Partially Edentulous Asymmetric Class III Malocclusion: Lower Second Molar Extraction, Autotransplantation, and Space Closure

Abstract

***Diagnosis**: A 34-year-7-month-old female presented with chief complaints of compromised facial esthetics and unilateral collapse of posterior occlusion. Clinical examination revealed mandibular prognathism, facial asymmetry, Class III malocclusion, missing LL6, residual roots of LL7 and LL8, and over eruption of UL5-UL7. The Discrepancy Index (DI) was 25.*

***Treatment**: A conservative treatment plan was designed to preserve the natural dentition. To create a symmetric occlusal plane, the UL5-UL7 segment was intruded with anchorage provided by two 2x8-mm mini-screws. The LR7 was endodontically treated and autotransplanted into the LL7 extraction socket. A passive self-ligating appliance was installed to align and retract the lower dentition to correct the Class III molar relationship.*

***Outcomes**: The autotransplanted molar healed successfully, and subsequently ankylosed in an acceptable position. The bite was opened about 1.5°, crowding was corrected, and the dentition was well aligned to Class I canine and molar relationships. The ABO Cast-Radiograph Evaluation (CRE) was 22, and the Pink & White dental esthetics score was 7. (J Digital Orthod 2020;59:4-19)*

Key words:
Autotransplantation, Class III malocclusion, increased vertical dimension of occlusion, molar intrusion, facial asymmetry, mandibular arch retraction

Introduction

The dental nomenclature for this report is a modified Palmer notation. Upper (*U*) and lower (*L*) arches, as well as the right (*R*) and left (*L*) sides, define four oral quadrants: UR, UL, LR and LL. Teeth are numbered 1-8 from the midline in each quadrant, e.g. a lower right first molar is LR6.

History

A 34-year-7-month-old female presented for orthodontic consultation with chief complaints: protrusive lower lip and poor chewing ability. The pre-treatment facial photographs (*Fig. 1*) show a straight profile (*G-Sn-Pg' 0*°), long face, and facial asymmetry (*Table 1*). Intra-oral examination revealed a Class III malocclusion with anterior crossbite (*right side*). The lower dental midline and chin were deviated to the right about 2-5mm. All of the LL molars were compromised by caries: LL6 was missing, but residual roots remained for LL7 and LL8. The UL5-UL7 segment was over-erupted, the mandible was protrusive, vertical dimension of occlusion (*VDO*) was excessive, and lips were incompetent (*Figs. 1-3*). The asymmetric intermaxillary molar relationship was 8mm Class III on the right side.

Eric Hsu,
Lecturer, Beethoven Orthodontic Course (Left)

Po-Jan Kuo,
Periodontist, Jing-Jong Lin Orthodontic Clinic (Center left)

John Jin-Jong Lin,
Examiner, Journal of Digital Orthodontics
Director, Jin-Jong Lin Orthodontic Clinic (Center right)

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

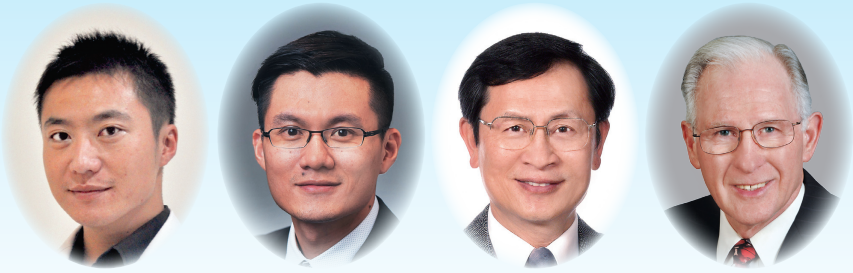


Fig. 1: Pre-treatment facial photographs, 34y7m female

Fig. 4: Post-treatment facial photographs, after 25 months of active treatment

Fig. 2: Pre-treatment intra-oral photographs

Fig. 5: Post-treatment intra-oral photographs

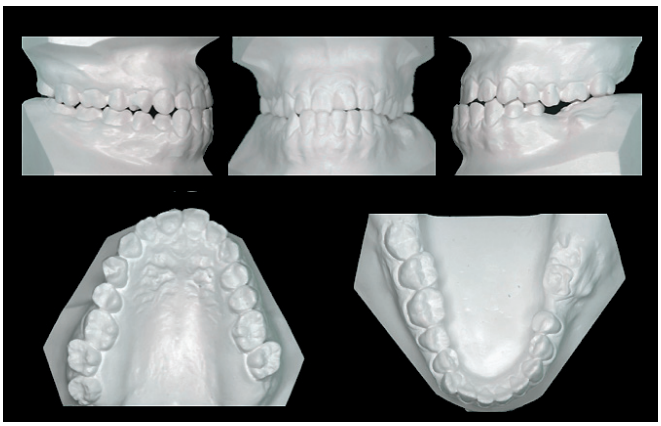


Fig. 3: Pre-treatment study models (casts)

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

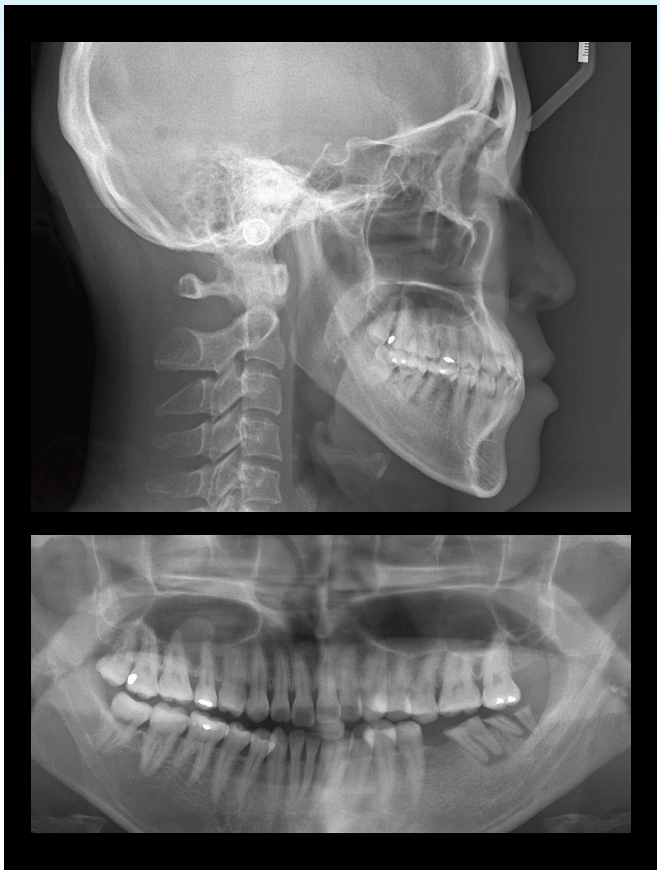


Fig. 7:
Pre-treatment cephalometric and panoramic radiographs document the original dentofacial morphology. The panoramic film (lower) reveals the over-eruption of UL5-UL7.

