

# Lower incisor extraction: An orthodontic treatment option

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## Abstract

Lower incisor extraction can be regarded as a valuable option in the pursuit of excellence in orthodontic results in terms of function, aesthetics and stability. The aim of this study was to gather information about the indications, contraindications, advantages, disadvantages and stability of the results achieved in treatments performed with lower incisor extraction. This treatment option may be indicated in malocclusions with anterior tooth size discrepancy due to narrow maxillary incisors and/or large mandibular incisors. It is contraindicated in malocclusions without anterior discrepancy or with discrepancies caused by large maxillary incisors and/or narrow mandibular incisors. The literature suggests this method affords improved posttreatment stability compared with premolar extraction. As well as a careful diagnosis, established with the aid of a diagnostic setup, professional skills and clinical experience are instrumental in achieving successful orthodontic results with this treatment option.

**Keywords:** Orthodontics. Corrective Orthodontics. Tooth extraction.

## INTRODUCTION

The development of orthodontics through scientific research and clinical observations has brought with it the realization that in order to achieve a normal occlusion tooth extraction is often required, be the extracted teeth premolars—as is predominantly the case—or other teeth.

Extractions for orthodontic purposes were made as early as the eighteenth century by Hunter, whose reports were published in his book: “The Natural History of Human Teeth.” Edward Hartley Angle condemned this practice in the belief that “...better balance, more harmony and the best possible proportions of the mouth in its multiple

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relationships require the presence of all teeth and each tooth should occupy a normal position.”<sup>3</sup>

This assertion was disputed by Calvin Case, who argued that the basal bones could not be induced by mechanical means to grow beyond its inherent size. Therefore, without extractions it would not be possible to resolve severe skeletal-dental discrepancies, and it would not justify compromising normal occlusion and producing severe protrusion by keeping all teeth in the mouth.<sup>3</sup> Case warned, though, that patients should not be treated according to a single model since malocclusions can have either hereditary and environmental origins, or even a combination of the two.<sup>3</sup> Therefore, extraction of permanent teeth should be considered in the treatment of certain malocclusions.<sup>3</sup> Eventually, tooth removal became common practice in orthodontic treatment and the first premolars were almost always selected due to their proximity to the incisors, which enabled correction and retraction of these teeth.

If, on the one hand, extractions facilitated orthodontic mechanics, on the other, they brought to light a range of treatment options, and in order for better planning to be established and practiced it is crucial that diagnosis be thorough and well executed. Besides periapical, panoramic and occlusal X-rays, cephalograms, photographs and models, it is essential to produce a diagnostic setup.<sup>4</sup>

Prior to choosing the most favorable treatment option it is important to analyze treatment goals, stability, the final occlusion to be achieved and the esthetic conditions that constitute a case. In view of this fact, lower incisor extraction becomes an alternative treatment for malocclusions that do not fit the conventional forms of extraction since they are more stable in the long term.<sup>21</sup>

The aim of this study was to compile available information in the literature, emphasizing indications, contraindications, advantages and disadvantages, stability of results, limitations, clinical considerations and case reports on the extraction

of mandibular incisors as an additional option in the correction of malocclusion.

## INDICATIONS

» Angle Class I malocclusion with severe anterior tooth size discrepancy (greater than 4.5 mm) due to agenesis of incisors or a deficient mesiodistal diameter of the upper incisors (narrow) or, conversely, excessive mesiodistal diameter of the mandibular incisors.<sup>1,10,17,20,28</sup>

» Dental Class I malocclusions with normal maxillary dentition, adequate posterior intercuspation and lower anterior crowding with lack of space for approximately one mandibular incisor.<sup>1,24,28</sup>

» Dental Class I malocclusions with anterior crossbite due to crowding and protrusion of the lower incisors; adequate posterior intercuspation, acceptable facial esthetics and absence of skeletal-dental discrepancy in the upper arch.<sup>22</sup>

» Cleft lip and palate cases where, after mandibular surgery, it was not possible to establish proper overbite and overjet, rendering necessary the extraction of a mandibular incisor to foster stable surgical results.<sup>23</sup>

» Cases in which one wishes to avoid increasing intercanine width in certain malocclusions.<sup>6,12,20,27</sup>

» Malocclusions that tend towards a Class III malocclusion.<sup>8,9</sup>

» As a non-surgical alternative in Class III treatments.<sup>7,8</sup>

» As a compromise solution in adult treatment or in relapse situations.<sup>30</sup>

» Adult patients with mild to moderate Class III malocclusion with relatively small crowding and incisors with a non-triangular form.<sup>8</sup>

» Moderate Class III malocclusions with anterior crossbite, or incisors with edge-to-edge relationship, showing a tendency towards anterior open bite.<sup>7</sup>

» Class II Division 1 skeletal and dental malocclusions with maxillary protrusion and crowding

or protrusion of the lower incisors. Typically, lower incisor extraction should be associated with the extraction of maxillary premolars while keeping the Class II molar relationship but establishing normal canine occlusion.<sup>11,12,13,18,29</sup>

» Malocclusions with a malformed or periodontally compromised mandibular incisor, whose maintenance would not provide any benefit whatsoever in view of the stability of the dentition as a whole.<sup>6,7,21,28</sup>

It is noteworthy that the main indication to extract a lower incisor is the presence of tooth size discrepancy equal to or greater than 4.5 mm due to lower anterior excess or upper anterior deficiency.<sup>1,15,21,28</sup>

### CONTRAINDICATIONS

» All cases requiring extractions in both arches with severe overbite and horizontal growth pattern, bimaxillary crowding, no tooth size discrepancy in the anterior teeth, anterior tooth size discrepancy due to narrow mandibular incisors and/or broad maxillary incisors, pronounced overjet.<sup>1,28</sup>

» Cases with “triangular” lower incisors and minimum crowding with less than 3 mm lack of space, which should preferably be treated without extractions by stripping the incisors to prevent the reopening of spaces and loss of interdental gingival papilla between the remaining incisors, which might compromise esthetics.<sup>2,8,20,28</sup>

» Cases where the diagnostic setup demonstrates that lower incisor extraction can result in excessive overbite.<sup>29</sup>

» Cases in which a high insertion of the lower labial frenum may cause gingival recession in the remaining incisor to be moved to the frenum area.<sup>29</sup>

### ADVANTAGES

Lower incisor extraction apparently includes the following advantages:

» Maintains or reduces intercanine width.<sup>10</sup>

» Maintains the overall arch form, minimizing or preventing its expansion, preserving supporting structures<sup>11</sup> and increasing the potential for greater stability.<sup>6,28</sup>

» Reduces retention time as the likelihood of relapse is decreased.<sup>6,28</sup>

» Quickly retracts anterior segments, if necessary.<sup>6,28</sup>

» Diminishes the risk of anchorage loss since there is a solid anchorage unit in the posterior segments.<sup>6,28</sup>

» Reduces the need for elastic use. This is especially important for children or patients with behavioral disorders or non-compliant individuals.<sup>6,28</sup>

» Provides space in the area of greater crowding in the pretreatment stage.<sup>8,10,24</sup>

» Improves parallelism between lower anterior tooth roots and reduces root proximity.<sup>10</sup>

Mandibular incisor extraction allows a reduction in tooth volume, minimizing changes in profile while reducing treatment time.<sup>11,22</sup> It allows orthodontists to improve dental occlusion and esthetics through minimum orthodontic action.<sup>11</sup>

Levin<sup>14</sup> argues that lower incisor extraction:

» Improves facial profile by reducing the appearance of “mandibular protrusion.”

