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Original Research

Assessment of removal of root canal dentin and apical transportation with different rotary systems

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ABSTRACT:
Background: The aim of the current research was to compare the removal of root canal dentin and apical transportation efficacy with two different rotary systems. **Material and methods:** 40 freshly extracted teeth were collected and stored in normal saline. Two study groups were formed with 20 specimens in each group as follows: Group A: sample teeth in which canal preparation was done using WaveOne files, and Group B: sample teeth in which canal preparation was done using ProTaper rotary files. A post canal preparation CBCT was carried out to compare differences with the pretreatment status. Remaining Dentine Thickness (RDT) was assessed. SPSS software was used for statistical analysis of the collected data. **Results:** Statistically significant difference was observed in the canal transportation values in group 1 at point 4 mm and 8 mm from the apex. At point 12 mm from the apex, group 1 showed non-significant variation. **Conclusion:** Wave One single reciprocation file system was better than ProTaper file system.
Key words: Wave One, ProTaper, Remaining dentin thickness

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INTRODUCTION

One of the most important steps in root canal treatment is mechanical preparation, debriding the canal and creating a cone-shaped configuration for easy access, effective irrigation and three-dimensional obturation of the root canal space. Regardless of the technique used for debridement, this procedure results in removal of root canal walls, to some extent. Removal of more dentin from one side compared to other side of the canal wall which are located at similar distances from the long axis of the root, results in a procedural error known as canal transportation.[1-4] Canal transportation results in displacement of the physiologic end of the canal to a new operator-made location on external surface of the root, leading to accumulation of residual debris and microorganisms. Moreover, this procedural error compromises the uniformity of the root and reduces its fracture resistance and finally results in poor prognosis of treatment. Continuing debridement of the transported path by larger files creates a tear drop appearance at the apical area of the canal and might result in lateral perforation of the root. The shape created due to canal transportation does not provide a resistant form to condense gutta-percha which leads to poor compaction and over-extension of gutta-percha. Deviation from the initial form of the root canal, especially in the apical area, prevents proper obturation and seal against bacterial penetration, which can potentially result in treatment failure.[5-8]The aim of the present study was to compare the canal transportation, and remaining dentin thickness of WaveOne and ProTaper systems using cone beam computed tomography.

MATERIAL AND METHODS

The aim of the present study was to compare the canal transportation, and remaining dentin thickness of Wave One and ProTaper systems using cone beam computed tomography. 40freshly extracted teeth were collected and stored in normal saline. The length of all sample teeth were standardised to 18 mm by carrying out coronation of each sample if required. After this access cavity was prepared in each tooth using carbide burs. Two study groups were formed with 20 specimens in each group as follows: Group A: sample teeth in which canal preparation was done using WaveOne files, and Group B: sample teeth in which canal preparation was done using ProTaper rotary files.A post canal preparation CBCT was carried out to compare differences with the pretreatment status. Remaining Dentine Thickness (RDT) was assessed.SPSS software was used for statistical analysis of the collected data.

RESULTS

Statistically significant difference was observed in the canal transportation values in group 1 at point 4 mm and 8 mm from the apex. At point 12 mm from the apex, group 1 showed non-significant variation.

Table 1: Canal transportation at 4mm the apex

File System	Mean	Standard deviation	P value
WaveOne	0.06	0.03	0.000
ProTaper	0.13	0.06	(Significant)

Table 2: Canal transportation at 8mm the apex

File System	Mean	Standard deviation	P value
WaveOne	0.10	0.11	0.000
ProTaper	0.16	0.13	(Significant)

Table 3: Canal transportation at 12mm the apex

File System	Mean	Standard deviation	P value
WaveOne	0.08	0.12	0.211
ProTaper	0.09	0.11	

DISCUSSION

Elimination of microorganisms from the pulp and periapical region through root canal cleaning and shaping is among the most important goals of endodontic treatment. Root canal shaping is a key step in root canal treatment; if performed perfectly, it leads to a favorable prognosis. Cleaning and shaping of the root canal system should provide a conical shape with a consistent taper from the crown to the apex while preserving the original path of the canal. Also, the size of the apical foramen must remain as small as possible. However, procedural errors such as ledge formation, zipping, perforation or canal transportation may occur during root canal preparation, especially in curved canals. Irrespective of the techniques and instruments used, the cleaning and shaping process of the root canal system continuously removes dentin from the root canal wall. Excessive removal of intracanal dentin in a single direction (instead of equal dentin removal in all directions) leads to canal transportation. Canal transportation is the result of displacement of the physiologic apex to a new position on the external root surface by clinicians. These changes may negatively affect the quality of endodontic treatment by lowering the efficiency of disinfection.[7- 10]The aim of the present study was to compare the canal transportation, and remaining dentin thickness of Wave One and ProTaper systems using cone beam computed tomography.