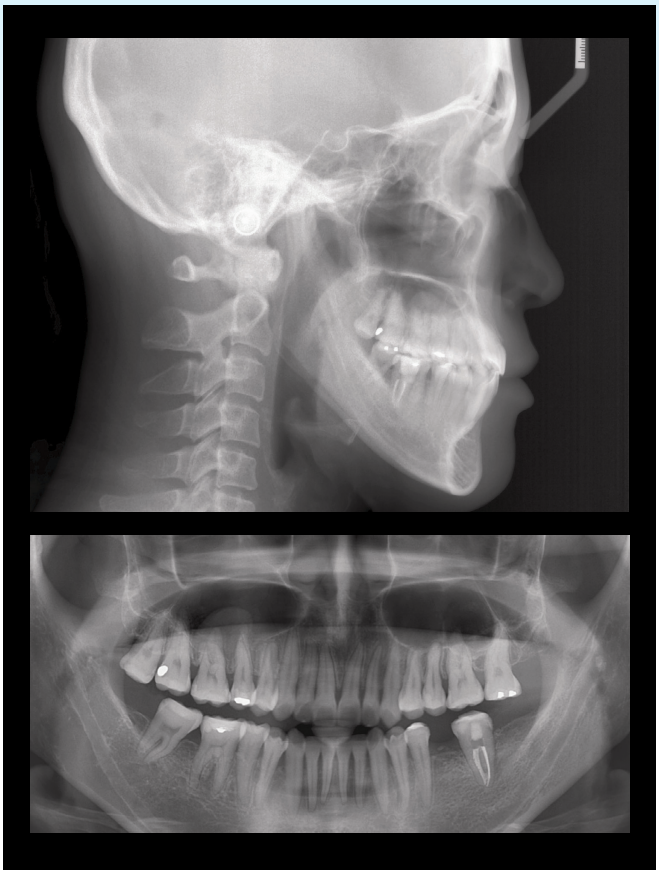


Fig. 8:
Post-treatment cephalometric and panoramic radiographs reveal the dentofacial morphology immediately after fixed appliances were removed.

Medical history was non-contributory, and there was no evidence of temporomandibular dysfunction (*TMD*). This case report demonstrates the correction of a severe, asymmetric, and partially edentulous Class III malocclusion with mini-screw anchorage and autotransplantation of a mandibular molar (*Figs. 4-6*). Pre-treatment and post-treatment cephalometric and panoramic radiographs are compared in Figs. 7 and 8, respectively. The dentofacial changes associated with comprehensive treatment are documented with superimposed cephalometric tracings (*Fig. 9*).

Diagnosis

Facial:

- Length: *Long tapered face in the frontal plane*
- Facial Convexity: *Concave profile, G-Sn-Pg' 0º*
- Symmetry: *Maxillary dental midline was 2mm to the left, and the chin point was ~5mm to the right.*
- Smile: *Incisal exposure was WNL, but the smile arc was unattractive.*
- Lip Competence: *Hypermentalis strain with lips closed*

Skeletal:

- Intermaxillary Relationship: *Bimaxillary protrusion (SNA 89.5°, SNB 89.5°, ANB 0°)*
- Mandibular Plane: *Increased (SN-MP 36.5°, FMA 29.5°)*
- Vertical Dimension of Occlusion (*VDO*): *Excessive (Na-ANS-Gn 57%)*
- Symmetry: *Mandible deviated to the right about 5mm*

Dental:

- Classification: *Full-cusp Class III relationship on the right*
- Overbite: *2mm*
- Overjet: *-2mm*
- Anterior Crossbite: *UR1, UR2*
- Missing/Hopeless Teeth: *LL6 was missing. LL7 and LL8 residual roots were retained.*
- Rotation: *UR4 rotated mesial in about 70°*

CEPHALOMETRIC SUMMARY			
SKELETAL ANALYSIS			
	PRE-Tx	POST-Tx	DIFF.
SNA° (82°)	89.5°	89.5°	0°
SNB° (80°)	89.5°	88°	1.5°
ANB° (2°)	0°	1.5°	1.5°
SN-MP° (32°)	36.5°	38°	1.5°
FMA° (25°)	29.5°	31°	1.5°
DENTAL ANALYSIS			
U1 To NA mm (4 mm)	5.5	4.5	1
U1 To SN° (104°)	114.5°	113.5°	1°
L1 To NB mm (4 mm)	6.5	4	2.5
L1 To MP° (90°)	75.5°	74°	1.5°
FACIAL ANALYSIS			
E-LINE UL (-1 mm)	-2	-2	0
E-LINE LL (0 mm)	2	0.5	1.5
%FH: Na-ANS-Gn (53%)	57%	57.5%	0.5%
Convexity: G-Sn-Pg' (13°)	0°	2.5°	2.5°

Table 1: Cephalometric summary

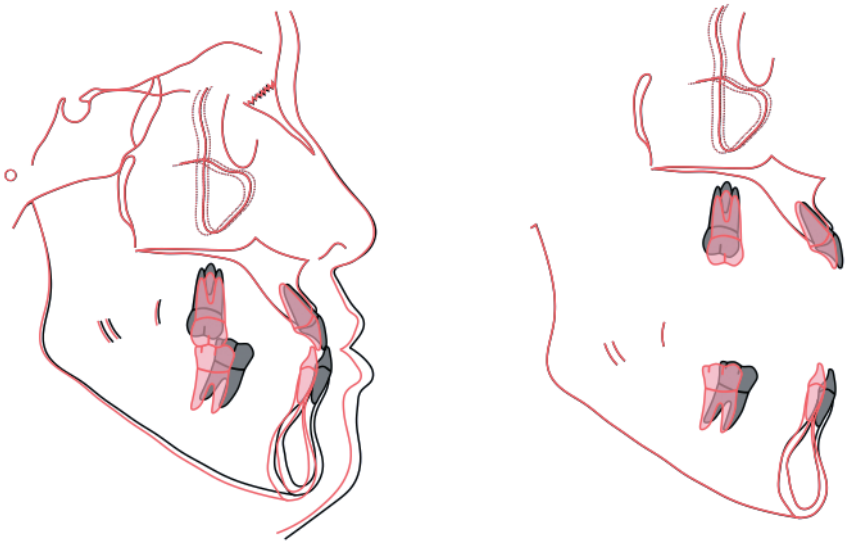


Fig. 9:
Pre- (black) and post-treatment (red) cephalometric tracings are superimposed on the anterior cranial base (left), on the maxilla (upper right), and on the stable internal structures of the mandible (lower right). Principal changes during treatment were retraction of the mandibular dentition and decreased lower lip protrusion.

