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Interceptive (Mixed Dentition): Case 1

LEARNING OBJECTIVES

- The records required for treatment of a mixed dentition
- The problem list for interceptive orthodontics: posterior crossbite
- The development of treatment objectives and formation of a treatment plan for a quad-helix appliance

Interview Data

This 8-year-old Caucasian male presented with maxillary constriction that manifested as a unilateral posterior crossbite of the mixed dentition.

- Development: pre-pubescent
- Motivation: good
- Medical history: non-contributory
- Dental history: seen regularly for dental visits
- Family history: no history of malocclusion
- Habits: none
- Limitations: none
- Facial form: mesoprosopic and ovoid
- Facial proportions: normal lower facial height



Figure 1.1 Full face at rest displaying a symmetric, ovoid face.

Clinical Examination

- Incisor-stomion (Figures 1.1 and 1.2):
 - At rest: 0 mm
 - Smiling: 6 mm
- Smile line: 0 mm gingival display
- Breathing: nasal
- Lips: together at rest
- Soft tissue profile: convex (Figure 1.3)
- Nasolabial angle: slightly obtuse
- Slightly high mandibular plane angle



Figure 1.2 Full face with smile showing full enamel appearance of the incisors and no gingival display.



Figure 1.3 Right lateral view of profile indicating a convex appearance and obtuse nasolabial angle.

Dentition (Figure 1.4)

- Teeth present clinically:

6edc21	12cde6
6edc21	12cde6

- Overjet: 4 mm
- Overbite: 0 mm with open bite tendency
- Diastema: 3 mm
- Midlines: maxillary midline coincident with face; mandibular midline 2 mm to left

Right Buccal View

The right buccal view can be seen in Figure 1.5.

- Molar, right: end-on, mixed dentition
- Canine: Class I
- Curve of Spee: flat



Figure 1.4 Anterior view of the dentition demonstrating midline diastema and mandibular shift to the left.

- Crossbite: none
- Caries: none

Left Buccal View

The left buccal view can be seen in Figure 1.6.

- Molar, left: Class II, mixed dentition
- Canine: cusp to cusp
- Curve of Spee: flat
- Crossbite: posterior crossbite
- Caries: none



Figure 1.5 Right buccal view of dentition indicating an end-on mixed dentition molar relationship.

Maxillary Arch (Figure 1.7)

- Symmetric, catenary curve form with no crowding; elastic separator (arrow) still in place in the left quadrant from previous orthodontic consult
- No caries

Mandibular Arch (Figure 1.8)

- Ovoid arch form with lingual holding arch in place
- Slight rotation of erupting incisors
- No caries



Figure 1.6 Left buccal view of dentition indicating a Class II mixed dentition molar relationship and posterior crossbite due to the functional shift of the mandible.

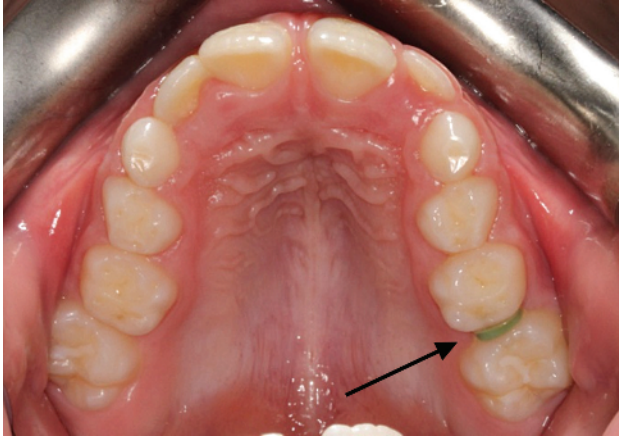


Figure 1.7 Occlusal view of the maxilla displaying a catenary arch form and rotated first permanent molars with separating elastic in place.

