

Considerations in Mandibular Incisor Extraction Cases

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Tooth-size-arch-length discrepancy, or arch crowding, has traditionally been managed by means of first or second premolar extractions; first or second molar extraction is a less common approach.¹ Incisor extraction is another alternative in the mandibular arch. In 1905, Jackson described a case in which two lower incisors were extracted at different times to relieve mandibular crowding.² Since then, a few case series and clinical studies of this treatment modality have been reported.³⁻⁵

Previous authors have listed specific criteria for mandibular incisor extraction: permanent dentition, minimal growth potential, a Class I molar relationship, a harmonious soft-tissue profile, minimal-to-moderate overbite, little or no crowding in the maxillary arch, an existing Bolton discrepancy, and a tooth-size-arch-length discrepancy of more than 5mm in the anterior region.^{3,6} A diagnostic setup is strongly recommended with this treatment approach.⁷⁻⁹

Mandibular incisor extraction has several advantages over premolar extractions. First, it may reduce treatment time, especially if crowding is limited to the anterior segment.⁷ Second, a more

stable result is likely in the anterior region, because expansion is not necessary and intercanine width is minimally altered.⁵ Finally, because little retraction is required compared with premolar extraction therapy, the anteroposterior position of the mandibular incisors is not changed, allowing maintenance of a harmonious profile.⁶

Mandibular incisor extraction therapy has some disadvantages as well. If no Bolton discrepancy exists, closure of the incisor space will result in increased overjet. If the overjet is adequate after the incisor is removed, the result will be a Class III occlusal relationship. Moreover, a midline discrepancy is inevitable, and the extraction site may reopen over the long term.^{5,10} Finally, the interproximal papillae may be sacrificed, which may lead to the development of open gingival embrasures or “black triangles”.^{4,11}

The critical decision of which lower incisor to extract depends on several considerations, including periodontal conditions, the presence of gingival recession, and the location of any restorations, including endodontic treatment. In addition, the mesiodistal width of each incisor should be measured and the anticipated amount of tooth movement determined with the Bolton analysis, keeping in mind that in the mandible, the central incisors tend to be smaller than the lateral ones. Extraction of a lateral incisor is generally preferred because it is less visible from the front,⁶ but the incisor that is farthest outside the natural arch and closest to the crowding is usually the best candidate for extraction.

Case Selection

Mandibular incisor extraction therapy is more appropriate for certain types of malocclusion than for others, making proper case selection important. It is especially suitable for patients with Class I (Fig. 1) and mild Class III malocclusions with mild open-bite tendencies.^{3,4} Faerovig and