The ABO Discrepancy Index (*DI*) was 25 as shown in the subsequent worksheet (*Worksheet 1*).

Treatment Objectives

The treatment objectives were:

1. Autotransplant the LR7 to the LL7 site.
2. Correct the Class III malocclusion by closing the lower right 2nd molar space.
3. Improve the facial profile and smile esthetics.

Treatment Alternatives

For skeletal asymmetry with mandibular prognathism, orthognathic surgery is often necessary to achieve a desirable result. However, the patient refused orthognathic surgery, which was previously suggested by multiple orthodontists. She preferred a more conservative treatment approach.

Plan A

First, extract the hopeless lower left molars and all wisdom teeth. Second, retract the LR buccal segment utilizing a temporary anchorage device (*TAD*) in the right mandibular buccal shelf area. Third, perform endodontic treatment and occlusal reduction for the over-erupted UL5-UL6. Fourth, place dental implants in lower left molar region and fabricate prostheses (*crowns*) to restore UL5 and UL6 (*Fig. 10*).

Plan B

Use infra-zygomatic crest (*IZC*) and palatal screws to intrude the upper left posterior segment. Autotransplant the endodontically treated LR7 to the LL7 extraction site. Correct the Class III molar relationship on the right by closing the LR7 extraction space. Finally, construct a fixed dental prothesis to restore the missing LL6 (*Fig. 10*).

The patient preferred Plan B because she perceived that it was the most cost-effective and conservative approach for a near-ideal result.

Appliances and Treatment Progress

The first priority was to achieve sufficient interocclusal space for the autotransplantation of the LR7 in the LL7 extraction site (*Fig. 10*). Two 2x8-mm stainless steel (*SS*) bone screws were installed between UL5 and UL6 on the buccal and palatal surfaces respectively. Six months later, the UL5 and UL6 were significantly intruded (*Fig. 11*).

Before orthodontic treatment, the patient received a cone-beam computed tomography (*CBCT*) examination to analyze the donor tooth (*LR7*) and recipient site (*LL7*). The shape and dimensions of the recipient site were compared to 3D measurements of the donor tooth to confirm compatibility. After a careful assessment, the LR7 was selected as the most appropriate donor tooth. A 3D replica of the LR7 was fabricated with a 3D printer after segmentation of the DICOM file.[1]

Pulp revascularization is not expected for a fully developed donor tooth, so presurgical endodontics was indicated. After completion of the endodontics on the LR7, occlusal reduction and fixation grooves were prepared. After flap elevation, the LL7 residual

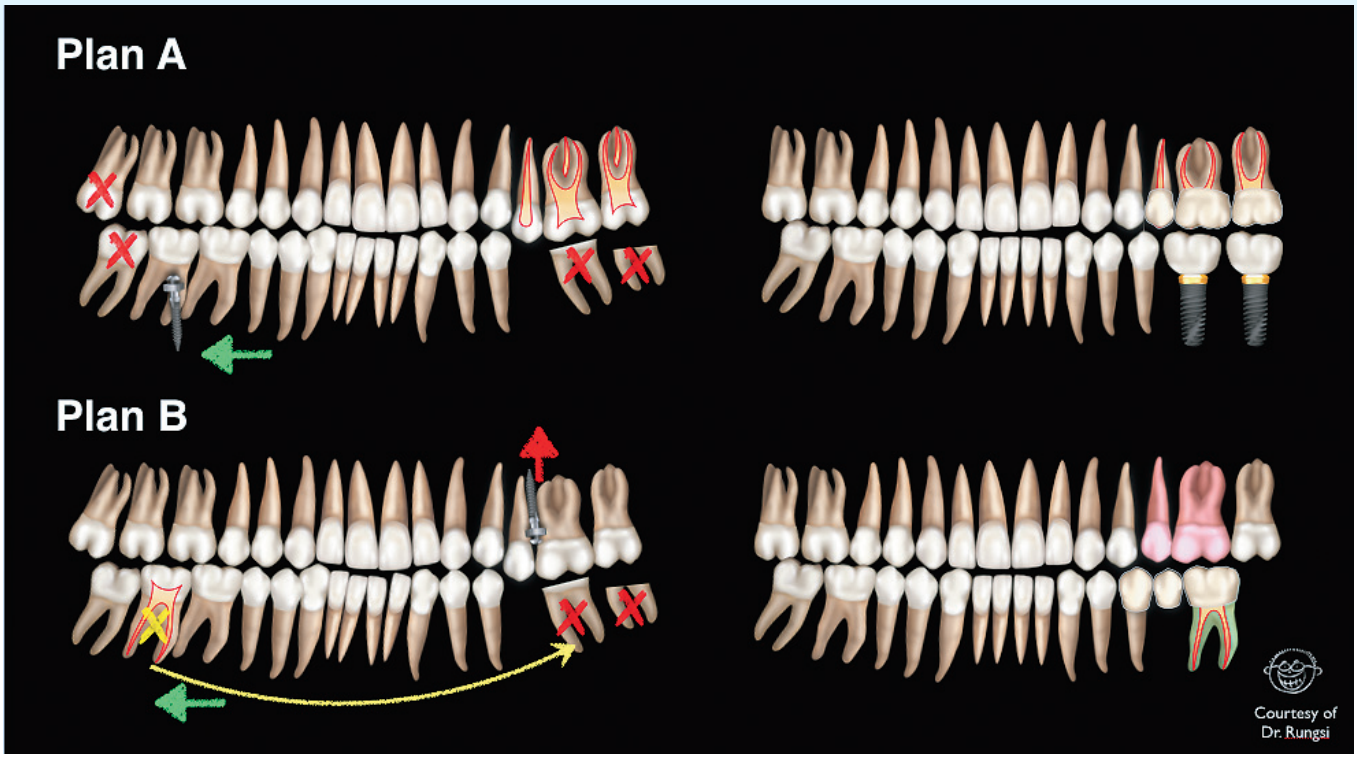


Fig. 10: Diagrams of the two treatment options: Plans A and B. See text for details.

