Comparative Evaluation Between Two NiTi Rotary Files Systems using CBCT

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ABSTRACT

Aim: The objective of the study was to compare the centering ability, dentin thickness and volume of removed dentin using two different file systems (Protaper Next & Wave One). Methodology: 50 mandibular molars were taken and divided into two groups. Mesiobuccal canal is standardized for evaluation and tooth was sectioned to remove distal root. Both the groups were scanned before and after instrumentation of the canal using CBCT and values are calculated for centering ability, dentine thickness and volume of removed dentin. Result: There was no significant difference between Protaper Next and WaveOne. Conclusion: Both the systems were efficient in shaping the canal without any deviation from the original path of the canal.

KEYWORDS: NiTi, Cone Bean Computed Tomography, Rotary File System

INTRODUCTION

Gradual improvements in rotary instruments have progressed and fastened the root canal procedures and resulted in less endodontic mishaps. The reciprocating motion may be considered as a recent revolution in mechanized root canal instrumentation; with its differentiated kinematics being reported as an periodical movement in which the instrument turns in the clockwise direction, and then counter-clockwise before completing a full 360° rotation cycle. Thus, the stress occurred on the instrument is declined, thereby considerably reducing its risk of fracture and enlarging its lifespan. Furthermore, the instruments are made of a M-Wire, which withstand alternate cycles of cold and heat during manufacture, and provides a significant increase in their shaping ability and mechanical strength.

A recently introduced new root canal instrumentation system, ProTaper Next file, with an offset design which affords rectangular cross-sectional design for enhanced cutting, loading, and auguring debris out of a canal ², in comparison to a file with a centered mass and axis of rotation. Among the instruments that are used in a reciprocating movement during biomechanical preparation, the Reciproc and WaveOne systems are the most widely used.

Till now, no studies have been conducted to determine the centering ability and dentine thickness between ProTaper Next and Wave One. Thus, the aim of this study was to compare the centering ability and dentine thickness between them using CBCT.

MATERIALS AND METHOD

The study was carried out in I.T.S Dental College & Research Center, Greater Noida in collaboration with Mahajan Diagnostic Center, New Delhi. A total of 50 recently extracted human mandibular molars were taken and divided into two groups. (Fig: 1) Group: 1 Protaper Next and Group: 2 WaveOne. The distal root was separated with a section cutting disk and the mesiobuccal root canal was selected for the study. The selected root canals were scanned using CBCT, to standardize the mesial root canal ranging from 15° to 45° using Schneider technique. All canals were prepared with crown-down pressureless technique to the working length. For irrigating the root canals, a freshly prepared 2.5% sodium hypochlorite solution was used. (Fig: 2)

CBCT: Before scanning the samples, they were mounted on a modelling wax sheet with a stapler pin placed at mesiobuccal side of root canal. (Fig: 3) Teeth were scanned before and after mechanical preparation with i-CAT CBCT and measurements were done using CS3D software. The calculation of the unprepared areas and the
calculation after root canal preparation were done. A1 was determined as the quantity of voxels from the outer surface of the mesial portion of the root to the mesial wall of the unprepared canal. A2 was determined as the quantity of voxels from the inner root surface of the mesial portion of the root to the wall of the canal after preparation. B1 was determined as the quantity of voxels of the outer surface of the distal portion of the root to the distal wall of the unprepared canal. B2 was determined as the quantity of voxels from the outer surface of the distal portion of the root to the distal surface of the canal after preparation (Fig: 4.1 and 4.2). Centralization ability ratio was calculated using the values

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\frac{(A1 - A2)}{(B1 - B2)}
\]

**Measurement of dentin thickness:** Dentin thickness was calculated from the periphery of the pulp space to the outer surface of the tooth in all the four directions at the three levels (cervical, middle, and apical). (Fig: 5.1 and 5.2)

**Measurement of Centering ability:**

The centering ability between 2 groups was statistically significant in the cervical pre-instrumentation. It was statistically significant for Apical pre-instrumentation. The centering ability between 2 groups was statistically not significant in the middle pre-instrumentation.

**RESULT**
One reason for this finding is that all the systems have non cutting tips that work with minimal penetration and concluded that One shape Files failed to stay centered in curved canals whereas there was no significant difference between others. At the cervical and apical levels, there was statistically significant difference between them ; pair-wise comparisons between the systems revealed that Wave One showed statistically significant highest mean ratio. There was no statistically significant difference between ratios after the two systems were used at the middle level.  

The second parameter evaluated was remaining dentine thickness at three different levels between both the groups. No statistically significant difference between Protaper Next and Wave One systems; both showed the statistically significant lowest mean values .The amount of remaining dentin between Protaper next and Wave One was similar (Table:3). This might have been because of the asymmetric design. Changes in original canal shape and curvature were not reported in the study.

Celikten et al. compared the Protaper next and One shape for evaluation of remaining dentin thickness and reported that there was no significant difference between them.

**CONCLUSION**

Protaper Next and Wave One systems produced canal preparations with adequate geometry with no significant differences between the two files.

**REFERENCES**