Function

- Maximum opening = 40 mm
- Centric relation-centric occlusion (CR-CO): coincident
- Maximum excursive movements: right = 6 mm; left = 7 mm; protrusive = 5 mm
- Temporomandibular joint palpation: normal
- Right and left masseter: negative to palpation
- Habits: none
- Speech: normal
- Late mixed dentition with all 32 permanent teeth present or developing
- Root length and periodontium appear normal
- Condyles appear normal (Figure 1.9)



Figure 1.8 Occlusal view of the mandible displaying an ovoid arch form with a lingual holding arch in place.

Diagnosis and Treatment Plan

As the patient is in the mixed dentition and displays a Class I skeletal and dental pattern (Figure 1.10; Tables 1.1 and 1.2), correction of the posterior crossbite is considered interceptive.

Maxilla – the maxillary first molars will be banded and a quad-helix appliance will be fabricated to rotate the molars and expand the palate. A lingual holding arch is presently on the mandibular arch to conserve leeway space and to maintain a non-extraction approach to further care in the future.

Once the posterior crossbite is over-corrected, the patient will be placed on a recall schedule and examined every 6 months for changes in the occlusion and eruption of the remaining permanent dentition.

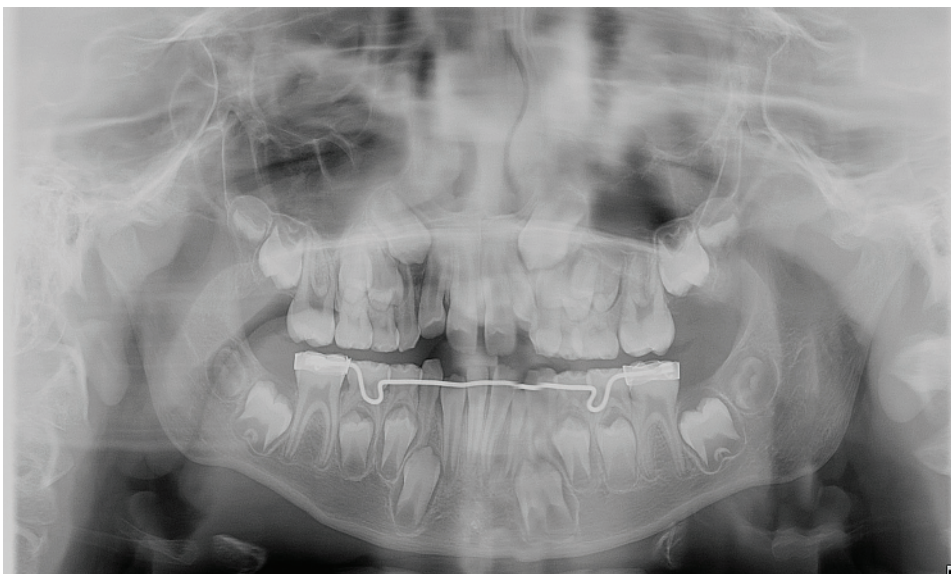


Figure 1.9 Panoramic radiograph indicating an early mixed dentition with a lingual holding arch present.

