

Implant-Orthodontic Combined Treatment: Congenital Missing Teeth with a Unilateral Crossbite

HISTORY AND ETIOLOGY

A 23-year-11-month-old male was referred by his dentist for orthodontic consultation (Fig. 1). His chief concern was dental spacing and multiple teeth in crossbite (Figs. 2-3). There was no other contributory medical or dental history. Clinical exam indicated multiple missing teeth in the maxilla: both lateral incisors, right 2nd premolar, and right 1st molar. The lower right 2nd premolar was also missing (Fig. 2). A treatment plan combining orthodontics, prosthetic implants and implant-supported prostheses was proposed to correct the skeletal and dental problems.

The patient was treated to the preprosthetic finish documented in Figs. 4-6. Pretreatment and posttreatment radiographs are illustrated in Figs. 7-8, respectively. Superimposed cephalometric tracings document the treatment achieved (Fig. 9). The details for diagnosis and treatment will be discussed.

DIAGNOSIS

Skeletal:

Skeletal Class I ($SNA\ 88^\circ$, $SNB\ 87^\circ$, $ANB\ 1^\circ$)

Mandibular plane angle ($SN-MP\ 31^\circ$, $FMA\ 26^\circ$)

Dental:

Right side lingual crossbite malocclusion associate with a functional shift.



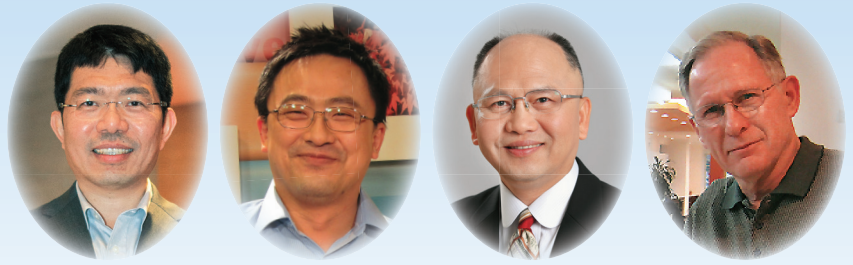
■ Fig. 1: Pretreatment facial photographs



■ Fig. 2: Pretreatment intraoral photographs



■ Fig. 3: Pretreatment study models



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 (from left to right)



■ Fig. 4: Posttreatment facial photographs

The overbite was 0 and overjet was -1mm on the right side.

Severe maxillary spacing was about 14mm due to multiple missing teeth: UR6 UR5 UR2 UL2.

Moderate mandibular spacing was about 6mm in the lower arch due to a missing LR5 and an anterior functional shift of the lower arch.

Mandibular dental midline was 4.5mm deviated to the right side of the facial midline.



■ Fig. 5: Posttreatment intraoral photographs

Facial:

Moderately convex profile with relative protrusion of the lips.

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

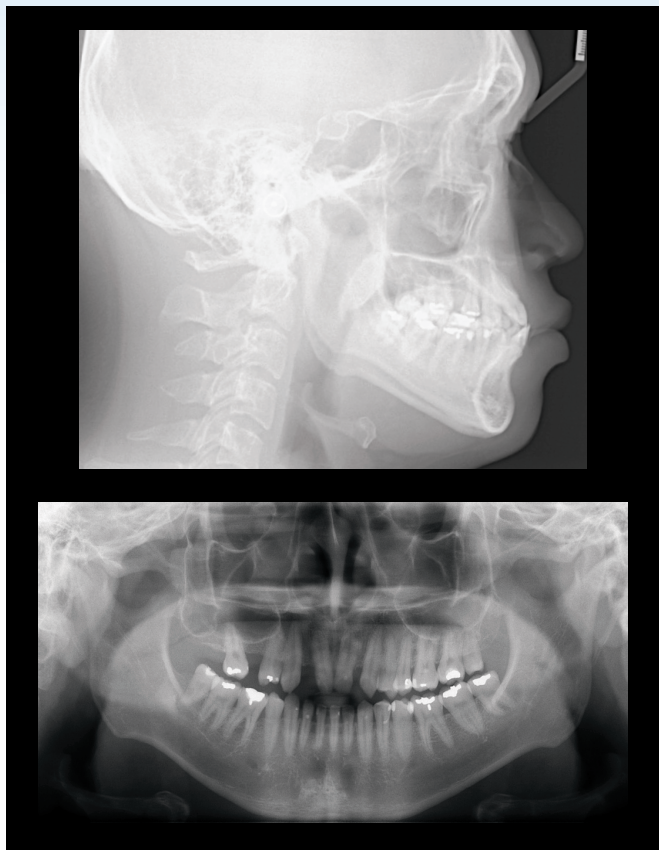
SPECIFIC OBJECTIVES OF TREATMENT

Maxilla (all three planes):

