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Original Research

Comparison of efficacy of ProTaper Retreatment files and Manual H-files in removing filling material from the root canals

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ABSTRACT:
Background: The dentist's skills are crucial to interpret correctly the radiographic features and establish a diagnostic hypothesis. Before endodontic retreatment can be performed on an obturated tooth with a failed root canal treatment, the root canal filling material needs to be effectively and completely removed from the canal. In general, filling materials composed mainly of gutta-percha are used for hermetic sealing of the root canals during endodontic obturation. The aim of this in-vitro study was to compare the efficacy of ProTaper Retreatment files and Manual H-files in removing filling material from the root canals. **Materials & methods:** 40 extracted mandibular premolars with closed apices, single canals, without any visible evidence of root fractures, cracks and external resorption were selected. Teeth were decoronated followed by cleaning and shaping will be performed using K-files with an apical enlargement. After biomechanical preparation, the canals was dried with absorbent paper points & obturated. The samples were randomly divided into two experimental groups each containing 20 samples; depending upon the instruments used to remove the root canal filling: Group 1: ProTaper Retreatment files, and Group 2: Hedstrom files with Solvent. All samples of all groups were rendered transparent. The total area of canal wall, as well as the area of remaining root canal filling material was measured using image analyzer software and the percentage was calculated. All the results were analysed by SPSS software. **Results:** Mean area of remaining root among specimens of group 1 and group 2 was 2.13 mm^3 and 3.81 mm^2 respectively. Significant results were obtained while comparing the mean area of remaining root canal filling material. **Conclusion:** From the above results, the authors concluded that area of remaining root canal filling material was significantly lesser among specimens of ProTaper Retreatment files group in comparison to the patients of the Hedstrom files.
Key words: Root canal therapy, Retreatment

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INTRODUCTION

The dentist's skills are crucial to interpret correctly the radiographic features and establish a diagnostic hypothesis. For the patient, the value of symptom (no pain) is essential. Apart from this, RCT success is associated with predictive aspects that eliminate the need of interventions and establishes treatment conclusion.[1, 2] Systemic and periodontal conditions should be carefully examined before RCT. Preoperative diagnosis of dental pulp and/or periapical tissues is an important reference to establish case prognosis. The dentist's health represents a human aspect that is frequently neglected and can also be a risk factor for the occurrence of intraoperative procedural errors. Human error may be associated with stress, working conditions, and lack of attention, adequate planning and sufficient knowledge of new technologies.[1-3]

The failure to localize and treat all of the canals of the root canal systems on the part of the operator is considered as one of the major causes of the root canal treatment failures. It has been shown that in majority of cases the general dental practitioners were responsible for the endodontic failures.[4, 5] The risk of missing anatomy is enhanced due to the intricacy of the root canal system. All the teeth may be found with extra roots/or canals, but the incidence of this observation is maximum in premolars and molars.[4, 5]

Before endodontic retreatment can be performed on an obturated tooth with a failed root canal treatment, the root canal filling material needs to be effectively and completely removed from the canal. In general,

filling materials composed mainly of gutta-percha are used for hermetic sealing of the root canals during endodontic obturation. As for the root canal space, it is usually small and narrow such that it is difficult to gain direct vision to the root canal. Several techniques have been proposed to remove filling materials from root canal system, including the use of endodontic hand files, Nickel Titanium rotary instruments, Gates Glidden burs, heated instrument, ultrasonic instruments, laser, and use of adjunctive solvents. Retreatment is a tedious and time consuming process leading to many procedural errors. Selecting the case for retreatment is a meticulous process where the pros and cons of tooth prognosis have to be weighed. So duration of time plays an important role in selecting the case.[6- 8] The aim of this in-vitro study was to compare the efficacy of ProTaper Retreatment files and Manual H-files in removing filling material from the root canals.

MATERIALS & METHODS

The present study is to compare the efficacy of ProTaper Retreatment files and Manual H-files in removing filling material from the root canals. 40 extracted mandibular premolars with closed apices, single canals, without any visible evidence of root fractures, cracks and external resorption were selected. Teeth were decoronated followed by cleaning and shaping will be performed using K-files with an apical enlargement. After biomechanical preparation, the canals was dried with absorbent paper points & obturated. The samples were randomly divided into two experimental groups each containing 20 samples; depending upon the instruments used to remove the root canal filling:

Group 1: ProTaper Retreatment files

Group 2: Hedstrom files with Solvent

All samples of all groups were rendered transparent. The total area of canal wall, as well as the area of remaining root canal filling material was measured using image analyzer software and the percentage was calculated. All the results were analysed by SPSS software. Chi-square test and student t test was used for assessment of level of significance. P- value of less than 0.05 was taken as significant.

RESULTS

The aim of this in-vitro study was to compare the efficacy of ProTaper Retreatment files and Manual H-files in removing filling material from the root canals. The samples were randomly divided into two experimental groups each containing 20 samples; depending upon the instruments used to remove the root canal filling: Group 1: ProTaper Retreatment files, and Group 2: Hedstrom files with Solvent. Mean area of remaining root among specimens of group 1 and group 2 was 2.13 mm^3 and 3.81 mm^2 respectively. Significant results were obtained while comparing the mean area of remaining root canal filling material.

