Class II Malocclusion with Impacted and Transposed Canines Treated with Modified Vertical Incision Subperiosteal Tunnel Access (VISTA) and Bone Screws

Abstract

Introduction: *A 11yr-8mo-old female presented with a chief complaint of unerupted bimaxillary right canines.*

Diagnosis: *The patient had a right end-on Class II and left full-cusp Class II dental malocclusion with an overjet of 8mm. A 100% impinging deep bite was also noted. This severe malocclusion was further complicated by an incompletely transposed and impacted maxillary right canine and a completely transposed and impacted mandibular right canine. The discrepancy index (DI) was 59.*

Etiology: *The cause of the severe impaction was a deviated path of eruption that may be related to over-retained primary canines.*

Treatment: *A right-sided infra-zygomatic crest (IZC) bone screw and a right-sided buccal shelf (BS) bone screw were used as anchorage for a modified vertical incision subperiosteal tunnel access (VISTA) submucosal procedure to retract unerupted bimaxillary right canines to their correct sagittal relationships, respectively. Bilateral IZC bone screws, Class II elastics, combined with anterior and posterior bite turbos (BTs) were used to correct the Class II malocclusion, excessive overjet, and deep bite.*

Outcome: *After 35 months of active treatment, this difficult malocclusion, with a Discrepancy Index of 59 points, achieved a Cast-Radiograph Evaluation score of 26 points and a Pink and White esthetic score of 4 points. The patient was very pleased with the treatment outcome. Final records were collected at the 1.5-year recall appointment. (J Digit Orthod 2022;65:4-24, reprinted with permission from Int J Orthod 2021;32(2):7-17)*

Key words: *Impaction, impacted and transposed maxillary canine, impacted and transposed mandibular canine, incompletely transposed impaction, completely transposed impaction, modified vertical incision subperiosteal tunnel access, VISTA, bone screw, closed eruption technique*

Introduction

Recovering severely displaced, impacted canines is among the most challenging clinical problems in orthodontics. An impacted canine can lead to strenuous tooth eruption and movement, which could thereby negatively influence its esthetics and functions.[1-4] Notably, the corrective treatment for a transposed impaction becomes an even greater challenge. The standard procedure to recover impaction includes surgical exposure and forced orthodontic eruption.[5,6] Kokich[7] has proposed three surgical methods for uncovering labially impacted maxillary canines: an excisional uncovering, a closed eruption technique (CE), and an apically positioned flap (APF). Accordingly, deep and high bony impactions require treatment using the latter technique, whereas horizontal bony impactions are more suitable for the last type. Previously, the anchorage for traction of the impacted canines has been achieved either through adjacent anchorage of teeth or through a main wire. If the deep impaction is severely displaced, it becomes impossible to move. In such a case, the anchorage for traction cannot

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provide a three-dimensional force to pull back the impaction to the baseline position

Bone screws can help guide impacted canines with greater precision during eruption while avoiding unwanted movement of anchorage teeth.[7] Their other advantages include ease of placement and removal, minimal need for patient compliance, and cost effectiveness.[8] They constitute a strategic component to the treatment of impacted teeth.

Fig. 1: *Pre-treatment facial and intra-oral photographs*

The vestibular incision subperiosteal tunnel access (VISTA), as developed by Zadeh,[9,10] repositions the gingival margins coronally to correct periodontal defects in the maxillary anterior region (Fig. 2). In contrast, a modified VISTA approach, as developed by Chang,[10-14] exposes the crown of the canine surface and provides an exit tunnel for the power chain. Its advantage lies in its relief on the strain when creating a full thickness flap in the procedure, whereby bone screws play an auxiliary role as anchorage devices.

The current patient is a rare and difficult case because she had two impacted and transposed canines: maxillary right canine, an incompletely transposed impaction, and mandibular right canine, a completely transposed impaction.[15-17] The purpose of this case report is to document our use of a modified VISTA method combined with placement of bone screws for managing transposed, labial impacted canines.

Diagnosis and Etiology

A 11-year-8-month-old girl presented with her parents for orthodontic consultation to evaluate her unerupted bimaxillary right canines. Clinical examinations showed that primary right canines in both arches were over-retained. In addition, the overjet was 8mm, and the overbite was 100% impinging deep bite. Right end-on Class II and left full Class II molar relationships were noted. A 2mm diastema was noted between the maxillary central incisors. On average, a 1mm space was found between all mandibular teeth (Figs. 1 and 3).

A panoramic radiograph revealed that the apex of the maxillary right canine was located in the proper eruption site, but its vertical position was 12mm apical to the alveolar crest. Besides, its crown tip overlapped the distal root surface of the maxillary right central incisor. The impacted mandibular right canine was parallel to its adjacent teeth, but its crown and root structure overlapped the root of the mandibular right lateral incisor. The maxillary right canine was diagnosed as incomplete transposed impaction, and the mandibular right canine was diagnosed as complete transposed impaction (Fig. 4).[15-17]

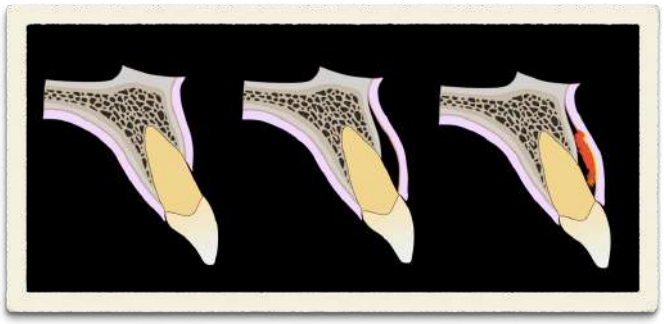


Fig. 2: *As shown from left to right, the VISTA procedure is a novel, minimally invasive approach for undermining the labial mucosa to correct soft tissue defects in the maxillary anterior region.*

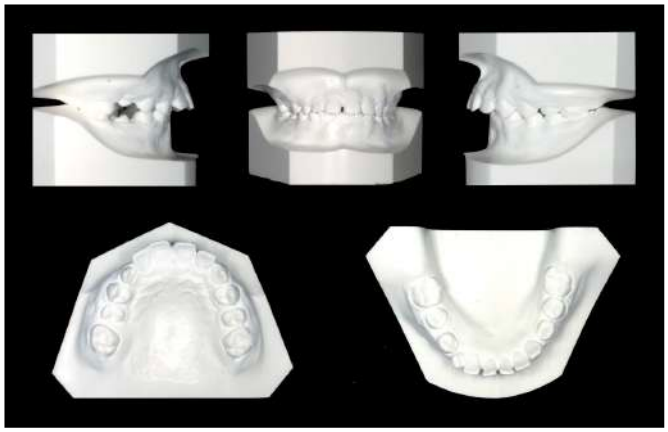


Fig. 3: *Pre-treatment study models (casts)*

Fig. 4: *Pre-treatment panoramic radiograph*

Lateral cephalometric analysis of the pre-treatment data indicated a low mandibular plane angle (15˚), a convex profile (G-Sn-Pg 26˚), and a protrusive upper lip (3mm to the E-Line). The bimaxillary incisors had increased axial inclination (U1 to SN 118˚, L1 to MP 116˚) (Fig. 5; Table 1). Pre-treatment CBCT images showed that the bimaxillary right canines are both labial impactions (Figs. 6 and 7). The American Board of Orthodontics (ABO) Discrepancy Index (DI) was 59 as shown in the subsequent worksheet.

Treatment Objectives

The treatment objectives were to align the bimaxillary impacted canines without causing detrimental effects on the adjacent incisors, to close all spacing, and to establish ideal overjet and overbite.

Treatment Alternatives

The ideal objective for a full fixed-appliance treatment would be to resolve the malocclusion and align the impacted cuspids. Two treatment plans were thus proposed: Option 1) would require surgical removal of the impacted canines, substituting them with the adjacent first premolar, and extracting the other two first premolars. This treatment option would warrant a shorter treatment time but would be detrimental to the patient's profile. On the other hand, Option 2) would involve a non-extraction treatment to align the transposed canines to their original positions. This would take more time to treat but would result in better esthetics and occlusion. After discussing the advantages and disadvantages of each option with the patient and her parents, we chose Option 2, the non-extraction treatment.

Treatment Progress

The treatment can be divided into two phases: the first phase to correct the impaction, and the second to complete the final alignment.

