The Orthodontic Management of Vertical Deficiencies in the Alexander Discipline

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Although there are several different approaches to treating vertical deficiencies, the Alexander Discipline is an efficient and effective technique to manage this group of malocclusions. Patient compliance is important because most of these treatments will require orthopedic appliances. Appropriate bracket selection and placement for maxillary arch development is essential. Specific arch wire designs incorporating a curve of Spee are used. The mandibular arch is then treated, focusing on torque control of the lower incisors while using a reverse curve of Spee in the tied-back arch wires and a bite plate if necessary. The ideal arches are then coordinated with various elastics as needed. Retention is then instituted. (Semin Orthod 2001;7:85-89.)

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Lower anterior vertical facial deficiencies are often accompanied by overeruption of anterior teeth and undereruption of posterior teeth. The result is an excessive curve of Spee in the mandibular arch and a reverse curve in the maxillary arch. This presents as an abnormally increased overbite. The freeway space in such cases is often excessive.

Skeletal discrepancies in the sagittal dimension can accompany vertical deficiencies. In growing children, Class II skeletal patterns may be treated orthopedically with headgear while simultaneously treating the orthodontic problems. Most deep-bite cases have low-angle skeletal patterns and therefore a cervical headgear is the appliance of choice in Class II patients.

Class III patterns may be treated orthopedically by using a face mask. In nongrowing patients, vertical deficiencies can be successfully treated with appropriate orthognathic surgery.

Principles in the Treatment of Vertical Deficiencies

Vertical deficiencies are most often corrected by intruding the anterior teeth, extruding the posterior teeth, or a combination of the two. Various orthodontic approaches have been advocated for the management of patients exhibiting vertical facial deficiency. The goal of the Alexander Discipline was to find an efficient and effective technique that offered as few negative side effects as possible. After a detailed evaluation, a diagnosis is made and a treatment plan is formulated.

Factors of special importance in this philosophy include the final position of the lower incisors. It is considered most important by advocates of this orthodontic approach to avoid the advancement of the lower anteriors. The one exception to this rule, however, is in the deep-bite patient where the incisors are excessively upright. Increasing anterior torque in both arches is necessary to achieve a normal interincisal angle.

Most deep-bite cases can be treated without extracting teeth. In cases with severe curve of Spee in the mandibular arch, it may be unwise to extract second bicuspids teeth. In cases where moderate crowding is a concern, interproximal enamel reduction is considered. For minor crowding in Class II patients, extraction of maxillary bicuspids teeth only may be appropriate. Extraction of a single mandibular incisor in a severe, lower arch length, discrepancy situation could also be a consideration.

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Maxillary Arch Development

Developing the maxillary arch is accomplished by eliminating rotations, closing spaces, accentuating the curve of Spee, and establishing proper torque in the anterior teeth. The maxillary arch is developed by using precision-designed, preadjusted brackets that allow treatment to progress efficiently and effectively (Fig 1). The system of brackets provides adequate interbracket space, excellent rotational control (including 15° offset on the upper first molars), and preadjusted slots. When placing the brackets on the teeth, proper height, angulation, and mesiodistal position are of great importance.

Maxillary Bracket Height

The normal position for the maxillary bracket is measured from the incisal edge or cusp tip to the center of the bracket slot. In some cases, the maxillary six anterior brackets are placed 0.5-mm more incisally and the posterior brackets are placed 0.5-mm more gingivally.

Curve of Spee

After the initial arch wire, an accentuated curve of Spee is placed to open the bite (Fig 1). Proper placement of the curve of Spee in the arch wire is critical (Fig 2). The curve should be placed in the arch wire from mesial to the Omega loop forward to the cuspid area and not beyond. In the flexible wires (0.016 stainless steel [ss], titanium molybdenum alloy) excessive curve can be placed to encourage bite opening. The face bow "stabilizes" the molars while the arch wire intrudes or "holds" the anterior teeth as the face grows. Care should be taken when placing a curve in a rectangular wire because this will increases the amount of torque on the upper incisors. The more torque needed, the more curve can be placed in the arch wire. Caution should be taken when placing a curve in the finishing 0.017 × .025 ss arch wire because this wire delivers a heavy force to the teeth.

When determining the amount of curve to place in the arch wire, it is important to look at

Figure 1. Pretreatment; overbite is 6 mm (A). After 4 months, 0.016 ss heat-treated arch wire with accentuated curve and tied back (B). Overcorrected in 17 × 25 ss finishing arch wires (C). Three months after appliances were removed (D).
the patient’s "smile line." If the incision-stomion measurement does not show a full clinical crown, then great care must be taken with the amount of curve placed in the arch wire. When gingival tissue is exposed when smiling, more curve can be placed in the arch wire.

This technique of arch leveling is so effective that if excessive curve is placed and not monitored closely, deep bites can turn into open bites. When this occurs, the excessive curve in the upper arch should be removed and the arch wire should be flattened.

