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Case Report

Orthodontic movement of a maxillary incisor through the midpalatal suture

A case report

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ABSTRACT

Orthodontic space closure is a treatment alternative when a maxillary central incisor is missing. The objective of this report was to present an unusual treatment in which a right maxillary central incisor was moved through the midpalatal suture to replace the absent contralateral tooth. The biologic aspects and clinical appearance of the recontoured lateral and central incisors were analyzed. The position of the examined teeth and the appearance of the surrounding soft tissues were satisfactory; however, the upper midline frenulum deviated to the left. The incisor was successfully moved with no obvious detrimental effects as observed on the final radiographs. In the radiographic and tomographic examinations, the midline suture seemed to have followed the tooth movement. The patient expressed satisfaction with the results. It was concluded that orthodontic movement of the central incisor to replace a missing contralateral tooth is a valid treatment option, and the achievement of an esthetic result requires an interdisciplinary approach, including restorative dentistry and periodontics. (*Angle Orthod.* 2012;82:370–379.)

KEY WORDS: Tooth movement; Orthodontic space closure

INTRODUCTION

Loss of permanent teeth can cause functional, esthetic, and psychological problems. A missing central incisor causes a very evident esthetic problem, and rehabilitation may require orthodontic treatment and prosthetic interventions.¹ Tooth movement across the midpalatal suture is a possible treatment alternative

for closing a maxillary anterior space. However, before selecting this treatment option, the clinician should consider the occlusal characteristics, space conditions, age, facial morphology, growth pattern, tooth morphology, and need for orthodontic treatment.²

Orthodontic treatment with translocation of a maxillary central incisor across the midpalatal suture has been previously described, representing an alternative for prosthetic dental replacement of anterior teeth.^{1,3–6}

Follin et al¹ performed an experimental study in Beagle dogs to determine the possibility of orthodontically moving a maxillary incisor across the midpalatal area and to analyze if this tooth movement results in displacement of the suture. The histological results indicated that in young animals, the midpalatal suture distorted in the direction of tooth movement and, apparently, the connective tissue of the suture was incorporated into the periodontal ligament. In the older animals, the central incisors moved across the mineralized suture without any impediment. In general, the authors concluded that it is possible to orthodontically move a maxillary central incisor across the midpalatal suture. Melnik⁵ presented a clinical report in which a central incisor could be translated across the midpalatal suture in young patients with the use of fixed appliances.

In addition to displacement of the suture reported in the literature, there is evidence that the labial frenum

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Figure 1. Pretreatment extraoral photographs.

tends to move in the direction of tooth movement.⁴ Frenectomy is often used in these cases at the end of orthodontic treatment.^{3,4}

The purpose of this report is to present an unusual treatment of a 19-year-old woman in whom the right maxillary central incisor was moved through the midpalatal suture to replace the central incisor of the opposite side.

History

A 19-year-old woman presented with the chief complaint of an unpleasant smile due to a missing maxillary central incisor. Her dental history showed a severe traumatic episode where the maxillary left central incisor was lost.

Diagnosis

The patient had pleasing facial esthetics and a Class I facial pattern. The smile esthetics were severely compromised due to the absence of the left central incisor (Figure 1). Intraorally, the patient had an Angle Class II molar relationship on the right side and a Class I molar relationship on the left side. The maxillary left central incisor and the maxillary left first and second molars were absent. In addition, the mandibular dental arch had mild crowding (Figures 2 and 3). Cephalometrically, there was a Class I skeletal relationship, and the panoramic and periapical radiographs showed a supernumerary tooth in the maxillary midline (Figure 4).

Treatment Objectives

The treatment objectives were to close orthodontically the space of the missing maxillary left central

incisor, to preserve the space of the missing maxillary left first molar to receive a dental implant, and to align the mandibular anterior teeth, improving her smile esthetics.

Treatment Alternatives

The first option consisted of distalizing the maxillary right posterior teeth with an intraoral distalizer. The maxillary left central incisor and the missing permanent left first molar would be prosthetically replaced.

The second treatment option was to close the space by moving the maxillary right central incisor through the midpalatal suture followed by mesial movement of the right lateral incisor and posterior teeth. The missing permanent left first molar would be replaced with a dental implant. This was the chosen option due to simpler mechanics that could also avoid a dental prosthesis or implant in the maxillary anterior region. The patient has also granted approval of publication of these records.

Treatment Progress

The treatment plan included moving the maxillary right central incisor through the midline, replacing the lost left central incisor, and the right maxillary lateral incisor to replace the central incisor. Consequently, the right maxillary canine would replace the lateral incisor and the first maxillary premolar would replace the canine.