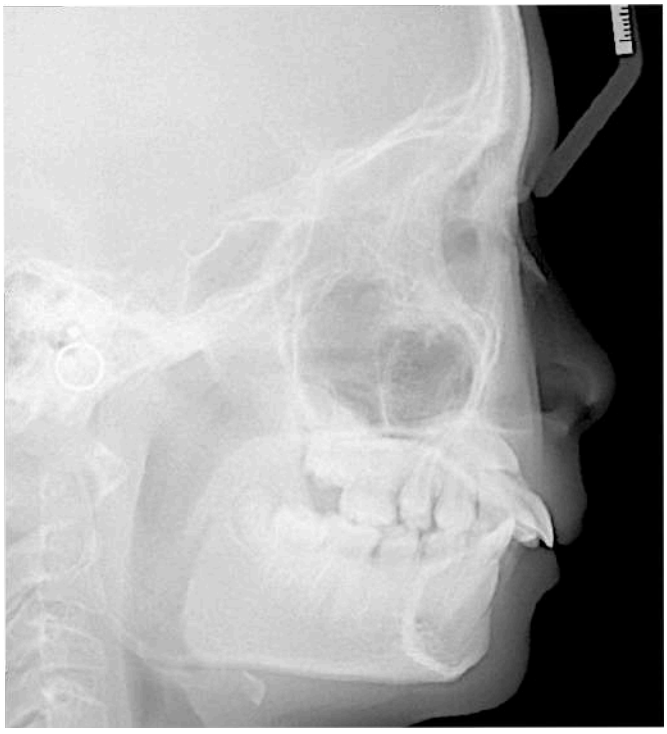


Fig. 5: *Pre-treatment cephalometric radiograph*

CEPHALOMETRIC SUMMARY			
SKELETAL ANALYSIS			
	PRE-TX	POST-TX	DIFF.
SNA° (82°)	82°	82°	0°
SNB° (80°)	79°	79°	0°
ANB° (2°)	3°	3°	0°
SN-MP° (32°)	15°	17°	2°
FMA° (27°)	8°	10°	2°
DENTAL ANALYSIS			
U1 TO NA mm (4mm)	8	3	5
U1 TO SN° (104°)	118°	93°	25°
L1 TO NB mm (4mm)	3	1	2
L1 TO MP° (90°)	116°	115°	1°
FACIAL ANALYSIS			
E-LINE UL (-1mm)	3	-0.5	3.5
E-LINE LL (0mm)	0.5	-1	1.5
%FH: Na-ANS-Gn (56%)	52%	53%	1%
Convexity: G-Sn-Pg (13°)	26°	23°	3°

Table 1: *Cephalometric Summary*

Phase 1: Correct the impaction

A self-ligating fixed appliance (Damon Q®, Ormco Corporation, Brea, CA) was bonded on all maxillary permanent teeth, except for the maxillary right lateral incisor. Notably, the unbonded lateral incisor acted as a free body to avoid any interference with the path of retraction which might result in more root resorption. A 0.014-in CuNiTi archwire was then engaged. A closed coil spring was inserted between the brackets on the maxillary right central incisor and the maxillary right first premolar to create space for the impacted maxillary right canine.

One month later, the initial surgery to expose the impaction was incorporated with a modified VISTA procedure designed to coordinate with an orthodontic retraction mechanism anchored by an extra-alveolar OrthoBoneScrew® (OBS) (2x12-mm, iNewton, Inc., Hsinchu, Taiwan). The bone screw had been placed in the right infra-zygomatic crest (IZC). The first vertical incision was performed along the mesial line angle of the lateral incisor. Following the initial incision, a periosteal elevator was used to detach the periosteum and expose the impaction, after which the bone covering the crown was removed down to the cementoenamel junction (CEJ). A button was bonded to the crown of the impaction. The bone in the planned path of retraction was removed with a #4 carbide round bur to facilitate tooth movement. Then, a second incision was performed along the mesial line angle of the maxillary right first premolar to make an exit tunnel for a power chain. A power chain was attached from the button to the IZC screw. After engaging the force, the two vertical incisions were sutured using 6-0 nylon to ensure minimal damage to the mucosa (Fig. 8).[10]

The procedure to recover the impacted mandibular right canine is similar to that mentioned above. The modified VISTA procedure was applied to coordinate with an orthodontic retraction mechanism that was anchored by an extra-alveolar OBS (2x12-mm) placed in the right buccal shelf (BS) (Fig. 9). Primary bimaxillary canines were then removed.

During the 5th month, the incision around the exit tunnel for the power chain had healed well. The loop of power chain was cut to reactivate the retraction force (Fig. 10). During the 7th month, a

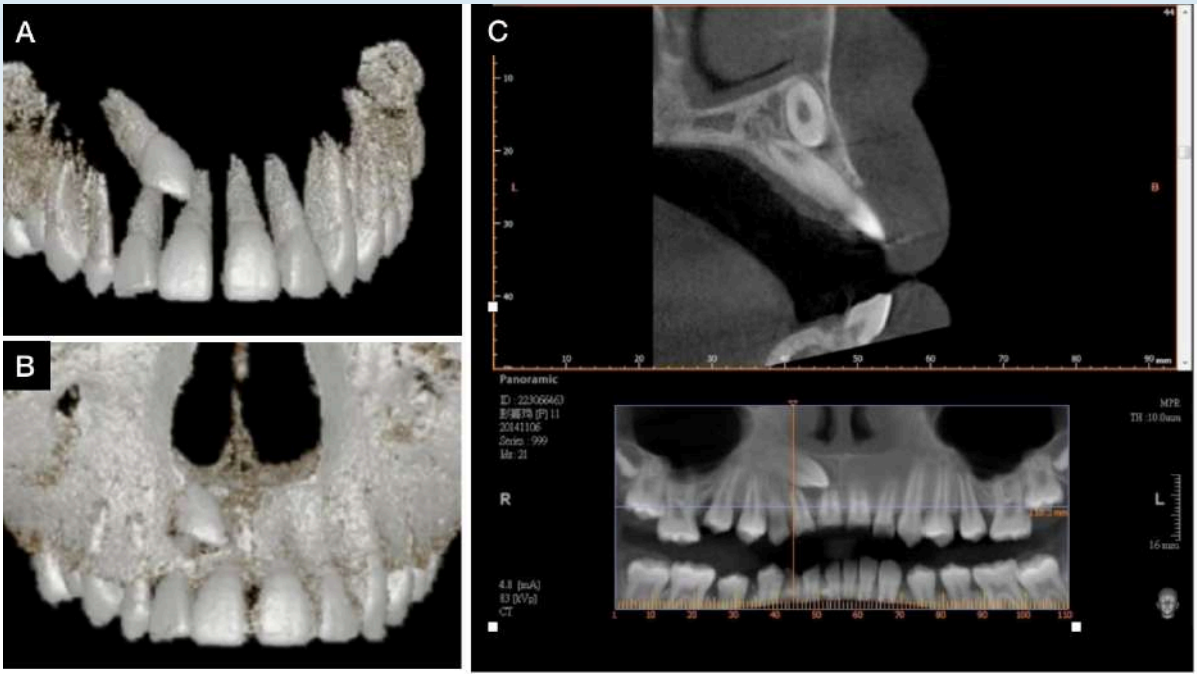


Fig. 6: *Pre-treatment CBCT*
A. 360º rotated animation around the impaction with the bone covering deleted. B. 360º rotated animation around the impaction covered with bone. C. Cross sectioned slice through the impaction

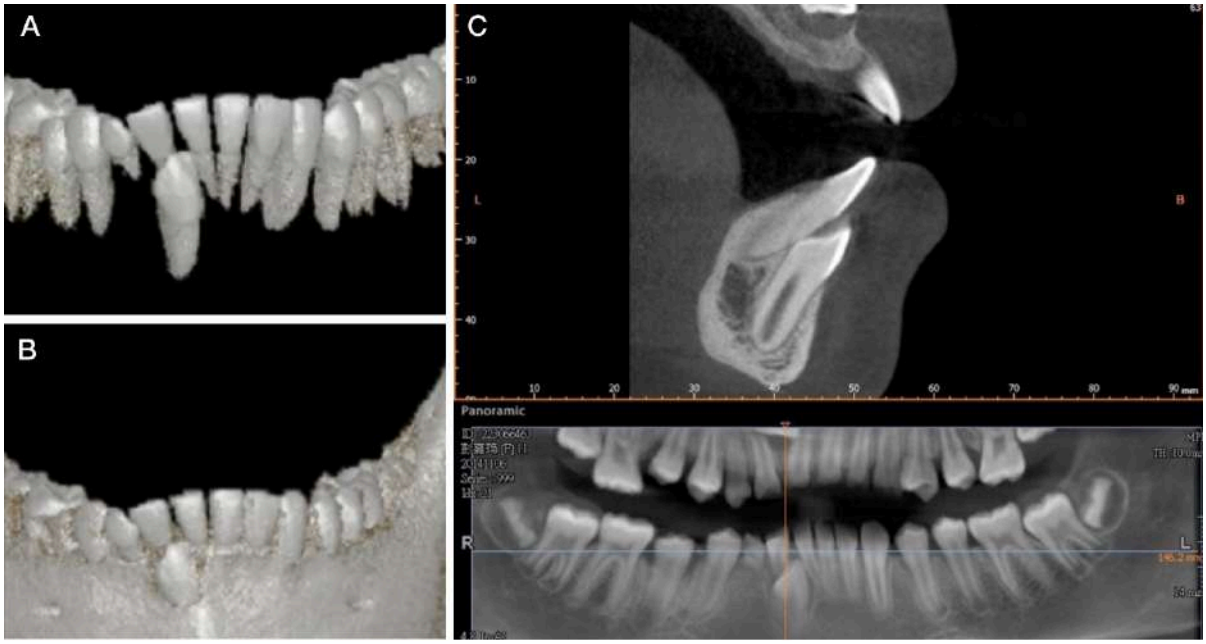


Fig. 7: *Pre-treatment CBCT*
A. 360º rotated animation around the impaction with the bone covering deleted. B. 360º rotated animation around the impaction covered with bone. C. Cross sectioned slice through the impaction

panoramic radiograph was taken to check the position of the two impacted canines. The mesio-distal position of impacted maxillary right canine was in the correct eruption position, but its vertical position was still far from the alveolar crest. The mandibular right canine crown went back into the oral cavity, but the apex was still located between the mandibular central and lateral incisors (Figs. 10 and 11). Subsequently, the right BS screw was removed, and a left IZC screw was installed.