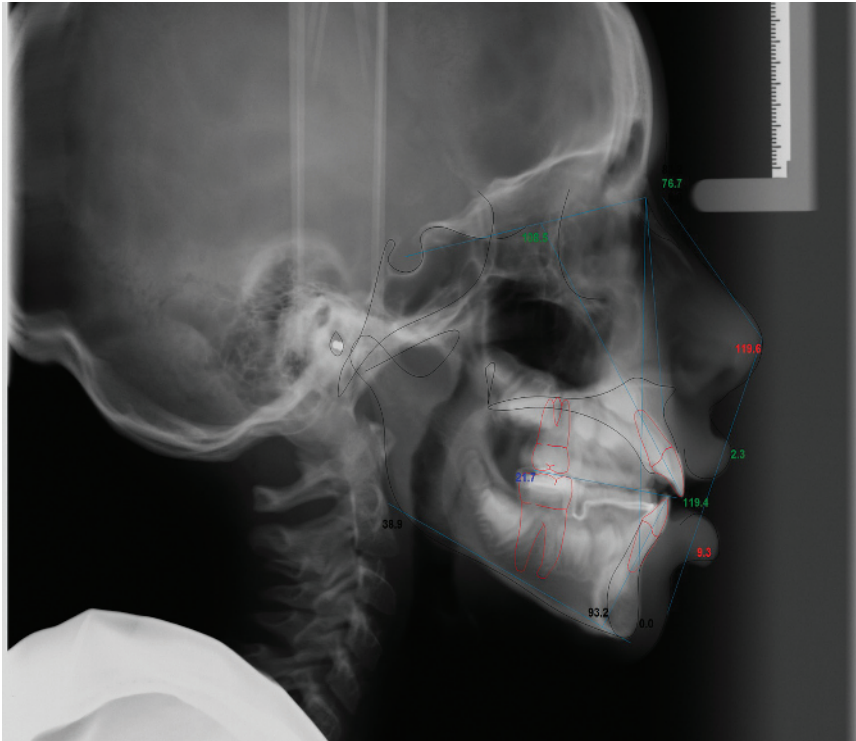


Figure 1.10 Digitized cephalogram of a Class I skeletal relationship and a high mandibular plane angle indicative of a vertical growing patient.

Table 1.1 Significant cephalometric values

	Norm	Patient pre-treatment
SNA	80°	83.2°
SNB	78°	76.7°
ANB	2°	+6.5°
WITS appraisal	-1 to +1 mm	+0.5 mm
FMA	21°	32.6°
SN-GoGn	32°	38.9°
Maxillary incisor to SN	105°	108.5°
Mandibular incisor to GoGn	95°	93.2°
Soft tissue		
Lower lip to E-plane	-2 mm	9.3 mm
Upper lip to E-plane	-1.6 mm	2.3 mm

SNA, sella-nasion-A point; SNB: sella-nasion-B point; ANB: A point-nasion-B point; WITS appraisal, Witwatersrand appraisal; FMA, Frankfort horizontal-mandibular plane (angle); SN-GoGn: sella nasion-gonion gnathion.

Table 1.2 The patient's problem list in three dimensions

	Transverse	Sagittal	Vertical
Soft tissue	Normal	Convex profile; full lower lip; obtuse nasolabial angle	Hyperdivergent
Dental	Bilateral posterior crossbite presenting as a unilateral crossbite due to the functional shift	Normal mixed dentition regarding molar and canine relationships	0 mm overbite
Skeletal	Maxillary constriction	Class I	Hyperdivergent

An argument may be made for an additional radiograph to be taken to aid in the diagnosis and treatment plan in patients with posterior crossbites who will require palatal expansion. The radiograph of choice is a posterior-anterior cephalogram, or PA radiograph as it is more commonly termed. In young, growing children where the clinical examination demonstrates no gross asymmetries and only functional shifts due to the crossbite, it is unnecessary to further expose the child to additional radiation that would have negligible clinical benefit.

Treatment Objectives

The patient's clinical problem in the mixed dentition will be addressed by correction of the posterior crossbite. Once corrected and maintained, the child will be evaluated annually for further orthodontic treatment if required. As the patient appears to be growing in a Class I direction both skeletally and dentally, it is anticipated that any further treatment would require only dental alignment.

Treatment Options

The options presented to the parent and patient were two-fold:

- 1) No treatment.
- 2) Interceptive treatment to correct the posterior crossbite through palatal expansion followed by comprehensive orthodontic care if it became necessary.

Both the patient and parent wanted option 2. Based upon the patient's skeletal and dental development, crossbite correction and palatal expansion would be undertaken with a quad-helix appliance, although other fixed appliances such as a rapid palatal expander could have been utilized as well. The quad-helix would also allow for the rotation of the maxillary molars in addition to the palatal expansion (Figures 1.11 and 1.12). The hyperdivergent tendency would also be evaluated during treatment, and further modifications to the appliance would be implemented if the overbite appeared to open excessively.



