Class IIIs, Too?

In some mild Class III situations, the extraction of mandibular premolars or a single incisor is occasionally considered to permit the retraction of lower anteriors to a positive overjet. A non-extraction alternative using mini-screw anchorage features some limited en masse protraction of the maxillary dentition (Figs. 1, 2 & 3) and/or the en masse retraction of the lowers (Figs. 4).

So, will en masse retraction (or protraction) with mini-screws eliminate the need for extractions? In some specific situations, it might make the difference, but this type of treatment is unlikely to supplant the need for sacrificing a few premolars in severely crowded and/or protruded situations. Perhaps for a few mild-to-moderate cases, the removal of premolars might fall to the wayside in favor of possibly extracting some third molars, followed by en masse retraction (anchored from mini-screws); but, at the end of the day, extraction by any other name (or any tooth)... still involves extractions.
Figs. 2: Class III 14-year-old female with compensated mandibular incisors treated with en masse protraction of the maxillary dentition using a TPA and palatal mini-screw. Forces are applied apical to the center of resistance of the maxillary dentition with the intent to maintain vertical dimension and avoid iatrogenic molar tipping. Note: Production of Class I occlusion and improved lip support in 18 months.

Figs. 3: Mild Class III female (age 13.5) treated in 20 months with maxillary en masse dental protraction using TPA constructed from the distolingual line angles of the first molars and direct anchorage from mini-screws inserted between the molars and second premolars (site of the largest interradicular space, favorable bone, easy insertion access).
Leeway space was defined by Nance as "the differential in tooth widths between deciduous and permanent buccal teeth." During the transition to permanent dentition, this space is unfortunately lost due to mesial drift of the first permanent molars. If the leeway space can be maintained, Gianelly has suggested that at least 77 percent of patients with crowding (but favorable profiles) might be corrected without either expansion or extraction — and it appears to be quite stable. A simple, mandibular lingual arch or lip bumper has historically been recommended to assist in preserving this space, but the effects of both are somewhat unpredictable. Could the introduction of TAD-supported anchorage for the management of the leeway space provide a more predictable and efficient method to resolve borderline crowding in a single-phase of orthodontic treatment without extraction, unstable expansion or lower incisor proclination? Mixed dentition patients that present with favorable leeway space, measured to be sufficient to resolve mandibular crowding, might benefit from mini-screw-supported treatment, initiated just prior to the exfoliation of the mandibular second primary molars. If adequate interradicular bone is available, mini-screws are placed between the mandibular first and second molars; otherwise, they might be inserted adjacent to the molars in the oblique ridge. As the primary molars are lost, elastic or coil spring forces are applied directly from the TADs to retract the mandibular first premolars into the available leeway space at the same time that the second premolars are erupting. As another option, these screws can also be ligated to the molars to provide indirect anchorage support for retraction forces applied from the molars to the premolars.

If second molars are unerupted or the bone density between the molars is poor, an alternative implant site should be considered. Mini-screws are easily inserted between the mandibular lateral incisors and canines. A "jig" with a compressed open-coil spring can be constructed from each TAD to push the first premolars distally into the leeway space.

As a fourth and perhaps most utilitarian alternative, a supporting arm (e.g., sectional .018x.018 wire with bayonet or offset bends) can be attached to the head of the screws (e.g., ligated or light-cure bonded) and extended to the first molars to act as indirect anchorage for retraction of the premolars into the residual leeway space. After the resolution of the lower irregularity, this same anchorage system can be used to assist with the intrusion of anterior teeth and also to counteract adverse reactive forces from Class II mechanics (i.e., Class II intermaxillary elastics, fixed functional appliances).
Figs. 5: Mini-screws were placed between the mandibular first and second molars at the mucogingival junction, immediately prior to the exfoliation of the mandibular second primary molars for a 12.5-year-old male. The screws provided direct anchorage for the retraction of the first premolars into the leeway space during the eruption of the second premolars. In addition, some en masse retraction of the mandibular dentition can be produced. Resolution of mandibular crowding was achieved in 11 months, without extraction or potentially unstable expansion.