Fig. 11:
Progress photographs for the intrusion of the UL5 and UL6 show power chains anchored by 2x8-mm mini-screws that deliver intrusive force on the buccal and lingual surfaces. Note after 6 months (6M) of treatment, there was adequate interocclusal space created for autotransplantation into the LL7 site.

roots were removed, and the sterilized 3D-printed replica was used to prepare the osseous recipient site. Bone defects on the buccal surface of the LL7 residual roots resulted in a buccal plate defect (*Fig. 12*).

The height of the distal alveolar ridge was reduced with a chisel to establish optimal bone architecture. Then, the donor tooth was carefully extracted by using a dental forceps. The roots of the donor tooth were coated with enamel matrix derivative (*Emdogain®*)[2] (*EMD*), and the LR7 was inserted into the LL7 recipient site. The buccal osseous defect was grafted with freeze-dried bone allograft (*FDBA*). The flap was repositioned, soft tissue was sutured, and the transplanted tooth was stabilized using horizontal cross mattress sutures (*Fig. 13*). This non-rigid form of fixation was maintained for 2 weeks.[3,4] One month after surgery, the transplanted tooth was well healed. There were no symptoms nor evidence of root resorption.

A 0.022" slot passive self-ligating (*PSL*) bracket system, Damon Q® (*Ormco, Brea, CA*), was selected. Standard torque brackets were bonded on the upper incisors, and low torque brackets were bonded inversely (*upside down*) on the lower incisors.[5] The initial archwires were 0.013" CuNiTi wire in the upper and 0.014" CuNiTi in the lower. A tie back ligature was placed between the LR6 and LR8 to prevent dislodging of the wire. One week

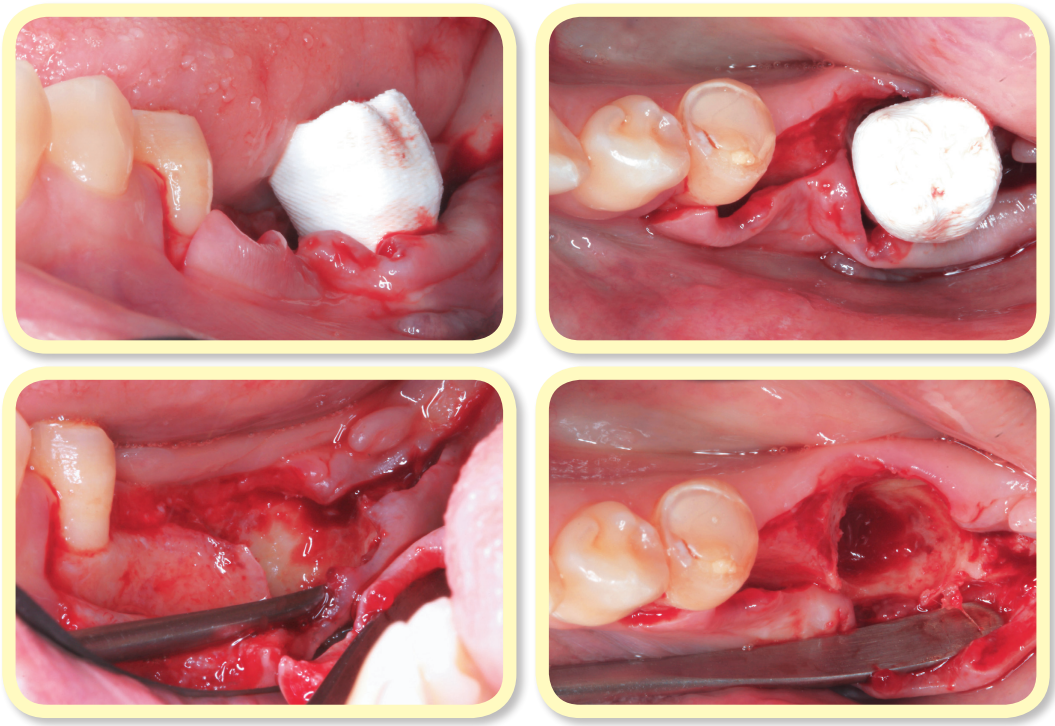


Fig. 12:
A 3D-printed replica was used to prepare the osseous contours of the recipient site (upper left and right). A lack of buccal bone was noted after recipient site preparation (lower left and right).

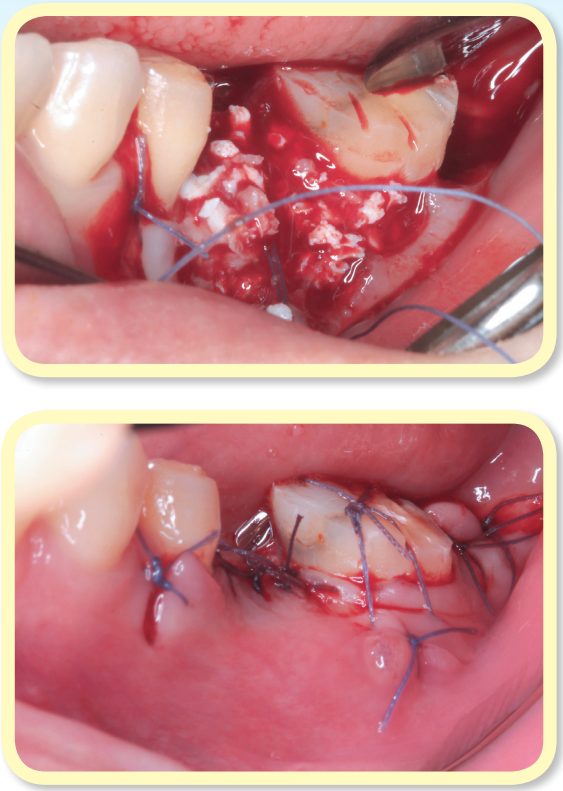


Fig. 13:
The donor tooth was transplanted, and the buccal osseous defect was grafted. See text for details.

later, a 2x8-mm bone screw was placed mesial to the autotransplanted tooth. A chain of elastics was applied from the LL3 to the LR mini-screw to correct the lower midline deviation.

