Space Closure for Congenitally Missing Upper Second Premolars with Molar Protraction Through the Floor of the Maxillary Sinus

Abstract

A 21-year-old male presented with a chief complaint of missing maxillary second premolars. The edentulous spaces were retained as implant sites with band-and-loop fixed space maintainers. Presurgical evaluation, after the space maintainers were removed, revealed caries on the mesial of both first molars, and inadequate implant sites. The patient opted for orthodontic space closure, which required protracting the upper molar roots through the floor of the maxillary sinus. Routine orthodontic space closure, supplemented with Class III elastics and mandibular buccal shelf bone screws, produced a pleasing result. There was no clinical evidence of root resorption or other complications. This partially edentulous malocclusion, with an American Board of Orthodontics (ABO) Discrepancy Index (DI) of 13 points, was treated to an ABO Cast-Radiograph Evaluation (CRE) score of 19 points in 26 months. (Int J Orthod Implantol 2016;43:32-48)

Key words:

Congenital missing premolars, buccal shelf bone screws, maxillary sinus floor, overbite anchorage

History and Etiology

A 21-year-old male with a partially edentulous malocclusion was referred for orthodontic consultation (*Fig. 1*). The chief complaint was bilateral edentulous spaces due to congenitally missing maxillary second premolars. The spaces were retained as potential implant sites with band-and-loop space maintainers (*Figs. 2-3*). After the retainers were removed, presurgical evaluation of the implant sites revealed caries on the mesial of both first molars (*Figs. 4 and 5*). Bone width and depth were inadequate for conventional implant placement. Orthodontic space closure was deemed a more predictable and cost-effective option compared to placing implant-supported prostheses, with bone grafting and soft tissue augmentation procedures. The patient concurred, and a pleasing result (*Figs. 6-8*) was achieved for this partially edentulous malocclusion (*DI 13*)[1] with 26-months of active treatment. Both premolar spaces were closed, the profile was preserved, and lip protrusion was corrected (*Figs. 9 and 10*). Superimposed tracings of cephalometric radiographs before and after treatment (*Fig. 11*) revealed that the maxillary molars were translated anteriorly, but as expected the anterior segment was retracted slightly, resulting in an end-to-end incisal relationship. As an adjunctive measure, it was necessary to retract the entire lower arch with anchorage provided via buccal shelf bone screws.[2] The maxillary first molars were finished in a Class II molar relationship with a final CRE score[3] of 19 (*Fig. 8*). The detailed diagnosis, treatment plan, mechanics and outcomes assessment are presented in this report.

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■ *Fig. 1*: *Pre-treatment facial photographs*

■ *Fig. 2*: *Pre-treatment intraoral photographs*

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

■ *Fig. 4*:
The upper right edentulous space is atrophic on the buccal and palatal surfaces. Note caries on the mesial surface of the first molar. The latter is a significant risk for long-term use of band and loop space maintainers.

■ *Fig. 5*:
The upper left edentulous space has similar deficiencies including molar caries when compared to the left side.

Fig. 6: Post-treatment facial photographs

Fig. 7: Post-treatment intraoral photographs

Fig. 8: Post-treatment study models

Diagnosis

Skeletal:

- Class II skeletal relationship (*SNA 82.4°, SNB 75.7°, ANB 6.7°*)
- Increased mandibular plane angle (*SN-MP 37.4°, FMA 30.2°*)

Dental:

- Bilateral Class I molar relationship
- Mild crowding of about 2mm in the lower arch
- Overjet 2mm
- Overbite 2mm
- Missing upper second premolars (*congenital absence*)

Facial:

- Acceptable profile with slightly protrusive lips

The ABO Discrepancy Index (*DI*) was 13[1] as shown in the subsequent worksheet.

Specific Objectives of Treatment

Maxilla (*all three planes*):

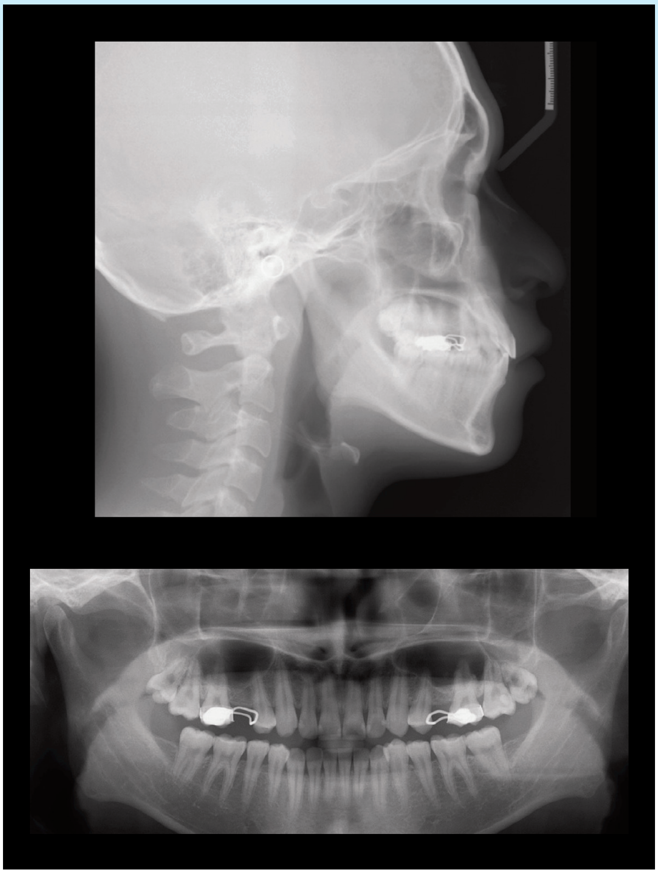
- A - P: *Maintain*
- Vertical: *Maintain*
- Transverse: *Maintain*