» Enables easy alignment of the lower anterior teeth.

» Establishes an esthetically pleasing and functionally effective overbite.

» Properly positions upper anterior teeth with acceptable axial inclinations instead of having to procline them to enable the positioning of all lower anterior teeth.

### DISADVANTAGES

According to Brandt and Safirstein.<sup>6</sup>

» There is a tendency for space to reopen in the extraction site, especially when a lower central incisor is extracted. Irrespective of the parallelism between the roots adjacent to the extraction area the incidence of space reopening is common.

» It can create a tooth size discrepancy, especially if lower incisor extraction is associated with premolar extraction.

» There may be differences in color between lateral incisors and canines, which are often darker. This complication can and should influence the treatment plan, particularly in female patients.

Other undesirable effects include: increased overbite and overjet beyond acceptable limits, partially inadequate occlusion, crowding relapse in three incisors as well as esthetic loss of interdental gingival papilla in the extraction area.<sup>8,22,28,30</sup>

Removal of a lower incisor also affects the inter-occlusal relationship of anterior teeth. If the upper anterior teeth are not sufficiently reduced through stripping, a more pronounced overjet may remain.<sup>11,25</sup>

According to Canut<sup>7</sup>, in certain cases, especially in adults, space cannot be completely closed or can easily reopen, resulting in a visible diastema in an area of considerable periodontal and esthetic importance. Moreover, an inadequate dental midline relationship compromises dental esthetics.

Sheridan and Hastings<sup>25</sup> argue that a remaining triangular space may appear in the extraction area, especially in older patients.

## DIAGNOSTIC SETUP

Setup is a diagnostic tool that shows orthodontic treatment outcome in study models to aid in determining the best treatment option. One can simulate various treatment options such as: without extractions, with stripping, with increased axial inclination, with premolar extraction or associated procedures.<sup>16</sup>

Kokich, Shapiro<sup>11</sup> and Tuverson<sup>29</sup> summarize the importance of the setup as one of the most valuable orthodontic records to determine if a lower incisor requires extraction. Setup is the most accurate method to predict potential interocclusal relations to be accomplished through orthodontic treatment, and it would be reckless to start treatment without first reviewing the overjet and overbite that would result from such procedure. It should be emphasized

that if overbite is excessive or buccal occlusion is unacceptable in the setup, stripping the upper arch should be considered, within acceptable limits. If the occlusal outcome remains dissatisfactory then probably the extraction of an incisor should not be the treatment of choice.<sup>29</sup>

## SELECTION OF THE INCISOR TO BE EXTRACTED

Following the decision to extract one lower incisor, professionals must define which one to remove. Indication depends on a combination of the following factors: type of malocclusion, amount of anterior tooth size discrepancy, arch length deficiency in the anterior region, dental and health conditions of the supporting tissue and upper and lower dental midline relationship.<sup>1</sup>

Type of malocclusion and periodontal tissue health may influence the choice of the tooth to be extracted since if the tooth is diagnosed with ankylosis, tooth rotation or severe ectopic eruption far away from its normal position, it becomes the best option. Extraction of the worst positioned incisor is a means to prevent relapse by limiting the unnecessary movement of many teeth.<sup>7</sup>

Bolton's tooth size analysis may assist in determining the discrepancies and asymmetries in both arches, thereby establishing whether the best indication would be the removal of the wider lateral incisor or the narrower central incisor.<sup>5,30</sup> Some professionals still prefer to remove the narrower central incisor, arguing that it promotes stability, especially in cases with less crowding.<sup>22,26</sup>

Neff<sup>9</sup> reported that he prefers to extract the lateral incisor in the belief that the distal face of a central incisor has better contact with the mesial surface of the canine. He further explains that when extracting a central incisor, contact occurs between the mesial surface of the remaining central incisor and the mesial surface of the lateral incisor, and even if the teeth are perfectly upright and parallel, sometimes an undesirable black triangle remains between the middle third of the tooth and the gingiva.

## PERIODONTAL PROBLEMS

Proper alignment between remaining incisors should be established after a lower incisor extraction to avert periodontal issues with esthetic involvement.<sup>22</sup>

Tuverson<sup>29</sup> warned that gingival recession could occur in the extraction space in patients at risk for periodontal disease, especially if the roots of the teeth adjacent to the space are not positioned correctly. Even in a simple space closure procedure it is essential to overcorrect root parallelism.

In cases with preexisting periodontal problems, Valinoti<sup>30</sup> considered that the decision to remove an incisor on account of buccal gingival recession or the presence of bone defects in the lower anterior area is contraindicated since the problem may persist. One should resort to periodontal treatment before deciding on the best treatment option. If the case does not present with any anterior tooth size discrepancy lower incisor extraction is contraindicated given the preexisting periodontal problem.

## CANINE GUIDANCE

As in all orthodontic treatments, in cases of lower incisor extraction one should also establish canine guidance or group function in the working side, and no interference in the balancing side. Protrusive excursion should result in adequate posterior protrusive disocclusion. As seen in the literature, canine guidance may be lost due to the more mesial positioning of the mandibular canines.<sup>7</sup> However, this could be avoided if an accurate diagnosis is established before deciding to extract a lower incisor.

To Kokich and Shapiro,<sup>11</sup> a more mesial positioning of the lower canines may be compensated by adjusting the non-functional portion of the cusp tips of the lower canines, or by extruding the lower incisors to ensure that the functional contacts are maintained in centric occlusion. If the upper anterior dental excess is properly corrected disocclusion can be established by means

of canine guidance. However, where this is not possible, group disocclusion can be accomplished orthodontically by performing occlusal adjustment and eliminating all balancing interference.<sup>11,12,25</sup>

Valinoti,<sup>30</sup> however, warns that in the occlusion of six maxillary anterior teeth with five lower teeth, canines end up in normal occlusion, or else the upper canines will disocclude with the first premolars, i.e., the distal ridge of the maxillary canines will occlude with the mesio-occlusal ridge of the first mandibular premolars.

One can choose to introduce dental compensations to restore contact between the canines and restore the disocclusion function of these teeth:

- To position the lower canines, either completely upright or with a slight distal crown inclination in relation to their basal bone.
- Incorporate a mild offset on the distal side of the lower canines, making them more prominent.
- If possible, to incorporate artistic bends in the lower incisors in the non-extraction quadrant in order to consume space and distalize the lower canines.
- Strip the upper incisors to move the maxillary canines mesially.
- Position the upper canines with a mesial crown inclination.
- Reduce or remove the offset on the mesial side of the upper canines, making them less prominent.
- Perform a careful occlusal adjustment.

These options for compensatory orthodontic movements should be tested in advance by means of the diagnostic setup.

