READER'S FORUM

Kang JM, Park JH, Bayome M, Oh M, Park CO, Kook YA, Mo SS

A three-dimensional finite element analysis of molar distalization with a palatal plate, pendulum, and headgear according to molar eruption stage.

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First of all, I want to thank the authors for this interesting article. I am in agreement with the authors in that modified palatal anchorage plate is an effective appliance to distalize the maxillary molars. Also, I hope to request the authors to address the following questions to clarify what was conveyed in the article.

Q1. In the design of cervical-pull headgear described in the finite element model, no counter arch was present. If there is a mandibular dentition, could it be possible for the parameter of Z to be different from what was reported in the result section?

Q2. In the case of bone-anchored pendulum appliance, the first molar showed mesial-in rotation. But, the force of distalization was applied from palatal side. In such a case wouldn't it more likely to result in mesial-out rotation of molar?

Q3. In the case of bone-anchored pendulum appliance, the second molar showed extrusion. Could you please explain more about this phenomenon?

Questioned by

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A1. Our finite element model contains no mandible. Therefore, we cannot give a concrete comment on imaginary situations especially in a mathematical analysis study. Moreover, when a movable component such as mandible is added to the model, its resistance to the maxillary tooth movement would depend on various factors such as its position, the properties of the joint and the connectors simulating the muscles. Therefore, it is impossible to speculate whether the presence of the mandibular dentition would affect the results of the tooth movement in the vertical dimension.

A2. Both modified palatal anchorage plate and bone anchored pendulum appliances showed mesial-in rotation because the force was placed palatally. This means that the mesial part of the tooth is rotating medially toward the inside while the distal part is rotating laterally to the outside.

A3. With the bone-anchored pendulum appliance, the second molar demonstrated uncontrolled distal and buccal tipping and extrusion of the mesiolingual cusp. For the bone-anchored pendulum appliance, only the 1st molars were connected to the appliance. Therefore, the force was applied to the 2nd molar through the contact area between the 1st and 2nd molars which were both located slightly medial to the center of resistance. This type of force system is a single force that would result in a combination of translatory and tipping movement because it is not passing through the center of resistance of the 2nd molar. As a result, the crown of the 2nd molar would be tipped distally as the distalizing force is applied occlusal to the center of the resistance.

Also, the mesial-in rotation of the 1st molar results in a distobuccally directed force on the 2nd molar which

result in buccal tipping as the transverse component of the force is applied medial and occlusal to the center of resistance and acting from palatal to buccal direction. Therefore, the 2 tipping movements of distal and buccal directions would result in extrusion of the mesiolingual cusp of the 2nd molar.

Replied by

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