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Stiffness-deflection behavior of selected orthodontic wires

Jay M. Oltjen, DDS, MS;^b Manville G. Duncanson, Jr., DDS, PhD;^c Joydeep Ghosh, DDS, MS;^d Ram S. Nanda, DDS, MS;^{a, e} G. Frans Currier, DDS, MSD, M.Ed^f

^aRam S. Nanda, University of Oklahoma, College of Dentistry, Departments of Orthodontics and Dental Materials, 1001 S.L. Young Blvd. Oklahoma City, OK 73190

^bJay M. Oltjen, former graduate student, University of Oklahoma College of Dentistry.

^cManville G. Duncanson Jr., professor and chair, Dept. of Dental Materials, University of Oklahoma College of Dentistry.

^dJoydeep Ghosh, assistant professor, Dept. of Orthodontics, University of Oklahoma College of Dentistry.

^eRam S. Nanda, professor and endowed chair, Dept. of Orthodontics, University of Oklahoma College of Dentistry.

^fG. Frans Currier, professor, Dept. of Orthodontics, University of Oklahoma College of Dentistry.

ABSTRACT

Treatment of horizontal and vertical tooth discrepancies requires wires of low stiffness to produce forces as the teeth are leveled and aligned. In this investigation, the stiffness characteristics of several solid and multistrand nickel-titanium and stainless steel orthodontic wires were determined at selected clinically relevant deflections. Twenty specimens of 24 different wires were tested in both three-point and three-bracket bending modes. The unloading force deflection plot of each wire was described by a polynomial regression from which wire stiffnesses were obtained by mathematical differentiation. Graphs of the functional relationship between stiffness and deflection are presented. The results of this investigation show that wire stiffness can be altered not only by changing the size, but also by varying the number of strands and the alloy composition. An equally important finding was the dependence of stiffness on deflection for most of the wires measured. Comparisons were also made between the stiffness values obtained in three-point bending and the three-bracket bending systems.

KEY WORDS: Orthodontic wires, Stiffness.

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