Mandibular incisor extraction therapy

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Extracting a mandibular incisor has been stigmatized as an expedient that may adversely affect the occlusion. However, when properly used, the extraction is only one aspect of the total correction of the malocclusion. Failure to observe this will fulfill the negative predictions. Articulating six maxillary with five mandibular anterior teeth necessitates a visualization of the posttreatment occlusion, and therefore specific criteria for case selection are essential. Treatment trends oscillate between nonextractions and four premolar extractions, with perhaps insufficient attention currently given to alternatives. This middle of the road approach is indicated in carefully selected cases, especially where space requirements and facial esthetics do not call for greater dental movements. (AM J ORTHOD DENTOFAC ORTHOP 1994;105:107-16.)

Several approaches for crowded mandibular anterior teeth are currently employed: distal movement of posterior teeth, lateral movement of canines, labial movement of incisors, interproximal enamel reduction, removal of premolars, removal of one or two incisors, and various combinations of the above. Selecting the best treatment is often difficult, and all guidelines do not apply to every case.

Even more vexing to the clinician is that no one of these treatment plans can predict ultimate stability with even reasonable certainty. Studies show a natural long-term unpredictable tendency for mandibular intercanine width to decrease in treated and untreated dentitions, for bites to deepen, and for posterior teeth to move forward for many years with recrowding of anterior teeth.15 These findings are at variance with some of the previously mentioned treatment plans for crowding. It does seem reasonable, however, to ask: “Are retainers forever?”

REVIEW OF THE LITERATURE

No reports are available on the frequency of a mandibular incisor extraction, perhaps indicating its infrequency, or its infrequent reporting. However, there are references to it, often as case reports,6-10 or as one of many possible approaches for crowding.11-16 Others advise it for cases of anterior tooth size discrepancies,11,17,18 or to harmonize with an absent maxillary lateral incisor.19,20 Gingival hypertrophy in this area may be another indication.21

The prevailing opinion is to reserve the procedure for the atypical, compromise, or relapse case, and even then caveats are voiced regarding overjet increase, space opening, and a compromised contour of the papillae. Increase in anterior overbite is the most frequent warning.10,20,22

Tuverson is more optimistic. “Occasionally the orthodontic treatment plan indicates extraction of a lower incisor or space closure when a lower incisor is missing. Because of the excellent results frequently obtained, these are no longer considered ‘closet cases.’ Although once looked upon as a ‘dastardly act,’ provoking negative feelings similar to those encountered when premolars were first extracted, the extraction of one or even two lower incisors is becoming more common in orthodontic treatment and case presentations.”19 In conjunction with the extraction, he advises “accurate mesiodistal enamel reduction of maxillary central incisors” where indicated.

SELECTION OF SUITABLE CASES

There are malocclusions with crowding of mandibular anterior teeth that may be candidates for one incisor
extraction. As with every malocclusion, a visualized treatment objective (VTO) is necessary, but in addition, these cases require visualizing the atypical articulation of six maxillary anterior teeth with five mandibular anterior teeth. Certain criteria will aid in the selection of suitable cases:

1. Treatment strategy will begin with accurate measurements of required arch length and available arch length in the entire mandibular arch, or tooth-size-arch-length-discrepancy (TSALD). A calculation will indicate whether removal of an incisor produces harmony between the two, or excess space or deficiency.

   An assessment of available space will also include both a consideration of the depth of the curve of Spee, and the inclination of the lower incisors. Leveling the curve of Spee and incisor uprighting, will require additional space if these are indicated.23

2. An additional consideration is the intercanine width, and the effect of an incisor extraction on it. Unless these teeth were originally ectopic, function and future stability are best served if the width is maintained,1,2 and a future natural decrease anticipated.3,5

3. With six maxillary anterior teeth now articulating with five mandibular anterior teeth, the overbite must be maintained or, if deep, reduced. Overjet is likewise maintained or reduced to produce centric occlusal contacts. Maxillary and mandibular canines will finish in ideal Class I relations, or the distoincisal inclines of maxillary canines may occlude with the mesioocclusal inclines of mandibular first premolars.

   Reference to the Neff Coefficient or the similar Bolton Index and other guides will aid in determining maxillary to mandibular tooth size discrepancies and asymmetries.11,17,24

   These, in conjunction with TSALD, will indicate whether the removal of the larger lateral incisor or the smaller central incisor is indicated. Usually, removal of the smaller central incisor is advisable. However, it is our observation that the decision to remove a particular incisor because it exhibits dehiscence of its labial gingiva is usually contraindicated, since the defect may remain. A surgical repair is first performed and then the decision made whether to remove the incisor with the repaired gingiva, or another. The decision to remove
an incisor in the presence of bony defects in this area must be carefully evaluated.