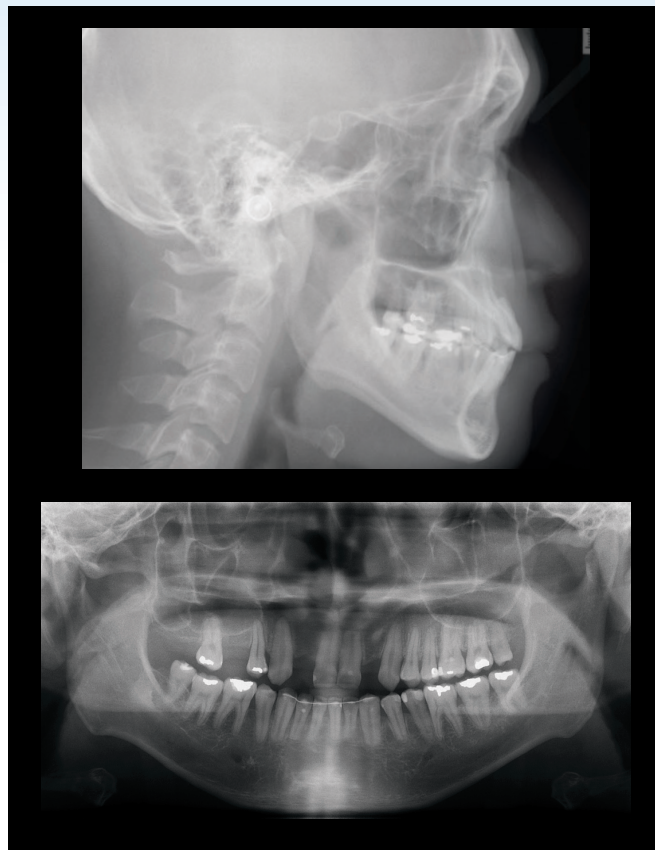
- A - P: Maintain
- Vertical: Maintain
- Transverse: Increase Mandible (all three planes):
- A - P: Retract (correction of anterior functional shift)
- Vertical: Clockwise rotation of 1-2°
- Transverse: Maintain



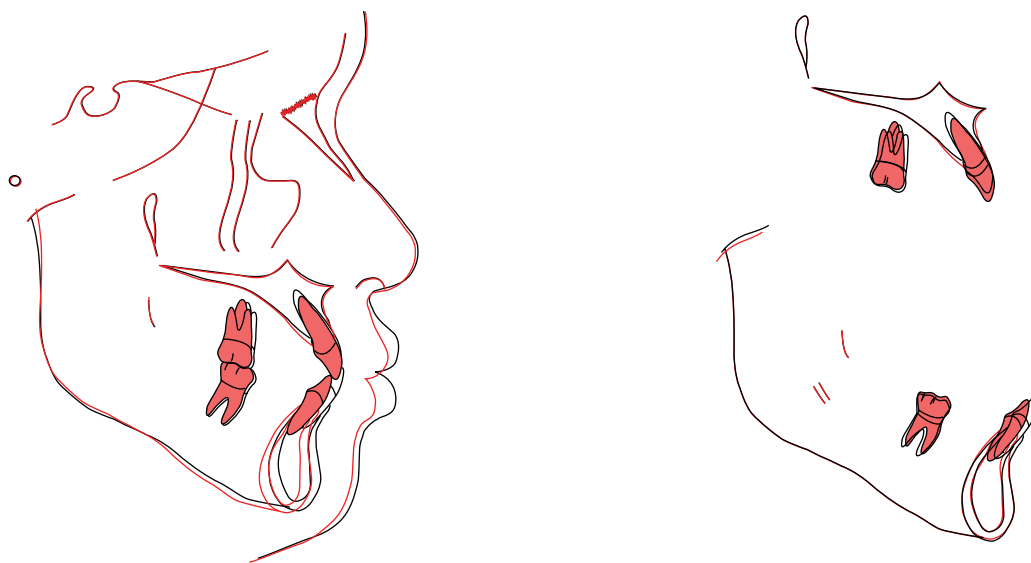
■ Fig. 6: Posttreatment study models



■ Fig. 7: Pretreatment pano and ceph radiographs



■ Fig. 8: Posttreatment pano and ceph radiographs



■ Fig. 9: Superimposed tracings

The mandible moved in a clockwise direction, the lips were retracted and the nasolabial angle was increased. The upper first molars were moved distally. The upper incisors were extruded. The lower incisors were retracted and intruded. The lower first molars were extruded.

CEPHALOMETRIC			
SKELETAL ANALYSIS			
	PRE-Tx	POST-Tx	DIFF.
SNA°	88°	89°	1°
SNB°	87°	86°	2°
ANB°	1°	3°	2°
SN-MP°	31°	34°	3°
FMA°	26°	29°	3°
DENTAL ANALYSIS			
U1 TO NA mm	3 mm	3 mm	0 mm
U1 TO SN°	115°	112°	3°
L1 TO NB mm	7 mm	6 mm	1 mm
L1 TO MP°	94°	96°	2°
FACIAL ANALYSIS			
E-LINE UL	2 mm	0 mm	2 mm
E-LINE LL	5 mm	0 mm	5 mm

■ Table. Cephalometric summary

Maxillary Dentition

- A - P: Increase arch circumference to correct anterior crossbite and create spaces for UR6 and UL2 implants.
- Vertical: Extrude incisors to create overbite.
- Inter-molar/Inter-canine width: Increase to correct right anterior and posterior crossbite, and create space for UL2 implant.

Mandibular Dentition

- A - P: Retract to correct anterior crossbite.
- Vertical: Extrude molars to open the vertical dimension of occlusion (VDO).
- Inter-molar/Inter-canine width: Decrease to correct right posterior crossbite.

Facial Esthetics: Retract upper and Lower Lips



■ Fig. 10:

0.022-in Damon 3MX standard torque brackets (Ormco) were used. Bite turbos were bonded on the mandibular molars.



■ Fig. 11:

Class III elastics (3.5 oz, 1/4") from upper molars to lower canines were introduced to improve anterior crossbite.



