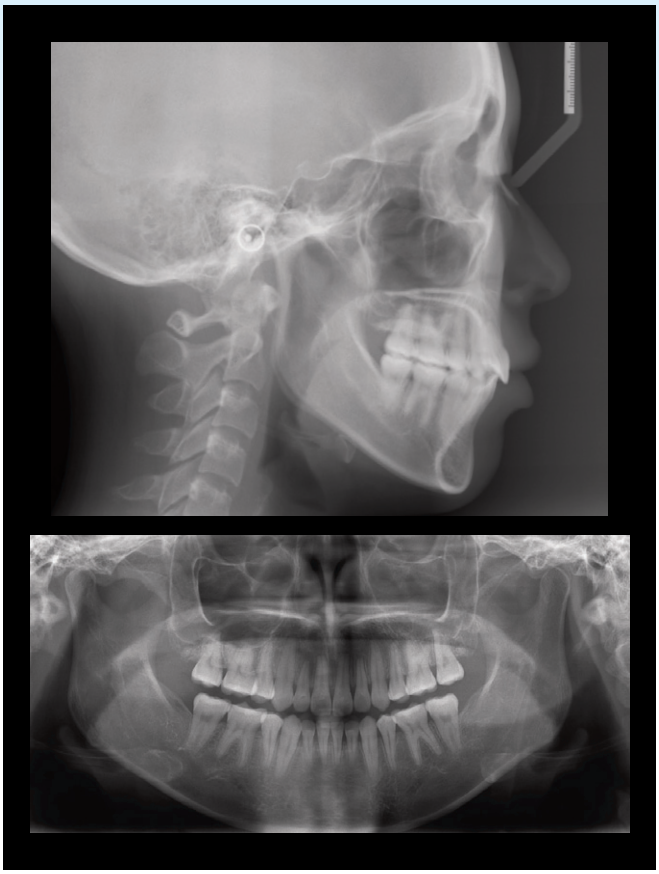


Fig. 8:
Post-treatment panoramic and cephalometric radiographs

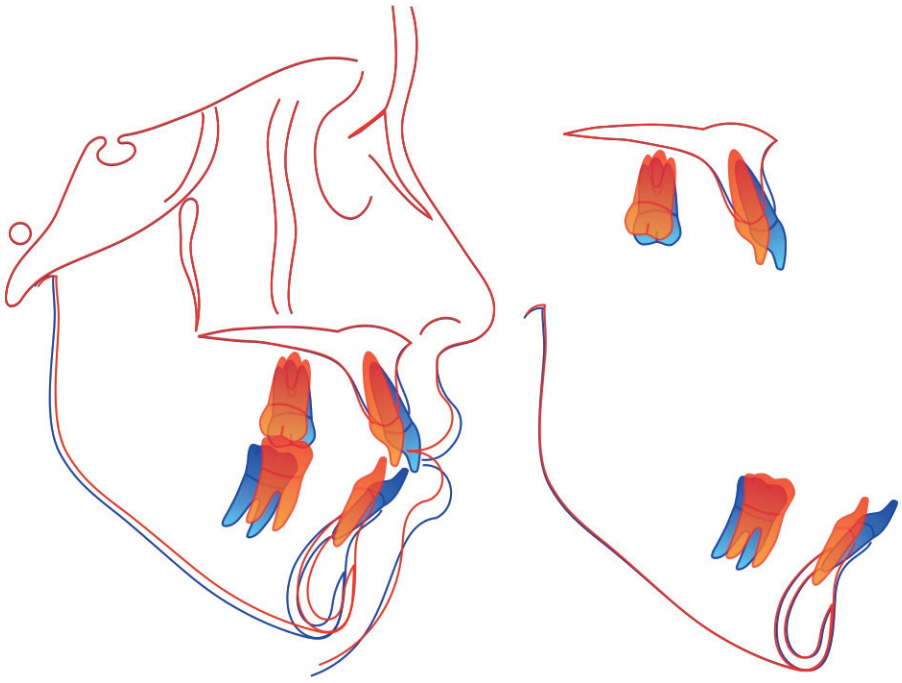


Fig. 9: Cephalometric superimpositions (Blue:initial, Red: final)

strain (*Fig. 1*). The dental and facial midlines were coincident, but the chin point deviated slightly to the right. Pre-treatment intraoral photographs and study casts revealed Class I canine, but full-cusp Class II molar relationships bilaterally (*Figs. 2 and 3*). There was a shallow overbite of 0.5mm and slight overjet of 1mm. The cephalometric analysis (*Table 2*) reveals the following angles: ANB 6.5°, SN-MP 43.8°, FMA 33.0°, U1-SN 103.2°, L1-MP 105.1°. All of these measurements were consistent with a Class II, high mandibular plane angle (*MPA*) malocclusion with incisal compensation. The etiology appeared to be primarily genetic because a convex profile with bimaxillary protrusion is a common facial type for the patient's ethnic group.[1]

Skeletal:

- Sagittal Relationships: *SNA 82.6°, SNB 76.1°, ANB 6.5°*
- MPA: *SN-MP 43.8°, FMA 33.0°*
- Facial Symmetry: *Chin point deviated slightly to the right*

Dental:

- Missing Teeth: *Both maxillary first premolars*
- Molar Relationship: *Bilateral full cusp Class II*
- Canine Relationship: *Bilateral Class I*
- Overjet: *1mm*
- Overbite: *0.5mm (5%)*
- Space: *1mm deficiency in the lower arch*
- Midlines: *Upper and lower dental midlines were coincident with the facial midline*
- Arch Forms: *Symmetrical ovoid in the maxilla and in the mandible*

Facial: Chinese Ethnicity

Fig. 10: Profile comparisons: Pre-treatment (12y2m), Post-treatment (13y4m), and 5-year-follow-up (18y3m).

- Convex profile
- Obtuse nasolabial angle
- Mandibular retrognathism
- Increased Lower Facial Height (*LFH*): *Excessive vertical dimension of occlusion (VDO)*
- Lip Incompetence: *Obvious mentalis strain and perioral muscle tone with mouth closed*

ABO Discrepancy Index (*DI*): 25 as shown in the subsequent worksheet.

Specific Objectives of Treatment

After a thorough examination, and detailed discussion with the patient, retreatment with lower 2nd premolar extractions and IZC bone screw anchorage was planned.

Maxilla (*all three planes*):

- A - P: *Retract A point slightly*
- Vertical: *Maintain*
- Transverse: *Maintain*

Mandible (*all three planes*):

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

Maxillary Dentition:

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

CEPHALOMETRIC			
SKELETAL ANALYSIS			
	PRE-Tx	POST-Tx	DIFF.
SNA°	82.6°	82.5°	-0.1°
SNB°	76.1°	76.5°	0.4°
ANB°	6.5°	6.0°	-0.5°
SN-MP°	43.8°	42.4°	-1.4°
FMA°	33.0°	32.4°	-1.4°
DENTAL ANALYSIS			
U1 TO NA mm	3.8 mm	1.0 mm	-2.8 mm
U1 TO SN°	103.2°	97.1°	-6.1°
L1 TO NB mm	1.6 mm	6.1 mm	-5.5 mm
L1 TO MP°	105.1°	87.4°	-17.7°
U1 TO PP mm	29.7 mm	28.3	-1.4 mm
U6 TO PP mm	26.2 mm	24.1	-2.1 mm
L1 TO MP mm	44.8 mm	42.9 mm	-1.7 mm
L6 TO MP mm	33.4 mm	34.1 mm	0.7 mm
FACIAL ANALYSIS			
E-LINE UL	2.5 mm	-0.2 mm	-2.7 mm
E-LINE LL	7.0 mm	3.4 mm	-3.6 mm

■ Table 1: Cephalometric summary

Mandibular Dentition:

- A - P: *Maximal retraction of the anterior segment*
- Vertical: *Intrude incisors*
- Inter-molar / Inter-canine Width: *Maintain*

Facial Esthetics:

- Bimaxillary retraction
- Decrease LFH and the VDO
- Relieve mentalis strain to restore lip competence

Treatment Plan

Extract both lower 2nd premolars, and place IZC miniscrews (*2x8mm, SS*) bilaterally, to establish anchorage in two upper posterior quadrants. Retraction of both arches to correct the bimaxillary protrusion and lip incompetence. Intrude the entire maxillary arch to close the VDO and rotate the mandible anteriorly to reduce LFH.

Appliances and Treatment Progress

After extracting the lower 2nd premolars, both arches were bonded with an .022" slot Damon Q® passive self-ligating (*PSL*) appliance (*Ormco, Glendale, CA*) (*Fig. 11*). High torque brackets were used on the upper anteriors (*canine to canine*) to increase the palatal root torque while retracting the upper arch. Standard torque brackets were used in the lower arch. Both initial archwires were .014x.025" CuNiTi.

In the 10th month of treatment, the lower anteriors were retracted and the extraction spaces were closed, but the overjet was excessive. Two stainless steel (*SS*) infrazygomatic (*IZC*) miniscrews (*2x8mm*) were installed and upper arch retraction was initiated (*Figs. 12 and 13*). Two months later, the upper left miniscrew was loose, and it was replaced with another IZC miniscrew positioned about 4mm to the distal. CBCT images confirmed that the temporary anchorage devices (*TADs*) were buccal to the roots of the molars (*Figs. 14 & 15*). The overbite increased as the anterior segments were retracted on a flexible

Fig. 11: Full mouth passive self-ligating appliance with high torque brackets in the upper anterior segment.

Fig. 12:
After 10 months of treatment, the lower incisors were retracted and the overjet was increased. Two IZC miniscrews were placed to provide posterior maxillary anchorage for retraction and intrusion of the upper arch.

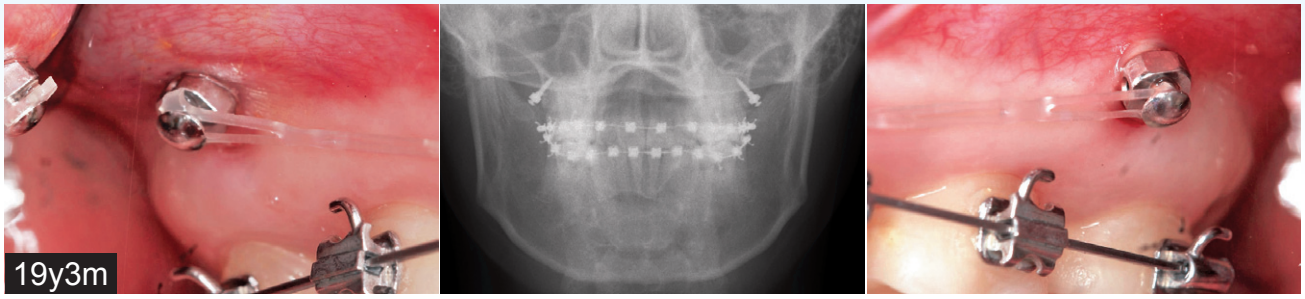


Fig. 13:
Position and angulation of IZC miniscrews is shown at 19y3m of age. The tissue level views are displayed on the right and the left, and the position of the screws lateral to the roots of the molars is revealed in an anterior-posterior radiograph (center).

Fig. 14:
The left IZC bone screw was loose two months after it was placed (19y5m). A new IZC miniscrew was placed 4 mm distally as shown in the panoramic radiograph (left) and intraoral photograph (center). The right photograph reveals the clinical picture when the original IZC screw was removed.

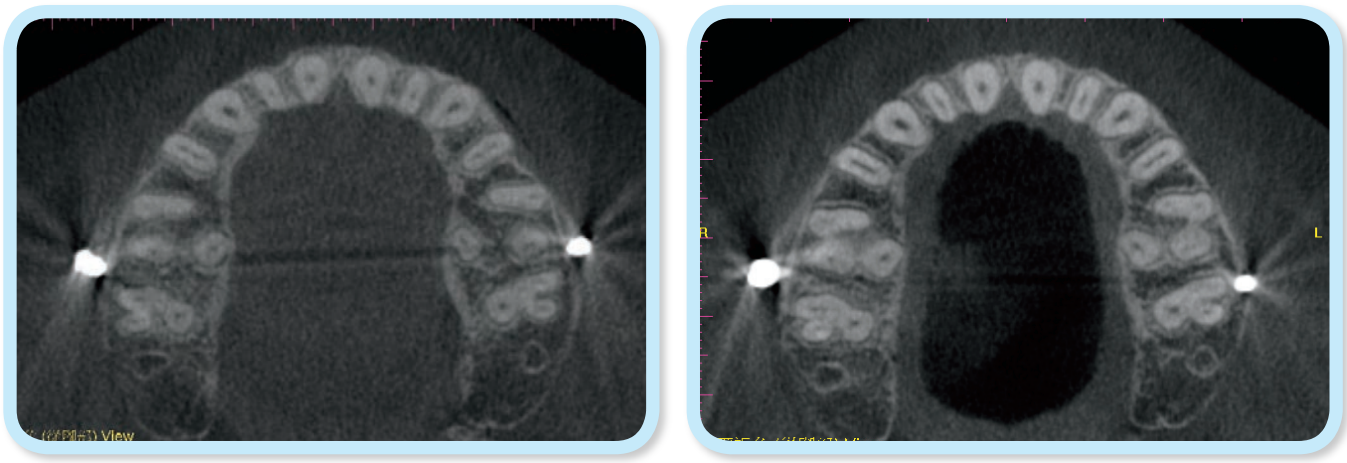


Fig. 15:
Axial view from a CBCT demonstrate that the IZC screws are lateral to the roots of upper molars, so the entire upper dentition can be retracted without root interference.

archwire (*Fig. 16*), so bite turbos were constructed with glass ionomer cement on the lingual surfaces of the upper central incisors to open the bite. When the posterior bite is opened, the relatively weak moments generated by the archwire are sufficient for leveling the arch (*Fig. 17*).

After 18 months of treatment, both lower extraction spaces were closed and the canine and molar relationships were near Class I (*Fig. 17*). In the last 3 months of active treatment, cross elastics from the buccal of the upper molars to the lingual of the lower molars were utilized to reduce the buccal overjet in the molar areas (*Fig. 18*). All fixed appliances were removed after 25 months of treatment (*Figs. 4-6*).

Results Achieved

The patient was treated to the desired result, as planned (*Figs. 4-6*). Cephalometric and panoramic radiographs document the pre-treatment and post-treatment morphology (*Figs. 7 and 8*). Cephalometric tracings superimposed in Fig. 9 show the treatment effects, and Table 1 is a summary of the cephalometric measurements. The score for

Fig. 16:
At 19y5m the bite was opened with bite turbos constructed with glass ionomer cement on the lingual surfaces of the maxillary central incisors (center). See text for details.

Fig. 17:
After 18 months of treatment (19y11mo), the lower extraction spaces were closed, the arch was leveled, and the buccal relationships were approaching Class I.

Fig. 18:
Cross elastics from the buccal of the upper molars to the lingual of the lower molars reduced the buccal overjet and coordinated the arch forms.

the American Board of Orthodontics (*ABO*) Cast-Radiograph Evaluation (*CRE*) was 10, as documented in the subsequent worksheet.

Maxilla (*all three planes*):

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

Mandible (*all three planes*):

- A - P: *Protracted*
- Vertical: *Decreased by forward rotation*
- Transverse: *Maintained*

Maxillary Dentition

- A - P: *Retracted*
- Vertical: *Intruded*
- Inter-molar / Inter-canine Width: *Expanded*

Mandibular Dentition

- A - P: *Retracted*
- Vertical: *Intruded incisors*
- Inter-molar / Inter-canine Width: *Expanded*

Facial Esthetics:

- LFH and VDO: *Decreased*
- Lips: *Retracted*
- Lip Competence: *Mentalis strain relieved and lips contact in repose*

Facial Esthetics: Substantially improved and well harmonized.

Retention

Upper Hawley and lower spring retainers were delivered after the fixed appliances were removed at the 25th month of treatment. The patient was instructed to wear both retainers full time for the first 6 months and nights only thereafter. In addition, the patient was trained in proper home hygiene and maintenance of the retainers.

Final Evaluation of the Treatment

Overall, the patient was well satisfied with the treatment outcome. The CRE score of 10 points indicates an excellent intermaxillary alignment. A Class I canine and molar relationship with good

interdigitation was achieved bilaterally. Most of the points deducted on the CRE were for minor problems in alignment/rotations, marginal ridge discrepancies, or a lack of occlusal contact for the upper lateral incisors. See the subsequent worksheet for details. Facial esthetics were dramatically improved by retracting the dentition and decreasing the lower facial height.

Discussion

A convex profile with lip protrusion is a common Asian facial type.[1] Taiwanese clinicians have a preference for the facial profiles of extraction patients,[1] but there is no statistically significant preferences for other parameters, such as tooth alignment, overbite, overjet, midline symmetry, or posterior occlusion.[2] Premolar extraction is the most common orthodontic treatment plan for correcting a convex profile with protrusive lips and lip incompetence.[3,4] With extraction therapy, the most common post-treatment changes are an increase of the nasolabial angle, retraction of upper and lower lips to the E-line, and an decrease in the depth of the labiomental fold. The current patient was first treated at the age of 12 with upper first premolar extractions. That camouflage approach achieved a stable occlusion with molar relationships in a full cusp Class II,[5,6] but there was little improvement in the facial profile (*Fig. 10*). After 5 years of follow up, the patient was dissatisfied with her facial form, and desired retreatment. The lower second premolars were extracted to provide anchorage to retract the incisors to align them over the apical base of bone[2] and improve the facial esthetics (*Fig. 19*).

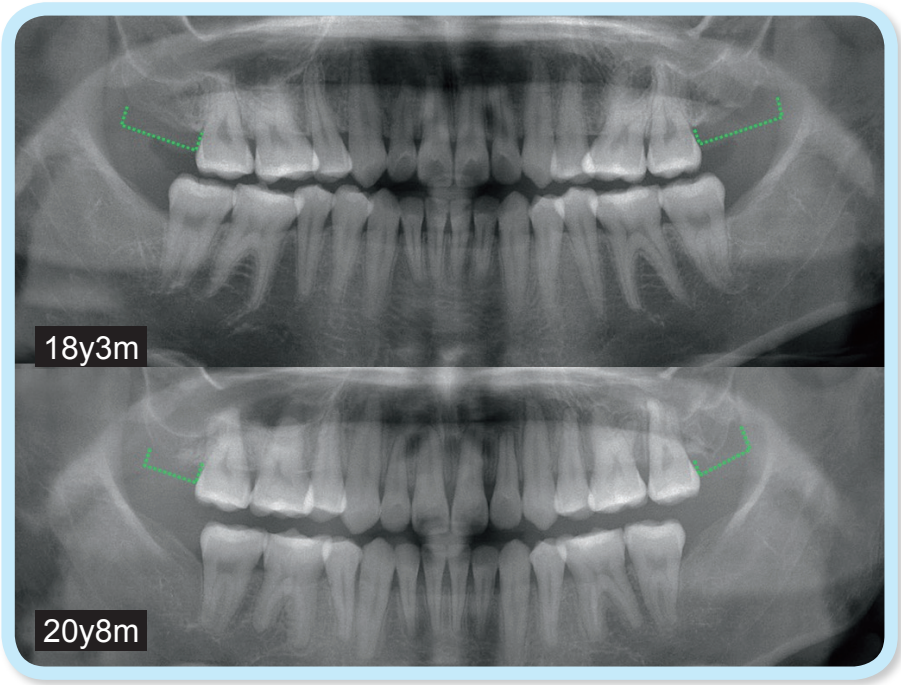
Missing first premolars limited the treatment options in the maxilla. The IZC miniscrews, positioned buccal to the maxillary molars, were a ideal solution for retracting the upper arch in coordination with

Fig. 19: The retraction of the dentition and decrease in LFH have greatly improved the facial profile at 20y8m.

mandibular space closure. Reduction of bimaxillary protrusion improves facial balance by correcting lip competence and sulcus depth as the lip prominence is reduced.[7-9] In addition to the mesial movement of the lower molars during space closure (*Fig. 9*), the firm IZC anchorage was adequate for retracting the entire upper arch to achieve a Class I molar relationship at the finish.[10-12] The upper arch was substantially retracted (*Fig. 20*) but also intruded to close the lower facial height (*Fig. 9*). In addition to the superior component of force from the IZC anchorage, the anterior bite turbos contributed to incisor intrusion that resulted in counterclockwise rotation of the mandible.

As noted in Figure 9, there was compensatory extrusion of the lower molars as the upper molars were intruded. Miniscrews in the posterior mandible would probably control lower molar extrusion and enhance the decrease in lower facial height (*Fig. 21*), but this approach may have been problematic for the present patient, because there was a tendency for the overbite to increase as the anterior segments were retracted (*Fig. 16*).

In the last 2 months of treatment, a .019x.025" NiTi archwire with 20 degrees of lingual root torque was used in the upper arch to increase the labial crown torque of the maxillary incisors (*Fig. 22*). If this arch



■ *Fig. 20:*
Comparison of panoramic radiographs from before (18y3m) to after retreatment (20y8m) document the substantial retraction of the maxillary arch (green brackets).

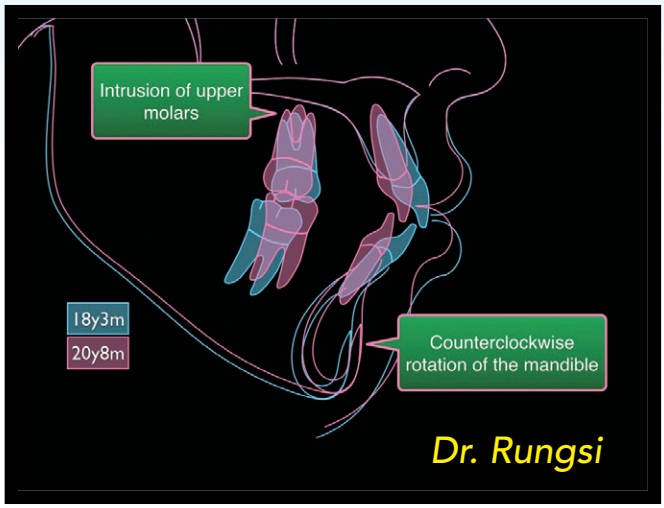


Fig. 21:
A schematic diagram by Dr. Thavarungkul Rungsi demonstrates the mechanism for counterclockwise rotation of the mandible when the maxillary arch is intruded.

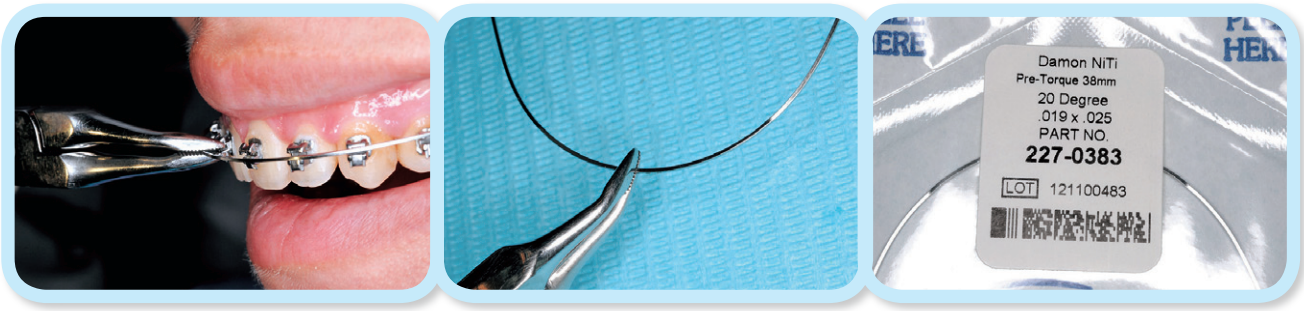


Fig. 22: A 20° pre-torqued .019x.025" NiTi arch wire was used to increase the axial inclination of the upper incisors.

wire had been used earlier in treatment, it may have been possible to make the upper incisors less upright.

Conclusion

Class II division 1 malocclusion can often be treated with maxillary premolar extraction, but the molar relationship shifts to Class II. Furthermore, there is a limited potential for facial correction, particularly if the lower incisors are protrusive. Retreatment to correct lip protrusion with lower premolar extraction is not feasible without supplemental maxillary anchorage. Posterior miniscrews placed between the roots of the teeth would inhibit arch retraction, so IZC bone screws placed buccal to the roots of the upper molars are an ideal solution for the maxillary anchorage necessary to correct protrusive, incompetent lips.

References

1. Xu TM, Liu Y, Yang MZ, Huang W. Comparison of extraction versus nonextraction orthodontic treatment outcomes for borderline Chinese patients. Am J Orthod Dentofacial Orthop 2006;129:672–7.
2. Boley JC, Pontier JP, Smith S, Fulbright M. Facial changes in extraction and nonextraction patients. Angle Orthod 1998;68:539–46.
3. James RD. A comparative study of facial profiles in extraction and nonextraction treatment. Am J Orthod Dentofacial Orthop 1998;114:265–76.
4. Drobocky OB, Smith RJ. Changes in facial profile during orthodontic treatment with extraction of four first premolars. Am J Orthod Dentofacial Orthop 1989;95:220–30.
5. Conley RS, Jernigan C. Soft Tissue Changes after Upper Premolar Extraction in Class II Camouflage Therapy. Angle Orthod 2006;76(1):59-65.
6. Zierhut EC, Joondeph DR, Artun J, Little RM. Long-term profile changes associated with successfully treated extraction and nonextraction Class II Division 1 malocclusions. Angle Orthod 2000;70:208–19.
7. Hershey HG. Incisor tooth retraction and subsequent profile change in post adolescent female patients. Am J Orthod 1972;61:45–54.
8. Rains MD, Nanda R. Soft-tissue changes associated with maxillary incisor retraction. Am J Orthod 1982;81:481–8.
9. Talass MF, Talass L, Baker RC. Soft-tissue profile changes resulting from retraction of maxillary incisors. Am J Orthod Dentofacial Orthop 1987;91:385–94.
10. Lin JJ. A new method of placing orthodontic bone screws in IZC. News&Trends in Orthod 2009;13:4-7.
11. Lin JJ. Creative Orthodontics: Blending the Damon system & TADs to p pmanage difficult malocclusions. 2nd ed. Taipei: Yong Chieh Enterprise Co, Ltd; 2010. p. 187-207.
12. Zhang N, Bai Y, and Li S. Treatment of a Class II Division 1 malocclusion with miniscrew anchorage. Am J Orthod Dentofacial Orthop 2012;141:e85-e93.

Discrepancy Index Worksheet

TOTAL D.I. SCORE 25

OVERJET

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

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

Total = 0

OVERBITE

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

Total = 0

ANTERIOR OPEN BITE

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

Total = 0

LATERAL OPEN BITE

2 pts. per mm. per tooth

Total = 6

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 ____ 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° = 4 pts.

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

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

SN-MP

≥ 38° = 2 pts.

Each degree > 38° 6 x 2 pts. = 12

≤ 26° = 1 pt.

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

1 to MP ≥ 99° = 1 pt.

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

Total = 16

OTHER (See Instructions)

Supernumerary teeth	_____ x 1 pt. =	_____
Ankylosis of perm. teeth	_____ x 2 pts. =	_____
Anomalous morphology	_____ x 2 pts. =	_____
Impaction (except 3rd molars)	_____ x 2 pts. =	_____
Midline discrepancy (≥3mm)	@ 2 pts. =	_____
Missing teeth (except 3rd molars)	_____ x 1 pts. =	_____
Missing teeth, congenital	_____ x 2 pts. =	_____
Spacing (4 or more, per arch)	_____ x 2 pts. =	_____
Spacing (Mx cent. diastema ≥ 2mm)	@ 2 pts. =	_____
Tooth transposition	_____ x 2 pts. =	_____
Skeletal asymmetry (nonsurgical tx)	@ 3 pts. =	_____
Addl. treatment complexities	0 x 2 pts. =	0

Identify:

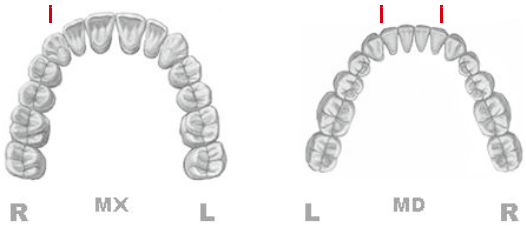
Total = 0

Cast-Radiograph Evaluation

Total CRE Score 10

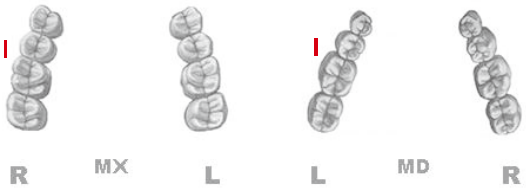
Alignment/Rotations

3



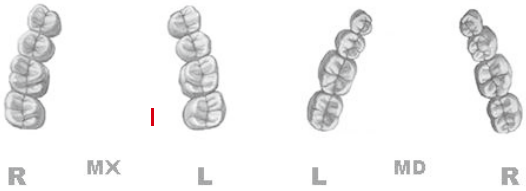
Marginal Ridges

2



Buccolingual Inclination

1

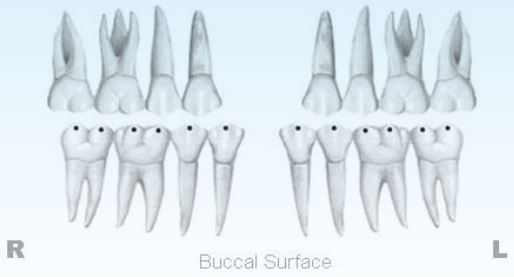


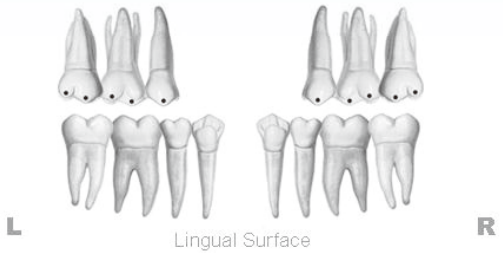
Overjet

3

Occlusal Contacts

0



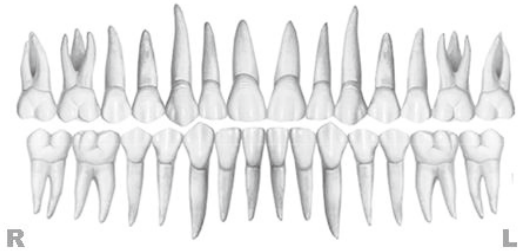


Occlusal Relationships

0

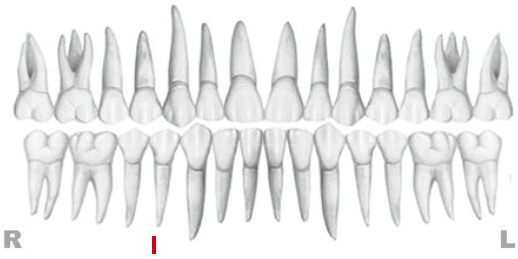
Interproximal Contacts

0



Root Angulation

1



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

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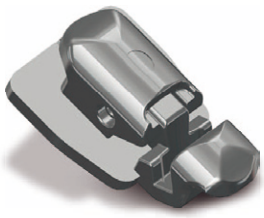
Dr. Giuseppe Scuzzo

舌側矯正專家Dr. Giuseppe Scuzzo，在義大利、瑞士及西班牙的大學皆有開設相關課程，並發表超過七十幾篇相關論文和出版三本專書。除此之外，他與日本的舌側矯正專家Dr. Takemoto一起發明了數種主流的舌側系統：STb, ALIAS, LSW, Square slot bracket 等。



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Acquired Malocclusion Due to Early Loss of Permanent First Molars: OBS-Anchored Orthodontics and Implant-Supported Prostheses

Abstract

A 27-year-old female presented with a complex malocclusion: 1. mandibular midline and occlusal plane deviated to the left, 2. excessive gingival display when smiling, 3. multiple missing teeth, 4. atrophic edentulous space in the upper left first premolar area, 5. deepbite, and 6. lingual crossbite from the maxillary right lateral incisor to the second premolar. All four first molars plus the upper left first premolar were missing, and the upper right first premolar was compromised. Etiology of the severe acquired malocclusion, Discrepancy Index (DI) 33, was attributed to an occlusal collapse when the deciduous second molars exfoliated. Treatment was rendered with a full fixed orthodontic appliance, utilizing passive self-ligating brackets and extra-alveolar (E-A) OrthoBoneScrew (OBS) anchorage. Orthodontic site development, followed by implant-supported prostheses restored the maxillary second premolar areas. A diode laser was used for a maxillary midline frenectomy, and selective gingivectomy to improve soft tissue contours. The interdisciplinary treatment for this severe malocclusion required 71 months. Outcome assessments were a Cast-Radiograph Evaluation (CRE) score of 25, Pink & White dental esthetic score of 5, and implant esthetic score of 0. (Int J Orthod Implantol 2016;42:20-41)

Key words:

Self-ligating fixed appliance, lingual crossbite, bite turbos, extra-alveolar (E-A) OrthoBoneScrews (OBSs), gummy smile, gingivetomy, diode laser, occlusal canting, midline discrepancy, 2B-3D rule, Implant site development.

History and Etiology

A 27-year-old female presented for an evaluation of multiple edentulous spaces, dental extrusion, crossbite, gummy smile and facial asymmetry (*Figs. 1-3*). There were no contributory medical problems; however, the early loss of permanent first molars appeared to be a major contributing factor to the acquired malocclusion. The complex acquired malocclusion had five missing permanent teeth, all four first molars and the upper left first premolar, and the left second premolar was compromised by severe attrition and endodontic treatment. The alignment of the dentition was irregular due to occlusal compensations. From the occlusal view, severe atrophy of the buccal surface was noted in the upper left first premolar area, and there was a lingual crossbite from the right lateral incisor to the second premolar. Excessive gingival exposure was apparent when smiling. The mandibular midline and occlusal plane were canted to the left (*Fig. 2*). The patient was treated to an good dentofacial relationship (*Figs. 4-9*). Cephalometric and panoramic radiographs document the pre-treatment condition (*Fig. 7*) and the post-treatment results (*Fig. 8*). Superimposed cephalometric tracings before and after treatment are shown in Fig. 9. The diagnosis, interdisciplinary treatment and outcomes for this challenging malocclusion are discussed in detail.