During the 11th month, closed eruption technique was performed because of the unexposed maxillary right canine. The bone covering the maxillary right canine was removed to attach a ligature wire from the impacted crown to the main wire (Fig. 12). The track of tooth movement was recorded in Fig. 11.

Phase 2: Complete the final alignment

Also, during the 11th month, a self-ligating fixed appliance (Damon Q®, Ormco Corporation, Brea, CA) was bonded on all mandibular permanent teeth and the maxillary lateral incisor, standard torque brackets were selected for the lower incisors, and high torque brackets were chosen for canines. An 0.014-in CuNiTi archwire was engaged. Notably, the axis of the bracket had been tilted distally relative to the axis of the mandibular right canine, such that the apex could be shifted distally in order to correct for its transposed apex (Fig. 13).

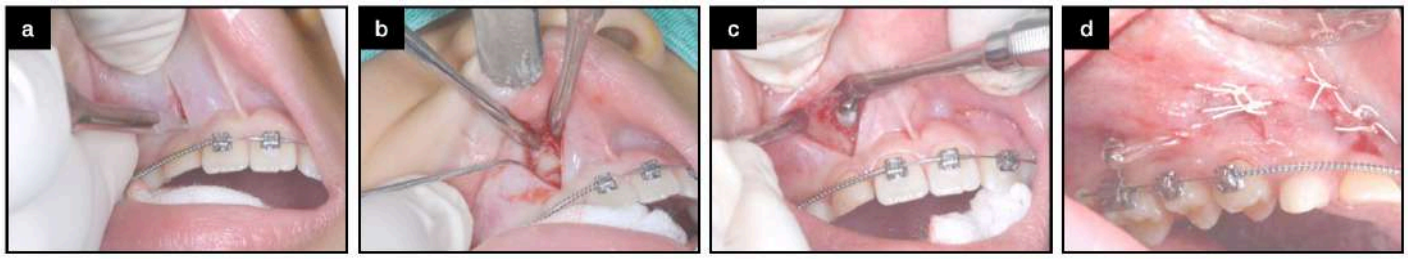


Fig. 8: *Procedure of the maxillary right canine surgery*
(a) The first incision was made along the mesial line angle of the maxillary right lateral incisor. (b) The bone covering the crown of the impaction was exposed, and then removed. (c) A button was bonded onto the crown of the impaction and all obstacles were removed. (d) a second incision was performed along the mesial line angle of the maxillary first premolar to establish a traction route for the power chain. The power chain was retracted from the IZC screw to the button. Finally, the two incision lines were closed with a 6-0 Nylon.

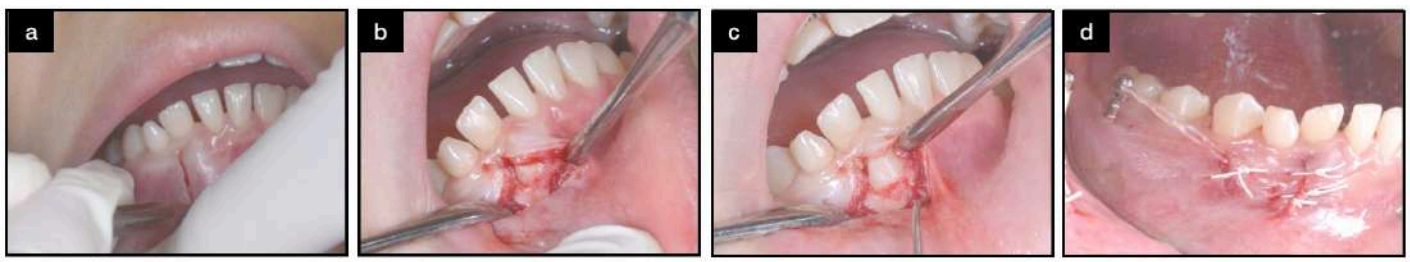


Fig. 9: *Procedure of the mandibular right canine surgery*
(a) The first incision was along the mesial line angle of mandibular right lateral incisor. (b) The bone covering the crown of the impaction was exposed, and then removed. (c) All obstacles were removed after the button was bonded onto the crown. (d) A second incision was performed along the mesial line angle of the mandibular first premolar to establish a traction route for the power chain. The power chain was retracted from BS screw to the button. Finally, the two incision lines were closed with a 6-0 Nylon.

Fig. 10: *Healing process after surgical exposure in 5th month, 7th month, and 9th month*

