

Determination of the force systems produced by different configurations of tear drop orthodontic loops

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Editor's summary

Orthodontic treatment with extractions requires specific mechanics for space closure. The mechanics for space closure by means of loops on continuous or segmented archwires provides a controlled orthodontic movement with adequate biological forces. The teardrop loops have been commonly used in Orthodontics. However, there are few studies regarding the intensity of the force released by teardrop loops built with different metallic alloys, with or without a helix, and the magnitude of the gable bends. The aim of the present study was to compare the force produced by teardrop loops made of stainless steel and titanium molybdenum alloy (TMA) wires, with transversal sections 0.017 x 0.025-in and 0.019 x 0.025-in, with and without a helix, up to maximum activation of 5 mm. Eighty teardrop loops were distributed into two groups: Group 1 = teardrop loops and Group 2 = teardrop loops with helix. These groups were subdivided, depending on the alloys used (stainless steel or TMA) and the

transversal sections of the archwire (0.017 x 0.025-in and 0.019 x 0.025-in), resulting in 10 loops per subgroup. Gable bends of 0° and 40° and activations up to 5 mm (evaluated on each 1 mm) were tested on a universal testing machine (Instron Inc., United States of America). The data were submitted to the Analysis of Variance followed by Tukey's test ($p < 0.05$). The results showed that the greater force released by teardrop loops was observed with a 0.019 x 0.025-in stainless steel archwire, and a 40° gable bend. Furthermore, teardrop loops with a helix produce lower force, decreased by 23% for stainless steel and 30% for TMA wires. The teardrop loops made of TMA release lower forces than the stainless steel ones, being the type of material the most important variable affecting the force magnitude. The authors conclude that all teardrop loops with no gable bends (0°) generate low moment/force ratio, leading to uncontrolled tipping. On the other hand, with a 40° gable bend teardrop loops with a helix produce greater moment/force ratio, enough to promote orthodontic movement with controlled tipping.

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