One month into active treatment, buccal and lingual elastic chains were applied to correct the severe mesial-in rotation of UR4 (*Fig. 14*).[6] At the same time, an open coil spring was utilized between the UR3 and UR5 to increase space to assist with negative overjet correction. Two months later, the rotation and anterior cross bite were sufficiently corrected, so the UR4 was bonded with a bracket, and a 0.013" CuNiTi super archwire was engaged.

At the 5th month of treatment, an orthodontic band with an attached bracket was cemented on the autotransplanted tooth to prevent it from fracturing. Meanwhile, both upper and lower arch wires were changed to 0.014x0.025" CuNiTi to improve alignment.

Seven months into treatment, both archwires were changed to 0.018x0.025" CuNiTi. An open coil spring was placed between LL5 and LL7 to retract and upright the LL7. By the 9th month of treatment, there was no further movement of LL7. Ankylosis was suspected, and subsequently confirmed radiographically (*Fig. 15*). Twelve months into treatment, the extraction space of LR7 was closed. Both archwires were replaced with 0.016" CuNiTi. Up and down vertical elastics (*Fox, 1/4", 3.5oz*) were applied to settle the occlusion.

In the 15th month of treatment, torquing springs were used to correct the lingually inclined lower incisors, and both archwires were changed to

Fig. 14:
The UR4 is rotated distal in by increasing the space in the arch and applying a rotating force with a couple applied on the buccal and lingual surfaces. See text for details.

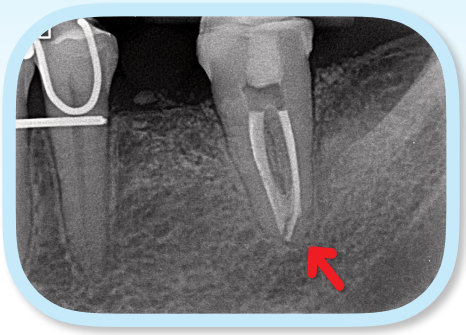


Fig. 15:
The transplanted tooth appears to be ankylosed in the apical region (red arrow). See text for details.

0.018x0.025" CuNiTi. By the 20th month of treatment, interproximal reduction was performed on the lower incisors to correct dark triangles. In the 23rd month of treatment, Class II elastics (*Fox, 1/4", 3.5oz*) were used to finish the anterior overjet. After 25 months of active treatment, all fixed appliances were removed.

Treatment Results

The patient was treated to the desired result as documented in Figs. 4-6. Substantial improvement was achieved in facial esthetics, dental alignment, and intermaxillary occlusion. No periodontal problems were noted.

The post-treatment panoramic radiograph documented acceptable root parallelism, except for the LR segment. The roots of both the LR5 and LR6 were oriented mesially (*Fig. 8*). Superimposed cephalometric tracings revealed that the entire mandibular arch was retracted about 4mm, which showed the effectiveness of Class III elastics combined with buccal shelf mini-screw anchorage to intrude the UR posterior segment. The axial inclination of the upper incisor was decreased by 1° (*U1-SN: PRE-Tx 114.5°, POST-Tx 113.5°*), and the axial inclination of the lower incisors was well maintained despite considerable retraction (*L1-MP: PRE-Tx 75.5°, POST-Tx 74°*). Bite opening associated with autotransplantation of the LR7 to LL7 increased the mandibular plane angle 1.5° (*SN-MP: PRE-Tx 36.5°, POST-Tx 38°*), which assisted the anterior crossbite correction. The patient was well satisfied with the result.

The ABO CRE score was 22 points, as shown in the supplementary CRE worksheet (*Worksheet 2*).[7] The residual deficits were overall tooth alignment and lingual inclination of some posterior teeth. The Pink & White dental esthetic score was 7 points (*Worksheet 3*).[8]

Retention

Hawley retainers were delivered for each arch. The patient was instructed to wear them full time for the first month and nights only thereafter. Instructions were provided for home hygiene as well as for maintenance of the retainers.

Discussion

1. Molar Intrusion

Over-extrusion of the left maxillary posterior segment was due to the loss of mandibular antagonists. Unilateral dental extrusion into an edentulous space may be associated with functional disturbances and occlusal interferences, which may complicate restoration with orthodontic and/

or prosthetic procedures. Conventional options for correcting the problem include: 1) coronal reduction of a molar crown(*s*), which may require root canal therapy and full coverage restoration; 2) posterior sub-apical osteotomy, an orthognathic surgical procedure and an expensive option that entails the risk of general anesthesia and molar devitalization; and 3) orthodontic intrusion of maxillary molars. The third option is the most conservative approach, but a desired result is difficult to achieve with only labial intrusive force because the teeth tip buccally and palatal cusps may interfere with occlusion.

Conventional techniques for intrusion require anchorage reinforcement by incorporating multiple teeth in the anchorage segment and/or the use of extraoral devices. The latter typically requires elastics so patient cooperation is an important factor. Routine orthodontic mechanics may extrude the anchorage rather than intrude the extruded tooth. Preventing extrusion of an anchorage tooth or segment is a critical factor for achieving desirable dental intrusion. Skeletal anchorage devices include dental implants, surgical mini-plates, and mini-screws. Temporary anchorage devices (*TADs*) are increasingly popular anchorage for intrusion. The TADs for the present patient were two mini-screws placed between the UL5 and UL6 on buccal and palatal surfaces, respectively. To prevent root resorption, intrusive force levels were kept relatively low, but an optimal force is yet to be established for dental intrusion with mini-screws.[9]

