Class III treatment with invisalign in non-growing patients without extractions

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Keywords

Class III malocclusions can be skeletal or dental. In a Class III skeletal discrepancy, the maxilla can be retro gnathic, the mandible can be prognatic, or both conditions may be present. In these patients, the ANB angle is decreased at 0 degrees or less, and the Wits analysis is negative.

In non-growing patients with dental class III malocclusion or very mild skeletal discrepancy, non-extraction treatment may be attempted with clear aligners with mandibular interproximal reduction (IPR) in conjunction with class II elastic wear and mandibular molar distalization.

Tools for Anteroposterior Correction

1. Precision cuts: May be place on maxillary molars and mandibular canines. This will have a mesial force on the entire maxillary arch and a distal force on the mandibular arch. Utilizing the principle of interarch anchorage, the maxillary arch acts as the anchorage for mandibular arch distalization.
2. Power ridges: it may be placed on the mandibular incisors to correct the mandibular incisor inclination during distalization.
3. Optimized root control attachments: allow for bodily translation of teeth when distalizing mandibular premolars and canines to correct a class III malocclusion.

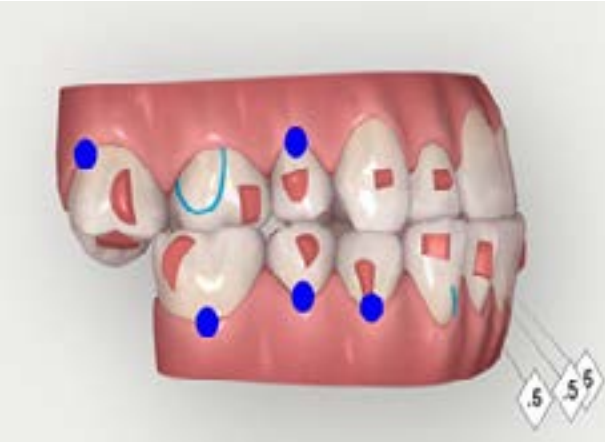


Image 1 shows the precision cuts in maxillary molars and mandibular canines and optimized root control attachments in lower premolars.

Posterior IPR

In conjunction with anterior IPR may be prescribed for:

Resolution of crowding

To correct an anterior Bolton tooth size discrepancy

To retract the mandibular incisors to correct an anterior cross bite

To decrease the amount of overall mandibular molar distalization required.

Image 2 shows power ridges located in lower incisors to correct the inclination during distalization.

Class III elastic simulation jump

Class III elastics will be required to be worn full-time. The patient may start with a ¼ inch, 2 oz (light) elastic, and working up to a ¼ -inch 4,5oz (medium) elastic as treatment progresses. Elastics may be worn unilaterally or bilaterally, depending on the presentation of the malocclusion. The effect of the Class III elastic will be seen as a simulation jump in the ClinCheck software. The AP correction may be changed to view it as a single simulation jump in the last stage of treatment. This is useful in determining what the final occlusion would look like if the patient were noncompliant in wearing elastics.

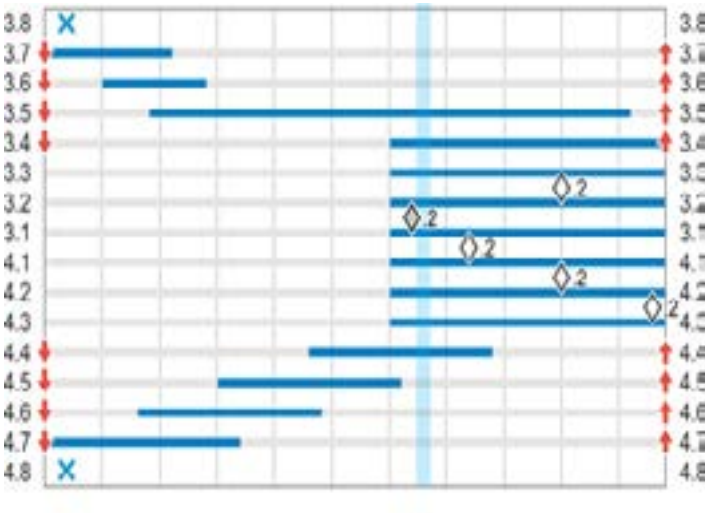
Sequential distalization of mandibular molars

A third option for dental movement in class III correction is sequential distalization of the mandibular molars. It is possible to correct a half-cusp Class III molar relationship with mandibular molar distalization. Sequential distalization of the mandibular molars may be prescribed in combination with posterior IPR. This reduces the amount of distalization required to correct to a Class I molar and canine relationship. Precision cuts for Class III elastics may also be requested. Class III elastics are worn to reinforce anchorage and to assist tooth movements already built into the aligner. In

masse distalization may also be attempted by placing temporary anchorage devices (TADs) in the buccal shelf of the mandible on both sides The TADs may be engaged with removable intraoral elastics attached to precision-cut hooks on the mandibular canines of the aligner. Alternatively, the TAD may be engaged with a power thread, elastomeric chain, or nickel- titanium closing coil to a power arm on the mandibular canines.

