Correction of a severely rotated maxillary central incisor with the Whip device

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Abstract Objective: The aim of this case report was to introduce an appliance that can be used for correcting severe rotation of anterior teeth in pre-adolescent children.

Appliance design and testing: This is a case report of an 11-year-old Iranian boy with a mixed dentition Class I malocclusion defined by a severe rotation of upper left central incisor and a mesiodens between the centrals. The supernumerary tooth was first extracted, and then a Whip device including removable appliance, a cantilever spring and bonded tube on rotated tooth was inserted into his mouth. After 8 months, the upper left central incisor was orthodontically brought into proper alignment. Circumferential supracrestal fibrotomy was done next to overcorrection of the tooth and one week after surgery, the device was removed and the retention was started.

Conclusion: The whip device, a removable appliance can be very effective for correcting severe rotation of anterior teeth.

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1. Introduction

The supernumerary tooth is an extra tooth which develops in addition to the regular number of teeth. It is derived from a developmental disturbance during odontogenesis (Gündüz and Mugelali, 2007; Srivatsan and Aravindha Babu, 2007). There is evidence of hereditary and environmental factors leading to this condition (Primosch, 1981; Giancotti et al., 2002; Russell and Folwarczna, 2003; Ersin et al., 2004; Gündüz and Mugelali, 2007).

The mesiodens is a common supernumerary tooth which is often a malformed, peg-like tooth that occurs between the maxillary central incisors (Srivatsan and Aravindha Babu, 2007). The mesiodens is more common in the permanent than the primary dentition and the incidence of its occurrence is 0–1.9% for deciduous teeth and between 0.15–3.8% for permanent teeth (Srivatsan and Aravindha Babu, 2007). Mesiodens very frequently causes retention of permanent incisors which erupt spontaneously after the extraction of supernumerary teeth, if there is sufficient space in the dental arch and conserving the eruptive force (Fernández-Montenegro et al., 2006).
In addition, mesiodens can delay or prevent eruption of central incisors in 26–52% of cases, cause ectopic eruption, displacement or rotation of a central incisor in 26–63% of cases, and labially displace incisors in 82% of cases (Gardiner, 1961; Primosch, 1981; Russell and Folwarczna, 2003). Less common complications involving the permanent incisors include dilacerations of the developing roots, root resorption and loss of tooth vitality. Also, space loss and a midline shift of the central incisors may occur, since the lateral incisors will erupt and may drift mesially into the central space (Primosch, 1981; Hattab et al., 1994). Thus, a significant delay in treatment can create the need for more complex surgical and orthodontic management.

Tooth rotation, which is one of the most common side effects of a mesiodens, is defined as observable mesiolingual or distolingual intra-alveolar displacement of the tooth around its longitudinal axis (Baccetti, 1998).

A rotated upper central incisor can be corrected by a removable orthodontic appliance and minimal force, but severe rotations, rotation of other teeth and multiple rotations can be corrected by using a fixed appliance (Isaacson et al., 2003). Many rotations are associated with an element of apical displacement and will be difficult to correct with a removable appliance (Isaacson et al., 2003).

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

2. Appliance design

The device included a removable orthodontic appliance, a cantilever spring (Whip) and a bonded tube. The removable appliance was made of acrylic base plate, posterior bite plane, circumferential clasps on the upper primary canines and the maxillary first permanent molars, and Adams clasps on the upper primary second molars (Fig. 1).

All the clasps were made of 28 mil (0.7 mm) stainless steel wire (Dentaurum, Germany), except the 24 mil (0.6 mm) wire which was used for clasps on canines.

In designing removable appliance, we did not put Adams clasps on first permanent molars because of its excessive springiness and inadequate strength of the Whip spring due to increased wire length. Therefore, in order to avoid deformity of the Whip spring we made Adams clasps on second maxillary primary molars.

On the other hand, a mandibular first molar bonded tube (standard edge wise, 18 mil tube slot, Dentaurum, Germany) was bonded directly on the labial surface of the rotated tooth by means of self-cured composite (Master Dent, UK).