Mandible (*all three planes*):

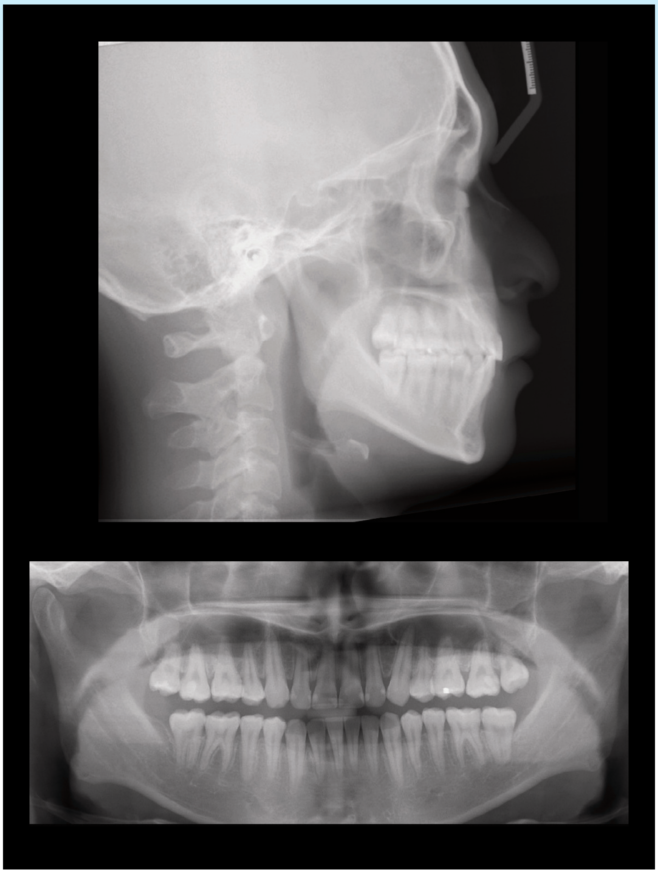
- A - P: *Maintain*
- Vertical: *Maintain*
- Transverse: *Maintain*

Maxillary Dentition

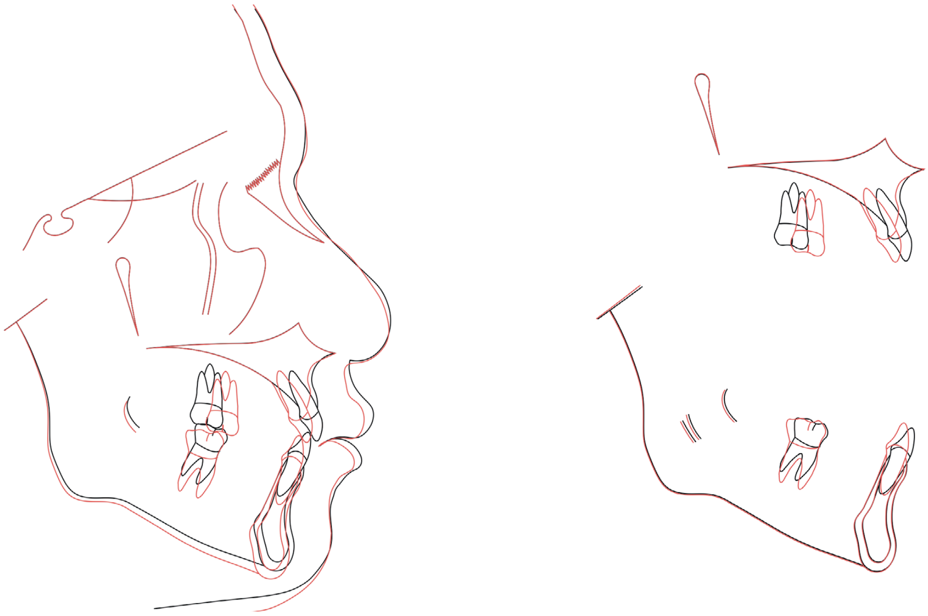
- A - P: *Retract*
- Vertical: *Maintain*
- Inter-molar / Inter-canine Width: *Maintain*



■ *Fig. 9:*
Pre-treatment cephalometric and panoramic radiographs show missing maxillary second premolars with band and loop space maintainers in each edentulous site.