A diagnostic set-up of both arches is informative if performed with extreme accuracy, and often suggests minor interproximal reduction of maxillary anteriors to allow their retraction, alignment and maxillary to mandibular arch coordination. However, Sheridan warns that "stripping is an irreversible procedure and should be initiated with this in mind."26

4. As with all ideal treatment, an objective will be canine rise or posterior group function on the working side, and an absence of cuspal interferences on the nonworking side. The protrusive excursion will result in posterior disclusion.

5. Dental esthetics will require proper positioning in the sagittal plane of maxillary and mandibular anterior teeth, relative to the commonly used reference lines. An interincisal angle in the normal range is a major contributor to esthetics. However, standards formulated for four mandibular incisors may not be applicable when only three are present.

Facial esthetics will require a reasonably accurate prediction of the effects of growth and dental movements. Two maxillary or four premolar extractions, or nonextraction therapy, may affect the facial profile. A lower incisor extraction in itself will not.

6. This modification of the anterior occlusion requires consideration of the reciprocal reactions that may occur in the posterior occlusion, and whether they are desirable. There are instances where after alignment and positioning of the three lower incisors, part of the extraction space remains. This may be advantageously used to mesialize posterior teeth in cases where one or both buccal segments are in full or partial Class II relation. If space exists where canines are in Class I relationship, their slight additional mesial movement for space closure will place maxillary canines in partial occlusion with mandibular first premolars. This may be
Fig. 3. Case 1. Posttreatment facial and oral views.

Fig. 4. Case 2. Pretreatment facial and oral views.
preferable to esthetic bonding, which we have not found necessary.

If these criteria are to be satisfied, orthodontic treatment will rarely be in the mandibular arch only. If they can be satisfied, the case may be a candidate for mandibular incisor extraction therapy.

7. The decision to extract is best postponed until the early permanent dentition, when fewer dental and skeletal variables are present. The concept of early premolar removal is not applicable to mandibular incisor removal. In addition, mechanotherapy is improved with a full complement of teeth.

DISCUSSION

Treatment of the total malocclusion is primary, and the removal of a lower incisor is only part of it. Yet the "stigma" attached to this therapy has been noted, and the references cited are predominantly negative, arising perhaps from unfavorable experiences. These may be the result of faulty case selection, faulty mechanics, or mechanics suitable for other extractions, but not for a mandibular incisor. The ease and rapidity of the extraction space closure and resulting alignment may distract attention from the total requirements of the malocclusion. The caveats regarding increase in overbite are well taken if control of the vertical dimension is inadequate. However, in our experience, a deep anterior overbite does not in itself contraindicate this therapy.

The maxillary midline will overlie the remaining central incisor. We do not believe that this absence of a mandibular dental midline affects occlusion, esthetics, periodontal health, or stability, the principal requirements of orthodontic therapy.

Treatment options in the mandible are more limited than in the maxilla, because of the predominantly cortical bone, the mentalis muscle, and the absence of sutures. In addition, facial and orbicularis muscles, together with the buccinator and the superior constrictor of the pharynx, combine to form a continuous func-
tioning envelope which limits anterior, lateral, and posterior movements.\textsuperscript{27} If achieved, instability may follow.\textsuperscript{3,28,29} Periodontal integrity,\textsuperscript{29,30} and facial esthetics\textsuperscript{29} may also be negatively affected by expansion of anterior teeth.

Interproximal enamel reduction (stripping), another treatment alternative, has been advised by Peck and Peck\textsuperscript{31} "as an essential orthodontic treatment ingredient," and has gained popularity in recent years with air rotor stripping.\textsuperscript{28} Questions have been raised concerning the thinness of lower incisor enamel\textsuperscript{31,33} possible damage to it,\textsuperscript{34} and the need for its protection in a plaque prone area.\textsuperscript{35} Others have voiced concerns about resorbing crestal bone and reducing space for the interproximal papillae.\textsuperscript{3,34,36,37}

Do mandibular incisor extraction cases exhibit less recrowding after long-term retention? It is our clinical impression that they do. This may be due to the maintenance of teeth nearer their original positions where muscle pressures are less likely to introduce instability. Another possibility is the minimum stress on adjacent anchorage during space closure, leaving all or most of the acquired space for the anterior correction. Riedel has suggested that incisor extraction may give greater stability in this area in the absence of permanent retention.\textsuperscript{30} His most recent investigation confirms this.\textsuperscript{38} Today's concern with stability indicates the need for further research.

Four premolar extractions will continue to be the optimum treatment for many malocclusions having greater space requirements and the need for improved facial esthetics. However, with careful selection and management, there are cases that can be successfully treated with a mandibular incisor extraction. This approach will be a valuable addition to our armamentarium.