The arch wire is "toed in" slightly distal to the omega loop to help rotate and control the first molars. All ss wires are tempered (heat-treated) before inserting. After the initial wire, all arch wires are tied back by using omega loops.

**Bite Plate**

If the bite has not opened adequately after a few months of treatment in the finishing arch wires, a bite plate is placed. It is not placed until the maxillary arch form is close to completion, usually the month before the lower brackets are placed. By delaying bite plate placement, fewer bite plate adjustments are needed. The bite plate is adjusted so that the upper teeth do not touch the lower brackets on closure. An example of a bite plate in an adult patient is shown in Figure 3.

In some cases, special lingual brackets can be bonded to upper incisors to achieve the same bite opening result.

**Mandibular Arch Development**

Treatment of the mandibular arch is initiated approximately 6 months after the maxillary brackets are placed. Precision-designed, preadjusted brackets with adequate interbracket space and rotational control that will eliminate rotations and close spaces while establishing torque control in the anterior teeth are used. First molars will be uprighted and the arch leveled. Second molars should be banded. When placing brackets on the teeth, attention must be directed at their proper height, angulation, and mesiodistal position. Lower anterior brackets must not be placed more incisally than is usual because this would result in premature contact with the maxillary incisors when occluding.

In the mandibular arch, if torque needs to be controlled, the initial arch wire must be rectangular. Torque in the incisor brackets is $-$5°. The first molars have $-$6° tip in the brackets to upright them. After the initial arch wire, all wires are tied back. A reverse curve of Spee is placed to level the arch.

**Coordination of the Arches**

After developing both arches, they must be coordinated. Both the maxillary and mandibular arch forms are established by using the Alexander Archform Template (ORMCO, 1717 W. Collins Ave, Orange, CA). The maxillary first molars have been derotated and mandibular second molars have been constricted. Curves of Spee have been placed in the arch wires to level the arches.

Since fewer arch wires are needed because of the interbracket space, each wire can remain in the patient’s mouth for longer periods of time. It is important to get into the finishing arch wires quickly and allow time for the arch wire to deliver their forces (Alexander Discipline Principle #13). The action of the curve in the arch wire takes time to be effective. If the overbite is not opening adequately, the arch wire may be removed after 2 to 4 months for recontouring and/or increasing the amount of curve in it.

**Elastics**

Elastics are used to further coordinate the arches. It is important to remember that no elastics should be used until finishing arch wires are in place (with some exceptions). To help level the mandibular arch, box elastics can be used in the bicuspid area. Class II and midline elastics are used after the overbite approximates
normal if the headgear has not resolved the Class II condition.

Proper interincisal angle should be established with the normal overjet and an overcorrected overbite. Finishing elastics\(^2\) are used to finalize the posterior occlusion for long-term stability.

Retention

Retention for vertically deficient patients is similar to that of other patients except that a bite plate is placed on the maxillary retainer and is adjusted so that the posterior teeth are just out of occlusion. The patient sleeps in the retainer for 2 to 3 years. The mandibular cuspid-to-cuspid bonded 0.0215 multistranded wire can be worn indefinitely.

Stability

The most important aspect is stability of the treated malocclusion. Long-term studies performed on patients treated by Alexander reported that, "overbite and overjet were reduced significantly with treatment and were seen to be stable following orthodontic treatment."\(^3\) Elms\(^4\) stated that, "overall, the treatment effects remained stable 6.5 years following retention and 9 years following treatment."

A study focusing exclusively on the leveling of the mandibular arch in patients who had an excessive curve of Spee was carried out.\(^5\) Carcara\(^6\) concluded that the Alexander Discipline is an effective continuous arch wire technique for leveling the curve of Spee in Class II, Division I deep-bite cases treated by nonextraction in which the initial curve of Spee is 2 to 4 mm.

Conclusion

Precision control of intraoral and extraoral forces makes this system work efficiently. The entire arch is banded/bonded simultaneously, eliminating the need for sectional mechanics and excessive arch wire changes. The bracket design allows larger and stiffer wires with a curve to be placed earlier. The stored-up energy of the arch wire in the interbracket spaces allows it to be active over a longer period of time. Maxillary molars are controlled with 15° rotational offset, and slight toeing in of the arch wire eliminates the need for a transpalatal arch. Tying back of the arch wires prevents flaring and spacing of the maxillary anterior teeth and maintains the arch length. When using rectangular arch wires, it also allows the maxillary incisor roots to tip lingually while some bodily intrusion takes place, thereby opening the bite.

Leveling the maxillary arch first provides
easier bracket placement later on in the mandibular arch. The $-5^\circ$ torque of the mandibular incisors and $-6^\circ$ tip of the mandibular first molars are effective in controlling the incisor position and leveling the mandibular arch. Fewer arch wire changes and longer intervals between appointments make this technique very efficient.

Final results show correction of overbite, torque control of the incisors, good interincisal angle, upright mandibular molars, a level mandibular arch, and maintenance of the mandibular plane angle.

References