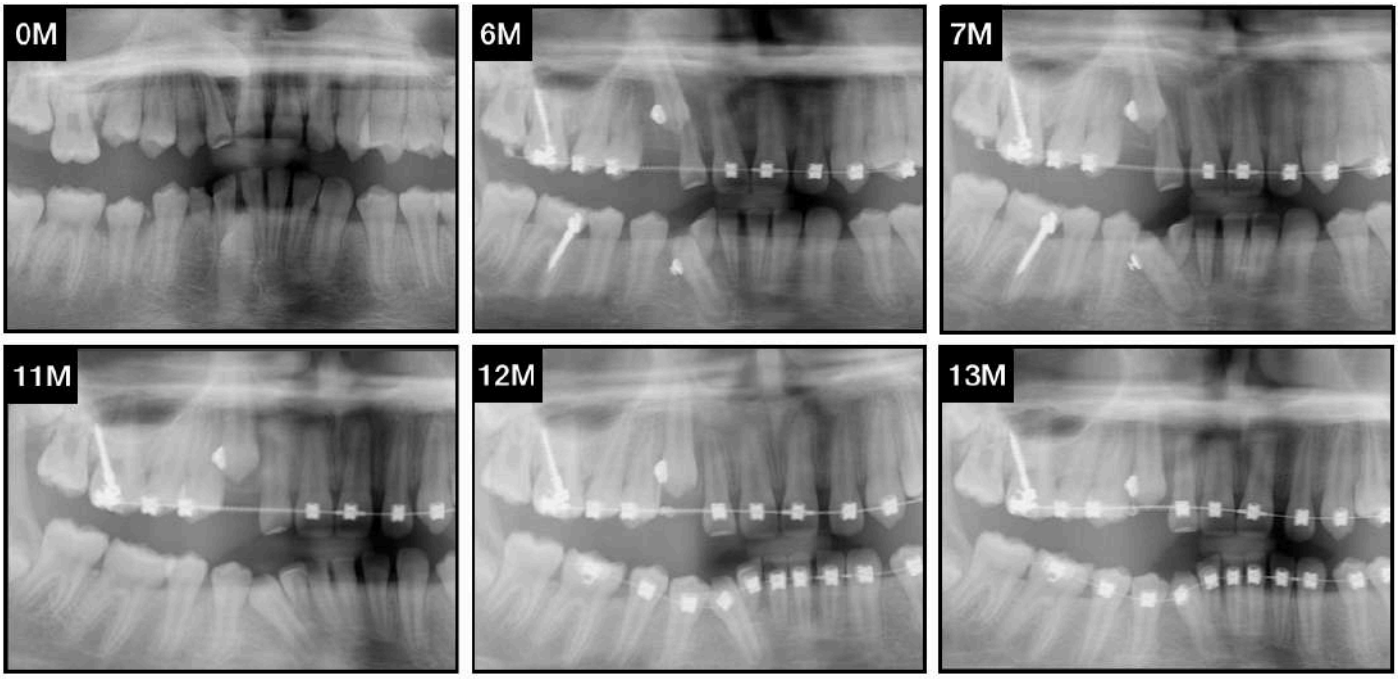


Fig. 11: *Track of tooth movement*

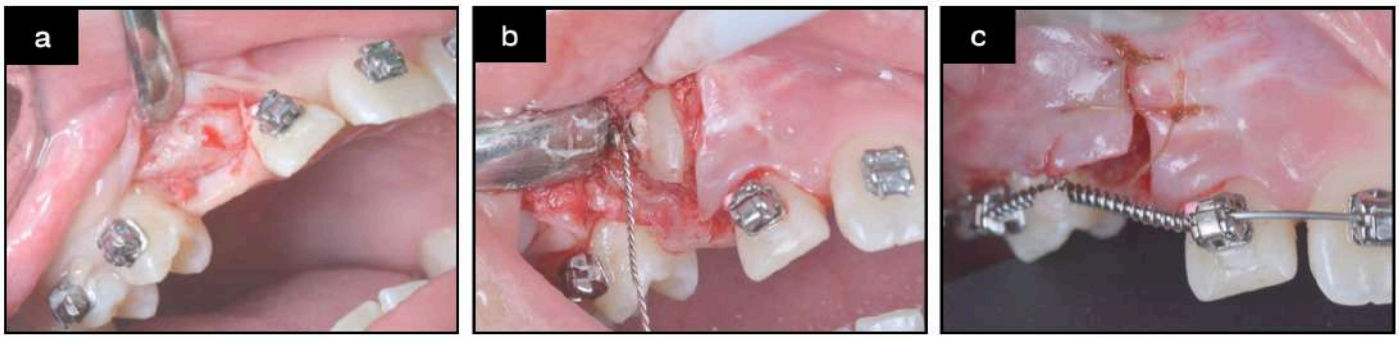


Fig. 12: *Procedure of the closed eruption technique in 11th month*

During the 14th month, the maxillary right canine had been finally completely recovered. A high torque Damon bracket was bonded. The sequence for the upper archwire was 0.014-in CuNiTi, 0.014x0.025-in CuNiTi, 0.017x0.025-in TMA, and 0.016x0.025 SS. The sequence for lower archwire was 0.014-in CuNiTi, 0.014x0.025-in CuNiTi, and 0.017x0.025-in TMA (Table 2).

During the 16th month, bite turbos were bonded on the occlusal surfaces of bilateral mandibular first molars to remove any occlusal interference. A canine Class II malocclusion was observed; as such, Class II elastics (Quail 3/16-in 2-oz, Ormco, Glendora, CA) were bilaterally worn from the upper canines to the lower first molars.

Fig. 13: *The axis of the bracket was tilted distally to the axis of mandibular right canine in order to move the apex distally.*

Alignment and leveling were completed in the 22nd month, but deep bite, 2mm overjet, and bilateral canine Class II relationships were still noted. In order to fix the above problems, the bite turbos were

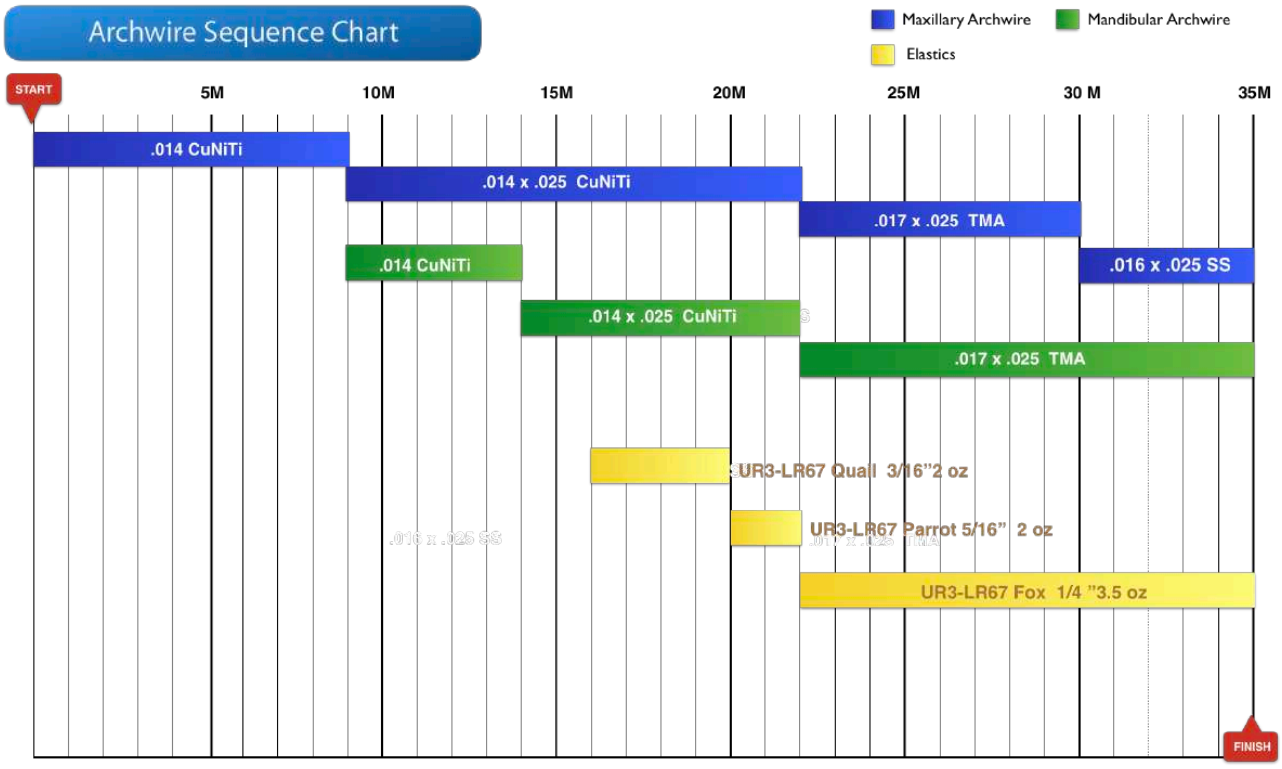


Table2: *Archwire sequence chart*

removed in the lower arch, and new ones were placed on the lingual surface of the bilateral maxillary central incisors. In addition, Class II elastics and bilateral IZC screw retraction were used. After 35 months of orthodontic treatment, all brackets were debonded, and a fixed retainer was bonded on the lower anterior incisors. Maxillary and mandibular clear overlay retainers were delivered for full-time wear for the first six months and nights only thereafter. The entire treatment sequence is documented in Figs. 14-18.

Treatment Results

The treatment results for this patient were excellent. All teeth have been well aligned in their proper positions (Figs. 19 and 20). Bilateral occlusal relationships are Class I with a normal overjet and overbite. All treatment objectives were successfully reached. A panoramic radiograph revealed good root parallelism (Fig. 21). The superimposed mandibular image of the post-treatment cephalometric data (Table 1) and the cephalometric

Fig. 14: *Frontal view of the treatment sequence is shown at treatment times in months (M): 1M, 12M, 14M, 18M, 22M, 25M,29M, and 32M.*

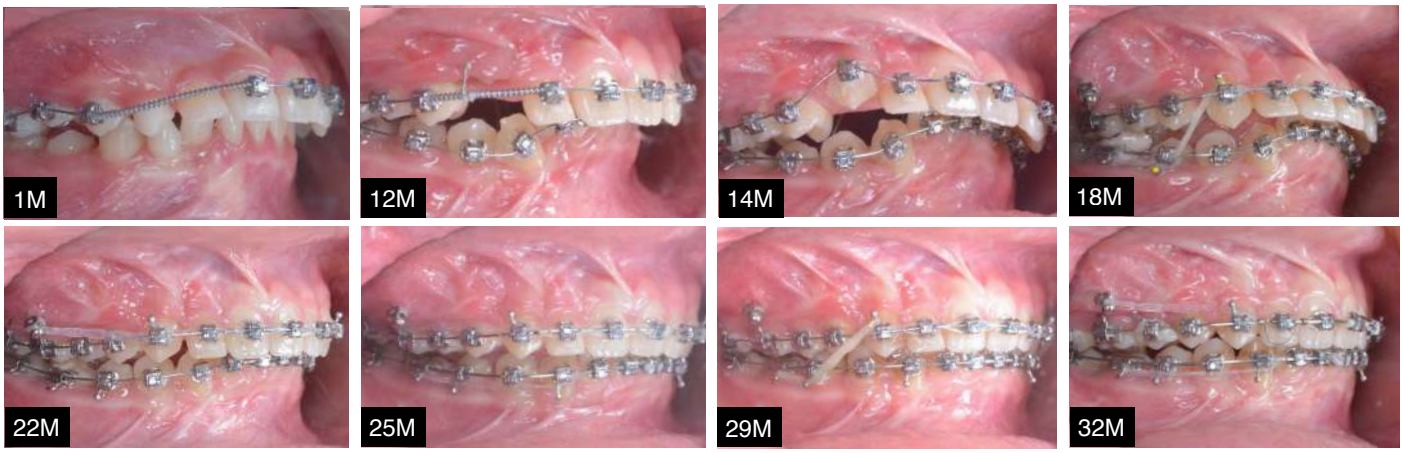


Fig. 15: *Right view of the treatment sequence. Note: the eruption procedure of the impacted bimaxillary right canines*

