The Effect of Activation Value on Load-deflection Properties of New and Recycled Nickel-Titanium Arch Wires

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Abstract

Statement of Problem: The application of nickel-titanium arch wires is very common in the first stage of orthodontic treatment.

Purpose: The aim of this study was to evaluate the effect of activation value on load-deflection properties of two types of nickel-titanium archwires. The changes occurring in bending properties of these wires after recycling were also assessed.

Materials and Method: In this in vitro study, 80 specimens from single-strand Ni-Ti (Rematitan “Lite”) and multi-strand Ni-Ti (SPEED Supercable) wires were selected and subjected to a three point bending test in the “as-received condition” and “after 2 months immersion in a simulated oral environment and autoclave sterilization”. The wires were activated up to 3 or 6 mm distances and unloading forces were recorded using Zwick testing machine. The data were analyzed using T-test.

Results: Rematitan “Lite” showed significantly greater force than Supercable at both 3 and 6 mm activations (p <0.05). The single-strand nickel titanium wire showed lower forces at 6 mm activation compared with 3 mm activation. In contrast, severe activation of multi-strand Ni-Ti wire caused a longer plateau range and, consequently, the unloading forces of this wire at 1.5, 1.0 and 0.5 mm deflections were higher in severe activation than in moderate activation. The effect of recycling on bending properties of Ni-Ti wires was not clinically considerable.

Conclusion: Application of a multi-strand Ni-Ti wire is useful when a very light force is needed for tooth alignment. The magnitude of forces exerted in three point bending test depended on the amount of wire activation. The tested wires can be reused at least once.

Key words: Nickel-titanium, Orthodontic wire, Load-deflection, Recycling