Traumatic loss of a maxillary central incisor treated with nonextraction orthodontics

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This case report describes the orthodontic treatment of a girl who lost her maxillary left central incisor from trauma. The patient had a concave profile, a Class I molar relationship on the right side and a Class II molar relationship on the left side, with a slight maxillary retrusion, an anterior edge-to-edge bite, and a posterior crossbite. Therefore, the treatment consisted of rapid palatal expansion to widen the maxilla in a transverse direction along with reverse headgear to improve the incisor relationship. The crown of the left canine was modified to resemble the left lateral incisor, and a porcelain veneer was placed to make the left lateral incisor resemble the left central incisor. This case report illustrates how orthodontics alone can be used to treat a missing central incisor, without a bridge or an implant. (Am J Orthod Dentofacial Orthop 2013;143:246-53)

Traumatic loss of maxillary incisors during the active teenage years is a serious and challenging clinical situation. 1 Because of the frequency of dental trauma in infancy and childhood, traumatized teeth with various long-term prognoses pose a problem when planning orthodontic treatment. 2 An orthodontist often becomes involved in managing these patients because of accompanying malocclusions such as midline shift, anterior crossbite caused by space loss, or ectopic eruption of adjacent teeth. 1

The alternative approaches include reimplantation of the avulsed tooth, autotransplantation, placement of a bridge or an implant during adulthood, and substitution of the ipsilateral lateral incisor for the central incisor after space closure. 3 The choice of the appropriate solution for the missing maxillary central incisor depends on the specific characteristics of each situation. 4 However, the success of reimplantation depends on the status of the tooth’s root, 5 the ability to perform endodontics, 3 and the length of time that the tooth has been out of the alveolar socket. 6 Some adolescents whose roots are not completely formed should not have restorations.

This case report describes the orthodontic treatment of a patient who was missing a maxillary central incisor because of trauma; the treatment was completed without placing a bridge or an implant.

DIAGNOSIS AND ETIOLOGY

This girl had avulsed her maxillary left central incisor when she was 8 years old. Although the tooth was retrieved at that time, the patient did not see a dentist to treat the trauma. At 14 years of age, she became concerned about the esthetic appearance of her teeth and facial profile and wanted orthodontic treatment. At that age, all permanent teeth had erupted, and the edentulous space had closed entirely.

Viewed from the front, her face was well balanced and symmetric. Her facial profile was concave, with a slight maxillary retrusion and normal vertical proportions. No signs or symptoms of any temporomandibular joint disorder were noted.

Intraorally, she had a mild Angle Class I molar and premolar relationship on the right side and an Angle Class II molar and premolar relationship on the left side. She had an anterior edge-to-edge bite and a posterior crossbite combined with palatal transversion and crossbite of the maxillary right lateral incisor.

The maxillary dental midline deviated by 2.0 mm to the left with respect to the facial midline because of the missing central incisor. The mandibular dental midline was almost coincident with the facial midline. She had mild crowding of the maxillary and mandibular arches (Figs 1–3).
Fig 1. Pretreatment facial and intraoral photographs.

Fig 2. Pretreatment dental casts.
TREATMENT OBJECTIVES

The primary treatment objectives were to restore the normal appearance of the maxillary anterior teeth and establish an acceptable occlusion despite the missing central incisor. The other essential objectives were to protract and expand the maxilla to correct the maxillary deficiency and the posterior crossbite. Ideal overbite relationships were also desirable to establish immediate anterior guidance. Additional objectives were to eliminate the crowding and correct the maxillary dental midline.

TREATMENT ALTERNATIVES

Based on the objectives, 2 treatment options were proposed. The first option consisted of increasing the arch length and opening a space for the missing central incisor along with restoration of the space with a bridge or an implant. The second option consisted of orthopedic and orthodontic treatment, including rapid palatal expansion to expand the maxilla in a transverse direction with reverse headgear to correct the maxillary retrognathia and anterior crossbite. The left lateral incisor could be substituted for the central incisor, and the left canine could be substituted for the lateral incisor; no bridge or implant would be necessary. This option seemed to be the most plausible.

The option of opening an edentulous space for a bridge would be difficult because of the inclination of the anterior teeth and the patient’s vertical skeletal pattern. Furthermore, it would most likely extend the treatment time. Considering all of these factors, we discussed the treatment options with the patient’s parents and then decided on the second option.

TREATMENT PROGRESS

Treatment began with rapid palatal expansion and reverse headgear to protract the maxilla downward and forward and to expand the maxilla transversely. Meanwhile, fixed 0.022 × 0.028-in preadjusted brackets were placed on the mandibular teeth (Fig 4). Reverse headgear was worn 12 to 14 hours at night, with 1 kg
Fig 4. Expansion and facemask protraction in progress intraoral photographs.

Fig 5. Posttreatment facial and intraoral photographs.
of force, and Class III elastics was used during the daytime. After 5 months, the maxillary teeth were bracketed because sufficient overjet had been achieved. The initial alignment was performed with nickel-titanium archwires, followed by space creation to obtain room for the midline correction and restoration of the maxillary left lateral incisor that would be substituted for the central incisor. The crown of the maxillary left canine was modified to resemble a lateral incisor by careful reshaping. Vertical intermaxillary elastics were used for about 8 weeks to obtain satisfactory tooth interdigitation. Active treatment was completed in 23 months; the appliances were removed, and Hawley retainers were placed for retention.