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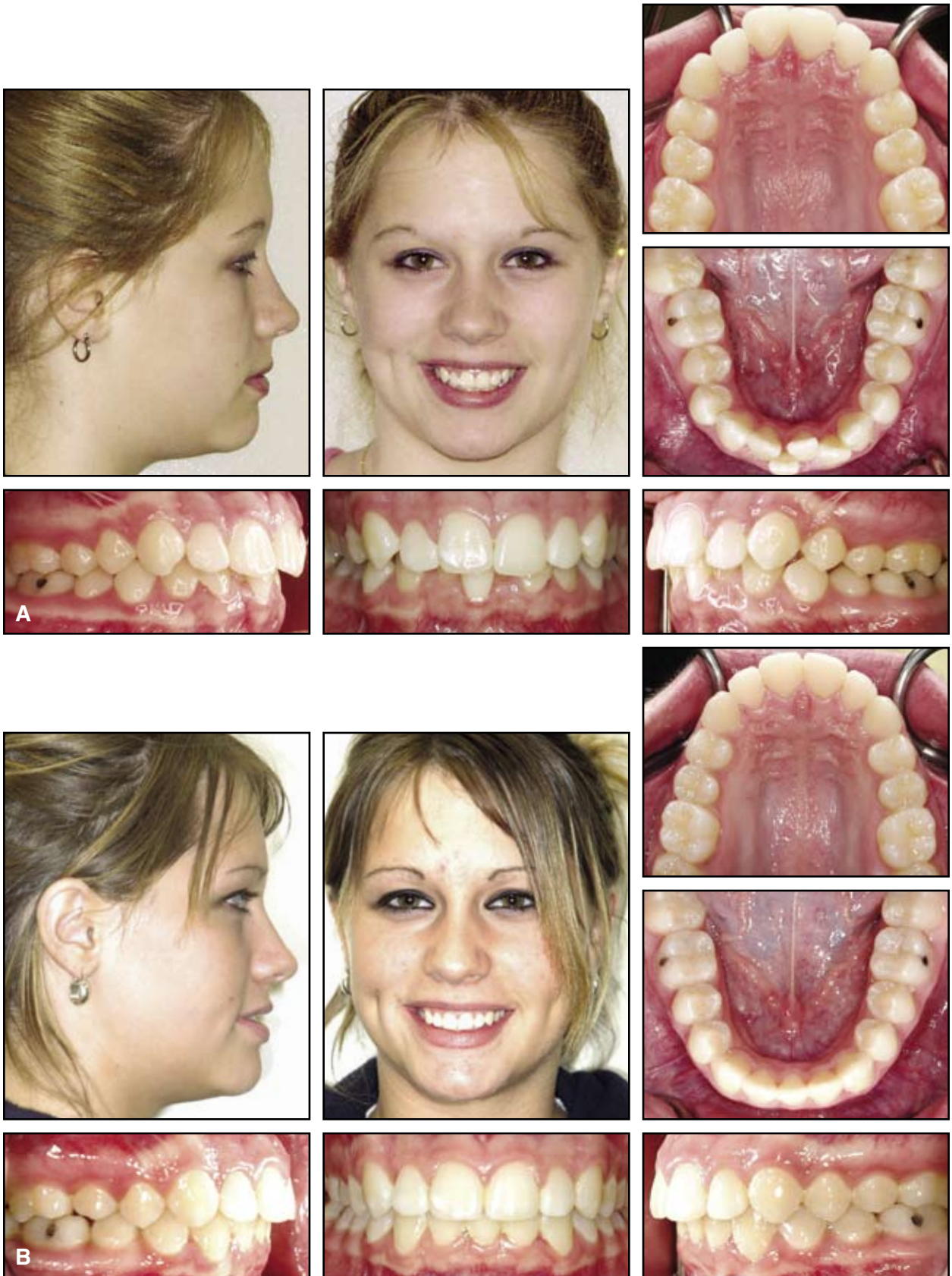


Fig. 1 Case 1. A. 15-year-old female patient with more than 5mm of mandibular anterior crowding, mild maxillary crowding, harmonious profile, Class I molar relationship, and minimal-to-moderate overbite before treatment involving extraction of mandibular right central incisor. **B.** Patient after 20 months of treatment, showing achievement of proper overjet and overbite and maintenance of buccal anteroposterior relationship. New mandibular midline is at midpoint of left central incisor.