■ *Fig. 10:*
Post-treatment cephalometric and panoramic radiographs document dentofacial morphology.



■ *Fig. 11:*
Superimposed cephalometric before (black) and after (red) treatment show slight extrusion of upper and lower molars, consistent with moderate posterior rotation of the mandible. The lower arch was retracted with buccal shelf bone screws.

Mandibular Dentition

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

Facial esthetics: Maintain

Treatment Plan

The treatment plan focused on posterior maxillary space closure. A non-extraction approach was indicated because of the acceptable facial profile with moderate lip protrusion. The mechanics plan was to align the upper arch up to a .017x.025" TMA archwire, and then close space with a chain of elastics, supplemented with Class III elastics. Use mandibular shelf bone screw anchorage[2] to retract the lower arch as needed to produce an acceptable incisal relationship. Finish the interdigitation in a Class I cuspid and Class II molar occlusion. Immediately after removing the fixed appliances, deliver clear overlay retainers for each arch.

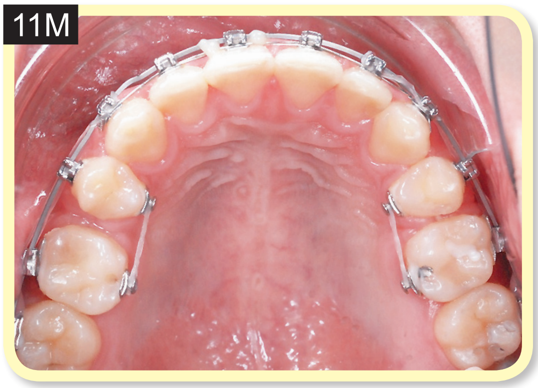
CEPHALOMETRIC			
SKELETAL ANALYSIS			
	PRE-Tx	POST-Tx	DIFF.
SNA°	82.4°	81.5°	0.9°
SNB°	78.7°	78°	0.7°
ANB°	3.7°	3.5°	0.2°
SN-MP°	37.4°	38.5°	1.1°
FMA°	30.2°	31.3°	1.1°
DENTAL ANALYSIS			
U1 TO NA mm	1 mm	2 mm	1 mm
U1 TO SN°	104.6°	104.6°	0°
L1 TO NB mm	6.5 mm	5 mm	1.5 mm
L1 TO MP°	94.9°	86°	8.9°
FACIAL ANALYSIS			
E-LINE UL	2 mm	0 mm	2 mm
E-LINE LL	2 mm	0 mm	2 mm

■ Table 1: Cephalometric summary

Appliances and Treatment Progress

Damon Q® .022" slot self-ligating appliance (*Ormco, Glendora, CA*) was bonded on both arches. The Zoo-Series elastics® and archwires utilized in the treatment were produced by the same manufacturer. High torque brackets were used for the upper incisors and standard torque brackets were used for the lower anteriors. The archwire sequence for both arches was .014" CuNiTi, .014x.025" CuNiTi, .017x.025" TMA, and .016x.025" stainless steel (SS). Six months into treatment bilateral Class III elastics (*Fox, 3.5oz*) were applied to facilitate protraction of the maxillary molars and retraction of the entire lower dentition (*Fig. 12*). In the 7th month of treatment, buttons were bonded to the palatal surface of the upper second premolars and first molars, and an elastic chain was applied to assist space closure (*Fig. 13*). At 11 months, the Class III elastic on the right side was stopped to allow correction of the midline discrepancy with continued intermaxillary traction on the left side. Bilateral space closure was achieved using power chains on the facial surface (*Fig. 13*). In the 19th month of treatment, bilateral mandibular buccal shelf bone screws (*2x12mm OrthoBoneScrew®, Newton's A Ltd, Hsinchu, Taiwan*) were placed to retract the lower dentition (*Fig. 14*). In the 24th month, crimpable hooks were installed between the maxillary central and lateral incisors bilaterally. Cross arch elastics (*Fox, 1/4", 3.5oz*) were used to correct the lower midline (*Fig. 15*), which had shifted to the right ~1mm. In the 25th month of treatment, the bone screws were removed, and the upper archwire was cut distal to the first premolar on the right side, and distal to the upper first molar on the left side. The distal segments of the cut archwires were removed and buccal occlusal contacts were finished with intermaxillary elastics (*Chipmunk, 1/8", 3.5oz*). After 26 months of active treatment, all appliances were removed. A diode laser was used to adjust gingival contours as needed for optimal anterior aesthetics (*Fig. 16*).

■ *Fig. 12*:
Class III elastics were used bilaterally to facilitate protraction of the maxillary first molars, retract the lower dentition, and open the vertical dimension of occlusion.



■ *Fig. 13*:
Palatal buttons were bonded on the maxillary first premolars and molars to facilitate space closure.

■ *Fig. 14*:
At 19 months the bilateral buccal shelf bone screws are providing anchorage to retract the entire lower arch.

■ *Fig. 15*:
At 24 months, cross arch elastics were used to correct the lower midline discrepancy.