■ Fig. 12:

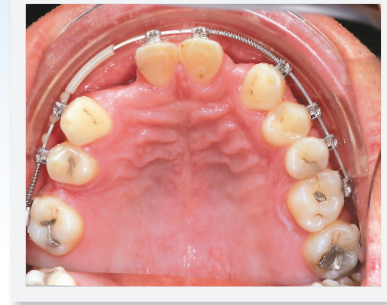
Class II elastics (4.5 oz, 1/4") from upper canines to lower molars were introduced to improve this 3mm of overjet.



■ Fig. 13:
 .014 CuNiTi archwire was placed on upper arch.



■ Fig. 14:
 .017x.025 low friction TMA archwire was placed on upper arch.



■ Fig. 15:
 The open coil springs were placed between right first premolar and second molar, left incisor and canine.



■ Fig. 16:
 Power chains were attached from upper canine to canine to close spaces of UR2 and UL2 area. After that, reopen spaces to create adequate bone volume for implantation.



■ Fig. 17:
 The open coil springs were placed between right first premolar and second molar, right canine and incisor, left incisor and canine.



■ Fig. 18:
 The created space for UR6, UR2 and UL2 were 9mm, 7mm, and 7mm respectively. The bony concavity of upper lateral incisors was noted.

TREATMENT PLAN

A full fixed orthodontic appliance was used to correct the right posterior crossbite, close lower anterior spacing, coordinate the arches, and improve the soft tissue profile (Fig. 10). The UR7 lingual crossbite was corrected with cross elastics on the affected side with bite turbos on the opposite side to open up the bite. The lower arch was constricted to help correct the right posterior lingual crossbite.

Posterior bite turbos with Class III and Class II elastics corrected the sagittal discrepancy in occlusion and improved the facial profile (Figs. 11-12). The occlusion was detailed with finishing bends. The spaces for

implantation were prepared with open coil springs (Figs. 13-18). Mandibular anterior spaces were closed with "power tube" (elastic ligature) from LR3-LL3. After fixed appliance were removed, a clear overlay retainer was delivered for the upper arch and a lower fixed 3-3 retainer was bonded to all teeth in the anterior segment.

APPLIANCES AND TREATMENT PROGRESS

.022" Damon 3MX standard torque brackets (Ormco) were used. Both arches were bonded and aligned. The archwire sequence for the upper arch was .014 CuNiTi, .014x25 CuNiTi, .017x25 TMA and

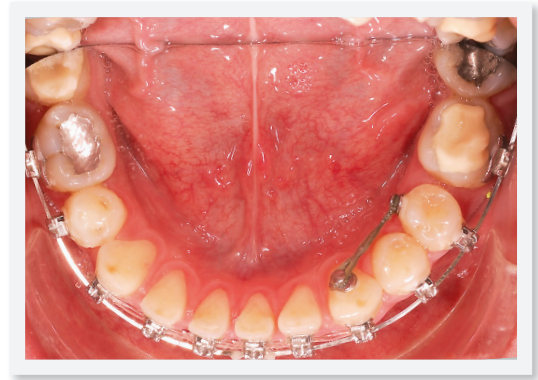
.019x25 SS. The lower archwire sequence was .014 CuNiTi, .014x25 CuNiTi, .016x22 SS, .017x25 TMA and 019x25 SS. Posterior bite turbos were bonded on the mandibular molars (LR6, LL7) to facilitate crossbite correction (Figs. 10-12). After four months of initial alignment and leveling, a panoramic film was taken. The malaligned brackets (LR5, LL4, LL5) were rebonded. In the 7th month of treatment, a .017x25 low friction TMA archwire was placed in the upper arch and a .016x22 SS arch wire was inserted in the lower arch (Figs. 7, 20). Constriction of the lower SS arch-wire was performed to assist in correction of the right posterior, lingual crossbite. Class III elastics (3.5 oz, 1/4") from upper molars to lower canines were introduced to correct the anterior crossbite (Fig. 11). The A-P discrepancy was corrected by flattening the plane of occlusion and opening the vertical dimension of occlusion. A power tube, elastic ligature from lower 3-3 was activated to close the interdental space and decrease the intercanine distance (Fig. 19). A power chain was attached from the LL3 lingual button to the LL5 lingual button to achieve rotation of LL5 (Fig. 20). After 8 months, an open coil spring was applied between the upper left central incisor and canine to create space for an implant (Fig. 15).

In the 10th month of treatment the anterior crossbite was overcorrected. Class II elastics (4.5 oz, 1/4") from upper canines to lower molars were introduced to increase the overjet to 3mm (Fig. 12).

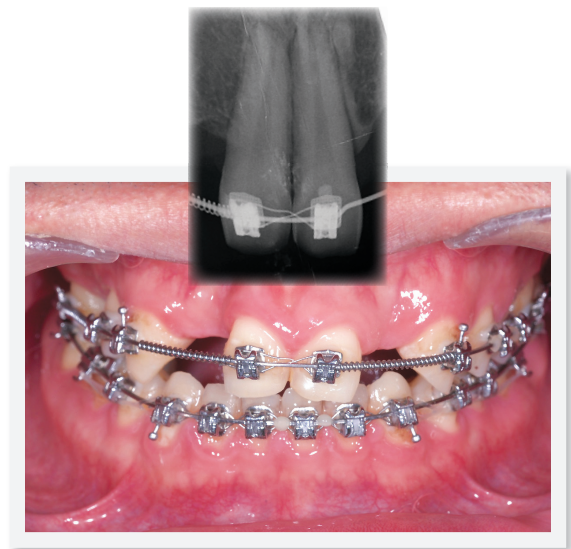
In the 14th month of treatment, the lower arch-wire was changed to .019x25 SS. Constriction of lower archwire was performed to assist in correction of the posterior lingual crossbite on the right side. Open coil springs were applied between UR7 and



