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FORCE AND MOMENT/FORCE RATIO OF ORTHODONTIC LOOPS

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ABSTRACT

The present work has the purpose of determining the force systems in α (horizontal force, M/F ratios) of the T and L shaped loops for the same vertical dimension (7mm), as well as for the same inter-bracket distance (13 mm). With five different pre-activation bends and two metallic alloys (stainless steel and titanium-molibdenum alloy - TMA) with a section of 0,017”x 0,025”

INTRODUCTION

When the orthodontic device is activated, the clinician has control over three variables that determine the success of tooth movement. The first variable is the moment-force ratio (M/F); the second concerns the magnitude of the moment and the employed force, and the third, their constancy (Burstone, 2003).

It is important that, when using an orthodontic appliance, the professional determines the force system it generates, it means have the notion of the magnitude of the forces and moments developed during its activation (Kuhlberg, 2003). The possibility to quantify, as well as to control M/F ratios in the brackets are the key for a controlled and predictable dental movement (Viecilli, 2006).

Two hundred loops were submitted to the mechanical essay - for each pre-activation ten loops were used (5), metallic alloy (stainless steel and titanium-molibdenum alloy - TMA) and geometry (T and L shaped loops). The moment and horizontal force intensities were quantified using the OrthoMeasure Moment apparatus (Braun, 2002), the testing table and a digital comparator. The values were registered every 0,5mm of activation, with an initial activation of 1 mm and a final activation of 6mm. The data was statistically analysed using the ANOVA methodology for a significance level of 5%.

RESULTS AND CONCLUSIONS

The results allowed us to conclude that there are statistically significant average differences according to the pre-activation in all kinds of loops [TMA L (fig.1), and T (fig. 2), steel L and T] at strength and ratio M/F levels.

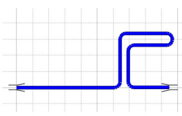

Fig. 1 - L loop

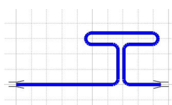

Fig. 2 ~T loop

As to what concerns force, L loops registered higher values than T loops (fig. 3) and the influence from pre-activation of force localization was confirmed. Also for M/F ratios, T loops registered higher values than L loops. In the absence of pre-activations, the TMA loops presented higher values than steel loops, the maximum registered level being inferior to the vertical dimension of the loop (fig. 4). In the loops without pre-activation, an augmentation on the M/F ratio was demonstrated through an activation augmentation, an opposite was assessed in pre-activated loops.

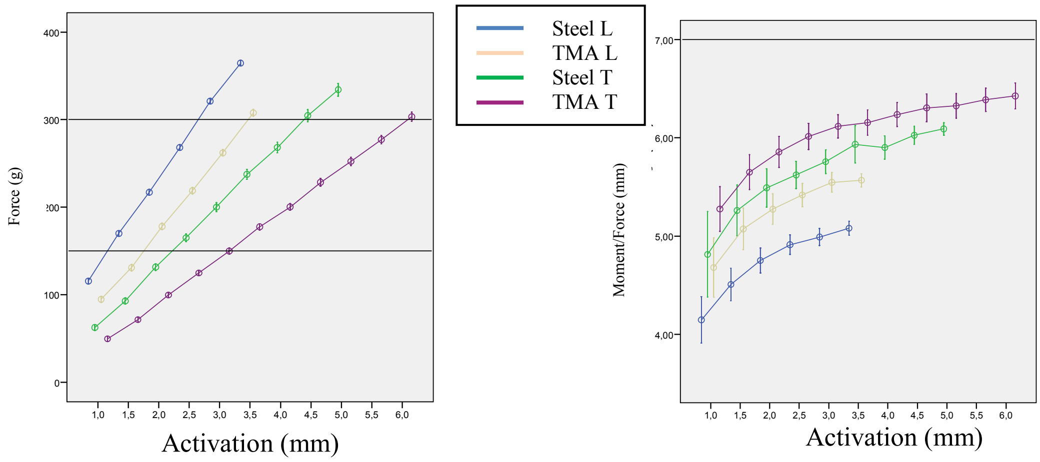

Fig. 3 - Force/activation (without pré-activation)

Fig. 4 - (Moment/Force)/activation (without pré-activation)

In most of the activations with pre-activated loops, the steel presented M/F ratio values higher than TMA. The increase in M/F ratio, assessed with the insertion of pre-activation bends, was higher when the bend distribution was partial or completely gingival. The loop presenting the best compromise between force and M/F ratio was the T loop in TMA, with a pre-activation of 40º, in the 1 mm to 4 mm activation interval.

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