



## Original Article

### COMPARATIVE EVALUATION OF DEBRIS REMOVAL USING PROTAPER RETREATMENT FILES AND HEDSTRÖM FILES - AN EX VIVO EVALUATION.

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#### Abstract

**Background:** Endodontic retreatment is performed due to endodontic failures. The main purpose of retreatment is cleaning and shaping of the root canal with removal of old root filling material. Thus, the aim of our study was to compare the efficiency of protaper retreatment files and H-file during root canal retreatment. **Material and methods:** A sample of 30 recently extracted human mandibular premolars were collected for the study. The teeth with single root canals, completely formed apices and root curvature not exceeding 10° were selected for the study. The teeth which have cracks, open apices, root caries or root resorption were excluded from the study. The teeth stored at 37°C in 100% relative humidity for 1 month, allowing the setting of the sealer and mimicking a clinical condition. Thirty teeth were divided into 2 groups, 15 in each. Group I – Protaper retreatment files and Group II – H files. Statistical analysis was done by using SPSS, version 22 (SPSS, Inc., Chicago, IL). The level of significance applied for all tests was set at  $p < 0.05$ . **Results:** The results of our study shows that the filling material remnants were more in group II using H-file in comparison with Protaper retreatment files. The result of other variable that was percentage of removed material was more in Group I as compared to Group II. **Conclusion:** The present study concluded that ProTaper retreatment files were found to be effective in the removal of gutta-percha from the root canal in comparison to the H-files.

**Keywords:** Gutta-percha, Protaper Retreatment files, H-files.

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**How to Cite:** Grewal G. Comparative Evaluation of Debris Removal Using Protaper Retreatment Files and Hedström Files-An Ex Vivo Evaluation. IDA Lud J–*le* Dent 2018;2(4):22–26.

## INTRODUCTION

The main cause of failure in root canal treatment is the persistence of infection due to insufficient cleaning and consequently inadequate filling of the root canal system.<sup>1,2</sup> Non-surgical endodontic retreatment is done mainly to eliminate the persistent infection of the root canal system. *Enterococcus faecalis* have been identified predominantly from the failed root canals. Retreatment requires complete removal of the root canal filling material, followed by further shaping, cleaning, disinfection and re-obturation to reestablish healthy periapical tissues.<sup>3,4</sup> Removal of gutta-percha and sealer is an important factor in root canal retreatment, since this enables thorough chemo-mechanical instrumentation and disinfection of the root canal system.<sup>5</sup> Various types of motor driven instruments, made from nickel titanium (NiTi) alloys in different designs and variable tapers, have been successfully used in cleaning and shaping of the root canals.<sup>6</sup> The ProTaper Retreatment® (PTR) (Dentsply Maillefer, Ballaigues-Switzerland) system was introduced, consisting of a set of three instruments with different lengths, multiple and progressive tapers, and different apical diameters: D1 (size 30.,09 taper 16 mm length, active tip), D2 (size 25.,08 taper, 18 mm), and D3 (size 20.,07 taper and the cervical, middle, and apical thirds of the root canal, respectively). Therefore, the purpose of this *ex vivo* study was to evaluate the effectiveness of the rotary system **Protaper Retreatment Files** during the removal of filling material in comparison with manual **Hedström files** (Dentsply Maillefer, Ballaigues-Switzerland).

## MATERIAL AND METHODS

A sample of 30 recently extracted human mandibular premolars were collected for the

study. The teeth with single root canals, completely formed apices and root curvature not exceeding 10° were selected for the study. The teeth which have cracks, open apices, root caries or root resorption were excluded from the study. The external root surfaces of teeth were cleaned off adherent tissue tags and debris. Teeth were stored in normal saline solution and kept in 2.5% sodium hypochlorite for 24 h before the procedure.