Initially, the supernumerary tooth was removed. Preadjusted fixed appliances were installed in the maxillary and mandibular arches. Leveling and alignment were initiated with 0.016- and 0.018-inch nickel-titanium arch wires followed by 0.016-, 0.018-, 0.020-,

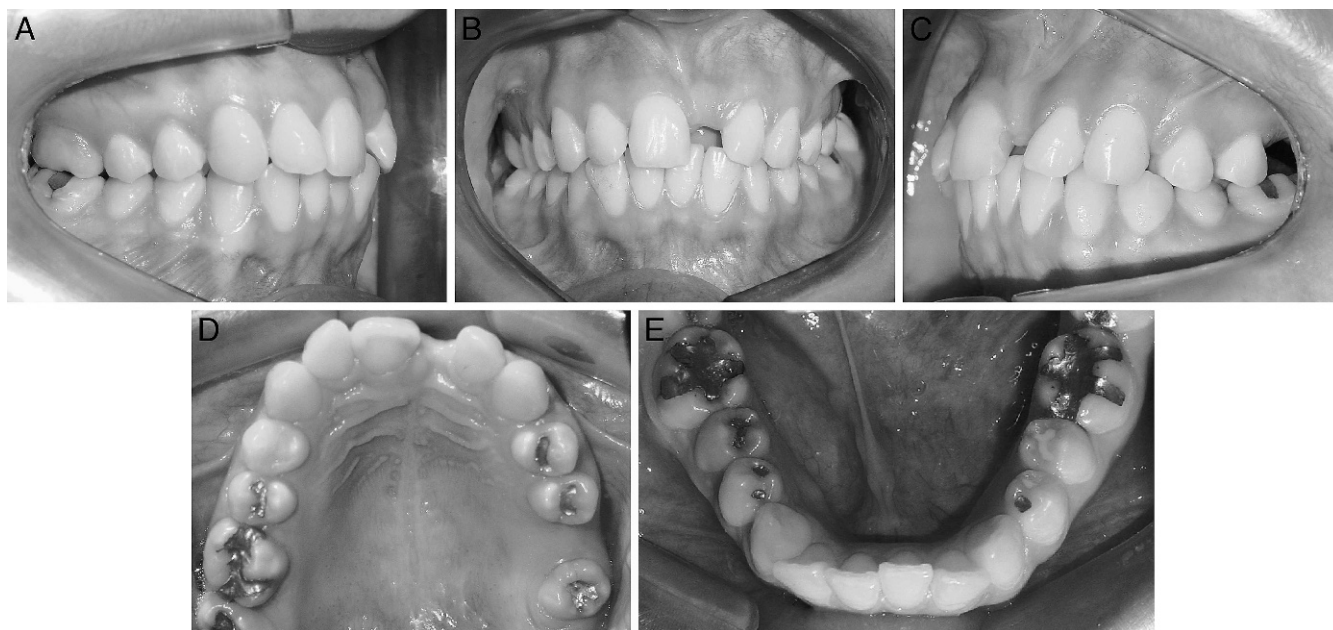


Figure 2. Pretreatment intraoral photographs.

and 0.019- × 0.025-inch stainless-steel arch wires. A nickel-titanium open-coil spring was used to slowly move the right maxillary incisor to the left side through the midpalatal suture (Figure 5). After initial movement with open-coil springs, elastic chains completed the movement (Figure 6). The same mechanical approach was performed for the right maxillary lateral incisor and

canine. Class III elastics were used with rectangular stainless-steel arch wires to move the maxillary posterior teeth forward into a complete Class II molar relationship. The mild mandibular dental crowding was corrected with interproximal stripping. Finishing occlusal procedures were performed to improve final gingival esthetics. The maxillary right lateral incisor was

