

Lower Incisor Extraction in Orthodontic Treatment

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Four Clinical Reports

Four different clinical cases in which the treatment plan finally selected included the extraction of one lower incisor and reduction of upper anterior tooth width.

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Most orthodontists have treated at least one patient in whom a lower incisor was either missing or so seriously damaged by injury or disease that its removal presented the best prospect for the patient. These experiences make one well aware of the unfavorable anterior tooth size discrepancy that may exist in such cases, and the difficulties that this presents in achieving a good occlusal result.

In some cases, however, the intentional extraction of a lower incisor can enable the orthodontist to produce enhanced functional occlusal and cosmetic results with minimal orthodontic manipulation. Four very different cases in which the treatment plan included the extraction of one lower incisor are presented here. Each is presented with a full discussion of the rationale, potential problems, clinical procedures and results.

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Fig. 1 Case 1, cephalometric tracings superimposed on anterior cranial base
pretreatment - solid lines
posttreatment - dashed lines

Case 1 — Female, 13 years

Figs. 1-3

This patient's concerns were centered on the cosmetic and dental hygiene aspects of the severe lower incisor irregularity, which was the only dental relationship presenting a need for correction.

The molar relationships were normal, with centric occlusion and centric relations coincident. The maxillary dental arch was generally well aligned, with the maxillary dental midline coincident with the facial midline. The lower dental midline deviated 4mm to the left.

The profile was straight, with good ver-

tical balance and lip competence. Cephalometric analysis showed all skeletal and dental relationships within normal limits.

Intraoral tissues were normal and healthy, except for a lack of attached gingivae on the labial aspect of the lower left cuspid. Bolton tooth-size analysis* showed a lower anterior excess of only 0.4mm.

Treatment goals were to alleviate the lower arch length deficiency without excessive dental expansion or unfavorable profile changes.

*Bolton, W. A., Disharmony in tooth size and its relation to the analysis and treatment of malocclusion, *Angle Orthod.* 28:113-130.

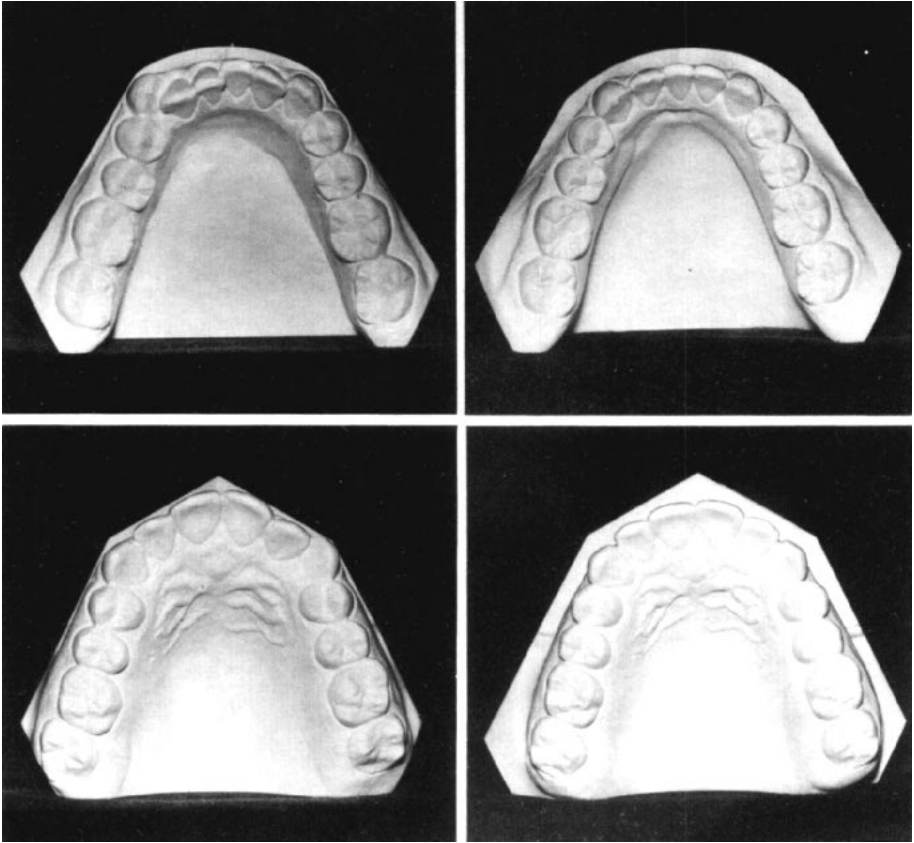


Fig. 2 Case 1, occlusal views of dental casts
left - pretreatment
right - posttreatment

Treatment

Three approaches to the treatment of this malocclusion were considered — nonextraction, four bicuspid extraction, and lower incisor extraction.

Nonextraction was ruled out because of the severe lower arch length deficiency, the inadequate zone of attached gingivae labial to the lower left cuspid, and the risk of long-term instability.

It was believed that the extraction of four first bicuspid could result in excessive retraction of the uncrowded maxil-

lary incisors, compromising the facial profile and incisor relationships.

In order to evaluate the possible effects of extracting one lower incisor, a waxed diagnostic setup was constructed. This showed that satisfactory occlusal relationships could be achieved by removing 4.2mm of interproximal enamel from the maxillary anterior teeth to compensate for the newly reversed tooth-size discrepancy. This approach was finally selected because it could alleviate the lower arch length deficiency without affecting the facial profile.

