

Lingual Biomechanics: Vertical or Horizontal Slot?

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ABSTRACT

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Introduction

The first! modern» orthodontic appliance was described by Pierre Fauchard, who is widely considered as the father of modern dentistry, in 1728 [1]. This brace was de- signed to expand the arch and was made of a gold or silver horseshoe shaped band attached to the teeth with silk ligatures. Since the appearance of orthodontic brackets, several changes, particularly in his body, have been made. Changes in the bracket' body are still happening [2]. The place where the orthodontic wire enters and is tied, is called "slot" and presents many variations, both in its shape and dimensions as well as in the insertion direction in which the orthodontic wire is inserted [3]. The purpose of this study is to present the two different orthodontic wire placements, [4] horizontal and vertical, and to study and record the disadvantages and advantages of orthodontic movements in the three dimensions of space [5].

Horizontal or Vertical Slot for the Orthodontic Bracket?

Material and Methods

We compared two lingual brackets:

- The Kurz 7th Generation by ORMCO [6] and

- The Magic lingual bracket by Dentarum for the front teeth as well as for the back teeth [7]. The advantages and disadvantages of the movements were studied and recorded: protrusion, retraction, intrusion, extrusion of the anterior teeth, extrusion of the posterior teeth, torque, rotation of the anterior teeth, rotation of the posterior teeth, up righting of the anterior teeth and up righting of the anterior teeth the posterior teeth [8-10] (Figures 1-18).



Figure 1: Central Incisor "Kurz 7" Bracket.



Figure 2: Central Incisor "Magic" Bracket by Dentaureum (Vertical slot)



Figure 3: Central Incisor "Kurz 7" Bracket by Ormco (Horizontal slot).



Figure 4: Upper Premolar "Magic" Bracket.



Figure 5: "Kurz 7" Anterior Brackets with the wire in place.

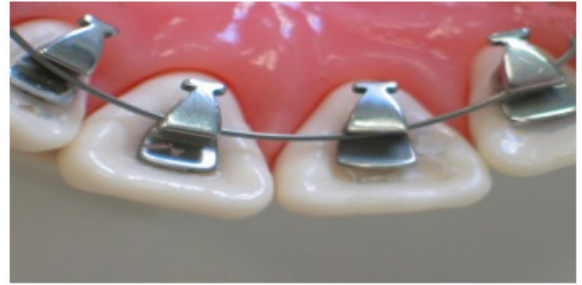


Figure 6: "Magic" Anterior Brackets with the wire in place (Vertical Insertion).



Figure 7: "Kurz 7" Posterior Brackets with the wire in place (Horizontal Insertion).



Figure 8: "Magic" Posterior Brackets with the wire in place (Vertical Insertion).

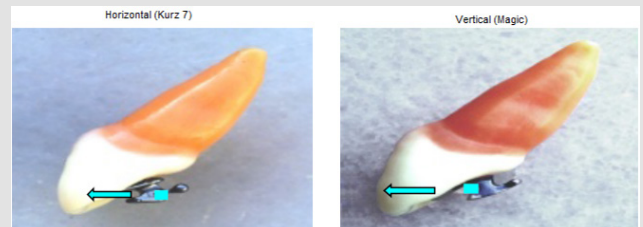


Figure 9: Protrusion: Both brackets respond well.

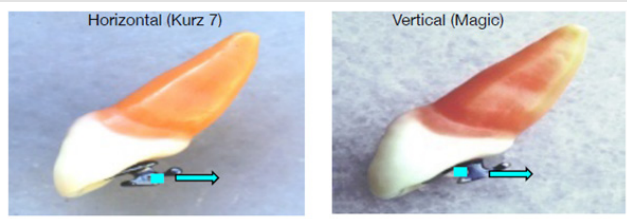


Figure 10: Retraction::Advantage Magic.



Figure 15: Rotation of Posterior Teeth: Advantage magic.

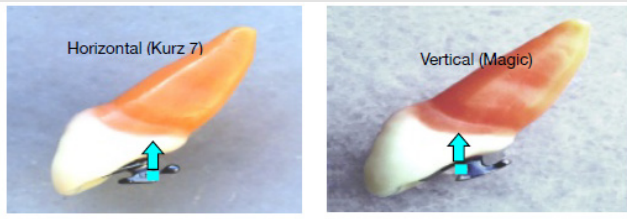


Figure 11: Intrusion: Both brackets respond well.



Figure 16: Uprighting of Anterior Teeth: Both brackets respond well.



Figure 12: Extrusion of Anterior Teeth: Both brackets respond well.



Figure 17: Uprighting of Posterior Teeth: Advantage Kurz 7.

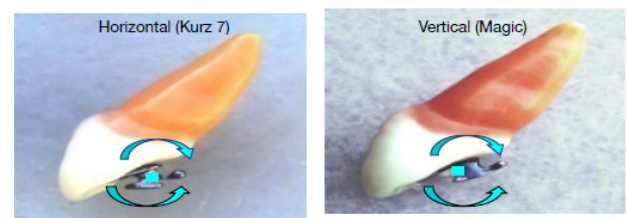


Figure 13: Torque: Both brackets respond well.



Figure 18: Extrusion of Posterior Teeth: Advantage Kurz 7.

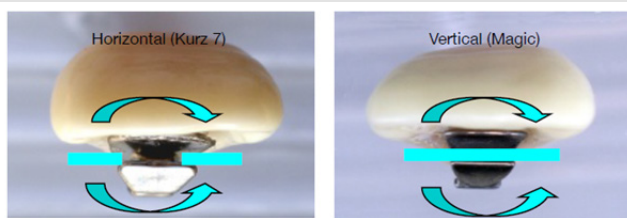


Figure 14: Rotation of Anterior Teeth: Both brackets respond well.

Results

No difference was observed in protrusion movement in both horizontal and vertical slots. On the contrary, during the retraction movement with the ORMCO Kurz 7th Generation bracket with horizontal slot, the orthodontic wire tends to come out of its slot, while with Dentarum's Magic lingual bracket this phenomenon is not observed. In the Intrusion movement there was no difference in biomechanics between the two brackets. The same happens

for the orthodontic movement of the extrusion but only for the anterior teeth, because for the posterior teeth the orthodontic wire in the Dentarum Magic bracket with the vertical slot has a tendency to go out. Regarding the torque, no difference was observed between horizontal and vertical slot brackets. No difference was also observed between the anterior brackets in moving the rotation, but for the posterior brackets the horizontal insertion is more disadvantageous because the wire tends to move away from the slot. Finally, for the Up righting of the anterior teeth there was no biomechanical difference, in contrast to the posterior ones where the choice of the horizontal slot is preferable.

Conclusion

A frequent problem that occurs in orthodontics is that the force applied on the brackets tends to pull the wire out from the slot. The "Kurz 7" horizontal slot bracket is problematic during retraction and rotation of the posterior teeth. The Magic vertical slot bracket is problematic during extrusion and up righting of the posterior teeth. Also, the "Magic" anterior brackets act like the horizontal slot brackets because of the special design of their slot. Taking in consideration the importance of bodily retraction in orthodontics,

as well as the better accessibility and ease of use of the vertical slot brackets - we think that in certain cases a vertical slot bracket like "Magic" can be a good alternative to the widely used "Kurz 7" horizontal slot bracket.

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