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Original Article

Comparison of Gutta Percha Removal with Manual H-Files and ProTaper with or Without Eugenate

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ABSTRACT

Objective: To compare manual H-File with ProTaper Retreatment files for the abolition of Gutta Percha filling material from the root canals with or without solvent use (Eugenate).

Study Design: Quasi-experimental study.

Place and Duration of Study: Operative Dentistry Department, Armed Forces Institute of Dentistry, Rawalpindi Pakistan, from Sep 2019 to Feb 2020.

Methodology: Forty mandibular premolars with previously failed root canal treatment were chosen. They were randomly divided into four groups, each with ten teeth. Gutta-percha filling material elimination was done with manual H-Files and rotary ProTaper with and without Eugenate and evaluated radiographically. The time duration for complete removal was also noted and evaluated by stopwatch.

Results: Out of the total 40 patients 22(55%) were female and 18(45%) were males. Comparison of mean operating time duration of elimination of Gutta Percha filling material from the canals was less with ProTaper with Eugenate compared with the other three groups; however, it showed statistically significant differences among groups (p<0.05).

Conclusion: Every group showed some residual filling material in the canals. ProTaper D retreatment files with Eugenate performed faster than ProTaper alone, followed by manual H-files without Eugenate and Eugenate.

Keywords: Eugenate, Gutta-percha removal, H-Files, ProTaper.

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INTRODUCTION

Non-surgical root canal retreatment is considered the treatment modality for the tooth with failed root canal treatment.[1] Various factors for teeth accompanied by failed root canal include contaminated filled root canal, re-infection, inadequate or incomplete obturation and apical or coronal leakage.[2] Most frequently, Enterococcus faecalis was found in inadequately root canal-treated teeth.[3]

Gutta-percha is most commonly used as a root canal-filling material.[4] Various methods for eliminating the gutta-percha from the canals include rotary, manual, reciprocating and ultrasonic instruments with or without solvents. Organic solvents used in endodontics are Chloroform, halothane, orange oil, eucalyptol and xylene.[5,6]

Orange oil (Eugenate, Produits Dentaires SA) does not account for any harmful effects, has low water solubility, is alcohol soluble, and is utilised in medicaments for fragrance and flavour.[7]

Manual instruments used for retreatment purposes are K and H Files, while ProTaper Universal retreatment files (Dentsply Maillefer, Ballaigues) were specifically designed for and were demonstrated to be successful in eliminating root canal filling materials. The scheme comprises three progressively tapering rotary instruments with a convex triangular cross-sectional device. The D1 instrument (tip 30, taper 0.09) facilitates the initial access into the gutta-percha.[8] The D2 instrument (tip 25, taper 0.08) was intended to abolish the Gutta Percha at the middle third of the canal. The D3 instrument (tip 20, taper 0.07) is designed for the elimination of the remaining part of the Gutta Percha up to the working lengths.[9]

Some studies demonstrated that rotary files have the same working efficiency as manual files with reduced operational time.[10] Therefore, the study aimed to compare the competence of ProTaper and manual H-File with or without Eugenate solvent for removing Gutta Percha filling material from root canal-treated teeth. The time taken for this was also noted and evaluated.

METHODOLOGY

The quasi-experimental study was conducted at Operative Dentistry Department, Armed Forces Institute of Dentistry (AFID), Rawalpindi Pakistan, from September 2019, to February 2020, after Ethics Committee approval (Certificate # 905/Trg—ABP1K2).

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The sample size was calculated using the G* power program taking mean for Group 1=219.80± 29.68 and mean for Group 2=451.20± 7.8.[11]

Inclusion Criteria: Individuals aged 18-50 years, of either gender, presenting with pain in previously root canal-treated teeth, teeth with single canals, closed apices, and teeth with no evidence of internal and external resorption were included.

Exclusion Criteria: Patients with posts or separated instruments in the canal, severely curved root canals, furcal or apical bone loss, perforations, abnormal occlusion, periodontal disease, fractured or cracked teeth, multi-rooted teeth and more than one canal in a tooth were excluded.

A thorough history, clinical examination, and investigations were performed. Informed consent was taken from the included patients. Forty Patients were randomly distributed into four groups containing ten patients each (Figure).