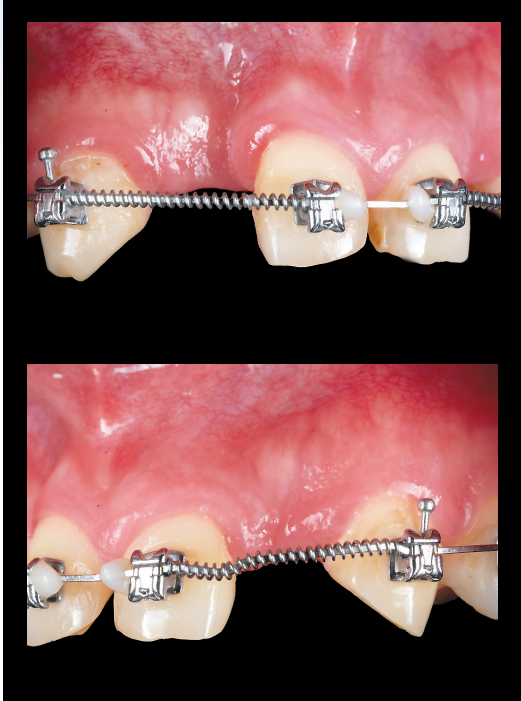
■ Fig. 19:
A power tube from lower 3-3 was inserted to close interdental space and decrease intercanine distance.



■ Fig. 20:
A power chain was attached from LL3 lingual button to LL5 lingual button to improve the rotation of LL5.



■ Fig.21:
An anterior periapical radiograph was exposed to evaluate bracket positions.



■ **Fig. 22:**

The bony concavity of upper lateral incisors would be improved by augmenting buccal bone with GBR procedure after orthodontic treatment.

UR4, UL1 and UL3 to create spaces for implants. In the 14th month of treatment, a button was bonded on the lingual side of the upper right second molar to accommodate upper and lower cross elastics for lingual crossbite correction. In the 19th month of treatment, after the crossbite bite was corrected, an anterior periapical radiograph and a panoramic film were exposed to evaluate the bracket positions relative to the axial inclinations of all teeth (Fig. 21). The bracket of UR1 was then rebonded to improve axial inclination. The differential spacing achieved was 7mm between UR7 and UR4, 8mm between UR3 and UR1, and 6.5mm between UL1 and UL3. In the 23rd month of treatment, power chains were attached from upper canine to canine to close the spaces in the areas of the UR2 and UL2. Previously constricted spaces in the maxillary arch

were widened to stimulate new bone formation to create adequate osseous volume for subsequent implantation; the principal concern was the labial concavity in the area of the missing upper lateral incisors (Figs. 16-18). One month later, the patient asked to finish the orthodontic treatment as soon as possible for personal reasons. The space closing then re-opening procedure was terminated. The bony concavity in the upper lateral incisal areas could be improved by augmenting buccal bone with GBR procedure after orthodontic treatment, if necessary (Fig. 22). The major concern was to create adequate space and bone volume for implants to replace UR2 and UL2. In the 32nd month of treatment, the space created for UR6, UR2 and UL2 implants was 9mm, 7mm, and 7mm, respectively (Figs. 5, 6, 8 and 18).

After 32 months of preprosthetic orthodontics treatment, all appliances were removed. An upper clear overlay retainer and a fixed lower anterior (Md 3-3) retainer were delivered, and the patient was referred to receive implant-supported prostheses by a specialist.

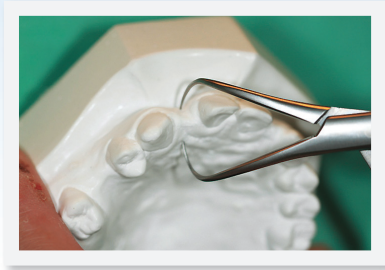
RESULTS ACHIEVED

Maxilla (all three planes):

- A - P: Maintained
- Vertical: Maintained
- Transverse: Increased

Mandible (all three planes):

- A - P: Retracted with clockwise rotation
- Vertical: Increased ~2mm with clockwise rotation
- Transverse: Maintained



■ Fig. 23: Bone height and width were estimated.



■ Fig. 24: The wax up model

Maxillary Dentition

- A - P: Right Molar was moved distally.
- Vertical: Incisors extruded
- Inter-molar/inter-canine width: Increase the inter-canine width.

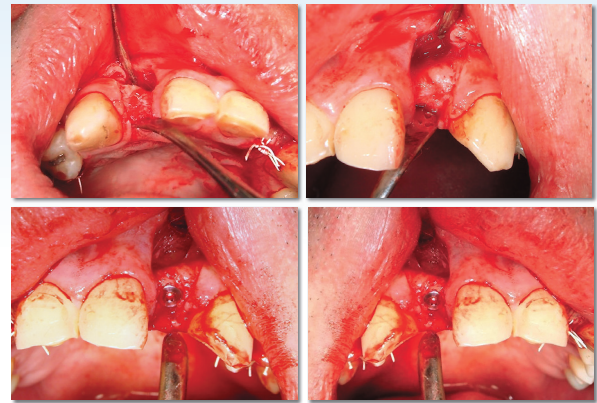
Mandibular Dentition

- A - P: Incisors retract
- Vertical: Incisors intruded
- Inter-molar/inter-canine width: Spacing closed and crossbite corrected.