Whip spring was fabricated by bending a vertical loop facing upward and immediately a vertical loop facing downward into 14 mil stainless steel wire at one end (Fig. 2).

The mesial end of the spring was inserted into the tube slot and bent towards the gingiva, and the hook located in the distal end of the wire was engaged to the bridge portion of the upper primary second molar Adams clasp.

3. Case report

An 11-year-old Iranian boy was referred to the Faculty of Dentistry of Mashhad University of Medical Sciences with a chief complaint of severe rotation of the upper anterior tooth. The child’s medical history was non-contributory for pertinent findings. His facial profile was mild convex. The clinical examination showed good facial symmetry and competent lips at rest. Intra oral examination revealed Class I malocclusion with severe rotation of left central maxillary incisor due to a supernumerary tooth located between maxillary central incisors (Fig. 3).

A Class I skeletal pattern with no vertical dysplasia was confirmed by routine cephalometric analysis and there were no transverse problems noted during the oral examination. Oral hygiene was poor as evidenced by mild gingivitis. Radiographs confirmed a mesiodens and severe rotation of the upper left central incisor.

The mesiodens was first extracted by an oral surgeon under local anesthesia, and after 10 days, an alginate impression was taken of the upper jaw. The removable appliance which was designed and constructed was explained to the patient. The bonded tube was placed on the labial surface of the rotated tooth according to plan. A Whip spring was constructed and ligated into place. The mesial end of the wire was turned down in the conventional manner, for preventing the wire from dislodging (Fig. 4). In order to protect buccal mucosa from irritation due to long span of unbracketed wire (space from the tube of the upper central incisor to the primary second molar) the
The patient was told to wear the appliance full time and not to remove it even during meals. The boy was seen for routine orthodontic adjustment visits every four weeks. After 8 months of these mechanics, the upper left central incisor was repositioned to its normal position (Fig. 5).

After over correction of the tooth, circumferential supracrestal fibrotomy was done by a periodontist in order to prevent relapse.

One week after fibrotomy, the appliances were removed and retention was started by a modified Hawley retainer with an acrylic bar on its labial bow. At the time of appliance removal the child’s radiographic and intra oral appearance were consistent with what one would normally find in a child of his age.

4. Discussion

Supernumerary teeth are a disorder of odontogenesis relatively common in the oral cavity and characterized by excess number of teeth. The term mesiodens is used to refer to a supernumerary tooth in the central region of the premaxilla between the two central incisors. The complications associated with mesiodens include: lack of eruption of permanent teeth, the deviation of the eruption path, rotations, root absorption, pulp necrosis with loss of vitality and diastema (Giancotti et al., 2002). Several clinical treatments have been proposed in the literature for correcting tooth malpositions caused by a mesiodens (Burton-Douglass, 1993; Ochoa Grijalva and Kuster, 1993; Giancotti et al., 2002).

The typical fixed appliance for mixed dentition treatment is a ‘2 * 4’ arrangement (2 molar bands, 4 bonded incisors). When a fixed appliance includes only some of the teeth, arch wire spans are longer, large moments are easy to create, and the wire themselves are more springy and less strong. Since the available permanent teeth are grouped in anterior (incisor) and posterior (molar) segments, the apparently simple fixed appliances used in the mixed dentition can be quite complex to use appropriately. In addition, with only the first molars
available as anchorage in the posterior segment of the arch, anchorage control is both difficult and more critical (Proffit and Fields, 2000).

For a mixed dentition child with a severely rotated central incisor, Whip appliance has several advantages as follows:

1. Solving the problem in the mixed dentition
2. Anchorage control is less critical
3. Force system is relatively simple
4. Oral hygiene management is easier
5. Patient cooperation is less critical

The latter is due to patient discomfort when he or she removes the removable appliance from the mouth, because in this situation, the distal end of the whip spring is inserted into the buccal mucosa.

Derotated teeth have a strong tendency to relapse, for this reason it should be overcorrected if possible and retained full time for at least 6 months. Whip appliance is a fixed-removable appliance which could efficiently correct severely rotated anterior teeth, such as the maxillary central incisor in a short duration.

References


Figure 5  Facial and intraoral photographs of the patient after 8 months.