Dr. Ming-Jen Chang,
Associate editor, International Journal of Orthodontics & Implantology (Left)

Dr. Chris Chang,
Founder, Beethoven Orthodontic Center
Publisher, International Journal of Orthodontics & Implantology (Center)

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

Fig. 1: Pre-treatment facial photographs

Fig. 4: Post-treatment facial photographs

Fig. 2: Pre-treatment intraoral photographs

Fig. 5: Post-treatment intraoral photographs

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

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

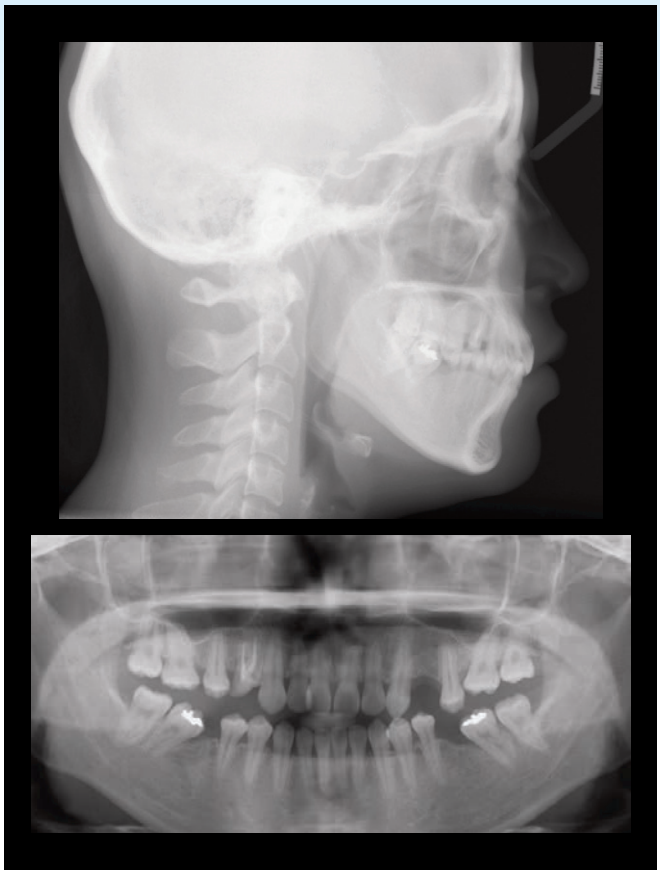


Fig. 7:
Pre-treatment cephalometric and panoramic radiographs

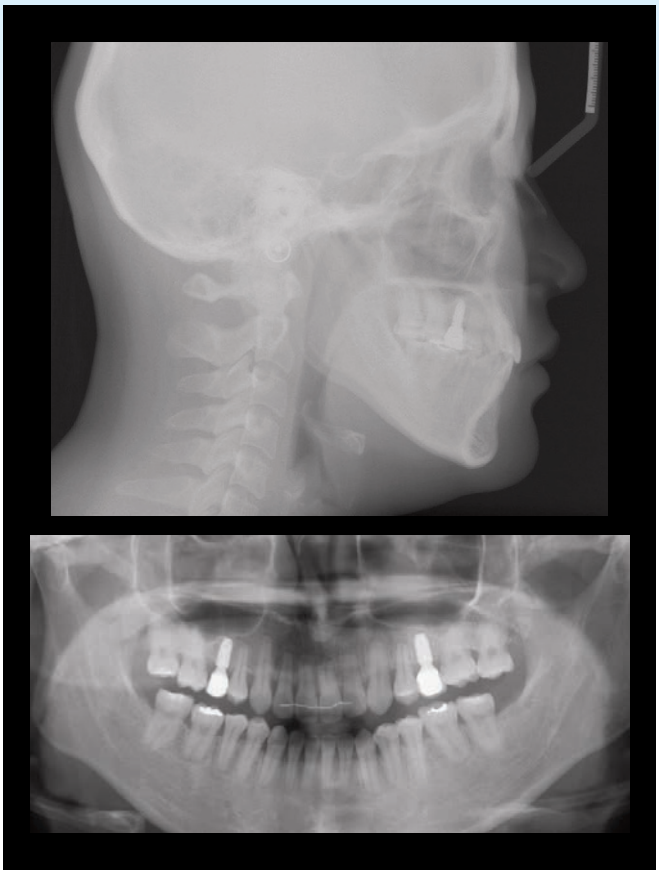


Fig. 8:
Post-treatment cephalometric and panoramic radiographs

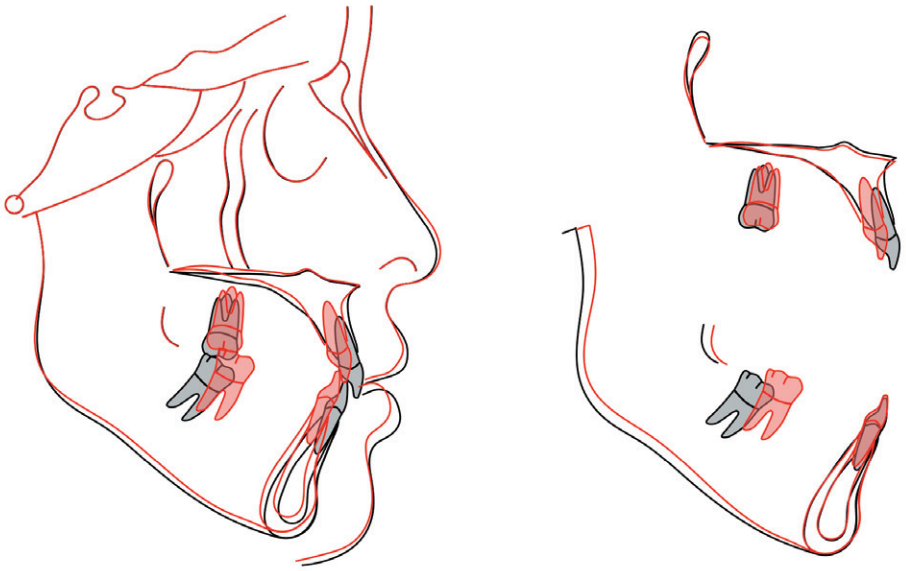


Fig. 9:
Superimposed tracings of the pre-treatment (black) and post-treatment (red) cephalometric radiographs show the dental and skeletal changes during treatment. See text for details.

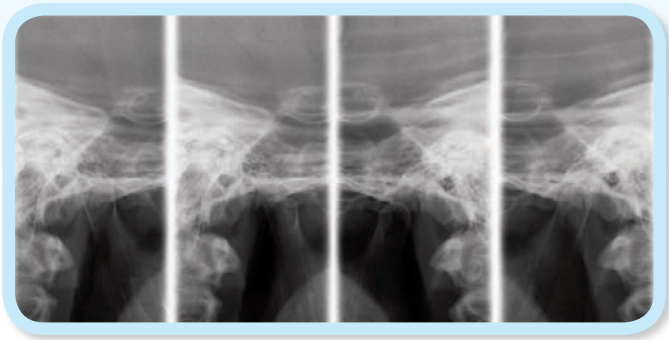


Fig. 10:
The morphology of the mandibular condyle heads was asymmetrical.

Diagnosis

Skeletal:

- Sagittal Relationship: *SNA 81°, SNB 76°, ANB 5°*
- High mandibular plane angle: *SN-MP 44°, FMA 37°*
- Condylar heads: *asymmetric in length (Fig. 10)*

Dental:

- Bilateral Class I molar relationships
- Missing teeth: *#3, 12, 14, 19, & 30*
- Compromised teeth: *severe attrition and root canal treatment of #5*
- Lingual crossbite: *from the maxillary right lateral incisor to the second premolar*
- Occlusal Compensation: *multiple teeth extruded and/or tipped into edentulous spaces*
- Alveolar process atrophy: *buccal aspect of the edentulous #12 space*
- Midlines: *mandible was shifted 3mm to the right of the maxillary dental midline*
- Esthetics: *gummy smile and occlusal canting*

Facial:

- Profile: *facial convexity and lip protrusion is within normal limits (WNL)*
- Facial symmetry: *deviated to the right*

The ABO Discrepancy Index (*DI*) was 33, as documented in the subsequent worksheet.

Specific Objectives of Treatment

1. Align and level the dentition
2. Prepare implant sites and correct interocclusal spaces
3. Correct the lingual crossbite
4. Correct the gummy smile, dental midline deviation and occlusal canting
5. Achieve an ideal overjet and overbite relationship

Maxilla (*all three planes*):

- A - P: *Maintain*
- Vertical: *Maintain*
- Transverse: *Expand to correct the lingual crossbite*

Mandible (*all three planes*):

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

Maxillary Dentition:

- A - P: *Retract incisors and move molars anteriorly*

- Vertical: *Maintain*
- Inter-molar / Inter-canine Width: *Expand as needed to correct anterior crowding*

Mandibular Dentition:

- A - P: *Mesial movement and up-righting of molars, slight retraction of incisors*
- Vertical: *Slightly extrude molars as they are up-righted*
- Inter-molar / Inter-canine Width: *Expand as needed to relieve anterior crowding*

Facial Esthetics:

- Maintain the profile, correct gummy smile

Treatment Plan

Minimizing the numbers of implants was an important objective. The first priority was to extract the residual portions of the upper right first premolar (#5). High torque brackets were prescribed for the upper incisors and standard torque brackets for the lower incisors. A bite turbo was planned to facilitate development of the arch form and the correction of the lingual crossbite.

Place OrthoBoneScrews® (*OBSs*) (*Newton's A Ltd, Hsinchu, Taiwan*) bilaterally in the mandibular buccal shelves, as well as between the maxillary central and lateral incisors bilaterally, to intrude the maxillary anterior segment. Intermaxillary elastics were prescribed for midline and occlusal plane correction as needed.

Implant site development: translate both upper second premolars anteriorly to prepare an adequate ridge proximal to the maxillary molars. Retain the corrected dentition with a lingual fixed retainer for the mandibular anterior segment, and clear overlay retainers for both arches.

CEPHALOMETRIC			
SKELETAL ANALYSIS			
	PRE-Tx	POST-Tx	DIFF.
SNA°	81°	80°	1°
SNB°	76°	75.5°	0.5°
ANB°	5°	4.5°	0.5°
SN-MP°	44°	43°	1°
FMA°	37°	36°	1°
DENTAL ANALYSIS			
U1 TO NA mm	1 mm	1 mm	0 mm
U1 TO SN°	94°	92.5°	1.5°
L1 TO NB mm	6 mm	5 mm	1 mm
L1 TO MP°	83.5°	80.5°	3°
FACIAL ANALYSIS			
E-LINE UL	-1 mm	-3 mm	2 mm
E-LINE LL	0.5 mm	-2 mm	2.5 mm

■ Table 1: Cephalometric summary

Appliances and Treatment Progress

Following extraction of the upper right first premolar, an .022" slot D3MX® fixed appliance (*Ormco Corporation, Glendora, CA*) was bonded on the lower arch, utilizing standard torque brackets on the incisors. Following placement of the initial archwire (*.014" CuNiTi*), an anterior bite turbo was bonded on the occlusal surface of the lower left canine (#27) to open the bite for lingual crossbite correction (*Fig. 11*). To balance the occlusion an additional bite turbo

Fig. 11: To assist in correcting the right buccal crossbite, a bite turbo was bonded on the lower right canine (#27).

can be placed on the lower left terminal molar if needed. High torque brackets were bonded on the maxillary anterior teeth three weeks later. After two months of initial alignment and leveling, the lingual crossbite was corrected and the bite turbo(s) were removed. Lingual buttons were bonded on all four mandibular molars and cross elastics (*Chipmunk 1/8", 3.5oz*) were applied to all molars (*Fig. 12*).

The upper arch was bonded and aligned with the following arch wire sequence: .014" CuNiTi, .016" CuNiTi, .014x.025" NiTi, .017x.025" TMA, .019x.025" SS and .019x.025" pretorqued 20º. The lower arch was aligned with the following arch sequence: .014" CuNiTi, .018" CuNiTi, .014x.025" NiTi, .017x.025" TMA and .016x.025" SS. During the course of the treatment, flexible sleeves were placed on the upper archwire in the first premolar edentulous areas to prevent irritation of the buccal mucosa (*Fig. 13*).

Implant Site Preparation: The atrophy of the buccal plate required bilateral bone augmentation procedures, prior to placing implants in the maxillary first premolar edentulous spaces. The

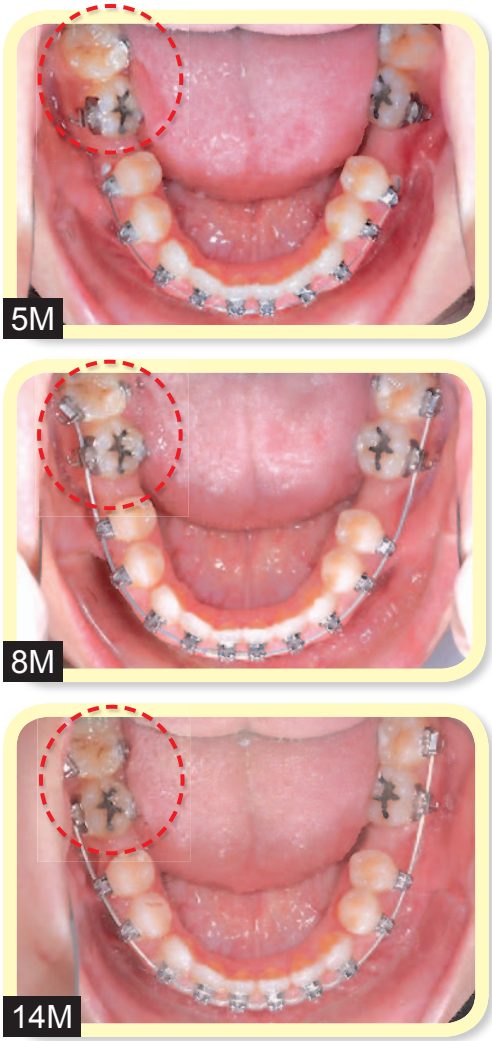
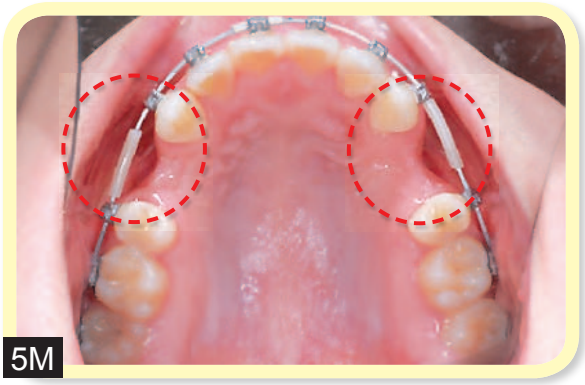


Fig. 12:
Once the upper right teeth lingual crossbite was corrected, the bite turbo was removed (5M). After the crossbite was corrected, the lower posterior segments were rapidly aligned (8M and 14M). aligned, particularly on the patient's right side (red dotted circles), (8M and 14M).

patient had financial constraints and concerns about additional surgery, so an alternate approach was selected: translate second premolars anteriorly to prepare implant sites proximal to the upper molars, bilaterally. At 26 months into treatment (*Fig. 14*) lingual buttons were bonded on the maxillary canines and premolars to facilitate mesial translation of the premolars. Power chains were used on the buccal and lingual surfaces to move the premolars anteriorly (*Fig. 14*).



■ *Fig. 13:*
Two flexible sleeves were inserted on the archwire in the maxillary edentulous areas (red dotted circles) to control irritation of buccal mucosa.

Anterior bite turbos were placed on the palatal surfaces of the two upper central incisors (*#8 and 9*) to facilitate correction of the anterior overbite (*Fig. 14*). The patient was instructed to wear Class II light, short elastics (*Fox 1/4, 3.5oz*) bilaterally from the upper canines to the lower 2nd molars to retract the upper anterior teeth and reduce the overjet.

In the 33rd month of treatment (*33M*), a progress panoramic radiography was taken to evaluate axial inclinations. Brackets were repositioned on

■ *Fig. 14:*
Instead of bone augmentation to correct the severe bony defects in the maxillary arch (11M), the second premolars were moved into the first premolar sites (19-36M) to prepare implants sites between the premolars and the molars bilaterally (40M).

inadequately aligned teeth; mandibular molar corrections are highlighted with yellow lines in Fig. 15. Extra-alveolar (*E-A*) OBSs (*2x12mm, Newton's A Ltd, Hsinchu, Taiwan*) were implanted bilaterally in the lower buccal shelves. Power chains were stretched bilaterally, from the lower 2nd premolars to the bone screws, to retract the lower arch and correct the mesial tipping of the lower molars, bilaterally. Five months later, the aligned dentition was corrected and the bone screws were removed.

Precise bracket repositioning was performed repeatedly throughout the treatment. In the 40th month of treatment, the occlusal cant was corrected, but the midline deviation persisted. The upper midline was 2mm left of the facial midline, and lower dental midline was deviated ~3mm to the right of the upper dental midline. The best compromise was to shift the maxillary dental midline to the right until the right buccal intercuspation was corrected. Thus, a right infrazygomatic crest (*IZC*) OBS was installed to provide anchorage for a power chain to correct the right buccal segment (*Fig. 16*).

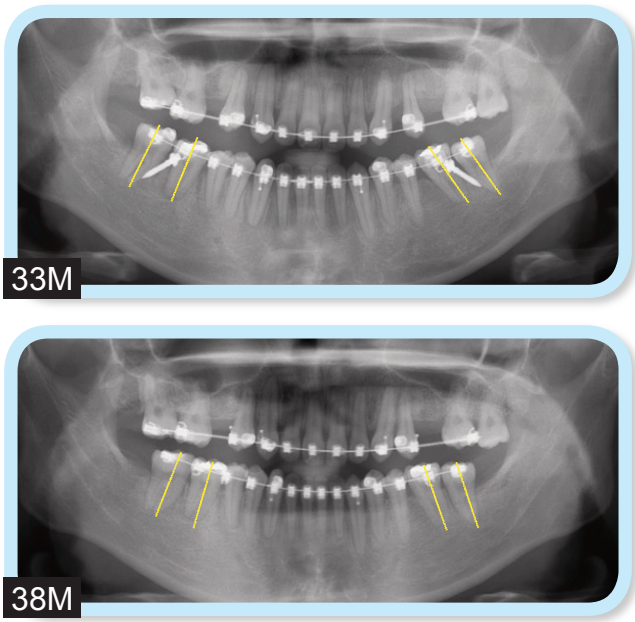


Fig. 15:
Bone screws were placed in the mandibular buccal shelves (33M) to align the mandibular molars (38M). The yellow lines demonstrate the correction of axial inclination as the molars are moved mesially.

After 45 months of treatment (*45M*), all of the chief complaints were corrected except the excessive gingival display (*"gummy smile"*) problem. Two OBSs (*1.5x8mm*) were placed between the maxillary central and lateral incisors bilaterally to serve as anchorage to intrude the maxillary anterior segment (*Fig. 17*). After 4 months of power chain traction, the right screw loosened and was reinserted between the lateral incisor and canine. The distance between the left bone screw and the main archwire decreased from 12 to 8mm after 6 months of traction (*51M*) (*Fig. 17*). As the incisors intruded, the overjet increased to ~4mm, so another bone screw was placed in the maxillary lleft IZC, to provide bilateral anchorage to retract the anterior segment (*Fig. 18*). Class II light elastics (*Fox 1/4, 3.5oz*) were used bilaterally from the upper canines to the lower molars to retract the upper anterior segment to reduce the overjet to 2mm.

After 58 months of orthodontic treatment, the dentition was well aligned (*Fig. 18*), but when all the fixed appliances were removed at 62 months, there was a prominent labial frenum and bulbous, inferiorly positioned gingival margins in the maxillary

Fig. 16:
The lower dental midline was deviated about 3mm to the right (center). An IZC OBS was placed on the right side to rotate the maxillary midline distally (left). Protraction of the second premolar continued on the left side of the arch (right). See text for details.

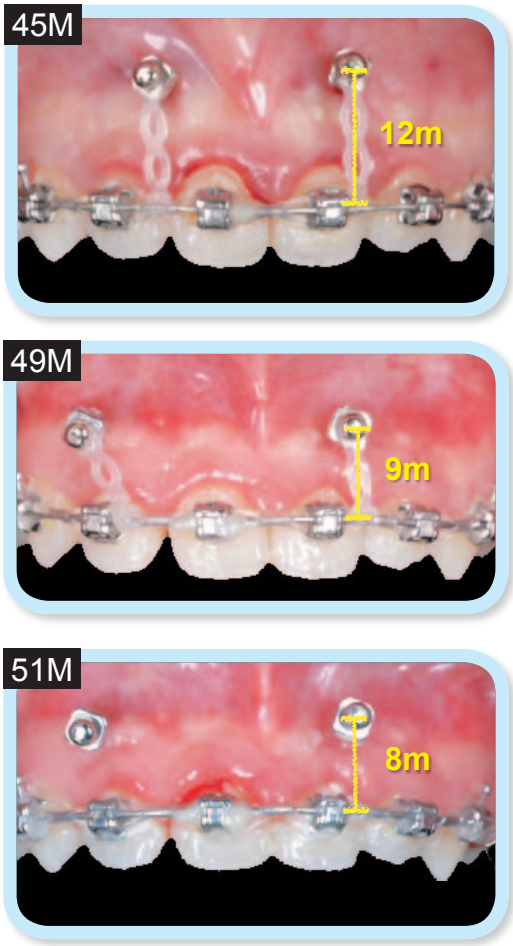


Fig. 17:
Intrusion of the maxillary anterior segment is shown at 45, 49 and 51 months (45-51M). The distance from the bone screw on the left side and the archwire decreased 4mm from 45M to 51M.

anterior segment (*Fig. 19*). Excessive gingival sulcus depth was noted on the labial surfaces, so a gingivectomy was performed with a diode laser to improve the exposed tooth proportions for all teeth in the maxillary anterior segment. During the same procedure, the labial frenum was removed to help prevent a diastema from opening between the central incisors (*Fig. 19*). A fixed retainer was bonded from 2-2 (*lateral incisor to lateral incisor*) in the maxillary arch and clear overlay retainers were delivered for both arches.

Implant Placement

The bone volume for the maxillary implant sites was assessed with a CBCT scan (*Fig. 20*). The width of the spaces was 7.5mm on the right side and 8mm on the left. The depth of the implant sites, from the alveolar crest to the floor of the maxillary sinus, were also measured as 7.5mm bilaterally (*Fig. 20*). Referring to the Sinus Lift Decision Tree (*Fig. 21*)[1], a short fixture (*4x8mm OsseoSpeedTX, Dentsply, Harrisburg, PA*) was chosen. A crestal incision was performed at the palatal line angle of the edentulous space with

Fig. 18:
After 58 months (58M) of orthodontics treatment, all spaces were closed, except for the two implant sites mesial to the maxillary molars.

a No. 15c scalpel. Sulcular incisions were made on the buccal and palatal sides of the adjacent teeth for flap reflection. A first lancer drill was used for the initial osteotomy. A periapical film was taken, with a surgical guide pin placed, to check the long axis of the osteotomy and its proximity to adjacent teeth. Following the manufacturer's recommended drilling and expansion procedure, the implant sites were surgically developed, step by step. According to the 2B-3D rule,[1] the two implant fixtures were installed bilaterally in the edentulous spaces mesial to the upper molars. Flared healing abutments (*Ø4.5-H4*) were used to help form the peri-implant mucosal contour and to conform to the cervical contour of the restoration. The flap was repositioned and closed with interrupted 5-0 Gore-Tex® (*Flagstaff, AZ*) sutures. Post-operative periapical radiographs and intraoral photographs were taken to check the position and angulation of the implants (*Figs. 22 and 23*).

At the time of implantation, two small spaces between the upper canines and first premolars were noticed, bilaterally. The pre-treatment and post-treatment occlusal photographs (*Fig. 24*) demonstrated substantial arch expansion during alignment, that probably contributed to the spaces, but the patient was satisfied with the result, and had no interest in further orthodontic treatment.

Implant Prosthesis Fabrication

Five months after the implants were placed, the healing abutments were removed, and the implant position was assessed with the 2B-3D rule: >2mm of

buccal bone and the implant is 3mm apical to the crown margin, to provide a 3mm biological width of soft tissue.[1] Direct abutments (*Ø5x2.5mm, 3.5/4.0*) were selected for each implant in preparation for prosthesis fabrication.

Fig. 19

After the fixed appliances were removed, a prominent labial frenum and inadequate enamel exposure of the incisal labial surfaces were noted at 62 months (62M). A gingivectomy and labial frenectomy were performed with a diode laser. See text for details.

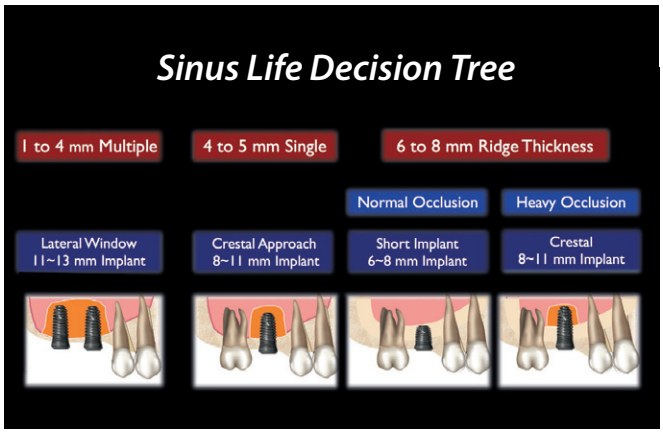
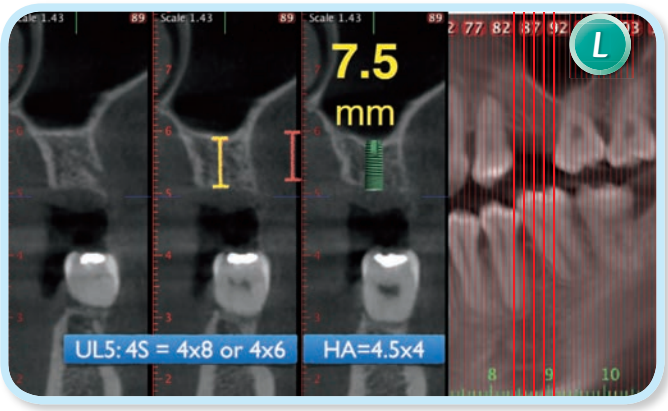


Fig. 21

Chang's sinus lift decision tree is a helpful guide for selecting an implant with appropriate height and width. See Chang et al. 2012 (reference #1) for details.



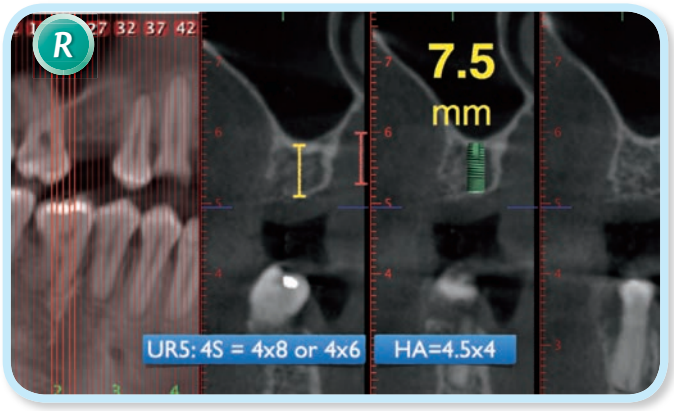


Fig. 20:

Following orthodontic preparation of the implant sites, a CBCT scan was used to evaluate the alveolar bone volume available for implants on the right (R) and left (L) sides. Note that the depth of the alveolar process beneath the maxillary sinus was 7.5mm on each side.

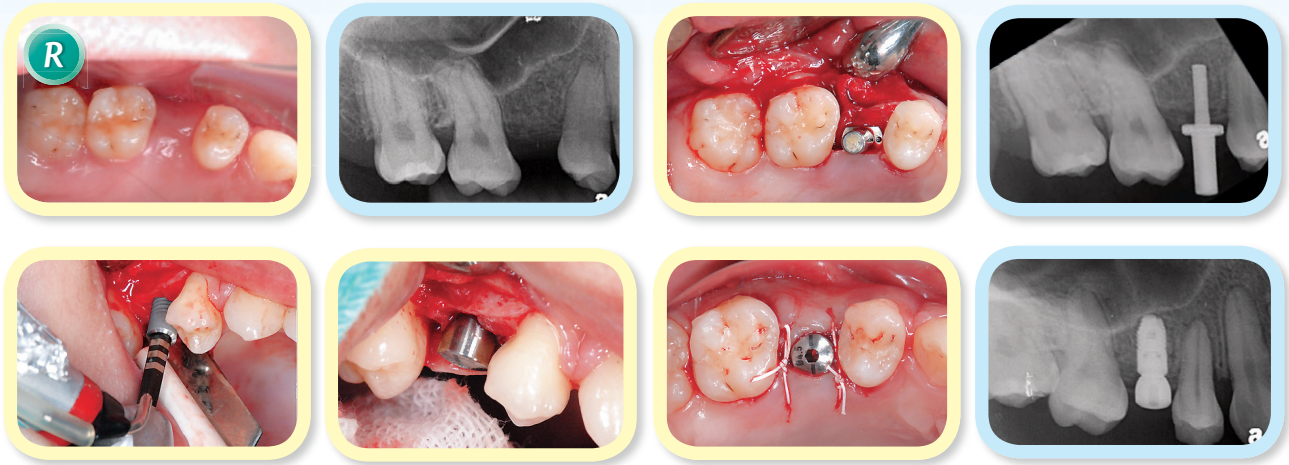


Fig. 22:
The implantation procedure for the maxillary right side (R) is documented with photographs and periapical radiographs.

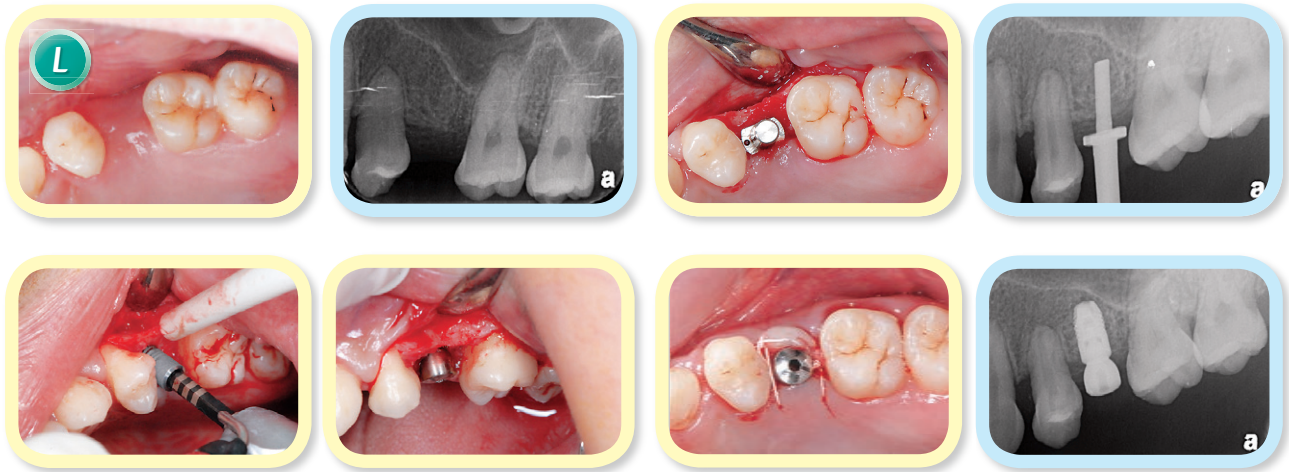


Fig. 23:
The implantation procedure for the maxillary left side (L) is documented with photographs and periapical radiographs.

Before taking the impression, the abutments were torqued twice to 25~30 N-cm with a torque wrench. The screw access hole for the abutment was then sealed with a small cotton pledget and temporary cement. For the abutment-level impression, the surface of the abutment was aligned with the raised knob on the Impression Pick-up and then seated on the Pick-up, by firmly snapping it into place. A closed-tray impression technique was used. Polyvinyl siloxane impression material was injected to make the impression. The impression was checked for the correct and stable retention of the Impression Pick-up. The abutments were

Fig. 24:
Following orthodontics treatment, two small spaces (yellow arrows) were noted between the upper canines and first premolars bilaterally (left). Comparison of pre-treatment (0) and post-treatment (62) arch forms shows the substantial expansion accomplished during active treatment.

then cemented with the Tony caps to prevent soft tissue overgrowth. The height of the abutments must not infringe on the 2mm of occlusal clearance required for the fabrication of a porcelain fused to metal crown. However, insufficient inter-occlusal space was noticed. Dura-lay resin was used as a guide for trimming the abutments. The height of the abutment post was adjusted intraorally with a diamond bur, mounted in a high speed hand piece, to provide inter-occlusal clearance for fabrication of the porcelain fused to metal crown, and then the crowns were fabricated by a commercial laboratory.

Unfortunately, the first prostheses did not fit probably because of an incomplete impression. The double core packing technique was used to retract the gingiva. A direct impression was made with polyvinyl siloxane, and poured with type IV dental stone. One month later, the second prostheses failed again because of an alignment error. After making three new impressions, the casts were subsequently articulated with check-bite records. The subsequent crowns fit properly. Gingival marginal integrity was verified with a dental explorer, and the appropriate tightness of the contact area was confirmed with dental floss. After the final fit of the prostheses was checked with periapical radiographs, the permanent crowns were luted to place with permanent cement (*Fig. 25*).