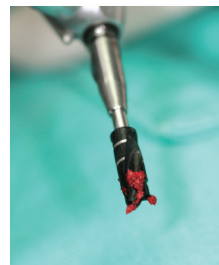
Facial Esthetics: Upper and lower lips were retracted.

RETENTION

The lower fixed retainer (3-3) was bonded on every tooth. An upper clear overlay was delivered. The patient was instructed to wear the overlay full time for the first 6 months and nights only thereafter. Home care and maintenance instructions for the retainers was provided. The patient was referred to



■ Fig. 25: .
A #12 blade was used to make an incision along the gum line. The Nobel Active implants were chosen for this case.



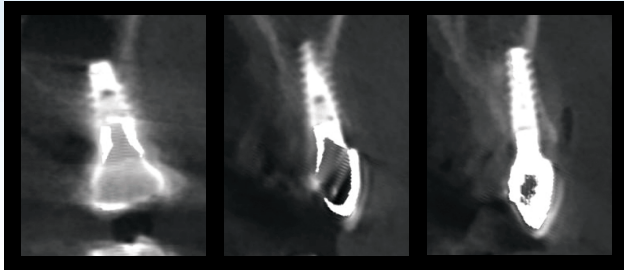
■ Fig. 26:
Using low speed (800rpm) to collect bone chips.



■ Fig. 27:
The healing abutments, 5*5mm, were inserted to allow the patient with his continuous use of the clear retainer.



■ Fig. 28:
The APF incision of UR2 appeared unnatural and separated from the adjacent gum line.



■ Fig. 29: .
Cone Beam Computed Tomography (CBCT) was used to check implant conditions at the one year follow-up.

a specialist for subsequent implants placement and prosthetic restoration of the partially edentulous maxillary arch.

IMPLANT PLACEMENT PROCEDURES

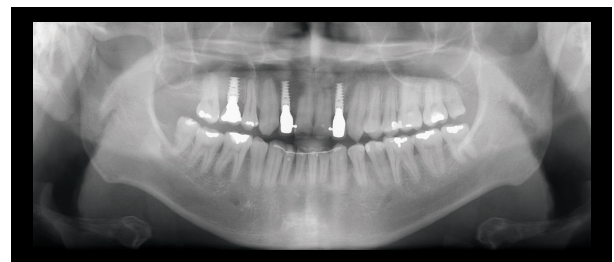
Step 1. Bone height and width were estimated by traditional panoramic, periapical film technique and study model measurements (Fig. 23). In addition, crown morphology and the pathway of insertion were designed using a model wax up (Fig. 24).¹¹⁻¹⁴

Step 2. Following injection of local anesthetic, a #12 scalpel blade was used to make vertical incisions to reflect an apically positioned flap (APF) on the labial surface (Fig. 25). When preparing the implant site, the bur was turning at low speed (800 rpm) to allow the collection of bone chips for subsequent grafting procedures as needed (Fig. 26).

Step 3. Although no CBCT scan was taken initially to evaluate the bone height, the UR2 implant site was estimated to require at least 8.5mm of bone height. In addition, for an implant 3.5mm in diameter, the following osseous requirements are necessary: 2mm on the buccal side, 1mm on the lingual



■ Fig. 30:
Posttreatment photographs of Implant-Orthodontic combined treatment



■ Fig. 31:
Posttreatment pano radiograph of Implant-Orthodontic combined treatment

side, and at least 2mm on the mesial and distal to provide for adequate soft tissue contours. Fig. 23 reveals that only 6mm of bone height is available so bone grafting¹⁵⁻¹⁷ was indicated. The UR6 area was estimated to have 5mm of bone height. If the planned implant was 10mm in length, a sinus lift procedure was indicated prior to implant placement. Thus, the order of surgical procedures was UR6, UL2, and UR2 (Fig. 27).



■ Fig. 32:
Posttreatment study models of Implant-Orthodontic
combined treatment

Step 4. An osteotome was used to elevate the bone at the site of missing UR6 after reflecting a full thickness flap.¹⁸ A 5x10mm implant (*Nobel Active RP*) was inserted with a torque of 35 N-mm to achieve good initial stability.

Step 5. After elevation of the full thickness flap, it was observed that the bone shape was slightly concave on the buccal for UL2. Because of the expansion capability of the Nobel Active implant, it is typically chosen for the anterior area, especially for areas with thin bone. In this case, a 3.5x13mm Nobel Active NP implant (*Fig. 25*) was chosen to ensure no exposure of any groove on the body of the implant. No bone graft material was used. Strong initial stability was observed with torque of 45 N-cm.

Step 6. After elevation of the full thickness flap on UR2, it was observed that the bone shape was actually more concave on the buccal side, relative to UL2. A 3.5x13mm Nobel Active NP implant was used for this procedure. However, bone chips were

collected from the hole drilling procedure for UL2 to be used for the buccal side of UR2 to provide added bone thickness (*Fig. 26*).¹⁵

Step 7. A submersion healing technique was chosen, so the soft tissue flap was closed and sutured. This approach allowed the patient to continue to wear clear retainers to retain all spaces and alignment of dentition.