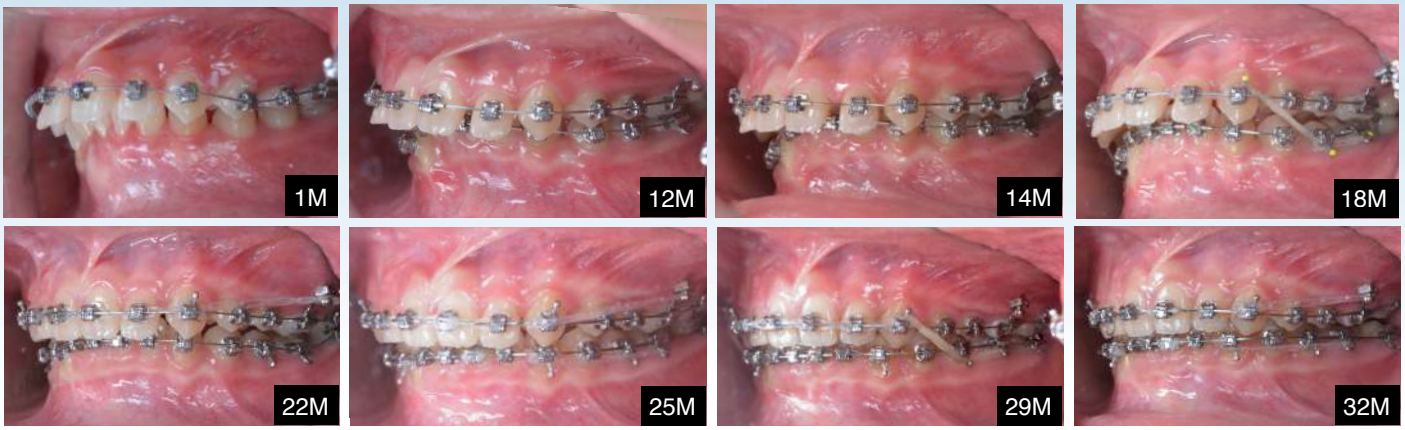


Fig. 16: *Left view of the treatment sequence. Note: the correction procedure for deep bite*

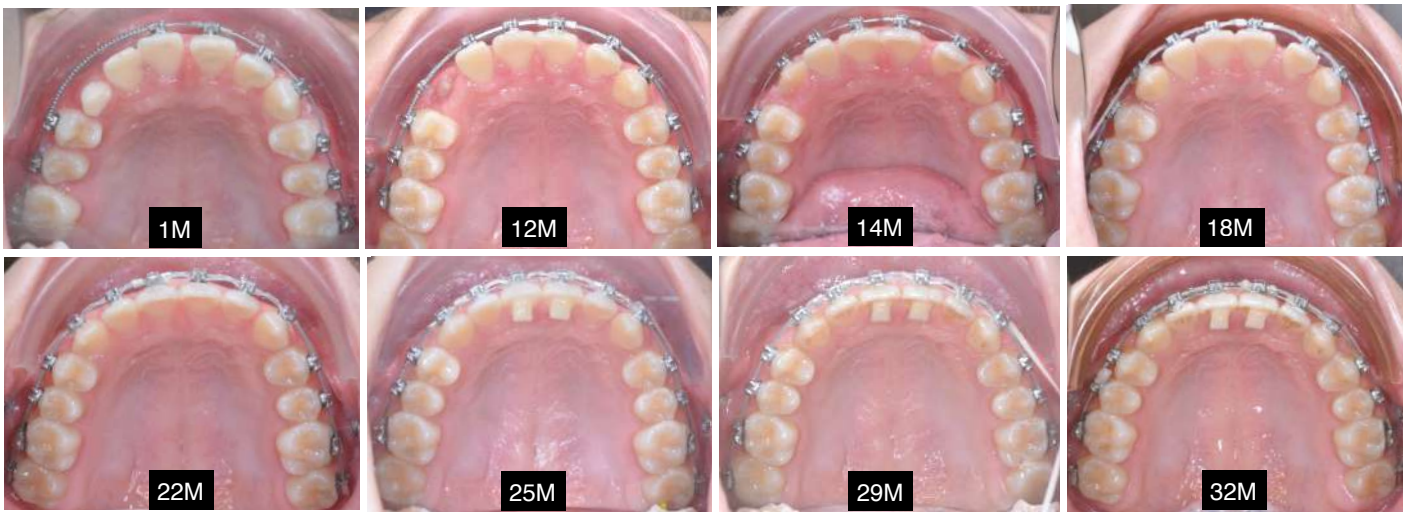


Fig. 17:
The progress of the upper arch is shown. Note: Bite turbos were boned on the lingual surface of bilateral maxillary central incisors to remove occlusal interference.

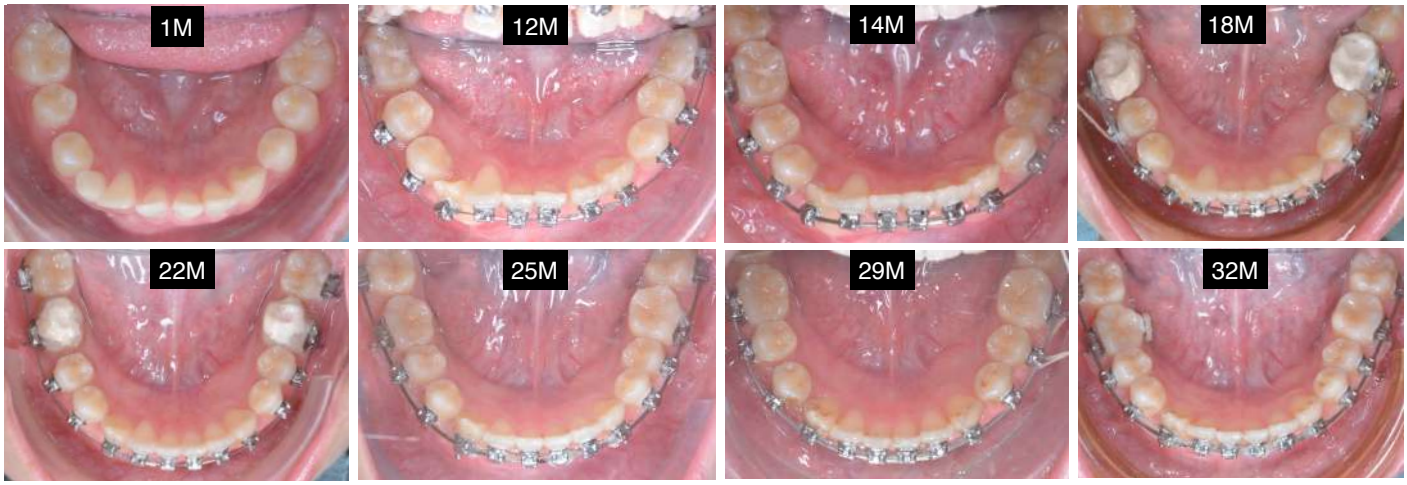


Fig. 18:
The progress of the lower arch is shown. Note: The correction procedure for distal-tilting mandibular right canine is at 12M, 14M, 18M and 22M.

superimpositions (Figs. 22 and 23) show the growth in condylar length that contributes to the increased facial height. The maxillary incisors have been retroclined by 25˚, and the mandibular incisors have moved vertically downwards. The patient was satisfied with her teeth and profile. The CRE score was 26 points as shown in the subsequent worksheet. Most of the points deducted were for the buccolingual inclination and occlusal contact. Four points were deducted from the P&W esthetic score, as documented in the supplementary worksheet at the end of this report. At the 18-month follow-up, intra-oral photographs show that the occlusion was still stable (Fig. 24).

Discussion

Phase 1: Correction of the impaction

According to Kokich's[7] article in 2004, there were three techniques which can recover impacted labial impactions: excisional uncovering, apically positioned flaps, and closed eruption (CE) techniques. For surgical exposure of a labial or intra-alveolar impaction of a maxillary canine, Kokich identified four

Fig. 19: *Post-treatment facial and intra-oral photographs*

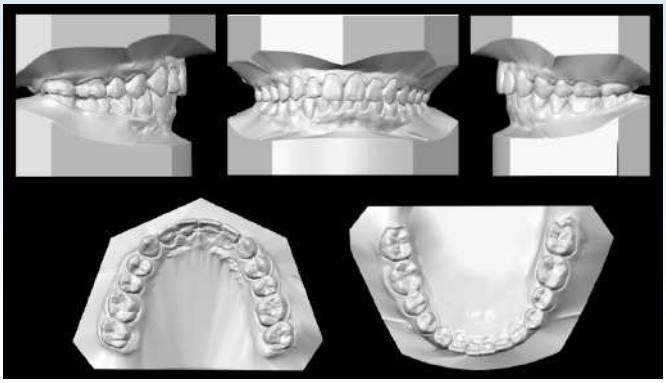


Fig. 20: *Post-treatment study models (casts)*

Fig. 21: *Post-treatment panoramic radiograph*

criteria which should be evaluated to determine the correct method for uncovering the tooth:

1. the labiolingual position of the impacted canine crown,
2. vertical position of the tooth relative to the mucogingival junction (MGJ),
3. the amount of keratinized tissue surrounding the impacted canine, and
4. the mesiodistal position of the canine crown.