Results Achieved

Maxilla (*all three planes*):

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

Mandible (*all three planes*):

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

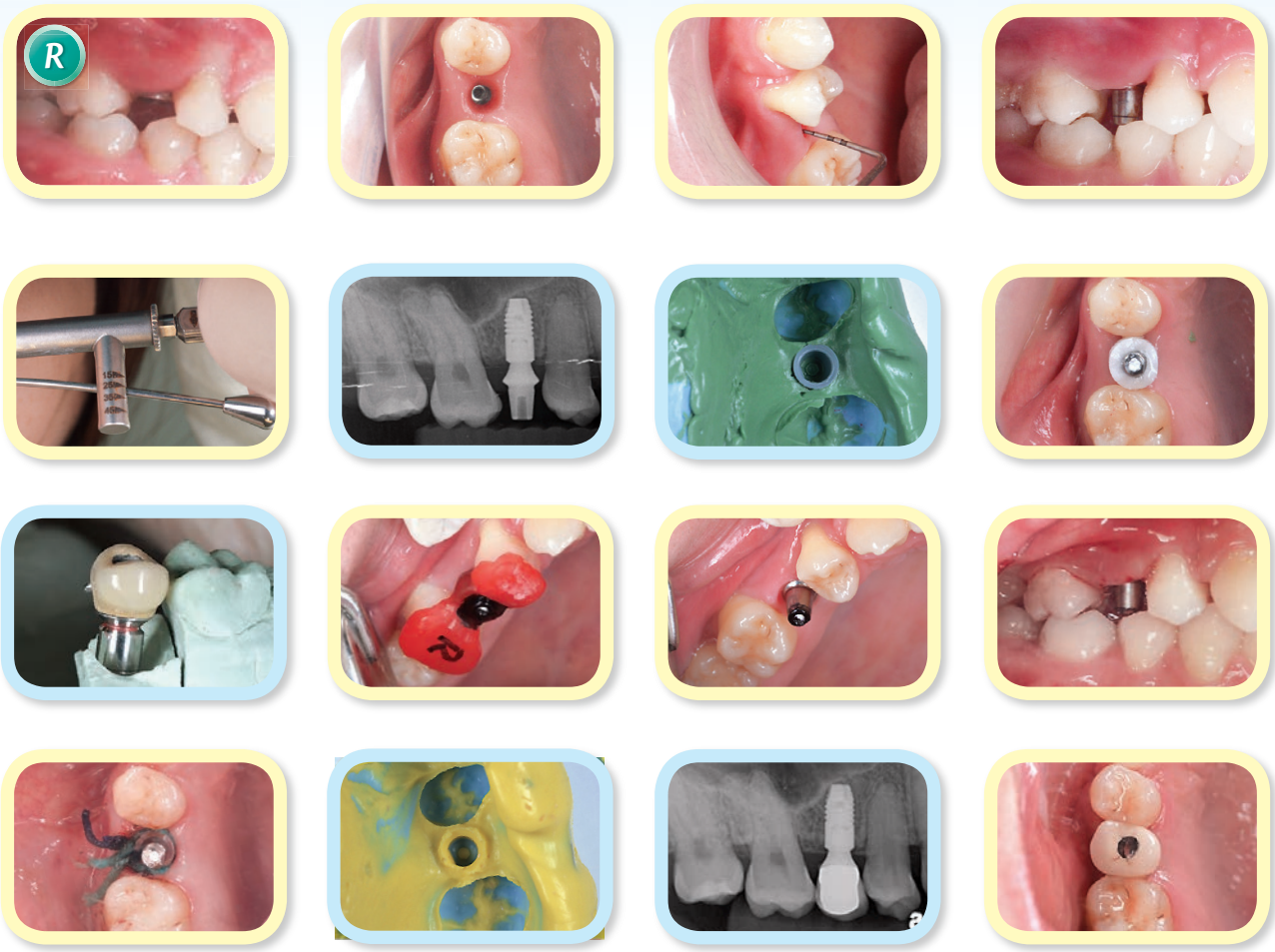


Fig. 25:
The implant prosthesis fabrication procedure is illustrated for the upper right side with a series of photographs and periapical radiographs. The same procedure was utilized on the left side.

Maxillary Dentition

- A - P: *Incisors retracted*
- Vertical: *Intruded*
- Inter-molar / Inter-canine Width: *Expanded to correct crossbite*

Mandibular Dentition

- A - P: *Anterior incisors retracted and molars protracted*
- Vertical: *Incisors and molars extruded*
- Inter-molar / Inter-canine Width: *Expanded to conform to the upper arch*

Facial Esthetics: The profile was maintained and the lips were retracted and remained competent. The gummy smile and occlusal canting were improved.

Retention

Fixed lingual retainers were bonded on the mandibular incisors and clear overlay retainers were delivered for both arches. The patient was instructed to wear the removable retainers full time for the first 6 months and nights only thereafter. Instructions were provided for home hygiene as well as for the maintenance of the retainers.

Final Evaluation of the Treatment

Cephalometric analysis (*Table 1*) and superimposition of the tracings (*Fig. 9*), show that the incisors in both arches were retracted. The upper molars were intruded and moved forward slightly. The lower molars were moved forward and extruded. The mandible rotated counter-clockwise, resulting in a 1° decrease in the mandibular plane angle, and a 1° reduction in the SNA angle. The upper incisor to SN angle was decreased from 94° to 92.5°. The lower incisor to the mandibular plane angle decreased from 83.5° to 80.5°. There were significant changes in arch forms and inter-occlusal space related to correction of the crossbite and occlusal irregularities (*Figs. 5 and 6*). Other dentofacial problems were markedly improved, such as the maxillary gingival display, occlusal cant and midline deviation (*Fig. 4*).

The ABO Cast-Radiograph Evaluation score was 25 points.[2] The major discrepancies were occlusal relationships (*6 points*), marginal ridges (*8 points*), alignment/rotation (*5 points*) and root angulation (*3 points*). The patient chose to retain the small spaces between the bilateral upper canines and 1st premolars. Overall, the dentition was well aligned, midlines were improved, and the patient was satisfied the final result.

Discussion

The common goals in dentistry for restoring missing teeth are to achieve normal function, comfort, esthetics, speech, and health. In Taiwan, an increasing fraction of the population is partially edentulous, because a smaller fraction of the population is losing all their teeth (*totally edentulous*). The early loss of permanent first molars are associated with a variety of acquired malocclusions[3,4] that occur after the deciduous second molars are exfoliated. Although teeth may be lost to caries at any age, a common problem is incisor-molar hypomineralization, a worldwide problem with a prevalence of 10-22%.[5,6] The latter is a developmental problem associated with the illness of a child <3 years of age. Fever is thought to disrupt enamel formation of permanent first molars, rendering them susceptible to caries when they erupt. The problem is often not realized by the patients until the child has a tooth ache, and then the first molars are extracted prior to the loss of the second deciduous molars. In the absence of posterior centric stops in the late transitional stage of occlusal development, may result in severe acquired malocclusions.[3,4]

Alveolar ridge atrophy is common for edentulous spaces, particularly during the first 6 months after extraction. Continued modeling and remodeling over 6 months results in a 40% decrease in alveolar

height and 60% decrease in alveolar width.[7] The loss of individual teeth obviously compromises esthetics and function, but it may also contribute to an acquired, debilitating malocclusion. Contributing factors may be alveolar defects, tooth size to arch length discrepancies, crossbites, gummy smile, occlusal canting and midline discrepancies.

Acquired malocclusions[3,4] often require interdisciplinary care: orthodontics, implants, periodontics and prosthodontics. Stepovich[8] as well as Hom and Turley[9] have shown that atrophic alveolar spaces can be closed and alternate implant sites opened, in the presence of a healthy periodontium. Horizontal and/or vertical defects in an edentulous ridge are challenging problems that usually require bone and soft tissue augmentation to serve as an appropriate implant site (*Figs. 2 and 3*). A viable alternative is orthodontic tooth movement to create an appropriate implant site that does not require tissue augmentation (*Figs. 22 and 23*). As a result of this treatment, lost function and occlusion is rehabilitated by the natural teeth and the long-term functionality of implant-supported prosthesis is satisfactory for the patient.[10]

Occlusal irregularity in the partially edentulous dentition is associated with tipping and extrusion (*supra-eruption*) of teeth into extraction spaces.[11] The treatment options available for extruded (*supra-erupted*) teeth are: 1. extraction, 2. reduction of crown height, which may require endodontics, or 3. orthodontic intrusion.[12]

For a missing tooth, the usual options are an implant, conventional fixed prosthesis, or orthodontic space closure.[13,14] A dental implant may provide the anchorage to close a missing first molar space(*s*) to restore an intact arch.[13-15] Eliminating longterm prosthetic devices is the best option.[14] If a prosthetic device is necessary, an implant provides several advantages over other restorative options. It looks and functions more like a natural tooth and does not require the preparation of adjacent teeth. Furthermore, a dental implant replaces the tooth root which helps preserve the periodontium. Based on the biologic evidence, the 2B-3D rule is an ideal implant placement guide.[1,16] What is the 2B-3D rule? 2mm of buccal bone thickness should be preserved and the implant should be placed 3mm below the future prosthesis cervical margin. The 2B-3D rule is a practical guide, for both single implants and full mouth rehabilitation, to achieve ideal implant positions.[16]

Gummy smile also known as "*gingival smile*" or "*excessive gingival display*" refers to a condition in which there is a display of over 4mm of the labial gingiva superior to the maxillary incisors when smiling. The etiology of gummy smile may involve one or more of the following conditions: 1. short upper lip, 2. hypermobile lip, 3. vertical maxillary excess, 4. anterior over-eruption, 5. wear and compensatory eruption, 6. altered active eruption, and 7. altered passive eruption.[17-19]

There are three traditional methods for correcting a gummy smile: 1. orthodontic intrusion of teeth to superiorly reposition the periodontium,[17] 2. periodontal surgery to lengthen the visible crown of a tooth (*typically performed on short teeth*),[18] and 3.

orthognathic surgery to intrude the maxilla.[19] These traditional methods are not necessarily appropriate for a hypermobile lip. The latter has popularized additional approaches: 1. Botox® (*Allergan, Irvine, CA*) injected into the muscles of the upper lip is an effective method, but it must be repeated every 3-6 months to maintain an optimal effect, and 2. lip repositioning surgery which severs the muscles that elevate the lip so that a broad smile in the vertical dimension is inhibited. This is an irreversible solution. Diagnosis is the key to a successful outcome for gummy smile.[20]

Diode lasers are capable of precision cuts in gingiva and other soft tissues; they also eliminate bleeding at the site and reduce the healing time for the patient.[21] This procedure also can be used for a variety of other soft tissue surgeries, such as periodontal therapy[22] and implant procedures,[23] as well as endodontics and tooth whitening. The gingival level on each individual tooth is important for a harmonious smile. Assuming there is adequate periodontal pocket depth, a modest and symmetric gingivectomy with a diode laser can produce dramatic results (*Fig. 19*).[23]

The etiology of facial asymmetry includes: 1. genetic or congenital malformations, e.g. hemifacial microsomia and unilateral clefts of the lip and palate, 2. environmental factors, e.g. habits and trauma, 3. functional deviations, e.g. mandibular shifts as a result of tooth interferences.[24] The condyle plays an important role as a secondary growth site in the mandible and serves as a pivot point during jaw opening. Facial asymmetry and a lateral deviation in the midline of the mandible may be related to condylar hyperplasia. Figure 10 shows asymmetric lengths for the mandibular condyles, which may be related to the facial deviation (*Fig. 1*). Since there is no enlargement of the condylar head on the affected side, it does not appear to be a pathologic condition, such as condylar hyperplasia. However, the asymmetric condylar length may reflect a compensation to an environmental factor such as sleep posture or scoliosis.[25] Dental asymmetries and functional deviations can be treated orthodontically, but skeletal asymmetries are not usually amenable to orthodontic treatment. When approaching the orthodontic correction of a facial asymmetry, it is important to begin with the end in mind.[26]

Conclusion

Partially edentulous malocclusions are particularly challenging if there is an underlying developmental component. A thorough facial, dental and functional evaluation is necessary to establish the likely etiology of the problem. Reversing the etiology of the problem(*s*) is the most direct strategy for resolving a malocclusion in a stable manner. Orthodontic alignment may involve preparation of symmetric sites for implant-supported prostheses to improve a patient's dental alignment, occlusal relationships and facial esthetics. Despite minor mechanical problems, the correction of the current severe malocclusion continued to improve after treatment, resulting in an optimal dental and facial esthetics.

Acknowledgment

Thanks to Mr. Paul Head for proofreading this article.

References

1. Chang MJ, Chang CH, Roberts WE. Combined Implant-Orthodontic Treatment for an Acquired Partially-Edentulous Malocclusion with Bimaxillary Protrusion. Int J Orthod Implantol 2012;28:38-64.
2. The American Board of Orthodontics. Grading System for Dental Casts and Panoramic Radiographs. 7th ed. St. Louis (MO): The American Board of Orthodontics; 2012.
3. Lu SW, Chang CH, Roberts WE. Asymmetric crowded Class II with missing first molars: space closure or implants? Int J Orthod Implantol 2015;40:18-37.
4. Yeh HY, Chang CH, Roberts WE. Conservative treatment of a skeletal Class III malocclusion complicated with atrophic extraction sites and periodontal compromise. Int J Orthod Implantol 2016;42;44-59.
5. Pitiphat W, Savisit R, Chansamak N, Subarnbhesaj A. Molar incisor hypomineralization and dental caries in 6-7 year old children. Pediatric Dentistry 2014;36(7):478-82.
6. Wuollet E, Laisi S, Salmela E, Ess A, Alaluusua S. Background factors of molar-incisor hypomineralization in a group of Finnish children. Acts Odontol Scand 2014;72(8):963-9.
7. Bartee BK. Extraction site reconstruction for alveolar ridge preservation. Part 1: Rationale and materials selection. J Oral Implantol 2001;27:187–93.
8. Stepovich ML. A clinical study on closing edentulous spaces in the mandible. Angle Orthod 1979;49:227-233.
9. Hom BM, Turley PK. The effects of space closure of the mandibular first molar area in adults. Am J Orthod 1984;85:457-469.
10. Arslan SG, Tacir IH, Kama JD. Orthodontic and prosthetic rehabilitation of unilateral free-end edentulous space. Au Dent J 2006;51:(4):338-341.
11. Davies S, Gray RMJ. What is occlusion? Br Dent J 2001;191:235–245.
12. Ricketts DNS, Smith BGN. Minor axial tooth movement. Eur J Prosthodont Dent 1993;1:145–149.
13. Roberts WE, Marshall KJ, Mozsary PG. Rigid endosseous implant utilized as anchorage to protract molars and close an atrophic extraction site. Angle Orthod 1990;60(2):135-152.
14. Roberts WE, Nelson CL, Goodacre CJ. Rigid implant anchorage to close a mandibular first molar extraction site. J Clin Orthod 1994;28(12):693-704.
15. Roberts WE, Arbuckle GR, Analoui M. Rate of mesial translation of mandibular molars using implant-anchored mechanics. Angle Orthod 1996;66(5):331-8.
16. Chang CH. The 2B-3D rule for implant planning, placement and restoration. Int J Orthod Implantol 2012;27:79-101.
17. Peck S, Peck L, Kataja M. The gingival smile line. Angle Orthod 1992;62:91-100.
18. Wu H, Lin J, Zhou L, Bai D. Classification and craniofacial features of gummy smile in adolescents. J Craniofac Surg 2010;21(5):1474-1479.
19. Rossi R, Benedetti R, Santos-Morales RI. Treatment of altered passive eruption: periodontal plastic surgery of the dentogingival junction. Eur J Esthet Dent 2008;3(3):212-223.
20. Otto Z. Plastic-esthetic periodontal and implant surgery: a microsurgical approach. Quintessence Publishing Co, Ltd. 2012.
21. Goharkhay K, Moritz A, Wilder-Smith P, Schoop U, Kluger W, Jakolitsch S, Sperr W. Effects on oral soft tissue produced by a diode laser in vitro. Lasers Surg Med 1999;25(5):401-406.
22. Moritz A, Schoop U, Goharkhay K, Schauer P, Doertbudak O, Wernisch J, Sperr W. Treatment of periodontal pockets with a diode laser. Lasers Surg Med 1998;22(5):302-311.
23. Maiorana C, Salina S, Santoro F. Treatment of Periimplantitis with Diode Laser: A Clinical Report. J Oral Laser Applications 2002;2:121-127.
24. Samir E. B, Paul S. B, John G. K. Dental and facial asymmetries: a review. Angle Orthod 1994;64(2): 89-98.
25. Zhou S, Yan J, Da H, Yang Y, Wang Na, Wang W, Ding Y, Sun S. A correlational study of scoliosis and trunk balance in adult patients with mandibular deviation. PLoS One 2013;8(3):e59929.
26. Pitts T. Begin with the end in mind: Bracket placement and early elastics protocols for smile arc protection. Clinical impressions 2009;17(1):4-13.

Discrepancy Index Worksheet

TOTAL D.I. SCORE 33

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 = 2

Total = 2

OVERBITE

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

Total = 2

ANTERIOR OPEN BITE

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

Total = 0

LATERAL OPEN BITE

2 pts. per mm. per tooth

Total = 6

CROWDING (only one arch)

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

Total = 0

OCCLUSION

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

Total = 0

LINGUAL POSTERIOR X-BITE

1 pt. per tooth Total = 2

BUCCAL POSTERIOR X-BITE

2 pts. per tooth Total = 0

CEPHALOMETRICS (See Instructions)

ANB ≥ 6° or ≤ -2° = 4 pts.

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

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

SN-MP

≥ 38° = 2 pts.

Each degree > 38° 6 x 2 pts. = 12

≤ 26° = 1 pt.

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

1 to MP ≥ 99° = 1 pt.

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

Total = 14

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)	5 x 1 pts. =	5
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:

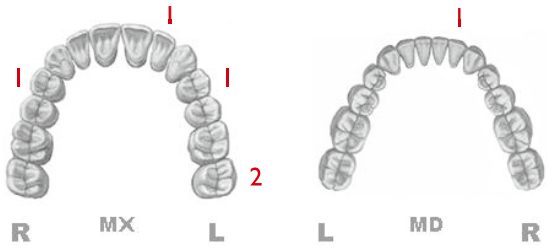
Total = 7

Cast-Radiograph Evaluation

Total CRE Score **25**

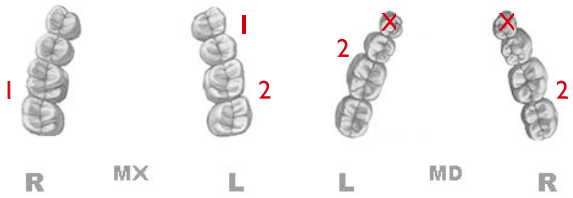
Alignment/Rotations

5



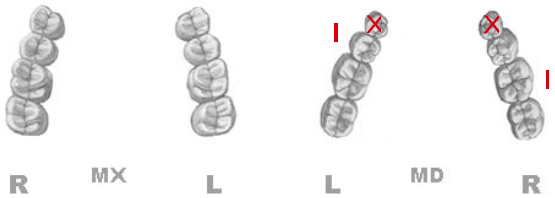
Marginal Ridges

8



Buccolingual Inclination

2

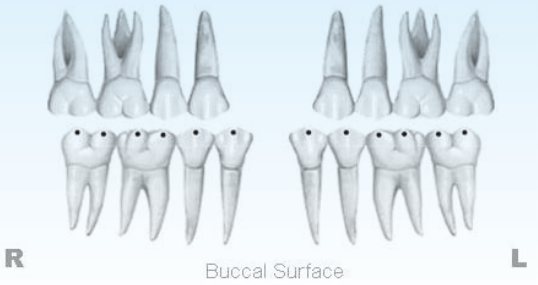


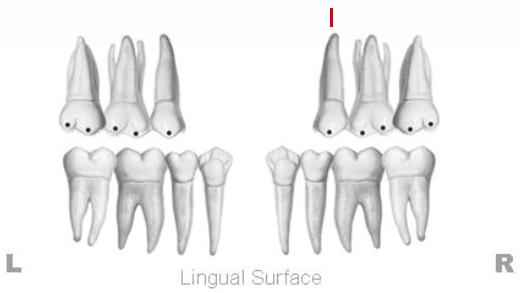
Overjet

1

Occlusal Contacts

1



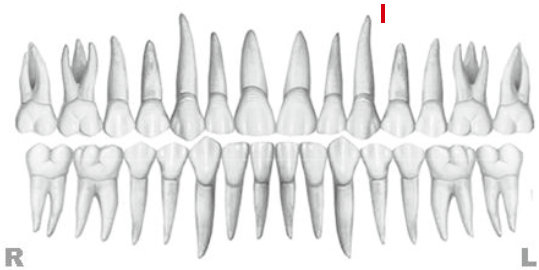


Occlusal Relationships

6

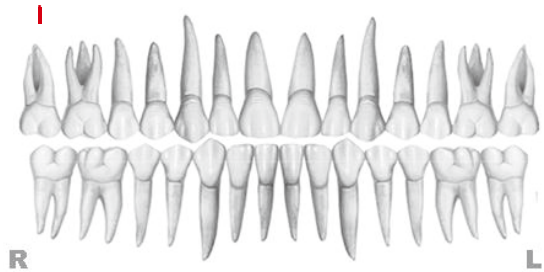
Interproximal Contacts

1



Root Angulation

1



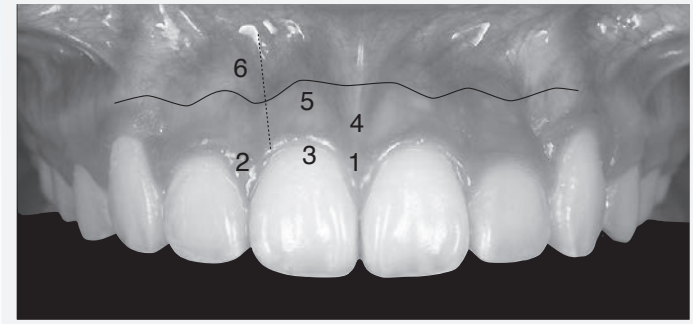
INSTRUCTIONS: Place score beside each deficient tooth and enter total score for each parameter in the white box. Mark extracted teeth with "X". Second molars should be in occlusion.

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

Total Score: = 5

1. Pink Esthetic Score

Total = 2

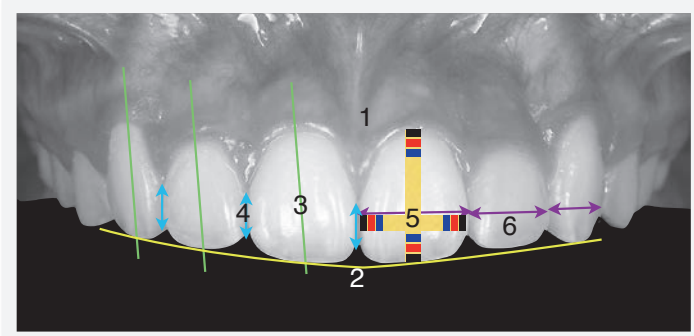


1. Mesial Papilla	0	1	2
2. Distal Papilla	0	1	2
3. Curvature of Gingival Margin	0	1	2
4. Level of Gingival Margin	0	1	2
5. Root Convexity (Torque)	0	1	2
6. Scar Formation	0	1	2

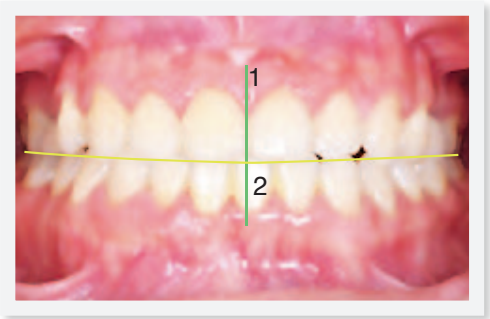
1. M & D Papilla	(0)	1	2
2. Keratinized Gingiva	(0)	1	2
3. Curvature of Gingival Margin	(0)	1	2
4. Level of Gingival Margin	0	(1)	2
5. Root Convexity (Torque)	(0)	1	2
6. Scar Formation	0	(1)	2

2. White Esthetic Score (for Micro-esthetics)

Total = 3



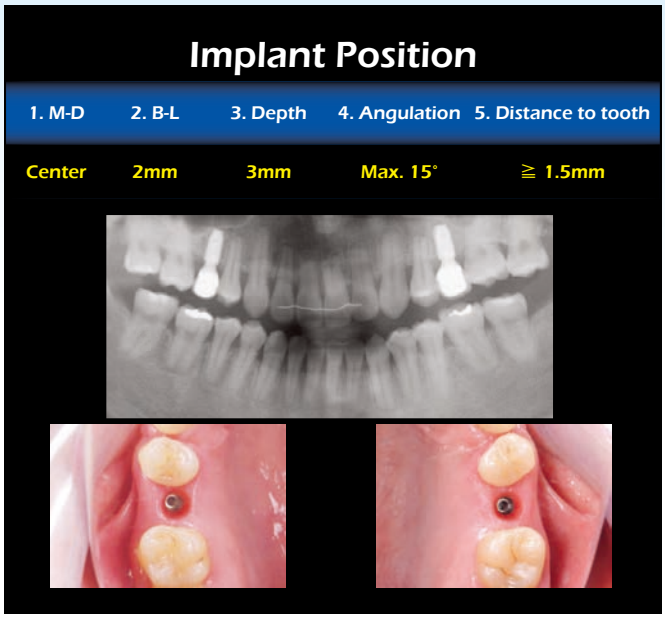
1. Midline	0	1	2
2. Incisor Curve	0	1	2
3. Axial Inclination (5°, 8°, 10°)	0	1	2
4. Contact Area (50%, 40%, 30%)	0	1	2
5. Tooth Proportion (1:0.8)	0	1	2
6. Tooth to Tooth Proportion	0	1	2



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

Implant-Abutment Transition & Position Analysis

3. Implant Position

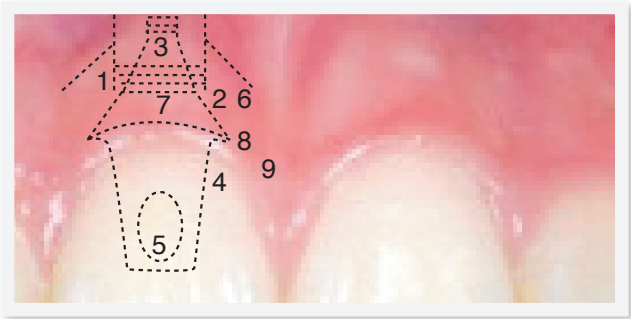


Total = 0

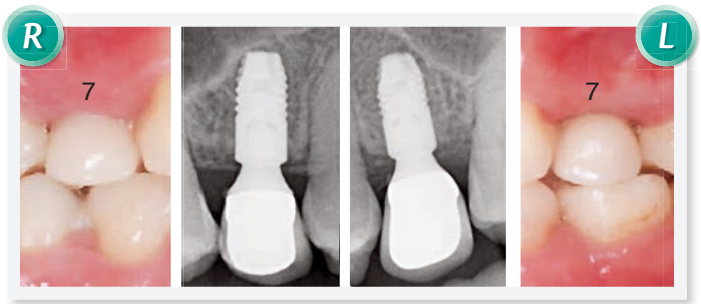
1. M & D (Center)	0	1	2
2. B & L (Buccal 2 mm)	0	1	2
3. Depth (3 mm)	0	1	2
4. Angulation (Max. 15°)	0	1	2
5. Distance to Adjacent Anatomy	0	1	2

1. M & D (Center)	(0)	1	2
2. B & L (Buccal 2 mm)	(0)	1	2
3. Depth (3 mm)	(0)	1	2
4. Angulation (Max. 15°)	(0)	1	2
5. Distance to Adjacent Anatomy	(0)	1	2

4. Abutment transition Contour



E : external connection,
I : internal connection,
S : screw type,
C : cement type,
P : palatal/central,
B : buccal



Total = 1

1. Fixture Cervical Design	N	Y	
2. Platform Switch	N	Y	
3. I-A Connection Type	E	I	
4. Abutment Selection	S	C	
5. Screw Hole Position	P	B	
6. Marginal Bone Loss	0	1	2
7. Modified Gingival Contour	0	1	2
8. Gingival Height	0	1	2
9. Crown margin fitness	0	1	2

1. Fixture Cervical Design	N	(Y)	bone level
2. Platform Switch	N	(Y)	platform
3. I-A Connection Type	E	(I)	11° morse taper
4. Abutment Selection	S	(C)	cement-retained
5. Screw Hole Position	P	B	incisor
6. Marginal Bone Loss	(0)	1	2
7. Modified Gingival Contour	0	(1)	2
8. Gingival Height	(0)	1	2
9. Crown margin fitness	(0)	1	2

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2. Board eligible

所有申請加入會員資格的醫師始可參加入會考試，參加考試的醫師將從四百題題庫選出的一百道題目作答，以 70 分（含）為通過標準，通過的醫師即可獲得 Board eligible 資格。考試的時間為一個小時。下次考試的時間為年中/年度大會前一週，以線上進行考試。

3. Diplomate

已獲得會員資格者，需要提出三篇案例報告，其中一篇案例需要再做口頭報告，通過審查後，始可獲得 iAOI 的 Diplomate 資格。三篇案例中，至少須有一篇案例，同時涵蓋 矯正與植牙領域。此為單一案例的個案報告。報告人和評論人需在規定的時間內完成報告及講評。每個報告人需在 12 分鐘內報告單一個案。大會會在第十分鐘時響第一次鈴，第十二分鐘到時會直接將麥克風關閉。每個個案報告結束後，全體評論人共有八分鐘可以講評。 大會會在第六分鐘時響第一次鈴，第十分鐘到時會直接將麥克風關閉。評論人如果有額外的意見可以以書面方式提供給報告人。

4. Ambassador

獲得院士資格的醫師，將有機會受邀在 iAOI 年度大會中提出六篇矯正與植牙結合的案例報告。完成報告的醫師，始取得 iAOI Ambassador 的資格，並且獲頒紀念獎牌，以表揚醫師對學會的特別貢獻。

＊國際矯正植牙期刊 (IJOI) 是國際矯正植牙學會 (iAOI) 發行的官方刊物。

Conservative Treatment of Periodontally Compromised Class III Malocclusion Complicated by Early Loss of Lower First Molars

Abstract

A 29-year-old woman presented with a skeletal Class III malocclusion, anterior crossbite, atrophic extraction sites in the mandibular first molar areas, and periodontal pockets on the mesial aspect of the lower second molars. Probable etiology of the anterior crossbite was early loss of lower first molars. The severe malocclusion (Discrepancy Index 30) was corrected with the asymmetric extraction of maxillary second premolar and a passive self-ligating appliance. The anterior crossbite was resolved with anterior bite turbos and light force Class III elastics. Despite the periodontal problems, closing the mandibular spaces was deemed the best option for retracting the mandibular anterior segment to correct lower lip protrusion. Following 38 months of active treatment, dentofacial esthetics were improved and excellent dental alignment was achieved (Cast-Radiograph Evaluation 23). After treatment, the periodontally-compromised mandibular second molars had grade I mobility without pain, in addition to external root resorption. Follow-up records one year later documented the stability of the malocclusion correction. Periapical radiographs at 1 and 1.5yr after treatment revealed improvement in the osseous support, and an arrest of root resorption for the right mandibular second molar, but the mesial root of the contralateral second molar was affected by internal and external root resorption. Both compromised lower second molars served as adequate anchorage and subsequently functioned normally. Although one or both of the compromised molars may be lost in the future, retaining them for as long as possible was the optimal treatment plan. (Int J Orthod Implantol 2016;42:44-59)

Key words:

Class III anterior cross-bite malocclusion, atrophic extraction site, external root resorption, self-ligating appliance

Skeletal Class III malocclusion with anterior cross-bite requires a careful differential diagnosis to formulate a viable treatment plan, particularly when there is periodontal compromise. Clinical examination[1-4] is usually more reliable than cephalometric analysis for determining if conservative treatment without orthognathic surgery is indicated. Functional assessment in centric relation (C_R) and centric occlusion (C_O) is critical for distinguishing a true skeletal Class III from a pseudo Class III malocclusion.[4] Pseudo Class III patients who have an orthognathic profile in C_R usually have a good prognosis with conservative treatment.[5]

Closing atrophic extraction sites in the posterior mandibular arch is challenging. If the periodontium is healthy, the space can be closed with routine mechanics, anchored with osseointegrated extra-alveolar implants.[6-8] If the periodontium is compromised, space closure is much less predictable.[9-11] Bone resorption decreases an edentulous alveolar ridge in width and height;[10,11] however if the periodontium of the second molar is healthy, it will generate new bone ahead of the moving tooth.[12,13] On the other hand, a

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

Fig. 1: Pre-treatment facial and intraoral photographs.

compromised periodontium may fail to generate adequate new bone and attached gingiva as the space is closed; in addition, it may present an increased risk of root resorption.[14-16]

The aim of this case report was to present a conservative approach to a skeletal Class III malocclusion, compromised by atrophic mandibular spaces and periodontal deterioration.

Diagnosis and Etiology

A 29-year-old woman was concerned about her unattractive smile. There was no contributory medical history and the only relevant dental history was the loss of lower first molars in childhood, probably due to molar-incisor enamel hypomineralization.[17,18] The latter type of enamel defects, which affect up to 20% of children worldwide, is thought to result from common illnesses with high fever in the first year or two of life. When the affected first molars erupt, they are susceptible to catastrophic caries, resulting in extraction during the juvenile years. Loss of these posterior centric stops in occlusion can result in functional shifts such as anterior crossbite (*Fig. 1*) when the deciduous molars are lost. Facial examination revealed symmetry in the frontal plane, a concave profile, and a prominent lower lip. The anterior segment of the lower arch was prominently displayed when smiling (*Fig. 1*). This clinical picture is consistent with a loss of posterior occlusal support in early adolescence.

There were no signs or symptoms of temporo-mandibular joint dysfunction (*Fig. 2*). The maxillary dental midline was coincident with the facial midline, but the mandibular dental midline was 2mm to the left in C_O. There was an anterior crossbite of all four maxillary incisors (*Fig. 1*). A fracture line was noted on the occlusal surface of a maxillary left second premolar, between the palatal cusp and an amalgam restoration, that was deemed unrestorable. The pre-treatment study casts showed a Class I

Fig. 2:
Functional assessment of mandible movement is an important diagnostic procedure.

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

molar relationship (*Fig. 3*). Overjet was a negative 2mm and overbite was 6mm. There was 10mm of crowding in the upper arch but the lower arch had 11mm of edentulous space. The buccolingual widths of atrophic alveolar ridges in the lower arch was 4mm on the right side and 5mm on the left.

The pre-treatment cephalometric analysis was consistent with a Class III skeletal pattern. There was decreased axial inclination for both the upper and lower incisors. Lips were retrusive in the upper arch, and protrusive in the lower (*Fig. 4, Table I*). The panoramic radiograph (*Fig. 5*) revealed that the mandibular second molars were mesially inclined with significant periodontal pockets on the mesial surface, particularly on the left side. The maxillary right third molar was impacted.

Fig. 4:
Pre-treatment cephalometric radiograph in centric occlusion (CO).

The American Board of Orthodontics (*ABO*) Discrepancy Index (*DI*) was 30 points, as shown in the Supplementary Discrepancy Index (*Worksheet 1*).

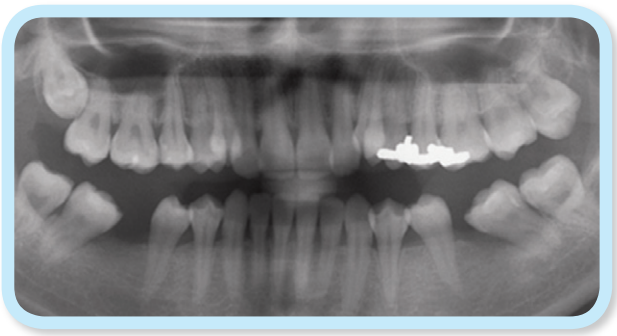


Fig. 5:
Pre-treatment panoramic radiography reveals mandibular edentulous spaces and periodontal pockets on the mesial surfaces of the lower second molars.