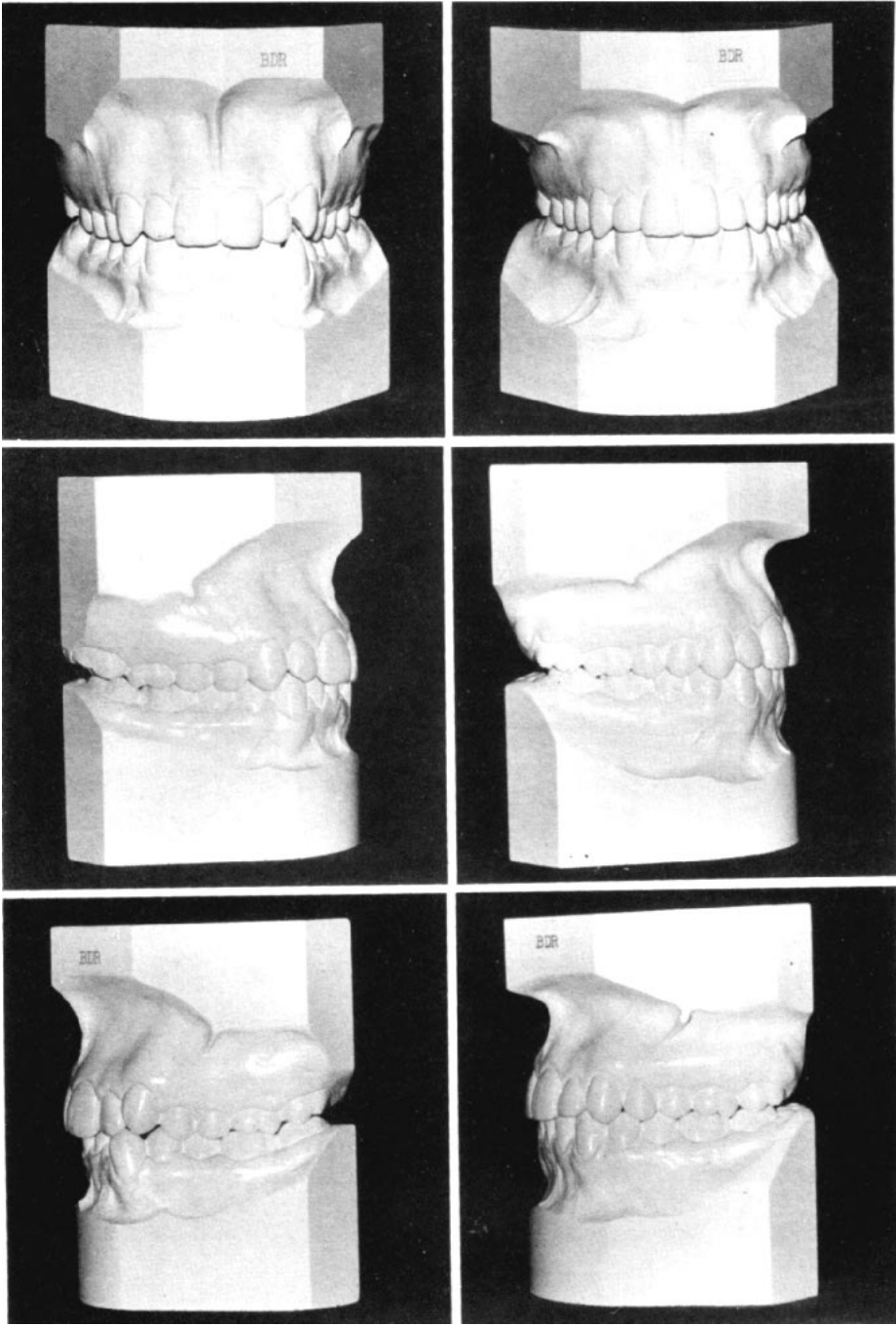


Fig. 3 Case 1, occlusion left - pretreatment right - posttreatment

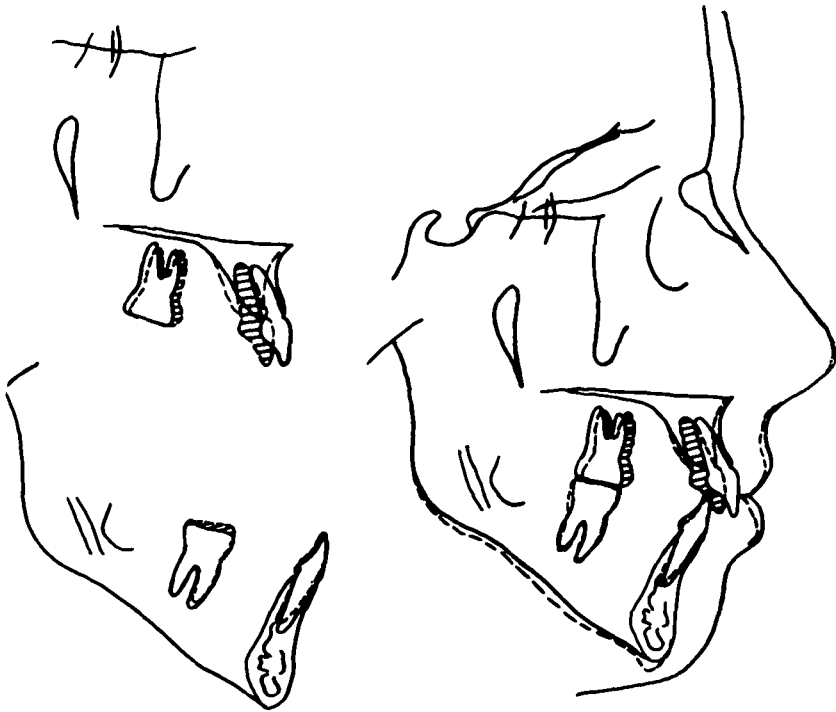


Fig. 4 Case 2, cephalometric tracings superimposed on anterior cranial base
 pretreatment - solid lines
 posttreatment - dashed lines

The active treatment period was 14 months.