Step 8. Three months later, the implant base was exposed and soft tissue healing abutments (5x5mm) were inserted (*Fig. 27*). The patient continued to wear the clear retainer. The following week, an impression was taken to fabricate a final screw-retained porcelain fused to metal (*PFM*) crowns with a UCLA angled abutment. The gingival lines across the original APF incisions of UR6 and UL2 appeared smooth and related to the adjacent gingival contour harmoniously (*Fig. 30*). However, the APF incision of UR2 appeared unnatural and unharmonious with the adjacent gingival margin (*Fig. 28*). It was necessary to accept this abnormal gingival morphology as an esthetic compromise; fortunately, the adjacent papilla appeared to be healthy.

Step 9. Cone Beam Computed Tomography (*CBCT*) was used for the one year follow-up (*Fig. 29*). As predicted, the buccal bone of UR2 was thin, but it was relatively thicker for UL2. The UR6 had less bone density particularly at the implant apex.

FINAL EVALUATION OF TREATMENT

The Cast-Radiograph Evaluation was scored at 27 points, which was deemed to be an excellent result

for a severe malocclusion. The major finishing discrepancies were occlusal interdigitation (6 *points*), uneven marginal ridges (5 *points*), occlusal contacts (5 *points*), and alignment (4 *points*). The retraction of the anterior dentoalveolar process resulted in the E-line decreasing from 2/5mm to 0/0mm. As documented in Fig. 30, facial esthetics improved as the lips were retracted and the nasolabial angle was increased. As planned, the mandible rotated in a clockwise direction due to the extrusion of lower molars by using Class II elastics. The posterior intercuspation was acceptable and the panoramic radiograph (Fig. 31) showed good root position overall. Posttreatment facial photographs, following completion of implant-orthodontics treatment are shown in Fig. 30. Overall, there was significant improvement in both dental esthetics and occlusion.

DISCUSSION

The key issue for this case was determining how much space was required for restoration of the missing teeth, as well as how to correct the crossbite on the right side. Unilateral lingual crossbite is a difficult clinical problem for orthodontists. The first step in resolving the problem is expanding the upper arch¹ or constricting the lower arch. As the crossbite is corrected, appropriate spaces must be produced for restoration of the missing teeth. Missing maxillary lateral incisors can be managed with fixed partial dentures, implant-supported prostheses or canine substitution.²⁻⁵ The selection of the type of restoration is based upon several factors: 1. amount of space available, 2. bone remaining between the adjacent teeth, 3. the type and mass of gingival tissue surrounding the missing teeth area, 4. the age of the patient, and 5.

economic considerations. For the present patient, the missing teeth were restored with implant-supported crowns.⁵ Preprosthetic orthodontics is important adjunctive treatment to prepare implant sites relative to osseous volume, bone height, sufficient interdental space, and optimal soft tissue conditions, prior to implant placement. However, controlling treatment time is another critical issue to achieve satisfactory results for patients. Esthetic analysis^{7,8} is particularly advantageous for evaluating the amount of space required for implantation, especially in the esthetic zone. The latter is defined as any dentogingival areas exposed during normal function or social interaction, such as smiling. The spaces for implants were prepared by sliding mechanics with NiTi springs on .019x25 SS and/or .017x25 TMA archwires (Figs. 14-17). It is important to monitor the torque of incisor brackets and/or archwires to control the axial inclination of teeth, particularly in the anterior segments. Periodic periapical films of upper and lower anterior areas can help identify problematic bracket positions in the second order (Fig. 21). For example, the bracket of UR1 was rebonded for the present patient. However, for third order control of axial inclination, as well as for evaluation of available bone, a CBCT is indicated.

Constriction of the lower arch-wire was performed to assist in correction of the posterior lingual crossbite. Cross elastics from UR7 to lower LR6 were introduced to correct lingual crossbite relation. These procedures, however, result in discrepancies in the buccolingual inclination of lower right molars. The other major deduction in the Cast-Radiograph Evaluation was uneven marginal ridges, particularly of the right posterior teeth. The best

way to avoid this problem is to take a diagnostic model a few months before appliance removal. Detailing problems can be identified and corrected. In brief, pre-torqued, self-ligated brackets and posterior bite turbos in conjunction with Class III elastics and constricted SS archwire are effective mechanics for the correction of unilateral crossbite in adult patients. A satisfactory result was achieved within 32 months of active treatment.

Important considerations for managing complex malocclusions, with congenitally missing teeth, are as follows:

1. Upon reviewing the outcome of UR6, bone grafting was indicated during the osteotome procedure when the bone height was preliminarily estimated as 4.7mm.¹⁸ Bone grafting could have generated more bone surrounding the implant surface, especially at the root apex area adjacent to the maxillary sinus.
2. CBCT can provide accurate and precise diagnostic information, such as bone height, width, and density. The procedure should be routinely used for preliminary patient evaluation. Unfortunately, the traditional evaluation tools, such as panoramic and periapical films, provide only limited and partial information.
3. The surgical procedures could be modified to minimize peri-implant gingival compromise. Taking impressions, constructing a provisional crown (*plastic*), installing the provisional crown, and then delivering a new retainer, can all be performed on the same day of the initial implant surgery.¹⁴ Using this modified approach, the gingival margin would be stabilized in three months, making it possible to obtain an impression for the permanent crown. This approach is more predictable esthetically.
4. The post-APF results of UR2 were less than ideal due to the unnatural appearance and separation from the adjacent gingival line. However, the same APF procedure was used for UR6 and UL2, and satisfactory results were observed. Possible explanations as well as future recommendations are:
 - a. If the incision line is above the mucogingival junction (MGJ), scarring will be more apparent.
 - b. After the elevation of the full thickness flap, the gingiva tends to be more constrictive and tight. Therefore, it is recommended that a periosteum releasing procedure be conducted one more time before suturing. In addition, suturing should not be too tight. The soft tissue margins should just be brought into contact.
 - c. Scarring is diminished if a bevel technique is utilized during incision.
 - d. If the attached gingiva is thin, regardless what procedure is used, significant scarring will be unavoidable.
 - e. To minimize objectionable scarring, the incision can be conducted in a less visible site, such as the premolar area.
 - f. Recommended procedures for resolving scarring are first to apply the vertical incision subperiosteal