## STABILITY OF RESULTS

One of the major challenges in orthodontic practice refers to the stability of treatment results. Valinoti<sup>30</sup> suggested in 1994 that the extraction of a lower incisor is less likely to exhibit crowding relapse after retention because the incisor is located closest to the area where the

problem is located, requiring less movement and effort to be exerted on the original conditions of the other teeth. However, there are still limitations that make it difficult to ensure greater stability after retention. Riedel et al<sup>21</sup> suggested that the extraction of a lower incisor can provide greater stability in the anterior area in the absence of permanent retention.

In the long-term, cases with extraction of a lower incisor show less crowding relapse after retention than cases treated with premolar extraction by virtue of the following factors: original position of teeth is in large part preserved so that muscular pressures are less likely to introduce instability, and minimal effort exerted on the adjacent anchorage during space closure, using most of such space to correct the anterior region.<sup>30</sup>

## CASE REPORTS

### Clinical Case 1

#### Diagnosis and etiology

Caucasian male patient, 23 years and 8 months of age. His chief complaint was: "Please straighten out my teeth." The clinical examination showed a mesofacial pattern, no apparent facial asymmetry, straight profile, normal lower face, prominent nose, normal nasolabial angle, nasal breathing, normal speech and swallowing, deviation to the right when opening mandible, presence of TMJ clicking, but with no pain (Fig 1).

The intraoral evaluation revealed low risk of developing caries, healthy gums, Angle Class I molar relationship, canines in Class I, severe lower anterior crowding but mild in the upper arch, reduced overbite, satisfactory posterior occlusion in both the vertical and horizontal direction. Lower midline deviation of less than 1mm to the left side and upper midline coinciding with the mid-palatine raphe (Fig 1).

The model analysis disclosed Bolton's discrepancy with 2.3 mm lower anterior excess.

Panoramic radiograph showed all permanent teeth (Fig 2). Cephalometric analysis was performed to check for protrusion in the maxilla and mandible in relation to the cranial base, skeletal Class II malocclusion, brachyfacial pattern, protruding upper and lower incisors and increased axial inclination. Straight skeletal and facial profiles (Fig 3, Tab 1).

#### Treatment goals

The treatment aimed to eliminate the lower anterior discrepancy, correct the lower incisor crowding, align and level the teeth, and establish adequate overjet and overbite using an orthodontic appliance.

#### Treatment planning and mechanics

A corrective standard Edgewise appliance (0.022x 0.028-in slot) was set up and the patient underwent extraction of the lower left central incisor and stripping in the upper arch. During correction mechanics the following was performed: alignment, leveling and repairing of dental rotations with 0.014-in to 0.020-in stainless steel wire, maintaining the posterior occlusion with passive bends, space closure through tie-back in the archwires, elastic chain and buccal (root) torque in the incisors. In the next step, 0.019x0.025-in archwires were used in the upper and lower arches in a coordinated manner using forms and torques that were ideal for intercuspatation and finishing. The planned retention consisted of upper and lower removable wraparound retainers, and a 3x3 lingual retainer on lower incisors and canines.

#### Treatment results

At the end of treatment there was improvement in facial esthetics, molar and canine in Class I occlusion, normal overjet and overbite (Fig 4).

The main treatment goals were achieved. The lower anterior crowding was corrected after extraction of a lower central incisor.



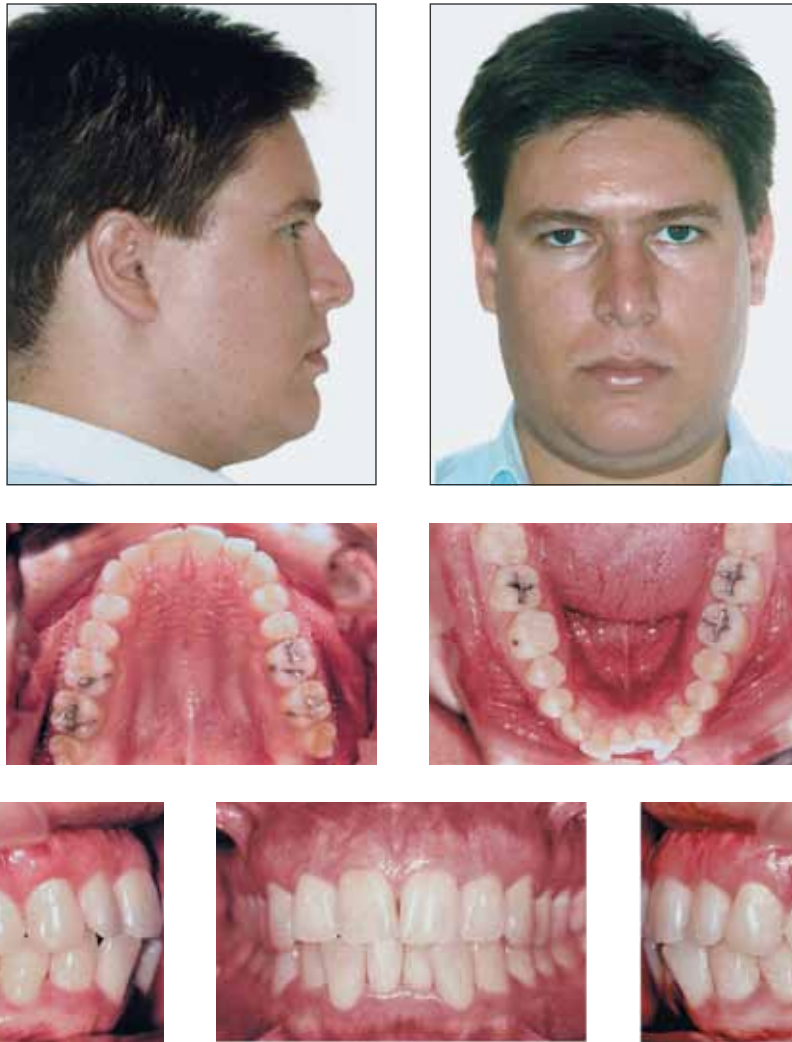


FIGURE 1 - Clinical case 1: initial extraoral and intraoral photographs.

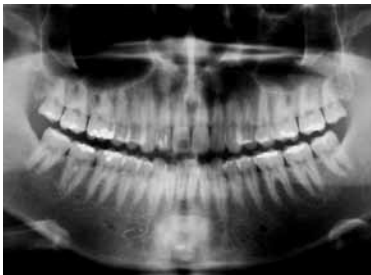


FIGURE 2 - Initial panoramic radiograph.



FIGURE 3 - Initial cephalogram and cephalometric tracing.

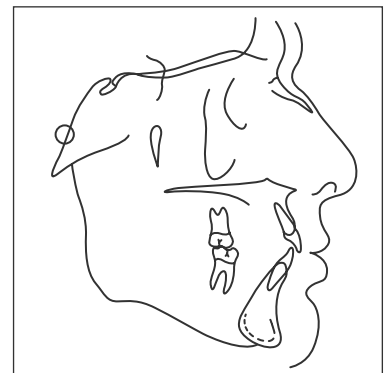


TABLE 1 - Cephalometric evaluation: pretreatment and posttreatment.