When the impaction is apical to the MGJ, either an apically positioned flap (APF) or closed eruption technique may be chosen. The closed eruption technique is more appropriate than an APF when the impaction is in a high position.[18] APF is indicated for cases where the crown of the impaction is positioned mesially and over the root of the lateral incisor.

Fig. 22: *Post-treatment cephalometric radiograph*

For our patient, not only was her maxillary right canine highly impacted, but its crown tip also overlapped distal root surface of the maxillary right central incisor. Her mandibular right impacted canine was parallel to the adjacent teeth, but its crown and root structure overlapped the root of the mandibular right lateral incisor. Based on Kokich's criteria, neither CE nor APF can solve this dilemma. The main reason for this is that Kokich did not apply bone screws in his methods that provided a three-dimensional force to help the

tooth recover from such a deep and severely displaced impaction. Therefore, the surgical exposure of impacted canines was limited.

In addition to bone screws, the modified VISTA technique developed by Beethoven Orthodontic Center, originally devised by Zadeh[9] in 2011, provides a minimally invasive yet effective method to resolve such difficulty.

Presently, the criteria proposed by Kokich[7] to determine the correct method for uncovering the tooth has been modified to include the following three main criteria: 1. CBCT assessment of the labiolingual position of the impacted canine crown, 2. a proper design for surgical intervention, and 3. precise mechanical design of the force system.[10]

1. CBCT assessment of the labiolingual position of the impacted canine crown

Three dimensional CBCT imaging is essential for designing a treatment plan for the impacted canine, as it reveals the relationships between the impacted tooth, adjacent teeth, and the cortical bone. Three types of 3D images are required: 1. 360° rotated animation around the impaction covered with bone, 2. 360° rotated animation around the impaction with the bone covering deleted, and 3. cross-sectioned slices through the impaction.[19]

2. A proper design for surgical intervention

The design for surgical intervention is determined by the location of the apex, as well as the mesio-distal and vertical position of the crown tip.[20] APF is

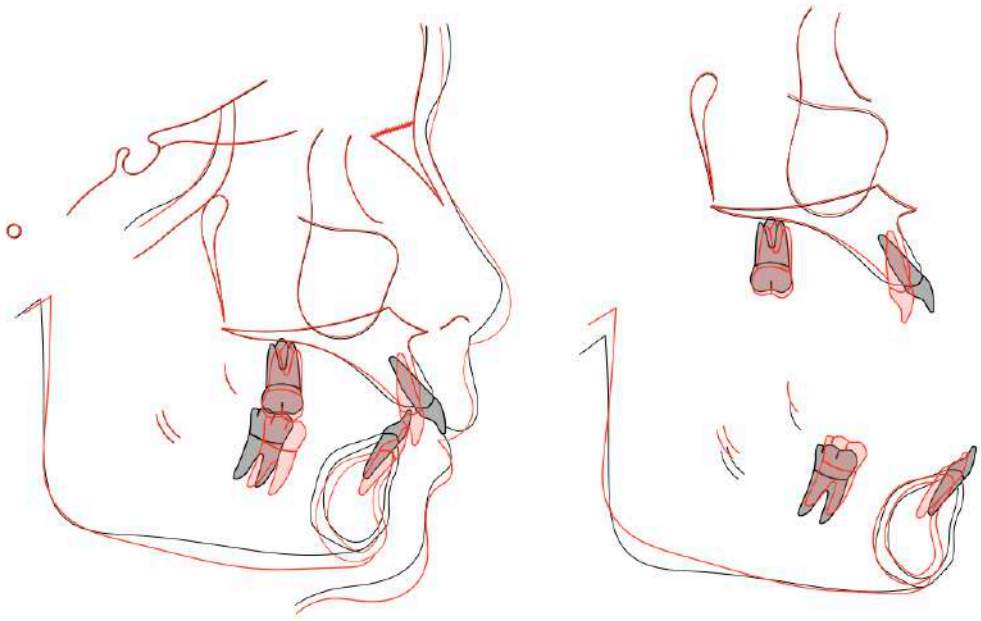


Fig. 23:
Superimposed tracings of the initial (black) and final (red) cephalometric films reveal the skeletal and dental changes that occurred during treatment. After treatment, mandibular growth, retroclination of upper incisors, and intrusion of lower incisors were observed.

Fig. 24: *18-month follow-up facial and intraoral photographs*

the most disadvantageous among the three techniques proposed by Kokich. Because high labial impactions were uncovered with an apically positioned flap, it would result in instability of the crown and possible reintrusion of the tooth after orthodontic treatment. This disadvantage is not observed in teeth uncovered with closed eruption technique.[7] Therefore, APF is seldom used in Beethoven's practice. The vestibular incision subperiosteal tunnel access (VISTA) method coronally repositions gingival margins to correct periodontal defects in the maxillary anterior region (Fig. 2).[7] This approach begins with a vestibular access incision which can be made through the periosteum to elevate a subperiosteal tunnel. The Beethoven group led by Chang[10-14] further adapted a modified VISTA technique for the surgical management of labially impacted, transposed canines. The modified procedure utilizes the same subperiosteal tunneling method to produce a path for submucosal retraction of the impacted

canine.[10-14] Either modified VISTA or CE is the present surgical technique used.

This procedure of the modified VISTA decreases invasive surgery, optimizes esthetic outcomes, and limits the threat of external root resorption.[10] Full-thickness flap (closed eruption technique) provides better visibility but results in shrinkage of flap and gingival recession.[21] In contrast, the modified VISTA method eliminates any substantial loss of gingival height because it does not reflect any flap. Its major drawback lies in its limited visibility related to the full-thickness flap and the surgery method and is therefore technique-sensitive.

3. Precise mechanics of force system

The force to retract impaction could be anchored in the main wire, molars, or bone screws. If the impaction is far away from the eruption site, the former two may result in archwire deformation and unwanted tooth movement. The independent force system of bone screws provides the necessary retraction force, without producing undesired side effects on other teeth.[10,18]

As mentioned previously, the patient had two canine impactions, both of which are labial impactions according to CBCT images. The cause of the severe impaction was apparently a deviated path of eruption that may be related to over-retained primary canines.[1] The impacted maxillary right canine, incompletely transposed impaction, was uncovered by the modified VISTA procedure and was retracted using an IZC screw. After ten months of retraction, the mesio-distal position of the impacted maxillary right canine was corrected, but its vertical position was still 3mm apical to the alveolar crest. At this moment, the IZC occlusal retraction was limited. Hence, the secondary surgical exposure, closed eruption technique was performed to expose the impacted crown. The bone surrounding the crown was removed, and a ligature wire was tied between the maxillary right canine button to the main wire. After three months, the impacted maxillary right canine was recovered, and a high torque bracket was bonded. The treatment then moved on to align all teeth. If the first surgical exposure had been performed with 3D lever arm[14] and bone screws were done, the secondary surgical exposure could have been avoided.

The impacted mandibular right canine, completely transposed impaction, was uncovered by modified VISTA and retracted by BS screws. After six months, the impaction was recovered; four months later, a full mouth fixed appliance was bonded on all lower teeth. In Fig. 18, the tip of mandibular right canine tilted distally at the 12th month. The axis of the bracket was tilted distally relative to the axis of mandibular right canine in order to move the apex distally to correct its transposed apex. The axis of mandibular right canine was corrected successfully during the 22nd month.

Phase 2: Alignment of all dentition

When considering whether to extract or not for the eruption site, the patient's craniodental relationship should be taken into consideration. The current patient was diagnosed as having proclined anterior incisors with an 8mm overjet, but the skeletal relationship was Class I. Spacing was noted over bimaxillary arch, and incomplete growth of her nose and mandible was also found, due to the fact

she was only 11 years old. As a result, non-extraction procedure was chosen. IZC screws, along with bite turbos and Class II elastics were used to solve the Class II malocclusion, deep bite, and 8mm overjet.

Conclusions

The treatment of impacted and transposed teeth constitutes a challenge for clinicians. For our patient with two severely impacted and transposed canines, we found it necessary to apply the following steps in devising her treatment:

1. assessing the labio-lingual position of the impacted canine crown using a three dimensional image (CBCT),
2. a proper design for surgical intervention, and
3. a precise mechanics of force system design.

Subsequently, we found that a modified VISTA method, together with application of bone screws, benefitted the patient mainly because of its minimal invasiveness, more solid recovery, and also limitation of subsequent morbidity.