■ *Fig. 16: A diode laser was used to adjust the gingival contour to improve the soft tissue esthetics.*

Results achieved

Maxilla (*all three planes*):

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

Mandible (*all three planes*):

- A - P: *Slightly retracted as the bite opened*
- Vertical: *Increased by posterior rotation of the mandible*
- Transverse: *Maintained*

Maxillary Dentition

- A - P: *Retracted*
- Vertical: *Molars slightly extruded*
- Inter-molar / Inter-canine Width: *Maintained*

Mandibular Dentition

- A - P: *Retracted*
- Vertical: *Incisors extruded*
- Inter-molar / Inter-canine Width: *Maintained*

Facial esthetics: Protrusive upper and lower lips were retracted

Retention

Upper and lower clear overlay retainers were delivered with instructions for full time wear the first 6 months, and nights only thereafter. Instructions were provided for home care and maintenance of the retainers.

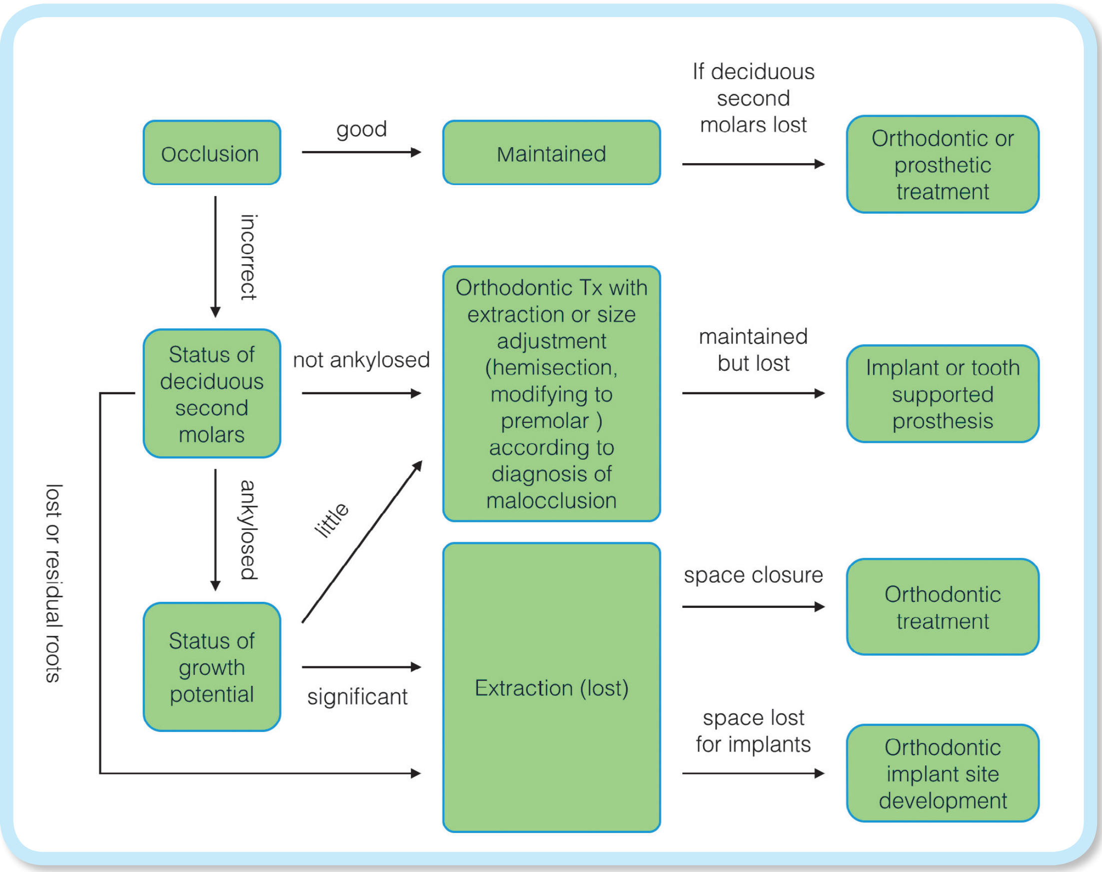
Final Evaluation of Treatment

The ABO CRE score[3] was 19 points. The major discrepancies were in the occlusal contacts (3 *points*), marginal ridges (*4 points*) and alignment (*3 points*). The occlusion was finished in a Class II molar relationship because of the missing maxillary premolars. This is an optimal occlusion for the present patient, so no points were deducted for occlusal relationships. The maxillary and mandibular anterior segments were retracted to correct the protrusive lips. The maxillary buccal spaces were closed with molar protraction through the floor of the maxillary sinuses. No root resorption or other adverse outcomes were noted. Both the patient and the clinician were satisfied with this result.