CEPHALOMETRIC			
SKELETAL ANALYSIS			
	PRE-Tx	POST-Tx	DIFF.
SNA°	79°	79°	0°
SNB°	83°	81°	2°
ANB°	-4°	-2°	2°
SN-MP°	34°	35°	1°
FMA°	23°	24°	1°
DENTAL ANALYSIS			
U1 TO NA mm	4 mm	5 mm	1 mm
U1 TO SN°	102°	103°	1°
L1 TO NB mm	2 mm	1 mm	1 mm
L1 TO MP°	85°	82°	3°
FACIAL ANALYSIS			
E-LINE UL	-6 mm	-5 mm	1 mm
E-LINE LL	-2 mm	-3 mm	1 mm

Table 1: Cephalometric summary

Treatment Objectives

1. Full fixed, passive self-ligating appliance to level and align both arches.
2. Open the bite and rotate the mandible posteriorly.
3. Tip the upper incisors anteriorly and retract the lower incisors for anterior cross-bite correction and to improve the incisor display when smiling.
4. Extract the unrestorable, cracked maxillary left second premolar.
5. Upright and protract the mandibular molars to close the atrophic first molar spaces.
6. Retract the mandibular anterior segment to correct the lower lip protrusion.
7. Mandibular dental midline correction with asymmetric intermaxillary elastics.
8. Optimize occlusal contacts with archwire finishing and posterior vertical elastics.[19]

Treatment Alternatives

Asymmetric extraction of maxillary premolars is efficient for relieving crowding and correcting the midline, but the patient has a retrusive upper lip and decreased axial inclination of the maxillary incisors. A better alternative was extraction of the compromised maxillary left second premolar because it was not restorable with routine procedures.

The long-term prognosis for the mandibular second molars was guarded because of the periodontal pockets on their mesial surfaces. However, those teeth are still viable anchorage units for retracting the mandibular anterior segment. If the lower second molars are extracted, implant-supported anchorage would be necessary to establish centric stops in occlusion to retract the mandibular anterior segment.[12,13] However, implant placement would require augmentation bone grafts to increase the width of the edentulous spaces. Considering the pros and cons, the patient selected the most conservative approach: retaining the compromised mandibular second molars to serve as anchorage to retract the mandibular anterior segment. She understood that in the future it may eventually be necessary to extract the compromised lower second molars and replace them with implant-supported prostheses.

Treatment Progress

The maxillary left second premolar was extracted. An .022-in fixed appliance Damon Q (*Ormco, Glendora, CA*) fixed appliance was bonded on both arches, using low torque brackets on the maxillary central incisors and canines. After the fixed appliances were placed, the maxillary right third molar was extracted. Open coil springs were placed between maxillary central incisors and canines to open space bilaterally. In the lower arch, low torque brackets were bonded upside down on the incisors, and high torque brackets were placed on the canines (*Fig. 6*). Two anterior bite turbos were bonded in the lingual surface of the mandibular central incisors and light short Class III elastics (*2oz*) were used to correct anterior cross-bite (*Figs. 6 and 7*). Six months into

Fig. 6:
The anterior crossbite was corrected with bite turbos, alignment of the maxillary anterior segment and 2oz Class III elastics. See text for details.

Fig. 7:
Two anterior bite turbos were bonded in the lingual surfaces of the mandibular central incisors.

Fig. 8:
Once the anterior crossbite was near resolution, low torque brackets were bonded on the maxillary lateral incisors.

active treatment, the anterior cross-bite was almost corrected and the maxillary lateral incisors were bonded with low torque brackets (*Fig. 8*).

In the nineteenth month, .016x.025" stainless steel archwires were placed in both arches. The upper archwire was expanded and the lower archwire was constricted. Buttons were bonded on the lingual surfaces of the mandibular first premolars and second molars to receive power-chains for space closure (*Fig. 9*). Class II elastics (*3.5oz*) were applied

Fig. 9:
Nineteen months (19M) into treatment, buttons were bonded on the mandibular first premolars and second molars, and power chains were used on the buccal and lingual surfaces to close the lower posterior spaces.

from the mandibular second molar to the maxillary canine, bilaterally. In the thirtieth month, spaces were closed and a Class II elastic (*3.5oz*) was applied from mandibular right second premolar to maxillary left central incisor for dental midline correction (*Fig. 10*). Two months before the fixed appliances were removed, the upper archwire was sectioned distal to the canines, and all upper teeth from first molar to first molar were ligated with stainless steel to prevent space opening. The lower archwire was sectioned mesially to the terminal molar, finishing bends were placed in the buccal segments, and vertical elastics were used to optimize intermaxillary tooth contacts (*Fig. 11*).

Fig. 10:
At thirty months (30M), an elastic (3.5oz) (not shown) was applied from mandibular right second premolar to maxillary left central incisor for dental midline correction.

Fig. 11:
The upper archwire was sectioned distal to the canines and the lower archwire was sectioned distal to the first molars. Light vertical elastics (2oz) were used to settle the posterior occlusion. Finishing bends were placed in the lower archwire.

Treatment Results

Facial esthetics were markedly improved by correcting mandibular lip protrusion and increasing the maxillary incisor exposure when smiling (*Fig. 12*). Near ideal dental alignment was achieved as evidenced by an ABO Cast-Radiograph Evaluation (*CRE*) score of 23 points (*Worksheet 2*). The major residual discrepancies were the axial inclinations of the mandibular left and maxillary right second molars. Substituting mandibular third for second molars is challenging because of morphologic variability. Specialized mechanics are often required to optimize intermaxillary alignment (*Fig. 13*). The asymmetric extraction of the maxillary left second premolar helped relieve crowding but resulted in a Class II molar relationship on the right side (*Fig. 14*).

The post-treatment panoramic film revealed external root resorption on the periodontally compromised mandibular second molars (*Fig. 15*). These teeth were slightly mobile, but vital and pain-free dental units that were in a satisfactory functional occlusion. The concave profile was improved (*Fig. 16*) due to the retraction of the mandibular anterior segment, correction of lower lip protrusion, and opening

Fig. 12: Post-treatment facial and intraoral photographs.

Fig. 13:
The bracket was bonded in a more distal position on the first molar to achieve distal-out rotation for improving the occlusal finish.

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

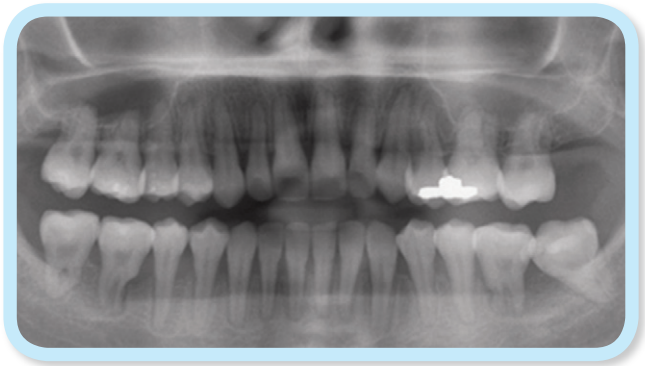


Fig. 15: Post-treatment panoramic radiograph.

Fig. 16: Post-treatment cephalometric radiograph.

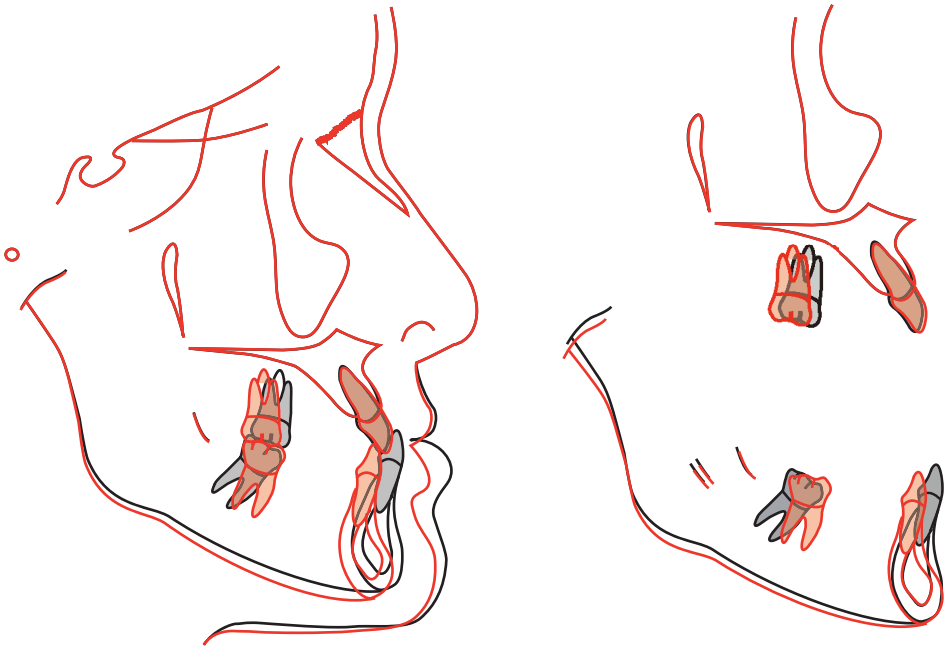


Fig. 17:
Cephalometric tracings before (black) and after (red) treatment were superimposed on the anterior cranial base (left). The upper right illustration is a superimposition of tracings on the maxilla, and the lower right is a superimposition of tracings on the skeletally stable mandibular structures (internal symphysis and inferior alveolar canal).

of the vertical dimension of occlusion (*Fig. 17*). The maxillary molars were retracted, and the mandibular second molars were uprighted and extruded. Leveling the occlusal plane resulted in posterior rotation of the mandible to improve the concave profile (*Fig. 17*). The patient was well satisfied with the result and understood the necessity to monitor the compromised lower second molars long-term. Follow-up periapical radiographs at 1 and 1.5 years revealed improvement in the osseous support for the right mandibular second molar, but external and internal root resorption affected the mesial root of the contralateral second molar (*Fig. 18*).

Fig. 18: One year follow-up records document that the correction of the malocclusion is stable.

Discussion

The conservative treatment of Class III malocclusion is challenging primarily due to inadequate diagnosis. Because of the necessity for extensive tooth movement, periodontal health is essential, particularly if closure of atrophic space is required. The 3-Ring Diagnosis is an effective method, and for the differential diagnosis for identifying Class III malocclusions that are well suited to conservative treatment.[1,2,5] There are three critical considerations:

Profile in CR: If the facial profile is orthognathic, or at least acceptable in the C_R position, the patient is a good candidate for conservative dentoalveolar treatment. If the patient has a severe prognathic mandible with a concave profile in C_R, orthognathic surgery is usually the best treatment option.

Class: Evaluate the sagittal classification of the canines and first molars in C_O. An anterior crossbite is readily resolved when the molars are Class I in C_O (*pseudo Class III*) compared to Class III in C_O (*true skeletal Class III*).

Functional Shift: The presence or absence of a functional shift from C_R —> C_O is a essential aspect of the diagnosis. Class III patients with a functional shift (*pseudo-Class III*) have an improved prognosis for conservative treatment that is proportional to the magnitude of the shift.

The present Class III patient had a straight facial profile and Class I molar relationship in C_R. Anterior bite turbos and light force Class III elastics facilitated anterior crossbite correction. In the eleventh month of active treatment, the anterior crossbite was corrected.

Closing atrophic extraction sites lengthens the treatment time, and may result in significant root resorption.[14-16] Thirty months were required to upright, align, and mesially translate the mandibular second molars. The alternatives were to extract the second molars and protract the third molars to serve as prosthetic abutments, or remove all mandibular molars in favor of implant-supported prostheses. The latter approach could shorten the orthodontic treatment time, but that advantage would probably be offset by bone augmentation and implant surgical procedures. Moreover, maintaining the posterior centric stops in occlusion facilitated correction of the anterior crossbite and excessive overbite.

Mesial translation of the periodontally compromised mandibular second molars was a calculated risk, but that approach had two important advantages: 1. development of the narrow alveolar ridges as potential implant sites if needed, and 2. retract the mandibular anterior segment to correct the anterior crossbite and excessive lower lip protrusion. To help

control the expression of external root resorption, the force levels and treatment time are minimized, as much as possible.[14,15] Periodic pauses in treatment allowed the resorbed cementum to heal.[14,16]

The primary concerns associated with closure of the lower atrophic spaces were the narrow ridges and periodontal pockets on the mesial aspects of the tipped second molars. Pseudo-periodontal pockets are common on mesially tipped mandibular molars,[15] but the initial panoramic radiograph for the present patient suggested the pockets were considerably deeper than that (*Fig. 5*). According to Brown,[9] orthodontic uprighting reduces the depth of pseudo-pockets but well established apical migration of the epithelial attachment persists. An important consideration when uprighting mandibular molars is occlusal trauma, which may contribute to alveolar bone loss and root resorption.[20-22] Occlusal trauma for the present patient was controlled with anterior bite turbos and occlusal adjustment of the mandibular second molars.

The narrow ridges were expected to contribute to bone loss as the periodontally compromised second molars were moved mesially.[23,24] The ideal dimensions of the alveolar ridge for mandibular first molar space closure are reported to be 6mm or less of mesiodistal length and 7mm of buccolingual width.[25] However, if the periodontium is healthy, space closure will generate adequate periodontium.[6-8] To prevent the tendency for mesial and lingual tipping of second molars during space closure, a relatively large rectangular stainless steel archwire was used, and force was applied from both the buccal and lingual surfaces.[26,27]

Although both mandibular atrophic spaces were closed, and the severe malocclusion was resolved, the mandibular second molars were both slightly mobile. Post-treatment radiographs revealed a bilateral loss of supporting bone and external root resorption. Periapical radiographs at 1 and 1.5yr of follow-up revealed improvement in the osseous support for the right mandibular second molar, but the contralateral second molar continued to be affected by root resorption. Continued monitoring of the questionable teeth is indicated. In the future, it may be necessary to remove one or both of them in favor of implant-supported prostheses. Despite this potential problem, the periodontally compromised second molars served as important anchorage units to resolve the malocclusion and develop the edentulous areas as implant sites. At 1.5yr after treatment the affected molars are stable and comfortable dental units in routine function (*Fig. 19*), but continuing clinical and radiographic monitoring is required.

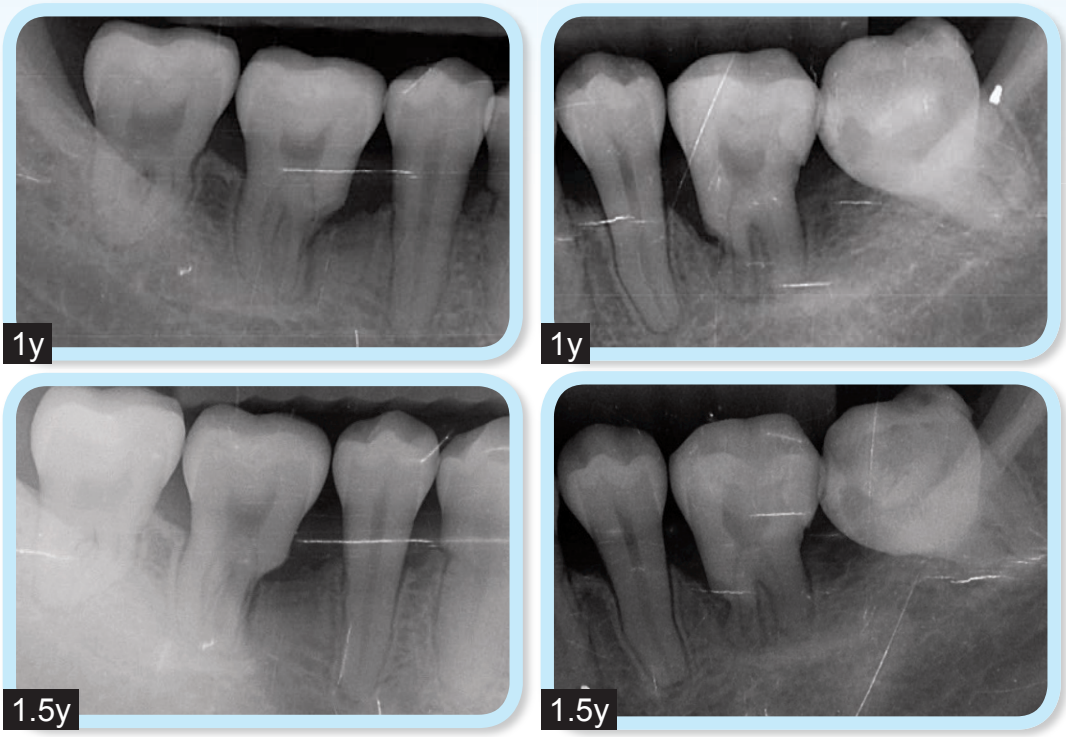


Fig. 19:
Periapical radiographs of the mandibular buccal segments show the osseous support of both periodontally compromised second molars is relatively stable. Root resorption has ceased on the lower right second molar (lower left radiograph), but is still evident on the external and internal surfaces of the mesial root of the lower left second molar (lower right radiograph).

Conclusions

An appropriate differential diagnosis of Class III malocclusion with anterior crossbite requires an assessment of its etiology, as well as an evaluation of the facial profile, molar classification, and functional shift. Differentiating true skeletal from pseudo Class III malocclusions is critical for prescribing the appropriate treatment. Closing atrophic edentulous sites is desirable if the result is a more favorable alignment of the teeth. For the present patient, the utilization of periodontally compromised molars for anchorage provided an optimal outcome.

References

1. Lin JJ, Liaw JL, Chang CH and Roberts WE. Class III Correction Orthodontics. Taipei: Yong Chieh Enterprise Co, Ltd; 2013.
2. Lin JJ. Creative Orthodontics: Blending the Damon system & TADs to manage difficult malocclusion. 2nd ed. Taipei: Yong Chieh Enterprise Co, Ltd; 2010.
3. Lin JJ. The Most Effective and Simplest Ways of Treating Severe Class III, without Extraction or Surgery. Int J Ortho Implantol 2014;33:4-18.
4. Ngan P, Hu AM, Fields HW Jr. Treatment of Class III problems begins with differential diagnosis of anterior crossbite. Pediatr Dent 1997;19(6):386-95.
5. Tseng LY, Chang CH, Roberts WE. Diagnosis and conservative treatment of skeletal Class III malocclusion with anterior cress bite and asymmetric maxillary crowding. Am J Orthod Dentofacial Orthop 2016;149(4):555-566.

6. Roberts WE, Marshall KJ, Mozsary PG. Rigid endosseous implant utilized as anchorage to protract molars and close an atrophic extraction site. Angle Orthod 1990;60(2):135-152.
7. Roberts WE, Nelson CL, Goodacre CJ. Rigid implant anchorage to close a mandibular first molar extraction site. J Clin Orthod 1994;28(12):693-704.
8. Roberts WE, Arbuckle GR, Analoui M. Rate of mesial translation of mandibular molars using implant-anchored mechanics. Angle Orthod 1996;66(5):331-8.
9. Brown IS. The effect of orthodontic therapy on certain types of periodontal defects. J Periodontol 1973;44:742-56.
10. Ostler M, Kokich V. Alveolar ridge changes in patients congenitally missing mandibular second molars. J Prosthet Dent 1994;71:144-9.
11. Kokich VG, Kokich VO. Congenitally missing mandibular second premolars: clinical options. Am J Orthod Dentofacial Orthop 2006;130:437-44.
12. Roberts WE: Adjunctive orthodontic therapy in adults over 50 years of age: clinical management of compensated, partially edentulous malocclusion. J Indiana Dent Assoc 1997;76(2):33-41.
13. Roberts WE, Hartsfield JK. Multidisciplinary management of congenital and acquired compensated malocclusions: diagnosis, etiology and treatment planning. J Indiana Dent Assoc 1997;76(2):42-51.
14. Roscoe MG, Meira JBC, Cattaneo PM. Association of orthodontic force system and root resorption: A systematic review. Am J Orthod Dentofacial Orthop 2015;147:610-26.
15. Maués CP, do Nascimento RR, Vilella Ode V. Severe root resorption resulting from orthodontic treatment: prevalence and risk factors. Dental Press J Orthod 2015;20(1):52-8.
16. Aras B, Cheng LL, Turk T, Elekdag-Turk S, Jones AS, Darendeliler MA. Physical properties of root cementum: Part 23. Effects of 2 or 3 weekly reactivated continuous or intermittent orthodontic forces on root resorption and tooth movement: A microcomputed tomography study. Am J Orthod Dentofacial Orthop 2012;141:e29-e37.
17. Pitiphat W, Savisit R, Chansamak N, Subarnbhesaj A. Molar incisor hypomineralization and dental caries in 6-7 year old Thai children. Pediatric Dentistry 2014;36(7):478-82.
18. Wuollet E, Laisi S, Salmela E, Ess A, Alaluusua S. Background factors of molar-incisor hypomineralization in a group of Finnish children. Acts Odontol Scand 2014;72(8):963-9.
19. Steffen JM, Haltom FT. The five-cent tooth positioner. J Clin Orthod 1987;21(8):528-9.
20. Saga AY, Maruo IT, Maruo H, Filho OG, Camargo ES, Tanaka OM. Treatment of an adult with several missing teeth and atrophic old mandibular first molar extraction sites. Am J Orthod Dentofacial Orthop 2011;140:869-78.
21. Yusof WZ, Ghazali MN. Multiple external root resorption. J Am Dent Assoc 1989;118:453-5.
22. Cakmak F, Turk T, Karadeniz EI, Elekdag-Turk S, Darendeliler MA. Physical properties of root cementum: Part 24. Root resorption of the first premolars after 4 weeks of occlusal trauma. Am J Orthod Dentofacial Orthop 2014;145:617-25.
23. Kessler M. Interrelationships between orthodontics and periodontics. Am J Orthod 1976;70:154-72.
24. Stepovich ML. A clinical study on closing edentulous spaces in the mandible. Angle Orthod 1979;49:227-33.
25. Hom BM, Turley PK. The effects of space closure of the mandibular first molar area in adults. Am J Orthod 1984;85:457-69.
26. Sandler PJ, Atkinson R, Murray AM. For four sixes. Am J Orthod Dentofacial Orthop 2000;117:418-34.
27. Yeh HY, Chang CH, Roberts WE. A treatment of a bimaxillary protrusion case with canine substitution and impacted third molar uprighting. Int J Orthod Implantol 2013;29:76-88.

Discrepancy Index Worksheet

TOTAL D.I. SCORE 30

OVERJET

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

Negative OJ (x-bite) 1 pt. per mm. per tooth = 7

Total = 7

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

Total = 0

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° 2 x 1 pt. = 2

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 = 6

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)	2	x 1 pts. =	2
Missing teeth, congenital	_____	x 2 pts. =	_____
Spacing (4 or more, per arch)	_____	x 2 pts. =	_____
Spacing (Mx cent. diastema ≥ 2mm)		@ 2 pts. =	_____
Tooth transposition	_____	x 2 pts. =	_____
Skeletal asymmetry (nonsurgical tx)		@ 3 pts. =	_____
Addl. treatment complexities	2	x 2 pts. =	4

Identify: Atrophic ridges (both sides)

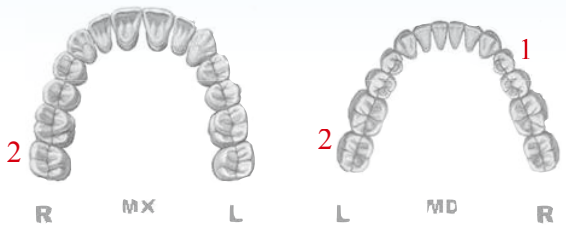
Total = 6

Cast-Radiograph Evaluation

Total Score: 23

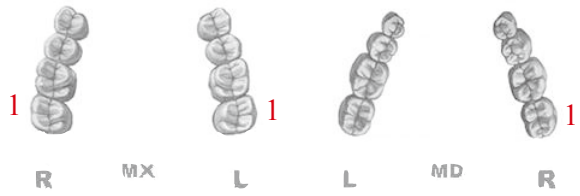
Alignment/Rotations

5



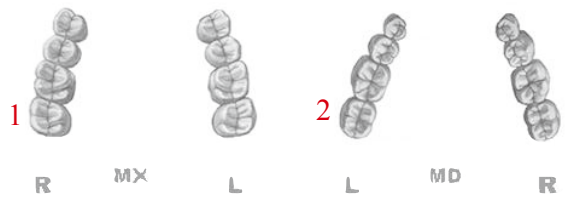
Marginal Ridges

3



Buccolingual Inclination

3

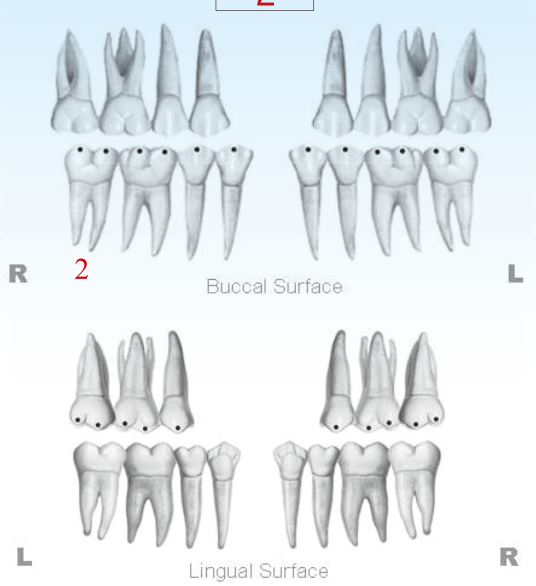


Overjet

1

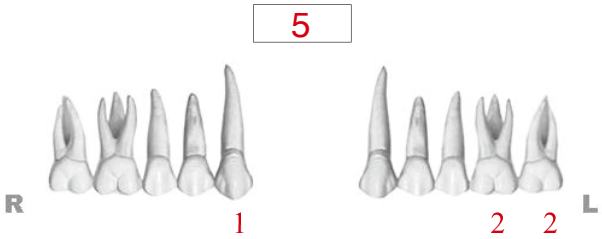
Occlusal Contacts

2



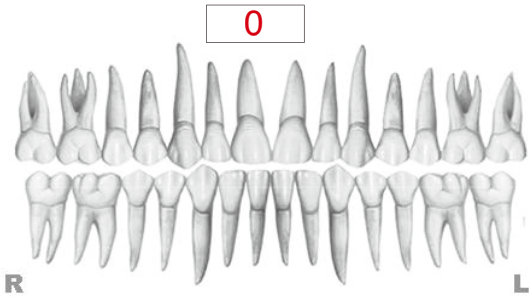
Occlusal Relationships

5



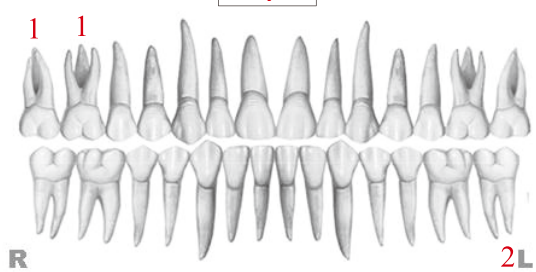
Interproximal Contacts

0



Root Angulation

4



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.

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Dr. John Lin

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

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Day 4	Keynote workshop

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Extraction Treatment for an Asymmetric Class III/I Malocclusion with Blocked-Out Canine, Bimaxillary Crowding, Midline Deviation

Abstract

A 20y2m female presented for orthodontic consultation to evaluate severe crowding, ectopic eruption of the upper right canine, a canted occlusal plane, and protrusive lips. Clinical examination revealed a Class III/I asymmetric malocclusion with severe crowding, narrow arches, a steep mandibular plane (SN-MP 41˚), and flared lower incisors (L1 to MP 108˚). The Discrepancy Index (DI) for this challenging malocclusion was 32. All four first premolars were extracted and the malocclusion was treated with passive self-ligating brackets. The pleasing result is documented by a Cast Radiograph Evaluation (CRE) of 24 and a Pink & White (P&W) dental esthetic score of 4. Follow-up records two years later revealed a stable result. (Int J Orthod Implantol 2016;42:64-80)

Key words:

Blocked out canine, severe crowding, midline deviation, asymmetric Class III malocclusion, passive self-ligating appliance, posterior crossbite

Introduction

Blocked-out maxillary canines are one of the most frequently encountered problems in orthodontic practice because they are usually the last teeth to erupt during the late transitional phase of dental development. If the maxillary dentition is severely crowded, one or both canines may erupt high in the labial fold. This is a common problem in developed countries because children tend to consume a refined diet, which does not require sufficient biting strength to fully develop the jaws in width.[1]

Consistent with this dental history, a 20y2m female presented for orthodontic consultation with severe crowding, relatively narrow arches, a unilateral posterior lingual crossbite, a unilateral Class III molar relation, and a unilateral blocked out maxillary canine. This case report demonstrates the treatment using passive self ligating brackets, open coil springs, bilateral Class III and crossbite elastics, which eventually led to elimination of orthognathic surgical approaches.

Dr. Angle Lee,
Editor, International Journal of Orthodontics & Implantology (Left)

Dr. Chris Chang,
Founder, Beethoven Orthodontic Center
Publisher, International Journal of Orthodontics & Implantology (Middle)

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

Diagnosis

Pre-treatment facial photographs (*Fig. 1*) revealed a protrusive facial profile, primarily due to the prominent position of the lower lip. Intraoral views (*Fig. 2*) and study casts (*Fig. 3*) showed a Class III molar relationship on the right side and Class I molar relationship on the left side. Tooth Size Arch Length Discrepancy was 13mm of crowding in the maxillary arch, with 9mm of crowding in the mandibular arch. The right permanent maxillary canine (*Tooth #6*) was blocked out of the arch in the labial direction. In centric occlusion (*Co*), the upper midline was shifted to the right ~5mm. Crossbites were noted on the right posterior (*Teeth #31*) and anterior (*Teeth #22, 23, 26-28*) regions. Detailed photograph of the maxillary anterior regions (*Fig. 4*) documented the complexity of the malocclusion. In addition, generalized crowding was noted in both arches (*Figs. 2-3*). There was no further contributory medical or dental history.

Cephalometric radiograph (*Fig. 5*) revealed skeletal Class I relationship (*SNA 81°, SNB 77°, ANB 4°*), increased mandibular plane angle (*SN-MP 41°*), as well as 2mm negative overjet and proclination of both upper and lower incisors (*L1 to MP 108°*). Panoramic radiographs (*Fig. 5*) showed that the

Fig. 1: Pretreatment facial photographs show a relatively protrusive profile with a prominent lower lip.

Fig. 2: Pre-treatment intraoral photographs

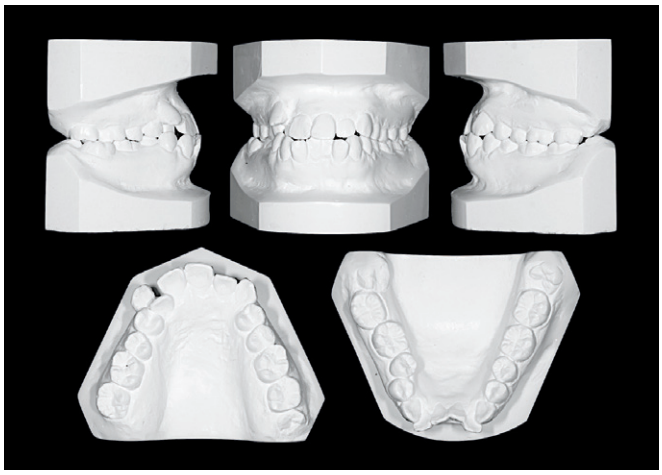
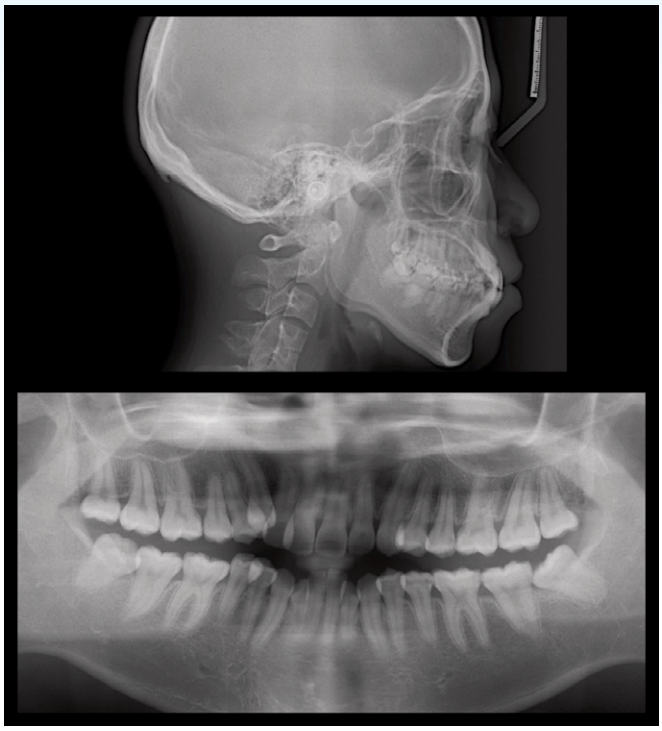


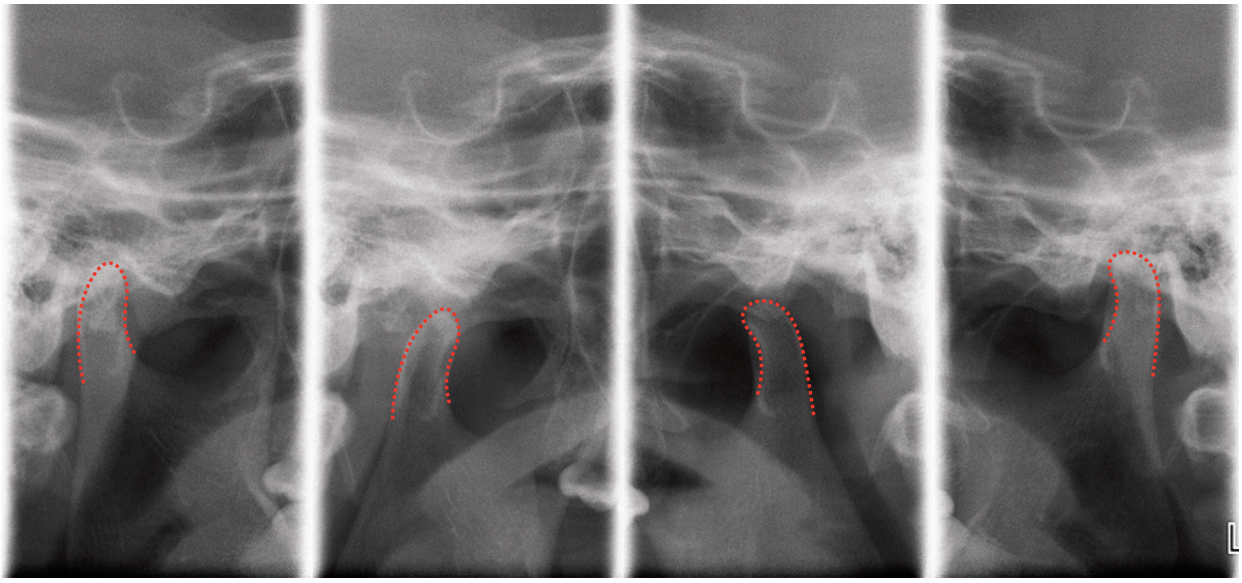
Fig. 3: Pre-treatment study models (casts)

upper incisors (*Teeth #7-10*) were tilted in a clockwise direction producing a canted occlusal plane (*Fig. 1*). Asymmetric movement of condylar head was documented during mouth opening (*Fig. 6*). There were no other signs or symptoms of temporo-mandibular disorder.