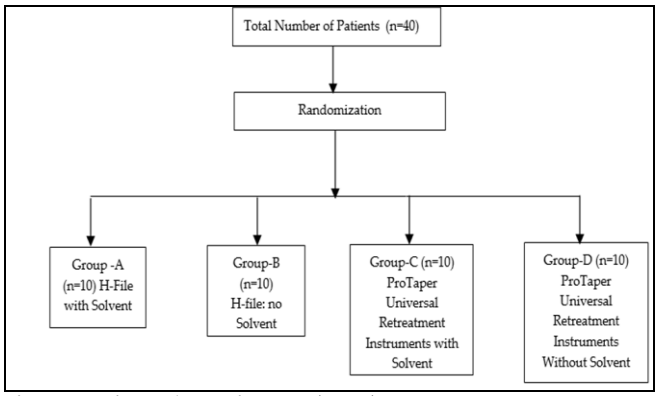

Figure: Patient Flow Diagram (n=40)

In Group-A: H-File with solvent: the #3 and #2 Gates-Glidden Drills (Dentsply, Maillefer, Ballaigues, Switzerland) worked in a crown-down manner and withdrew Gutta Percha from the coronal part of the canal. 3-4 drops of Eugenate (orange oil) placed in the canal space created by gates-glidden drills #15 H-File (Dentsply, Maillefer, Ballaigues) was presented in the canal after 2 minutes till the working length. Canals were instrumented up to size 40 to remove the gutta-percha. The solvents were reintroduced whenever required. Retreatment was considered absolute when no more gutta perch or sealer was noticed on the last instrument.

In Group-B: H-file: the above technique was repeated, except no solvent (Eugenate) was used in this group. In Group C: ProTaper Universal retreatment instruments with solvent, for removal of the material from the coronal part of the canal, the D1 file was used, 2-3 drops of Eugenate deposited in the space created by D1, while the D2 and D3 instruments were used for elimination of the softened Gutta Percha from the middle and apical thirds of the canal. The solvent is refreshed when needed. In Group-D: ProTaper Universal retreatment instruments, the teeth in this group were treated as Group C, except no solvent (Eugenate) was used in this group.

After instrumentation with each file, the root canal was flushed with 2.5% NaOCl. In total, 20 ml of NaOCl was utilised during each retreatment practice. The root canals were irrigated with 1 ml of 2.5% NaOCl using a 30G needle and syringe after mechanical retreatment. They were then filled with 15% EDTA, which was placed in the canal for 3 min. This was followed by rinsing with 1 ml of 2.5 % NaOCl and drying with sterile paper points. All rotary files were functional with an electric motor (ENDO-MATE, NSK). Speed and torque were set according to company instructions. The time needed for retreatment in each group was recorded by a stopwatch. Radiographs were used to evaluate retreated teeth. The time it took to enter the canal with the first gates glidden drills until the completion of reinstrumentation was documented with a stopwatch.

Statistical Package for Social Sciences (SPSS) version 25.0 was used for the data analysis. Quantitative variables were expressed as Mean±SD and qualitative variables were expressed as frequency and percentages. One-way analysis of variance (ANOVA) was applied to gauge the mean differences among the groups. The group differences were calculated using Post Hoc test (Tukey HSD). The *p*-value of ≤0.05 was considered statistically significant.

RESULTS

Forty Patients were randomly distributed into four groups containing ten patients each. Out of the total 40 patients 22(55%) were female and 18(45%) were males. The mean age of the patients was 31.925±8.841. The mean total operating time with a significant difference ($p<0.05$) among the study groups (Table-I). Rotary techniques with Eugenate (Group-D) were significantly faster than manual techniques (Group A and B) ($p<0.05$). However, the difference was not significant for Rotary Techniques without Eugenate (Group-C) and H Files (Group-A). Overall, the Protaper system without the Eugenate system was the most effective because it was the fastest, and its differences with all the remaining groups were

significant (p<0 .05) except with the H file without the Eugenate system. On the contrary, the H File without Eugenate was the slowest with the most GP remnants and had significant differences (p<0.05) with all the remaining groups (Table-II).