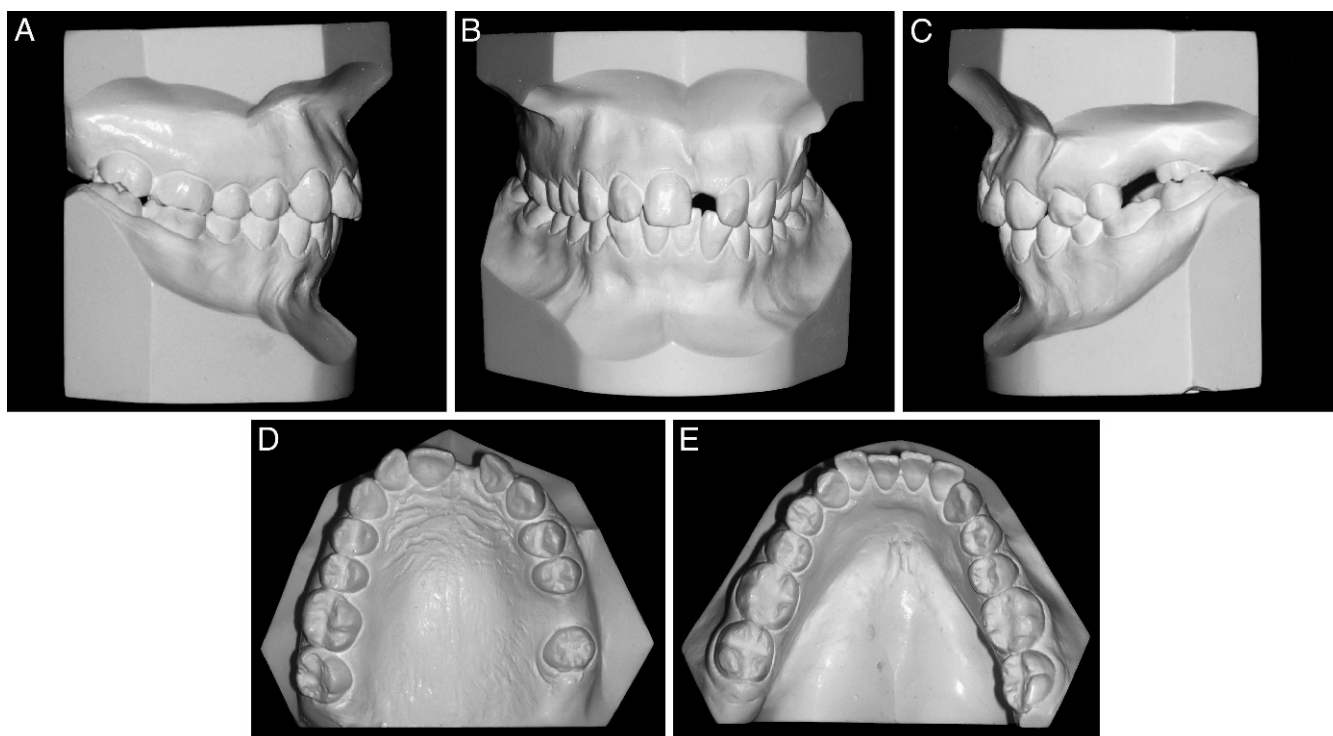


Figure 3. Initial dental casts.



Figure 4. Initial cephalometric, panoramic, and periapical radiographs showing a supernumerary tooth next to the root of the maxillary right central incisor.

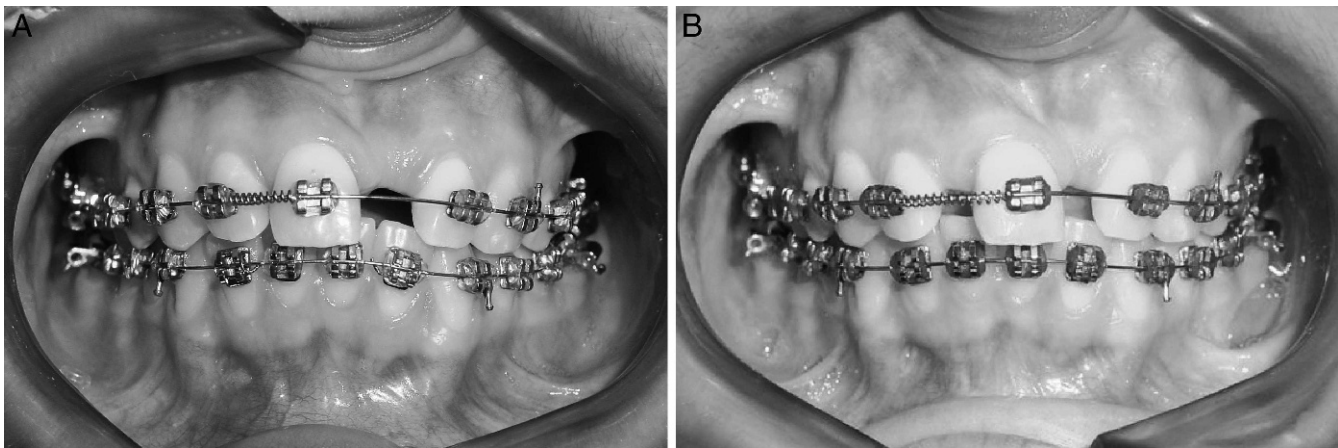


Figure 5. Intraoral photographs 4 and 7 months after the beginning of treatment, respectively.

intruded using wire bends to level the gingival margin according to the transposed central incisor (Figure 7). The right maxillary canine was labially tipped to simulate the lateral incisor. The maxillary central incisor was successfully moved to the opposite side 7 months into treatment (Figure 8). After appliance removal, augmentation of the right maxillary lateral incisor was performed through esthetic restoration. Treatment time was 3 years, including 7 months of interruption for patient's private reasons. Maxillary

retention consisted of a palatal wire bonded to the right central and left lateral incisors and a Hawley plate. Mandibular retention was performed with a mandibular bonded canine-to-canine retainer (Figures 9 and 10).

Five years later, the patient returned for a follow-up examination and asked for improvement in the esthetic results. Preadjusted appliances were bonded on the maxillary arch (Figure 11). The right lateral incisor had its bracket bonded closer to the incisal edge to intrude it and



Figure 6. Intraoral photographs 13 months after the beginning of treatment.



Figure 7. Intraoral photograph showing intrusion of the maxillary right lateral incisor with wire bends.

simulate the gingival margin level of a central incisor. Three months later, the appliances were removed. After appliance removal, a cone beam computed tomography (CBCT) of the maxilla was requested. The axial slices confirmed that the midline suture had deviated to the left. Also, the incisor canal showed a morphological distortion with a slight deviation to the left (Figure 12). The patient was retained with a stainless-steel round wire bonded on the lingual aspects of the right central incisor and canine, which was recommended to remain permanently to avoid space reopening in the maxillary anterior region (Figure 13).

Treatment Results

Movement of the incisors across the midline was previously described only in adolescents.^{1,3-7} All

published cases with midline crossing were initiated during the mixed dentition, and treatment was completed at approximately 12 years of age. A recently published case report described treatment in a 13-year-old patient.⁷ This is the first report showing the procedure performed in an adult patient. In addition, our case report has the uniqueness of showing the final results of tooth movement across the midpalatal suture documented by means of CBCT.

