

## Correction of severe tooth rotation by using two different orthodontic appliances: Report of two cases

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### Case Report

#### Abstract

**BACKGROUND AND AIM:** Severe rotation of tooth is one of the most common problems in orthodontics and considered as a developmental phenomenon. These rotations can cause cosmetic problems, gingival recession, and traumatic occlusion. By using removable appliances, severe rotations can be treated. Furthermore, gingival damage, tooth attrition, and transposition of other teeth could be prevented. Early treatment of these rotated teeth could improve dental aesthetic affecting on child's behavior and enhanced self-confidence. This case report presents two treated cases using the removable appliance in severe tooth rotations.

**CASE REPORT:** Case 1: The severe rotation of right upper central incisor in a 9-year-old girl is corrected with removable orthodontic appliance and whip spring. Case 2: The severe rotation of left lower lateral incisor in an 8-year-old girl is corrected with a force couple and elastic anchored on the removable orthodontic appliance.

**CONCLUSION:** In this paper, it was revealed that to correction the problem, in the first case a removable appliance with a whip spring was used and in the second case, a removable appliance in combination with bracket and elastic was efficient to prevent from a complicated orthodontic treatment in the future.

**KEYWORDS:** Rotation; Removable Orthodontic Appliance; Correction

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Crowding is the most common dental malocclusion and associated with a reduction in the size of the jaws. The role of crowding in the development of dental caries and periodontal disease has been confirmed.<sup>1</sup> A rotated central incisor creates numerous aesthetic and psychological problems for a patient. Tooth rotation is considered as observable mesiolingual or distolingual intra-alveolar displacement of the tooth around its longitudinal axis.<sup>2</sup> The exact etiology of tooth rotation is unknown, but it seems to be a developmental phenomenon. Displacement of dental follicle

and path of tooth eruption can create tooth rotations.<sup>1,3</sup> If there are multiple rotations of teeth, comprehensive orthodontic treatment with fixed appliances are used. But in cases with a single severe tooth rotation, it can be used removable appliances, for correction of rotated teeth.<sup>4,5</sup>

When a fixed orthodontic appliance is used to correct only some of the teeth in the mixed dentition, arch wire spans are longer, the wire is springier and large movements are easily possible. However, it may be difficult to use fixed appliances correctly during the mixed dentition period since the available permanent

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teeth are grouped into anterior (incisor) and posterior (molar) segments. In addition, anchorage control becomes difficult as only the first permanent molars serve as an anchorage in the posterior segment of the arch.

The whip appliance was introduced by Houston and Isaacson in 1980. The original appliance has been mildly modified to better satisfy the therapeutic needs. This appliance consists of a removable orthodontic plate, a cantilever spring and a bracket or bonded tube that enables effective correction of severely rotated anterior teeth in a short period of time. Better anchorage control, relatively simple force system, easier oral hygiene management, and less critical patient cooperation are the advantages of the appliance.<sup>6</sup> Correction of the rotated teeth in early ages also prevents from irreparable injuries to the supporting tissues, and dental follicle transposition.<sup>7</sup> Canine-lateral transposition can be problematic in laterally mandibular movements.<sup>8</sup> In addition, avoiding of tooth eruption in a rotated position can reduce the relapse of treatment.<sup>9</sup> The early treatment of these rotated teeth could improve dental aesthetic affecting on child's behavior and enhanced self-confidence. Researchers have also found that an attractive appearance and social acceptance can assist the individual in achieving social success.<sup>10</sup> In this report, two different methods for correction of severe tooth rotation by means of removable orthodontic appliances offered.

In the first case, severe rotation of right maxillary central incisor in a 9-year-old girl corrected by whip spring and removable orthodontic appliance and in the latter one, severe rotation of lower left lateral incisor in an 8-year-old girl corrected by a force couple and elastic anchored on the removable orthodontic appliance.

## Case Report

### Case 1

The 9-year-old girl was referred to the private

practice with the chief complain of severe rotation of the upper anterior tooth (Figure 1). Her medical history revealed no problems. Clinical examination showed a slightly convex facial profile and symmetric face. The soft tissue of the lips, chin, and nose were evaluated. Intraoral examination revealed class I malocclusion, but over jet and overbite was reduced. In panoramic radiography, severe rotation of the upper right central incisor was observed. The device included a removable orthodontic appliance, a whip spring and a bonded tube (Figure 2).



Figure 1. Central incisor with 90° rotation



Figure 2. Removable appliance, whip spring and bonded tube

The removable appliance consists of acrylic base plate, circumferential clasps on the maxillary first permanent molars and a labial arch on the upper primary canines.

Molar Adams clasps and labial arch were made of 28 mil (0.7 mm) stainless steel wire (Dentaurum, Germany). A bonded tube (Dentaurum, Germany) was bonded on the 1/3 incisal area of the labial surface of central incisor with light-cured composite resin (Trans Bond XT, 3M Unitek, USA). To increase flexibility, the range of motion and easier insertion of coil springs, whip spring was made with a segment of 0.4 mm stainless steel orthodontic wire (Dentaurum GmbH & Co. KG TurnstraBe 31, 75228 Inspringen-Germany) and a length of 20 mm. The mesial end of the spring was inserted into the tube slot and bent toward the gingiva, and the hook located in the distal end of the wire was engaged to the labial arch. The patient was monitored monthly and during 4 months the upper right central incisor was repositioned to its normal position (Figure 3). The induction force of flexibility of the wire corrected the rotated tooth. After over correcting the tooth rotation, the appliance was removed, and retention begins using a modified Hawley retainer. Circumferential supra crestal fiberotomy surgery was not performed because no satisfaction of her parents.



