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(excerpts from Dr. Barry
Musikant's Lecture at
Kentucky Dental
Association on
March 14, 2014)

Dentinal microcrack formation during root canal preparations by different NiTi rotary instruments and the self-adjusting file.

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Source: Department of Endodontics, Faculty of Dentistry, University of Cukurova, Adana, Turkey.

Abstract

INTRODUCTION: The purpose of this study was to compare dentinal microcrack formation while using hand files (HF), 4 brands of nickel-titanium (NiTi) rotary files and the self-adjusting file.

METHODS: One hundred forty mandibular first molars were selected: 20 teeth were left unprepared and served as control, and the remaining 120 teeth were divided into 6 groups. HFs, HERO Shaper (HS; Micro-Mega, Besancon, France), Revo-S (RS, Micro-Mega), Twisted File (TF; SybronEndo, Orange, CA), ProTaper (PT, Dentsply Maillefer), and SAFs were used to prepare the 2 mesial canals. Roots were then sectioned 3, 6, and 9 mm from the apex, and the cut surface was observed under a microscope and checked for the presence of dentinal microcracks.

RESULTS: The control, HF, and SAF groups did not show any microcracks. In roots prepared with the HS, RS, TF, and PT, dentinal microcracks were observed in 60%, 25%, 44%, and 30% of teeth, respectively. There was a significant difference between the control/HF/SAF group and the 4 NiTi rotary instrument groups ($P < .0001$). However, no significant difference was found among the 4 NiTi rotary instruments ($P > .005$).

CONCLUSIONS: All rotary files created microcracks in the root dentin, whereas the SAF file and hand instrumentation presented with satisfactory results with no dentinal microcracks.

Potential relationship between design of nickel-titanium rotary instruments and vertical root fracture.

[Kim HC](#), [Lee MH](#), [Yum J](#), [Versluis A](#), [Lee CJ](#), [Kim BM](#).

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Abstract

INTRODUCTION: Nickel-titanium (NiTi) rotary files can produce cleanly tapered canal shapes with low tendency of transporting the canal lumen. Because NiTi instruments are generally perceived to have high fracture risk during use, new designs have been marketed to lower fracture risks. However, these design variations may also alter the forces on a root during instrumentation and increase dentinal defects that predispose a root to fracture. This study compared the stress conditions during rotary instrumentation in a curved root for three NiTi file designs.

METHODS: Stresses were calculated using finite element (FE) analysis. FE models of ProFile (Dentsply Maillefer, Ballaigues, Switzerland; U-shaped cross-section and constant 6% tapered shaft), ProTaper Universal (Dentsply; convex triangular cross-section with notch and progressive taper shaft), and LightSpeed LSX (Lightspeed Technology, Inc, San Antonio, TX; noncutting round shaft) were rotated within a curved root canal. The stress and strain conditions resulting from the simulated shaping action were evaluated in the apical root dentin.

RESULTS: ProTaper Universal induced the highest von Mises stress concentration in the root dentin and had the highest tensile and compressive principal strain components at the external root surface. The calculated stress values from ProTaper Universal, which had the biggest taper shaft, approached the strength properties of dentin. LightSpeed generated the lowest stresses.

CONCLUSION: The stiffer file designs generated higher stress concentrations in the apical root dentin during shaping of the curved canal, which raises the risk of dentinal defects that may lead to apical root cracking. Thus, stress levels during shaping and fracture susceptibility after shaping vary with instrument design.

The ability of different nickel-titanium rotary instruments to induce dentinal damage during canal preparation.

[Bier CA](#), [Shemesh H](#), [Tanomaru-Filho M](#), [Wesselink PR](#), [Wu MK](#).

Source: Department of Restorative Dentistry, Araraquara Dental School, São Paulo State University, UNESP, Araraquara, SP, Brazil.

Abstract:

The purpose of this study was to compare the incidence of dentinal defects (fractures and craze lines) after canal preparation with different nickel-titanium rotary files. Two hundred sixty mandibular premolars were selected. Forty teeth were left unprepared (n = 40). The other teeth were prepared either with manual Flexofiles (n = 20) or with different rotary files systems: ProTaper (Dentsply-Maillefer, Ballaigues, Switzerland), ProFile (Dentsply-Maillefer), SystemGT (Dentsply-Maillefer), or S-ApeX (FKG Dentaire, La Chaux-de-Fonds, Switzerland) (n = 50 each). Roots were then sectioned 3, 6, and 9 mm from the apex and observed under a microscope. The presence of dentinal defects was noted. There was a significant difference in the appearance of defects between the groups (p < 0.05). No defects were found in the unprepared roots and those prepared with hand files and S-ApeX. ProTaper, ProFile, and GT preparations resulted in dentinal defects in 16%, 8%, and 4% of teeth, respectively. Some endodontic preparation methods might damage the root and induce dentinal defects.

The effects of canal preparation and filling on the incidence of dentinal defects.

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Abstract

AIM: To evaluate ex vivo the incidence of defects in root dentine before and after root canal preparation and filling.

METHODOLOGY: Eighty extracted mandibular premolars were divided equally in four groups. Group 1 was left unprepared. All other root canals were prepared using Gates Glidden drills and System GT files up to size-40, 0.06 taper at the working length. Group 2 was not filled while the canals of the other groups were filled with gutta-percha and AH26, either with a master cone and passive insertion of secondary gutta percha points (group 3) or lateral compaction (group 4). Roots were then sectioned horizontally 3, 6, and 9 mm from the apex and observed under a microscope. The presence of dentinal defects (fractures, craze lines or incomplete cracks) was noted and the differences between the groups were analysed with the Fisher's exact test.

RESULTS: No defects were observed in the roots with unprepared canals. The overall difference between the groups was significant ($P < 0.05$). Canal preparation alone created significantly more defects than unprepared canals ($P < 0.05$). The total number of defects after lateral compaction was significantly larger than after noncompaction canal filling.

CONCLUSION: Root canal preparation and filling of extracted teeth created dentine defects such as fractures, craze lines and incomplete cracks

To Contact Dr. Barry Musikant
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The Endodontic Offices of Musikant, Kase, Dukoff, Bui & Kim recently launched a new online community www.ddschat.com an interactive online forum focused on excellence in dental education. Created by a group of practicing Endodontists, this website was created to share examples of clinical excellence, logical alternative ways to practice dentistry, tips which make dentistry more affordable, and safe & efficient techniques to enhance your practice.

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