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EVALUATION OF FRICTION OF SELF-LIGATING DAMON 3 BRACKET AND CONVENTIONAL BRACKETS SYSTEM: A REVIEW.

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Abstract

Objective: evaluation of friction forces between Damon bracket and conventional bracket considering in vitro studies of literature.
Materials and methods: evaluation of thirteen in vitro studies of literature from 1998 to 2016.
Results: the production of low friction by self- ligating bracket depends to diameter of archwire and so is obtained easily with round archwire and another factor that influences the friction is the bracket design.

Introduction

Sliding a tooth along an archwire is a very common orthodontic procedure to translate tooth, but one of the disadvantages of this system is the frictional forces between wire and brackets. These forces can result in decreased treatment efficiency, loss of anchorage and , consequently, unwanted tooth movement. Two major types of friction can be defined: static friction which is the resistance that prevents initial movements tooth and kinetic friction which is the force required to resist the sliding motion of one solid object over another at constant speed (1).
The nature of friction in orthodontics is multifactorial, which is derived from both mechanical and biological factors; mechanical factors such as archwire properties , method of ligation and bracket properties; biological factors such a as saliva, plaque, corrosion and food particles (2).
The method of ligation have a central role in the making of friction forces , therefore various method have
been proposed to reduce these forces such as self-ligating bracket. SLBs are ligatureless bracket systems
that have a mechanical device which is built into the bracket to close off the slot. There are two types of self-ligating bracket: active SLB, that have a spring clip that presses against the archwire and passive SL in which the self-ligating clip does not press against the wire. The Damon 3 SLB is a passive self- ligating bracket and use covers that slide vertically in an occlusal direction. The slot size of this brackets is 0.022x0.027 inch.(1).
Nowadays, self-ligating brackets have become very popular in orthodontics practice and both patients and orthodontist are more interested in using them.
The aim of this review is the evaluation of the studies that compare the friction forces in Damon 3 brackets and conventional bracket system.

Methods

It was realized a search on Pubmed of in vitro studies from 1998 to 2016 using key word like "Damon bracket", "self-ligating bracket" and "low friction in orthodontic". Have been selected thirteen articles which are compared self-ligating bracket and conventional bracket.

Discussion

By the result of the studies analyzed, in literature there are two groups of studies based on the resistance forces to sliding and static friction in Damon and conventional brackets. One group reported no significant
differences between self-ligating and conventional brackets (1-8- 9-11- 12-13), while the other group (2-3 -

7-10- 14-15- 16-) claimed that self -ligating brackets produce less friction than conventional ones with a significant difference. These differences depends on the type of wire used; Pandis et al. (8)mentioned there was no difference in frictional forces between SLB and conventional brackets because they used rectangular archwire that fill the slot of Damon bracket and produce more friction; Kumar et al.(6) have shown that friction appears to increase as archwire diameter increases, also with Damon bracket, in fact with all the bracket type the 0.019x0.025 inch. steel stainless wire produces the highest friction, even if Damon 3 passive SL system showed the lowest friction for all dimension of test wire compared to the other
type of bracket tested. The group of studies that

claimed the less friction of self- ligating brackets are based
on the use of a round archwire that canâ€™t contact all the surface of the slot and consequently less friction arise. Tecco et al.(7) have shown that Damon 3 produced less friction with a round wire and that time 3, SLB active produced more friction; these differences observed among the SLB could be explained by the differences in the shapes of their little caps that can or not press the wire against the slot and increase the friction. So two important factors affect the arise of friction forces: diameter of wire, bracket design (5).
The presence of a flared slot allows better guidance of the wire at the bracket corner, like says Crincoli et al. (3), this slot design reduce the binding and notching of the wire against the corner of the bracket. When
the corner of contact between bracket and archwire is wide, the sliding movement of teeth can be
disturbed by vertical forces produced at both ends of the bracket slot as the bracket archwire angulation increases and causes binding. Under high magnification of an electron microscope the corners of Damon
brackets slot showed smooth surfaces and so that reduce the friction (4).

Conclusion(s)

Reduction of frictional forces during sliding mechanics increases the efficiency of the orthodontic
treatment, but the choice of bracket system may consider the phase of treatment. SLB system is more efficient in the alignment phase (6) because produced low friction compared to conventional bracket,
where the ligature contact the wire and make high friction.

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