Discussion

Management of Congenital Missing Premolars

Second premolars have a high prevalence of congenital absence, exceeded only by third molars. The problem is more common in the mandibular (*2.91-3.22%*) than the maxillary (*1.39-1.61%*) arch.[4] Kokich[5] and numerous other authors[6-11] have presented scenarios for managing congenitally missing teeth that were complied into a flow chart to help practitioners make clinical decisions for individual patients (*Fig. 17*). When congenitally missing second premolars are diagnosed, the first priority is to inform the patient and parent, and then carefully consider the orthodontic options. Space closure is usually the most desirable longterm outcome, but if the deciduous second molar(*s*) are healthy and the dentition is well aligned, a retained primary molar may be retained for several decades.[6,7] However, prudent oral hygiene measures should be reviewed with routine follow-up as indicated.



■ *Fig. 17:*

A schematic flow chart is designed to guide the diagnostic and treatment planning process for managing congenitally missing premolars.

Ankylosis of the deciduous second molars is an important consideration because the future implant site may be compromised. If a deciduous molar is out of occlusion and the interproximal bone levels are sloped in an apical direction, the tooth is probably ankylosed. The diagnosis is confirmed by percussion with a hand instrument. An ankylosed tooth has a sharp "*bone ring*" compared to a "*muted thump*" for teeth with an intact PDL. If an affected patient has significant growth potential, the ankylosed primary molar should be extracted to avoid a progressive vertical bony defect. The most common treatment options are to close the space or maintain an edentulous site for an implant-supported prosthesis.

When the edentulous premolar space is a future implant site, Ostler and Kokich[8] suggest avoiding a space maintainer, in favor of allowing the adjacent teeth to drift and tip naturally, followed by orthodontics for site development as needed. The data supporting this approach is the pattern of atrophic resorption of edentulous areas. The ridge width decrease 25% within 4 years, and after another 3 years, the ridge narrows another 5%, for a total reduction of 30% over 7 years. The ridge may still be wide enough for a dental implant but the fixture usually must be placed in a less esthetic lingual position because of bone resorption along the facial surface of the edentulous space.[8] Site development with orthodontics is usually required to separate the adjacent teeth and close interproximal contacts, thereby creating a wider ridge with more buccal bone support.[5] As shown in Fig. 17, the alternative is orthodontic space closure.

Reducing the Width of a Retained Primary Molar

In the absence of ankylosis, a viable option is reduction of the width of the deciduous molar to achieve optimal orthodontic alignment.[5] For younger patients with substantial growth potential, the first option is hemisecting the deciduous second molar. Removing the distal half of the deciduous molar allows the permanent molar to drift mesially and erupt.[9,10] Hemisection permits the occlusion to be more optimally corrected in the sagittal plane, but it is usually a commitment to an implant-supported prosthesis after growth is completed. The second option is moderate reduction of both the mesial and distal surfaces of the primary second molar. To avoid sensitivity and resist caries it is important to leave a layer of interproximal enamel on each surface. This method improves buccal interdigitation after orthodontics, and the retained primary molar can be retained well into adulthood.[7]

Managing the Current Malocclusion

The patient reviewed for this care report was diagnosed with bilateral congenitally missing maxillary second premolars, and his dentist decided to restore the missing premolar sites with dental implants. Band-and-loop space maintainers were placed to maintain space for the implants until adolescent growth was complete,[11] but they entailed the risk of caries to the permanent molars (*Figs. 4 and 5*). It is important to delay dental implants until growth is complete because osseointegrated fixtures are unable to adapt to changes in the intermaxillary dimension,[12] but, delaying implant placement exposes the edentulous sites to atrophic bone resorption. Furthermore, the sagittal width of the retained spaces for the current patient were inadequate for implants, which indicated that the space maintainer were not fabricated until substantial space was already lost. In retrospect, it appears the space maintainers were contraindicated because the implant site was already compromised and the appliances resulted in mesial caries on both first molars (*Figs. 4 and 5*).

As advocated by Kokich and colleagues,[5,8] it may have been wise to allow the maxillary molars to drift into the edentulous spaces, and then consider the orthodontics and prosthetic options when growth was complete. That scenario benefits orthodontic space closure, and if implants are the desired option, the edentulous sites benefit from orthodontic site preparation. Another prosthetic preparation option is to move the first premolar into the edentulous space to create a more optimal implant site, in the space vacated by the first premolar. It is also possible to move the premolar into the site to create new bone and then back out again to hopefully create a better implant site in the second premolar area. Extensive translation of a tooth to create an implant site requires considerable treatment time, and may result in undesirable side effects. Furthermore, the procedure poses a risk of root resorption, and atrophic bone modeling tends to occur immediately after the alveolar process is no longer adequately loaded,[12] so most prepared implant sites may be compromised by the time the procedure is completed.

Long-Term Solution

Proper orthodontics management of congenitally missing teeth results in a long-term resolution for the problem. An optimally aligned normal dentition is superior to any prosthesis. The latter are mechanical devices with a typical lifespan that is far less than the expected longevity of the patient. The most effective treatment strategy for congenitally missing teeth is to diagnose the problem early and focus on an orthodontics solution.