References

1. Becker A, Chaushu S. Etiology of maxillary canine impaction: A review. Am J Orthod Dentofac Orthop 2015;148(4):557–67.
2. Takahama Y, Aiyama Y. Maxillary canine impaction as a possible microform of cleft lip and palate. Eur J Orthod 1982;4:275-7.
3. Sacerdoti R, Baccetti T. Dentoskeletal features associated with unilateral or bilateral palatal displacement of maxillary canines. Angle Orthod 2004;74:725-32.
4. Kılıç N, Oktay H. Orthodontic intervention to impacted and transposed lower canines. Case Rep Dent 2017: https://doi. org/10.1155/2017/4105713
5. Lee M-Y, Park JH, Jung J-G, Chae J-M. Forced eruption of a palatally impacted and transposed canine with a temporary skeletal anchorage device. Am J Orthod Dentofac Orthop 2017;151(6):1148–58.
6. Kocsis A, Seres L. Orthodontic screws to extrude impacted maxillary canines. J Orofac Orthop 2012;73(1):19–27.
7. Kokich VG. Surgical and orthodontic management of impacted maxillary canines. Am J Orthod Dentofac Orthop 2004;126(3):278–83.
8. Heravi F, Shafaee H, Forouzanfar A, Zarch SHH, Merati M. Forced eruption of palatally impacted canines using bracket-head miniscrews. J Clin Orthod 2014;48(9):576–80.
9. 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(6):653–60.
10. Su CW, Chang CH, Roberts WE. Management of an impacted maxillary canine with the vertical incision subperiosteal tunnel (VISTA) technique. J Digit Orthod 2018;50:52–71.
11. Su CW, Hsu YL, Chang CH, Roberts WE. Soft tissue considerations for the management of impactions. Int J Orthod Implant 2011;24(50–59).
12. Su CW, Chang CH, Roberts WE. Soft tissue considerations for the management of impactions. Int J Orthod Implant 2013;31:100–9.
13. Chen CK, Chang CH, Roberts WE. Class III with multiple gingival recession: Vestibular incision subperiosteal tunnel access (VISTA) and platelet-derived growth factor BB. Int J Orthod Implant 2014;35:22–36.
14. Lin A, Chang CH, Roberts WE. VISTA and 3D OBS Lever-arm to recover a labially-impacted canine: Differential biomechanics to control root resorption. J Digit Orthod 2019;54:28–48.

15. Shapira Y, Kuftinec MM. Tooth transpositions: A review of the literature and treatment considerations. Angle Orthod 1989;59(4):271-6.

16. Tseng YC, Chang HP CT. Canine transposition. Kaohsiung J Med Sci 2005;21:441-447.

17. Liu PH, LaiEH YH, JZ C. Orthodontic treatment of a complete transposed impacted maxillary canine. J Dent Sci 2015;10:102e108.

18. Su CW, Chang CH, Roberts WE. Highly positioned and transalveolar impacted maxillary canine. Int J Orthod Implant 2011;24:14-26.

19. Peng WL, Chang CH, Roberts WE. Early treatment of anterior crossbite combined with bilateral maxillary labially impacted canines. Int J Orthod Implant 2016;44:46-60.

20. Hsu YL, Chang CH, Roberts WE. Early intervention for multiple impacted teeth: More comprehensive clinical assessment with the iSAS method. News Trends Orthod 2010;20:32-47.

21. Velvart P, Ebner-Zimmermann U, Ebner JP. Comparison of papilla healing following sulcular full-thickness flap and papilla base flap in endodontic surgery. Int Endod J 2003;36(10):653-9.

Discrepancy Index Worksheet

TOTAL D.I. SCORE: 59

OVREJET

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

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

Total = 4

OVERBITE

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

Total = 5

ANTERIOR OPEN BITE

0 mm. (Edge-to-edge), 1 pt. per tooth
Then 1 pt. per additional full mm. Per tooth

Total = 0

LATERAL OPEN BITE

2 pts. per mm. Per tooth

Total = 0

CROWDING (only one arch)

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

Total = 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	2 pts.
Beyond Class II or III	=	1 pt. per mm. additional	4 pts.

Total = 6

LINGUAL POSTERIOR X-BITE

1 pt. per tooth Total = 0

BUCCAL POSTERIOR X-BITE

2 pts. Per tooth Total = 0

CEPHALOMETRICS (See Instructions)

ANB ≥ 6° or ≤ -2° = 4 pts.

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

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

SN-MP

≥ 38° = 2 pts.

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

≤ 26° = 1 pt.

Each degree < 26° 11 x 1 pt. = 11

1 to MP ≥ 99° = 1 pt.

Each degree > 99° 17 x 1 pt. = 17

Total = 30

OTHER (See Instructions)

Supernumerary teeth	_____	x 1 pt.	= _____
Ankylosis of perm. Teeth	_____	x 2 pts.	= _____
Anomalous morphology	_____	x 2 pts.	= _____
Impaction (except 3rd molars)	2	x 2 pts.	= 4
Midline discrepancy (≥ 3mm)		@ 2 pts.	= _____
Missing teeth (except 3rd molars)	_____	x 1 pt.	= _____
Missing teeth, congenital	_____	x 2 pts.	= _____
Spacing (4 or more, per arch)	1	x 2 pts.	= 2
Spacing (Mx cent. diastema ≥2mm)		@ 2 pts.	= 2
Tooth transposition	_____	x 2 pts.	= _____
Skeletal asymmetry (nonsurgical tx)		@ 3 pts.	= _____
Addl. treatment complexities	3	x 2 pts.	= 6

Identify: One highly incomplete transverse impaction, one complete transposed impaction