TREATMENT RESULTS

Upon smiling, an ideal amount of tooth display was achieved. The anterior gingival margins were leveled, and a porcelain veneer was used to build up the maxillary left lateral incisor and transform it into a central incisor. The maxillary left canine was reshaped and transformed into the ipsilateral maxillary lateral incisor (Figs 5-8).

Intraorally, the arch length and width deficiencies were eliminated in the maxillary arch, satisfactory tooth alignment was obtained, and overbite and overjet were improved. The Class I molar relationship on the right side was maintained, and a Class II canine relationship was obtained on the left side. The patient’s upper lip prominence was dramatically increased. The patient and her parents were pleased with the final results.

DISCUSSION

This article describes a strategy for orthodontic treatment without a bridge or an implant for a patient who had avulsed a maxillary central incisor. The patient was a child when the tooth was avulsed and did not see a dentist at the time. A few years later, when she wanted to begin orthodontic therapy, the edentulous space had closed almost entirely. It can be advantageous to place nothing in an edentulous space. This choice allows the adjacent lateral incisor and contralateral central incisor to drift and erupt bodily toward each other and close the space. A distinct advantage is that the erupting teeth will drift bodily in a growing child and bring the alveolar bone as well. The edentulous space will completely close by the time the remaining teeth have erupted. In this situation, the better option for overcoming a missing maxillary central incisor was to substitute the lateral incisor for the central incisor in the final occlusal scheme. When a lateral incisor is substituted for a missing maxillary central incisor, several important steps will ensure an esthetic result. First, the gingival margins of the maxillary anterior teeth must be positioned properly. When the lateral incisor is substituted for the central incisor, the canines are substituted for the lateral incisors.

Fig 6. Posttreatment dental casts.
In this situation, the orthodontist must disregard the incisal edges of these teeth as guides for final tooth positioning. During orthodontic treatment, the maxillary canines must be extruded to move their gingival margins incisally to resemble the usual gingival margin position of lateral incisors. The lateral incisor must be intruded significantly so that its gingival margin matches the adjacent central incisor and creates the illusion of a normal anterior gingival level.

An additional benefit of intruding the lateral incisor is to facilitate restoration of this tooth into the shape of the central incisor. Because the lateral incisor must be grossly overcontoured, this type of restoration is easier when the clinician has a longer rather than a shorter tooth to restore. Additionally, when a lateral incisor is substituted for a central incisor, the provisional restoration should have a mesial surface shape that matches the adjacent central incisor. The emergence profile of a maxillary central incisor is generally flat on the mesial surface. The orthodontist must move the lateral incisor close enough to the central incisor to allow the restorative dentist to contour the restoration properly.

When clinicians must make a decision about a patient with a traumatically avulsed maxillary central incisor, several options exist for replacing the missing tooth. The options that have been commonly used have advantages and disadvantages. The most conservative approach for managing an avulsed central incisor is to reimplant it as soon as possible. The greatest benefit of successful reimplantation is preservation of the alveolar bone. However, if the implanted tooth becomes ankylosed, it obviously will not erupt and could create a significant alveolar defect. The vertical discrepancy would even be magnified if the patient has significant growth remaining.

Second, if an avulsed tooth is not a good candidate for reimplantation, autotransplantation might be an option. However, the patient should have an arch-length deficiency, and the root formation of the premolars should be between one half and two thirds developed.

Fig 7. Posttreatment lateral cephalogram, tracing, and panoramic radiograph.
The technique for extracting and reimplanting a root and crown without damaging the tissues surrounding the root is difficult and requires experience, with a delicate approach.

Third, if reimplantation and autotransplantation are not possible, a typical solution for maintaining the edentulous space is to construct a temporary removable prosthesis with a plastic tooth during childhood and adolescence, and to place a bridge or an implant during adulthood. This will improve esthetics, speech, and function. However, placing a temporary removable prosthesis in the edentulous space during the transition from the mixed to the permanent dentition seems to be unadvisable because without a tooth developing in this site, the alveolar ridge would be narrow and difficult to restore in the future with either a bridge or an implant. Furthermore, either reimplantation or autotransplantation is unpredictable, and replanted teeth have variable long-term prognoses and can present a problem when it is time to begin orthodontic therapy.

In a young patient, if nothing were placed in the edentulous space, what would occur? In this report, we obtained a satisfactory result in a patient who had an avulsed maxillary central incisor but did not seek treatment until after the edentulous space had closed. Based upon this evidence, we propose that 1 strategy is no treatment after the trauma, wait for spontaneous closure of the edentulous space, and then use orthodontic therapy to create the appropriate tooth position for restoration during adulthood.

CONCLUSIONS

The clinical result of restoring a lateral incisor as a central incisor in our patient was satisfactory. She was pleased with the treatment result, even though the crown morphology of the recontoured lateral incisor did not ideally match that of the contralateral lateral incisor. The appearance of the gingival margins was nearly ideal. This report presents a method of treating a missing maxillary central incisor without replacing the tooth with a bridge or an implant.

REFERENCES


