

ORIGINAL RESEARCH

Effectiveness of different rotary file system in removing the root canal filling materials

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ABSTRACT:

Background: To evaluate effectiveness of various rotary file systems in removal of root canal filling materials. **Materials & methods:** A total of 30 subjects were enrolled. 30 premolar teeth were shaped up to F2 using the ProTaper Universal rotary file system. The results were analysed using the SPSS software. The p- value less than 0.05 was considered statistically significant. **Results:** The percentage of removal of root canal filling has been recorded. The Protaper Universal R shows median 96.32, minimum 91.08 and maximum 99.20. **Conclusion:** Edge File XR can be used as an alternative to ProTaper Universal files.

Keywords: Root canal filling materials, ProTaper, Endodontics.

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INTRODUCTION

Endodontic therapy aims to create healthy periapical tissues and maintain their health. For this, it is necessary to remove the infected tissue in the root canal cavity as much as possible, disinfect the root canals, and block them as effectively as possible.¹ In recent years, many studies have evaluated the success of endodontic treatment. As a result of these studies, success rates varying between 68% and 98% have been reported.^{2,3} Despite high success rates in first-time root canal treatments, unsuccessful endodontic treatments are also reported.⁴ Maximum removal of guttapercha and sealer followed by re-instrumentation is very crucial for successful re-treatment. As the bacteria or fungi surviving and thriving under the guttapercha and sealer have to be removed.^{5,6} Guttapercha can be removed using K or H files along with chemical solvents. Alternatively, it can also be removed from the coronal portion using gates glidden drills or heated pluggers followed by the use of ultrasonics, lasers or Ni Ti rotary files for the remaining part of the canal.^{7,8} Pro-Taper instruments (Dentsply-MailleferBallaigues, Switzerland) have a convex triangular cross-sectional design with different

shafts. A new NiTi rotary system, ProTaper Universal Tulsa (Dentsply Tulsa, Tulsa,) is introduced. This new system is integrated with 3 ProTaper retreatment files, D1, D2, D3. The 3 ProTaper Universal System retreatment files (PTUS) are designed to facilitate the removal of filling material. Each file has different lengths, tapers, and apical tip diameters. Mtwo Retreatment Files consist of two instruments of 21mm length with active cutting tip: R1 (size 15, 0.05 taper) and R2 (size 25, 0.05 taper). They have S- shaped cross-section but a shorter pitch length to enhance the advancement of the file into the filling material. They are used at a speed of 250-350rpm and a torque of 120gcm. These instruments are characterized by two cutting edges, which cut dentine effectively.⁹ The main goal of nonsurgical root canal retreatment is to reestablish healthy periapical tissues. Only if the filling can be removed completely and the canal negotiated to the apical foramen, can the prerequisites for successful retreatment be fulfilled?¹⁰ The success rates of orthograde retreatment are reported to range from approximately 65% to more than 80%.¹¹ Hence, this study was conducted to evaluate effectiveness of

various rotary file systems in removal of root canal filling materials.

MATERIALS & METHODS

A total of 30 subjects were enrolled. 30 premolar teeth were shaped up to F2 using the ProTaper Universal rotary file system. The samples were randomly divided into three groups according to the file system used to remove gutta-percha was performed (n=10): ProTaper Universal Retreatment, ProTaper NEXT and EdgeFile XR NiTi system. The percentages of filling material removed from root canals were calculated.