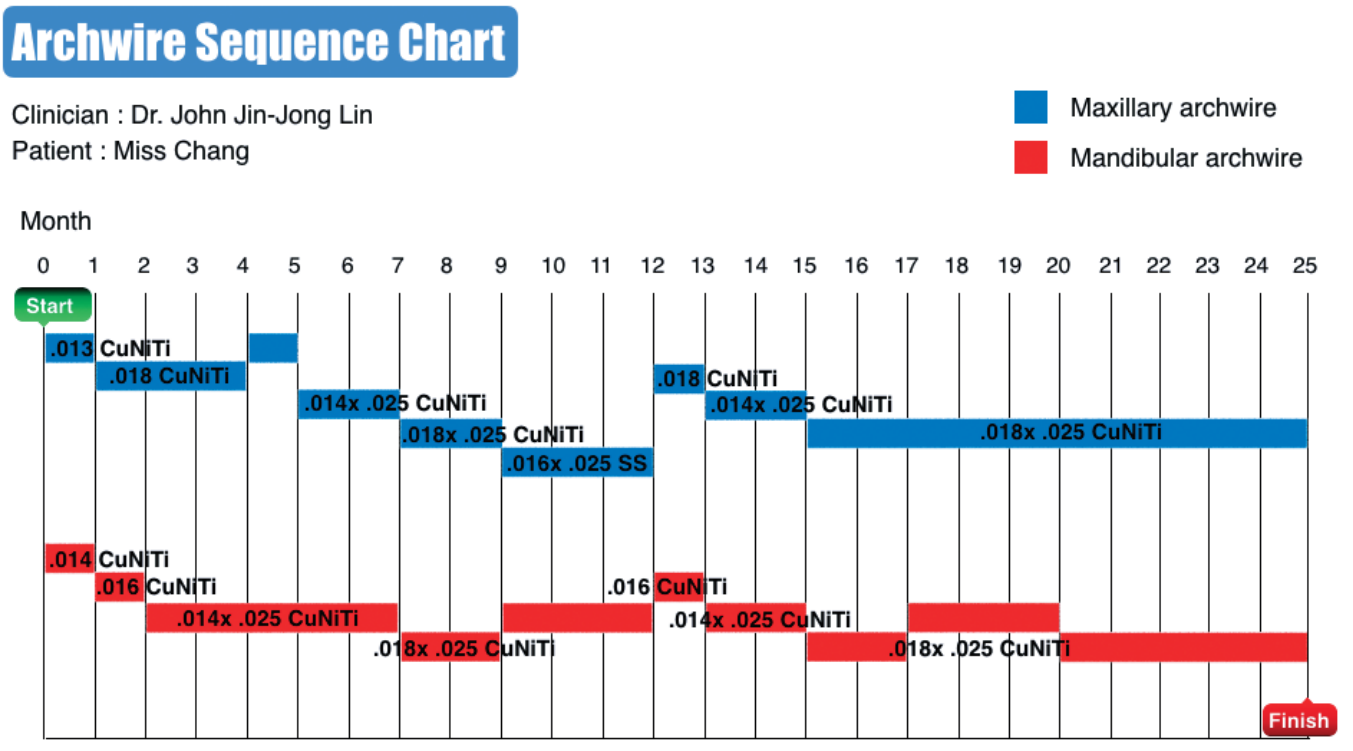


Fig. 16: Archwire sequence chart

2. Space Closure

The LR7 extraction provided the space needed to correct the negative overjet and to improve buccal intercuspation. Elastomeric chains on both the buccal and lingual surfaces enhance the efficiency of space closure and help control side effects. For instance, applying force only on the buccal surface usually results in distal-out rotation of the terminal molar in the anchorage unit and increases the Curve of Spee (*posterior openbite*).[10] Another concern with space closure is excessive retraction of the incisors, which often results in a facial profile compromise. Torque control with incisor bracket selection and/or third order adjustment of archwires is an important factor.

3. Autotransplantation

Autogenous tooth transplantation refers to surgical repositioning of a tooth (*teeth*) in the same patient. Assuming a suitable donor tooth is available, this procedure may be helpful for managing spaces due to congenitally missing teeth, ectopic eruption, severe caries, periodontal disease, trauma, or endodontic failure.[11,12]

The survival rate for tooth autotransplantation ranges from 81-90%.[13] Reattachment of soft tissue to the root surface occurs within 2 weeks,[4] but complete healing as evidenced by a radiographically evident PDL space and lamina dura around the root requires about 8 weeks.[14]

The most important criteria for the recipient site is adequate bone support to retain the transplanted tooth. There must be sufficient alveolar bone support in all dimensions with adequate attached keratinized tissue to allow for stabilization of the transplant. In addition, the recipient site should be free from acute infection and chronic inflammation.[15] For the present patient, it was necessary to remove granulation tissue from the LL7 extraction site prior to seating the transplant. Antibiotic prophylaxis (*Amoxicillin 500mg q.i.d. for 3 days*) was provided. This approach was deemed essential for autotransplantation success.

An important factor for bone formation is good cervical approximation of the transplanted tooth to the bone of the recipient area. If cervical approximation is adequate, most tooth roots heal as a closed wound so there is lower chance of infection. The LR7 was the best fit for the donor site as confirmed by the surgical fit of the replica (*Fig. 12*).

Maintaining vitality of the PDL is an important goal during transplant surgery because a traumatized root surface is often associated with ankylosis.[16,17] The latter is one of the common complications for tooth autotransplantation (*Fig. 15*). This phenomenon is probably due to the periodontal ligament (*PDL*) damage that is inherent in the tooth transplantation process. PDL damage is probable for long (*14mm*), completely formed roots. Adjacent osseous tissue attaches to the tooth root in the absence of a well-formed PDL. If the position of an ankylosed tooth is acceptable, normal function can be expected for a long period of time. However, the affected tooth

cannot adjust to changes in dentofacial relationships with physiologic tooth movement, so occlusal modification is not indicated.

Severe root resorption is the most common cause of transplant failure. During autogenous tooth transplantation, extraoral endodontic treatment prolongs the extraoral transplant time which can result in loss of vitality of PDL, Hertwig's epithelial root sheath, and root cementum.[18] All of these factors may contribute to progressive root resorption.

To reduce the extraoral time, the endodontic treatment was performed before extracting and transplanting the tooth. Vitality of the PDL is important for transplant success.[19] The PDL is sensitive to changes in pH and osmotic potential, so its viability is reduced by extended extraoral "*dry time*" prior to transplantation.[20]

In comparison to implants, rapid bone induction around a transplanted tooth is a significant advantage. This anabolic osseous response generates new bone around the transplant which is observed radiographically as rapid bone regeneration and delineation of a lamina dura.[4]

Conclusions

A pleasing result for a challenging Class III malocclusion was achieved in 25 months without orthognathic surgery. With a thorough diagnosis and meticulous treatment plan, autogenous transplantation is a viable treatment modality for many partially edentulous patients, particularly if extractions are needed. Patient selection involves a careful 3D evaluation of the proposed donor tooth and the recipient site. Success depends on treatment planning, surgical skill, and good patient compliance. A sterilized 3D replica of the donor tooth is helpful for the osseous preparation of the recipient site.