All children should receive an orthodontics evaluation early in the mixed dentition stage. If second premolar agenesis is diagnosed, and there is also a significant malocclusion, the preferred option is early extraction of the second deciduous molars to allow the space(*s*) to close naturally, and then finish the space closure with full fixed orthodontics in adolescence. In the absence of malocclusion and particularly for patients with a relatively flat face, there are two orthodontic options, and both usually require extra-alveolar bone screw anchorage[2] to protract molars. The space can be closed in adolescence or later in life after the retained deciduous molars are lost. For a longterm solution to the problem, space closure by protracting posterior segments with extra-alveolar bone screw anchorage[2] is an increasingly preferred option because there is less risk, greater longterm predictability, and it is usually more cost effective than implant-supported or conventional prostheses.

Moving teeth through the floor of the maxillary sinus

Moving teeth through the floor of the sinus has long been a viable clinical option based on physiologic principles[12] and is further supported by experimental studies.[13,14] However, Wehrbein et al.[15,16] reported that orthodontic tooth movement through the maxillary sinus was limited, but Park et al.[13] reported that teeth can be moved through the anatomic limitations, such as thin cortical bone, a suture or maxillary sinus. Kuroda et al.[14] evaluated bone surface modeling by moving maxillary first molars of mice in a palatal direction for up to 14 days, with a nickel-titanium super elastic load. They found bone resorption along the periodontal ligament (*PDL*) surfaces in the direction of tooth movement, but a layer of bone separating the PDL from the sinus membrane was always maintained due to apposition on the corresponding bone surface of the sinus. It was concluded that this physiologic phenomenon was due to the mechanical stress of tooth movement. In a case report, Park et al.[13] showed that teeth readily moved through the sinus by both translation and tipping without regard to the anatomy of the sinus. In contrast, Wehrbein et al.[15] stated that bodily or tipping movement through the maxillary sinus depends on the morphology of the antrum. They demonstrated that if there is a more vertical extension of the basal maxillary sinus in front of the tooth to be moved, greater tipping was accomplished than with teeth moved through a more horizontal maxillary sinus base. For the present patient, superimposed tracings of panoramic radiographs demonstrated that the teeth in the buccal segments were translated through the sinus (*Fig. 18*), so the experience is consistent with both previous studies.[14,15]

Root resorption is a concern when teeth are moved through cortical plates of bone, such as the floor of the sinus. In that regard, Wehrbein et al.[16] detected root resorption histologically in tissue specimens, but not in routine clinical radiographs. Kuroda et al.[14] failed to note any significant root resorption on teeth that had been moved through the maxillary sinuses. These data suggest there is little significant risk of root resorption when teeth are moved through the sinus with routine orthodontic mechanics. This conclusion is consistent with the physiologic principles of bone modeling.[12]

Orthodontic outcomes

The patient reported here presented with a relatively good facial profile that should be preserved.[17] It was desirable to protract the molars rather than retracting the anterior segment, but the problem is adequate anchorage for mesial translation. A relatively deep bite with no overjet in a patient with decreased vertical dimension of occlusion can provide adequate anchorage

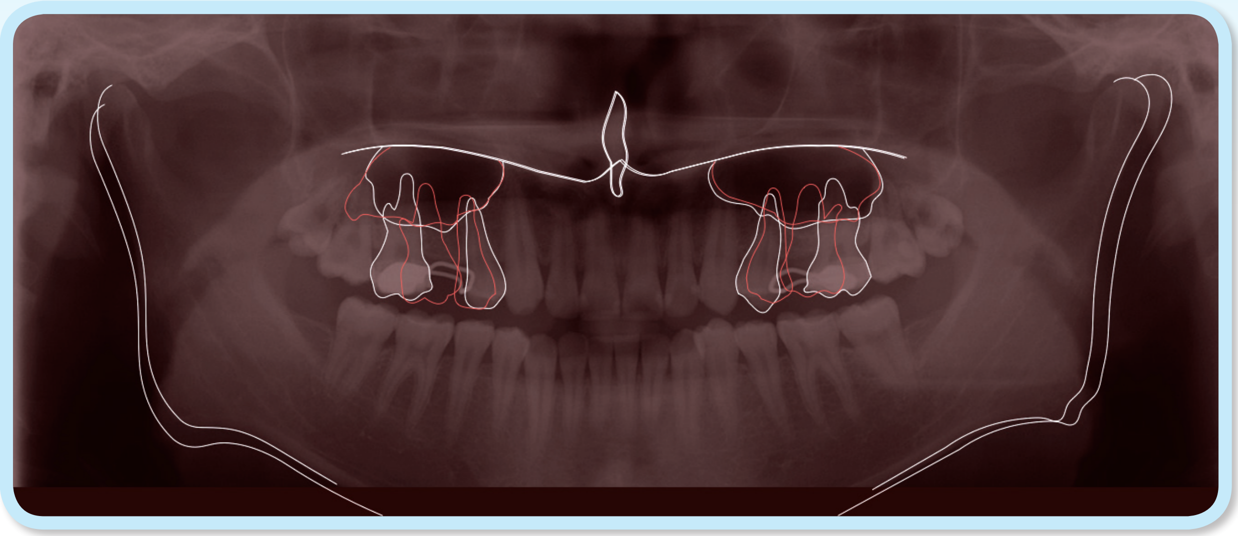


Fig. 18:
Superimposition of pre- and post-treatment tracings of panoramic radiographs show that the path of tooth movement was through the floor of the maxillary sinus, bilaterally.