Table: percentage of root canal filling removed.

	n	Median	Minimum	Maximum
Protaper Universal R	10	96.32	91.08	99.20
ProTaper NEXT	10	99	92.85	99.81
EdgeFile XR	10	98.52	95.16	99.90

DISCUSSION

Gutta-percha in combination with a sealer is the most frequently used obturating material. The different types of root canal sealers are zinc oxide eugenol based, glass ionomer based, resin and silicone based sealers. Techniques described for gutta-percha removal include the use of heat, hand instruments, solvents, automated rotary instruments, ultrasonics, lasers and more recently NiTi rotary instruments.^{12,13} NiTi rotary files have advantage in root canal preparation due to their unique physical properties. NiTi files have three times more elastic flexibility than stainless steel files due to its very low modulus of elasticity and superior resistance to torsional fracture. They are advantageous in instrumentation of canals with challenging shapes. In order to improve working safety, shorten preparation time and create a continuously tapered, conical flare of preparations, advanced instrument designs with non-cutting tips, radial lands, different cross-sections, superior resistance to torsional fracture and varying tapers have been developed. NiTi instruments maintain canal shape without zipping and ledge formation compared to hand instrumentation. NiTi rotary instrumentation plasticizes the Gutta-Percha (GP) through frictional heat, softened Gutta-Percha (GP) is less resistant and easier to be penetrated and removed.¹⁴ Hence, this study was conducted to evaluate effectiveness of various rotary file systems in removal of root canal filling materials.

In the present study, a total of 30 subjects were enrolled. The percentage of removal of root canal filling has been recorded. The Protaper Universal R shows median 96.32, minimum 91.08 and maximum 99.20. A study by Das S et al, sixty freshly extracted, single-rooted human mandibular premolars were instrumented with K-files, and each root canal was filled with gutta-percha and AH Plus (Dentsply Detrey, Konstanz, Germany) sealer using lateral compaction. ProTaper group was found to have less remnant filling material as compared to the other

The results were analysed using the SPSS software. The p- value less than 0.05 was considered statistically significant.

RESULTS

A total of 30 subjects were enrolled. The percentage of removal of root canal filling has been recorded. The Protaper Universal R shows median 96.32, minimum 91.08 and maximum 99.20. The Edgefile XR shows median value 98.52 and maximum value of 99.90. The Protaper NEXT shows median value 99 and maximum value 99.81.

groups in coronal and middle thirds, but a significant difference was observed between ProTaper and Mtwo and Mtwo and R-Endo in the non-solvent groups ($P < 0.05$). Mtwo group demonstrated less amount of remaining filling material in the non-solvent group. Both nickel-titanium systems and ProTaper and Mtwo retreatment file systems, were found to be effective in the removal of root canal filling material. However, complete removal of gutta-percha from root canals did not occur with any of the experimental groups.¹⁵

In the present study, the Edgefile XR shows median value 98.52 and maximum value of 99.90. The Protaper NEXT shows median value 99 and maximum value 99.81. Another study by Bhagavaldas MC et al, showed that none of the retreatment systems used in the study was able to completely remove the root canal filling material. D-RaCe with or without solvent showed significantly ($P > 0.05$) less filling material at all levels compared to MtwoR with/without solvent. Within the limitation of the study, D-RaCe rotary retreatment system is more effective in removing filling material from root canal walls when compared to MtwoR rotary retreatment system.¹⁶ The effectiveness of ProTaper Universal retreatment instrumentation is due to the convex triangular cross-section which renders a large internal area than Mtwo and R-Endo instrumentation systems for removal of the root canal filling material. The Mtwo instrumentation system has a greater apical diameter and an active tip with a positive rake angle which allow the files to reach the apical third bypassing the filling, thus facilitating removal of filling material and making the file more effective in apical third of the root canal system.¹⁷ Ozlek E et al, showed that there were no significant differences between the groups in the percentage of root canal filling material removal. However, a statistically significant difference was found between the groups in the time required to reach the apex and remove the entire filling material. The time required to remove

the root canal filling material was higher in the EdgeFile® X3 group. NiTi files manufactured for root canal preparation can be used effectively and safely to remove root canal filling materials. EdgeFile XR produced for retreatment can be used as an alternative to ProTaper Universal Retreatment files.¹⁸

CONCLUSION

Edge File XR can be used as an alternative to ProTaper Universal files.

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