Figure 3. Correction of the rotated tooth

### Case 2

The 8-year-old girl was referred to the School of Dentistry of Shiraz University of Medical Sciences, Iran, with chief complain of severe rotation of the lower left lateral incisor. The medical history of the child revealed no

problems. In the clinical examination, normal growth pattern was seen. In the extra oral examination, the patient's profile was slightly convex and in front view was normal. Intraoral examination showed class II malocclusion with the severe rotation of the lower left lateral incisor and over jet was increased (Figures 4 and 5). Upper mid-line was deviated to right (1 mm) and lower midline was deviated to left (2 mm). Space analysis by using radiography revealed lack of space for the eruption of permanent teeth in the mandible and maxilla (7 and 4 mm, respectively).



Figure 4. Intra oral view of the patient



Figure 5. Lateral incisor with 90° rotation

In the panoramic radiograph, lateral incisor had a severe rotation, and the risk of impaction or incomplete transposition of canine-lateral in the same side due to superimposition of the canine crown on the



lateral incisor root was observed. The device included a removable orthodontic appliance, two brackets (Dentaurum, Germany) on lingual and labial surfaces of the rotated tooth and elastic 3/16 Median pull (American Orthodontics EC Certification Service GmbH Sandgasse7, A-9300 St. Veit/glan, Austria). The removable appliance consists of an acrylic base plate, circumferential clasps on the mandibular first permanent molar, first and second primary molars and a labial arch on the lower incisors. Labial arch included a double loop at equal distances from the brackets (Figure 6). Molar Adams clasps and labial arch were made of 28 mil (0.7 mm) stainless steel wire (Dentaurum, Germany). Two brackets were bonded on the lingual and labial surfaces of the left lower lateral incisor with light cure composite resin (Trans Bond XT, 3M Unitek, USA). Using two equal forces (a force couple) and elastic 3/16 by the medium pull from opposite sides of the tooth, lateral incisor was derotated well during 2 months (Figure 7).



Figure 6. Appliance design



Figure 7. Removable appliance, two brackets and elastic in oral cavity

## Discussion

Severe tooth rotation can cause dental and gingival problems. It is also can create the inappropriate appearance and adverse psychological effects on the child's life. Although the etiology is clearly unknown, dental follicle displacement and path of tooth eruption can be the possible causes.<sup>1</sup> In two present cases, it seems to be the same causes. If these rotations cannot be modified, they cause a traumatic occlusion that it can cause gingival recession, root resorption in involved teeth. Since fixed orthodontic treatment in childhood and adolescence is not recommended, early correction of severe tooth rotations using removable devices or a combination of fixed and removable devices to reduce the injuries mentioned above could be very useful. Whip spring is an auxiliary spring and is usually placed in the molar band.<sup>4</sup>

Jalali and Bagherian<sup>11</sup> used whip spring joined to Adams clasp for correction of severe rotation of maxillary central incisor. They didn't observe any harmful side-effects on root development. They also mentioned, mobility and sensitivity to pain until 1 month after the active phase of treatment was normal. Mavragani et al.<sup>12</sup> mentioned that since root shortening due to apical resorption is one of the most serious side-effects of orthodontic treatment, it seems advisable to initiate orthodontic correction of the incisors at a young age during mixed dentition. Complications involving delayed treatment of a rotated permanent incisor include: Dilacerations of the developing roots, root resorption, loss of tooth vitality and compromised oral hygiene.<sup>2</sup> Whip appliance has many advantages for use in the mixed dentition as follows:

1. Offering a solution in the mixed dentition period, relatively in a short time
2. Providing increased vertical and horizontal anchorage due to palatal coverage
3. Anchorage control is less critical
4. Force system is relatively simple when

this appliance is used

5. Management of oral hygiene is easier

6. Patient compliance is less critical, because when removing the appliance, the damage of mucosa by wire leads to patient discomfort

7. Whip appliance can be used in emergency situations in the mixed dentition, such as traumatic occlusion of central incisors.<sup>13</sup>

In the first case, the spring was placed on the labial arch and the patient didn't have any limitation in wearing the removable appliance. After derotation of the tooth, the other appliance was used for retention. Mobility and mild pain were the natural complications of rotation correction, and these complications were observed in both patients. In treatment planning of the latter case, using the removable appliance and whip spring wasn't possible. Therefore, we used the combination of removable and fixed appliances to derotate the tooth. Rotation correction by using a light force in early stages of root development can lead to a stable outcome.

One of the problems with the use of whip appliance is that much attention should be considered not to activate it in the vertical plane, otherwise unwanted mesiodistal

crown and root movement may be occurred.<sup>4</sup> Furthermore, this appliance can hurt the mucosa if not adjusted carefully.

It is mentioned that rotations are easy to treat but very difficult to retain. There is a high risk of relapse due to stretching of the supra-alveolar and transseptal gingival fibers, which slowly reposition. Therefore, it should be overcorrected and long-term retention period is needed to achieve the stability of treatment. Correction of single tooth severe rotation using orthodontic appliances or a combination of fixed and removable orthodontic appliances is affordable and secure way, and the possible need for future orthodontic complex treatment reduce. Timely correction of these rotations reduces the risk of damage to gingiva and teeth and also traumatic occlusion decrease. The early treatment of these rotated teeth could improve dental aesthetic affecting on child's behavior and enhanced self-confidence.

### Conflict of Interests

Authors have no conflict of interest.

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