**CASE REPORTS**

**Case 1**

The patient was 9 years old at the start of appliance therapy. Oral and model analysis showed a Class II, Division 1 malocclusion in the mixed dentition, with a 9 mm overjet, a 50\% overbite (Fig. 1), and a tooth-size-arch-length-discrepancy (TSALD) of $-8.0 \text{ mm}$. The ANB angle was $5^\circ$, mandibular incisor to mandibular plane was $88^\circ$, and the
maxillary central incisor was 11 mm anterior to line Na-Po. Lips were protrusive relative to the nose-chin ("E") line (Fig. 2).

The first phase treatment was designed to reduce overjet and overbite and open spaces for permanent mandibular canines, where deciduous canines had exfoliated. Edgewise attachments (0.022 × 0.028) were placed on all permanent molars and incisors, and a progression of round stainless steel Australian arch wires were placed. Light Class II elastics retracted maxillary incisors. Earlier, cooperation with an activator was inadequate, and therefore extraoral force was not used in either phase. Overjet was reduced, and to test stability of the spaces gained for mandibular canines no retention was placed, and the spaces rapidly decreased (Fig. 1). The first phase treatment was 12 months, followed by observation without appliances.

The second phase treatment was begun when all teeth other than second and third molars had erupted. All teeth, except the lower right central incisor, which was extracted, received edgewise attachments. Immediate closure of the extraction space was begun before the natural resorption of the labial and lingual cortical plates, which occurs rapidly in this area and hinders closure. Simultaneously, maxillary and mandibular incisors were intruded, rotations corrected, and posterior corrections made with light Class II elastics. Six maxillary anterior teeth were interproximally reduced a total of 3.5 mm. Rectangular finishing arch wires (0.019 × 0.025) were placed for maxillary incisor lingual root torque, and for mandibular incisor lingual root-labial crown torque, with continuation of Class II elastics. Vertical elastics for canine seating were used for the final 4 months.

The second phase active treatment was 18 months. Retainers are a maxillary Hawley appliance and a mandibular bonded lateral to lateral incisor wire. Facial and intraoral photographs were taken during retention (Fig. 3).

Case 2

The patient was 13 years 11 months old at the start of appliance therapy. Dental analysis showed a Class II, Division 2 malocclusion, with buccal segments between Class I and Class II, supraocclusion of both anterior segments producing a deep overbite, and a mandibular TSALD of −8.0 mm (Fig. 4). Cephalometric values were within acceptable parameters, with the exception of the mandibular incisor to the mandibular plane (75°), and the interincisal angle (165°). Lips were slightly retrusive relative to the "E" line (Fig. 5).

The treatment plan was overbite correction by intrusion of maxillary and mandibular incisors, rotation corrections...
Case 3

The patient was 13 years 2 months old. Dental analysis showed a Class I malocclusion with 50% overbite, a 6 mm overjet, and a mandibular TSALD of -6.4 mm (Fig. 7). Large maxillary central incisors partially compensated for small maxillary lateral incisors. Significant cephalometric deviations were an ANB angle of 6°, a mandibular incisor to mandibular plane angle of 100°, and the maxillary central incisor 13 mm anterior to the Na-Po line. Lips were slightly protrusive relative to the "E" line (Fig. 8).

The treatment plan was intrusion of maxillary central incisors, their retraction aided by their interproximal reduction and the reduction of the mesial surfaces of maxillary canines of 3.5 mm, mandibular arch length deficiency correction by the extraction of the mandibular left central incisor, and intrusion of the five mandibular anterior teeth. Lingual root torque to maxillary central incisors was indicated, as was minor lingual root-labial crown torque to mandibular incisors, to maintain their existing positions.

Edgewise attachments were placed on all teeth, including mandibular second molars; maxillary second molars and third molars were not attached. This was followed by a progression of nitinol, round stainless steel and rectangular finishing wires, with space gained by 3.5 mm of upper anterior interproximal reduction and the extraction of a mandibular left central incisor, and slight mesialization of mandibular buccal segments to improve molar relations. Lingual root-labial crown torque to maxillary and mandibular incisors was indicated.

These goals were achieved with full edgewise (0.022 × 0.028) appliances, a progression of nitinol and round stainless steel arch wires, and rectangular finishing arch wires (0.021 × 0.025 maxillary and 0.019 × 0.025 mandibular). No extraoral forces or Class II elastics were used. Vertical elastics for canine seating were used for the final 3 months.

The active treatment time was 29 months. Retainers are a maxillary Hawley appliance and a mandibular bonded lateral to lateral incisor wire. Facial and intraoral photographs were taken during retention (Fig. 6).
arches. Class II elastics were used in conjunction with the maxillary torque force, and vertical elastics to maxillary canines for cusp seating near completion.

The active treatment time was 26 months. Retainers are a maxillary Hawley appliance and a mandibular bonded lateral to lateral incisor wire. Facial and intraoral photographs were taken during retention (Fig. 9).

REFERENCES


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