The facial profile remained unchanged after treatment (Figure 13). The gingival margins of the anterior teeth showed a slight level difference at the end of treatment, which was masked by the low smile arc. The patient smile was balanced and pleasing. The final radiographs showed that the right central incisor was successfully moved to the left, inducing midpalatal suture deviation to the same side (Figure 14). The final occlusion showed a Class II molar relationship on the right side and a Class I molar relationship on the left side (Figure 15).

There are several treatment alternatives to correct the absence of a maxillary incisor. To select the more appropriate treatment plan, it is necessary to consider many factors, such as the occlusion, tooth size or shape, and the periodontal conditions. Alternative treatment approaches include orthodontic space closure, dental implants,⁸ resin-bonded or conventional bridges,⁹ and replacement by autotransplantation of premolar.¹⁰ In the current case, orthodontic space closure of a missing maxillary central incisor was performed by moving the contralateral tooth across the midline. This eliminated the need for a prosthesis or dental implant in the anterior region and allowed

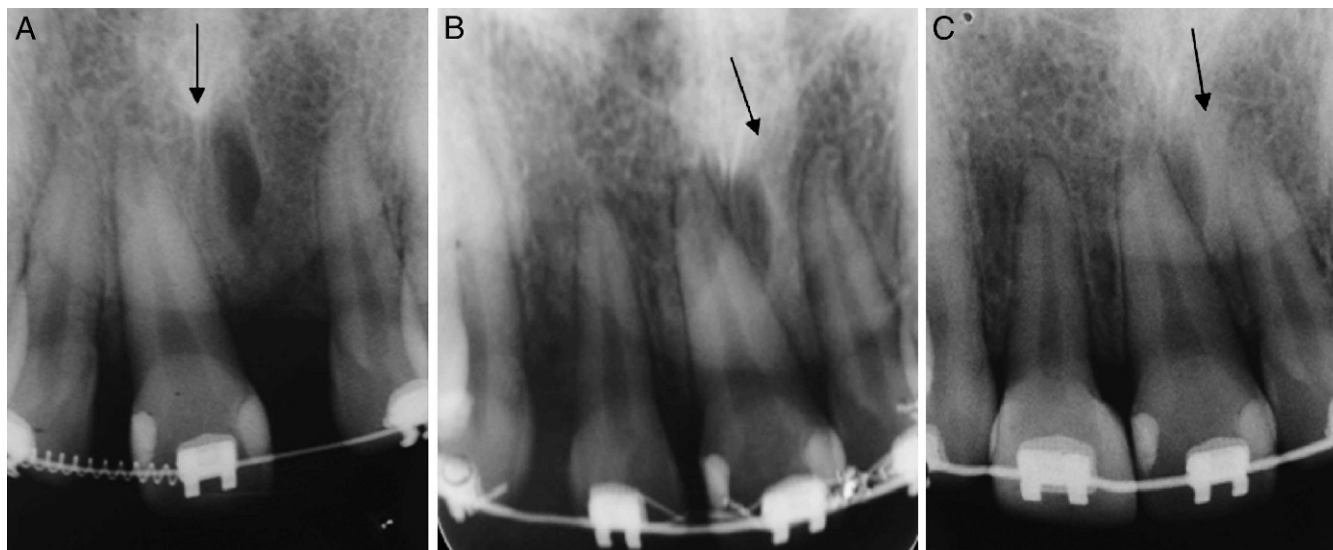


Figure 8. Sequence of periapical radiographs showing that the midpalatal suture deviated to the left following the central incisor movement (arrows).