Figure 1.11 Pre-treatment extraoral and intraoral composite photograph.



Figure 1.12 Post-treatment extraoral and intraoral composite photograph.

First Active Appointment with Quad-Helix in Place

The maxillary first molars were banded after 1 week prior to elastic separation and an iTero scan (Align Technology, Inc, San Jose, CA, USA) was done to

fabricate a fixed quad-helix (Figure 1.13). The quad-helix was initially activated (arrows) 8 mm (to half the buccal-lingual width of each molar) and cemented into place with glass ionomer. The mandibular holding arch was kept in place (Figure 1.14).

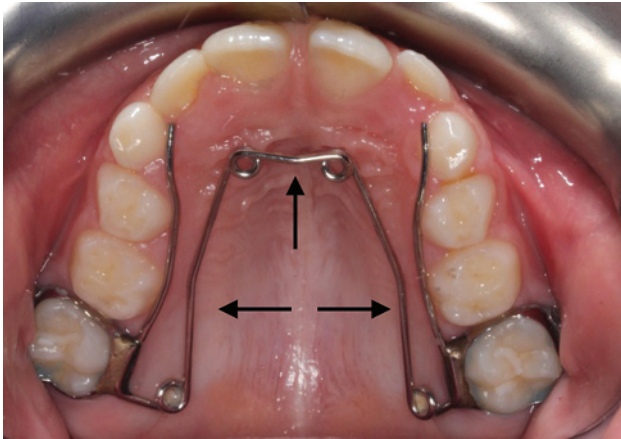


Figure 1.13 Occlusal view of the palate with initial insertion of the quad-helix. Note the anterior midline and lateral activations (arrows).



Figure 1.14 Occlusal view of the mandibular arch on the day the quad-helix was cemented to the maxillary arch.

Second to Fourth Active Appointments

The patient returned for two consecutive months after the initial activation and the appliance was expanded in the midline and along the lateral arms with three-pronged pliers; 3 months after the initial activation, the palatal form has changed to a broad ovoid configuration and the molars have rotated (Figure 1.15). Activation of only the arm between the two anterior helices would result in posterior expansion and further rotation of the maxillary molars; therefore the lateral arms were activated as well, to counteract this mesial-lingual rotation effect and to further

rotate the molars to a correct position. The lingual holding arch had broken and it was decided not to continue lower maintenance due to minimal apparent crowding and differential mesial-distal size relationships between the primary and succedaneous teeth (Figure 1.16).

The crossbite has been over-corrected by expansion of the dental arch and tipping of the maxillary posterior dentition buccally (Figures 1.17–1.19). This will allow for relapse to a normal transverse relationship. During the procedure the overbite relationship did not open and therefore there was no need for correction of an open bite.



Figure 1.15 Occlusal view of the palate 2 months after the original activation. The arch form has changed to an ovoid form and the molars are being rotated to a correct position.



Figure 1.16 Two months after activation of the quad-helix, the lingual arch was broken and removed.



Figure 1.17 Anterior view of the dentition 2 months after the original activation. The crossbite has been over-corrected.



Figure 1.18 Right buccal view of the dentition indicating over-correction of the posterior crossbite.

Six Months after Initial Placement of the Appliance



Figure 1.19 Left buccal view of the dentition indicating over-correction of the posterior crossbite.

The quad-helix has been removed and the crossbite has been corrected (Figures 1.20–1.24). The expansion has been over-corrected which will relapse through function to a normal transverse relationship. The width increased as measured from the gingival embrasures of the mesial-lingual cusps from 35 to 43 mm during the period of correction. No retention was necessary. The entire interceptive treatment occurred over a 6-month period.