Treatment Results

Superimposition of pretreatment and posttreatment cephalometric tracings showed minimal change in the soft tissue profile. The lower arch length deficiency was alleviated. The tooth-size discrepancy created by the incisor extraction was compensated by the removal of interproximal enamel from the maxillary anterior teeth. Cuspid disclusion was present in lateral excursions, there were no balancing interferences, and the posterior teeth discluded completely in protrusive function.

Case 2 — Mature adolescent female *Figs. 4-6*

This patient was referred by her general dentist, who was concerned about the irregularity and poor functional relationships of her teeth. The facial profile was convex, with a 4mm interlabial gap with the lips in repose.

Centric occlusion was coincident with centric relation, with a Class II molar relationship. Both arches were crowded. All cuspids were rotated and blocked out of the arch labially, with no cuspid function in excursive movements of the mandible. Bilateral balancing interferences

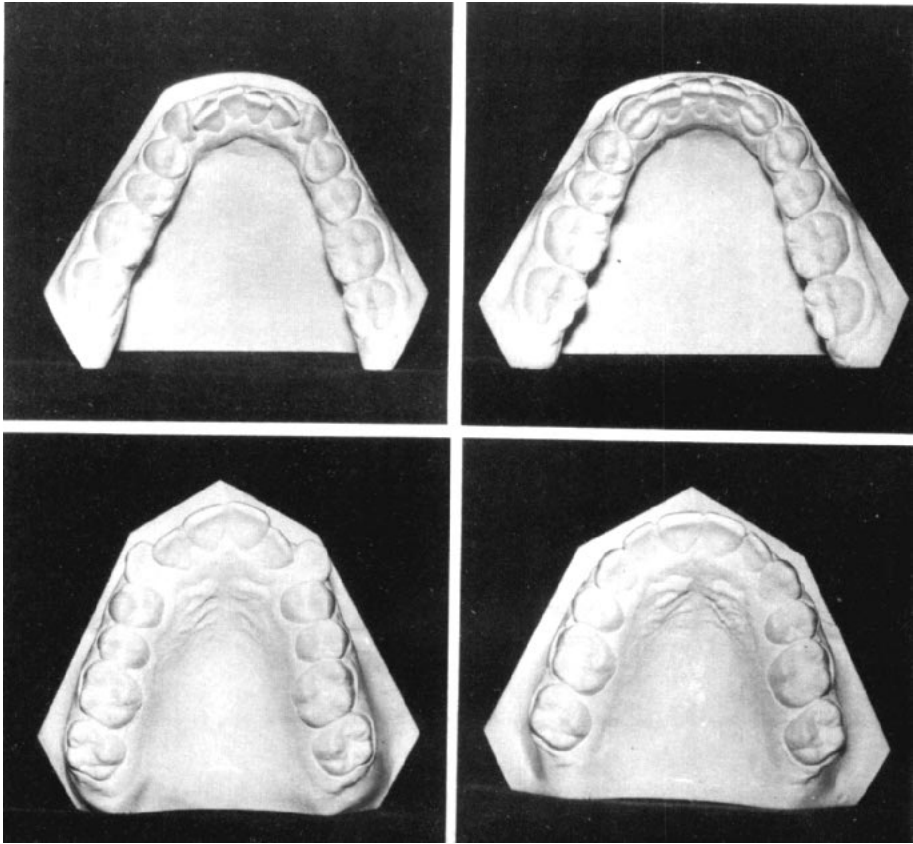


Fig. 5 Case 2, occlusal views of dental casts
left - pretreatment
right - posttreatment

were noted. The maxillary left first molar was in lingual crossbite.

Cephalometric analysis revealed a retrusive skeletal pattern with a retrognathic mandible. Incisor angulations were acceptable. The Bolton tooth size analysis showed a 1.1mm lower anterior excess. Intraoral examination revealed an insufficient zone of attached labial gingivae at both lower cuspids.

The objectives of treatment were to improve the functional occlusion and to improve facial esthetics by reducing lip strain.

Treatment

Three treatment alternatives were considered — extraction of upper first bicuspid and lower first or second bicuspid, bicuspid extractions with orthognathic surgery, and extraction of upper first bicuspid and one lower incisor.