■ *Fig. 4:*
The right maxillary canine is blocked out facially.



■ *Fig. 5:*
Pre-treatment cephalometric and panoramic radiographs



■ *Fig. 6:*
The temporo-mandibular joint imaging shows asymmetric movement of the condylar head during mouth opening. The two images on the left show the right condyle in the closed and open mouth positions, respectively. The two images on the right show the left condyle in the open and closed mouth positions, respectively.

The American Board of Orthodontics (*ABO*) Discrepancy Index (*DI*) was 32 points as shown in the subsequent worksheet 1.

Treatment Objectives

The principal objectives of the treatment were to correct (*1*) the blocked-out canine; (*2*) severe crowding in both arches; and (*3*) lingual crossbite on the right side.

Treatment Alternatives

Surgically assisted rapid palatal expansion and distraction of the labially placed maxillary right canine into the extraction space of the right first premolar by taking anchorage from a skeletal anchorage device, it was once used as a means to correct a case with a unilateral posterior lingual crossbite, an asymmetric molar relationship, and a maxillary right canine high in the labial sulcus.[2] As the patient refused to undergo surgery, we decided to plan a non-surgical approach.

The first premolars in all four quadrants were extracted to create space for correction of severe crowding in both arches. An open coil spring is indicated in the upper arch between the right central incisor and canine to create space for alignment of the palatally displaced lateral incisor, as well as to help correct the dental midline. Bilateral Class III and crossbite elastics[3] in addition to detailing bends will be used to refine the intermaxillary alignment. Following the removal of fixed appliances, the corrected dentition will be retained in both arches with clear overlay and fixed anterior retainers (*upper 2-2, lower 3-3*).

Treatment Progress

The fixed appliance selected was the .022" slot Damon Q bracket system (*Ormco, Glendora, CA*) with standard torque brackets in the anterior segments. The programmed archwire sequence for the upper arch was .014" CuNiTi, .014x.025" CuNiTi, .017x.025" TMA, and .019x.025" SS, and the lower archwire sequence was .014" CuNiTi, .014x.025" CuNiTi, .017x.025" TMA, and .016x.025" SS.

After extracting the four first premolars, brackets were bonded on all maxillary teeth. When the initial maxillary archwire (*.014" CuNiTi*) was inserted, an open coil spring was placed between the right central incisor and canine. A plastic thread was tied from right lateral incisor to the archwire (*Figs. 7-8*) to help control flaring of the central incisor and initiate

Fig. 7:
A compressed open coil spring was placed between right central incisor and canine, and then a plastic thread tied from right lateral incisor bracket to the main archwire. This mechanism is designed to reduce incisal flaring during the space opening process.

Fig. 8:
First premolars were extracted and the upper arch was bonded.

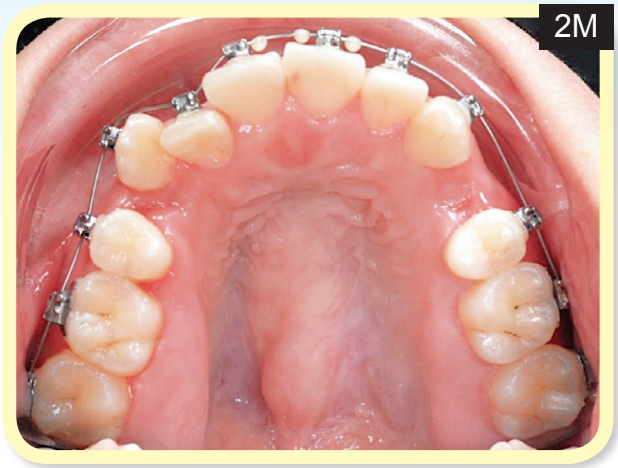


Fig. 9:
After 2 months of treatment, the right maxillary canine and adjacent lateral incisor were sufficiently aligned to be engaged with the continuous archwire.

correction of the maxillary midline. The patient was instructed to practice "*lip seal exercise*" to help prevent flaring of the anterior teeth.

» In the 2nd month of treatment, all teeth in the maxillary arch were fully engaged on the archwire (*Fig. 9*). The mandibular arch was bonded and the first lower archwire was .014" CuNiTi.

» In the 4th month of treatment, the archwire on the upper arch was changed to .014x.025" CuNiTi to continue the arch development, as well as to complete the leveling and alignment.

» In the 8th month of treatment, the right maxillary canine and adjacent lateral incisor were aligned (*Fig. 10*). The upper archwire was changed to .017x.025" TMA, and the upper 3-3 segment was ligated together with a figure-eight tie. A .014x.025" CuNiTi archwire was placed in the lower arch.

» In the 10th month of treatment, the archwire was

Fig. 10:
After 8 months of treatment, the right maxillary canine and adjacent lateral incisor were aligned in preparation for space closure.

changed to .019x.025" SS in the upper arch, with .017x.025" TMA in the lower arch. The lower 3-3 were ligated together by a figure-eight ligature tie. The upper and lower spaces were closed with elastomeric modules (*power chains*) on the main archwires. Both upper and lower arches were expanded with CuNiTi wires for 8 months.

Fig. 11:
Lingual buttons (blue circle) were bonded on the upper right molars to receive cross elastics to correct posterior crossbite (yellow circle).

» In the 15th month of treatment, bilateral Class III elastics (*Bear 1/4", 4.5oz*) from the upper 1st molars to lower canines were used to resolve the sagittal discrepancy.

» In the 16th month of treatment, all four third molars were extracted.

» In the 17th month of treatment, the archwire was changed to .016x.025" SS in the lower arch. Lingual buttons were bonded on teeth #12 and #13, and full time cross elastics (*Chipmunk 1/8", 3.5oz*) were applied to correct lingual crossbite of #17 and #18 (*Fig. 11*) Expansion of the upper archwire and constriction of the lower archwire were performed to assist in correction of the right posterior lingual crossbite.

» In the 21st month of treatment, the lingual crossbite was corrected, and cross elastics were continued for one more month to achieve over-correction. Class III elastics were maintained to complete correction of the sagittal discrepancy.

» In the 24th month of treatment, the patient was instructed to wear one L-type elastic (*Bear 1/4", 4.5oz*) from the upper right molars to the lower right canine to correct midline and detail the occlusion.

» In the 28th month of treatment, overbite and overjet were both 1mm. As illustrated in Figure 12, two intermaxillary elastics (*Monkey, 3/8", 3.5oz*) from the maxillary central incisors to the lower first molars on the opposite side were used to close the bite for final detailing.

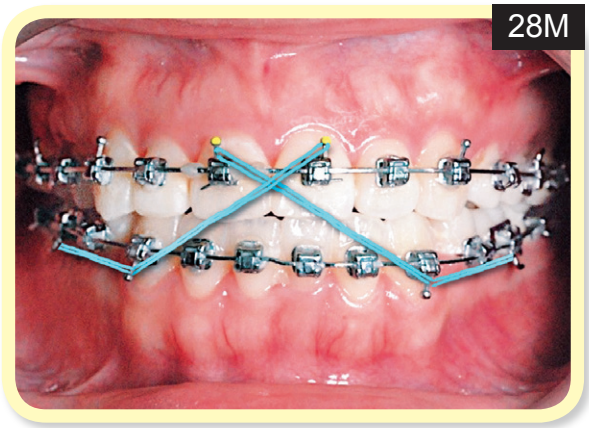


Fig. 12:
Two elastics (Monkey, ⅜", 3.5oz) were stretched from the central incisor to the molar on the opposite side. Note that the elastic passes beneath the hook on the lower canines. This configuration was designed to deepen the bite in preparation for final detailing.

After 32 months of active treatment, all appliances were removed. Upper and lower clear overlay and fixed anterior (*upper 2-2, lower 3-3*) retainers were delivered for both arches.

Treatment Results

The patient was treated to the desired result as documented in Figs. 13-15. The cephalometric and panoramic radiographs before and after treatment are shown in Figs. 5 and 16, respectively. Superimposed cephalometric tracings are presented in Fig. 17. The summary of cephalometric measurements is provided in Table 1.

CEPHALOMETRIC			
SKELETAL ANALYSIS			
	PRE-Tx	POST-Tx	DIFF.
SNA°	81°	80°	1°
SNB°	77°	76°	1°
ANB°	4°	4°	0°
SN-MP°	41°	41°	0°
FMA°	34°	34°	0°
DENTAL ANALYSIS			
U1 TO NA mm	7 mm	4 mm	3 mm
U1 TO SN°	106°	104°	2°
L1 TO NB mm	13 mm	7 mm	6 mm
L1 TO MP°	108°	95°	13°
FACIAL ANALYSIS			
E-LINE UL	0 mm	-1 mm	1 mm
E-LINE LL	5 mm	2 mm	3 mm

Table 1: Cephalometric summary

Fig. 13: Post-treatment facial photographs document a less protrusive orthognathic profile.

Fig. 14: Post-treatment intraoral photographs

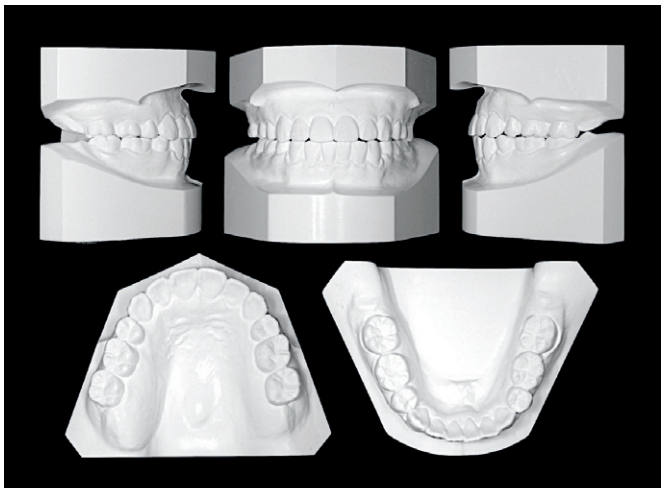


Fig. 15: Post-treatment study models (casts)

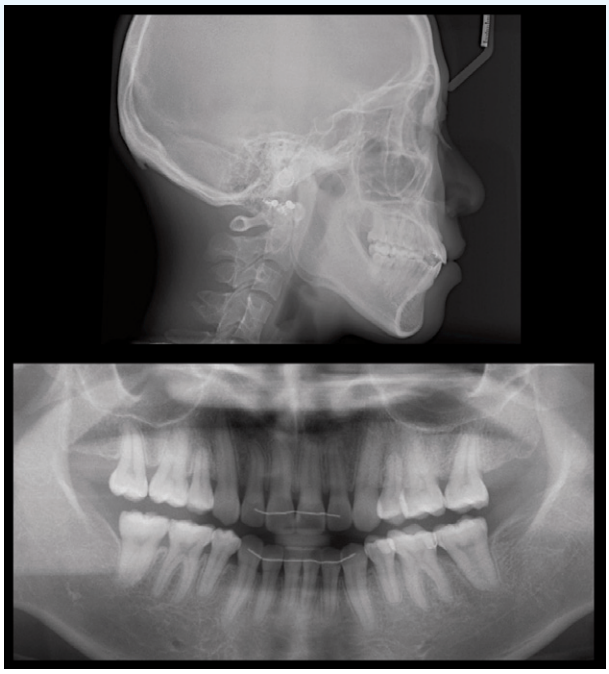


Fig. 16:
Post-treatment cephalometric and panoramic radiographs

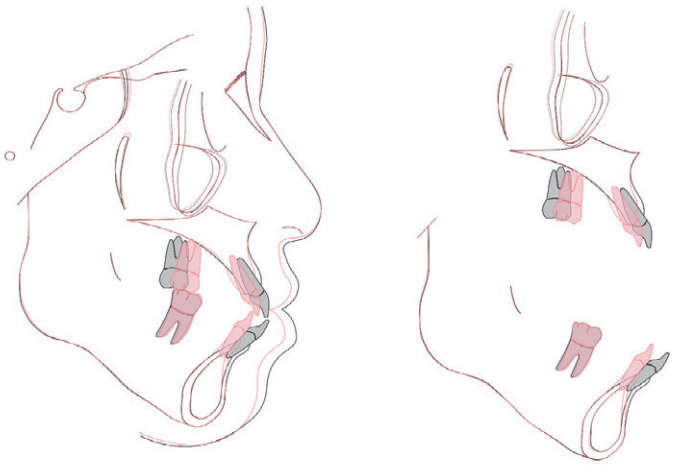


Fig. 17:
Cephalometric tracings document the dental and skeletal changes during treatment. The pretreatment (black) and post-treatment (red) tracings are superimposed on the anterior cranial base (left), as well as on the stable skeletal landmarks of the maxilla (upper right), and mandible (lower right).

The American Board of Orthodontics (*ABO*) Cast-Radiograph Evaluation (*CRE*) score was 24 points (*Worksheet 2*), as documented on the forms appearing later in this report. The major discrepancies were in bucco-lingual inclination (*9 points*). The maxillary dental midline deviation was decreased to 1mm right of the facial midline. All premolar-extraction space was closed and the blocked-out canine was well aligned.

The Pink & White dental esthetic score was 4 points (*Worksheet 3*), as documented on the form appearing later in this report. The gingival texture is healthy without any bony dehiscence or apparent bone loss.[4-5]

Overall, the anterior teeth were retracted (*Fig. 17*), the midline deviation as well as the right crossbite were significantly improved, and the maxillary arch was well expanded (*Fig. 14*). The patient was quite satisfied with the result (*Fig. 18*). Figs. 19a-d is a

Fig. 18:
A post-treatment portrait photograph shows the final result, with which the patient was well satisfied.

Fig. 19a:
The frontal view of the treatment sequence is shown in clockwise order from pretreatment (upper left) to post-treatment (lower left). The months of treatment is shown in the black box in the upper right corner of each photograph.

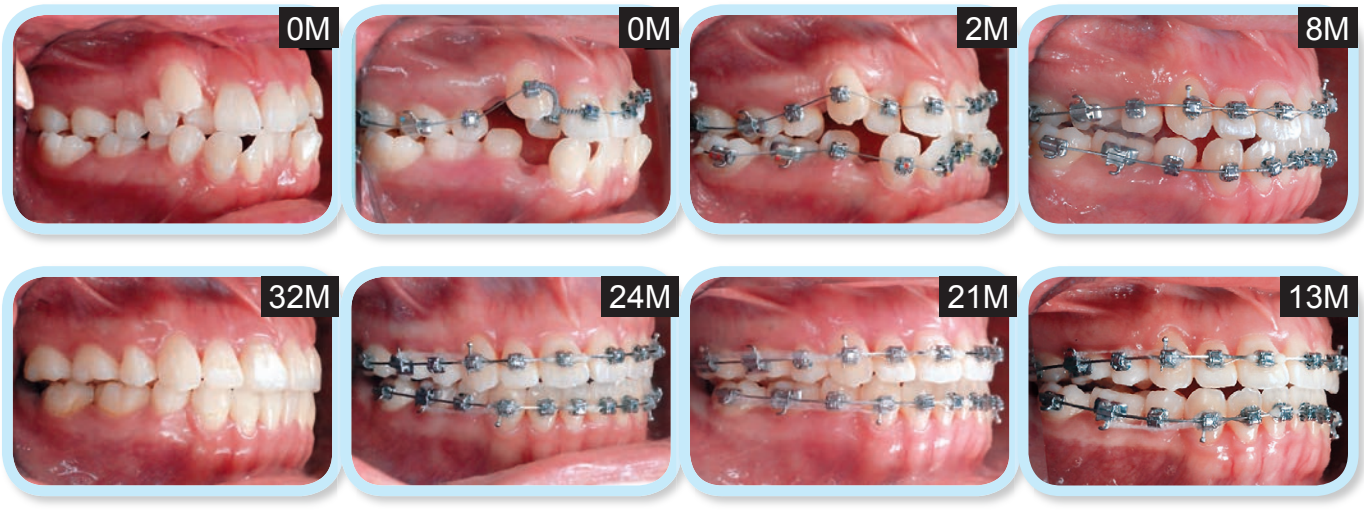


Fig. 19b:
The right lateral view of the treatment sequence is shown in clockwise order from pretreatment (upper left) to post-treatment (lower left). The months of treatment is shown in the black box in the upper right corner of each photograph.

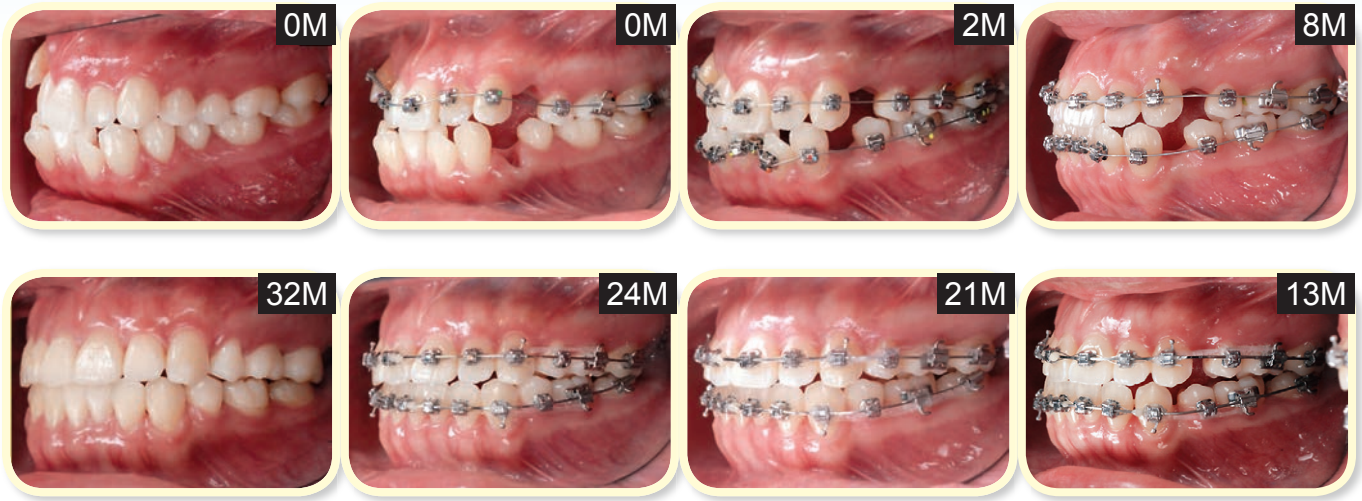


Fig. 19c:
The left lateral view of the treatment sequence is shown in clockwise order from pretreatment (upper left) to post-treatment (lower left). The months of treatment is shown in the black box in the upper right corner of each photograph.

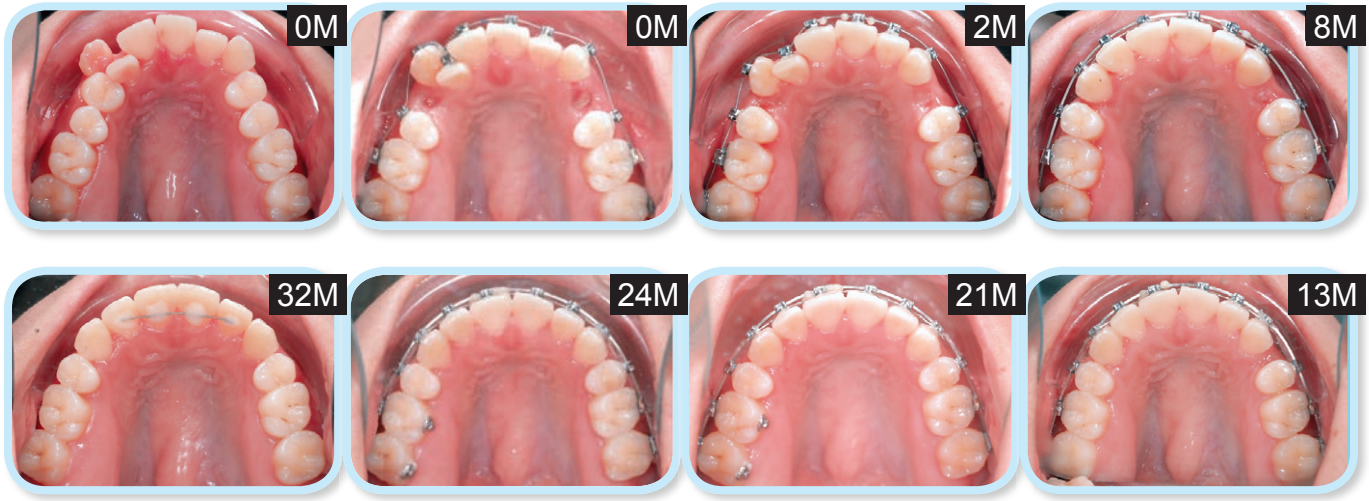


Fig. 19d:
The maxillary occlusal view of the treatment sequence is shown in clockwise order from pretreatment (upper left) to post-treatment (lower left). The number of months of treatment is shown in the black box in the upper right corner of each photograph.

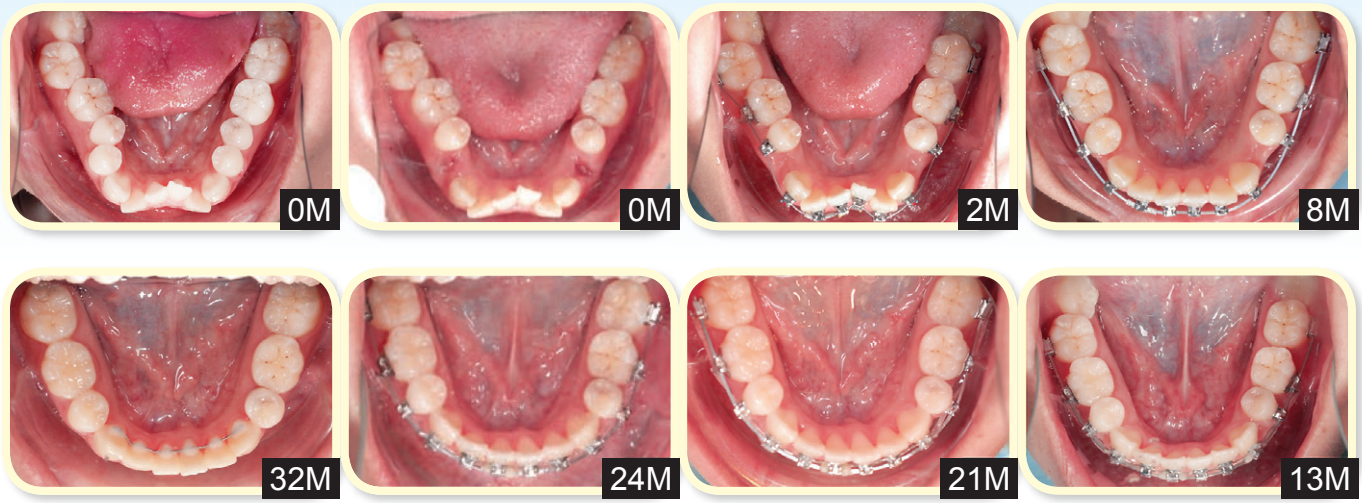


Fig. 19e:
The mandibular view of the treatment sequence is shown in clockwise order from pretreatment (upper left) to post-treatment (lower left). The months of treatment is shown in the black box in the upper right corner of each photograph.

sequence of intraoral photographs documenting the entire treatment sequence. Despite the asymmetric movement of the mandibular condyles during opening (*Fig. 6*), no significant temporo-mandibular disorders problems were noted during or after treatment.

Fixed retainers were bonded on all maxillary incisors and from canine to canine in the mandibular arch. Upper and lower clear overlay retainers were delivered. The patient was instructed to wear them full time for the first 6 months and then nights only. Home care and retainer maintenance instructions were also provided.

Discussion

When maxillary lateral incisors are blocked out to the palate, an open coil spring between the central incisor and canine is often indicated to create space.[6] As the space opens, the central incisor tends to move anteriorly, and may irritate the buccal mucosa (*Fig. 20*). For the present patient a modified approach was used. The blocked out lateral incisor was bonded at the start of treatment, and the archwire segment with the coil spring was directly secured to the lateral with a plastic ligature. This mechanism applies a restraining force on the central incisor, resulting in space opening that primarily involves distal movement of the canine (*Fig. 19d*). Lip seal exercises were also introduced to help control maxillary incisor flaring. Figure 19d documents that this approach efficiently opened the space and helped correct the midline deviation, with minimal flaring of the central incisors.

Analyzing the extensive documentation provided by Figs. 19a-d, helped identify additional measures that would have further improved clinical efficiency:

1. Cross-elastics on the right side and an occlusal bite turbo on the left side from the beginning of

Fig. 20:
The upper two illustrations show the result when an compressed open coil is used to open space for lateral incisors without engaging the blocked out teeth to decrease the tendency for central incisor flaring.[6] The lower two pictures from this case report show of the lateral incisor bracket with a plastic ligature to help control central incisal flaring and mucosal irritation. See text for details.

the treatment would have resolved the crossbite during the initial alignment phase. However, this approach requires close supervision because of the extrusive components of the cross-elastic (*Fig. 21*), particularly since the present patient has a high mandibular plane angle. To control this problem, buccal shelf miniscrews[7-8] provide direct skeletal anchorage with an intrusive component which is useful for controlling buccal segment extrusion to correct a canted occlusal plane.

2. Extracting the right lower third molar before bonding the lower arch would prevent blocking the path of tooth movement, as the lingual tipped second molar was uprighted.

3. Applying Class III elastics and space closure

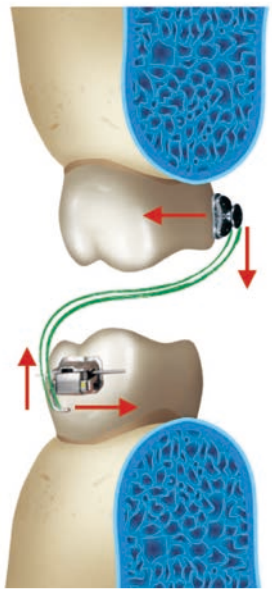


Fig. 21:
"Through the bite" or cross elastics produce the desired horizontal force to correct a crossbite. However, side effects are the vertical forces that tend to extrude the teeth. The latter must be carefully monitored to avoid excessive opening of the bite anteriorly.[9]

power chains earlier in the treatment would produce more efficient intermaxillary alignment.

It is important to integrate correction of the dental midlines into the space closure phase of treatment. Minor midline discrepancies at the finishing stage are not a significant problem, but it is quite difficult to correct large discrepancies after extraction spaces have been closed and occlusal relationships have been established.[10]

An upper 5mm midline discrepancy to the right was noticed before treatment, which was primarily related to crowding on the right side. After first premolar extraction and preliminary alignment, the midline discrepancy decreased to 2mm in 24 months. Then the patient was instructed to wear one L-type elastic (*Bear 1/4", 4.5oz*) from the upper right molars to the lower right canine to correct the midline and detail the occlusion. In the 27th month of treatment, the midline discrepancy decreased to 1mm. Alkhal[11] suggested that spontaneous midline correction can be facilitated by delaying extraction of the premolar on the crowded side; this approach also reduces the chance that the crowded canine will drop into occlusion in the wrong position.

Dental alignment and gingival margin contour were improved after the treatment (*Fig. 22*). Following treatment the maxillary dental midline was 1.0mm to the right of the facial midline, which is an insignificant problem because Kokich, Kiyak and Shapiro[12] found

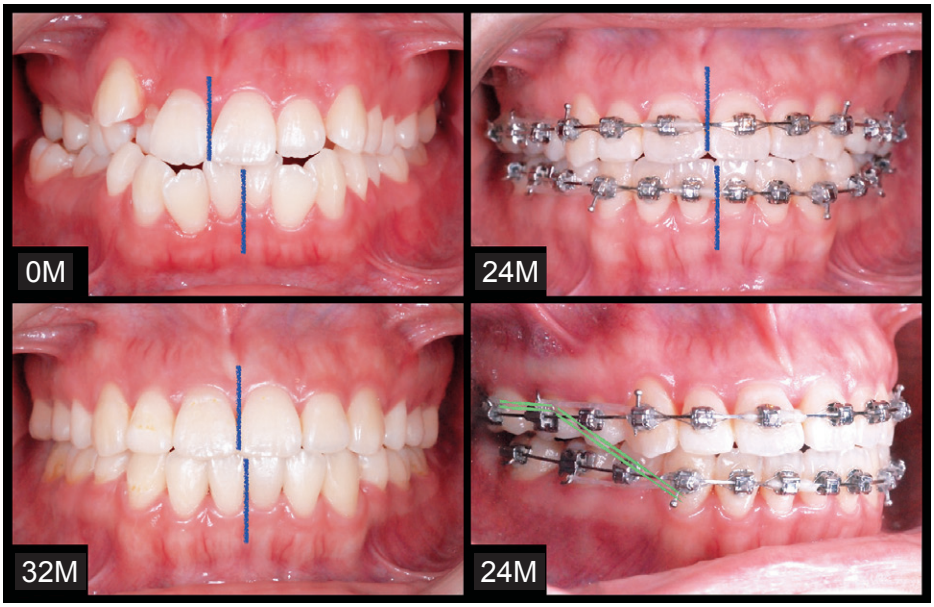


Fig. 22:
A 5mm midline discrepancy with the maxilla to the right was noticed before treatment (0M). After severe crowding on the right upper arch was relieved, midline discrepancy reduced to 2mm in the 24th month of treatment (24M) without any specific midline mechanics (upper right). Then the patient was instructed to wear one L-type elastic (Bear ¼", 4.5oz) from the upper right molars to the lower right canine (lower right). After treatment the maxillary dental midline was still deviated ~1.0mm to the right of the facial midline (32M).

that a 4mm midline discrepancy relative to the facial midline is undetectable by lay people and general dentists. Concurrently, the patient was well satisfied with her esthetic results. Two years later, the dento-facial result was stable (*Fig. 23*).

Conclusion

A patient presented with severe, asymmetric crowding in both arches, a blocked-out maxillary canine, an asymmetric Class III/I molar relationship, and a 5mm midline discrepancy. The DI for this challenging malocclusion was 32. Extraction of four first premolars and asymmetric space closure corrected an unattractive smile and irregular dentition, producing a board quality result in 32 months. A careful assessment of the clinical records suggested that refinements in the treatment protocol might have produced a more efficient resolution of malocclusion, probably significantly decreasing the treatment time.

Fig. 23: Two years later, the dento-facial result was stable.

References

1. Kiliaridis S, Georgiakaki I, Katsaros C. Masseter muscle thickness and maxillary dental arch width. Eur J Orthod 2003;25(3):259-63.
2. Uribe F, Agarwal S, Janakiraman N, Shafer D, Nanda R. Bidimensional dentoalveolar distraction osteogenesis for treatment efficiency. Am J Orthod Dentofacial Orthop 2013;144:290-8.
3. Pitts T. Dr. Tom Pitts' Secrets of excellent finishing. News & Trends in Orthodontics 2009;14:6-23.
4. Sarver DM, Yanosky M. Principles of cosmetic dentistry in orthodontics: part 2. Soft tissue laser technology and cosmetic gingival contouring. Am J Orthod Dentofacial Orthop 2005;127:85-90.
5. Su B. IBOI Pink & White esthetic score. Int J Orthod Implantol. 2013;28:80-85.
6. Chang MJ, Chang CH, Roberts WE. Atypical Extraction of Adult Orthodontic Treatment. Int J Orthod Implantol 2012;27:52-63.
7. Chang CH, Roberts WE. Stability of Mini-screws on Buccal Shelves: A Retrospective Study of 1680 Mini-screw Insertions by the same Orthodontists. Int J Orthod Implantol 2013;30:76-78.
8. Chang CH and Roberts WE, A Retrospective Study of the Extra-alveolar Screw Placement on Buccal Shelves. Int J Orthod Implantol 2013;32:80-89.
9. Contemporary Orthodontics. 4th ed. Issue 18. St Louis: Elsevier Mosby; 2007. p. 644-645.
10. Contemporary Orthodontics. 4th ed. St Louis: Elsevier Mosby; 2007. p. 608-609.
11. Alkhal HM, Rabie B, Wong RWK. Orthodontic tooth movement of total buccally blocked-out canine: a case report. Cases Journal 2009;2:7245-8.
12. Kokich VO Jr, Kiyak HA, Shapiro PA. Comparing the perception of dentists and lay people to altered dental esthetics. J Esthet Dent 1999;11:311-24.

Discrepancy Index Worksheet

TOTAL D.I. SCORE 32

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 = 4

Total = 4

OVERBITE

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

Total = 0

ANTERIOR OPEN BITE

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

Total = 0

LATERAL OPEN BITE

2 pts. per mm. per tooth

Total = 0

CROWDING (only one arch)

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

Total = 7

OCCLUSION

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

BUCCAL POSTERIOR X-BITE

2 pts. per tooth Total = 0

CEPHALOMETRICS (See Instructions)

ANB ≥ 6° or ≤ -2° = 4 pts.

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

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

SN-MP

≥ 38° = 2 pts

Each degree > 38° 3 x 2 pts. = 6

≤ 26° = 1 pt.

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

1 to MP ≥ 99° = 1 pt.