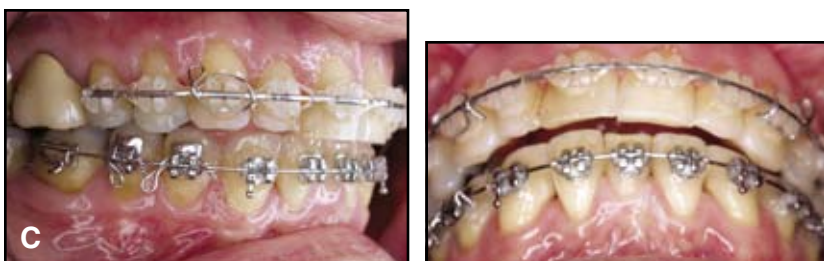
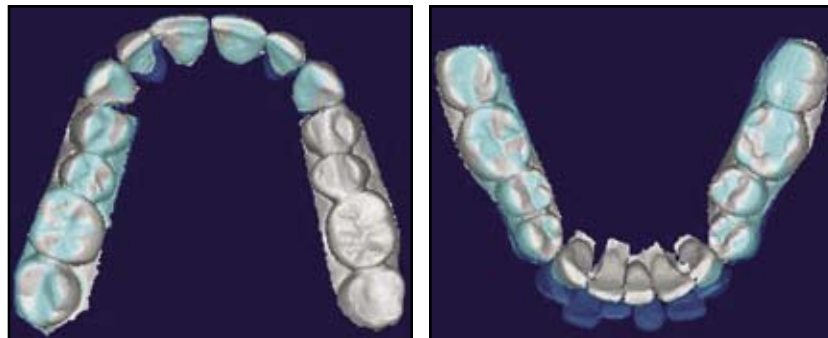
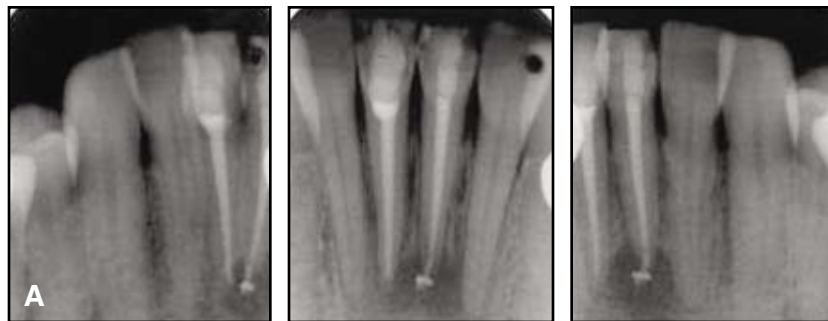


Fig. 2 Case 2. A. Adult patient with convex profile, mild Class II tendency, and moderate mandibular crowding before treatment. **B.** Occlusion after extraction of mandibular left central incisor; note excessive overjet. **C.** Progress records after 14 months of treatment, showing reduction of overjet through interproximal reduction of maxillary anterior teeth.