In a nongrowing patient with this degree of crowding, there was concern whether the extraction of four bicuspid could provide enough space to correct both the crowding and the molar relation-

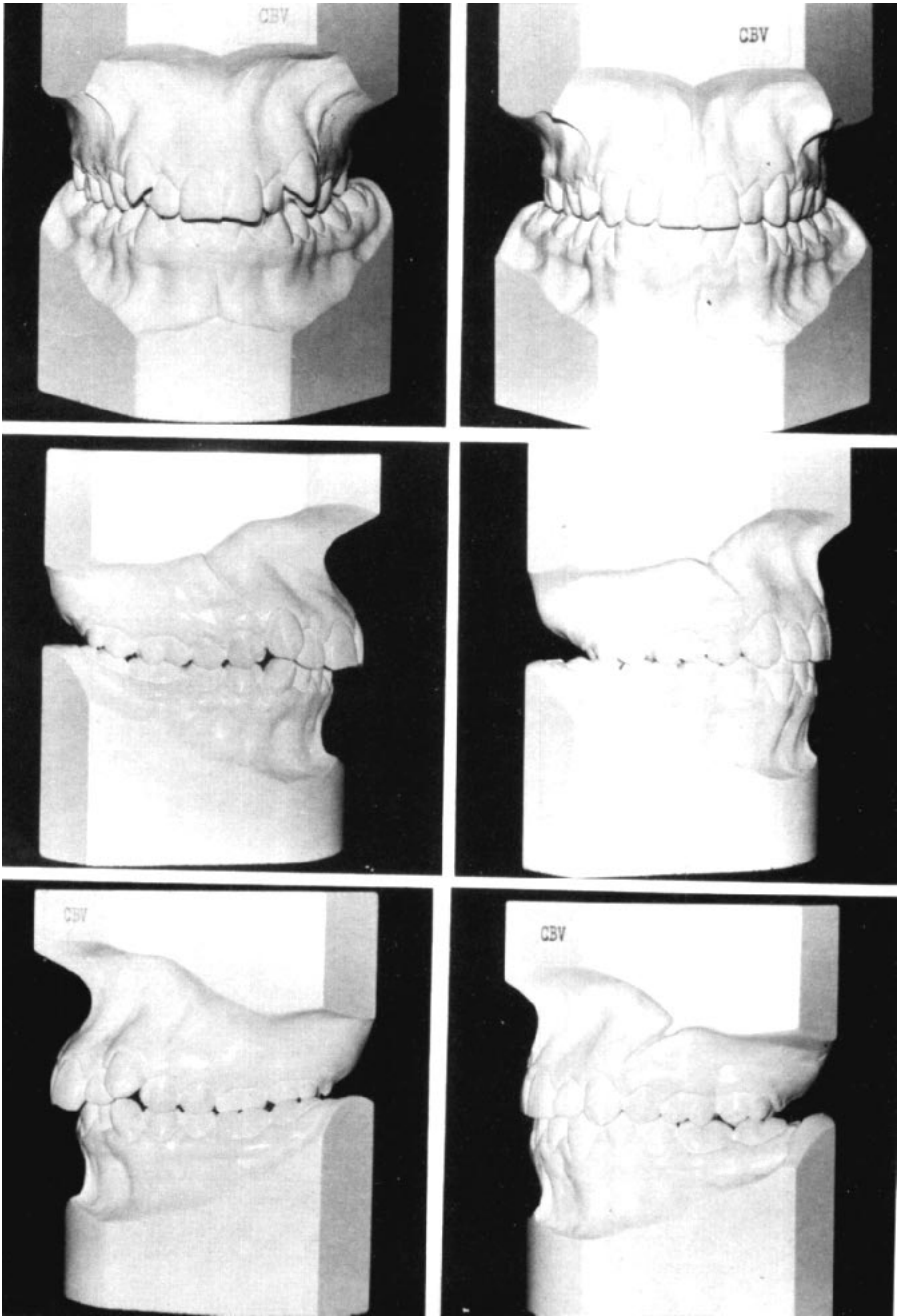


Fig. 6 Case 2, occlusion left - pretreatment right - posttreatment

ships without significant proclination of the lower incisors.

Orthognathic surgery was suggested, but the patient declined.

The third alternative, extraction of upper first bicuspid and one lower incisor, was evaluated with a diagnostic setup. This showed 2.9mm of upper tooth width excess. Since this alternative could alleviate the upper and lower crowding without jeopardizing the anteroposterior position of the lower incisors, it was selected.

The active treatment period was 23 months.

Treatment Results

Cephalometric superimposition showed minimal change in lower incisor position, with retraction of the upper incisors and a slight reduction in lip protrusion.

The arch length deficiencies were alleviated. The tooth-size discrepancy created by the incisor extraction was compensated by removal of interproximal enamel from the maxillary anterior teeth.

Cuspid disclusion was present, there were no balancing interferences in lateral excursions, and posterior teeth discluded completely in protrusive function.

Case 3 — Female, 44 years

Figs. 7-9

Periodontal concerns dominated in this Class II, division 2 malocclusion. The malocclusion was complicated by a significant lower arch length deficiency and diseased periodontium. Although the prognosis for several teeth was poor, no teeth were removed prior to orthodontic treatment.

The Bolton tooth-size analysis showed a lower anterior excess of 1.7mm. Treatment objectives included aligning the teeth without significant expansion,

establishing a satisfactory functional occlusion with minimal tooth movement, and maintaining or improving facial esthetics.

Treatment

The treatment alternatives considered included bicuspid extraction, lower incisor extraction, and orthognathic surgery.

Any combination of upper and lower bicuspid extraction was rejected because it was considered impossible to alleviate the arch length deficiencies and still provide enough space for correction of the anteroposterior relationships. This approach also would not provide for correction of the skeletal disharmony, thus requiring significant compensatory tooth movement.

Extraction of upper first bicuspid and a lower incisor was evaluated with a diagnostic setup, which showed a residual excess of 2.2mm in upper incisor width. While this treatment plan was preferable to the first, it still could not satisfy all of the treatment objectives.

