

Correction of sever rotation of central maxillary incisor with fixed-removable appliance in the mixed dentition stage: A case report

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Case Report

Abstract

BACKGROUND AND AIM: The aim of this case report is to present an approach used to correct severe rotation of anterior maxillary teeth in a pre-adolescent boy.

CASE REPORT: The patient was an 8-year-old boy in the mixed dentition stage and severe rotation of upper right central incisor. Whip appliance was consisted of a removable plate, a cantilever spring and a bonded molar tube on rotated tooth. After initial alignment and overcorrection of rotation during 6 months, circumferential supracrestal fiberotomy was performed. About 1 week after surgery, the device was removed and the retention period initiated.

CONCLUSION: He semi-fixed-removable appliance can be very effective for correcting severe rotation of anterior teeth.

KEYWORDS: Maxillary Incisor; Tooth Rotation; Whip Appliance

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Tooth rotation is defined as “a detectable distolingual or mesiolingual intra-alveolar displacement of the teeth around its longitudinal axis.”¹ The tooth rotation prevalence is 2.2-5.1% in general population.² The tooth rotation is classified into three categories according to Gupta et al.³ $< 45^\circ$, $45-90^\circ$ and $> 90^\circ$. They reported rotation was the most common anomaly (prevalence 10.2%), and the majority of tooth rotations were between 45° and 90° . According to their study mandibular premolars and maxillary central incisors were the most prevalent rotated teeth.³

The most common factors contributing to the development of rotation include: a supernumerary tooth, severe tooth size arch size discrepancy, ectopic eruption of permanent teeth, abnormality in tooth bud position, class II division 2 malocclusion, cleft

palate, over-retained primary tooth, and genetic factors.^{4,5}

The aim of this case report is to introduce a combined fixed-removable appliance, which can be prescribed for patients with severe rotated anterior teeth.

Case Report

An 8-year-old boy was referred to the Orthodontic Department of Kerman Dental School, Iran, with the chief complaint of severe rotation of the upper right central incisor. The patient had no significant medical history. Extraoral examination revealed a straight facial profile and symmetric face. Intraoral examination showed class I malocclusion with anterior dental crossbite due to upright maxillary incisors and severe rotation of right central maxillary incisor (Figure 1). A class I skeletal

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pattern with no vertical discrepancy was confirmed by routine cephalometric analysis (Figure 2). Oral hygiene was poor as clinically evidenced by mild gingivitis and high-level of dental caries (Figure 3).

Since the patient refused to accept fixed orthodontic treatment, correction of rotation had to be done with the aim of a fixed-removable appliance named whip appliance. An alginate impression was taken of the upper jaw, and the removable appliance was constructed on upper jaw model. As figure 4 shows, the appliance is made of acrylic base plate, C clasps on the upper canines, Adams clasps on the upper second primary molars and left maxillary central incisor. All the clasps were made of orthodontic 28 mil (0.7 mm) stainless steel wires, except the 24 mil (0.6 mm) wires which were used for fabricating C clasps on primary canines. Whip spring was made with orthodontic 14 mil stainless steel wires by bending a vertical loop near the canine area and a posterior loop

perpendicular to the first one which was attached to the Adams clasp on the second primary molars (Figure 4).

A standard edgewise 18 mil molar tube (Dentaurum, Ispringen, Germany) was bonded on the labial surface of the central maxillary incisor by means of light cured composite (Master Dent, London, UK). The mesial end of the whip spring was inserted into the molar tube and cinched gingivally. The distal hook of spring was placed on the bridge of the upper primary second molars Adams clasp (Figure 5).

The guidance of how to place and remove the appliance was told to the patient and emphasized that he is free to remove only for tooth brushing. The patient visited every 4 weeks. After 6 months, the position of upper right central incisor was corrected (Figure 6). Because of the high probability of relapse, after over correcting the rotation of the tooth, circumferential supracrestal fiberotomy surgery was done.



