orthodontics ALERT™

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Orthodontic Management of Vertical Bony Defects

Periodontal disease and traumatic occlusion have been shown to lead to vertical bony defects, which in turn can cause increased periodontal pocketing, gingival recession, tooth hypermobility and deterioration of the crown–root ratio. To prevent these from occurring, treatment of both inflammation and occlusion is necessary. Iino et al from Kagoshima University, Japan, documented the successful treatment of a 50-year-old woman by using orthodontics.

The woman had a Class I malocclusion with gingival recession, deep periodontal pockets, and hypermobility of the maxillary right lateral incisor, left canine and mandibular left central incisor. She also had a retrusive upper lip and anterior crossbite with an underlying Class III skeletal pattern. The patient was first treated by a periodontist until the inflammation receded and oral hygiene improved. The pulps of the 3 teeth were then extirpated, and temporary crowns were placed. An edgewise appliance was used to correct the anterior crossbite, and the 3 endodontically treated teeth were extruded until they were aligned. The orthodontic correction took 19 months.

As a result of this treatment, the patient's crossbite was corrected, and the traumatic occlusion and gingival esthetics improved. The patient demonstrated an improved occlusion and facial profile. Examination after completion of treatment showed an improvement in the isolated vertical defects, tooth mobility and crown–root ratio (Table 1).

Table 1. *Periodontal parameters before and after treatment*

Variable	Pretreatment	Posttreatment	Norm
Periodontal pocket depth, mm			
Maxillary right lateral incisor	3–4	2–3	1–2
Maxillary left canine	4–8	3	1–2
Mandibular left incisor	2–4	2–3	1–2
Tooth mobility, grade			
Maxillary right lateral incisor	1.5	1.0	0–1
Maxillary left canine	1.0	0.5	0–1
Mandibular left incisor	2.0	1.0	0–1
Crown–root ratio			
Maxillary right lateral incisor	1:0.4	1:0.7	1:1–1.5
Maxillary left canine	1:0.5	1:1.2	1:1–1.5
Mandibular left incisor	1:0.3	1:0.7	1:1–1.5

Conclusion

Tooth extrusion and periodontal treatment have now been shown to be an effective means of treating alveolar bone defects. Clinicians should consider orthodontic treatment for patients with similar periodontal problems, once inflammation is eliminated.

Iino S, Taira K, Machigashira M, Miyawaki S. Isolated vertical infrabony defects treated by orthodontic tooth extrusion. Angle Orthod *2008;78:728-736.*

The Effect of Maxillary Protraction on Pharyngeal Size

Class III malocclusions have been treated with maxillary protraction appliances for almost 50 years; however, little is known about the effect of maxillary protraction on pharyngeal size. Pharyngeal size is an important factor in diagnosing obstructive sleep apnea (OSA), so it is possible that maxillary protraction may be a successful, nonsurgical means of treating OSA by opening the upper airway. Oktay and Ulukaya from Ataturk University, Turkey, studied this possible relationship.

Twenty patients with Class III malocclusions were included in this retrospective study. All patients had been treated during their pubertal growth spurts and had lateral cephalograms taken before and after treatment. Treatment consisted of elastic forces applied to a face mask from hooks at the canine areas. The force was 600 g on each side, directed downwards from the occlusal plane. Face masks were worn 16 hours/day until a Class I molar and canine relationship was achieved. Linear, angular and area measurements were taken from the cephalograms. The area of the nasopharynx was defined as the area on the lateral cephalogram bounded anterosuperiorly by the Pm Vertical through the ethmoid registration point and inferiorly by a line connecting the hyoid bone with the third cervical vertebra. The oropharynx was the portion of the nasopharynx below the palatal plane and was further divided into upper and lower parts by the occlusal plane. Paired *t* tests determined the effects of the maxillary protraction appliances on craniofacial structures and airway sizes, while a correlation analysis investigated the possible relationship to airway size.

The pharyngeal airway was found to increase significantly in width and area as a result of protraction therapy. The maxilla advanced anteriorly, while the mandible was inhibited in this aspect. There was no correlation between the amount of pharyngeal growth and the craniofacial variables, suggesting that other factors play a role in this development.