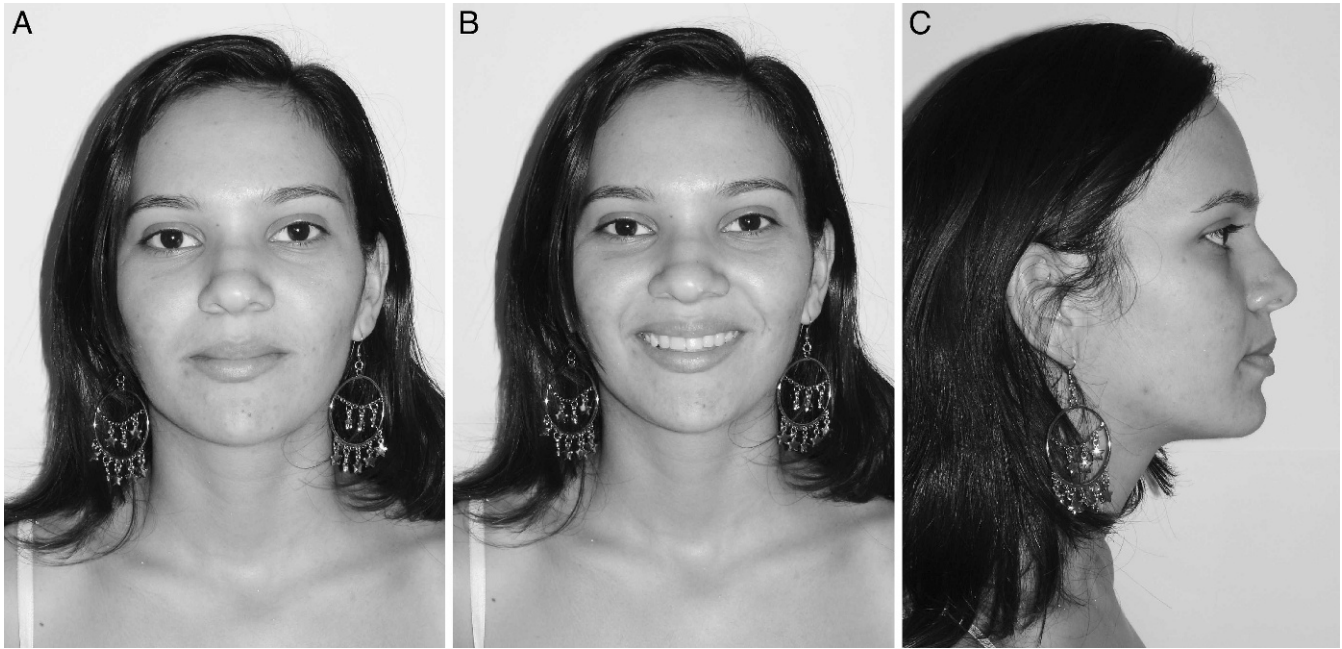


Figure 9. Posttreatment extraoral photographs.

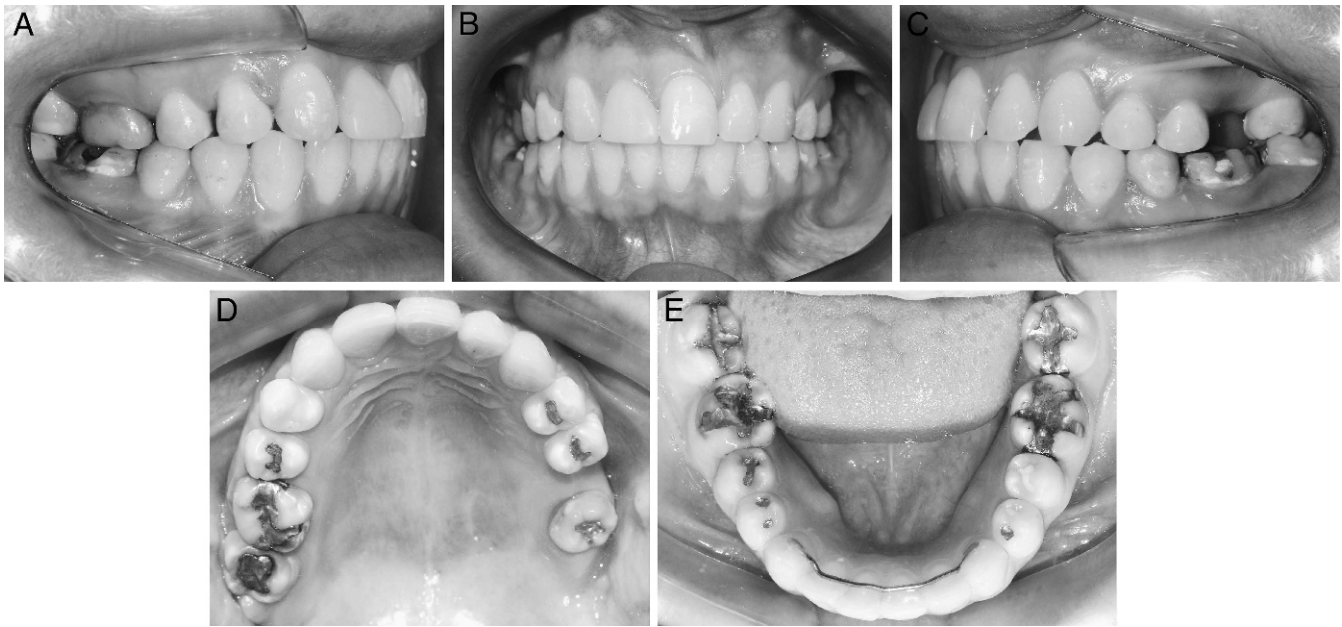


Figure 10. Posttreatment intraoral photographs.



Figure 11. Intraoral photographs during retreatment.