Figure 1. Extraoral and intraoral examination and radiograph before treatment



Figure 2. Lateral cephalogram radiograph before treatment



Figure 5. Whip device for derotating tooth

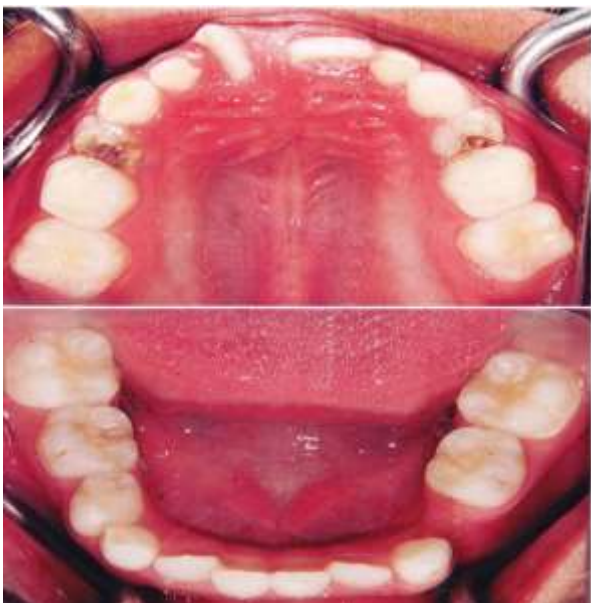


Figure 3. Tooth caries and premature missing of primary teeth before treatment



Figure 6. Overcorrected tooth



Figure 4. The design of removable appliance and whip spring

One week after fiberotomy, retention period was initiated using a modified Hawley retainer with Z-spring to increase the inclination of maxillary permanent incisors and correct anterior dental cross bite. Post-treatment records were taken and showed no significant changes or relapse within 6-month period of observation (Figure 7).

Table 1 shows the pre-treatment and post-treatment measurements of cephalometric variables. Cephalometric measurements confirmed increase upper incisors inclination.

Discussion

Several treatment options have been proposed for correcting tooth malpositions.⁶ The most used treatment option for teeth malpositions is a fixed "2 × 4 appliance" in

the mixed dentition stage (2 bands on the first molars and 4 brackets on incisors).⁷ Although this approach might correct all kinds of tooth rotations, but it has some limitations as well. With a fixed appliance just on molar tooth, arch wire spans become longer, so great moments are created, and the wire becomes more springy and weaker. Furthermore, because only the first permanent molar can be used as anchorage unit only limited movement can be done, and anchorage control is so critical. Therefore, breaking, distortion and displacement of the wire are expected.⁸ Despite the fact that fixed appliances seem simple, use of them in the

mixed dentition has complications that limit their usage. Another disadvantage of the fixed appliance is control of oral hygiene and increased the risk of decalcification of banded and bonded teeth.⁹

An alternative method for correction of tooth rotation is a removable orthodontic appliance with a labial bow and a palatal spring. In this appliance, the reactive forces are decreased, therefore, the problem of anchorage is resolved. This appliance might only modify mild rotations ($< 45^\circ$). Furthermore, treatment of rotations has a high chance of relapse so excellent patient compliance is needed in the usage of removable appliances.¹⁰



Figure 7. Final results of the treatment

Table 1. Cephalometric analysis of pre-treatment and post-treatment variables

Cephalometric index	Mean	Pre-treatment	Post-treatment
U1-SN	102	97	101
SNA	80	79	79
SNB	78	78	78
Man. Plan-SN	32	34	34

Because of the limitations of the mentioned methods, in this study, we introduce a removable appliance with fixed attachment for the treatment of the severe incisor rotation.

The advantages of whip appliance such as; simple force system, short duration of treatment, adequate anchorage due to palatal coverage and better management of oral hygiene, make it suitable for correction of tooth rotation in the mixed dentition.

As mentioned in previous articles good patient cooperation is a more probable in comparison to other removable appliance, since when patient removes the acrylic plate, the distal end of the whip spring penetrates into the buccal mucosa.^{11,12}

Complications that might arise during treatment phase are debonding of the attachment and distortion of the spring. A good level of compliance would minimize these

complications. Furthermore, the whip spring might wound the mucosa so, to deviate the wire from the vestibular mucosa some modification of the whip spring as mentioned by Parisay et al.,¹⁰ might be needed.

The whip appliance is a fixed-removable device which corrects severe rotation in the anterior teeth. By using this appliance, the clinician can correct tooth rotation in the early mixed dentition. This improves patient's self-confidence by improving smile esthetics in the preadolescent stage.

Conflict of Interests

Authors have no conflict of interest.

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