Cephalometric Measures	Pretreatment	Posttreatment
SNA	90°	91°
SNB	85°	85°
ANB	5°	6°
NAPg	8°	10°
SNGoGn	24°	22°
NSGn	60°	61°
Facial Axis	94°	94°
1-NA	25°	20°
1-NA	5 mm	5 mm
1-NB	31°	32°
1-NB	8 mm	10 mm
S-Ls	-3	-0,5
S-Li	-1	+1

The occlusion of the molars and premolars, which was very favorable, was maintained by carefully setting up the Standard Edgewise orthodontic appliance. In addition, normal overjet and overbite were attained, and the appropriate mandibular functions were established during lateral and protrusion movements.

Maxilla and mandible were unchanged in the anteroposterior vertical and lateral directions (Fig 5).

In the upper dentition there was no decrease in the axial inclination of the incisors (Fig 5), intercanine width was maintained and intermolar width slightly increased.

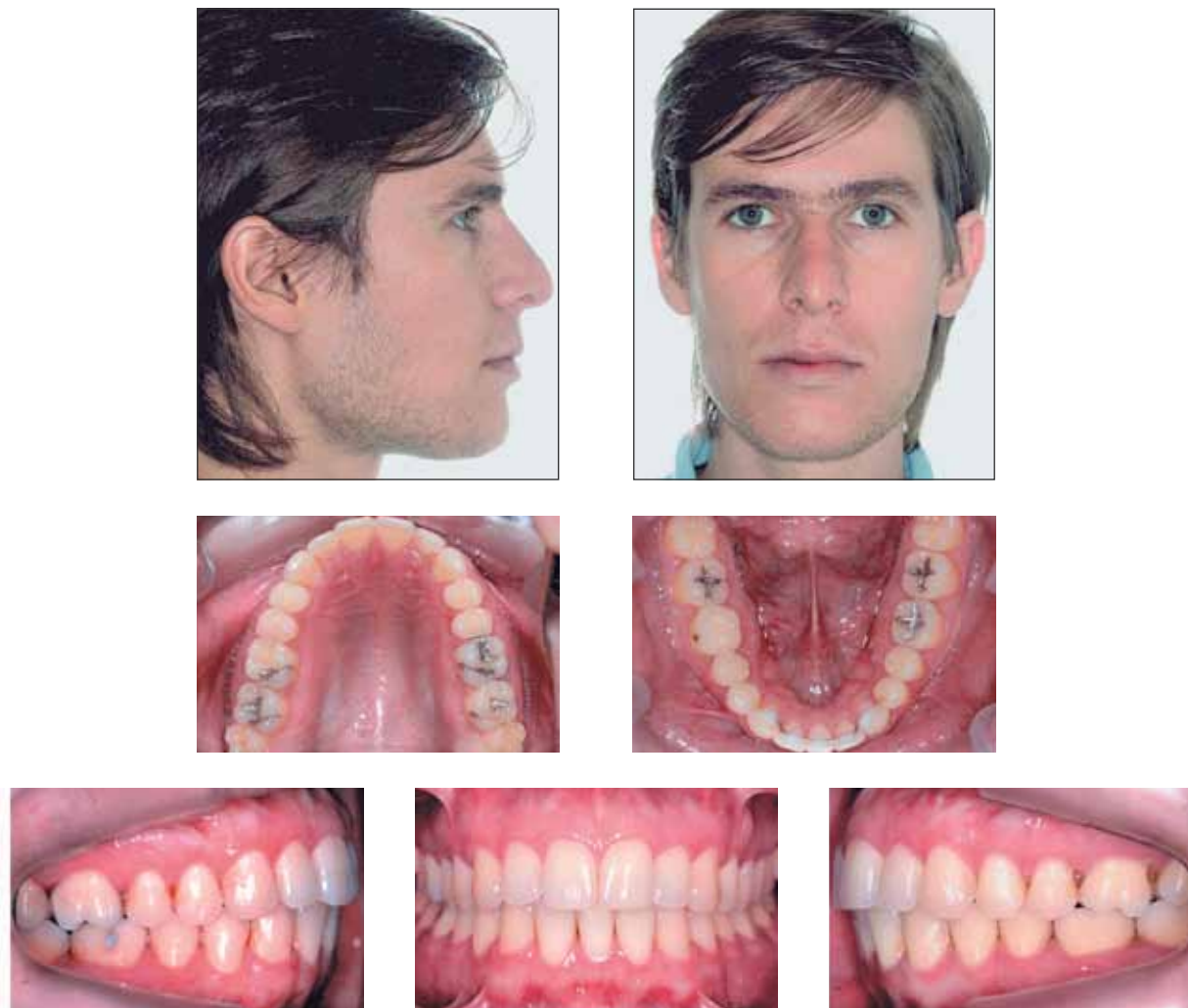


FIGURE 4 - Final extraoral and intraoral photographs.





FIGURE 5 - Final cephalogram and cephalometric tracing.

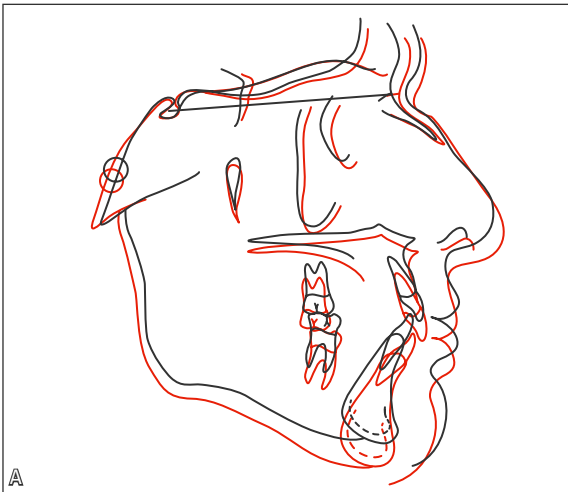
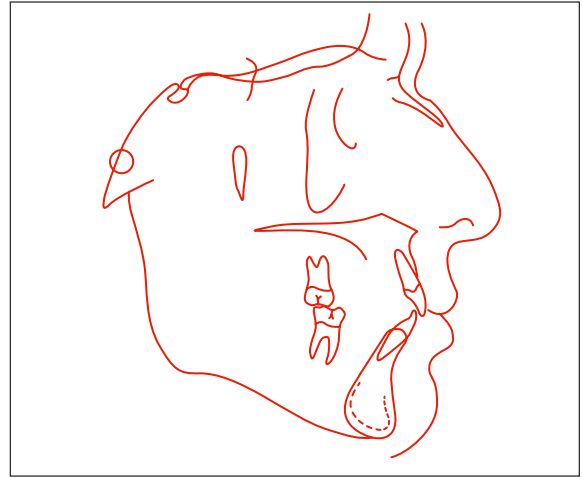


FIGURE 6 - Cephalometric superimpositions.

The lower dentition showed an increase in axial inclination and a slight protrusion of lower incisors (Fig 5), intercanine width was maintained and intermolar width slightly increased.

The complete superimposition illustrates minor facial and dental changes between the beginning and end of treatment, and the partial superimposition of the maxilla and mandible confirmed the decrease in axial inclination of upper incisors and increased protrusion of the lower incisors (Fig 6).