Table-I: Time Duration (in seconds) for Complete Gutta Percha Removal (n=40)

Study Groups (Method Of GP Removal)	Time duration (In Seconds) Mean±SD	*p*- value
Group A	288.70±9.10	<0.01
Group B	219.29±1.28	
Group C	74.79±3.31	
Group D	118.90 ±1.43	

Table-II: Contrast of the Time Duration (in Seconds) Intergroup Comparison

Study Group	Intergroup Comparison	*p*-value
Group B	Group A	0.011
	Group D	0.001
	Group C	0.01
Group A	Group D	0.012
	Group C	0.08
Group D	Group C	0.03

DISCUSSION

The retreatment prognosis is based on variations in the natural curvature of the root canal caused by previous root canal treatment. The quality of Gutta Percha filling material, postoperative restoration status, apical periodontitis, and any preoperative perforations are the factors for the consequence of retreatment.[10] Our study compared ProTaper D retreatment files with H-Files, which are traditionally used for root canal retreatment. Some studies found no significant difference between ProTaper and H files for root canal retreatment.[11]

Our study showed some residual filling material in both techniques, but the retreatment time was less with rotary instruments than with manual instruments. Various techniques appeared while assessing the remaining gutta-percha, including linear severance of teeth that may supersede gutta-percha remnants,[12] and a coalition of longitudinal and transverse sections for assessment in thirds of the canal.[13]

Faus-Matoses *et al*. compared two rotary systems for retreatment. They concluded that ProTaper Gold and Reciproc Blue files presented related potentiality regarding obturation material deletion and mean retreatment time duration.[1] Schirrmeister *et al*. concluded that less remaining obturation material in a short duration of time was seen with RaCe instruments compared to manual H-Files.[2] Takahashi *et al*. conducted a similar study, except Chloroform was used as a solvent. They concluded that ProTaper retreatment instruments without Chloroform demonstrated to be faster than the other three groups.[3]

Tasdemir *et al*. compared ProTaper and Mtwo instruments for retreatment and found that ProTaper left less filling material inside the root canal than Mtwo.[14] Unal *et al*. concluded that manual instruments are more effective for retreatment than rotary instruments in curved canals.[15]

Raj *et al*. concluded that the ProTaper Universal System showed the highest efficacy for removing Gutta Percha, followed by D-RaCe and H-file.[16] Georgi et al. showed that ProTaper and R-Endo rotary instruments might leave filling material inside the root canal, especially in the apical third.[17] Colaco *et al*. concluded that rotary techniques were more efficient than manual techniques in retreatment.[18]

Many studies have shown rotary endodontic instruments to be more competent at removing Gutta Percha than manual files. Other studies reported no significant difference between the ProTaper rotary system (Dentsply Maillefer) and several other instruments, including conventional hand files. This discrepancy could be attributed to differences in obturation techniques and retreatment methods.[10]

An organic solvent can soften Gutta Percha as it is well condensed and impenetrable by endodontic files. The ideal solvent must be efficient, non-toxic to the clinical staff, patient, and environment, non-carcinogenic, applicable for an adequate time, and cost-effective. Different solvents have different outcomes on different types of sealers. As Chloroform is highly unstable and can completely volatilise within one minute of contact with air, orange oil (Eugenol) is considered an effective and safer alternative.

LIMITATION OF STUDY

As manual H-Files and rotary ProTaper instruments showed Gutta Percharemnants in the canal walls, additional measures, such as other rotary systems or a combination of manual and rotary systems with solvents other than Eugenate, could have been used to evaluate. Only radiographs were used to evaluate; further work with other gauges, like fibreoptic endoscopes and dental operating microscopes, is needed.

CONCLUSION

Complete cleaning of root canals was not found in the studied groups. However, ProTaper D retreatment files with Eugenate performed faster than ProTaper alone, followed by manual H-Files without Eugenate, then manual H-File with Eugenate.

Conflict of Interest: None.

Authors Contribution

Following authors have made substantial contributions to the manuscript as under:

NI & SMH: Data acquisition, data analysis, data interpretation, critical review, approval of the final version to be published.

FTZ MA: Study design, data interpretation, drafting the manuscript, critical review, approval of the final version to be published.

AS: Conception, data acquisition, drafting the manuscript, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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