References

1. Kuo PJ, Hung TF, W WC, Yuh DY, Chang NS. Optimizing autotransplantation with simultaneous sinus floor elevation: applications of computer-aided rapid prototyping of 3D model. Poster presented at: 2014 Taiwan Academy of Periodontology Annual Meeting and International Symposium; November 8-9, 2014; Kaohsiung, Taiwan.
2. Prato GP, Zuccati G, Clauser C. Commentary: a translational medicine approach to tooth transplantation. J Periodontol 2017;88(6):519-525.
3. Pogrel MA. Evaluation of over 400 autogenous tooth transplants. J Oral Maxillofac Surg 1987;45(3):205-211.
4. Tsukiboshi M. Autotransplantation of teeth: requirements for predictable success. Dent Traumatol 2002;18(4):157-180.
5. Chang A, Chang CH, Roberts WE. Class III malocclusion with camouflage treatment and implant site development. Int J Orthod Implantol 2015;39:24-49.
6. Anghileri M. The "ANG (Anghileri) technique": making derotation easy. Int J Orthod Implantol 2016;43:76-79.
7. Casko JS, Vaden JL, Kokich VG, Damone J, James RD. American Board of Orthodontics: objecting grading system for dental casts and panoramic radiographs. Am J Orthod Dentofacial Orthop 1998;114(5):589–599.
8. Su B. IBOI Pink & White esthetic score. Int J Orthod Implantol 2013;28:80-85.
9. Herivi F, Bayani S, Madani AS, Radvar M, Anbiaee, N. Intrusion of supraerupted molars using miniscrews: clinical success and root resorption. Am J Orthod Dentofacial Orthop 2011;139(4 Suppl):S170-175.

10. Baik UB, Park JH. Occlusion and biomechanics. In: Baik UB, Park JH eds. Molar protraction: orthodontic substitution of missing posterior teeth. North Charleston, SC, USA: CreateSpace; 2013. p. 96-103.
11. Tsukiboshi M, Andreasen J, Asai Y. Autotransplantation of teeth. Chicago, USA: Quintessence; 2001:10–14, 97, 152–167.
12. Lee S. Transplantation and replantation of teeth. Seoul, Korea: Shinhung; 2008. p. 8–15, 92–116.
13. Mejàre B, Wannfors K, Jansson L. A prospective study on transplantation of third molars with complete root formation. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2004;97(2):231-238.
14. Mendes RA, Rocha G. Mandibular third molar autotransplantation - literature review with clinical cases. J Can Dent Assoc 2004;70(11):761–766.
15. Northway WM, Konigsberg S. Autogenic tooth transplantation: the "state of the art." Am J Orthod 1980; 77(2):146-162.
16. Hermann NV, Lauridsen E, Ahrensburg SS, Gerds TA, Andreasen JO. Periodontal healing complications following concussion and subluxation injuries in the permanent dentition: A longitudinal cohort study. Dent Traumatol 2012;28(5):386–393.
17. Waldon K, Barber SK, Spencer RJ, Duggal MS. Indications for the use of auto-transplantation of teeth in the child and adolescent. Eur Arch Paediatr Dent 2012;13(4):210–216.
18. Smith JJ, Wayman BE. Successful autotransplantation. J Endod 1987;13(2):77–80.
19. Andreasen JO. Periodontal healing after replantation and autotransplantation of incisors in monkeys. Int J Oral Surg 1981;10(1):54–61.
20. Lindskog S, Blomlöf L. Influence of osmolality and composition of some storage media on human periodontal ligament cells. Acta Odontol Scand 1982;40(6): 435–442.

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 = 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 = 1

LATERAL OPEN BITE

2 pts. per mm. per tooth

Total = 0

CROWDING (only one arch)

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

Total = 1

OCCLUSION

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

Total = 6

LINGUAL POSTERIOR X-BITE

1 pt. per tooth Total = 0

BUCCAL POSTERIOR X-BITE

2 pts. per tooth Total = 2

CEPHALOMETRICS (See Instructions)

ANB ≥ 6° or ≤ -2° = 4 pts.

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

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

SN-MP

≥ 38° = 2 pts.

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

≤ 26° = 1 pt.

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

1 to MP ≥ 99° = 1 pt.

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

Total = 0

OTHER (See Instructions)

Supernumerary teeth	_____ x 1 pt. =	_____
Ankylosis of perm. teeth	_____ x 2 pts. =	_____
Anomalous morphology	_____ x 2 pts. =	_____
Impaction (except 3rd molars)	_____ x 2 pts. =	_____
Midline discrepancy (≥3mm)	@ 2 pts. =	_____
Missing teeth (except 3rd molars)	_____ x 1 pts. =	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. =	3
Addl. treatment complexities	3 x 2 pts. =	6

Identify: Autotransplantation and UL5, UL6 intrusion.