Software design

The software was set up for sequential distalization, commonly referred to as V pattern staging. With this staging, the second molars distalize initially, with the first molar to first molar acting as the anchorage segment. When the second molar has moved halfway, the first molar starts to distalize, and finally the anterior segment is retracted. If posterior IPR is incorporated into the treatment plan, less distalization will be required to correct to Class I molar and canine relationships. Attachments for distalization: if the first and second molars crown presents a large surface area, it offers very good engagement of aligner material, so not attachments are required for distalization. Root control attachments are necessary on the premolars and canines for bodily translation.

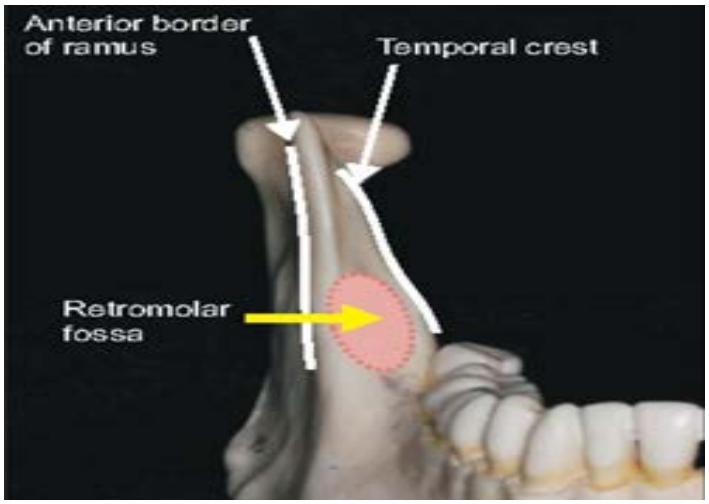


"V" pattern staging

Miniscrews for distalization

Retromolar Region Miniscrew

Sayed et al, used for the lower molar distalization miniscrews inserted at the retromolar pad. The average amount of distalization of mandibular first molar is 3.2 mm at the crown level. In conclusion, placing miniscrews at the retromolar pad area for lower molar distalization was found to be a simple and effective method for correcting anterior cross bite and mandibular anterior crowding or protrusion, without the need for patient compliance. Clinicians should carefully plan the placement of the miniscrews in this region due to the risk of inferior alveolar canal involve- ment. The thickness of the soft tissue in the retromolar area might not be appropriate for miniscrew placement in every patient. Few clinicians have been able to correct Class III malocclusion and distalize mandibular molars by 4–5 mm with miniscrews in the retromolar area. One reason is because the placement of just a single miniscrew on each side may not be sufficient to withstand the forces required for total arch distalization.



Retromolar Region for miniscrews

Interradicular Miniscrews

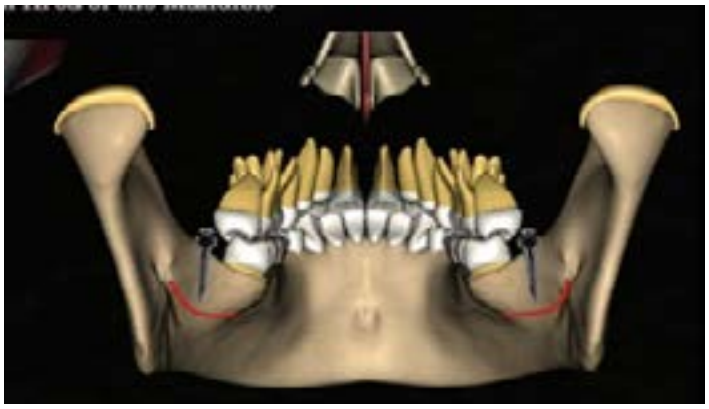
According to Schupp et al, after completion of the molar distalization, the distalization of the premolars began. To prevent mesial drift and create an anchor for the distalization of teeth from the canines forward, TADs need to be installed between the mandibular first molar and second molar and elastics need to be used. Following completion of both molar and premolar distalization, distalization of the canines and incisors begin, ending with an optimal over- bite of the anterior teeth. In the plan to move teeth with aligners, movements can be roughly divided into distalization of the mandibular and the posterior teeth, followed by retraction of the incisors. During each clinical visit, we checked to see whether tooth movement was consistent with the ClinCheck Soft- ware simulation to ensure sufficient adaptation of each aligner. Miniscrews installed into the interradicular spaces may interfere with the roots during distalization, and therefore the miniscrews might require relocation. Consequently, it might be difficult to distalize more than 2–3 mm with miniscrews in these locations.

Interradicular miniscrew for Class III correction

Buccal Shelf Miniscrew

The overall success rate for miniscrews placed in the buccal shelf region of the mandible for mandibular total arch distalization has been reported at about 93%. The direction of the miniscrews is almost parallel to the teeth and the insertion point might be either into attached gingiva or mucosal membrane, depending on anatomical variations of the patient.

A finite element study showed that the distalization was accompanied by counterclockwise rotation of the mandibular dentition resulting from molar intrusion and incisor extrusion.



Buccal Shelf Miniscrew position