The alternative ultimately selected was the third, combining surgical lengthening of the mandible with extraction of a lower incisor. This treatment plan offered the possibility of achieving all objectives, including a satisfactory occlusion, minimal tooth movement, and improved facial esthetics.

Total treatment time was 24 months, including 12 months of preoperative orthodontics, a 3-month surgery/healing period, and 9 months of postoperative orthodontic finishing.

Treatment Results

All orthodontic objectives were achieved. The patient was seen monthly by her periodontist for maintenance therapy throughout the treatment period, and

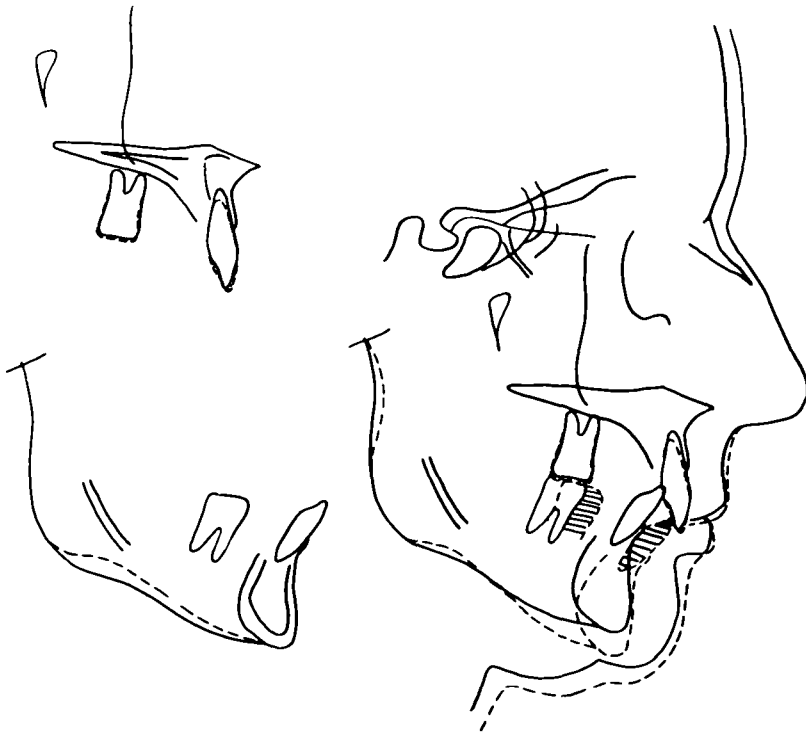


Fig. 7 Case 3, cephalometric tracings superimposed on anterior cranial base
 pretreatment - solid lines
 posttreatment - dashed lines

she experienced no major problems. Her periodontal condition had so improved by the end of treatment that she required less surgical periodontal therapy than originally anticipated.

Case 4 — Female, 25 years

Figs. 10-12

The chief complaint was sensitivity due to maxillary central incisor root exposure. Other concerns included an "uncomfortable bite" and a cosmetically unpleasing smile.

The malocclusion was Class II, Divi-

sion 2, with maxillary arch length deficiency and a posterior crossbite on the left side. The dental midlines were coincident with each other and with the facial midline. Centric relation was coincident with centric occlusion.

Lateral cephalometric evaluation showed a Class II skeletal pattern with maxillary dentoalveolar protrusion. With the exception of several areas of gingival recession, the patient was in good periodontal health.

Treatment goals were to alleviate the arch length deficiencies and improve the functional occlusion.

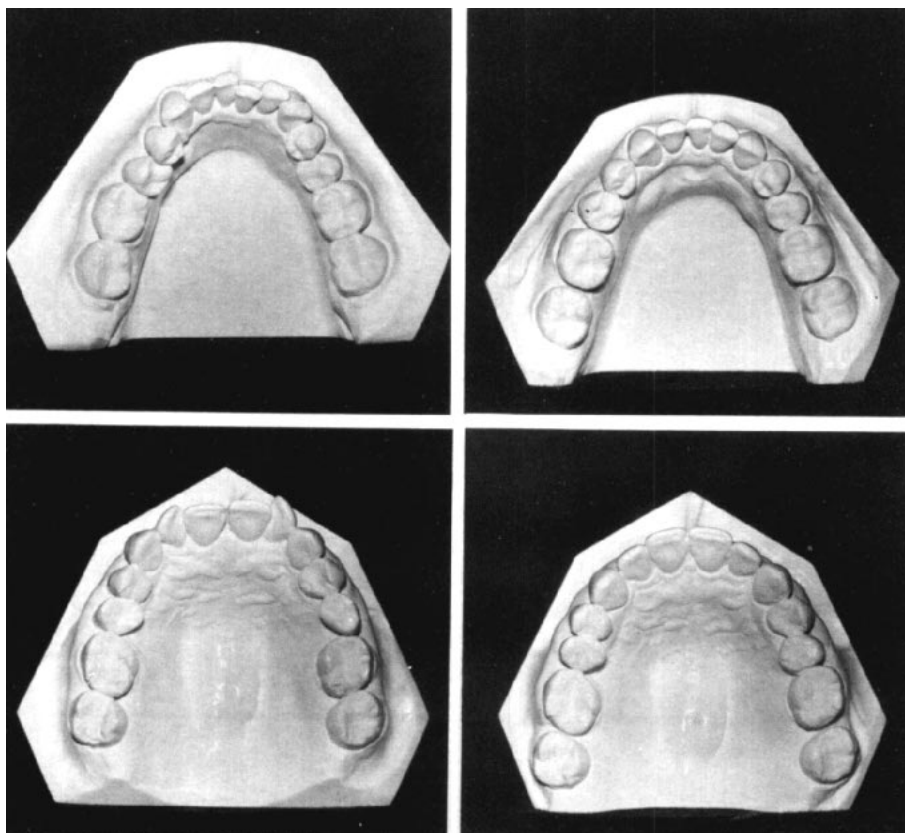


Fig. 8 Case 3, occlusal views of dental casts
left - pretreatment
right - posttreatment

Treatment

Several treatment plans were considered, including two combinations of bicuspid extractions and extraction of upper bicuspid along with a lower incisor.

