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A study on three rotary retreatment systems in removing Gutta-percha and sealer

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Abstract

Background: To study rotary retreatment systems in removal of gutta-percha and sealer.

Materials and methods: A total of 15 subjects were enrolled. The samples were randomly divided into three groups according to the file system used to remove gutta-percha was performed (n=5): ProTaper Universal Retreatment, ProTaper NEXT and Edge File XR NiTi system. 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 95.12, minimum 92.03 and maximum 99.12. The Edge file XR shows median value 98.16 and maximum value of 99.80.

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

Keywords: Pro Taper, retreatment, gutta-percha

Introduction

Failures are the pillars of success. Endodontic failures are no exception and hence would need retreatment. The main goal of retreatment is cleaning and shaping of the root canal with removal of old root filling material, and this can be achieved by either hand instruments or rotary instruments. Endodontic retreatment can be done either by nonsurgical retreatment (Orthograde) or by apical surgery (retrograde) ^[1]. The main goal of Orthograde retreatment is regaining access to the apical foramen by complete removal of root canal filling material, thus facilitating sufficient cleaning and shaping of the complete root canal system and then final obturation ^[2]. There has been an increased emphasis on preservation of teeth, including those with failed root-canal treatments (RCTs). Nonsurgical RCT is usually preferred for such cases, especially that the survival rate of teeth receiving nonsurgical root-canal retreatment is similar to that associated with primary treatments ^[3]. The main objective of nonsurgical RCT is to completely remove the root-canal filling materials (RCFMs) to allow effective disinfection and shaping of the root-canal system. This is essential for successful RCT ^[4]. Several tools have been employed for removal of RCFMs from the root-canal system, including chemical solvents ^[5], hand instruments, NiTi rotary instruments ^[7], Gates-Glidden drills ^[8], heat-transferring instruments and ultrasonics ^[6], and laser irradiation ^[9]. Traditionally, RCFMs were removed using hand-files with/without solvents ^[6]. However, this procedure can be tedious and time-consuming, especially if the RCFM is well-compacted ^[10].

Rotary nickel-titanium (NiTi) instruments have also been used for the removal of filling materials from root canals and various studies have reported their efficacy and safety ^[11,12]. The ProTaper Universal Retreatment system (Dentsply Maillefer, Ballaigues, Switzerland) was specifically developed for the retreatment that included three instruments as follows: D1-30/.09-16 mm, D2-25/.08-18 mm, and D3-20/.07-22 mm, which are used at 500 rpm ^[13]. These retreatment files have been found to be effective in removing root filling material ^[14], when compared to manual procedures. However, ProTaper retreatment files were found to be unable to render the canals free of root filling material. Indeed, retreatment files as well as the Hedström files left substantial amounts of material on the canal walls. ¹⁵ Hence, this study was conducted to study rotary retreatment systems in removal of gutta-percha and sealer.

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Materials and Methods

A total of 15 subjects were enrolled. 15 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=5): ProTaper Universal Retreatment, ProTaper NEXT and Edge File XR NiTi system. The percentages of filling material removed from root canals were calculated. The results were analyzed using the SPSS software. The p-value less than 0.05 was considered statistically significant.

Results

A total of 15 subjects were enrolled. The percentage of removal of root canal filling has been recorded. The Protaper Universal R shows median 95.12, minimum 92.03 and maximum 99.12. The Edge file XR shows median value 98.16 and maximum value of 99.80. The Protaper NEXT shows median value 99.02 and maximum value 99.68.

Table 1: percentage of root canal filling removed.

	n	Median	Minimum	Maximum
Protaper Universal R	5	95.12	92.03	99.12
ProTaper NEXT	5	99.02	93.12	99.68
EdgeFile XR	5	98.16	94.08	99.80

Discussion

The major factor for endodontic failure is the persistence of microbial infection in the root canal system and/or in the periradicular area. Nonsurgical management of the previously obturated canals is the initial treatment of choice for the management of such endodontic failures [16]. The goal of nonsurgical endodontic retreatment is to remove as much gutta-percha and sealer as possible. This procedure will uncover the remnants of necrotic tissue and bacteria which might have caused the periapical inflammation and pain. This will, in turn, enable chemo mechanical re-instrumentation and disinfection of the root canal system with antiseptic or antibacterial solutions and thus destroy the bacteria and clean the infected root canal [17,18]. Hence, this study was conducted to study rotary retreatment systems in removal of gutta-percha and sealer.

In the present study, a total of 15 subjects were enrolled. The percentage of removal of root canal filling has been recorded. The Protaper Universal R shows median 95.12, minimum 92.03 and maximum 99.12. 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 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 [19].

In the present study, the Edgefile XR shows median value 98.16 and maximum value of 99.80. The Protaper NEXT shows median value 99.02 and maximum value 99.68.

Another study by Marfisi K *et al.*, ninety single root canals were instrumented and randomly allocated into 6 groups of 15 specimens each with regards to the filling material and instruments used. No system completely removed the root filling material from root canal walls. No significant differences were observed between the rotary systems in terms of the area of filling material left within the canals ($p > 0.05$). There were statistically significant differences between the filling materials: Resilon/Real Seal had less residual material than gutta-percha/AH plus (CBCT: $P = 0.01$; microscope: $P = 0.018$). Mtwo Retreatment files were more rapid when removing filling material than ProTaper Retreatment files ($P = 0.19$) and Twisted Files ($P = 0.04$). No system removed the root filling materials entirely. Mtwo Retreatment files required less time to remove root filling material than the other instruments. Resilon was removed significantly better from the canal walls than gutta-percha, irrespective of the rotary instruments used [20]. Madarati AA *et al.*, depicted that the Mtwo-R group showed the highest mean remaining filling material (51%) ($p < 0.001$), with no significant differences among the other groups. The ProTaper group required the least time for filling-material removal (4.95 min), with significant differences compared to the other groups ($p < 0.05$), except the Wave One group (5.83 min; $p = 1.000$). Overall, 13 instruments (15.9%) were used for filling-material removal, with a significantly greater proportion in the Mtwo-R group (33.3%) compared to the other groups ($p = 0.009$). Reciprocating rotary systems were as effective as retreatment rotary systems in removing root-canal filling material. The Mtwo-R system showed the poorest performance with respect to removal effectiveness and instrument separation [21]. Tasdemir T *et al.* studied sixty freshly extracted human single-rooted teeth, each with one root canal, were instrumented with K-files and filled using cold lateral compaction of gutta-percha and AH Plus (Dentsply Detrey, Konstanz, Germany) sealer. The teeth were randomly divided into four groups of 15 specimens each. Removal of gutta-percha was performed with the following devices and techniques: ProTaper, R-Endo, Mtwo and Hedström files. The ProTaper group had less filling material inside the root canals than the other groups, but a significant difference was found between only the ProTaper and Mtwo groups ($p < 0.05$). The retreatment time for Mtwo and ProTaper was significantly shorter compared with R-Endo and manual instrumentation with Hedström files ($p < 0.001$). R-Endo was significantly faster than manual instrumentation ($p < 0.001$) [15].

Conclusion

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

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Author's Contribution

Not available

Conflict of Interest

Not available

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