

**The Effect of Fluoride Prophylactic Agents on Load  
Deflection of Nickel Titanium Orthodontic Wires  
(An in vitro study)**

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# ABSTRACT

The nickel titanium orthodontic wires have high resistance to corrosion because they form a thin, stable oxide layer .Nevertheless; fluoride prophylactic agents can cause corrosion and associated observable discolored surface changes of nickel titanium orthodontic arch wire.

This study was aimed to investigate the effect of different fluoride prophylactic agents (acidulated phosphate fluoride, neutral sodium fluoride and stannous fluoride gels) on the load deflection of nickel titanium orthodontic wires, and to evaluate the effect of immersion time in these fluoride prophylactic agents on the load deflection of nickel titanium orthodontic arch wire.

A spooled round (0.014 inch) nickel titanium orthodontic arch wire was immersed either in one of the tested fluoride prophylactic agents or in the controlled medium “normal saline”, where incubated at 37°C in special incubator at 3 time intervals (60, 90 and 120 minutes).The load deflection of the wires were measured with a specially designed test apparatus based on the mechanism of 3-point bending test. Photographic and topographic map filter images were also used to characterize the effect of fluoride treatment on the wire surface changes.

The nickel titanium arch wire after immersion in acidulated phosphate fluoride reveals lowest load deflection and highest dramatic corrosive surface changes among the immersion test media, while the immersion in neutral sodium fluoride reveals intermediate load deflection and high dramatic corrosive surface changes, and the immersion in stannous fluoride reveals highest load deflection which is closest to that in normal saline and least corrosive surface changes among the immersion test media. F test by ANOVA table shows that there is a highly significant difference ( $P < 0.0001$ ) between all chemical reagents at the mean 3 time intervals for the mean load deflection of nickel titanium arch wire ,and there is a significant difference ( $P < 0.05$ ) between time intervals of all chemical reagents for the mean load deflection of nickel titanium arch wire .

The results suggest that using fluoride prophylactic agents with nickel titanium arch wire could decrease the load deflection and could be associated with high and dramatic observable surface changes, the aggressiveness of arch wire surface changes will increase with increasing immersion time in the fluoride prophylactic agent ; in addition to the fact that there is an inverse relation between the immersion time and the load deflection of nickel titanium arch wire, this may contribute to prolong orthodontic treatment .Also it is concluded that the stannous fluoride seems to be the best fluoride prophylactic agent because it shows no detrimental effect neither on the load deflection nor on the surface changes of nickel titanium arch wire.