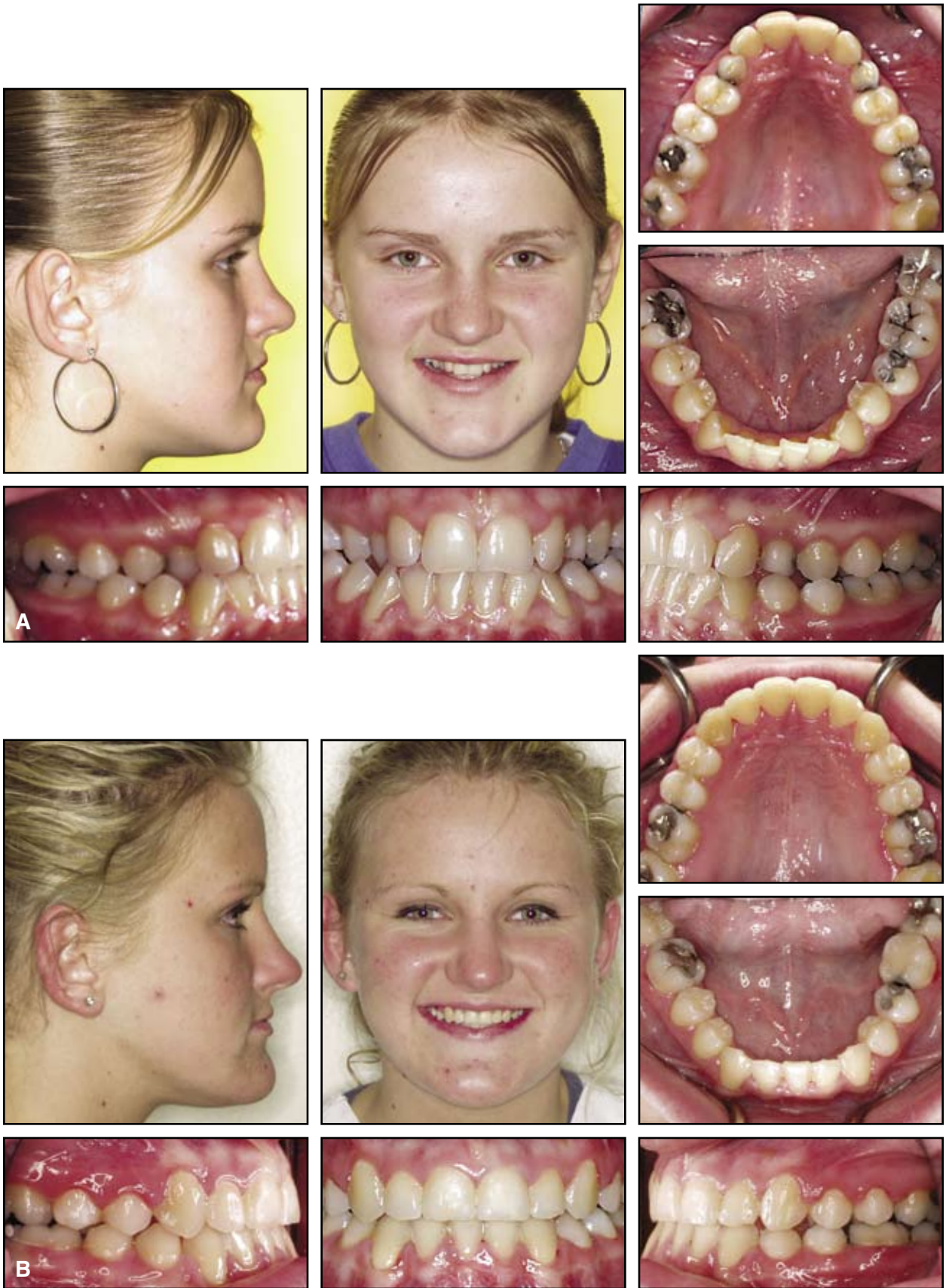


Fig. 3 Case 3. A. 13-year-old female patient with mildly concave profile and moderate Class III occlusion (half-cusp Class III relationship in left buccal segment) before treatment involving extraction of mandibular right central incisor. **B.** Patient after 38 months of treatment, showing slightly more concave soft-tissue profile, improved overjet and overbite, and unchanged buccal segments.