In the present study, statistically significant difference was observed in the canal transportation values in group 1 at point 4 mm and 8 mm from the apex. At point 12 mm from the apex, group 1 showed non-significant variation. SağlamBC et al compared apical transportation during retreatment using ProTaper Universal retreatment (PTUR), Mtwo R and D-RaCe instruments in curved root canals. 36 extracted mandibular molar teeth with curved mesiobuccal roots were selected. The teeth were embedded into acrylic blocks. The blocks were fixed on the experimental setup. After determining the working length (WL), mesiobuccal canals were prepared with ProTaper Universal rotary instruments to size F1 (20/0.06). After the obturation, the teeth were randomly divided into groups; the PTUR files were used as D1 (30/0.09) for coronal third and D2 (25/0.08) at WL. Mtwo R files, R1 (15/0.05) and R2 (25/0.05) were used at WL. D-RaCe files were used as DR1 (30/.10) in cervical third and DR2 (25/0.04) at WL. Image J analysis software was used to measure the apical transportation. There was no significant difference between groups in the apical transportation in either the mesiodistal ($p = 0.166$) or buccolingual ($p = 0.518$) direction. Among the 3 groups, the apical transportation was the greatest in the D-RaCe group. It can be concluded that all retreatment systems caused a similar level of apical transportation.[10]de Albuquerque MS et al compared root canal transportation, centering ability, and amount of dentin removed after root instrumentation with different rotary and reciprocating systems, using micro-computed tomography (micro-CT). Forty curved mesial canals of lower molars were selected and divided into four experimental groups ($n = 10$) according to the system used: protaper next (PTN), wave one gold (WOG), prodesign logic (LOG), and vortex blue (VTX). The roots were scanned before and after instrumentation using micro-CT, with a 16 μm isotropic resolution. Data were statistically analyzed using the Bioestat and the significance level was set at 0.05. For canal transportation, no significant differences were verified between the groups at 6 mm or 9 mm from the apex. At the apical third, LOG had a smaller mesial deviation when compared with PTN. A significant difference was

found at the apical and coronal thirds, though with LOG having the best centering ability at the apical third and the worst one at the coronal third. All systems caused a greater wear at the coronal third (9 mm), decreasing at the apical one (3 mm), with statistically significant differences. LOG removed less dentin from the apical third (3 mm) than did the other instruments. The systems evaluated presented different results for canal transportation, centering ability, and dentin removal at each third.[11].

CONCLUSION

Wave One single reciprocation file system was better than ProTaper file system.

REFERENCE

1. Üstün Y, Topçuoğlu H S, Düzgün S, Kesim B. The effect of reciprocation versus rotational movement on the incidence of root defects during retreatment procedures. IntEndod J. 2015;48(10):952–958.
2. Nevares G, de Albuquerque D S, Freire L G etal.Efficacy of ProTaper NEXT compared with Reciproc in removing obturation material from severely curved root canals: a micro-computed tomography study. J Endod. 2016;42(05):803–808.
3. Thompson M, Sidow SJ, Lindsey K, Chuang A, McPherson JC., 3rd. Evaluation of a new filing system's ability to maintain canal morphology. J Endod. 2014. June;40(6):867–70.
4. Madani ZS, Goudarzipor D, Haddadi A, Saeidi A, Bijani A. A CBCT Assessment of Apical Transportation in Root Canals Prepared with Hand K-Flexofile and K3 Rotary Instruments. Iran Endod J. 2015. Winter;10(1):44–8.
5. Schneider SW. A comparison of canal preparations in straight and curved root canals.Oral Surg Oral Med Oral Pathol. 1971. August;32(2):271–5.
6. Estrela C, Bueno MR, Sousa-Neto MD, Pécora JD. Method for determination of root curvature radius using cone-beam computed tomography images. Braz Dent J. 2008;19(2):114–8.
7. Haapasalo M1, Shen Y, Qian W, Gao Y. Irrigation in endodontics. Dent Clin North Am. 2010. April;54(2):291–312.
8. de Carvalho G M, Sponchiado Junior E C, Garrido A D, Lia R C, Garcia L daF, Marques A A, Garcia L da F, Marques AA. Apical transportation, centering ability, and cleaning effectiveness of reciprocating single-file system associated with different glide path techniques. J Endod. 2015;41(12):2045–2049.
9. Arruda EDS, Sponchiado-Júnior EC, Pandolfo MT, Fredson MAC, Roberi Garcia LDF, Marques AAF. Apical Transportation and Centering Ability After Root Canal Filling Removal Using Reciprocating and Continuous Rotary Systems: A CBCT Study. Eur J Dent. 2019;13(4):613-618.
10. Sağlam BC etal.Apical transportation during removal of root canal filling with different retreatment systems. Int J Artif Organs. 2016 Nov 29;39(10):541-545.
11. de Albuquerque MS et al. Canal Transportation, Centering Ability, and Dentin Removal after Instrumentation: A Micro-CT Evaluation. J Contemp Dent Pract. 2019 Jul 1;20(7):806-811.