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Dentoalveolar and skeletal effects related to Distal Jet appliance

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Abstract

Distal Jet appliance is a maxillary device used for distalization of 1st upper molars, which may be necessary to gain space in the upper arch or to correct a class II molar relationship. Its use is associated with anchorage loss, similarly to other intraoral distalizer. The aim of this study is evaluating dentoalveolar and skeletal effects associated to Distal Jet appliance.

Background

Distalization of upper molars may be necessary during orthodontic treatment in order to gain space in the upper arch or to correct a class II molar relationship.

The first device introduced for this purpose is headgear, which needs to be worn, being so strictly dependent on patient compliance (1). Solutions not dependent on patient compliance have been sought, leading to the introduction of fixed distal molar movement devices that are not dependent on the collaboration of patients. Among intraoral distalizers it is possible to find nickel-titanium springs(2), magnets(3), Pendulum(4), First Class (5), K-loop (6), Jones Jig (7) and Distal Jet (8).

The use of such devices is often associated with anchorage loss: usually these appliances use premolars as anchoring, so molar distalization often associates with the mesialization of the premolars and the protrusion of the incisors.

For this reason, this kind of treatment should be performed in subjects with not protruded incisors, limited overjet and normal or short facial height because of the probable upper 1st molars extrusion action, with an overbite reduction. Moreover a , in most cases it is possible to observe molar tipping (7).

To counteract anchorage loss, it is possible to use a skeletal anchorage with temporary anchorage devices (TADs) (9, 10), even though these can not be used in subjects under the age of 12.

The distal jet is a maxillary device that exerts its distalization action through a compressed nickel titanium spring coil between the first molars, on which bands are positioned, and a Nance button. Even the first premolars are banded and connected to the Nance button.

It can produce unilateral or bilateral molar distalization in 4 to 9 months(11). At the end of the distalization the device is converted into a Nance button to maintain the achieved results.

Among the advantages of distal jet appliance there are simple insertion and activation and easy conversion into a Nance button (12,13). It may also be used together with full bonded appliances (11).

Carano and Testa have claimed that the distal jet, compared to other intraoral distalizers, guarantees greater bodily displacement of the 1st upper molars with less distal tipping because the force is applied closer to the tooth resistance center than other devices (8).

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Materials and Methods

The objective of this study is to analyze and evaluate dentoalveolar and skeletal effects of distal jet appliance, used for upper 1st molars distal movement.

For this reason a research on principal electronic databases PubMed, Embase and Scopus was performed using the keywords [first molar distalization] [intraoral distalizer] [class II malocclusion] [distal jet appliance].

Discussion

Ngantung et al evaluated 33 patients treated with distal jet appliance, with bands positioned on the 1st molars and 2nd premolars. The average time for correction of class II molar relationship was 6.7+/- 1.7 months with a range of 4 to 11 months. The results showed a 1st molar distalization of 2.1+/-1.8 mm and a distal tipping of 3.3Â°+/- 3.7Â°, a mesial movement of 2nd premolars of 2.6 +/- 2.0 mm and the upper incisors to SN angle increased an average of 12.2Â°. There was an increase of lower anterior facial height of 2.4 +/- 1.9 mm (11).

Bolla et al evaluated 20 Class II patients treated with distal jet appliance and described, at the end of the

therapy, a 1st upper molars distalization of 3.2 mm, with a tipping of 3.18Â° (the tipping was influenced by the state of eruption of 2nd molars) and an extrusion of 0.5 mm; 1st premolars underwent a mesialization of 1.3 mm, with a distal axial inclination of 2.88 and an extrusion of 1.1 mm. Inclination of upper incisors and overjet did not change significantly during the treatment and also lower anterior facial height increased 0.9 mm in a non significant way. Moreover the distal jet appliance produced significant transverse maxillary changes, with a 2.9 mm intermolar width increase (14).

Chiu et al compared 32 subjects who received distal jet therapy together with fixed appliance and 32 subjects treated with the pendulum appliance. There were not significant sagittal or vertical skeletal changes in the two groups, with a slight opening of mandibular angle in both groups. The correction of molar class II relationship was greater in the pendulum group (3.8 mm for pendulum and 2.8 mm for distal jet), even though pendulum appliance was associated to a greater 1st molar distal tipping than the distal jet sample. In both groups upper 1st molars extruded slightly (0.5-1 mm). Increase in overjet and decrease in overbite were significantly higher in distal jet sample (15).

Cozzani et al evaluated and compared the efficiency of the traditional tooth-supported and an implant-supported distal jet. Upper 1st molars were distalized into an overcorrected Class I relationship, without statistically significant differences and also molar extrusion was similar between the two groups. A significant distalization of 1st premolars was seen in the group treated with the implant-supported appliance, while in the other group they slightly mesialized, probably because traditional distal jet is bonded to 1st premolars (16).

Pravinkumar et al analyzed 66 subjects requiring 1st molars distalization, divided in 3 groups: group I treated with pendulum appliance, group II treated with K-loop appliance and group III, treated with distal-jet appliance. The inclusion criteria were the presence of a I or II skeletal class, a normal or short lower face height and a II molar relationship. All the patients with an hyperdivergent growth pattern were excluded. The results showed insignificant changes in the SNA, SNB and ANB angles in all the 3 groups and a little backward rotation of mandibular plane. As regards patients trated with distal jet it was recorded an increase in vertical dimensions greater than what found by other authors, there was an overbite reduction of 1,8 mm, the average molar distalization was 3,9 mm and the position of upper incisors increased significantly (17).

Conclusions

Distal jet appliance appears to be an effective device in distalizing maxillary 1st molars, showing a better bodily movement and a less distal tipping than other appliances because of force direction, close to the upper 1st molars center of resistence. Its use is related to anchorage loss, with premolar mesialization, upper incisors protrusion, 1st upper molars extrusion with a clockwise mandibular rotation and overbite reduction. It may be necessary an anchorage reinforcement or, if the patient is older than 12 years old, the use of a skeletal anchorage with TADs.

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