Clinical contribution

Upper molar distalization on palatal miniscrews: an easy to manage palatal appliance

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\textbf{A R T I C L E  I N F O}

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\textbf{A B S T R A C T}

Upper molar distalization supported by miniscrews has become increasingly popular in the last years. A detailed clinical and lab procedure for the realization of a distalization appliance (fast back or distal jet) connected to miniscrews inserted in the anterior region of the palate is presented. A case report illustrates the use of a fast back appliance supported by miniscrews to correct the mesial shift of the molars and of the premolars as a consequence of an early loss of the maxillary deciduous canines.

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1. Introduction

The use of miniscrews as an aid in the distalization of the upper molars has become popular in the recent years\textsuperscript{1−11}. Miniscrews have been placed in different sites in the maxillary bone according to the biomechanical system selected for distalization. Some Authors\textsuperscript{1,4,10} prefer to place TADs in the interradicular space on the vestibular side of the maxilla and use miniscrews as indirect anchorage. A drawback of this approach is the poor quality of maxillary bone on the vestibular side,\textsuperscript{12} with few ideal sites for miniscrew insertion.\textsuperscript{13} Furthermore, sooner or later throughout the therapy, miniscrews must be removed because they are “on the way” of teeth moving in a distal direction (usually premolars).

The palatal bone is thicker than the vestibular bone\textsuperscript{12,14} and insertion sites around the midpalatal suture are safer, since they are far away from any dental root. The premolar zone of the palate has been considered as ideal for miniscrew insertion\textsuperscript{14}. Some Authors\textsuperscript{3,7,9} inserted TADs in the intermaxillary suture while others at its side (2 to 3 mm of distance from it)\textsuperscript{2,5,6,8}. In growing patient where the midpalatal suture can be still open\textsuperscript{15}, a position close to the suture may be preferable.

The purpose of this paper is to describe the clinical management of an effective distalization appliance (fast back or distal jet) supported by miniscrew(s) inserted in the anterior region of the palate close to the midpalatal suture. A case report illustrates the use of the appliance to correct a mesial shift of the molars and premolars as a consequence of an early loss of the maxillary deciduous canines.

2. Clinical procedure

The clinical procedure is divided into two appointments. During the first appointment the insertion of the miniscrews...
is performed and a precise impression with polyvinylsiloxane (PVS) is taken and sent to the technician. In the second appointment the appliance is delivered to the patient and activated.

The miniscrews used are 8 mm TADs (3 M Unitek, Monrovia, California, USA). This system was chosen because of the O-Cap, a hemispherical stainless steel structure with an inner O-Ring that is easy to connect to the head of the screw. This peculiar piece allows the technician to build different structures as needed either by connecting the O-Caps with a soldered stainless steel structure or by embedding them in a Nance button (Fig. 1). Since the O-Ring is made of rubber it allows some insertion play between the head of the minimplant and the O-Cap. This feature makes the installation of the appliance easier regardless of minor errors that may occur during the impression and lab procedures.

3. First appointment – Insertion of the miniscrew(s)

According to the width of the palatal vault (a preliminary transversal expansion may be needed) one or two miniscrews may be placed. Since it’s not clear in the literature which is the affordable limit of force (1.5 to 2 N for 9 mm miniscrews when the force is applied transversal to the head of the miniscrews)\(^1\) it is preferable to place two miniscrews as anchorage whenever possible. When the palatal vault is high it may be preferable to place one single miniscrew as two miniscrews would be too close to each other and it would be impossible to accommodate two O-Caps on the screw heads. By far, no problems were encountered on molar distalization supported by a single screw.

Miniscrews should be placed 2-3 mm aside of the mid-palatal suture at the height of the contact point between the first and second premolars, roughly distally to the third palatal rugae\(^1\) (Fig. 2). The direction of insertion should be parallel to the sagittal plane, with a slight anterior inclination so that the miniscrew is almost perpendicular to a plane tangent to the palatal vault at the insertion site (Fig. 3).

After insertion the clinician should check for primary stability of the screws, since the impression procedure which follows is quite demanding in terms of stress for the implants. If stability is poor a new screw can be placed a little anterior or posterior to the failed one. If stability is good an O-Cap is placed on the head of each screw as shown in Figure 2. While placing the O-Cap, it is important to safeguard the patient from swallowing it by holding it with a stainless steel 0.010-inch ligature.

4. First appointment - Precision impression

The orthodontist could take advantage of the impression materials used by the prosthodontist. The author suggests a mono-impression technique ("sandwich technique") in which a PVS putty base is placed in the impression tray by the assistant while the orthodontist covers the O-Cap and the molar surfaces with a light body PVS impression material. The result

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Fig. 1 – Possible configurations of the appliance: (A) Nance button with bilateral fast back, (B) Nance button with unilateral fast back, (C) Soldered stainless steel structure connecting the O-Caps with bilateral distal jet.

is an impression that is very precise in the palatal zone and in the molar area, a factor that is critical for a good manufacturing of the appliance. A two-phase impression technique also may be used.
An optimal screw placement results in the O-Cap being totally embedded in the impression material. If the miniscrew is inserted too deep into the bone, the O-Cap may lay too superficial in the impression (Fig. 4) and sometimes it may remain in the mouth when the tray is removed. In this case the orthodontist should place the missing O-Cap in the impression.

Finally a “courtesy” O-Cap should be placed on the head of each miniscrew so that the patient can feel more comfortable when swallowing or passing the tongue on the palatal vault.

5. Laboratory procedure

The technician must insert miniscrew analogues (or old screws) into the O-Cap and pour a stone model (Fig. 5). Following the indication of the orthodontist the technician can vary the appliance design as already mentioned (Fig. 1). Before sending the appliance back to the orthodontist, the O-Rings should be replaced with new ones because they are usually damaged during soldering (Fig. 6).

6. Second appointment - Delivery of the appliance

The orthodontist should remove the “courtesy” O-Caps that are in the patient mouth, taking care of ligating them to avoid accidental swallowing. A rapid test of miniscrew stability is recommended.

Appliance cementation is then similar to any other appliance with bands, with the exception of the palatal area where a light pressure will be enough to let the O-Caps integrated into the Nance button accommodate onto the miniscrew heads.

Activation of the distalization device (distal jet or fast back) should begin immediately with a moderate initial load. During the subsequent appointments the orthodontist should just check for the progress of the distalization and proceed with further activations until needed. The Nance button or the soldered part of the appliance should be cleaned at each appointment with water/air flow.
7. Case report

A 10-year-old patient presented with an early loss of the maxillary deciduous canines. As a consequence, the maxillary permanent first molars and the deciduous molars migrated mesially while the lateral incisors migrated distally (Fig. 7). The panoramic radiograph showed that the unerupted
premolars followed the mesial shift of the deciduous molars, closing the space for the eruption of the permanent canines (Fig. 8). A one screw/bilateral fast back appliance was applied in the mouth and distalization of the maxillary first molars lasted 6 months until the space for permanent canine eruption was restored and an overcorrection of the molar relationship was achieved. The post-distalization panoramic radiograph revealed the improvement in the inclinations of premolars and canines (before bracket placement) and the spontaneous distalization of the second premolars (Fig. 8). A superimposition of the lateral cephalograms on the maxillary stable structures showed a bodily distalization of the permanent first molars (-3.1 mm) without vertical eruption (-0.4 mm) or side effects on the upper incisors (Fig. 9). Brackets were then applied to distribute the spaces and to correct root inclinations (especially second premolars) while waiting for spontaneous eruption of the permanent canines (Fig. 10).

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