Figs. 6: A 13-year-old male with Class II, crowded late mixed dentition malocclusion featured leeway space sufficient to resolve the crowding. Direct anchorage from mini-screws inserted between lower first and second molars was used to retract first premolars into residual "e" space as second premolars were erupting, thereby, providing space for anterior crowding. Placing brackets on lower incisors should have been delayed until that space was created. Class II relationship was corrected using prototype Jasper Jumpers, indirectly anchored by the same mini-screws to reduce adverse flaring of the lower incisors that is common with fixed functional appliances.
Figs. 7: A 13-year-old male with a Class I late mixed dentition with deep overbite and moderate crowding. Leeway space was efficiently used. Direct anchorage for retraction of the premolars into the residual "e" space was achieved using mini-screws inserted adjacent to the lower molars. Bracketing the remaining teeth was then accomplished sequentially and treatment completed in 25 months.

Figs. 8: Leeway space was effectively utilized with indirect anchorage support to lower molars from a miniscrews inserted adjacent to lower molar for a 12.5-year-old female.
Figs. 9: (age 13; 26 months of treatment) Compressed coil spring jigs, fabricated from 0.18” stainless steel, were inserted through the heads of two mini-screws inserted between lower lateral incisors and canines. These jigs were used to push the premolars into the residual leeway space to resolve anterior crowding (although it would have been preferable to delay bracketing the incisors). Lexan beads, used with Jasper Jumpers, served as stops to prevent the coil spring from migrating up the bayonet bend. Forces were applied, via a couple, closer to the center of resistance in order to provide more bodily movement. Once the first premolars were distalized into the leeway space up to the erupting second premolars, the jigs then provided indirect anchorage for subsequent retraction of the remaining teeth.

Figs. 10: (age 12 and five months; 26 months of treatment) Sectional bayonet arms (.018” x .018”) were bonded into auxiliary tubes on mandibular first molars and bonded into the cross-slot heads of two mini-screws that were inserted between mandibular lateral incisors and canines. The mini-screws provided indirect anchorage for retraction of first premolars into residual “e” space, followed by resolution of anterior crowding in a conservative, one-phase, non-expansive treatment. Note: It would have been preferable to avoid bracketing the incisors until the residual space is closed to avoid any unintended intercanine expansion or incisor flaring.
Figs. 11: (age 10 and three months; 24 months of treatment) Residual leeway space was used to resolve moderate mandibular crowding using indirect anchorage from mini-screws inserted in the anterior alveolus. Sectional supporting arms are fabricated from .018”x.018” wire segments, inserted into auxiliary molar tubes and light-cure bonded into the cross-slot of the mini-screws. Incisor brackets were added after “e” space was efficiently depleted.

Figs. 12: (age 12.5; 18 months of treatment) Indirect anchorage from mini-screws was used to efficiently and effectively use leeway space to resolve a moderate arch length discrepancy without unstable bimaxillary expansion methods. The same mini-screw anchored arms supported Class II elastics.
Multi-tasking: Support for Class IIs

Regrettably, fixed functionals and Class II elastics tend to produce adverse labial flaring of mandibular incisors. This might give way to either a detrimental effect in lip protrusion, a reduction in the amount of mandibular advancement that is possible, or inherent instability. AlQabandi et al. reported six to seven degrees of lower incisor flaring occurs even when simply leveling the curve of Spee. As a consequence, some pre-adjusted appliance prescriptions feature lingual crown torque to counteract this effect (e.g., Butterfly System, American Orthodontics, Inc., Sheboygan, Wisconsin). Mini-screws that are used to manage the leeway space might also be multi-tasked to resist the “flaring” or bodily labial movement of the lower incisors during leveling and when using traditional Class II mechanics (Figs. 6, 12 & 13).

Conclusion

Mini-screw anchorage will not alter our diagnosis; only our treatment plans. It should, however, finally eradicate any concerns of adverse changes attending extractions, as spaces can be closed with predictability, while maintaining or even enhancing specific incisor and lip position. The question is no longer whether we should extract; rather, the key is now where the teeth should be positioned. Perhaps the fallacies and fables of the routine, destructive nature of “extractions in orthodontics” might finally be dismissed, based on both overwhelming evidence, combined with more predictable biomechanics using mini-screws.

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References


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