for molar protraction with a chain of elastics on a round stainless steel archwire.[18] This relatively efficient method is particularly effective when supplemented with intermaxillary elastics. To prepare the current patient for space closure, the maxillary anterior segment was aligned with sequential archwires. When the .017x.025" TMA archwire was inserted, the anterior segment was secured with a figure-eight steel ligature tie from canine to canine. Power chains were used from the maxillary canines to the first molars to close the buccal spaces. Buttons were bonded on the lingual surface of the maxillary first premolars and first molars, and lingual power chains were stretched between the attachments bilaterally. The lingual force was applied to control rotations by balancing the space closure force on the buccal and the lingual.[19] Class III elastics were applied from the upper first molars to the lower canines. With these efficient mechanics, spaces were closed completely within 4 months, but there was retraction of the incisors resulting in an end-to-end relationship (*Fig. 19*).

Fig. 19:
The anterior overjet was reduced to an end-to-end incisal relationship. Mandibular buccal shelf bone screws were required as anchorage to retract the entire lower arch.

■ *Fig. 20:*
2-yr follow-up profile and intraoral photographs. The dentofacial result was stable.

It should be noted that rectangular TMA is more resistant to sliding mechanics for molar protraction than a round SS archwire,[18] and that problem may have contributed to more maxillary incisor retraction than was desired.[20] At 11 months, the end-to-end incisal relationship required mandibular buccal shelf bone screws for anchorage to retract the lower arch. After 22 months of treatment, proper overjet was achieved and the final finishing stage was initiated to detail the occlusion. The appliances were removed after 26 months of active treatment. In retrospect the treatment time may have been decreased if the buccal segments had been protracted on a smooth round wire. Archwires that bind during sliding mechanics may increase the anchorage of the posterior segments, resulting in more retraction of the incisors.[20]

Conclusion

Congenitally missing premolars are frequently encountered in orthodontics, and their management has life-long consequence. Appropriate diagnosis, treatment and interdisciplinary care requires a careful analysis relative to the growth and development of the patient. Based on a review of literature, a schematic flow chart was constructed to guide clinicians in a step by step procedure for defining the optimal management of a specific patient. An important consideration in managing upper buccal spaces is the floor of the maxillary sinus. No significant restrictions or side effects are currently associated with moving the roots of healthy teeth through the floor of the maxillary sinus. On the other hand, implants are problematic. Ridge atrophy may decrease the width of an implant site, and an inferiorly positioned sinus restricts the depth of bone available for placing an implant. In general, orthodontic space closure is the preferred option for managing congenitally missing teeth. Extra-alveolar bone screw anchorage in the buccal shelf of the mandible and/or the infrazygomatic crest provides direct or indirect anchorage for retraction of anterior segments and protraction of buccal segments to close spaces due to congenitally missing teeth. Space closure entails less risk, is a more predictable restoration of esthetics and function long term, and is more cost effective.

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Discrepancy Index Worksheet

TOTAL D.I. SCORE 13

OVERJET

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

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

Total = 0

OVERBITE

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

Total = 0

ANTERIOR OPEN BITE

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

Total = 0

LATERAL OPEN BITE

2 pts. per mm. per tooth

Total = 0

CROWDING (only one arch)

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

Total = 1

OCCLUSION

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

Total = 2

LINGUAL POSTERIOR X-BITE

1 pt. per tooth Total = 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° ______x 1 pt. = ________

1 to MP ≥ 99° = 1 pt.

Each degree > 99° ________x 1 pt. = ________

Total = 4

OTHER (See Instructions)

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

Identify:

Total = 6

IMPLANT SITE

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

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

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

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

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

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

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

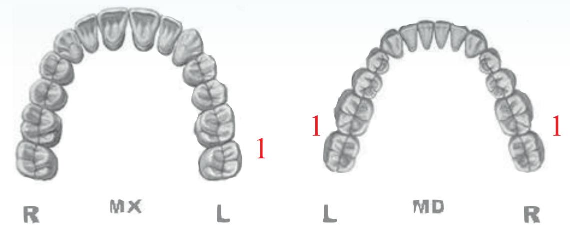
Total = 0

Cast-Radiograph Evaluation

Total Score: 19

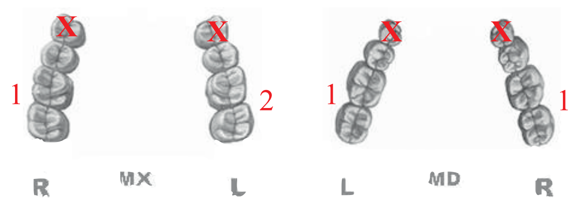
Alignment/Rotations

3



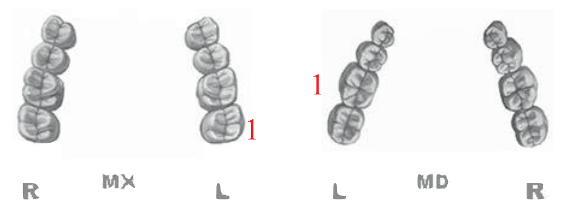
Marginal Ridges

5



Buccolingual Inclination

2

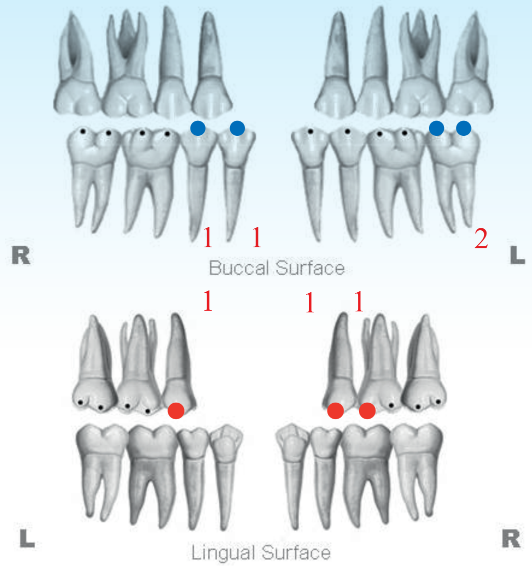


Overjet

0

Occlusal Contacts

7

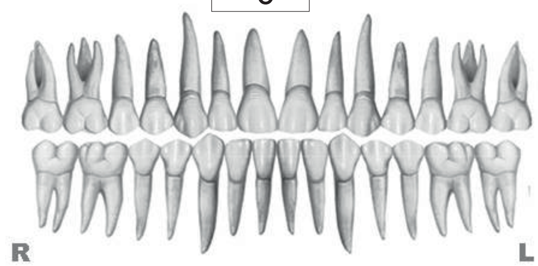


Occlusal Relationships

0

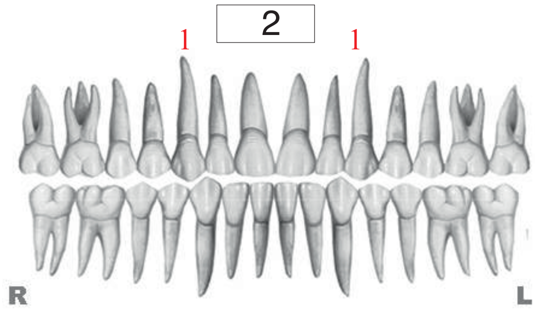
Interproximal Contacts

0



Root Angulation

2



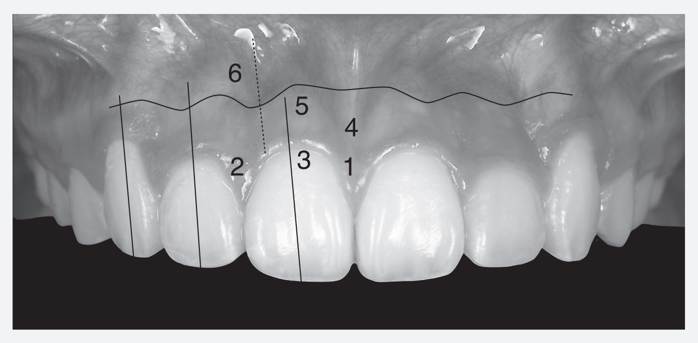
INSTRUCTIONS: Place score beside each deficient tooth and enter total score for each parameter in the white box. Mark extracted teeth with "X". Second molars should be in occlusion.

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

Total Score: = 3

1. Pink Esthetic Score

Total = 0

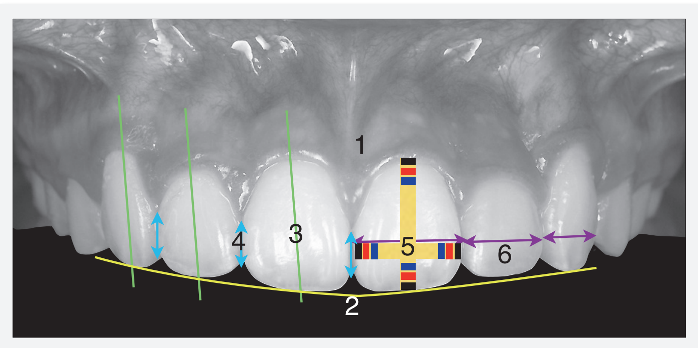


1. M & D Papilla	0	1	2
2. Keratinized Gingiva	0	1	2
3. Curvature of Gingival Margin	0	1	2
4. Level of Gingival Margin	0	1	2
5. Root Convexity (Torque)	0	1	2
6. Scar Formation	0	1	2

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

2. White Esthetic Score (for Micro-esthetics)

Total = 3



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

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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