tunnel access (*VISTA*) technique. An additional adjunctive procedure is a connective tissue graft (*CTG*) under the site of the scar, followed by gingivoplasty with a bur after three months of healing.^{19, 20}

CONCLUSION

Effective treatment of maxillary deficiency, associated with a functional shift, unilateral crossbite and multiple congenitally missing teeth, requires extensive preprosthetic preparation. Dentofacial orthopedic treatment combined with implant-supported prostheses can achieve optimal outcomes in many challenging clinical situations. A thorough diagnosis, well planned implant site preparation, and efficient force systems are essential components. Management of unfavorably positioned spaces, as well as correction of skeletal deficiency and functional anomalies are critical preparation for optimal restoration of esthetics and function.

ACKNOWLEDGMENT

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IBOI 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 = **3**

Total = 3

OVERBITE

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

Total = 0

ANTERIOR OPEN BITE

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

Total = 2

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 _____pts.
- Beyond Class II or III = 1 pt. per mm. _____pts.
additional

Total = 0

LINGUAL POSTERIOR X-BITE

1 pt. per tooth Total = 4

BUCCAL POSTERIOR X-BITE

2 pts. per tooth Total = 0

CEPHALOMETRICS (See Instructions)

ANB $\geq 6^\circ$ or $\leq -2^\circ$ = 4 pts.

Each degree $< -2^\circ$ _____ x 1 pt. = _____

Each degree $> 6^\circ$ _____ x 1 pt. = _____

SN-MP

$\geq 38^\circ$ = 2 pts.

Each degree $> 38^\circ$ _____ x 2 pts. = _____

$\leq 26^\circ$ = 1 pt.

Each degree $< 26^\circ$ _____ x 1 pt. = _____

1 to MP $\geq 99^\circ$ = 1 pt.

Each degree $> 99^\circ$ _____ 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 (≥ 3 mm) @ 2 pts. = 2
- Missing teeth (except 3rd molars) _____ x 1 pts. = _____
- Missing teeth, congenital 5 x 2 pts. = 10
- Spacing (4 or more, per arch) 2 x 2 pts. = 4
- Spacing (Mx cent. diastema ≥ 2 mm) @ 2 pts. = _____
- Tooth transposition _____ x 2 pts. = _____
- Skeletal asymmetry (nonsurgical tx) @ 3 pts. = _____
- Addl. treatment complexities _____ x 2 pts. = _____

Identify: **Trans-alveolar impaction**

Total = 16

IMPLANT SITE

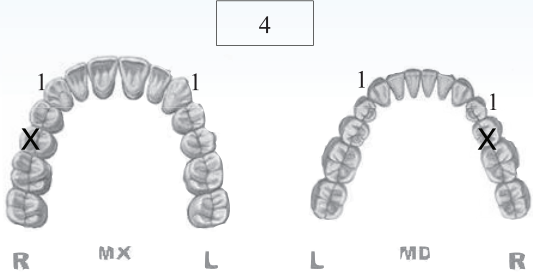
- Lip line : Low (0 pt), Medium (1 pt), High (2 pts) = 0
- Gingival biotype : Low-scalloped, thick (0 pt), Medium-scalloped, medium-thick (1 pt), High-scalloped, thin (2 pts) = 0
- Shape of tooth crowns : Rectangular (0 pt), Triangular (2 pts) = 0
- Bone level at adjacent teeth : ≤ 5 mm to contact point (0 pt), 5.5 to 6.5 mm to contact point (1 pt), ≥ 7 mm to contact point (2 pts) = 0
- 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) = 1
- Soft tissue anatomy : Intact (0 pt), Defective (2 pts) = 0
- Infection at implant site : None (0 pt), Chronic (1 pt), Acute(2 pts) = 0