Conclusion

Children and adolescents with airway problems may benefit from maxillary protraction. Clinicians should consider seeking this treatment for their patients.

Oktay H, Ulukaya E. Maxillary protraction appliance effect on the size of the upper airway passage. Angle Orthod *2008;78:209-214.*

What Is the Most Effective Treatment for Crossbite Correction?

Unilateral posterior crossbite is a relatively common occurrence in the deciduous and early mixed dentition. A variety of appliances are employed to correct this crossbite, including the quad-helix, removable expanders and composite onlays. Petrén and Bondemark from Malmö University, Sweden, completed a randomized controlled trial that evaluated the effectiveness of these methods for the correction of the posterior crossbite.

Sixty patients were recruited from 2 clinics, all with mixed dentition, unilateral posterior crossbite and no current sucking habits. The patients were randomly assigned to 4 groups: quad-helix, expansion plate, composite onlay and untreated control. The quad-helix was activated 10 mm before placement and every 6 weeks until treatment was complete; the appliance was retained for 6 months after treatment was concluded. The expansion plate was activated at 0.2 mm each week by the patient until correction was obtained, as monitored by an orthodontist. The expansion plate was kept in place for 6 months after completion. The composite onlay was placed on the occlusal surfaces of both mandibular first molars and checked every 6 weeks for 1 year. The control group received no treatment during the 1-year observation period. Treatment was considered successful if the crossbite was corrected.

Measurements were made from study casts taken before treatment and after 1 year of treatment. The maxillary and mandibular intercanine widths were measured between the cusp tips as well as the gingival margins, as were the maxillary and mandibular intermolar widths at comparable points (Table 2). The treatment time was also noted. The quad-helix method was determined to be superior to all others. It was more successful than the expansion plate and took less time for treatment. The expansion plate was successful in only two thirds of the patients. The composite-onlay method was ineffective in correcting the crossbite, and in the group without treatment, no improvements were seen.

Conclusion

This study demonstrated that the quad-helix should be the appliance of choice in correcting unilateral posterior crossbites. It is likely that using a removable appliance greatly affects the success of the treatment because of noncompliance.

Petrén S, Bondemark L. Correction of unilateral posterior crossbite in the mixed dentition: a randomized controlled trial. Am J Orthod Dentofacial Orthop *2008;133:790.e7-790.e13.*

Table 2. *Intercanine and intermolar width changes in treatment groups (mm)*

Measurement	Quad-helix	Expansion plate	Composite onlay	Control
Maxillary intermolar width at gingival margin	4.4 ± 1.19*	3.0 ± 1.57*	0.3 ± 0.30†	0.3 ± 0.32†
Maxillary intermolar width at cusp tips	4.6 ± 1.19*	3.5 ± 1.54*	0.5 ± 0.46*	0.4 ± 0.43†
Maxillary intercanine width at gingival margin	1.4 ± 0.96*	2.4 ± 1.12*	0.5 ± 0.67†	0.2 ± 0.35
Maxillary intercanine width at cusp tips	2.0 ± 1.18*	2.7 ± 1.20*	0.63 ± 0.70†	0.3 ± 0.43‡
Mandibular intermolar width at gingival margin	–0.1 ± 0.62	0.5 ± 0.67‡	0 ± 0.48	0.3 ± 0.25†
Mandibular intermolar width at cusp tips	0.2 ± 0.50	0.7 ± 0.80†	0.2 ± 0.70	0.2 ± 0.21†
Mandibular intercanine width at gingival margins	0 ± 0.40	0.2 ± 0.53	0 ± 0.18	0 ± 0.13
Mandibular intercanine width at cusp tips	0.1 ± 0.26	0.2 ± 0.28‡	0 ± 0.15	0 ± 0.20

*p < .001; †p< .01; ‡p < .05.

Anchorage with Miniscrew Implants

The current method of treatment for bimaxillary dental protrusion is to remove the 4 premolars and retract the anterior teeth. This results in the desired reduction in dental and soft-tissue protrusion. With the advent of temporary anchorage devices, it is now possible to use implants as a means of anchorage during the retraction of the anterior teeth.