Group	Area of remaining root canal filling material	Remaining root canal filling material
Group 1	2.13	1.99
Group 2	3.81	14.12
p- value	0.00 (Significant)	0.00 (Significant)

DISCUSSION

The clinical success rate of endodontic retreatment has been estimated to vary between 50-90%, depending on the effective elimination of necrotic tissue, bacteria, and infected obturation material such as gutta-percha and cements from root canal. Although numerous materials including pastes, cements, semisolid materials and solid materials have been used for obturation of root canals; gutta-percha combined with sealer is the most commonly used material. Many techniques have been described for removal of gutta-percha. These include endodontic hand files combined with heat or chemical solvents (chloroform, methylchloroform, carbon disulfide, carbon tetrachloride, benzene, xylene, eucalyptol oil, halothane, and rectified white turpentine), Gates-Glidden drills, engine-driven rotary files, ultrasonic instruments, heat carrying instruments, paper points with chemicals and lasers.[8- 11] Conventionally, the removal of gutta-percha using hand files has been found to be a tedious and time consuming process. Well compacted filling material offers resistance to instruments and incomplete removal of gutta-percha and sealer limits the access to the apical foramen and impairs root canal disinfection and reshaping. Use of solvents has been recommended to dissolve and remove gutta-percha for retreatment.[8- 11] The aim of this in-vitro study was to compare the efficacy of ProTaper Retreatment files and Manual H-files in removing filling material from the root canals. The samples were randomly divided into two experimental groups each containing 20 samples; depending upon the instruments used to remove the root canal filling: Group 1: ProTaper Retreatment files, and Group 2: Hedstrom files with Solvent. Mean area of remaining root among specimens of group 1 and group 2 was 2.13 mm^3 and 3.81 mm^2 respectively. Significant results were obtained while comparing the mean area of remaining root canal filling material. Our results were in concordance with the results were obtained by previous authors who also reported similar findings. Kesim B et al compared the efficacy of manual and mechanical instrumentation techniques, including ProTaper Universal retreatment system, Mtwo retreatment system, Reciproc system, and Hedström files, regarding removal of overextended root canal filling material. Eighty extracted human mandibular premolar teeth were prepared at the apical foramen level using Revo-S rotary files and subsequently obturated. The root canal filling material was deliberately extruded from the apex. Samples were transferred to glass vials that simulated the periapical area. Eighty samples of overfilled teeth were

randomly assigned to four equal groups (n = 20) for removal of the root filling material with ProTaper Universal retreatment files (Group 1), Mtwo retreatment files (Group 2), Reciproc system (Group 3), and hand files (Group 4). Removal of the root canal filling material and additional preparation were performed by individual instruments from each different system up to a #40 size. The external apical surface of the teeth and the surrounding glass vials were checked using a dental operation microscope with ×12.5 magnification. Samples were divided into two groups based on whether removal of the overextended root canal filling material was successful or not. The success rate for removal of overextended gutta-percha was greater for the Mtwo (30%) and hand files (30%) compared with the ProTaper (20%) and Reciproc (10%). However, no significant statistical differences existed among the experimental groups (P > 0.05). This study demonstrated that all tested systems had similar efficacy in removing overextended root canal filling material.[10]

Kaşıkçı et al compared the amount of apically extruded debris and of remaining filling material during the removal of root canal filling material using three rotary NiTi retreatment instruments or Hedström files. Ninety-six severely curved human molars of both jaws were selected. The root canals were prepared to size X2 (tip size 25, .06 taper) using the ProTaper Next system (Dentsply Sirona, Ballaigues, Switzerland), filled with gutta-percha and AH Plus sealer (Dentsply De Trey, Konstanz, Germany) and then randomly divided into four experimental groups (n = 24 each) with two subgroups of maxillary and mandibular teeth each. An experimental model was used as a phantom head to simulate the upper and lower jaws. The root filling materials were removed with one of the following files using a crown-down preparation technique: I. Hedström files (H-files) (VDW, Munich, Germany), II. R-Endo (Micro-Mega, Besançon, France), III. Reciproc (VDW) and IV. ProTaper Universal Retreatment system (PTU-R) (Dentsply Maillefer). Apically extruded material was collected in vials, which were weighed with a microbalance (10-5 g) before and after the retreatment. The area of residual filling material in the coronal, middle and apical root level was assessed using digital analysis. Reciproc was associated with significantly less extruded debris than the H-files (P = 0.009). No significant differences were detected amongst the four retreatment techniques concerning residual filling material (P = 0.082). The amount of extruded debris and areas of remaining filling material were not correlated (P = 0.901). Location of teeth in the maxilla or mandible had no impact on the amount of extruded debris within each instrument group (P = 0.609). However, when teeth were evaluated in general irrespective of the instruments, significantly more debris was extruded in the mandibular location (P < 0.001). All retreatment systems were associated with apical extrusion of debris, but H-files extruded significantly more material than Reciproc.[12]

CONCLUSION

From the above results, the authors concluded that area of remaining root canal filling material was significantly lesser among specimens of ProTaper Retreatment files group in comparison to the patients of the Hedstrom files.

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