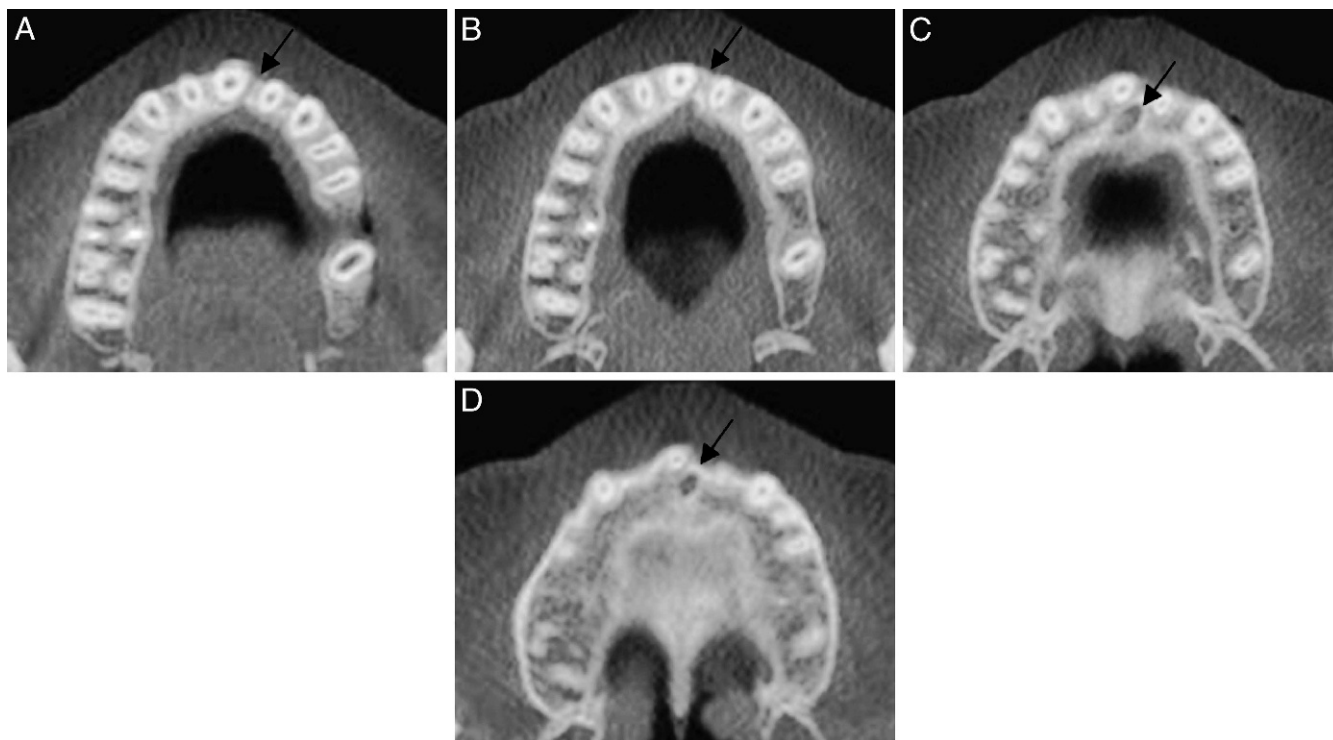


Figure 12. CBCT axial slices of the maxilla 5 years posttreatment. Observe the midline deviation to the left. The incisive canal also showed distortion to the left.

correction of the Class II subdivision malocclusion without distal movement of the right maxillary posterior teeth or tooth extraction.

Indications for orthodontic space closure in patients with missing central incisors and the proposed treatment alternatives have been discussed in some previous studies.¹⁻⁶ The applicability of moving maxillary incisors through the midline was sometimes questioned. Concerns were expressed regarding the treatment complexity, the risk for space reopening, the quality of the esthetic results, and, mainly, the difficulty of tooth movement across the midpalatal suture.^{4,5} The present results indicated that anterior space closure by moving the contralateral maxillary incisor is challenging and time-consuming.

When a maxillary lateral incisor substitutes a missing central incisor, several important steps will ensure an esthetic result. First, the gingival margins of the teeth must be properly positioned. The gingival margin of the central incisors should match the level of the maxillary canines, and the gingival margin of the lateral incisors should be positioned slightly coronally.¹¹⁻¹³ To reach this morphology, the substituting lateral incisor must be significantly intruded so that its gingival margin matches the adjacent central incisor.¹³ The gingival levels over the two central incisors should be at the same height for a satisfactory esthetic result.¹⁴ The

maxillary canine that will replace the lateral incisor should be extruded to move its gingival margin incisally to resemble the usual gingival margin position of the lateral incisor.¹⁴ In addition, by intruding the substituting lateral incisor, the restoration of this tooth into the shape of a central incisor is simplified. When the lateral incisor is restored to simulate a central incisor, it is difficult to create an ideal crown form because the mesial and distal surfaces of the crown must be overcontoured because of the narrower cervical region of the lateral incisor. Besides establishing an adequate crown length, intrusion of the lateral incisor allows that the proximal surfaces of the crown can be tapered gradually from the cervical margin to the incisal edge.^{13,14} In this case report, the right lateral incisor was intruded using wire bends during orthodontic finishing. However, an initial individualized bonding placing the bracket of the right lateral incisor closer to the incisal edge would be a better and more efficient choice.^{11,13,15} Gingivectomy cannot be performed after orthodontic treatment in these cases once the gingival sulcus of the lateral incisor shows a normal depth.¹²

Another challenge for the esthetic restoration of this case was to achieve symmetry between the maxillary central incisors besides an adequate anterior gum line. Maxillary central incisors have the mesial surface longer than the distal surface. The zenith (apical limit