Extraction of four bicuspid was rejected because of concern over the difficulties in correcting both the arch length deficiencies and the anteroposterior dental relationships.

While the Bolton tooth-size analysis showed only a 1.1mm lower anterior excess, a diagnostic setup was neverthe-

less used to evaluate the occlusion after extraction of upper first bicuspid and the lower left central incisor. This showed that a satisfactory occlusion could be achieved if the orthodontic therapy was augmented by the reduction of interproximal enamel on the distal of the upper central incisors.

The latter course of treatment was followed, with an active treatment time of 24 months. Since anchorage control was critical, a high-pull headgear to the first molars was used during maxillary space closure. A transpalatal arch added additional anchorage support.

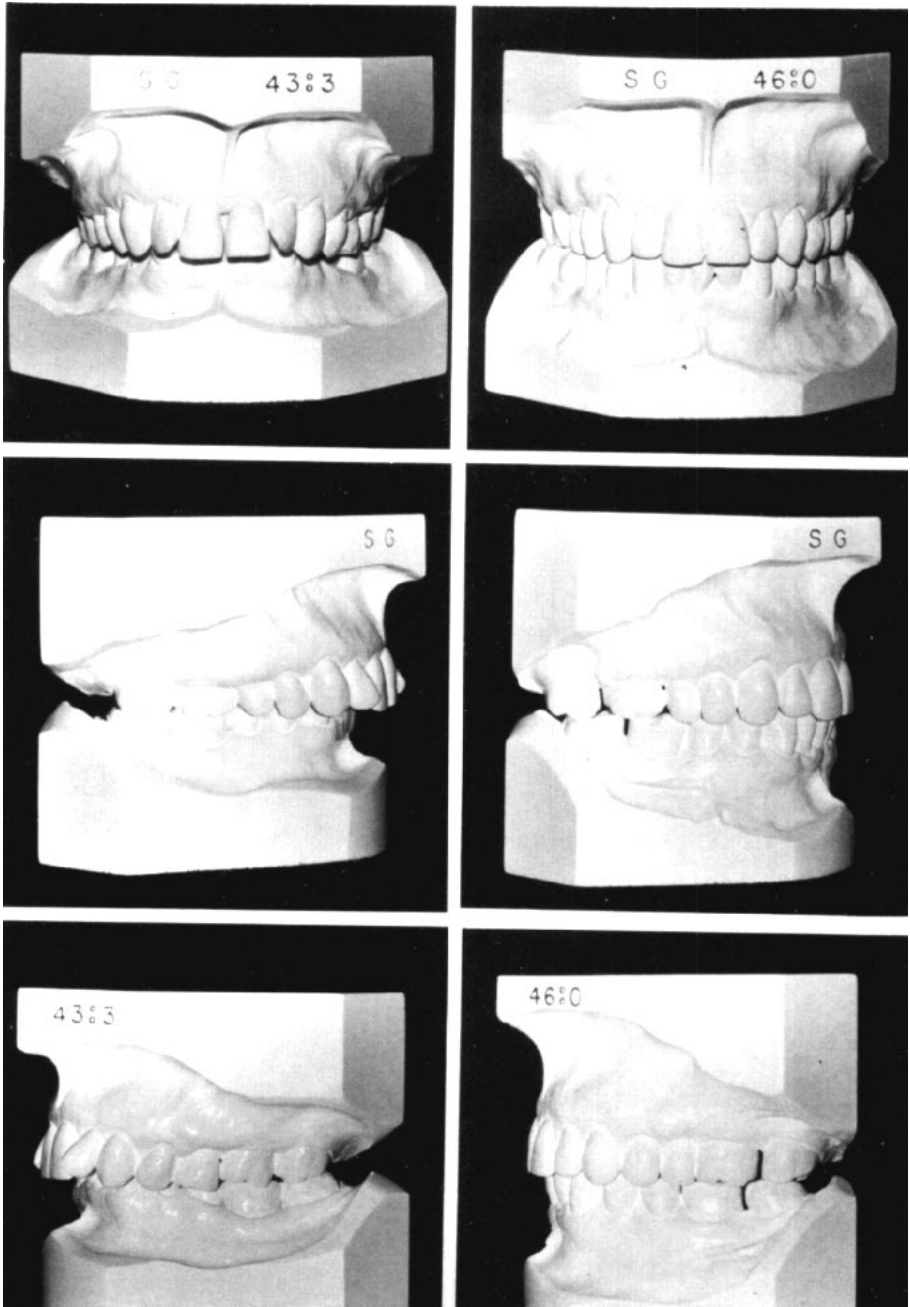


Fig. 9 Case 3, occlusion

left - pretreatment

right - posttreatment



Fig. 10 Case 4, cephalometric tracings superimposed on anterior cranial base
pretreatment – solid lines
posttreatment – dashed lines

Treatment Results

The maxillary incisors were reduced interproximally after all of the extraction spaces were closed and a satisfactory posterior occlusion had been established. Satisfactory relationships were achieved, although equilibration might be indicated after replacement of the stainless steel crown on the maxillary left first molar.