Prior to the debanding procedure, a progress panoramic radiograph was taken. It was recommended that extraction of the maxillary primary canines and first primary molars be performed due to the eruption angulation of the permanent maxillary canines (Figure 1.25). Three months after appliance removal, the occlusion appeared stable in a normal mixed dentition position with a normal transverse relationship.



Figure 1.20 Occlusal view of the maxillary arch 6 months after the initial activation. The appliance has been removed and the over-correction is allowed to relapse to a normal relationship.



Figure 1.21 Occlusal view of the mandibular arch 6 months after the initial activation.



Figure 1.22 Anterior view of the dentition 6 months after the initial activation, displaying the over-corrected relationship of the posterior crossbite.



Figure 1.23 Right buccal view of the dentition 6 months after the initial activation, displaying the over-corrected posterior crossbite.



Figure 1.24 Left buccal view of the dentition 6 months after the initial activation, displaying the over-corrected posterior crossbite.

Commentary

The correction of posterior crossbites may be undertaken with fixed or removable appliances; the mechanics may be of rapid or slow design. The age of the patient very often will dictate the appliance of choice. The mixed dentition patient may be treated with a slow-expansion device, such as the quad-helix that was used in this case, and one that is capable of delivering forces in ounce increments, as opposed to the rapid palatal expander which is used more often in the late mixed or full permanent dentition when the maxillary sutures require greater force for separation (pounds). Both the rapid- and slow-expansion devices are capable of suture expansion; however, the appearance of a diastema is more commonly seen in rapid palatal

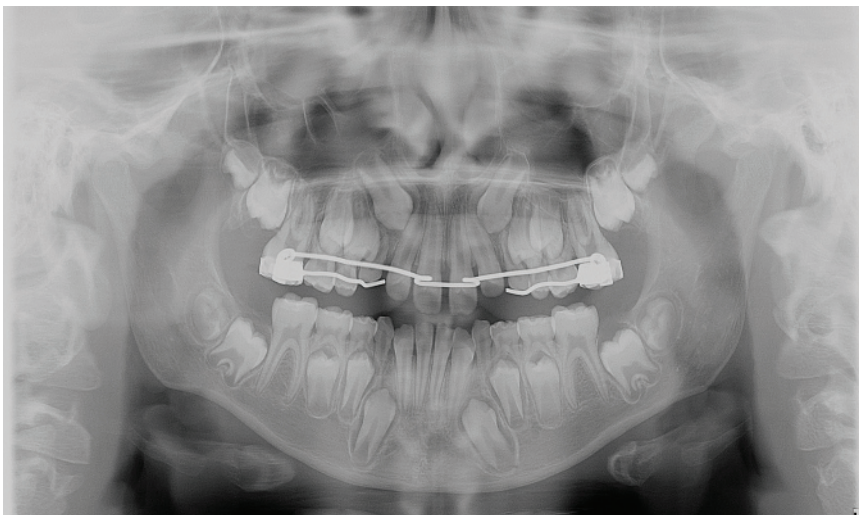


Figure 1.25 Progress panoramic radiograph taken prior to debanding. The angulation of the maxillary permanent canines indicated that extraction of the primary canines and first primary molars should be performed to aid in proper eruption.

expansion when forces are greater and the duration of treatment occurs over a much shorter time period, 2–3 weeks, rather than months as was seen with the quad-helix. It is also common for dental tipping to occur with slow expanders, but this is self-correcting because of over-expansion during treatment and as a result of

uprighting of the dentition through function once the appliance is removed. Once growth is complete and the sutures are fully fused, posterior crossbites are usually corrected with a surgical assist, often called SARPE, which is the acronym for a surgically assisted rapid palatal expansion.

Review Questions

- 1 What material is used to create space for band placement?
- 2 How may a quad-helix be activated?
- 3 What type of force values does the quad-helix deliver during activation?
- 4 What form of palatal expander is the quad-helix considered to be – slow or rapid; fixed or removable?

Suggested References

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