Digital analysis of shaping ability and topographic changes in M and C wire rotary NiTi systems.

Amr Khaled Abd El Aziz (✉ amr.khaled.beshr@gmail.com)

Faculty of dentistry - Cairo University

Method Article

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Abstract

The **primary outcome** of this study intends to assess the Shaping ability and surface topographic changes of the 2 rotary Nickel Titanium systems:

A) One Curve (Micro Mega, Besançon, France)

B) ProTaper Next (Dentsply Maillefer, Ballaigues, Switzerland)

What's new in the study is the use of AutoCAD program to assess the shaping ability of both instruments, after using them in a standardized conditions to evaluate the minor differences between the two different alloys used in each instrument.

While the **secondary outcome** of this study is to evaluate the instruments after multiple uses under the SEM to detect any aberrations or deformities in the instruments to detect its points of strength and weaknesses.

The study is planned for one year and it is not expected to be more than that according to the sample size and the availability of the tools needed for the trial.

Introduction

The main objective of endodontic treatment is to eliminate or minimize microorganisms in the root canal system while maintaining the original shape and path of the root canal. However, no instrument/technique can predictably eliminate all the microorganisms from the root canal system. The cleaning efficacy of endodontic instruments significantly decreases at the apical third of root canals. Many root canals have curvatures, and endodontic instruments tend to return to their original straight position during instrumentation of curved canals. Dentinal wall thickness in root canals has a direct relationship with root resistance to lateral forces.

Instruments and instrumentation techniques should be chosen and combined based on their shaping ability, particularly in curved canals, and on the possibility to achieve faster preparations, without deviations. The various NiTi file systems commercially available have different characteristics in terms of their cross-sectional shape, rake angle, taper, depth of flutes, and number of spirals or flutes per unit length all these conditions may affect file behavior.

Manufacturers are introducing various NiTi rotary systems with improved flexibility & superior canal anatomy preservation properties. Different methods have been conducted to improve the physical as well

as the mechanical properties of the rotary NiTi. Among these methods is the heat treatment of NiTi to produce a better arrangement of the crystal structure. Thereby leading to increased flexibility and improve fatigue resistance or plastic behavior.

Reagents

Equipment

Binocular stereo microscope

Scanning electron microscope

AutoCAD (Software)

Procedure

-Teeth will be collected and immersed in 5.25% NaOCl solution for 15 min

-The teeth will be stored in sterile saline until usage to preserve natural teeth hydration.

-Teeth will be radiographed using a conventional periapical radiograph

-According to radiograph, only Mesio Buccal canals with a 25°-40° degree curvature according to Schneider's method and with a fully formed apices will be used in this study.

-Teeth will be flattened to obtain a standard root length of approximately 15 mm.

-The canals will be irrigated with Saline during instrumentation; 3 ml between each subsequent file size change.

-After preparation the canals will be dried with paper points.

- 15mm of the mesiobuccal canal only will be used and the distal root will be removed by a TF-13 stone. (MANI, Japan)

Samples will be divided into 2 equal groups:

-Group A: Samples will be prepared by OneCurve. -Group B: Samples will be prepared by ProTaper Next.

Shaping ability of the suggested groups will be assessed by the percentage of the touched and the untouched walls.

-a custom-made brass mold will be constructed for embedding of teeth in resin blocks to standardize the photographs and facilitate the cutting and re-assembling procedures. The placement of the teeth in the uncured resin will be guided by a

-parallelometer to ensure that the long axis of the tooth is parallel to the long axis of the mold until setting.

After epoxy resin polymerization, all the blocks will be marked with a 0.5 indelible ink red marker at the determined apical, middle and coronal levels (3, 6, 9 mm from the apex respectively) as reference for sectioning using ISOMET™.

-A stereo microscope will be used to magnify and photograph the coronal aspect of each of the three sections (apical, middle and coronal) before and after instrumentation under a 16X magnification.

-After taking the post-instrumentation images and converting them to a JPEG format, a complete analysis will be made using the AutoCAD Software (Autodesk, CA, USA) to assess the surface area of the touched and the untouched walls in each group.

-Teeth will be post-operatively radiographed to assess the straightening of the canals after instrumentation which will be assessed by Schneider's method for each intervention group.

Troubleshooting

Reassembling the teeth is the process that could have some difficulties, and using a proper brass mould with tight corners can help avoiding any error while reassembling.

Time Taken

Around a year.

Anticipated Results

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- Affiliation: Professor of Endodontics, Faculty of Dentistry, Cairo University.
- Role: Chief supervisor.

Dr. Sherif El-Khodary (Co-supervisor)

- Affiliation: Lecturer of Endodontics, Faculty of Dentistry, Cairo University.
- Role: Co-supervisor.

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