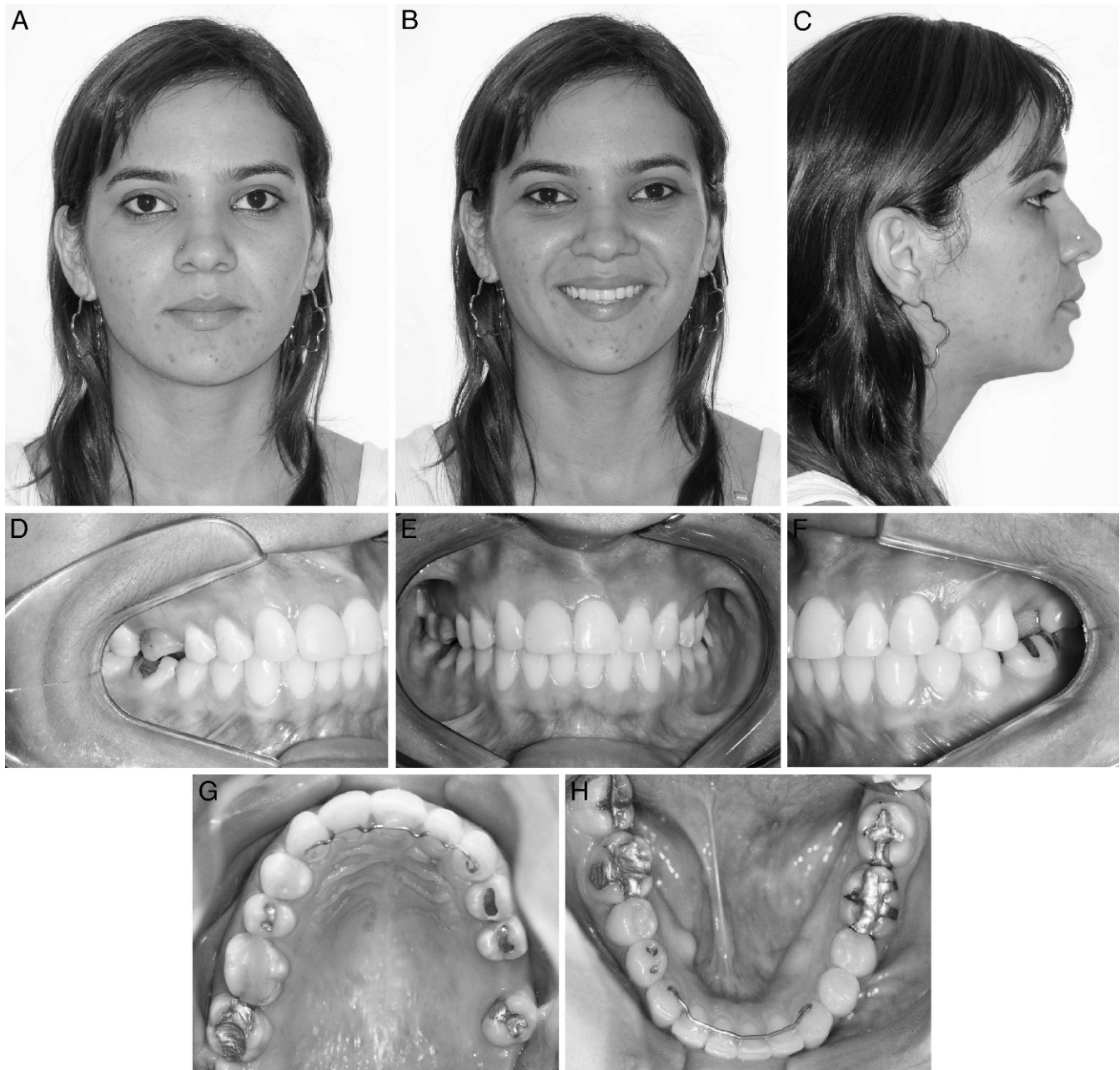


Figure 13. Extraoral and intraoral photographs 5 years posttreatment.

of the gingival contour of the labial surface) of the maxillary central incisors is shifted to the distal. In addition, the disto-incisal angle of the crown is rounder than the mesio-incisal angle. All of these aspects had to be modified in the right maxillary central incisor, which was moved to the opposite side to replace its contralateral. Restoration of the maxillary central and lateral incisors was performed transsurgically, with an open flap.¹⁶ The transsurgical procedure was important to allow the use of the rubber dam in an apical position to obtain an adequate emergence line of tooth crowns, avoiding dark triangles between the anterior teeth.

In addition, this procedure permitted an adequate marginal finishing of the restorations to avoid plaque accumulation, considering that a larger amount of resin composite was applied to transform the lateral incisor into a central incisor.

A fixed retainer consisting of a lingual wire bonded on the maxillary teeth adjacent to the initial space was placed and recommended to permanently remain because of the risk for space reopening (Figure 13).⁵ The space of the absent maxillary first molar on the left side was maintained to be rehabilitated with a dental implant (Figure 12).