## Clinical Case 2

### Diagnosis and etiology

Caucasian female patient, aged 12 years, with a chief complaint of “anterior crowding.” The clinical examination revealed a mesofacial pattern, symmetrical face, straight profile, normal lower face, average nose, normal nasolabial angle, nasal breathing, normal speech and swallowing, deviation to the right in closing the mandible, and the presence of painless clicking in the TMJ (Fig 7).

The intraoral evaluation disclosed low risk of

caries, healthy gums, occlusal trauma in tooth 21, molar Angle Class I relationship, Class I canines, 0.5 mm overjet and edge-to-edge overbite, crowding of upper and lower incisors. Lower midline deviation of less than 1 mm to the left side and upper midline coinciding with the mid-palatine raphe (Fig 7), nail biting, and enlarged palatine tonsils.

The model analysis indicated negative skeletal-dental discrepancy in the maxilla (-3.0 mm) and mandible (-3.5 mm), Bolton's tooth size discrepancy with 2.7 mm lower anterior excess. Panoramic radiograph showed all permanent teeth, second

premolar with open apex (Nolla stage 9), upper and lower second molars erupted (Nolla stage 8). The germs of the third molars were in the early crown formation phase (Nolla stage 4), except the upper left 3<sup>rd</sup> molar, which had not yet begun to calcify (Nolla stage 1). The trabecular bone and lamina dura were normal, with no images indicative of pathologies (Fig 8). The cephalometric analysis showed protrusion in the maxilla and mandible in relation to the cranial base, skeletal Class I malocclusion, dolichofacial pattern, protruding upper and lower incisors with increased axial inclination.

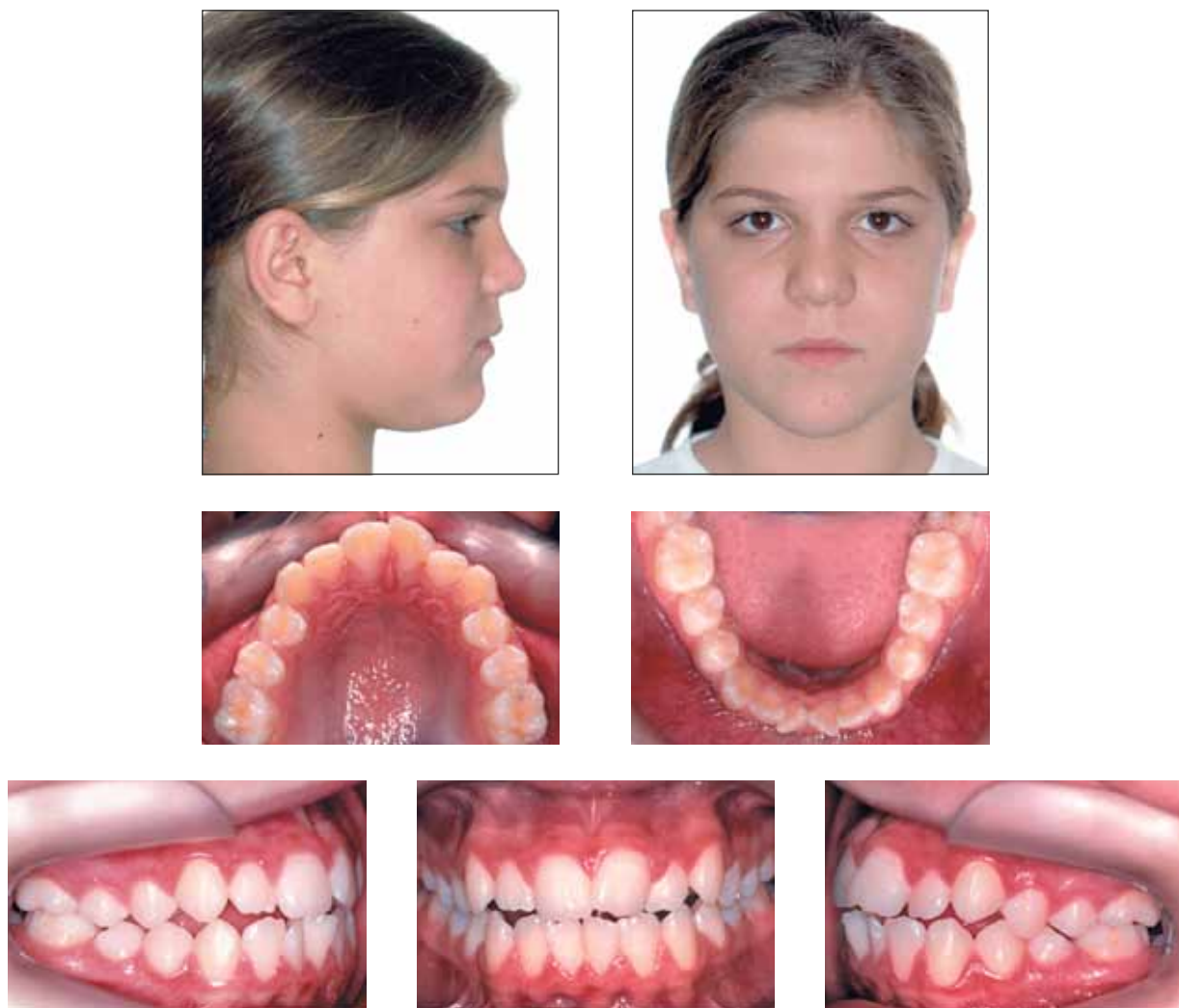


FIGURE 7 - Clinical case 2: initial extraoral and intraoral photographs.

Normal bone profile, straight facial profile and vertical facial growth (Fig 9, Table 2).

### Treatment goals

The objective was to maintain a Class I molar occlusion, eliminate the lower anterior discrepancy, establish appropriate overjet and overbite, align and level the teeth and correct the midline with a fixed orthodontic appliance.

### Treatment planning and mechanics

A corrective standard Edgewise appliance (0.022x 0.028-in slot) was set up and the patient underwent extraction of the lower right central incisor and stripping of the upper canines. During mechanical correction, the fol-

TABLE 2 - Cephalometric evaluation: pretreatment and posttreatment.

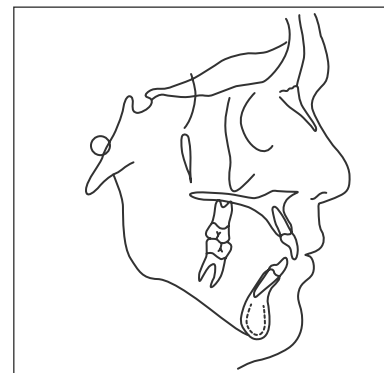
Cephalometric Measures	Pretreatment	Posttreatment
SNA	78°	76.5°
SNB	76°	77.5°
ANB	2°	-1°
NAPg	0°	3°
SNGoGn	36°	30.5°
NSGn	69°	69°
Facial Axis	85°	87°
1.NA	30°	34.5°
1-NA	8.5 mm	11.5 mm
1.NB	32°	25°
1-NB	6 mm	7 mm
S-Ls	0	-0.5
S-Li	-2	-1



FIGURE 8 - Initial panoramic radiograph.