Discussion

The rationales for extraction of a lower incisor in the four cases described were based on specific individual treatment

objectives. In each case the results were enhanced or treatment was facilitated by some combination of minimizing or completely avoiding arch expansion, protecting the supporting structures, decreasing the amount of tooth movement, minimizing facial change, and reducing treatment time.

HOWEVER, if lower incisor extraction is recommended without careful planning, the resulting occlusal discrepancy often cannot be resolved satisfactorily. The following discussion will address several key considerations in making the decision to extract a single incisor.

As with all orthodontic treatment, a

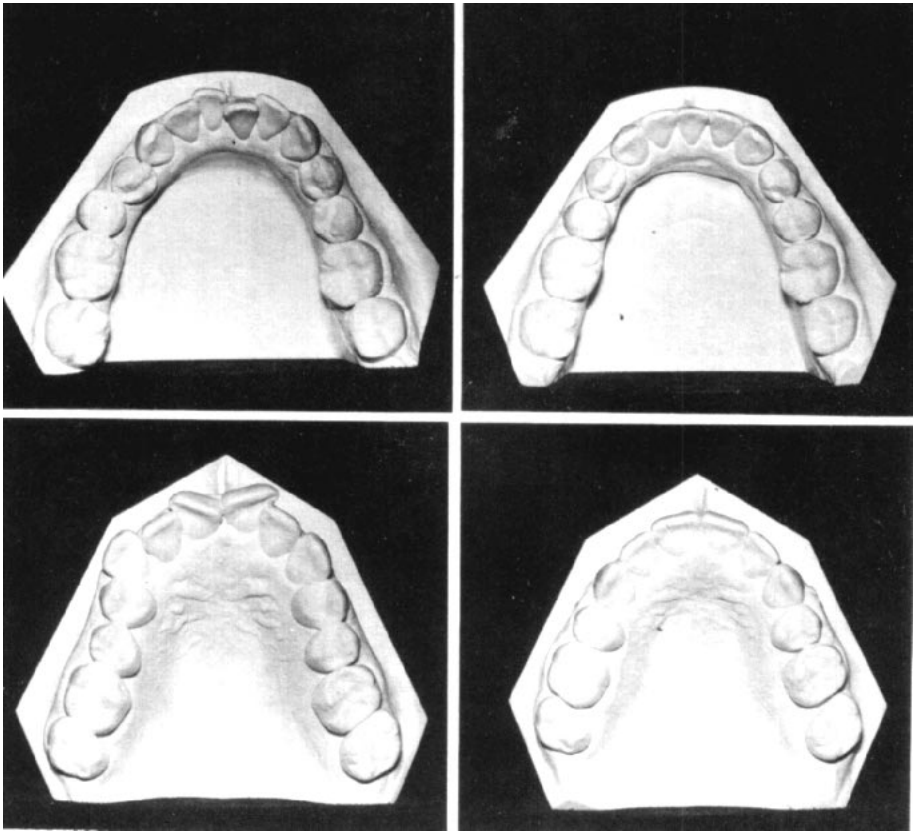


Fig. 11 Case 4, occlusal views of dental casts
left - pretreatment
right - posttreatment

careful examination including complete diagnostic records is critical. The authors consider a tooth-size analysis an important part of this evaluation. In some situations this may indicate little likelihood of a successful result with an incisor extraction, as in a case of significant maxillary anterior excess. On the other hand, if the analysis shows a lower anterior excess, the extraction of a lower incisor might have a positive effect.

A careful and realistic diagnostic setup can be an important aid in determining whether the occlusal result would be acceptable and consistent with the treat-

ment objectives. It can also demonstrate the amount of interproximal enamel that might be removed from the upper incisors, if that is to be considered.

How much enamel can be safely removed from the interproximal surfaces of the maxillary teeth? One limiting factor is obviously the thickness of the enamel. This can only be determined from exactly aligned and exposed radiographs. Enamel removal can be distributed among ten maxillary interproximal surfaces (the mesial surfaces of both cuspids and proximal surfaces of the four incisors) to compensate for lower incisor