After this, the teeth were opened for endodontic access with a round bur and pulp tissues were removed with barbed broaches. Number 10K file was passed 1 mm beyond the apical foramen to ensure the canal patency. The file which tightly fits at the apical foramen was selected for individual tooth and working length was established by subtracting 1 mm from this length. All teeth were prepared 1 mm short of the apical foramen with hybrid instrumentation technique. Coronal and middle third were prepared with Gates Glidden drill (size 1-3). Canals were then prepared with K file to a master apical file size 30 and step-back in 1 mm increments to an size 45. After each instrument the canals were irrigated with 5.25% sodium hypochlorite. Canal patency was maintained by inserting number 10 file slightly beyond the apical foramina during recapitulation. All teeth were obturated with cold lateral condensation with gutta-perch points and zinc oxide eugenol sealer. The access cavity of all the teeth were restored with Cavit and radiographs were taken and the teeth stored at 37°C in 100% relative humidity for 1 month, allowing the setting of the sealer and mimicking a clinical condition. Thirty teeth were divided into 2 groups, 15 in each.

Group I – Protaper retreatment files.

Group II – H files

Gutta-percha in all the two groups was removed with protaper retreatment files, and H files. Statistical analysis was done by using SPSS, version 22 (SPSS, Inc., Chicago, IL). The level of significance applied for all tests was set at  $p < 0.05$ .

## RESULTS

In our study thirty teeth were divided into 2 groups, 15 in each.

In Group I Protaper retreatment files were used whereas in Group II H files were used.

The results of our study shows that the filling material remnants were more in group II using H-file in comparison with Protaper retreatment files. (Table 1)

The result of other variable that was percentage of removed material was more in Group I as compared to Group II. (Table 1)

Filling material remnants on the root canal walls	Group	n	Mean	p-value
	Group I	15	0.88±0.92	0.035*
	Group II	15	1.56±1.11	
Percentage of removed material in the canal	Group	n	Percentage	0.042*
	Group I	15	98.6%	
	Group II	15	89.28%	

\*  $p < 0.05$  is considered to be statistically significant

**Table 1: Different variables for two groups.**

## DISCUSSION

The failure of an endodontic treatment may lead to root canal retreatment. Treatment alternative to root canal failure are non-surgical and surgical root canal retreatment. According to the literature the success of retreatment ranges from 40-100%. This variable outcome in retreatment is due to different factors such as age of the patient, type of teeth,<sup>7</sup> the presence of alteration in the natural course of root canal,<sup>8</sup> the technique used to remove the existing filling

material and possibility to repair pathologic or iatrogenic defect<sup>9</sup> and the possibility of removing the coronal restoration to assess the pulp chamber.<sup>10</sup> In our study thirty teeth were divided into 2 groups, 15 in each. In Group I Protaper retreatment files were used whereas in Group II H files were used. The results of our study shows that the filling material remnants were more in group II using H-file in comparison with Protaper retreatment files. The result of other variable that was percentage of removed material

was more in Group I as compared to Group II.

Fariniuk LF et al concluded that all groups presented remnants of filling material; PTU had the smallest amount and HF group presented the highest mean value ( $P < 0.05$ ) in all the thirds. The cervical third had the smallest amount of material when compared with the other thirds ( $P < 0.05$ ). HF group required a longer mean time, presenting significant difference ( $P < 0.05$ ).<sup>11</sup>

Chandrasekar AV et al conducted a study and results of the study show that the ProTaper retreatment files (97.4%) showed the highest efficiency in the removal of obturating material, which was followed by RaCe (95.74%), K3 (92.86%) and H files (90.14%) with the efficiency in the decreasing order. Similarly the mean apical extrusion in H files ( $0.000 \pm 0.002$ ) was significantly lower than all the rotary instruments. However, the difference among the rotary files were not statistically significant ( $p > 0.05$ ).<sup>12</sup>

Mittal N et al concluded that ProTaper retreatment system with solvent was better in gutta-percha removal.<sup>13</sup>

Arora C et al concluded that there was statistically significant difference in the apical extrusion of debris between hand instrumentation and protaper retreatment file and K3 file. The amount of extruded debris caused by protaper retreatment file and K3 file instrumentation technique was not statistically significant. All the three instrumentation techniques produced apically extruded debris and irrigant. The best way to minimize the extrusion of debris is by adapting crown down technique therefore the use of rotary technique (Protaper retreatment file, K3 file) is recommended.<sup>14</sup>

#### CONCLUSION:

The present study concluded that ProTaper retreatment files were found to be effective

in the removal of gutta-percha from the root canal in comparison to the H-files.

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**Conflict of Interest: None**

**Source of Support: NiL**



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