FIGURE 9 - Initial cephalogram and cephalometric tracing.



lowing was performed: alignment and leveling of the upper arch, allowing incisor proclination; retraction of the lower incisors using 0.014-in to 0.020-in stainless steel archwires; mesial migration of the lower left central incisor until the upper midline coincided with half of this tooth; mesial migration of the right mandibular lateral incisor and lower right canine, tooth after tooth, until a Class I canine relationship was achieved. In the next step, rectangular 0.019x 0.025-in archwires were used in the upper and lower arches, in a coordinated manner, with ide-

al forms and torques for intercuspation and finishing. The planned retention consisted of upper removable wraparound retainer and a 3x3 lingual retainer on lower incisors and canines. The patient was referred for evaluation by an otolaryngologist and an audiologist.

### Treatment results

At the end of treatment, the profile became slightly concave, occlusion displayed molar and canine Class I relationship, and adequate overjet and overbite (Fig 10).

The main treatment goals were achieved with the extraction of tooth 41 and lower incisor alignment. The molar and canine Class I relationship was maintained throughout the treatment. There was little change in facial profile, but esthetics was not compromised. From a functional standpoint results were satisfactory as incisor and canine guidances were restored.

The maxilla showed normal growth in the anteroposterior and transverse direction while in the vertical direction it was controlled. The mandible showed increased horizontal growth (Fig 11).

In the upper dentition there was a slight increase in intermolar width and a slight reduction in intercanine width, increased axial inclination and protrusion of the incisors (Fig 11, Table 2).



FIGURE 10 - Final extraoral and intraoral photographs.

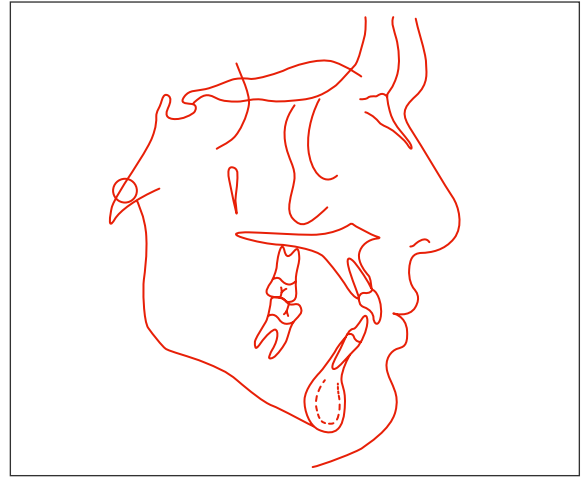


FIGURE 11 - Final cephalogram and cephalometric tracing.

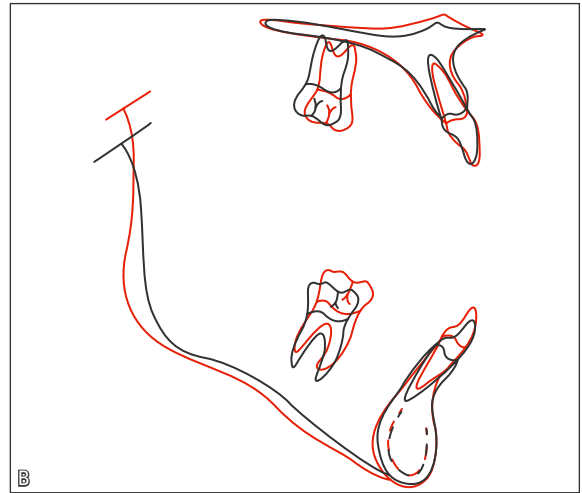
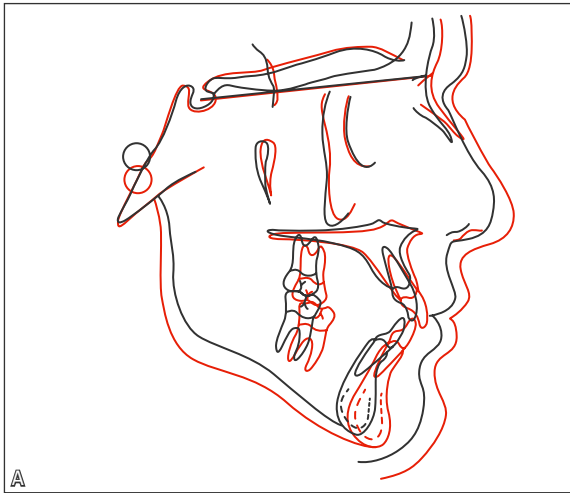


FIGURE 12 - Cephalometric superimpositions.

In the lower dentition there was improvement in incisor inclination, leveling of the curve of Spee and a slight reduction in intermolar and intercanine widths (Fig 11, Table 2).

The superimposition of cephalometric trac-

ings showed increased horizontal growth of the mandible, with counterclockwise rotation (Fig 12A). Partial superimpositions indicate vertical control of the mandible and decreased axial inclination of lower incisors (Fig 12B).



### Clinical Case 3

#### Diagnosis and etiology

Caucasian male patient aged 16 years and 11 months. His chief complaint was: "My lower teeth are crooked." The clinical examination revealed a mesofacial pattern, a slightly asymmetrical face, concave profile, normal lower face, average nose, normal nasolabial angle (Fig 13), nasal breathing, normal speech and swallowing, normal mandibular closing pattern, and normal TMJ.

The intraoral evaluation disclosed low risk of caries, healthy gums, Angle Class I molar

relationship, canines in Class I, crowding of upper and lower incisors, mild overjet and overbite. Lower midline deviation of less than 2mm to the left side and upper midline coinciding with the mid-palatine raphe (Fig 13).

The model analysis indicated no osseodental discrepancy in the upper arch, and negative in the lower arch (-2.5 mm), Bolton's tooth size discrepancy with 4.0 mm excess in the lower arch, and 2.6 mm in the lower anterior region. Panoramic radiograph showed all permanent teeth, with the third molars in formation.