Each degree > 99° 9 x 1 pt. = 9

Total = 15

OTHER (See Instructions)

Supernumerary teeth	_____ x 1 pt. =	
Ankylosis of perm. teeth	_____ x 2 pts. =	
Anomalous morphology	_____ x 2 pts. =	
Impaction (except 3rd molars)	_____ x 2 pts. =	
Midline discrepancy (≥3mm)	@ 2 pts. =	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

IMPLANT SITE

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

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

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

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

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

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

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

Total = 0

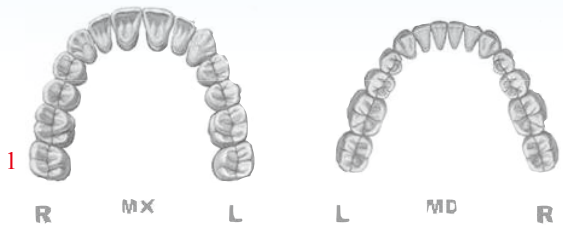
Cast-Radiograph Evaluation

Case # **Patient**

Total Score: 24

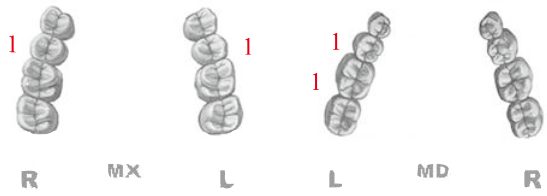
Alignment/Rotations

1



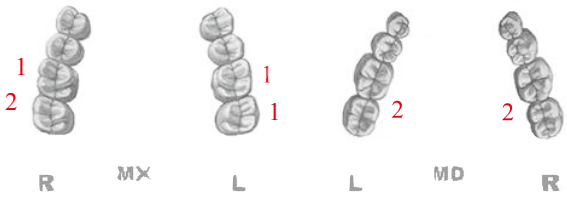
Marginal Ridges

4



Buccolingual Inclination

9

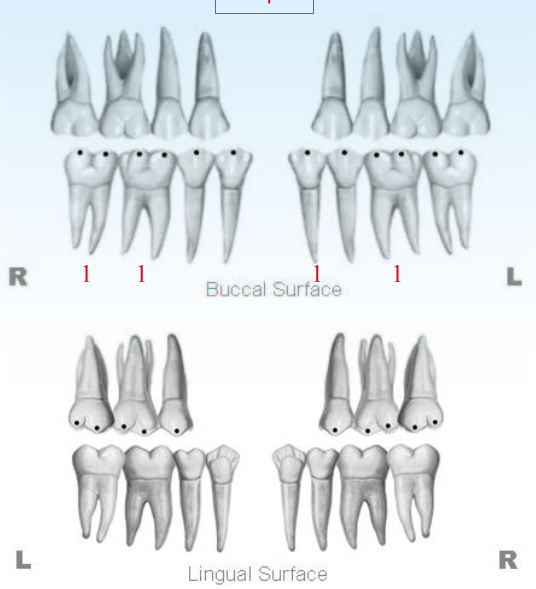


Overjet

1

Occlusal Contacts

4

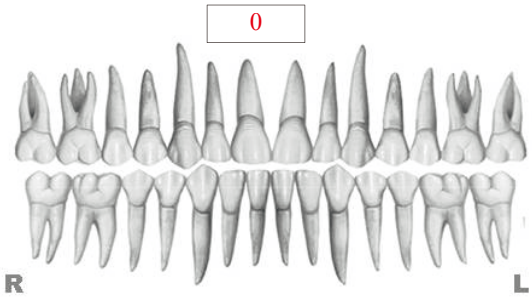


Occlusal Relationships

1

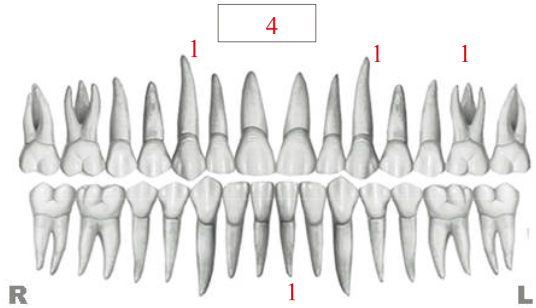
Interproximal Contacts

0



Root Angulation

4



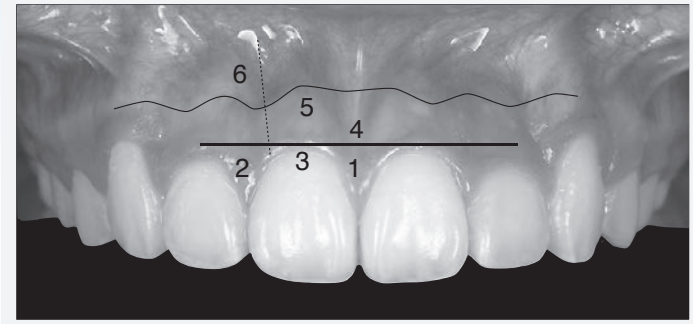
INSTRUCTIONS: Place score beside each deficient tooth and enter total score for each parameter in the white box. Mark extracted teeth with "X". Second molars should be in occlusion.

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

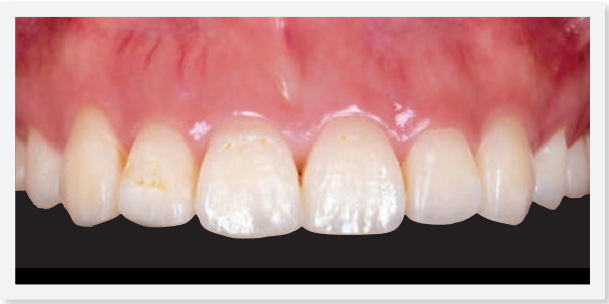
Total Score: = 4

1. Pink Esthetic Score

Total = 0



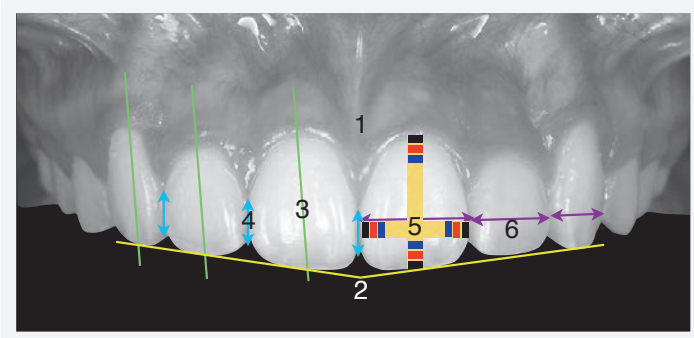
1. M-D Papilla	0	1	2
2. Keratinized Gingiva	0	1	2
3. Curvature of Gingival Margin	0	1	2
4. Level of Gingival Margin	0	1	2
5. Root Convexity (Torque)	0	1	2
6. Scar Formation	0	1	2



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

2. White Esthetic Score (for Micro-esthetics)

Total = 4



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

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

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Cleidocranial Dysplasia: Surgical and Orthodontic Management of Multiple Impactions in the mandible

Abstract

A 24-year-old female presented with the distinctive dentofacial features of cleidocranial dysplasia (CCD) including multiple supernumerary and permanent impacted teeth. Cone beam computed tomography (CBCT) was essential to accurately identify and plan the surgical recovery of the compromised permanent teeth. All obstacles in the paths of eruption were surgically removed, and OrthoBoneScrews (OBSs) with 3D lever arms provided the traction mechanics. Patients with CCD are complex problems, requiring carefully coordinated interdisciplinary care. (Int J Orthod Implantol 2016;42:84-96)

Key words:

supernumerary teeth, impaction, CBCT, OrthoBoneScrews, 3D lever arm, cleidocranial dysplasia

Introduction

Frontal bossing of the forehead, antimongoloid palpebral fissures, and a large number of impacted permanent and supernumerary teeth are consistent with the developmental anomaly cleidocranial dysplasia (*CCD*)(*Fig. 1*).[1-4] The preferred treatment for achieving an optimal dentition is to uncover and bond an attachment on each impacted permanent tooth, clear the path of eruption, extrude the impaction(s) with

Fig. 1:
A pre-treatment facial photograph and panoramic radiograph reveal the common dentofacial anomalies of cleidocranial dysplasia (CCD).

Dr. Eric Hsu,
Instructor, Beethoven Orthodontic Course (Left)
Dr. Chris Chang,
Founder, Beethoven Orthodontic Center
Publisher, International Journal of Orthodontics & Implantology (Center)
Dr. W. Eugene Roberts,
Editor-in-chief, International Journal of Orthodontics & Implantology (Right)

closed eruption technique, and optimally align each arch.[5] Specific surgical and orthodontic approaches are customized to achieve efficient treatment.[5-9] This case report is a step-by-step guide to the surgical and orthodontic procedures for managing patients with multiple impactions of permanent and supernumerary teeth. A checklist is provided to assist clinicians in the complex procedures.

Case Study

A 24y/o female presented for orthodontic consultation with a chief complaint of a malocclusion with many impacted teeth. Facial evaluation was a straight profile, frontal bossing of the forehead, and facial asymmetry due to maxillary and mandibular deviation to the right (*Fig. 1*). Intra-oral examination revealed an anterior open bite, 5mm overjet associated with severe crowding in the anterior maxilla (*Fig. 2*), numerous retained deciduous teeth (*Fig. 4*), and multiple impacted permanent, as well as supernumerary teeth (*Fig. 1*). Despite multiple dental eruption problems, the sagittal relationship of the malocclusion was Class I (*Fig. 5*). Panoramic radiography (*Fig. 1*) and cone beam computed tomography (*CBCT*) images (*Fig. 6*) were used to classify eight retained deciduous teeth, twelve impacted permanent teeth, and five supernumerary teeth in the symphysis area, and four supernumerary teeth in the maxilla. (*Figs. 1, 6 and 7*). The 3D CBCT images were used to define the precise morphology and location of the impacted teeth prior to their extraction or surgical uncovering and bonding in preparation for orthodontic traction.[5] These specialized procedures are presented in the subsequent checklist.

■ *Fig. 2:*
An intraoral photograph shows anterior crowding and an open bite.

■ *Fig. 3:*
A lateral cephalometric radiograph is consistent with the facial form of CCD.

Fig. 4:
Intraoral occlusal photographs reveal a highly arched palate with severe crowding in the upper arch (left) and and multiple retained deciduous teeth in the lower arch (right).

Fig. 5: Buccal-view intraoral photographs document a Class I malocclusion on both sides.

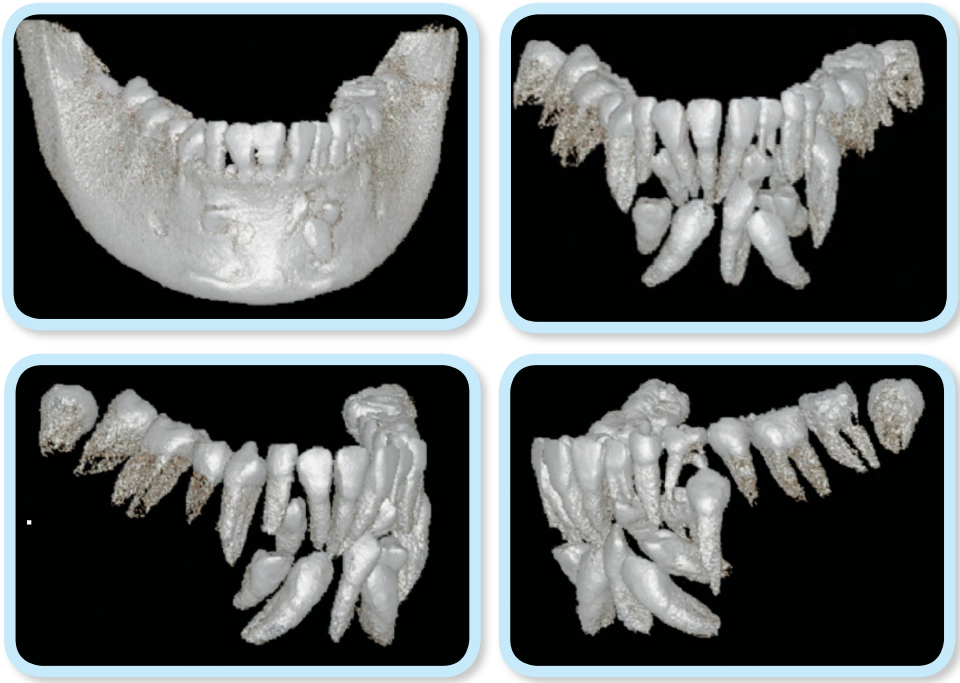


Fig. 6:
Cone beam computed tomography (CBCT) images of the lower arch reveal a complex array of impacted supernumerary and permanent teeth.

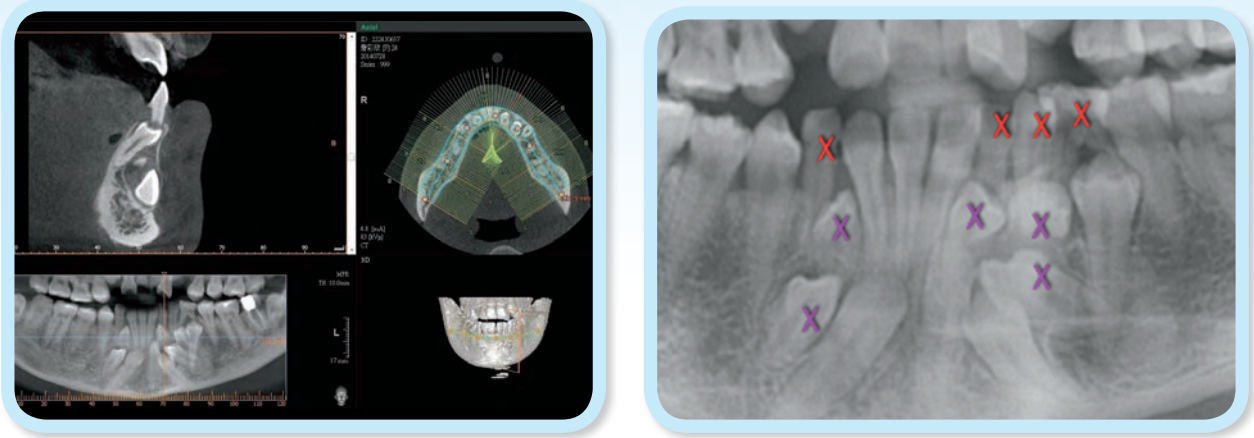


Fig. 7:
CBCT views (left) and a panoramic image (right) were utilized to identify and define the 3D positions of the impacted supernumerary and permanent teeth. The red Xs denote deciduous teeth that were extracted, and the purple Xs are supernumerary teeth that were removed to allow the impacted permanent teeth to erupt.

Surgery Procedures

Right side 1st surgery

1. Orientation: Begin with the end in mind.

The CBCT image is used as a digital map to design and sequence the clinical steps. Two dimensional (2D) plane radiographs (*panoramic and periapical films*) are inadequate for complex problems because they fail to reveal depth. CBCT provides the precise location of teeth in 3D.[5] CBCT slices assess the thickness and density of the covering bone. In addition, 3D imaging is critical for differential diagnosis because it shows root morphology and other anomalies that may affect treatment decisions. It is a waste of time and money to try to recover an unserviceable tooth.[6]

2. Flap Reflection

Apply local anesthesia to the surgical site, and then use the vertical incision subperiosteal tunnel access (*VISTA*)[7] technique to access the impactions. The vertical incision is made with a No. 15c surgical scalpel (*Fig. 8*), and the mucogingival flap is reflected with a surgical curette and periosteal elevator. The deciduous canine and adjacent supernumerary teeth are removed (*Fig. 9*). Use an explorer to penetrate overlying bone to locate the position of the permanent cuspid crown. There is a distinct, sharp recoil when an explorer engages enamel compared to bone. This is a simple and effective way to identify the crown of an impacted tooth.[2,3]

Fig. 8:
An intraoral photograph of the lower labial area shows a vertical incision for the minimally invasive VISTA surgical procedure.

Fig. 9:
The deciduous canine and adjacent supernumerary teeth were removed as atraumatically as possible.

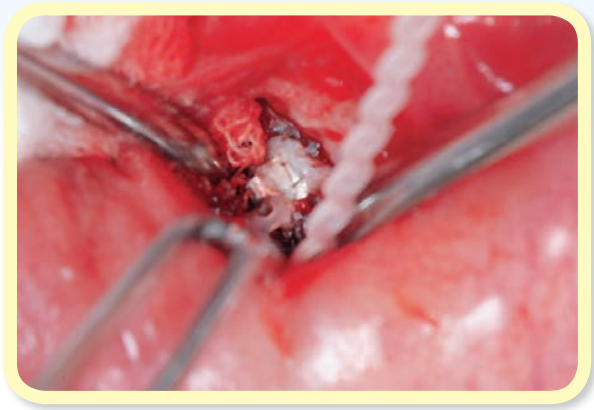


Fig. 10:
To avoid excessive bleeding during the bonding procedure, an eyelet is bonded on the enamel of the impacted canine before removing the bone to clear the path of eruption.

3. Etching & Bonding

Moisture control is essential for successful bonding of attachments, but it is also the most difficult part of the procedure. Bleeding can be controlled with electrocautery or gauze pressure. Water, saliva and residual blood are removed with high power suction, and then a bondable eyelet is bonded on the crown portion of the impacted canine (*Fig. 10*). A well trained, experienced assistant is very important for reducing the bonding time, which increases the probability of success. The longer the duration of the bonding procedure, the more likely it will fail.

4. Bone Removal

A high speed handpiece with a #5 carbide round bur removes the overlying bone down to the cementoenamel junction (*CEJ*). Removing the bone apical to the height of the crown curvature can facilitate tooth eruption. It is best to remove bone near the CEJ with a hand instrument to avoid injuring the tooth. Cervical damage to the tooth can subsequently result in external root resorption.[8]

5. Anchorage Screw and 3D lever arm

Make an indentation with an explorer in the right mandibular buccal shelf and then insert a 2x14mm OrthoBoneScrew® (*OBS*) with a rectangular hole through the head of the screw (*Newton's A Ltd, Hsinchu, Taiwan*) (*Fig. 11*). Make a series of vertical incisions at the corner of dental arch, apical to the area of the lower right cuspid and lateral incisor. Connect a power chain to the impacted canine, thread it beneath the soft tissue (*Fig. 12*), and attach the proximal end to the distal portion of the 3D lever arm. The latter is a spring made of

Fig. 11:
Marks (indentations) in the distal portion of the screw driver engaging the OBS are consistent with the screw holes for 3D lever arm insertion. This feature allows precise positioning of the OBS relative to the desired orientation of the 3D lever arm.

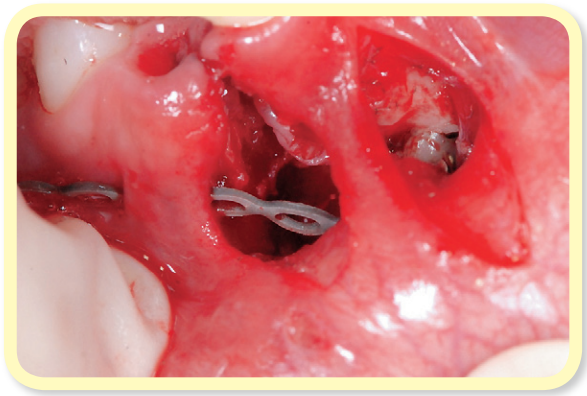


Fig. 12:
A power chain coursing beneath the alveolar mucosa (VISTA procedure) delivers the traction force from the 3D lever arm to the eyelet bonded on the impaction. See text for details.

.019x.025" SS that is inserted into the rectangular hole in the head of the OBS (*Fig. 13*). Polymerize flowable resin on both ends of the 3D spring to achieve retention in the OBS and to stabilize the power chain attachment to the lever arm (*Fig. 13*), which is activated to upright the impacted canine. The force system is designed to provide

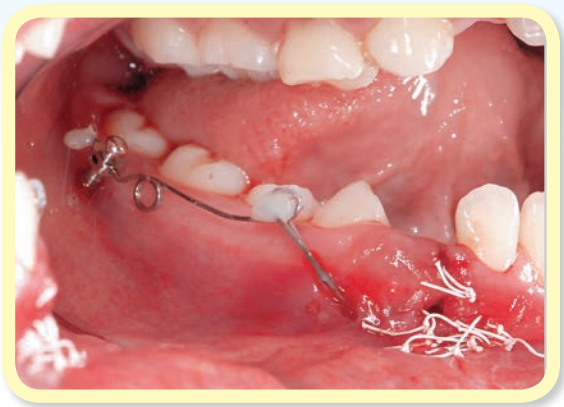


Fig. 13:
Traction is applied to the impaction by a power chain bonded to the distal end of the 3D lever arm.

direct traction to upright the impaction without producing deleterious side effects for the rest of the dentition. The flap is repositioned and closed with interrupted 5-0 GORE-TEX® sutures (*Flagstaff, AZ*). A post-operative panoramic radiograph confirms the desired position of the mechanics and angulation of the traction force (*Fig. 14*). In recovering the impaction, beware of impinging

Fig. 14:
A post-operative panoramic radiograph was exposed to check the position of the traction mechanism.

on the roots of adjacent teeth or in creating occlusal interferences.[4] It may be necessary to reposition the OBS as the impaction is extuded. The following is the specific series of surgical and traction procedures for the current patient:

Left side 1st surgery - 2 weeks later

1. Flap Reflection

Instead of the VISTA approach, an open flap surgical procedure was selected for the left side.[9] Since the surgical field was much wider on the left side of the arch, the minimally invasive VISTA surgical approach was impractical (*Fig. 15*).

Fig. 15:
An intrasulcular flap is reflected to expose the impacted canine.

2. Bone and Supernumerary Teeth Removal

The treatment objective was to retain all of the deciduous teeth for as long as possible to provide space maintenance and optimal masticatory capability. Considerable surgical care was required in removing the supernumerary teeth (*Fig. 16*).

Fig. 16:
Careful surgical technique is required for the relatively atraumatic extraction of the supernumerary teeth.

3. Etching & Bonding

A eyelet was bonded only on the canine because the lateral incisor is expected to erupt spontaneously when all the obstacles in its path were removed. It is important to only apply traction when needed; otherwise allow natural forces to prevail (*Fig. 17*).

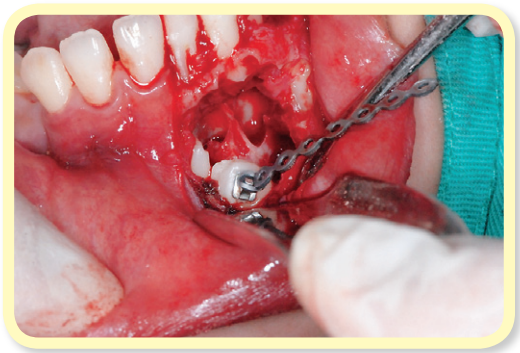
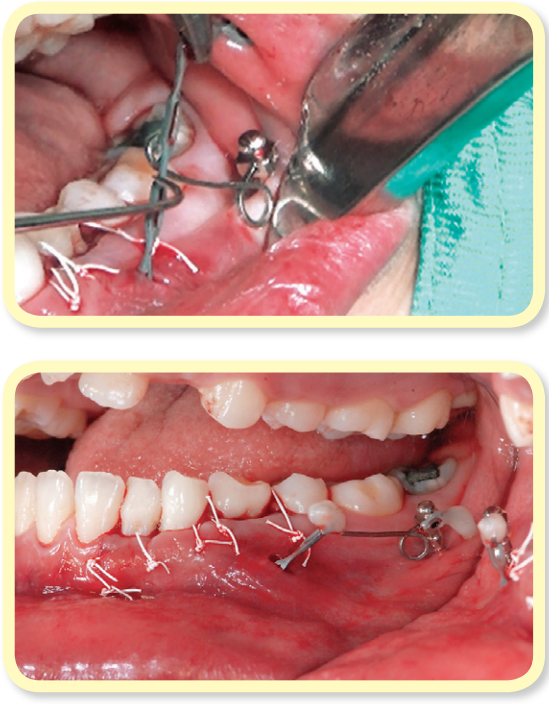


Fig. 17:
A power chain is attached to the eyelet on the impaction prior to sealing the connection with the polymerization of flowable resin.

4. Screws Insertion and 3D Lever Arm

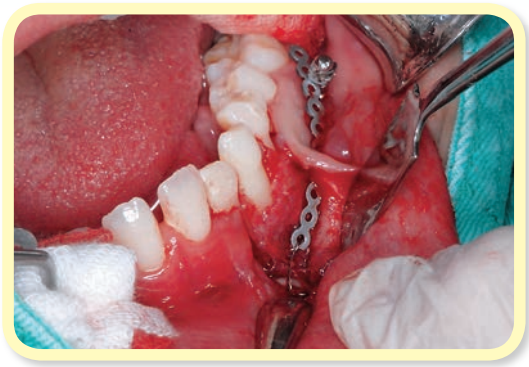
Make a small incision along the intended line of force to allow the power chain to pass through the soft tissue. The flap is then repositioned and closed with interrupted 5-0 GORE-TEX® sutures (*Fig. 18*). A panoramic radiograph is taken every month post-operatively, to check the progress in extruding the impactions, and to determine when a change in the direction of traction is required.



■ *Fig. 18:*
The 3D lever arm is activated by attaching a power chain (upper view). The activated position is shown in the lower view.

Left side 2nd surgery - 6 weeks later

The OBS was repositioned and the 3D lever arm was removed to achieve a more direct direction of traction on the impaction (*Fig. 19*).



■ *Fig. 19:*
The position of the OBS is positioned according to the desired direction of traction.

Right side 2nd surgery - 1 month later

A steel ligature from the impaction was extended through the soft tissue incision, and was then attached to the lever arm to extrude the impaction (*Fig. 20*).

■ *Fig. 20:*
The activated section of power chain is superficial to the flap.

Bonding lower bracket - 3 months later

When the panoramic radiograph showed that the lower left lateral incisor and the canines were in the desired positions, the right side lever arm was removed, brackets were bonded on the lower teeth, and an .014" CuNiTi archwire was placed.

Create space for eruption - 6 weeks later

The archwire size was increased to .018" CuNiTi and an open coil spring was activated to create spaces for the erupting teeth (*Fig. 21*).

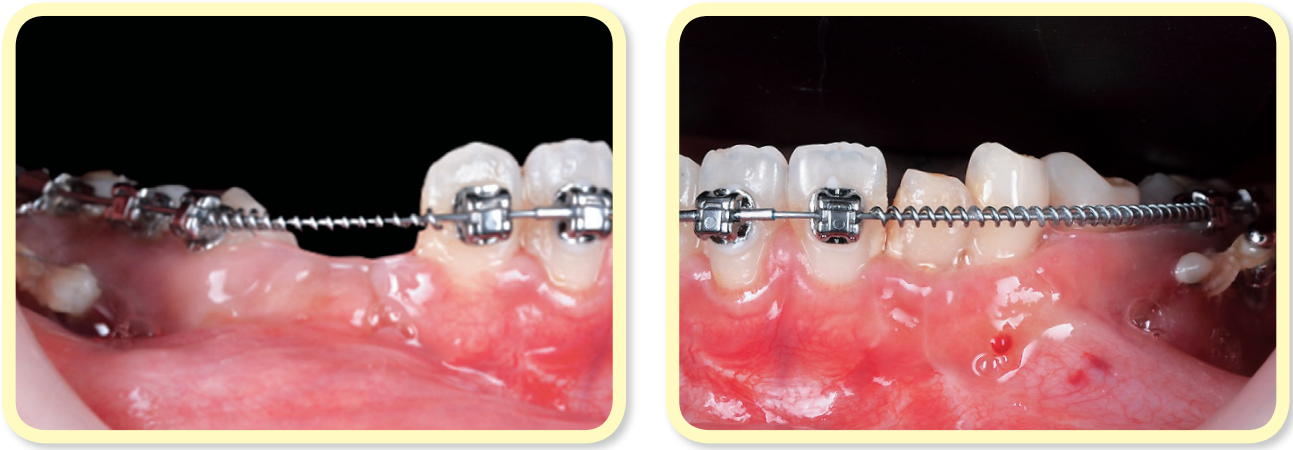


Fig. 21: NiTi open coil springs are used to create enough space to align the impactions when they erupt.

Change traction direction - 1 month later

The deciduous teeth in the path of eruption were extracted and the archwire was increased to .014x.025" CuNiTi. Elastic ligature was connected directly to the archwire to complete the extrusion of the impactions (*Fig. 22*).

Fig. 22:
After the remaining deciduous teeth are extracted, both lower impacted canines are bonded with attachments and traction is applied bilaterally.

Discussion

Marie-Sainton syndrome, also know as cleidocranial dysplasia (*CCD*), is an autosomal dominant skeletal dysplasia affecting primarily the development of the bones and teeth.[1-3] Expression of CCD can vary widely, even within the same family, and its prevalence is approximately one in a million live births, worldwide.

The etiology of the disorder is a mutation of the RUNX2 gene, that been mapped to chromosome 6p21 within the same region as CBFA1. The latter gene controls the differentiation of precursor cells into osteoblasts and is essential for both membranous and endochondral bone formation.[1]

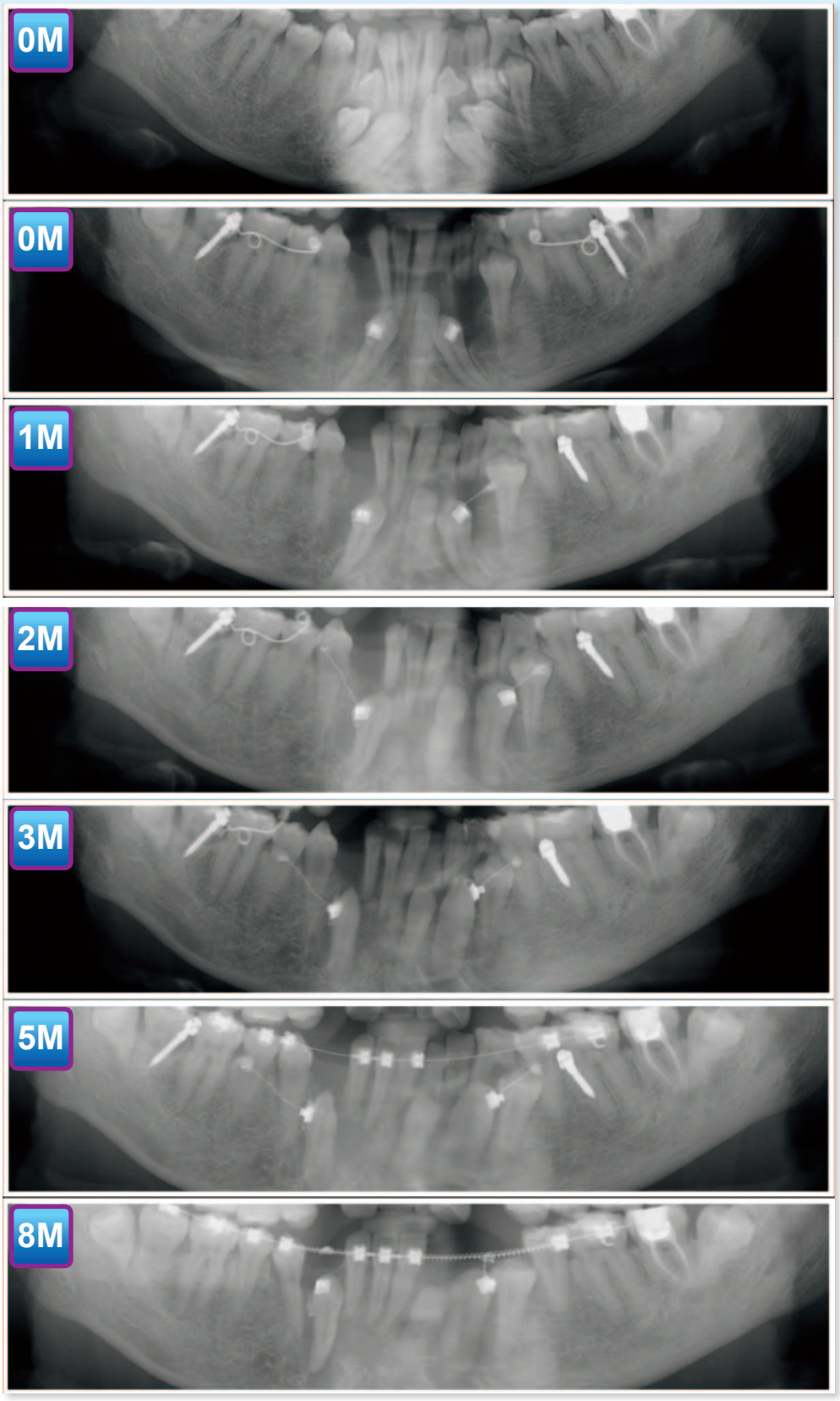


Fig. 23:
A sequential series of panoramic radiographs (0-8M) shows the progress for the bilateral recovery of the impacted lower canines.

Distinctive facial features of CCD include:

- Wide, short skull (*brachycephaly*)
- Prominent forehead.
- Hypertelorism, i.e. excessive space between the eyes
- Flat nose
- Underdeveloped maxillary arch, i.e. small upper jaw

CCD may be associated with decreased bone density (*osteopenia*) that progresses to osteoporosis and low trauma bone fractures at a relatively early age. In addition, hearing may be impaired and infections are relatively common in the inner ear and facial sinuses. Affected children may be mildly delayed in the development of motor skills, but intelligence is usually normal.

Characteristic dentoalveolar anomalies are frequently associated with CCD.[10] The palate is often highly arched, and clefts of the hard and soft palates are relatively common. Retention of the deciduous dentition in conjunction with impacted permanent teeth is a relatively common finding. If the primary teeth do exfoliate normally, the patients may be partially edentulous for a long period of time before the permanent teeth erupt, if they ever do. Permanent teeth usually show a delay of root development but still have the potential to erupt; however, the paths of eruption may be blocked by multiple supernumerary teeth. Surgical procedures to promote the eruption of the permanent teeth include extraction of deciduous teeth as well as removal of bone and supernumerary teeth blocking the paths of eruption. The large number of supernumerary teeth (~30) accompanied by a dentigerous cyst (*Fig. 24*) is a severe expression of CCD. The radiographic picture for supernumerary teeth is usually similar to a normal tooth, but there may be a lack of cellular cementum on the root,[11] and abnormal bone morphology.[12] For CCD patients, coordinated orthodontic and surgical procedures are effective for achieving acceptable dental form and function.

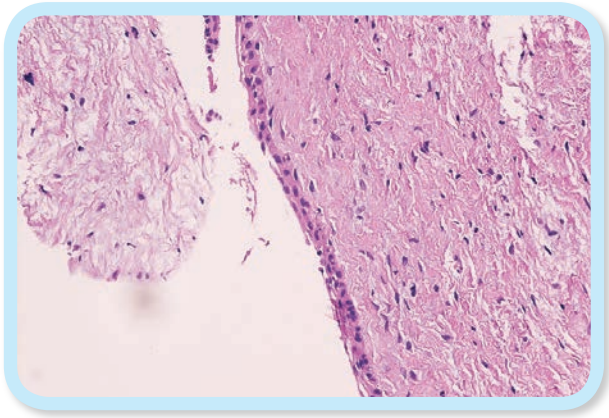


Fig. 24:
A tissue biopsy from the area distal to the impacted mandibular (Fig. 23:1) shows fragments of the stratified squamous epithelium that lined a dentigerous cyst.