Total = 11

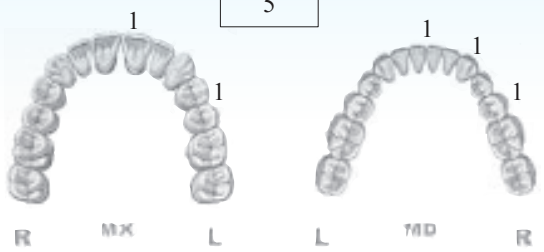
Cast-Radiograph Evaluation

Case # **Patient**

Total Score: 22

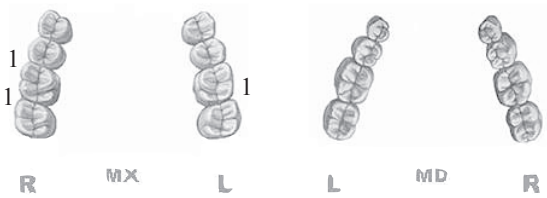
Alignment/Rotations

5



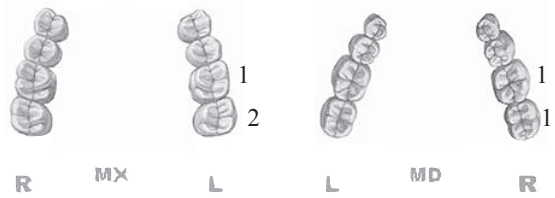
Marginal Ridges

3



Buccolingual Inclination

5

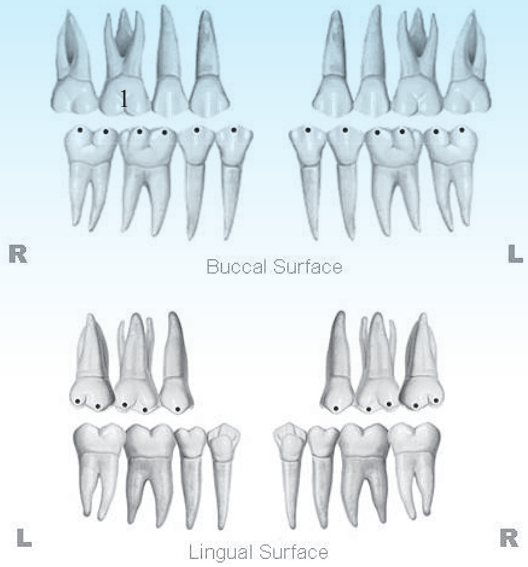


Overjet

4

Occlusal Contacts

0

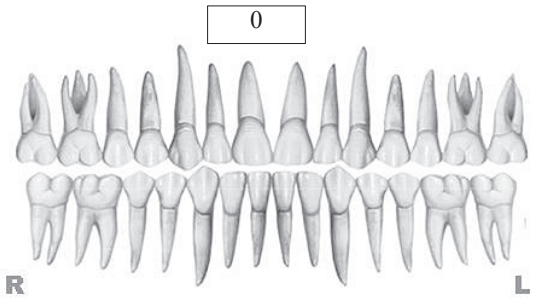


Occlusal Relationships

4

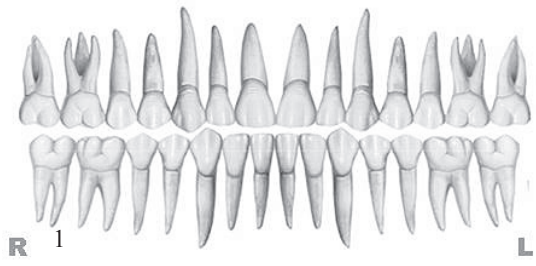
Interproximal Contacts

0



Root Angulation

1



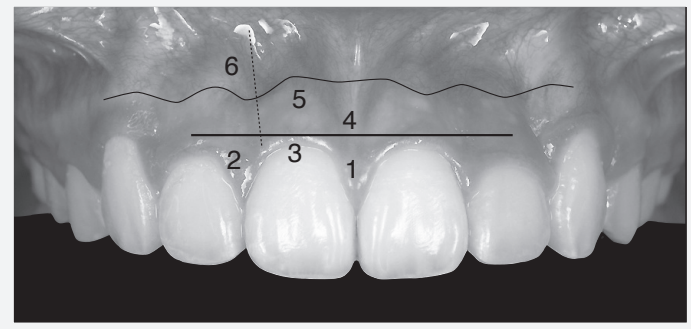
INSTRUCTIONS: Place score beside each deficient tooth and enter total score for each parameter in the white box. Mark extracted teeth with "X". Second molars should be in occlusion.

IBOI Pink & White Esthetic Score

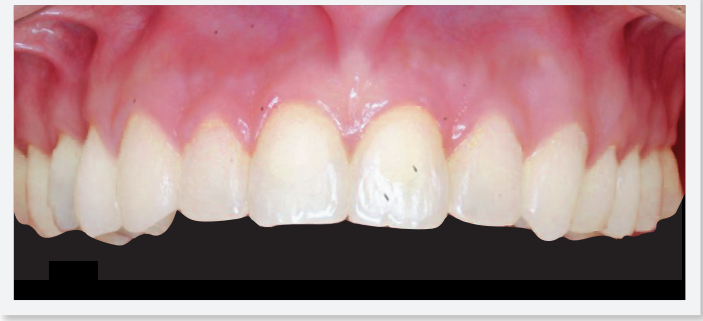
Total Score: = 7

1. Pink Esthetic Score

Total = 2



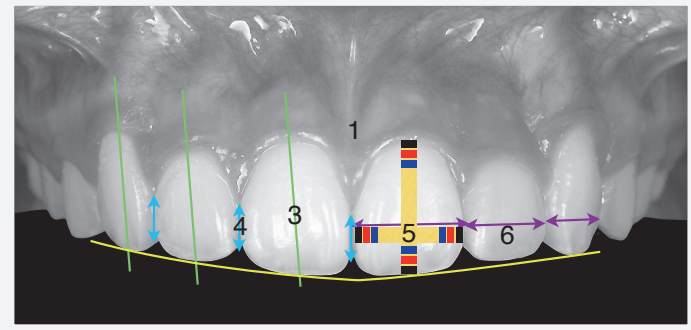
1. M & D Papillae	0	1	2
2. Keratinized Gingiva	0	1	2
3. Curvature of Gingival Margin	0	1	2
4. Level of Gingival Margin	0	1	2
5. Root Convexity (Torque)	0	1	2
6. Scar Formation	0	1	2



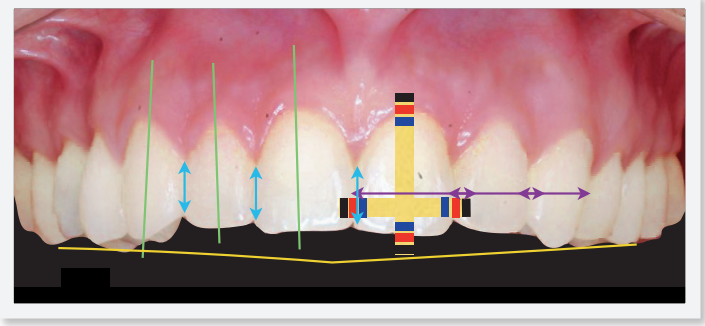
1. M & D Papilla	(0)	1	2
2. Keratinized Gingiva	(0)	1	2
3. Curvature of Gingival Margin	(0)	1	2
4. Level of Gingival Margin	0	(1)	2
5. Root Convexity (Torque)	0	(1)	2
6. Scar Formation	(0)	1	2

2. White Esthetic Score (for Micro-esthetics)

Total = 5



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



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