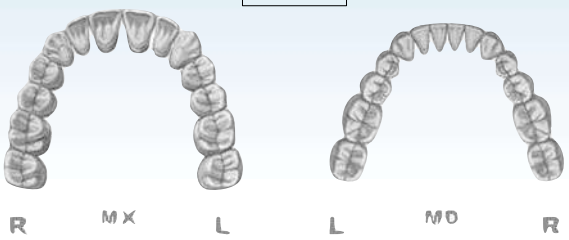
Total = 2

Cast-Radiograph Evaluation

Total Score: 26

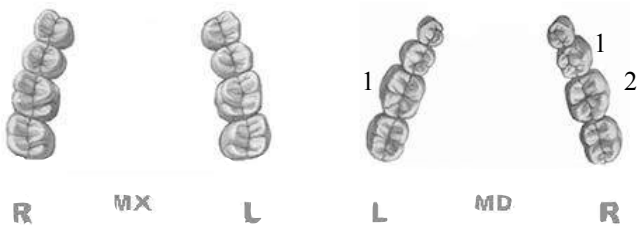
Alignment/Rotations

0



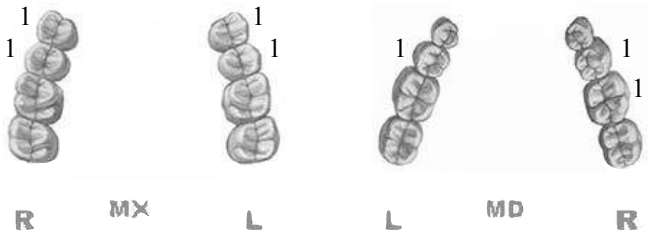
Marginal Ridges

4



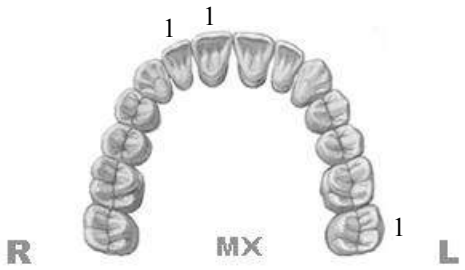
Buccolingual Inclination

7



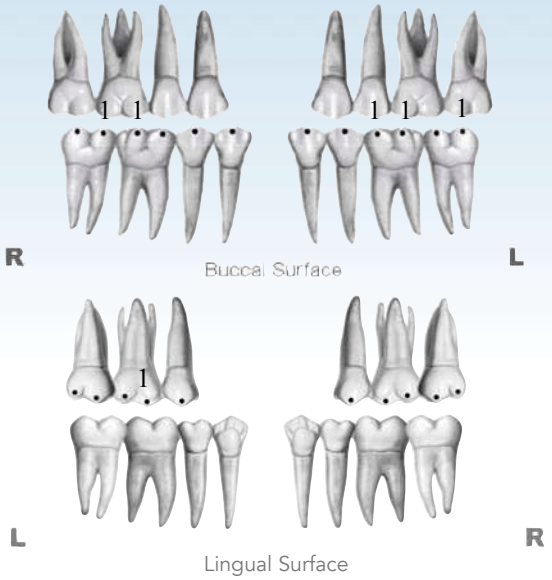
Overjet

3



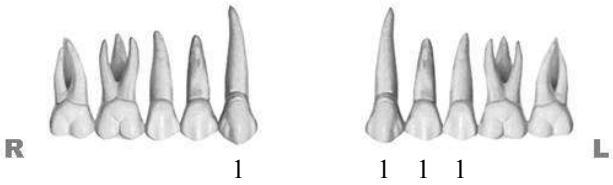
Occlusal Contacts

6



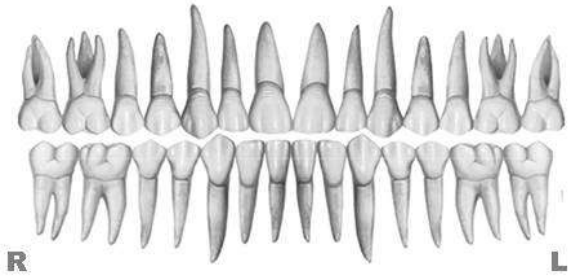
Occlusal Relationships

4



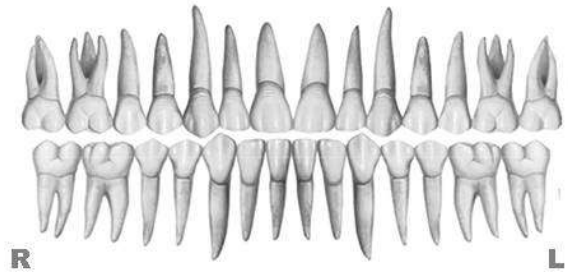
Interproximal Contacts

0



Root Angulation

0



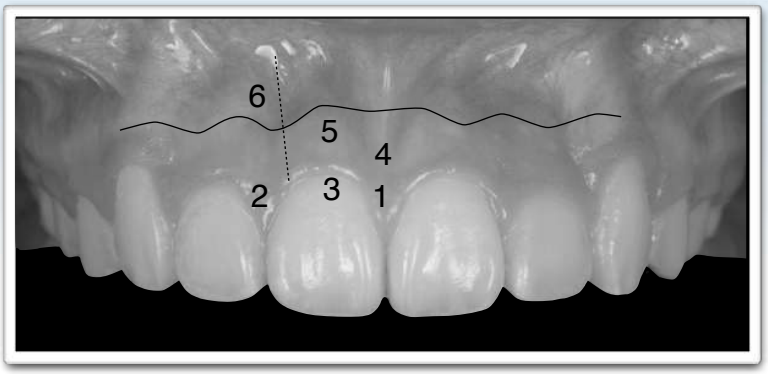
INSTRUCTIONS: Place score beside each deficient tooth and enter total score for each parameter in the white box. Mark extracted teeth with "X". Second molars should be in occlusion.

IBOI Pink & White Esthetic Score

Total Score = 4

1. Pink Esthetic Score

Total = 0

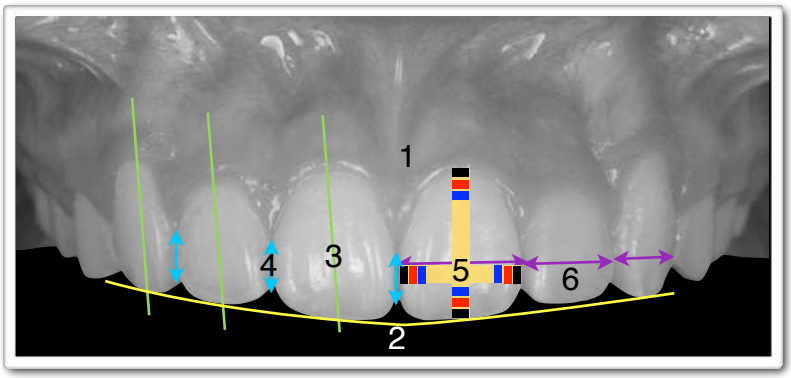


1. M & D Papillae	0	1	2
2. Keratinized Gingiva	0	1	2
3. Curvature of Gingival Margin	0	1	2
4. Level of Gingival Margin	0	1	2
5. Root Convexity (Torque)	0	1	2
6. Scar Formation	0	1	2

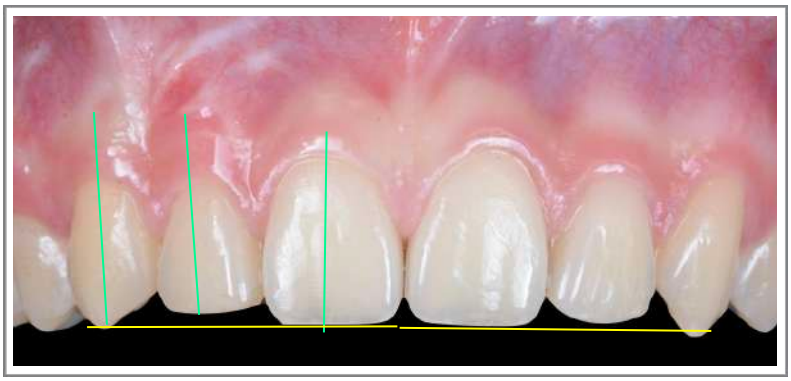
1. M & D Papillae	(0)	1	2
2. Keratinized Gingiva	(0)	1	2
3. Curvature of Gingival Margin	(0)	1	2
4. Level of Gingival Margin	(0)	1	2
5. Root Convexity (Torque)	(0)	1	2
6. Scar Formation	(0)	1	2

2. White Esthetic Score (for Micro-esthetic)

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	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	(0)	1	2
6. Tooth to Tooth Proportion	0	(1)	2

2022 Beethoven

Clinical Education

全新課程

Beethoven Clinical Education 主要針對修習過 Damon Master Program、且想要繼續獲取更進階臨床與學術訓練的醫師所專門設計的課程。此訓練課程除了包含**診間見習**之外，還新增了**學術文章寫作與演講的訓練**。醫師不僅可以於貝多芬矯正中心就近學習張慧男醫師的診間技術與經驗，也加入了**骨釘與 VISTA 術式**等操作課程，亦同時培養醫師**期刊寫作與高效簡報**的技巧。

修習完 Damon Master Program 與本課程，且完成**兩篇案例報告**文章後，就可取得赴**德國碩士班進修資格證書**。此系列課程能讓醫師在進入德國碩士班之前，做好最充分的準備。


Dr. Chris Chang


Dr. Bill Su


Dr. Joshua Lin

ABO Writing Training

Medical Writing Training-1 3/17

Medical Writing Training-2 3/31

Medical writing skills are crucial for clinicians, educators and researchers. This training contains academic medical writing on case reports. Participants will have a chance to publish articles for journals like Journal of Digital Orthodontics (JDO).

Presentation Workshop 4/7

The presentation workshop designed to help participants utilize the most frequently used presentation tools in Keynote to manage patient clinical records and create simple but effective patient communication presentation.

VISTA & 4 other Minor Surgeries for Orthodontic Practice

VISTA Hands-on Workshop 4/21

The VISTA (vertical incision subperiosteal tunnel access) surgical techniques for impacted cuspids will discuss the following topics:

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

TADs & Surgeries Hands-on Workshop 4/21

The workshop covers bonding on a typodont, TAD placement, and 4 minor surgeries for orthodontic practice.

Chairside Learning （視疫情狀況另行公佈）

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

時間：週四全天 (9 am - 5 pm)

新竹市建中一路 25 號 2 樓 (金牛頓藝術科技)

03-5735676#217 Chester Yu

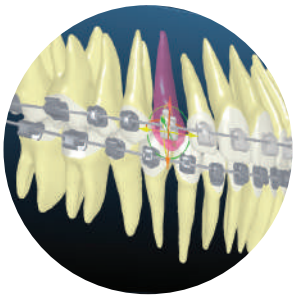
yuebucy@newtonsa.com.tw

Dental Clinic Established 1996
Beethoven

International Workshop

Digital Orthodontics, OBS, VISTA

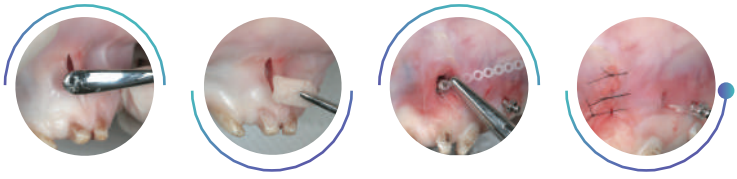
@Taiwan



INSIGNIA™

OBS

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



VISTA Vertical Incision Subperiosteal Tunnel Access

Registration:

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

For more information and registration, visit

http://iworkshop.beethoven.tw

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

Course Schedule

Day 1 **Chair–side observation**

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

Chris' Lecture:
Digital Orthodontics with TAD

Day 3 **VISTA Lecture & workshop**

Chris' Lecture:
VISTA for Impacted Cuspids

* The topics for VISTA workshop:

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

Prof. Dr. Paulo Fernandes Retto, Portugal

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

Digital Orthodontics, OBS & VISTA

Day 4 **Keynote workshop** (Optional)

by Newton's A team

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

Dr. Rungsi Thavarungkul, Thailand

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

KEYNOTE

THE LECTURER

Dr. Chris Chang

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