Conclusion

Keys to successful impaction recovery are:

- CBCT: Precise tooth identification and position are essential for surgical planning.
- Proficient Surgical Team: Decreases surgical time and increases reliability for bonding attachments.
- Clear the Eruption Pathway: Remove all the obstacles to eruption including deciduous teeth, supernumerary teeth, and bone.

- Bone near the CEJ: Carefully remove all osseous tissue impeding eruption with hand instruments.
- Well Designed Mechanics: An OBS with a 3D lever arm is recommended

Acknowledgement

Thanks to Mr. Paul Head for proofreading this article.

References

1. Mundlos S. Cleidocranial dysplasia: clinical and molecular genetics. JMG 1999;36.3.177-182.
2. Jensen BL, Kreiborg S. Development of the dentition in cleidocranial dysplasia. J Oral Pathol Med 1990;19:89–93.
3. Hitchin AD. Cementum and other root abnormalities of permanent teeth in cleidocranial dysostosis. Br Dent J 1975;139:313–318.
4. Kokich VG. Surgical and orthodontic management of impacted maxillary canine. Am J Orthod Dentofacial Orthop 2004;126:278-83.
5. Su B, Hsu YL, Chang CH. Soft Tissue Considerations for the Management of Impactions. News & Trends in Orthodontics 2011;22:54-9.
6. Su B, Hsu YL, Chang CH, Roberts WE. Soft Tissue Considerations for the Management of Impactions. Int J Orthod Implantol 2011;24:50-59.
7. Hsu YL, Chang CH, Roberts WE. OrthoBoneScrew. The dream screw for next generation's orthodontists. News & Trends in Orthodontics 2011;23:34-49.
8. Sawamura T, Minowa K, Nakamura M. Impacted teeth in the maxilla: usefulness of 3D Dental-CT for preoperative evaluation. Eur J Radiol 2003;47:221-6.
9. Chang A, Chang CH, Roberts WE. Simplified Open-window Technique for a Horizontally Impacted Maxillary Canine with a Dilacerated Root. Int J Orthod Implantol 2015;39:76-84.
10. Zadeh HH. Minimally Invasive Treatment of Maxillary Anterior Gingival Recession Defects by Vestibular Incision Subperiosteal Tunnel Access and Platelet-Derived Growth Factor BB. Int J Periodontics Restorative Dent 2011;31:653-660.
11. Discacciati JA, de Souza EL, Costa SC, Sander HH, Barros Vde M, Vasconcellos WA. Invasive cervical resorption: etiology, diagnosis, classification and treatment. J Contemp Dent Pract 2012;13(5):723-728.
12. Lukinmaa PL, Jensen BL, Thesleff I, Andreasen JO, Kreiborg S. Histological observations of teeth and peridental tissues in cleidocranial dysplasia imply increased activity of odontogenic epithelium and abnormal bone remodeling. J Craniofac Genet Dev Biol 1995;15:212–221.

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2016見習獎學金辦法

目的：

為促進國內牙科學術教育與牙科實務工作間的學習交流，並鼓勵國內牙醫系所學生在學期間能認識牙科實務操作環境，貝多芬齒顎矯正中心、安徒生兒童牙科、金牛頓植牙中心與金牛頓藝術科技特聯合提供本獎學金以及三天觀摩見習的機會。

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2. 學習如何應用資訊科技來提昇實務工作效率。
3. 觀摩矯正、兒童專科診所與植牙中心的經營模式。

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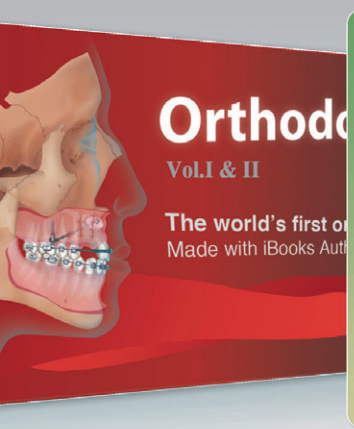
我覺得學到最多的不僅是在診所裡看到高效率的分配管理與經營模式，張慧男院長成功的態度與眼界更是值得我們學習的地方。從他分享自身的小故事中，我看到求知若渴的生活哲學與成功的一貫公式：**Passion, Practice and Persistence.** 他告訴了我們成功並非遙不可及的夢想，只要把握住基本功持續練習並且照著成功的態度前進，點滴改進，盡心盡力，相信總有一天能築夢踏實。**更難能可貴的是張院長樂於分享的熱情**，雖然已經到了可以退休的時候，仍努力於矯正學的教學與演講，**向完成三十本矯正學電子書**的目標前進。這些都是我們值得學習的榜樣與態度。

國防醫學院　劉育豪

高雄醫學院 蔣宜蓁

從張醫師講述赴國外學習矯正、在課業之餘勤練高爾夫球，最後終於一雪前恥拿下球賽冠軍的故事中，我看到了**張醫師對事物執著的態度，對於想要做好的事，一定加倍努力並以高效率達成目標**。憑藉著這樣不屈不撓的精神不斷地創新、精進，張醫師打造出一個令人刮目相看的團隊，集結各領域人才編寫電子書，展現出率領大團隊的領導力，也突顯了想為牙醫界做出貢獻的心。



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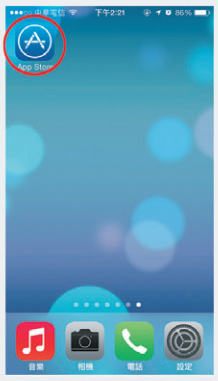

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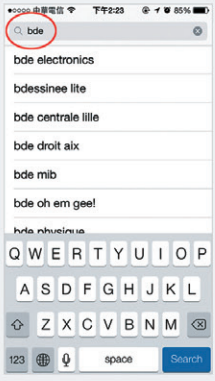

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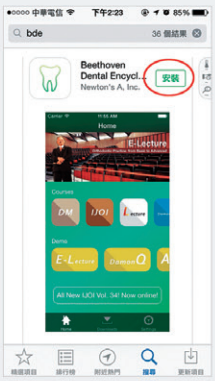

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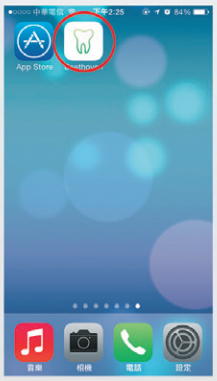

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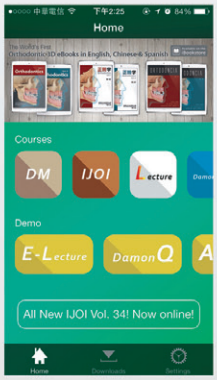

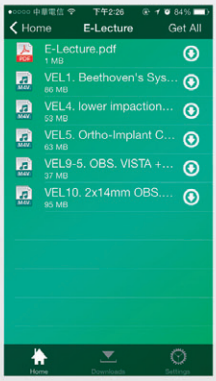

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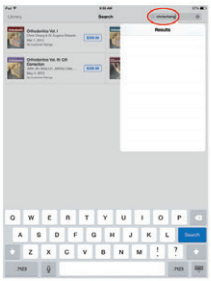

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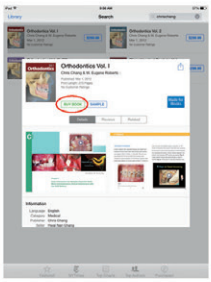

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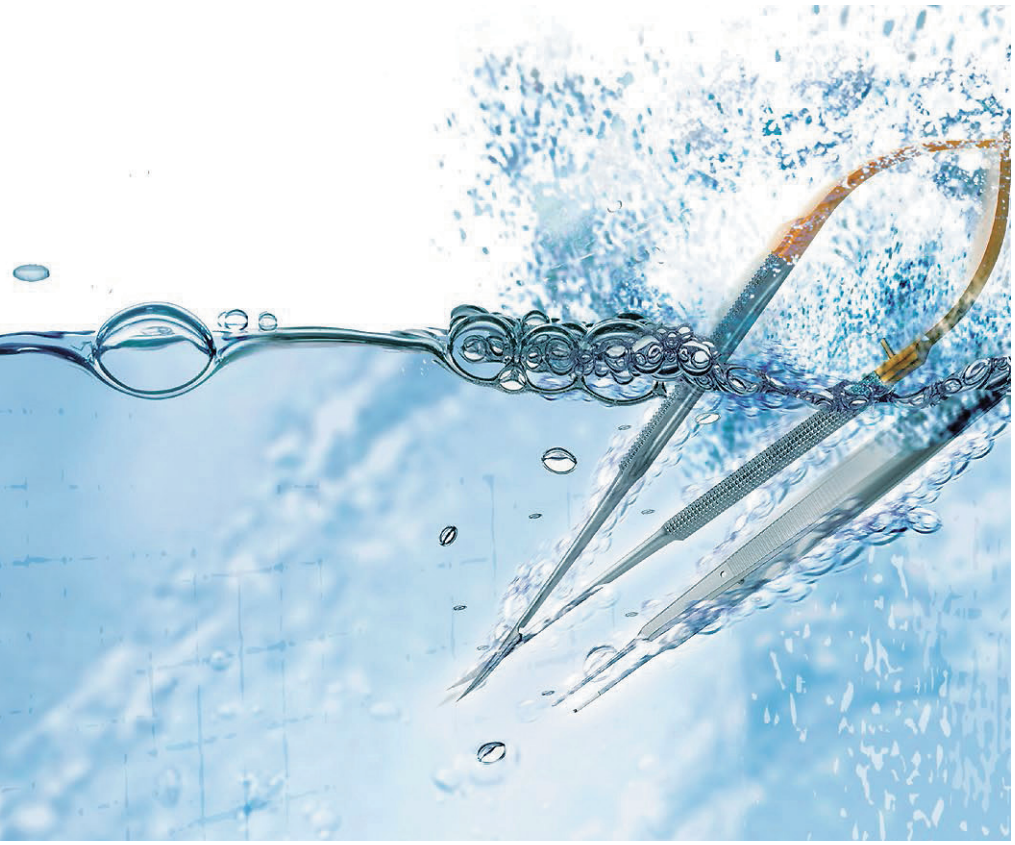

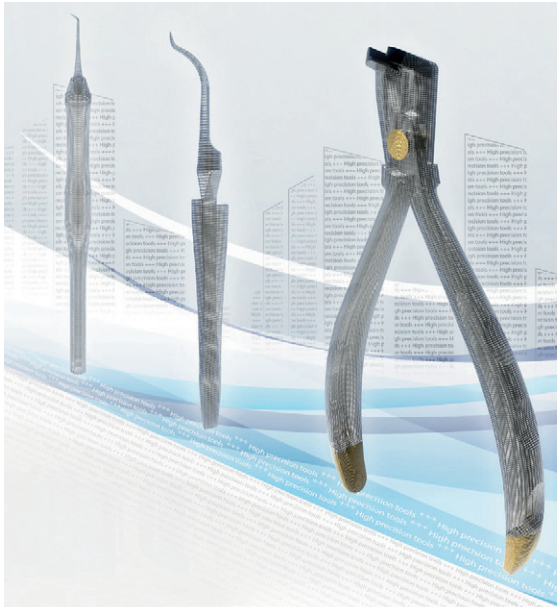

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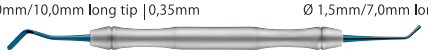
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Clinical tips for stress-free 2x4 Treatment

Early orthodontic treatment is commonly requested in pediatric dentistry (*pedodontic*) practices. A conventional 2x4 fixed appliance (*two molars and four incisors*) is one of the most frequently selected treatment options for correcting anterior crossbites and esthetic problems in the mixed dentition stage. Although the 2x4 appliance is very effective for minor crowding and arch length issues, patients often complain about soft tissue irritation. There are frequent emergency appointments because wires are displaced. This article shares two clinical tips to address these common problems.

First, soft tissue irritation of the buccal mucosa can be reduced by moving the molar tube mesially on the first molar or bonding it on the primary second molar (*Fig. 1*). Moving the tube forward decreases the length of the unsupported buccal segments of the archwire, resulting in less irritation and dislodgment of the archwire, particularly when the patient chews a large bolus of relatively rigid food. This is a common problem, particularly for highly flexible archwires like .014" CuNiTi (*Fig. 2*).

Fig. 1:
Moving the distal tube or bracket forward to the primary second molar helps control irritation of the buccal mucosa and decreases the length of the unsupported wire in the buccal segments.

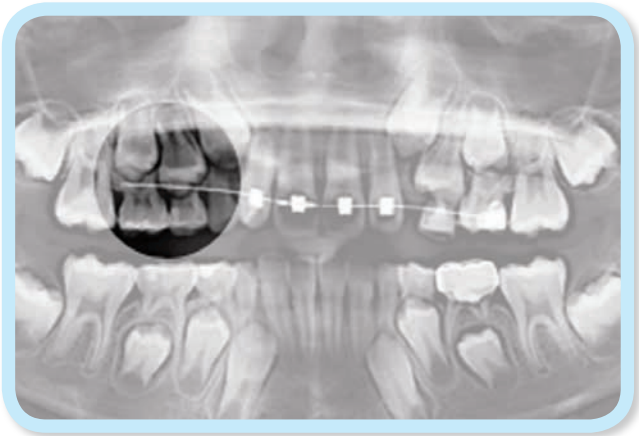

Fig. 2:
A panoramic radiograph shows that a flexible archwire in the buccal segment (highlighted circle) is easy to dislodge from a tube on the first molar.

Dr. Yu Lin Hsu, DDS
Associate editor, International Journal of Orthodontics & Implantology, Director of Andersen Pedodontic Clinic (Left)

Dr. Chris Chang,
Founder, Beethoven Orthodontic Center
Publisher, International Journal of Orthodontics & Implantology (Center)

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

Second, wire loosening can be a problem, when the upper arch is expanded. As the maxilla is widened, the archwire length is insufficient to remain engaged in the molar tubes. One of the solutions is to replace the tubes on the molars with regular brackets on the second primary molars (*Fig. 3*). This arrangement allows the practitioner to extend the wire beyond the bracket bilaterally and apply heat treating and bending to the ends of the wire, to resist dislodgment even when the main archwire is .014x.025" CuNiTi (*Fig. 4*).

These two tips help reduce patient discomfort, decrease emergency visits to correct loose (*disengaged*) wires, and prevent bracket swallowing incidents. By eliminating the common problems described, early orthodontic treatment can be stress-free.

Fig. 3:
Substituting a bracket on the second primary molar for the first molar tube decreases the length of the unsupported buccal segment. Increased archwire length distal to the bracket helps reduce dislodgment of the .014x.025" CuNiTi archwire.

Fig. 4:
Heat treating and bending the ends of the archwire distal to the second primary molar brackets help prevent wire dislodgment, and also decrease the probability that the molar bracket will be swallowed if it comes loose.

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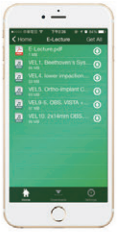

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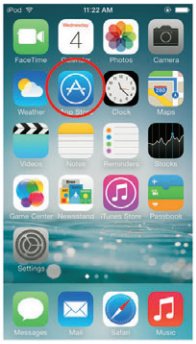

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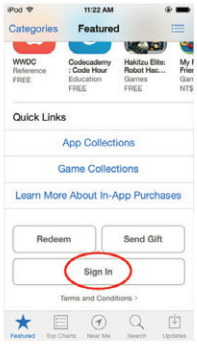

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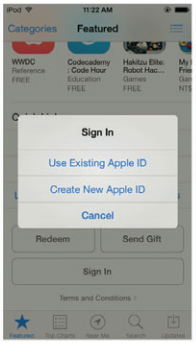

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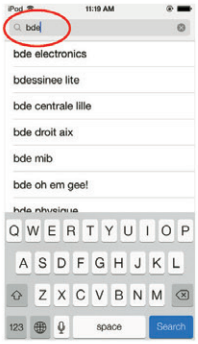

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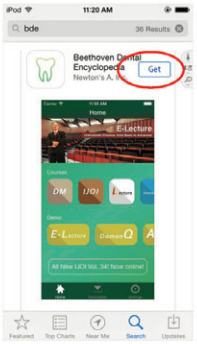

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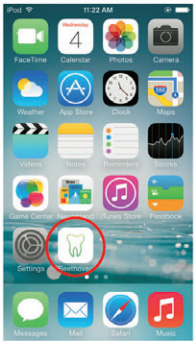

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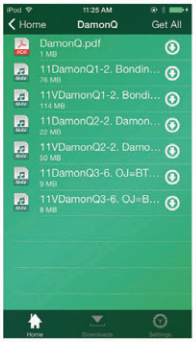

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This two-part collection is comprised of 9 cases submitted for the entrance examination into one of the most prestigious orthodontic associations in the world, the Angle Society. It also includes Chang's recent study on the effect of buccal shelf screws. Personal stories of Dr. Edward Angle are shared by E. Roberts, Sheldon Peck and Larry White. Written with a clinical focus, Angle Case Reports is recommended for practitioners to improve treatment quality and/or to prepare for board certification.

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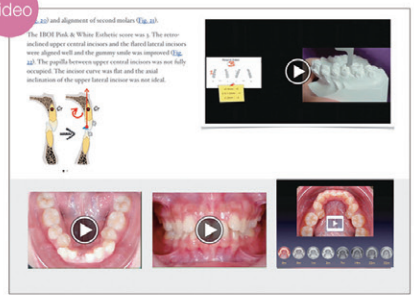

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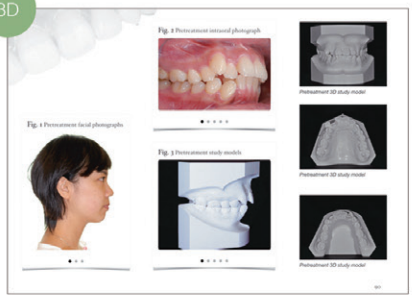

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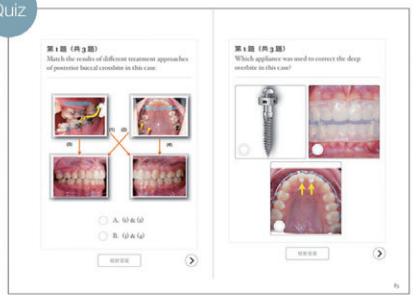

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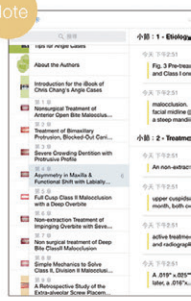

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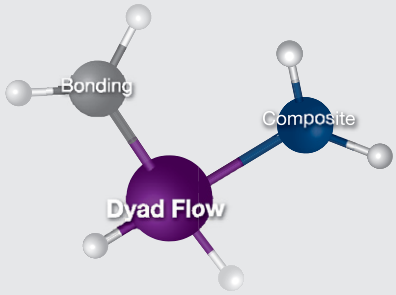

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- 有效的降低術後敏感問題。
- 延伸Optibond黏著劑的技術，對於牙本質與象牙質有足夠的黏著強度。
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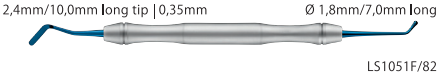

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Severe open bite and crowding case treated by a new passive self-ligating lingual bracket with square slots

Abstract

A 19-year-8-month male presented with a Class III/II asymmetric malocclusion complicated by severe crowding, anterior open bite, lingually ectopic eruption of the maxillary lateral incisors, steep mandibular plane, and facial asymmetry. The treatment began by using a trans-palatal arch and a mini-screw to intrude maxillary molars for a counter-clockwise rotation of the mandible. Two upper first premolars and one lower right first premolar were extracted, and the malocclusion was treated with passive self-ligating (PSL) lingual brackets with .018x.018" square slots. After 27 months of treatment, a dramatic improvement in both tooth alignment and occlusal function was achieved. (Int J Orthod Implantol 2016;42:108-119)

Key words:
Lingual appliance, passive self-ligating appliance, square slot, severe crowding, open bite, asymmetric Class III malocclusion, mini-screw

Introduction

Camouflaged orthodontic treatment are often requested by adult patients whose conditions indicate orthognathic surgery but prefer non-surgical treatment. The case report presents a conservative lingual orthodontic treatment for a skeletal open bite malocclusion with severe crowding. Satisfactory results were achieved after 27 months of treatment.

Diagnosis

A 19-year-8-month old man presented with severe crowding and anterior open bite. This case was given a nickname, ***Shark***, because of his crooked teeth. The medical history revealed the patient had allergic rhinitis combined with mouth breathing and tongue thrusting habits.

Pretreatment photographs indicate a slight mandibular shift to the left side and a straight profile (*Fig. 1*). When the patient smiled, the low position of the tongue and severe anterior open bite were observed. The intra-oral examination showed the molar relationship was Class III on the right side and Class II with crossbite on the left side. The overbite was -7mm and the overjet was +3mm. In the upper arch, diastema, severe anterior crowding with lateral incisors displaced lingually were noted. Upper left and right third molars had

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Director, E-Line Orthodontic Clinic in Tokyo, Japan (Left)
Yui Takemoto,
Lingual specialist, E-Line Orthodontic Clinic in Tokyo, Japan (Center)
Aya Takemoto,
Lingual specialist, E-Line Orthodontic Clinic in Tokyo, Japan (Right)

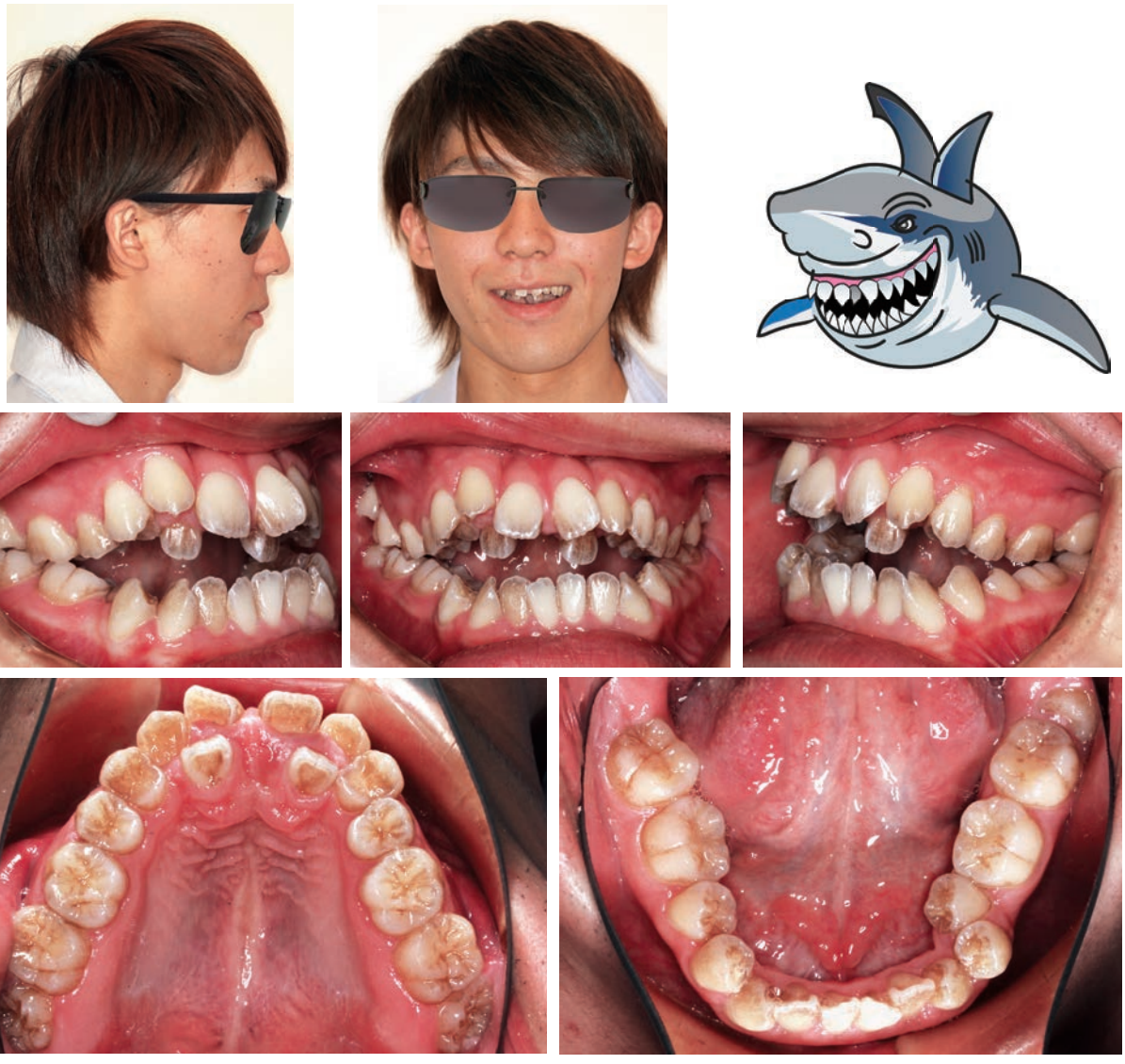


Fig. 1:
Pre-treatment facial photographs indicate a slight mandibular shift to the left side and a straight profile. Intra-oral photographs show a Class III/II asymmetric malocclusion complicated by severe crowding, diastema, anterior open bite, lingually ectopic eruption of the maxillary lateral incisors. This case was nicknamed as ***Shark****.*

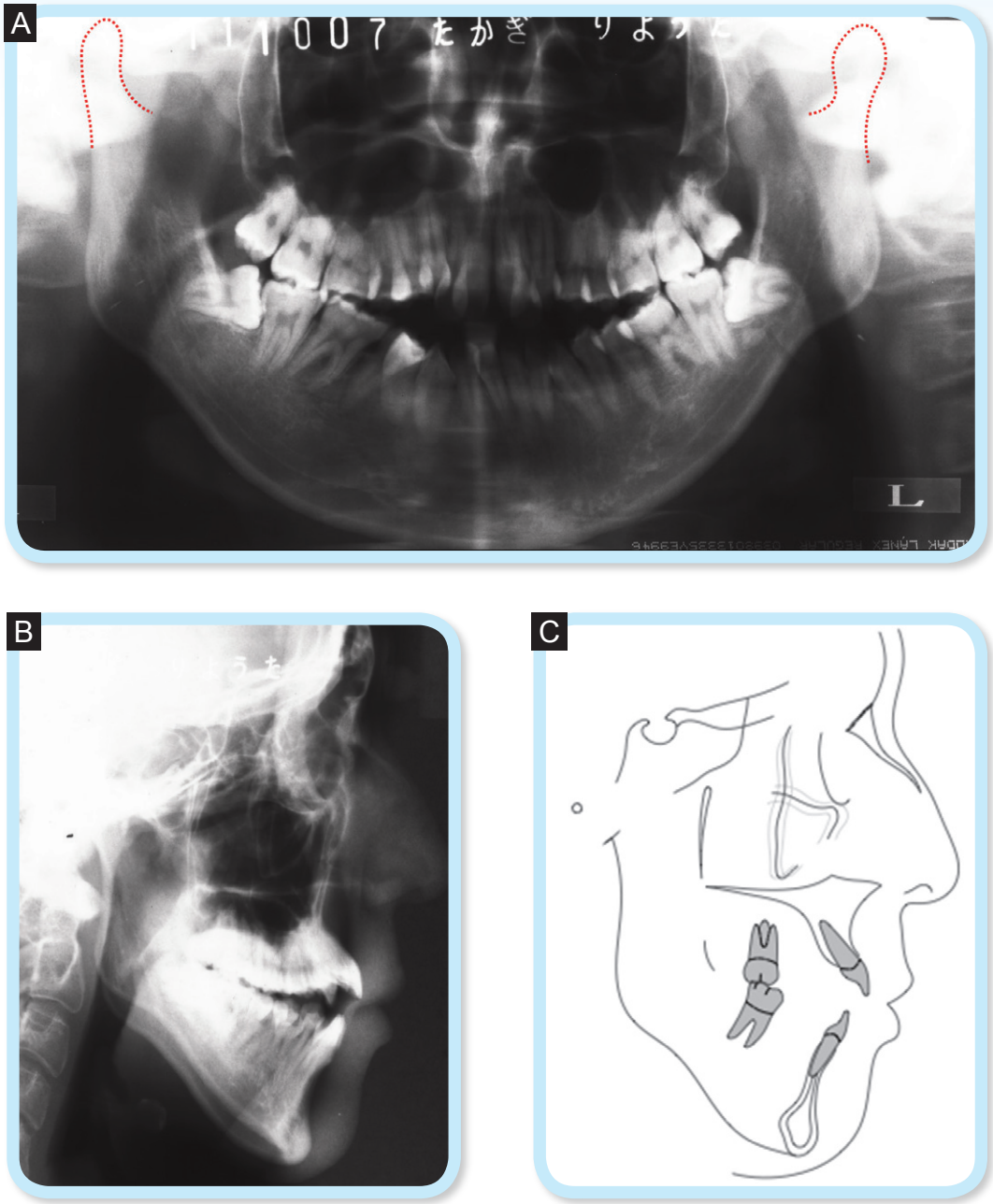


Fig. 2: Pre-treatment radiographs and tracing:
A. panoramic radiograph
B. lateral cephalogram
C. cephalometric tracing

erupted with buccal tipping conditions. In the lower arch, anterior and posterior crowding was observed. 2nd premolars was lingually-tipping, and 1st and 2nd molars were mesially-tilting (*Fig. 1*).

The upper arch length discrepancy was -13mm and -8mm for the lower arch. The upper arch was V-shaped while the lower was ovoid-shaped.

The panoramic x-ray (*Fig. 2A*) revealed upper third molars were erupted, but lower third molars were impacted. No abnormalities were observed in the roots or alveolar bone level. Condyle degeneration was observed bilaterally. The lateral cephalometric radiograph and tracing (*Figs. 2B,C*) indicated a skeletal Class I relationship (*SNA 77°, SNB 75°, ANB 2°*) with a steep mandibular plane angle (*SN-MP 49°*). The maxillary incisors were proclined (*U1-SN 114°*) while the mandibular incisors were retroclined (*L1-MP 77°*). The summary of cephalometric measurements was provided in Table 1.

CEPHALOMETRIC			
SKELETAL ANALYSIS			
	PRE-Tx	POST-Tx	DIFF.
SNA°	77°	77°	0°
SNB°	75°	76°	1°
ANB°	2°	1°	1°
SN-MP°	49°	47°	2°
FMA°	40°	38°	2°
DENTAL ANALYSIS			
U1 TO NA mm	5 mm	3 mm	2 mm
U1 TO SN°	114°	104°	10°
L1 TO NB mm	3 mm	4 mm	1 mm
L1 TO MP°	77°	80°	3°
FACIAL ANALYSIS			
E-LINE UL	-2 mm	-2 mm	0 mm
E-LINE LL	1 mm	2 mm	1 mm

■ Table 1: Cephalometric summary

Treatment Plan

Although severe skeletal open-bite and excessive crowding indicate orthognathic surgery as an ideal treatment option, the patient refused surgery and preferred camouflaged lingual orthodontic treatment instead.

Asymmetric extraction treatment with passive self-ligating (*PSL*) lingual fixed brackets and intruding mechanics were planned to close anterior open bite, relieve anterior crowding and align the dentition. Intruding mechanics was consisted of a trans-palatal arch (*TPA*) and a 1.8x8mm mini-screw (*Induce MS-II®, ORTHOLY, Japan*). Upper left and right 1st premolars and lower right 1st premolar were planned to be extracted. In addition, extraction of upper and lower 3rd molars were scheduled before the start of orthodontic treatment.

In the manual setup of the final occlusion, right 1st molar was finished in the Class I occlusion, while left 1st molar was finished in the Class II relationship after inter-proximal reduction (*IPR*) therapy. Setup models were also used for the indirect bonding of the lingual brackets (*Fig. 3*).[4,5]

Fig. 3: Manual setup for indirect bonding of lingual brackets. Note: The main archwire is straight without mushroom bends.

Treatment Progress

A TPA was attached, and a mini-screw (*Induce MS-II®, 1.8x8mm, ORTHOLY, Japan*) was inserted 1mm away from the mid-palatal suture to intrude the upper molars Fig 4.

In the 4th month of treatment, the TPA was removed. A full fixed, .018x.018" square slot, Alias® PSL lingual appliance (*Ormco, Glendora, CA*) was then bonded with an indirect bonding technique on both arches. Levelling was initiated by using .013" CuNiTi wires on both arches. To make space for upper central incisors, a NiTi coil spring was inserted between the upper lateral incisors (*Fig. 5*).

In the 6th month, a bracket was bonded on the upper right central incisor. On the lower arch, a .016x.016" CuNiTi wire was used to continue levelling.

In the 8th month, a .016" CuNiTi wire was used on the upper arch Fig 6.

In the 11th month, a .016x.016" CuNiTi wire was used on the upper arch for continued levelling. A .018x.018" CuNiTi wire was used on the lower arch to start the establishment of torque.

In the 14th month, .018x.018" stainless steel wires were used on the lower arches for space closure. Up and down elastics were started on the anterior segment.

In the 16th month, a .018x.018" CuNiTi wire was used on the upper arch to continue torque establishment.

In the 19th month, a .0175x.0175" TMA wire was used on the lower arch for detailing.

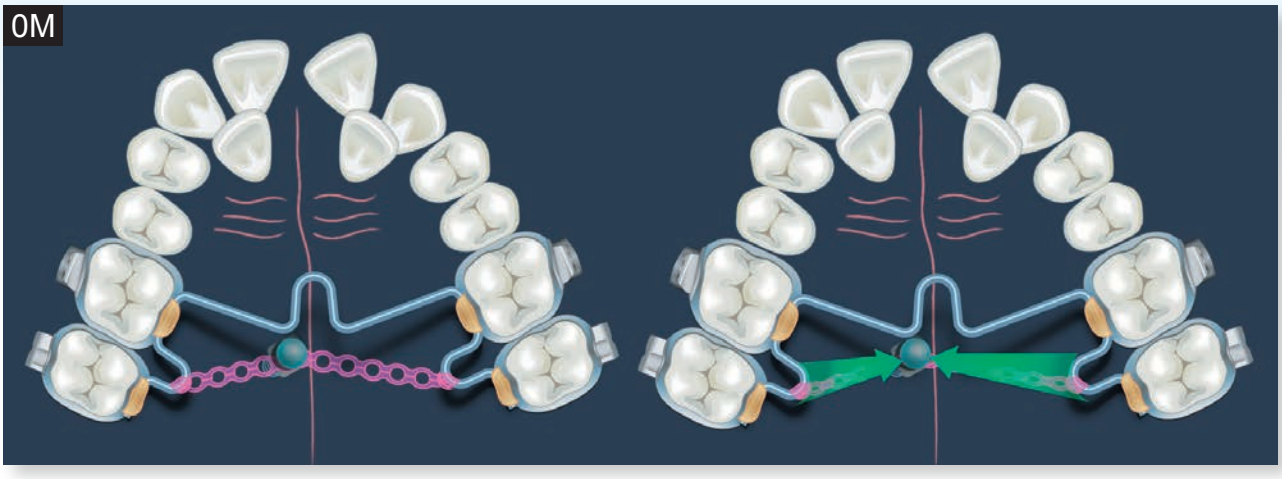


Fig. 4:
The drawing illustrates the intrusive forces generated by power chains applied from the molar bars of TPA to the mini-screw.