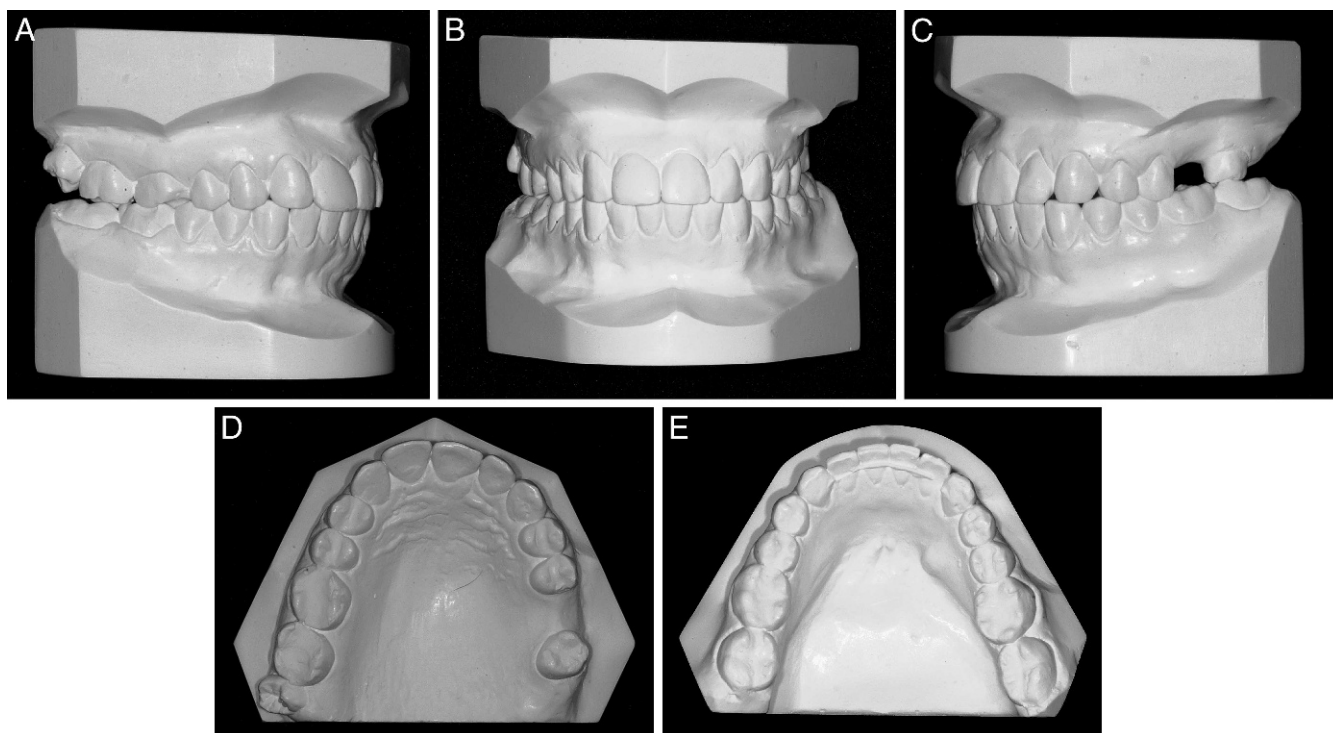
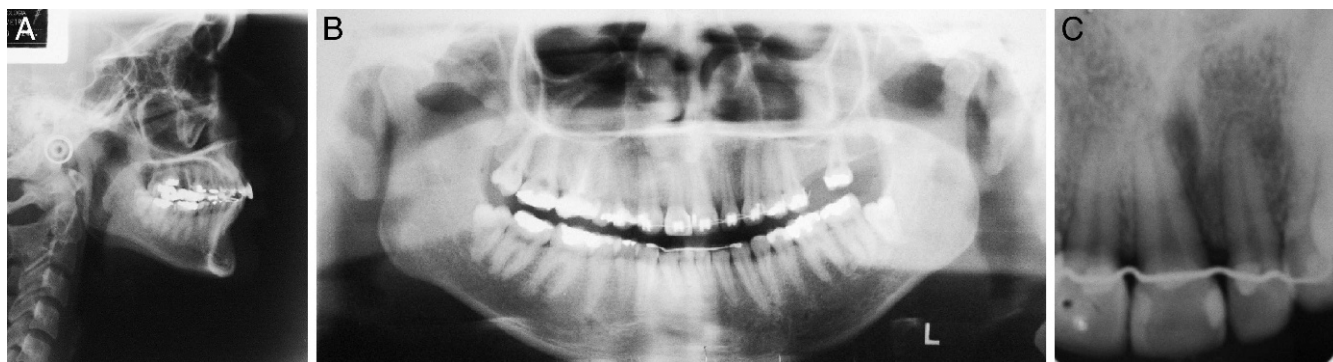


Figure 15. Final dental casts.

Based on the tomographic images, the midpalatal suture moved together with the right central incisor (Figure 12). Studies have shown that the midpalatal suture distorts in the same direction of tooth movement, and apparently, the connective tissue of the suture is incorporated into the periodontal ligament.^{1,3-6} On the other hand, if the suture is mineralized, the tooth moves normally.¹ In the present case, the connective tissue of the suture was pushed to the left, apparently becoming incorporated into the periodontal ligament. Moreover, the frenum moved in the direction of tooth movement, as demonstrated in previous reports (Figure 11).^{4,5}

In their reports, Cookson,³ Melnik,⁵ and McCollum⁴ did not demonstrate radiographically any root resorption. However, Follin¹ showed root resorption in the

cementum and dentin. In the present case, no root resorption was radiographically noticed.

A good result was accomplished at the end of treatment. The patient expressed satisfaction with the esthetic result. Success can be reached only with careful and detailed treatment planning. In addition, an interdisciplinary approach is often required.

CONCLUSION

- It is possible to move a maxillary central incisor through the midpalatal suture in an adult patient, achieving a satisfactory morphology and esthetics. In view of the midpalatal suture and labial frenum deviation to the same side of tooth movement, the fixed posttreatment maxillary retention should remain permanently.

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