

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. Mesio Buccal 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 Coputed Tomograpy, 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.¹ 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 augering debris out of a canal², 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



Fig: 1 Extracted Mandibular molars selected for the study

Next and Group: 2 WaveOne. The distal root was separated with a section cutting disk and the mesio Buccal 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 mesio Buccal 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

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Fig: 2 Materials used for the study

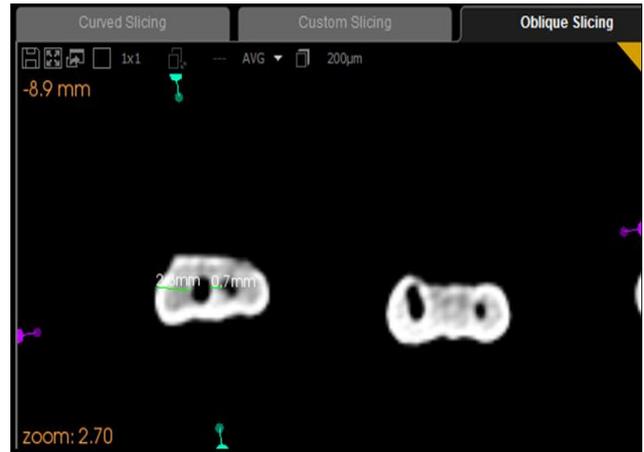


Fig: 4.2 Scan for Centering ability



Fig: 3 Samples mounted on wax sheet

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

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

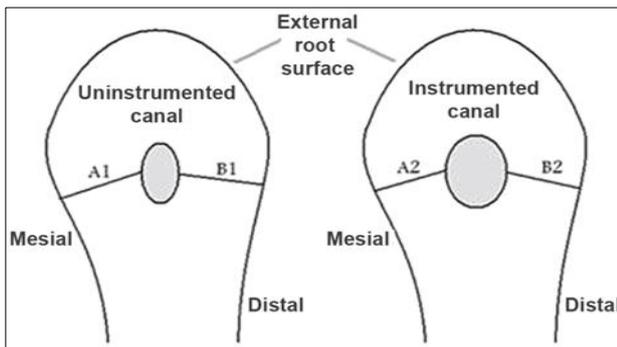


Fig:4.1 Calculation for Centering ability

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)

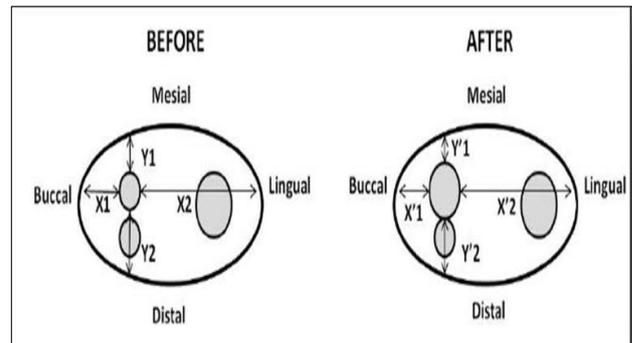


Fig: 5.1 Calculation for Dentin thickness

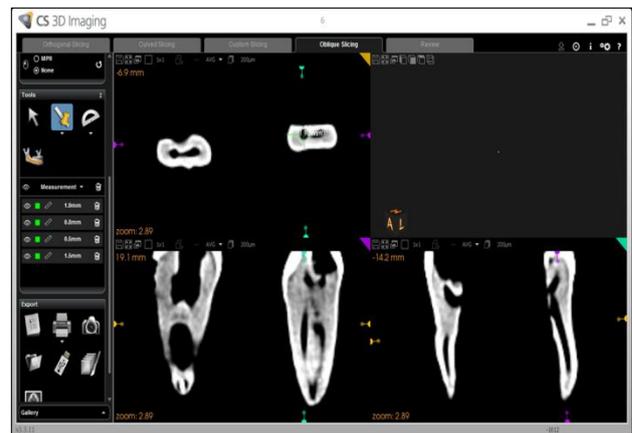


Fig: 5.2 Scan for Dentin thickness

RESULT

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.

Pre Instrumentation	Group 1	Group 2	p value
Cervical	0.023 ± 0.01	0.024 ± 0.02	0.076
Middle	0.021 ± 0.01	0.021 ± 0.02	0.600
Apical	0.019 ± 0.01	0.016 ± 0.01	0.014

Table 1 : Mean and standard deviation values for pre instrumentation of both the groups

Post instrumentation	Group 1	Group 2	p value
Cervical	0.025 ± 0.01*	0.038 ± 0.02*	0.014
Middle	0.023 ± 0.02	0.036 ± 0.02	0.859
Apical	0.022 ± 0.01	0.032 ± 0.01	0.549

Table 2 : Mean and standard deviation values for post instrumentation of both the groups

Table 1 & 2 shows that there is no significant difference between the two groups at cervical, middle and apical level ($p > .05$)

Measurement of Dentine thickness: Table 3 shows the mean of remaining dentin thickness has no significant difference between Protaper Next and WaveOne.

INSTRUMENT	APICAL	MIDDLE	CORONAL
Protaper Next	0.41	0.39	0.32
Wave one	0.5	0.42	0.37
p value	0.73	0.780	0.208

Table 3: Mean and Standard deviation of both the groups at different levels

DISCUSSION

The Protaper Next and Wave One are recently introduced file systems that are distinctly different in their geometric design. Noninvasive CBCT scanning was used because it provides an accurate, reproducible, 3- dimensional evaluation of changes in both dentin thickness and canal centering ability before and after preparation.⁷ The mesiobuccal canal was standardized as it is usually present with most torturous and accentuated curvature.

The first parameter evaluated in our study was centering ability. There is no significant difference between Protaper next and Wave One. Protaper Next showed the statistically significant lowest mean ratio. The comparisons among the two systems showed that there was no statistically significant difference between them (Table 1 & 2). One reason for this finding is that all the instruments have non cutting tips that work with minimal apical pressure and function only as a guide to allow easy penetration

Saber et al. compared Wave One, Reciproc & One shape 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.¹

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.²

CONCLUSION

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

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