Total = 1

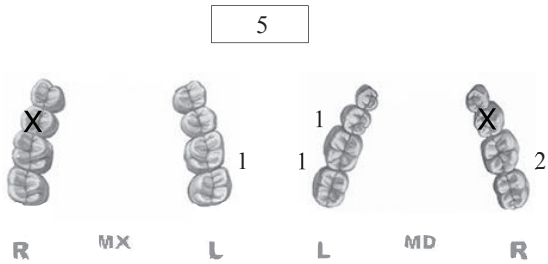
IBOI Cast-Radiograph Evaluation

Case # 1 Patient
 Total Score: **27**

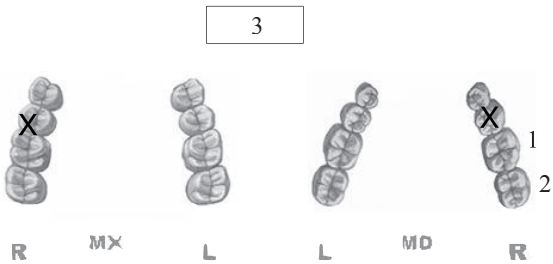
Alignment/Rotations



Marginal Ridges



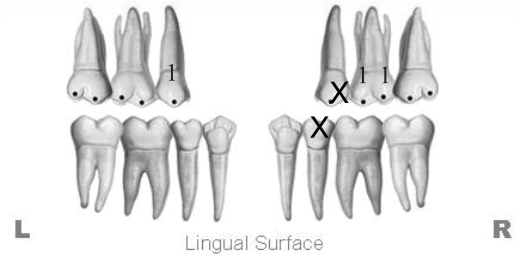
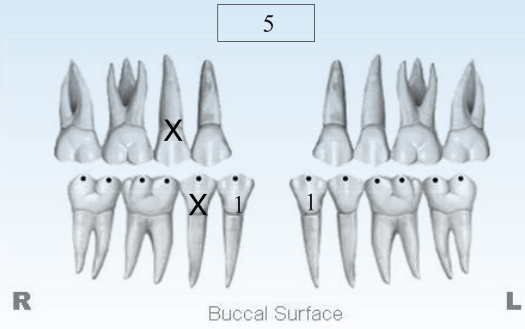
Buccolingual Inclination



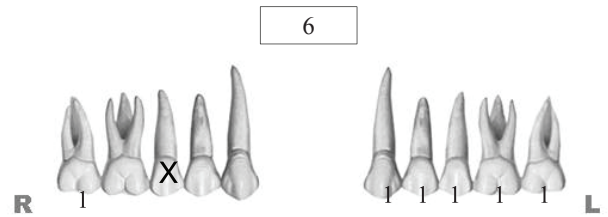
Overjet



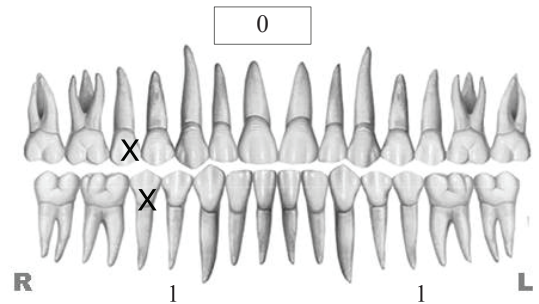
Occlusal Contacts



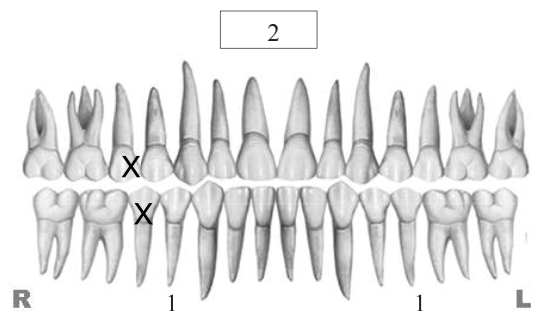
Occlusal Relationships



Interproximal Contacts



Root Angulation



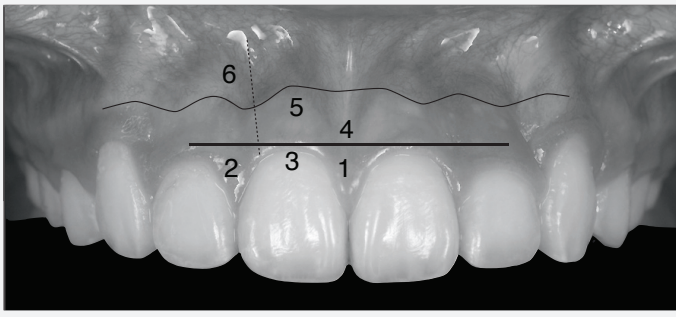
INSTRUCTIONS: Place score beside each deficient tooth and enter total score for each parameter in the white box. Mark extracted teeth with "X". Second molars should be in occlusion.

IBOI Pink & White Esthetic Score

Total Score: = 7

1. Pink Esthetic Score

Total = 3



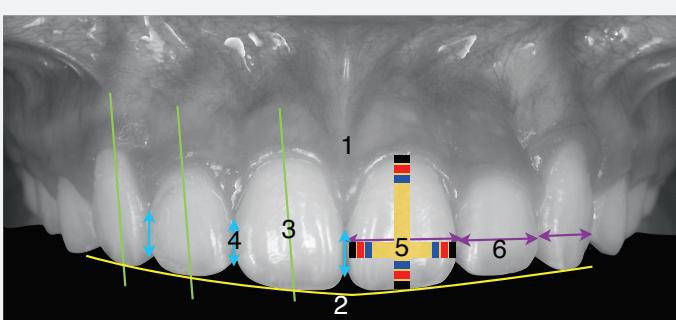
1. Mesial Papilla	0	1	2
2. Distal Papilla	0	1	2
3. Curvature of Gingival Margin	0	1	2
4. Level of Gingival Margin	0	1	2
5. Root Convexity (Torque)	0	1	2
6. Scar Formation	0	1	2



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 = 4



1. Tooth Form	0	1	2
2. Mesial & Distal Outline	0	1	2
3. Crown Margin	0	1	2
4. Translucency (Incisal third)	0	1	2
5. Hue & Value (Middle third)	0	1	2
6. 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