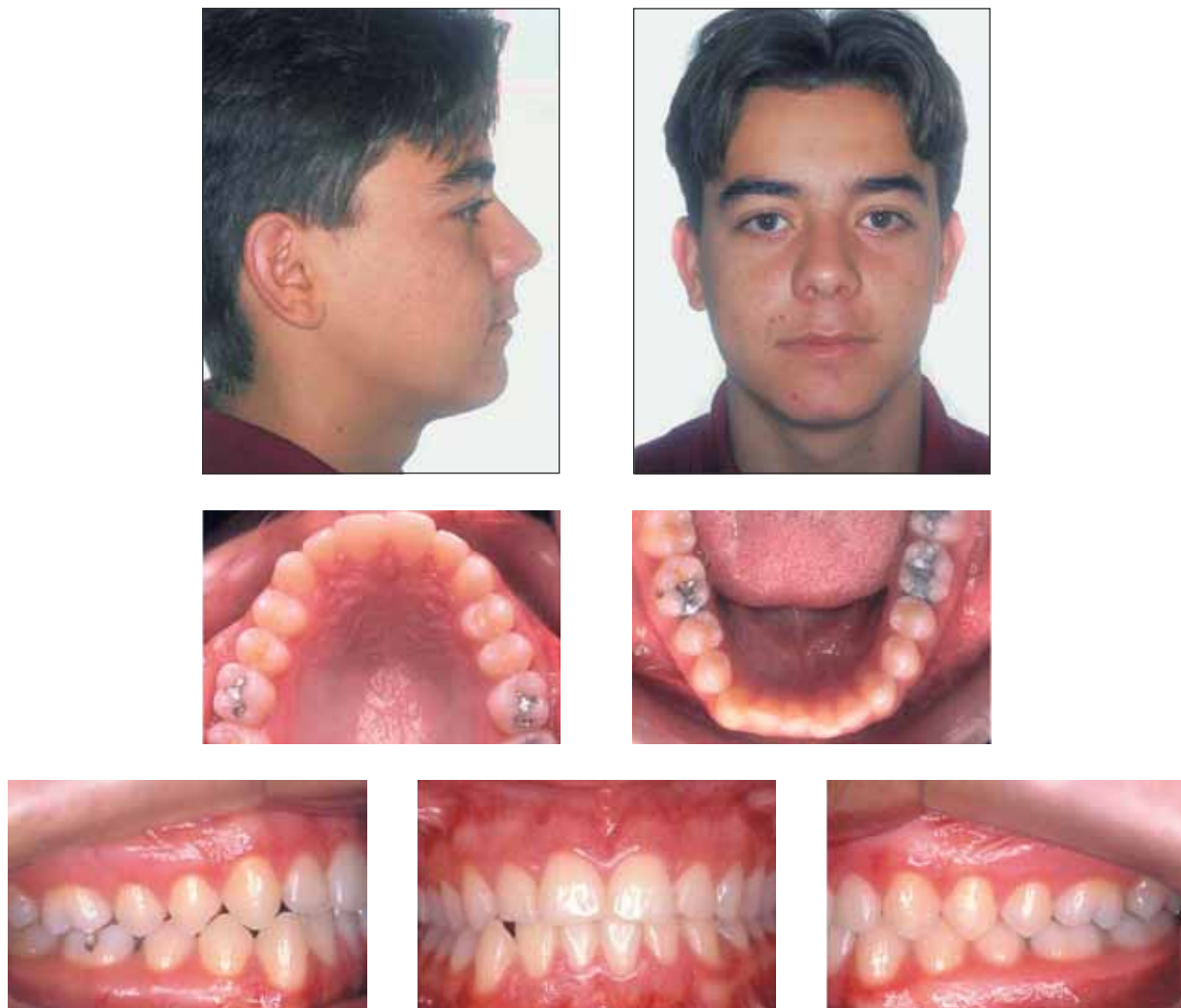


FIGURE 13 - Clinical case 3: initial extraoral and intraoral photographs.

The trabecular bone and bone crests were normal, as well as the lamina dura, with no images indicative of pathology (Fig 14). Cephalometric analysis was performed to verify that both maxilla and mandible were well positioned relative to the skull base and each other, in the anteroposterior direction (skeletal Class I), upper and lower incisors with increased and reduced axial inclination, respectively, with protruding upper incisors and lower incisors well positioned in their basal bones. Normal bone and facial profile slightly concave, normal vertical measures, and meso-facial pattern (Fig 15, Table 3).

TABLE 3 - Cephalometric evaluation: pretreatment and posttreatment.

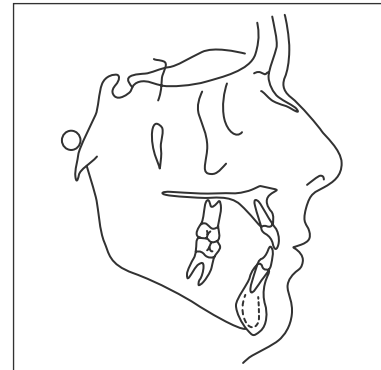
Cephalometric Measures	Pretreatment	Posttreatment
SNA	83°	84°
SNB	82.5°	82.5°
ANB	0.5°	1.5°
NAPg	1°	1°
SNGoGn	32°	31°
NSGn	66°	66°
Facial Axis	88°	88°
1.NA	25°	24°
1-NA	5.5 mm	5 mm
1.NB	21°	18°
1-NB	4 mm	3 mm
S-Ls	-1	-1.5
S-Li	-2	-2.5



FIGURE 14 - Initial panoramic radiograph.



FIGURE 15 - Initial cephalogram and cephalometric tracing.



### Treatment goals

The objective was to maintain a Class I molar occlusion, eliminate the lower anterior discrepancy, establish adequate overjet and overbite, align and level the teeth and correct the midline with a fixed orthodontic appliance.

### Treatment planning and mechanics

A standard Edgewise corrective appliance was set up (slot 0.022x 0.028-in), whereby the upper arch continued to undergo leveling in the posterior teeth and lateral incisors, with no artistic bends. The patient underwent extraction of the

lower right central incisor and during treatment it was assessed whether there would be the need for stripping of the upper incisors and teeth 34 and 44. In the alignment and leveling phase twist-flex and 0.014-in to 0.020-in stainless steel wires were used. As of the moment 0.020-in archwires began to be used, tooth 42 began to be moved mesially with elastic chain to close the extraction space. A 0.019x0.025-in archwire was placed in the upper arch with ideal form and torque for the case, as well as a coordinated 0.016x 0.022-in lower retraction archwire with tear drop loop. Subsequently, a lower 0.019x0.025-in finishing archwire was fabricated

with ideal form and torques, in coordination with the upper archwire. The planned retention consisted of upper and lower removable wraparound retainers, and a 3x3 lingual retainer bonded to the lower incisors and canines.

### Treatment results

The final occlusion showed molar and canine Class I relationship with normal overjet and overbite. Lower incisor alignment was accomplished (Fig 16).

The main treatment goals were achieved. The

lower anterior crowding was corrected after extraction of the lower central incisor.

Occlusion of molars and premolars seemed very favorable and was therefore maintained by carefully setting up the standard Edgewise orthodontic appliance. In addition, normal overjet and overbite were attained, and the appropriate mandibular functions were established during lateral and protrusion movements.

Maxilla and mandible showed normal growth in the anteroposterior, lateral and vertical directions (Fig 17).