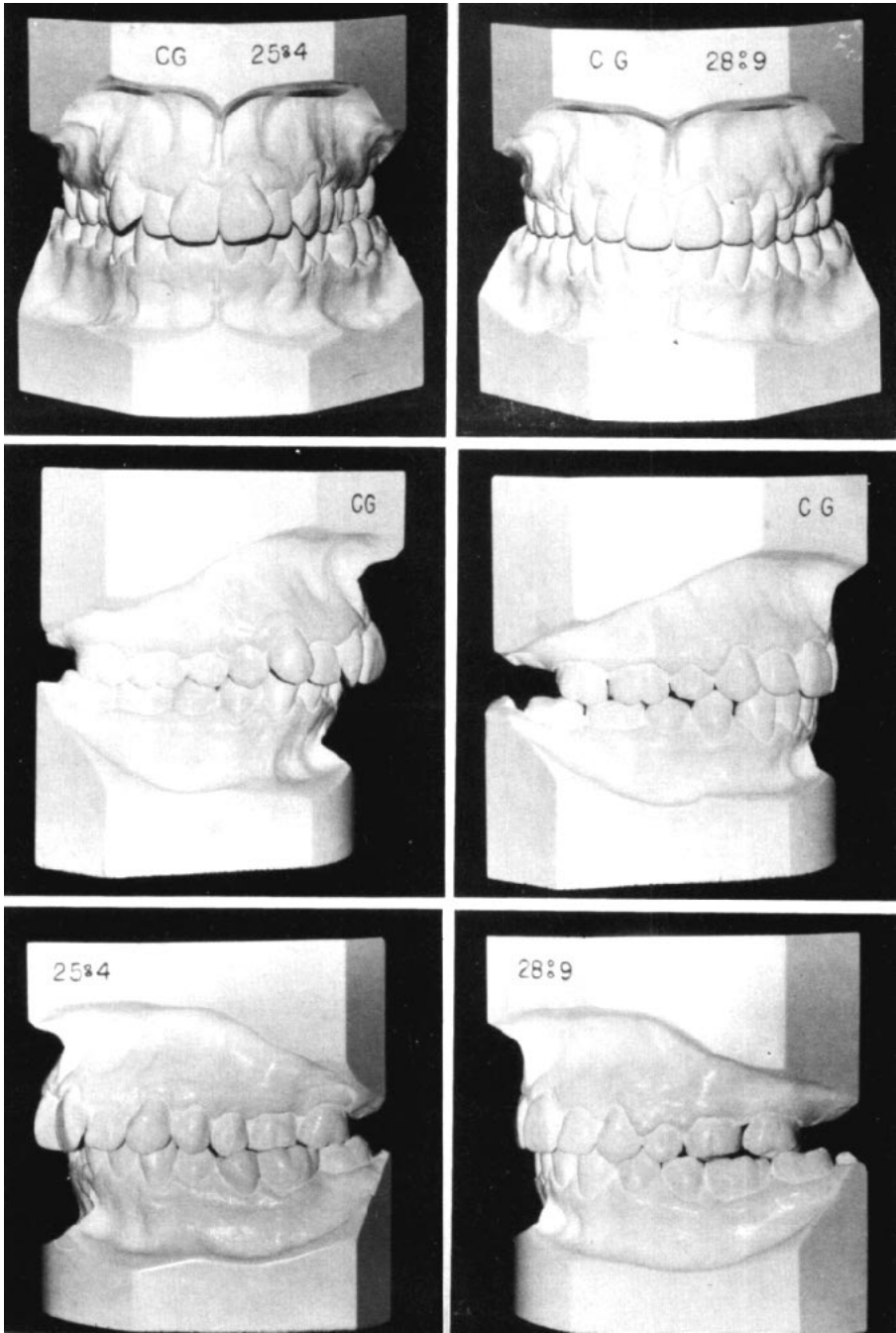


Fig. 12 Case 4, occlusion left – pretreatment right – posttreatment

extraction. The proximal enamel is usually thickest on the mesial surfaces of the cuspids and the distal surfaces of the central incisors, while the mesial surfaces of lateral incisors may have only 0.5mm of enamel.

The potential for reducing maxillary incisor width is also related to tooth shape. Those teeth which are wider at the incisal edge than near the cervical region are easier to reshape. Interproximal enamel reduction is most difficult and hazardous for those teeth which are widest in the cervical region. A diagnostic setup can also help to identify the areas where reduction will be most effective.

Excessive reduction of the anterior teeth can cause problems. If all enamel is removed from an interproximal surface, the potential for caries increases substantially, restoration is more difficult, and the teeth may be more sensitive to changes in temperature. In addition, if the interproximal surface is indiscriminately flattened, the interproximal contact will be lengthened gingivally, further reducing the space for the gingival papilla.

The longer the contact, the poorer the cosmetic result. In clinical practice these complications are rare; the most common problem is still achieving a satisfactory occlusal result.

Extraction of a lower incisor also affects the interocclusal relationships of the anterior teeth. If the maxillary anterior tooth widths cannot be reduced sufficiently, an overjet may remain. This may be reduced by establishing contact between the lower incisor edges and the lingual surfaces of the maxillary incisors.

Another way of compensating for residual overjet is by altering the angulation of the incisors. If the maxillary incisors are retroclined and the lower incisors are proclined, centric contact between the anterior teeth is easier to achieve. If incisal centric contact is maintained, the

patient will probably also have incisal guidance, with no posterior contacts in protrusive function.

Another potential problem with lower incisor extraction is that the lower cuspids are positioned more mesially. As a result, their cuspid tips will often contact the distolingual marginal ridges of the maxillary lateral incisors rather than the mesial fossae of the maxillary cuspids. This interference may be compensated by either equilibrating the nonfunctioning portion of the lower cuspid cusps, or extruding the lower incisors to maintain occlusal contact in centric occlusion. If the maxillary anterior tooth size excess is managed successfully, one can usually still achieve a cuspid-protected occlusion.

In some cases it is impossible to adequately compensate for the tooth size imbalance, so it may not be possible to achieve a cuspid rise. In these cases, group function may be produced orthodontically and by equilibration to eliminate cross-arch balancing interferences.

Summary

Records of four patients treated with the extraction of a mandibular incisor illustrate some of the special considerations involved in this type of therapy. Although the indications for this type of extraction decision are relatively rare, the possibility of incisor extraction should be a part of every clinician's portfolio of treatment techniques. If it is carefully planned and executed in the proper situation, incisor extraction can be an effective way of satisfying a particular set of treatment objectives.

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