Previous research suggested that implants allow for better space closure upon retraction, but further studies are warranted to determine the efficacy of this method. Upadhyay et al from the University of Connecticut undertook a randomized controlled trial to compare the anchorage afforded by this new method with that of traditional methods.

Forty female patients were recruited, each with a Class I malocclusion; the planned treatment for all was the extraction of the 4 first premolars and the retraction of the anterior teeth. Patients were randomly divided into 2 groups, 1 receiving mini-implants as anchors and 1 receiving no mini-implants but using headgear and other traditional sources of anchorage. Patients in the first group had mini-implants placed between the roots of the first molar and

second premolar in all 4 quadrants, with springs used for retraction.

Cephalometric radiographs were taken of each patient before and after treatment. Change in the vertical and horizontal positions of dental and skeletal landmarks were measured. There was a statistically significant decrease in the vertical facial dimensions in the implant group, but no decreases in the traditional treatment group.

The conventional treatment group demonstrated anchorage loss in the horizontal and vertical directions, while the implant treatment group showed anchorage gain and molar intrusion. The implant treatment group also demonstrated greater changes than the traditional treatment group in the angle of facial convexity, nasolabial angle and lower lip protrusion. Upper-lip protrusion and treatment time were equal in both groups.

Conclusion

Mini-implants were found to provide absolute anchorage and thus allow greater skeletal, dental and cosmetic changes compared with conventional methods of retraction. These mechanics are particularly indicated for patients with significant protrusion.

Upadhyay M, Yadav S, Nagaraj K, Patil S. Treatment effects of mini-implants for en-masse retraction of anterior teeth in bialveolar dental protrusion patients: a randomized controlled trial. Am J Orthod Dentofacial Orthop *2008;134:18-29.*

Rapid Maxillary Expansion For Patients with Conductive Hearing Loss

Rapid maxillary expansion (RME) is a common treatment for a variety of conditions. It is used regularly to treat transverse maxillary deficiency, posterior crossbite, crowding, abnormal breathing and conductive hearing loss in children with maxillary constriction. Only 2 studies have looked into the long-term effects of RME on conductive hearing loss and determined hearing abilities using pure-tone audiograms, but tympanometry, which tests middle ear function, is also a valuable component of a hearing evaluation. Kilic et al from Ataturk University, Turkey, investigated the long-term effects of RME on conductive hearing loss using both audiometric and tympanometric measurements.

Fifteen individuals, all with conductive hearing loss and narrow maxillary arches, were recruited for the study. RME appliances were placed in all and activated by 1 turn in the morning and 1 turn in the evening until satisfactory expansion was attained. All appliances were retained for 6 months after attaining expansion. An otorhinolaryngologist tested the hearing ability of each patient, using both pure-tone audiograms and tympanograms. Hearing levels were classified according to air-bone gap values and pure-tone thresholds. The thresholds at the speech frequencies of 200, 500, 1000 and 2000 Hz were obtained for each ear, and air-bone gap values at 500, 1000 and 2000 Hz were recorded.

Static compliance values and middle-ear volumes were measured using the tympanogram. Before treatment,

- 5 patients had minimal hearing loss,
- 8 had mild hearing loss and
- 2 had moderate hearing loss.

Measurements were taken at the end of expansion and at the end of the retention period. The statistics of the hearing levels and air-bone gaps were calculated for each time point and compared. A least significant difference test was performed to determine which time periods demonstrated the most significant change.

Hearing levels improved and air-bone gaps decreased at statistically significant levels during the active expansion and during the retention periods. Middle-ear volume increased throughout the experiment but significantly only during the retention period. No significant changes were found for the static compliance value.

Conclusion

These results showed that RME has a positive influence on hearing and eustachian tube function in patients with conductive hearing loss and transverse maxillary deficiency. This improvement may be explained by anatomic connections between the middle ear and the nasopharynx. Clinicians may wish to investigate RME for patients with conductive hearing loss.

Kilic N, Kiki A, Oktay H, Selimoglu E. Effects of rapid maxillary expansion on conductive hearing loss. Angle Orthod *2008;78:409-414.*

In the next issue:

Interceptive approaches to palatally displaced canines