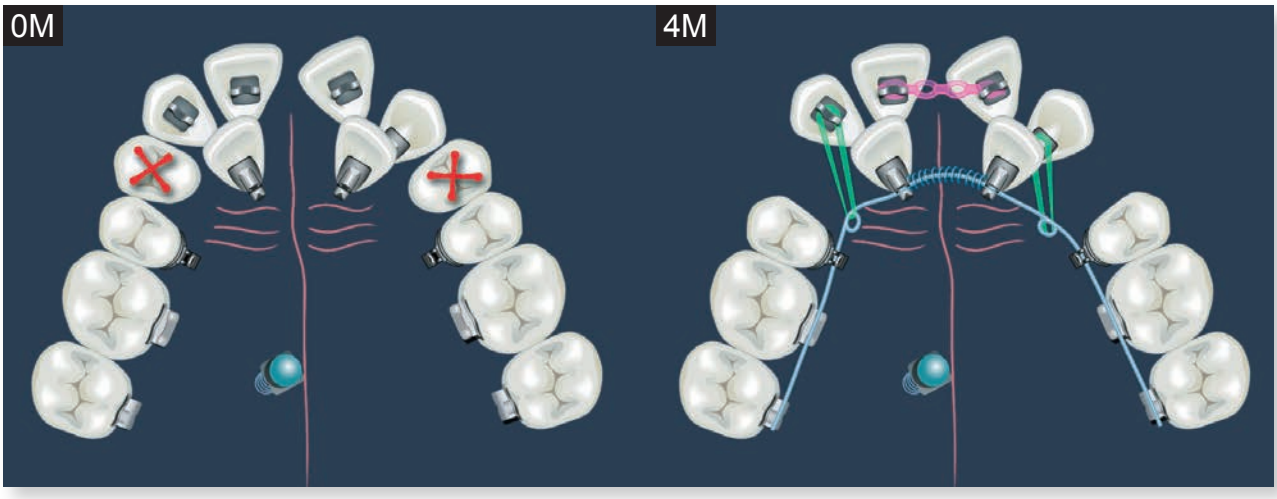


Fig. 5:
Left: The maxillary first premolars were extracted to relieve anterior crowding.
Right: A .013" CuNiTi wire was engaged in the maxillary arch. Power chains were used on two central incisors to close the diastema space. A NiTi coil spring was inserted between two lateral incisors to create space for central incisors. Two power chains were used from right and left maxillary canines respectively to the loops of the main archwire to distalize the canines.

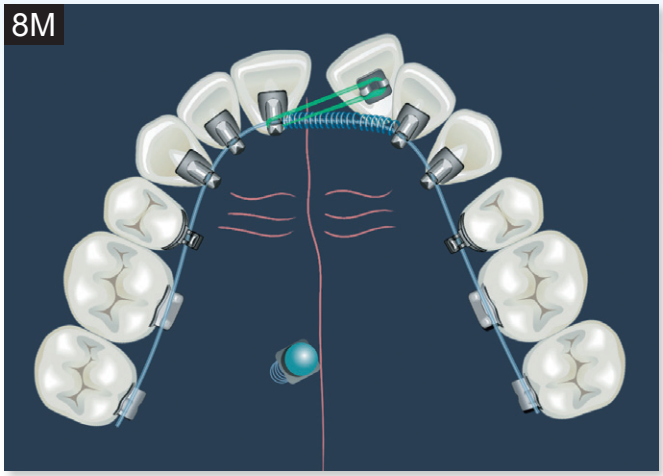


Fig. 6:
.016 Cu-NiTi was engaged in the maxillary arch. A NiTi coil spring was inserted between right central incisor and left lateral incisor to keep the space for left central incisor. A power chain was hooked between two central incisors to align left central incisor.

In the 21st month, a .0175x.0175" TMA wire was used for detailing on the upper arch.

After 27 months of active treatment, all appliances were removed. Figs. 7, 8 included intra-oral photographs documenting the entire treatment sequence.

Retention

Clear retainers were delivered on both arches initially after debonding. 6 months later, clear retainers were replaced by a QCM (*Quick-Change-Methods*) retainer on the upper arch and a spring retainer on the lower arch.

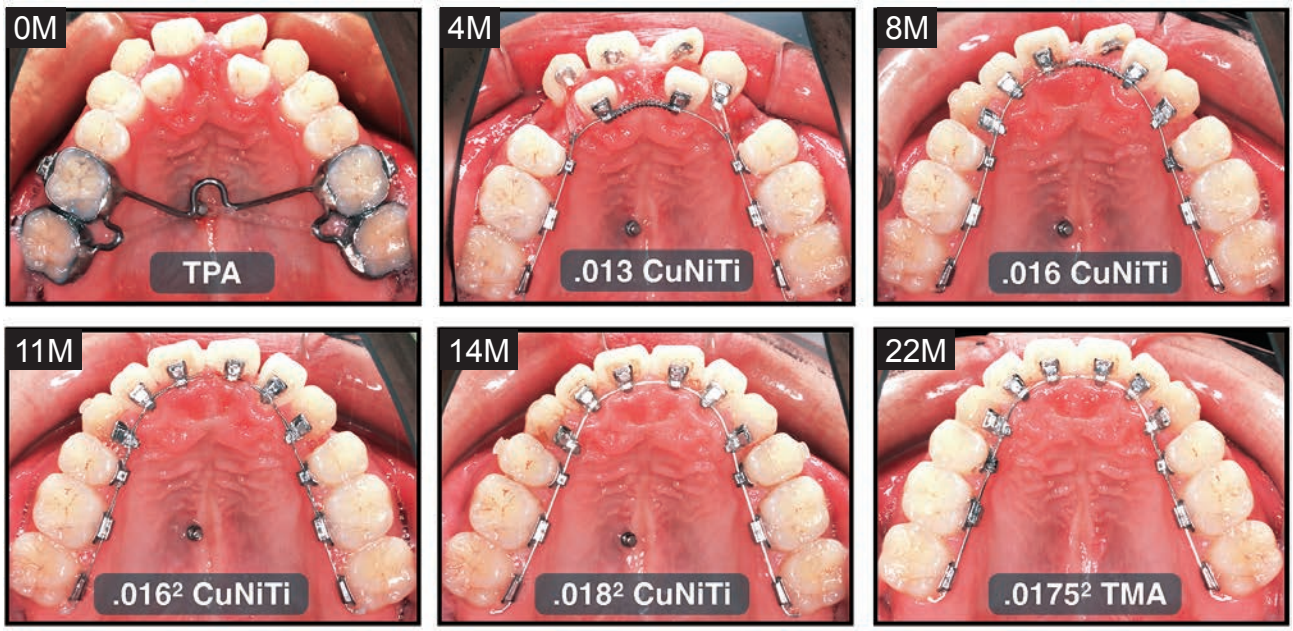


Fig. 7:
The maxillary occlusal view of the treatment sequence (upper left to lower right). The appliance or archwire is shown in the black box in the lower center of each photograph.

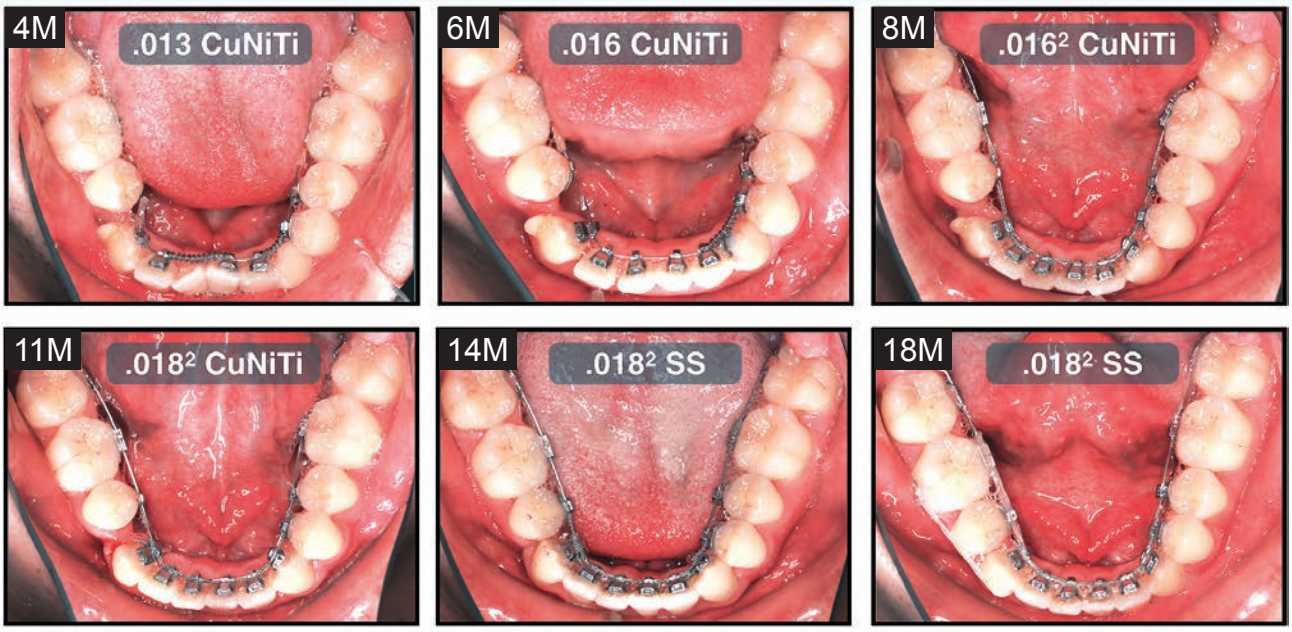


Fig. 8:
The mandibular occlusal view of the treatment sequences (upper left to lower right). The archwire is indicated in the black box in the upper center of each photograph.

Treatment Results

Dramatic improvement in alignment and occlusal functions can be observed in the extra-oral and intra-oral photographs (*Fig. 9*). Further post-treatment documentation is provided with a post-treatment radiograph, cephalometric tracing (*Fig. 10*) and a summary of cephalometric measurements (*Table 1*). Superimposed tracings (*Fig. 11*) indicate no skeletal growth. The mandible has been counter-clockwise rotated. The maxillary incisors have been retracted, extruded and uprighted. The mandibular incisors have been protruded, extruded and flared. The overjet has been improved from 6mm to 0mm, and overbite has been improved from -7mm to 3mm. The lower lip has been protruded.

Satisfactory results were achieved with a Class II relationship on the left, and a Class I occlusion on the right. Both upper and lower midlines coincide (*Fig. 9*).

Discussion

Severe crowding and anterior open bite commonly indicates surgical treatment. However, when conservative camouflaged orthodontic treatment was requested, applying intrusive forces to posterior teeth and planned extractions with a PSL appliance are possible options to close open bite, relieve crowding and align the dentitions. In this case as the mandible was rotated backwards and downward by the intruding mechanics from TPA and miniscrews, lingual orthodontic treatment could then further relieve the crowding and achieve alignment. The

Fig. 9:
Post-treatment facial and intra-oral photographs show satisfactory results were achieved with a Class II relationship on the left, and a Class I occlusion on the right. Both upper and lower midlines coincide.

intruding mechanics were consisted by connecting both left and right maxillary molars with a TPA and molar bars. Furthermore a power chain was attached from the molar bars to a mini-screw, placed 1mm away from the mid-palatal suture to intrude the maxillary molars. By superimposition, the maxillary molars were impacted by 1.5mm (*Fig. 11*). As the maxillary molars were intruded and moved mesially, the mandible was slightly rotated in a counter-clockwise direction. Up and down elastics were used to help increase the depth of the anterior bite.

Due to the lower midline shift to the left, a Class II molar relationship was found on the left side. Asymmetric extraction by extracting the maxillary left and right premolars and the mandibular right premolar only was

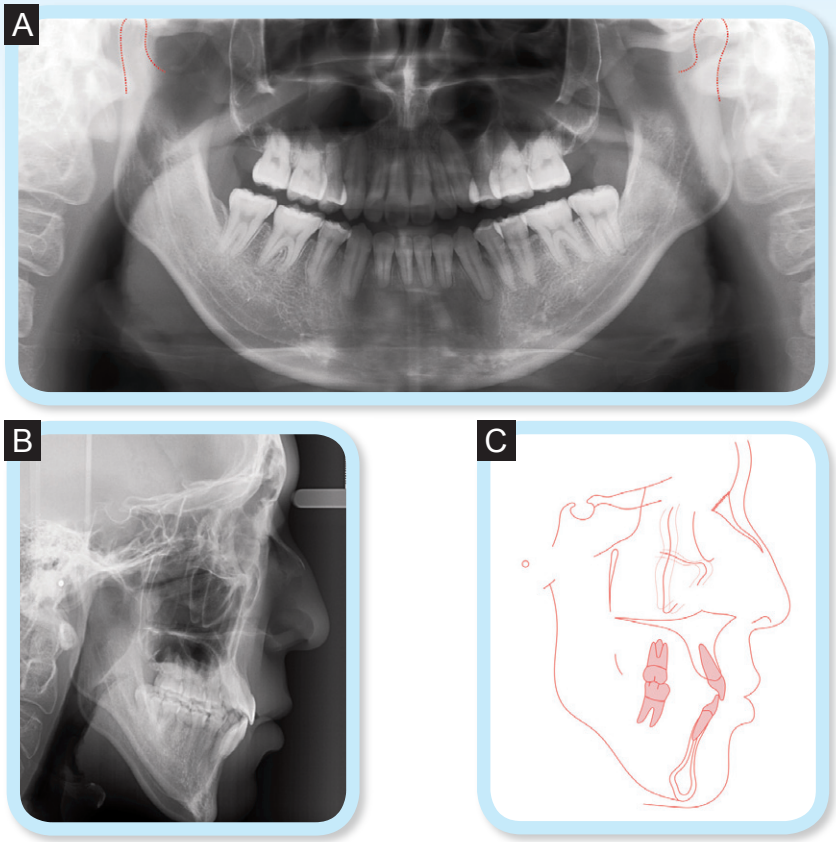


Fig. 10: Post-treatment radiographs and tracing: A, panoramic radiograph B, lateral cephalogram C,cephalometric tracing

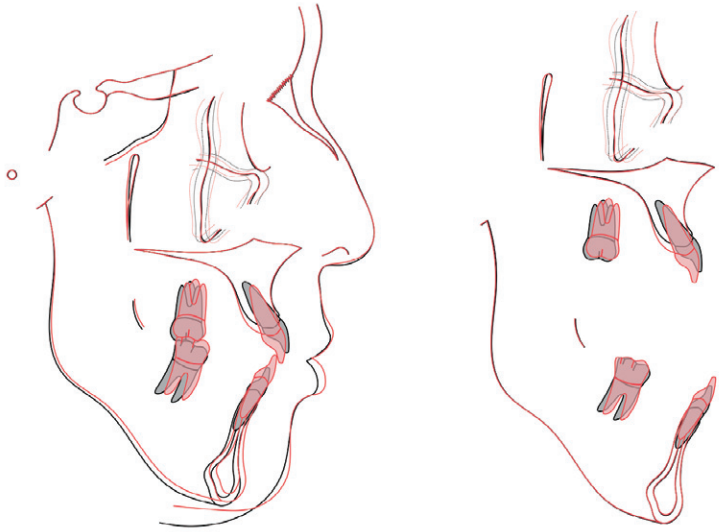


Fig. 11:
Cephalometric tracing documents the dental and skeletal changes during treatment. The pre-treatment (black) and post-treatment (red) are superimposed on the anterior cranial base (left), and on the stable landmarks of the maxilla (upper right), and mandible (lower right).The mandible has been counter-clockwise rotated. The maxillary incisors have been retracted, extruded and uprighted. The mandibular incisors have been protruded, extruded and flared.

planned, and left side class II finish was intentionally designed for midline-correction and mandible shift.

From the computed tomography (*CT*) view (*Fig. 12*), the maxillary left sinus was large, and the canine root was hitting the cortical bone, making distal root tipping difficult to achieve. It was decided to keep the maxillary left canine root mesially inclined.

Lingual orthodontic treatment has been considered one of the more aesthetic treatment options. However, a major drawback, that the ligation is often complex, time consuming and technique sensitive, has deterred many clinicians. Furthermore the difficulty in controlling rotation and torque of teeth and irritation are common critiques of lingual treatment.

The indirect bonding technique and a smaller bracket profile make the operation more efficient and easier to maneuver and increase patient comfort.

In addition, this new straight wire PSL system allows for full-size engagement of high-tech, soft, fine wires which can provide lighter forces than traditional rectangular slot brackets, due to its smaller bracket profile and square slot design. These features also indicate less play between the slot and wire and more precise tooth control (*Fig. 13*).[1-3]

Mushroom arch wires, typically used in conventional lingual orthodontic treatment, have been replaced by straight wires in recent years. In this lingual straight wire system, the operation is simplified and more consistent due to the elimination of complicated wire bending.[4,5]

Conclusions

TPA and mini-screws are effective to intrude posterior molars and close anterior open bite. Planned asymmetric extractions can relieve severe crowding while preventing further mandibular shift

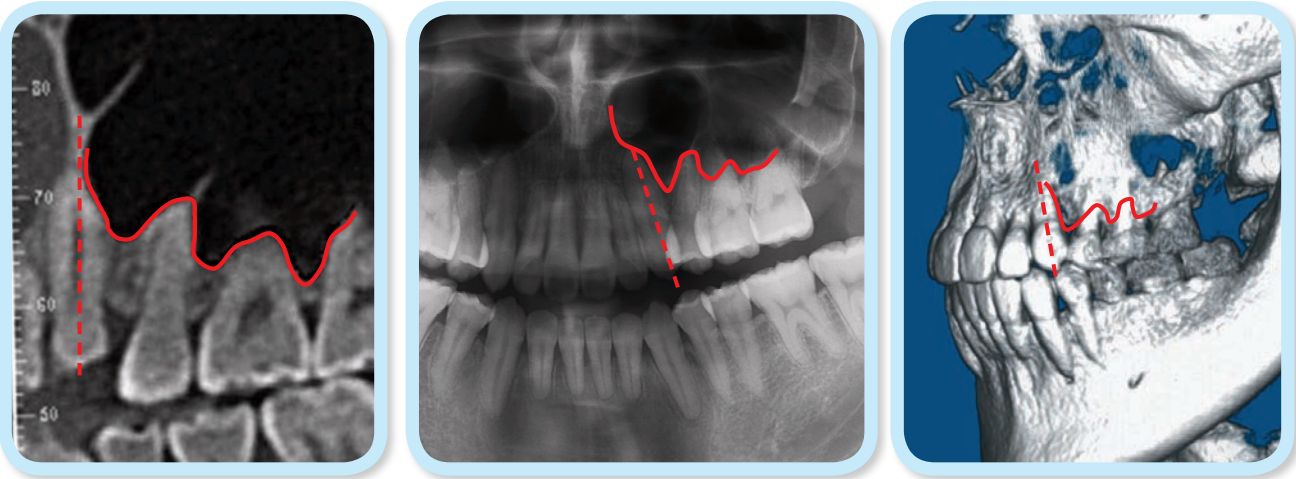


Fig. 12:
The maxillary left canine was left distally inclined. However the CT indicates the maxillary left sinus was large, and the tooth root hit the cortical bone. Therefore, tooth root control was deemed impossible.

Fig. 13:
The .018x.018" slot PSL bracket has less play between the slot and the wire. The force of the wire can be applied more precisely, and tooth control can be performed with appropriate orthodontic forces.

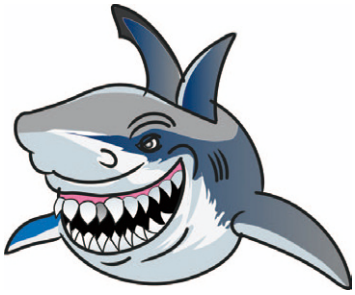
to one side and achieve satisfactory camouflaged treatment results. Conventional lingual orthodontic treatment is often critiqued as uncomfortable, time consuming and skill sensitive. However, this new PSL lingual bracket's smaller profile and square slot can increase patient comfort and minimise friction. Full size engagement of archwires provides precise control of rotation and torque and improve efficiency. The straight wire feature, furthermore, makes the operation easier to manage due to the elimination of complicated wire bending.

Acknowledgements

Thanks to Dr. Angle Lee for editing, Dr. Rungsi Thavarungkul for the beautiful illustration, and Ms. Tzu Han Huang for proofreading this article.

References

1. Scuzzo G, Takemoto K, Takemoto Y, Lombardo L. A new self-ligating lingual bracket with square slots. J Clin Orthod 2011 Dec;45(12):682-90.
2. Takemoto K, Scuzzo G, Lombardo L, Takemoto Y. Lingual straight wire method. Int Orthod 2009 Dec;7(4):335-53.
3. Lombardo L, Arreghini A, Ardha KA, Scuzzo G, Takemoto K, Siciliani G. Wire load-deflection characteristics relative to different types of brackets. Int Orthod 2011 Mar;9(1):120-39.
4. Lombardo L, Saba L, Scuzzo G, Takemoto K, Oteo L, Palma JC, Siciliani G. A new concept of anatomic lingual arch form. Am J Orthod Dentofacial Orthop 2010 Sep;138(3):260.
5. Scuzzo G, Takemoto K, Takemoto Y, Takemoto A, Lombardo L. A new lingual straight-wire technique. J Clin Orthod 2010 Feb;44(2):114-23.



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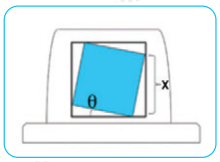
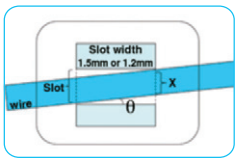


3rd-order play between square and rectangular slots and different sizes of archwires.

Square slot	.016" x .016" wire	.017" x .017" wire	.0175" x .0175" wire
.018" x .018"	~7–8° play	~3–4° play	~1–2° play
Rectangle slot	**.016" x .022" wire**	**.017" x .022" wire**	**.017" x .025" wire**
.018" x .025"	~5–6° play	~2–3° play	~2–3° play

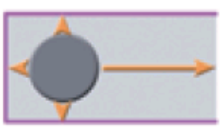


2nd-order play between STb SL Square Slot lingual brackets* with .018"x .018"square slots and different sizes of archwires.

Upper Anterior	.016" x .016" wire	.017" x .017" wire	.0175" x .0175" wire
.018" x .018" (1.5mm wide)	~1–2° play	~0–1° play	~0–1° play
Lower Anterior	**.016" x .016" wire**	**.017" x .017" wire**	**.0175" x .0175" wire**
.018" x .018" (1.2mm wide)	~2–3° play	~1–2° play	~0–1° play

Square slot
.018" x .018" slot

Rectangular slot
.018" x .025" slot



Rotation control with a round or square wire is more effective with a square slot.

Tipping control: square slot = rectangular slot
Rotation control: square slot superior to rectangular slot

* G. Scuzzo, MD, DDS, K. Takemoto, DDS, PHD, Y. Takemoto, DDS, G. Scuzzo, DDS, L. Lombardo, DDS. "A New Self-Ligating Lingual Bracket with Square Slots", *Journal of Clinical Orthodontics*, Volume XLV, No. 12 (2011): 682 - 683.

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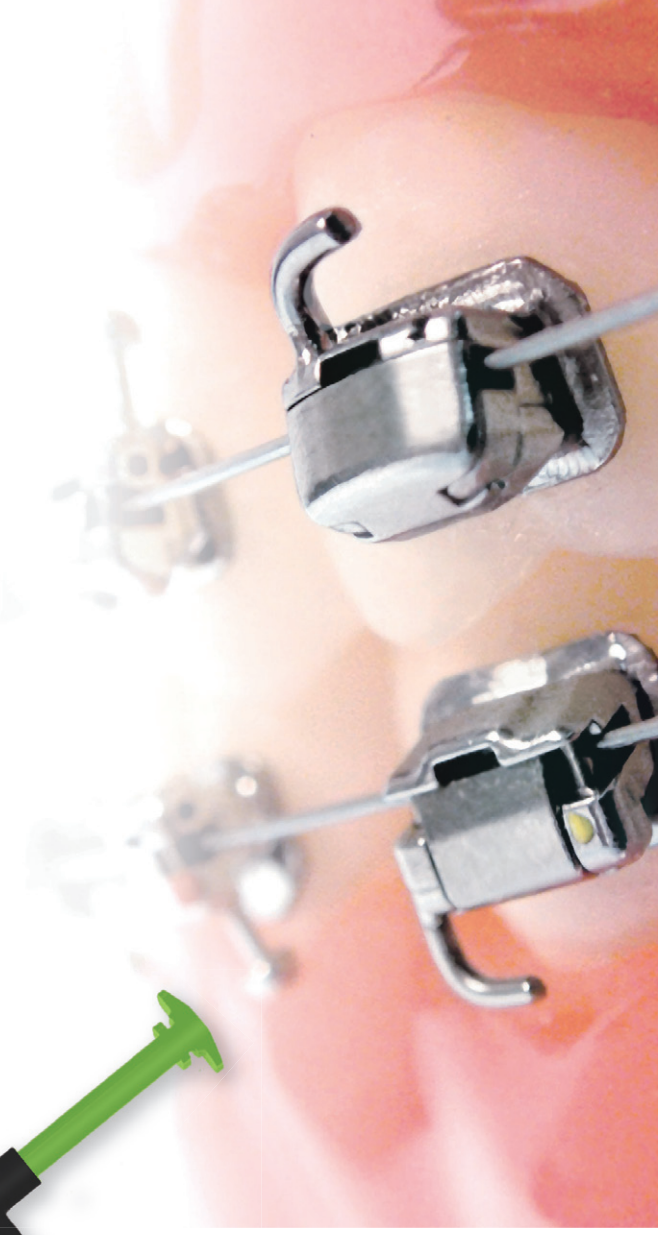

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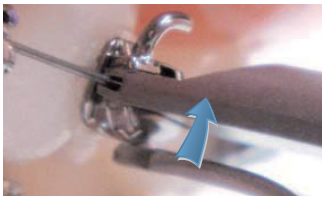

Position the grooved tines of the instrument on either side of the slot and engage the archwire. Gently squeeze the opposing prong and listen for the audible click to confirm the slide is closed.

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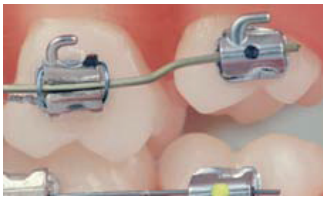
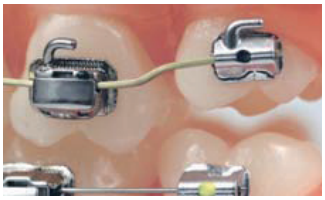


Convertible tubes require frequent tying of ligatures once the cap has been removed, which results in lengthy wire-change appointments, especially for cases involving impacted second molars.



The SnapLink re-convertible tube eliminates the need for constant tying, making it easy to connect to second molars – even when making wire bends – without downsizing to a smaller wire.

總代理 湧傑 YONG CHIEH 訂購專線：北區 (02)2778-8315 · 中區 (04)2305-8915 · 南區 (07)226-0030

Feedback from the 2015 Beethoven International Workshop

This workshop is a turning point for me, not only learning new techniques and philosophises in diagnosis, treatment planning and the use new tools to help with the treatment but how sharing knowledge, teaching skills and humbleness are the tools for a successful teacher which I found in the person of Chris Chang. Moreover, a wonderful committed team was supporting and helping all the way through the workshop.

Two days felt like a couple of hours with the amount of knowledge shared from both Chris and John Lin and I seriously would have liked to stay for longer. Maybe that is the only critique is that it was not long enough and it will never be long enough when learning from these two professional orthodontists.

Last but not least, Dr. Rungsi revealed the secret of how to present your work in a very bright, new and exciting way so the audiences can communicate and understand your thoughts and achievements in an easy way.

Regards,

Dr Hossam El Sanabary
iSmile Dental Clinic, Australia

It's an information-explosion era nowadays, but Albert Einstein once said: "*The only source of Knowledge is experience.*"

It is surely a big step forward in my professional life after my visit to Dr. Chang's office in Taiwan. Even though you can receive Dr. Chris Chang's teaching shared on Youtube, Facebook, in Journals, eBooks or by other online resources, I believe the most effective way of learning is to see and listen to his lecture as well as to operate in person to soak up his experiences.

I sincerely recommend my colleagues to make a visit and experience things he shared in person. I'm sure it will help you leap forward in your professional career just like me.

Best regards,

Serena Lee *Argentina*

Dear Dr. Chris Chang:

I had the pleasure of attending Dr. Chris Chang's Course from 1st-4th December 2015. My interest in the programme was purely from a surgical perspective but Dr. Chang's orthodontic lecture content was very informative and easy to follow. I learnt a lot. Lectures from Dr. John Lin were also excellent. Lecture content was up to date, state of the art and honest.

After the lectures, organized social events certainly added to the fun and enjoyment of the course. In addition, friendly assistance from Chris's staff, when needed, highlighted how well organized the Beethoven International Workshop was.

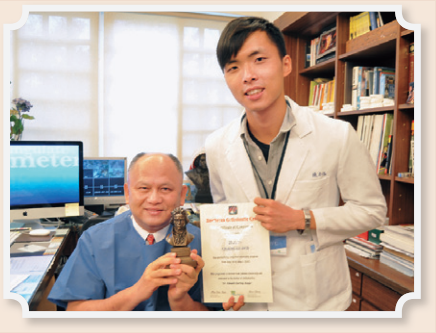
I would thoroughly recommend this course for BOTH specialist orthodontists and GP's who practice orthodontics.

With my appreciation and best regards,

Dr Dean A Martin, Dental Surgeon, Perth, Western Australia

貝多芬獎學金學員心得

我在這次的活動之中領悟到很重要的一件事，就是對於學習任何事情所應抱持的態度。其中之一是“Stay hungry, stay foolish.”，也是賈伯斯在史丹福大學演講所給予大學生的祝福：「虛心若愚，求知若飢」，不遺餘力的去開拓自己未知的領域。例如牙科學術方面，或是牙科診所管理以及一些Apple的相關軟體應用等等。然而對於已經學過的事物，也千萬不可驕傲的認為自己都會了而不勤加練習，導致日漸荒廢。



其次，聽取了張醫師的個人求學經歷分享之後，有一句話給我了大大的啟發，勤練基礎，奠定基石才是成功的祕訣，以及「Passion, Persistence, Practice」的三字箴言更是深深烙印在我的海馬迴之中。所以我認為我所學到最多的是對於每一件事物的態度。

令我印象最深刻的是在貝多芬矯正中心臨床見習觀摩時，第一次體會到什麼是醫療產業的泰勒化以及訓練助理的標準化流程，如此才能消化每天近百位預約掛號的病患，然而在忙碌中又將治療計畫向病人解釋得清清楚楚，讓我覺得能夠做到如此熟稔著實厲害。

張力仁 中山醫學院

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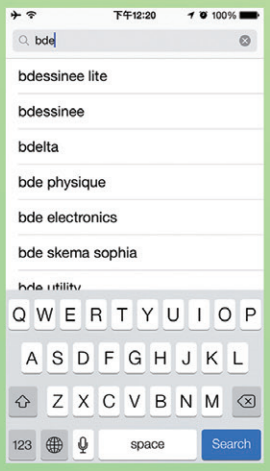

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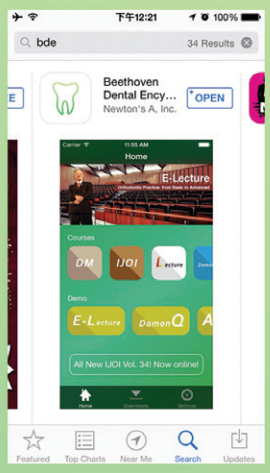

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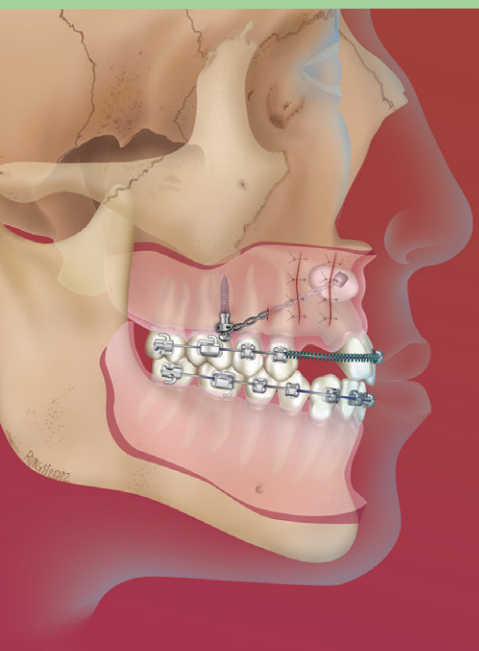

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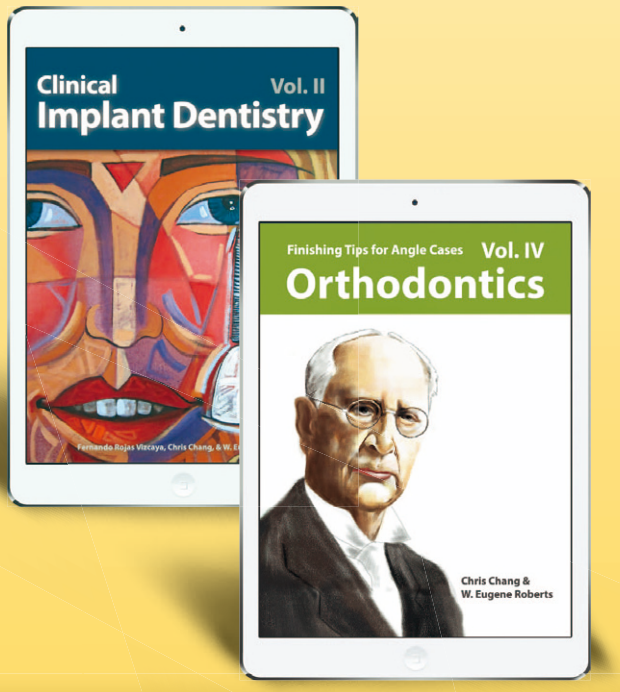

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2015-2016 USC-Taiwan Implant Program graduation ceremony. Program director, Dr. Homa Zadeh (center right), Dean Dr. Ilan Rostein (center left) and Taiwan program Director, Dr. Chris Chang (4th from the left).

ISSN 2079-6862