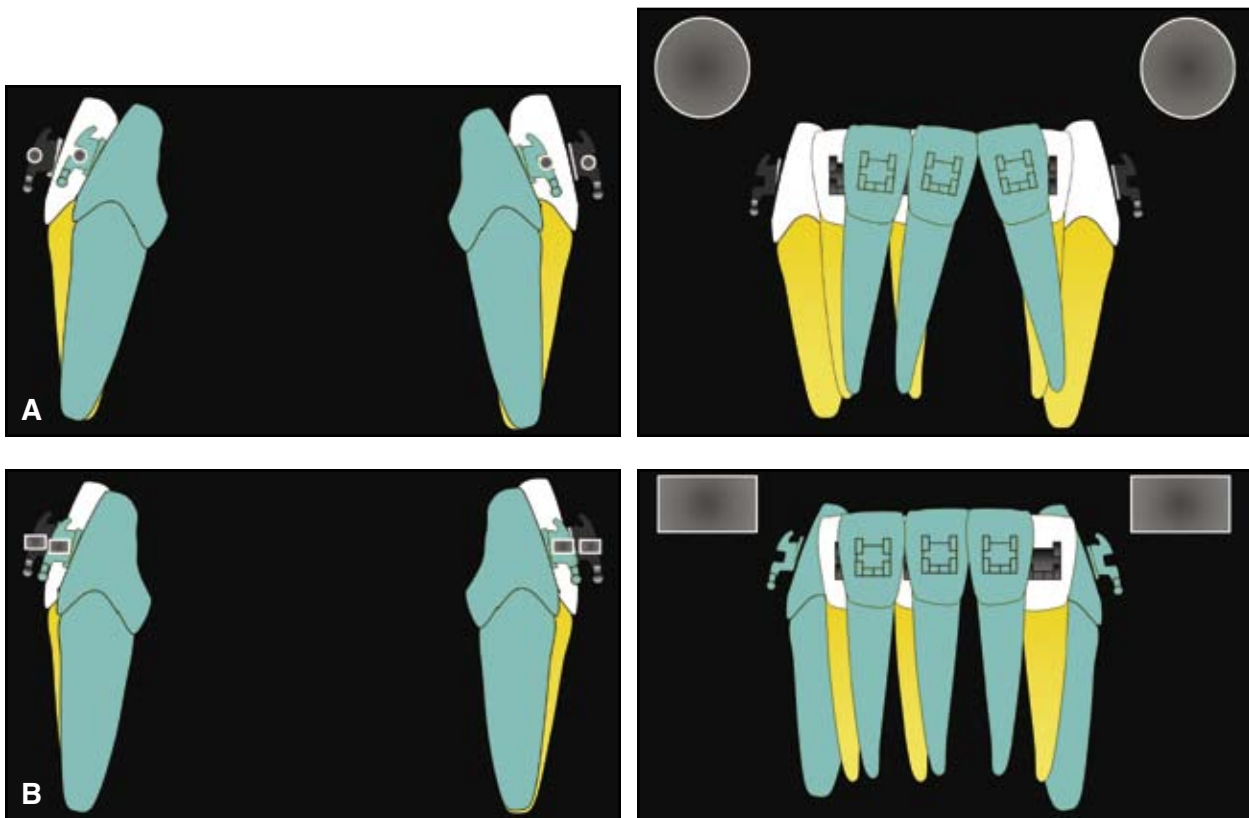


Fig. 4 A. Use of round wire for space closure can cause lingual tipping of canines (leading to excessive overbite in canine area) and mesial tipping of incisors; more incisal interproximal contact may create open gingival embrasure or “black triangle”. **B.** Use of rectangular wire to fill bracket slot will control both types of undesirable tooth movement. (Green-shaded teeth show tooth positions resulting from different mechanical approaches.)

Zachrisson reported that in mild Class III patients who underwent mandibular incisor extractions, the lower incisors were tipped lingually by about 5° and 2mm at the incisal edges, the intercanine width was reduced by an average of 3mm, and the intermolar width did not change.⁴ In the vertical dimension, the lower incisors moved not only lingually, but occlusally. Such extrusive movement would clearly be favorable in a patient with a mild Class III and anterior open bite.⁴

Mandibular incisor extraction may also be considered when the patient has congenitally missing maxillary lateral incisors and significant mandibular anterior crowding.^{12,13} The Bolton discrepancy created by the missing mandibular incisors can be normalized by reducing the mesio-distal space of the implant sites. To maintain sufficient space for the implants, however, the width of these sites should not be reduced to less

than 6mm.

Mandibular incisor extraction is generally contraindicated in a Class II patient, because it would result in a significant increase in overjet. The adult patient in Figure 2 presented with moderate mandibular crowding, a convex profile, and a Class II tendency. This patient had a history of trauma to the lower incisors, with a chronic periapical process on the mandibular left central incisor. In addition, Bolton analysis revealed a mandibular excess of .5mm. Given the tooth-size-arch-length discrepancy in the mandibular arch and the questionable prognosis of the mandibular left central incisor, it was decided to extract this tooth (Fig. 2B). Rather than extracting the maxillary premolars, we decided to significantly reduce the interproximal enamel of the six maxillary anterior teeth (Fig. 2C).