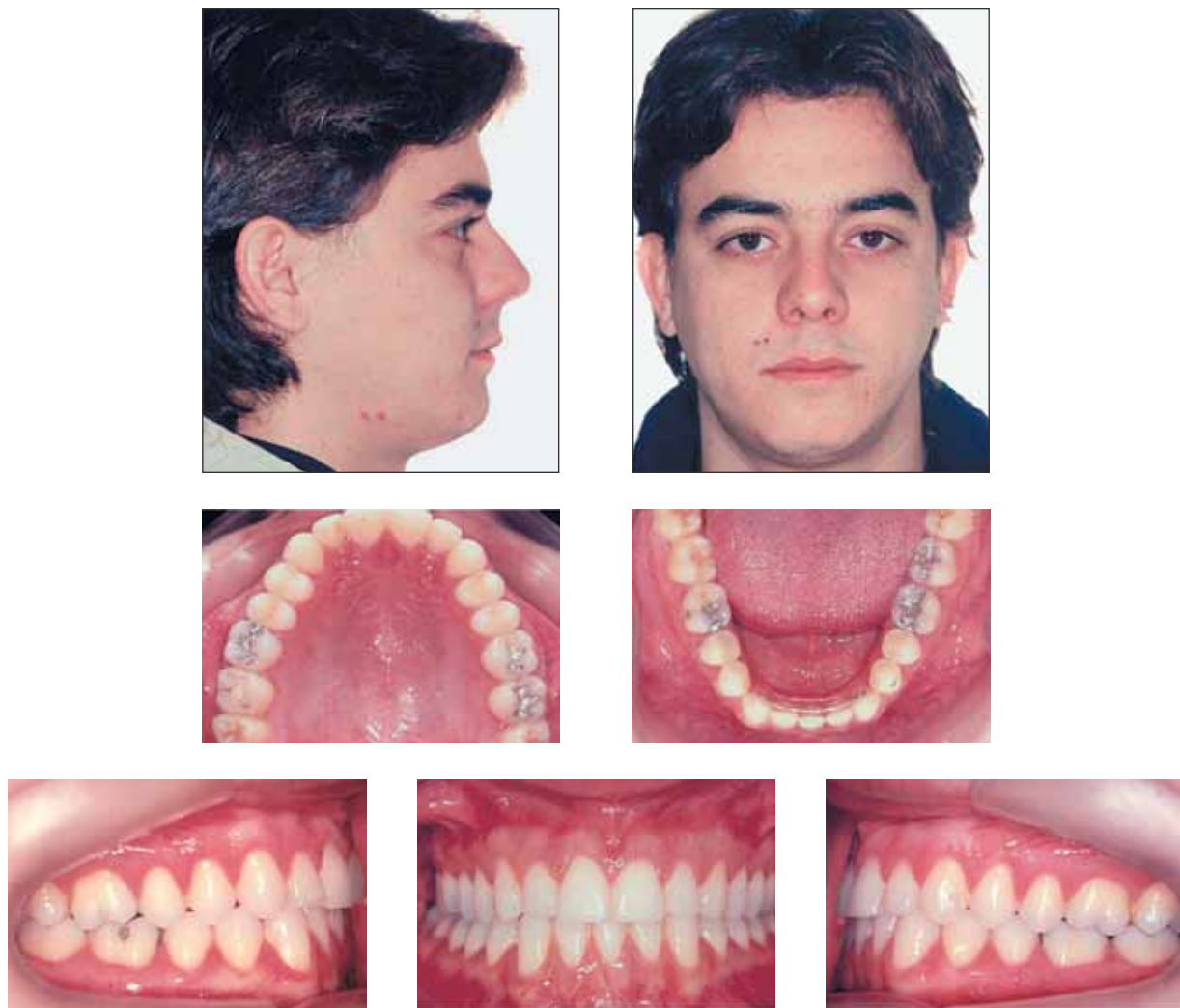


FIGURE 16 - Final extraoral and intraoral photographs.



FIGURE 17 - Final cephalogram and cephalometric tracing.

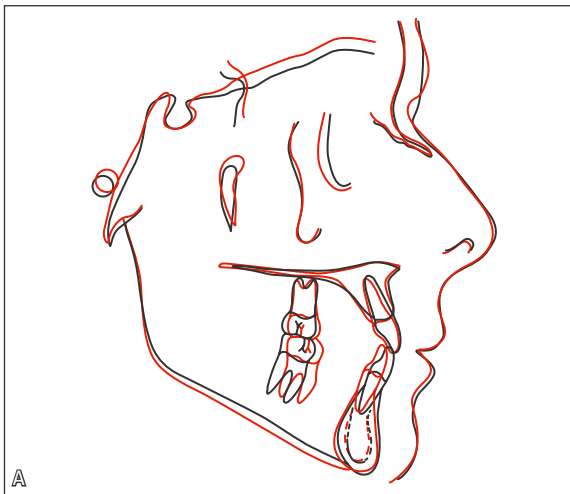
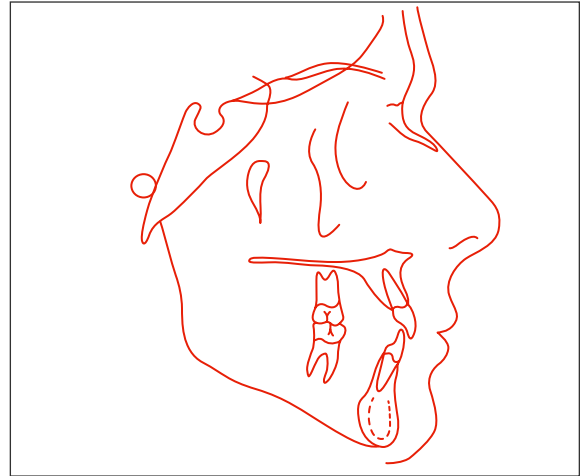
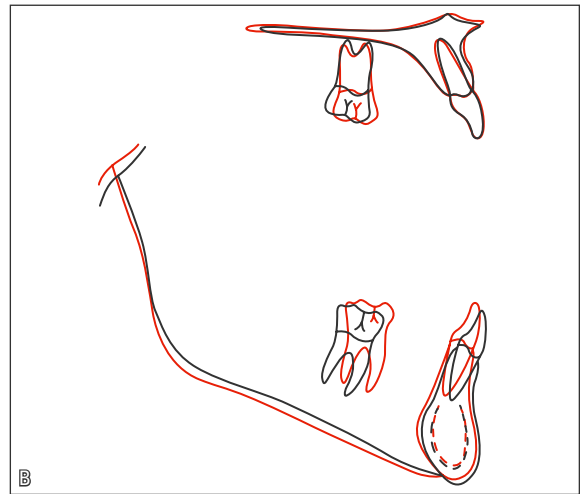


FIGURE 18 - Cephalometric superimpositions.



In the upper dentition, it was observed that the axial inclination and protrusion of upper incisors were slightly reduced (Fig 17, Table 3).

In the lower dentition, a slight retraction occurred (Fig 17, Table 3) with no concurrent changes on intermolar width and decreased intercanine width due to the extraction of tooth 41.

Since this case involved an adult patient, max-

illomandibular positions were maintained, as shown in Figure 18A. Figure 18B indicates that the upper incisors were maintained and the lower incisors were slightly retruded, with loss of anchorage in the upper and lower molars. There was also slight mandibular growth. Adequate incisal relationship was achieved while maintaining a favorable profile (Fig 18).

## FINAL CONSIDERATIONS

It is noteworthy that the main indication to extract a lower incisor is the presence of tooth size discrepancy equal to or greater than 4.5 mm due to lower anterior excess or upper anterior deficiency.<sup>1,15,21,28</sup> One should perform a careful diagnosis using a diagnostic setup to analyze treatment goals and occlusal outcome.

This treatment option may cause some of the following difficulties or limitations in orthodontic treatment: obtaining canine guidance, possibility

of spaces reopening, esthetic loss of gingival papilla, impact on the midline, overjet and overbite.

Crowding relapse after retention appears to be lower than in cases subjected to premolar extraction.

If properly indicated and carefully and appropriately conducted, lower incisor extraction can significantly contribute to the treatment of certain malocclusions and the pursuit of excellence in orthodontic treatment results, reflected in maximum function, esthetics and stability.



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