Mandibular incisor extractions are most

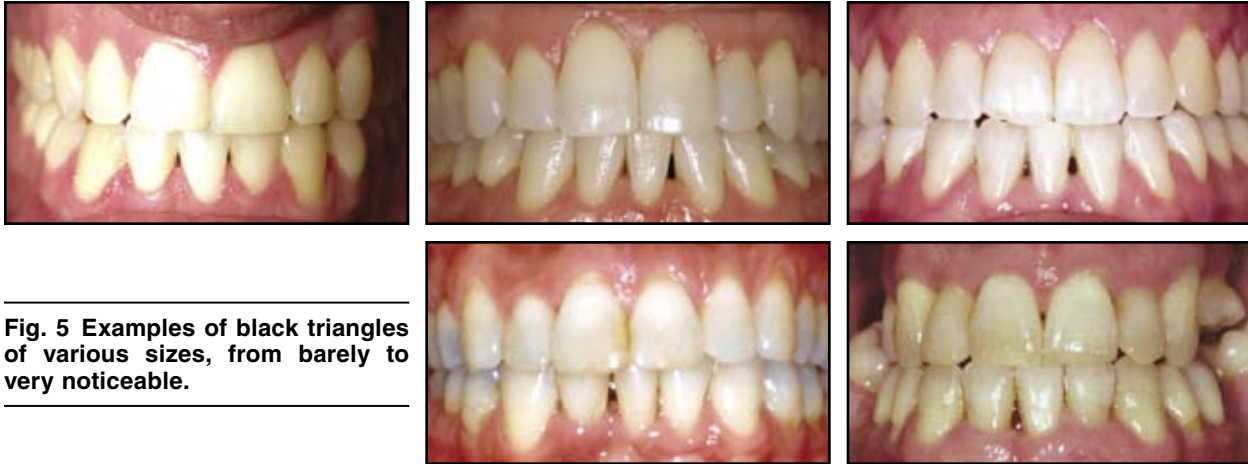


Fig. 5 Examples of black triangles of various sizes, from barely to very noticeable.

appropriate in patients who do not require antero-posterior alterations in the buccal segments. Therefore, it is generally not indicated in moderate-to-severe Class III malocclusions, because the buccal occlusion would not be corrected (Fig. 3).

Mechanics

The first challenge in mandibular incisor therapy is closure of the extraction space. To prevent excessive lingual tipping of either the incisors or the canines due to the forces generated by the elastomeric chain, space closure should be performed using the largest possible rectangular archwire (Fig. 4). This is particularly important in cases where the majority of the space will be closed by movement of the adjacent teeth. A rigid archwire will also prevent tipping of the adjacent incisors into the edentulous site, which would displace the tooth contact to the incisal edges, increasing the risk of black-triangle formation (Fig. 5).

Black triangles are not only common after mandibular incisor extraction therapy,^{4,11} but have been found to occur in 40% of adults after any kind of orthodontic treatment.¹⁴ This may be an important consideration, especially in older patients, since mandibular incisor display increases with age.¹⁵ Adult patients should be informed of the potential for such side effects.

Development of black triangles has been

attributed to a number of factors, including periodontal bone loss, more incisal interproximal contact, triangular incisors, and divergent root angulations.¹⁶ In a study of interproximal contacts between all teeth, Tarnow and colleagues found that if the distance from the crest of the bone to the interproximal contact exceeded 5mm, a black triangle would appear 98% of the time.¹⁷ Faerovig and Zachrisson reported no cases of black-triangle formation in a sample of patients who had undergone mandibular incisor extractions; they attributed their success to careful selection of patients with little pretreatment crowding, reduction of mesiodistal enamel as needed, and an emphasis on creating optimal axial inclinations of the lower incisors.⁴

In an unpublished study, we found black-triangle formation in nearly 70% of the patients who underwent mandibular incisor extractions, with the magnitude considered “significant” in 50% of the cases. No clear predictors were found, including age, sex, the amount of contact area before extraction, and whether the extracted incisor was central or lateral. We did find, however, that a more incisal interproximal contact after treatment was always followed by the formation of black triangles.

Although it may not be possible to eliminate black triangles completely, the risk can be reduced by limiting the distance from the crestal bone to

the contact area. This involves either increasing the bone level in the occlusal direction or moving the contact gingivally. The latter is usually more predictable, and it can be accomplished in one of three ways. First, the root structures can be converged to displace the contact more gingivally, although an extremely low gingival contact will enlarge the incisal embrasure, possibly resulting in uneven incisal edges. Second, the teeth adjacent to the gingival embrasure can be slenderized and the space closed through bodily translation. This option has a potential disadvantage: it may accentuate the anterior Bolton discrepancy created by the mandibular incisor extraction. Third, the incisors adjacent to the extraction site can be built up with composite or veneers. This can be technically difficult, because mandibular incisors tend to be small and often have triangular crowns and roots.

Conclusion

Mandibular incisor extraction can be an effective treatment option in selected cases, particularly those with mild Class III malocclusions. In patients with moderate crowding and without excessive mandibular tooth mass, interproximal reduction may be a better alternative. Formation of open gingival embrasures or black triangles is a common side effect of mandibular incisor extraction. It is difficult to predict the risk of this phenomenon, but it may be an important esthetic consideration, especially in older patients.

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