

A Comparative Evaluation of Efficacy of Rotary and Reciprocating Files in Removal of Gutta Percha in Endodontic Retreatment: An In Vitro Study

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ABSTRACT

Background: To evaluate the effectiveness of rotary file v/s reciprocating file system in removal of gutta percha in endodontic retreatment.

Materials and Methods: A total of 32 freshly extracted mandibular premolars with single canal were collected. Coronal structure of teeth was removed and made of equal length 16 mm. Access opening was done and canals was prepared using Hyflex CM. and obturated, then immersed in saline for seven days. The teeth were cleaned with protaper retreatment files and divided in two groups namely, Group A were cleaned and reshaped by Protaper Gold and Group B with Wave One. Teeth were sectioned and analysed in ADOBE photoshop.

Results: Data were collected, and statistical analysis was performed using T tests and Mann-Whitney Test.

Conclusion: None of the systems completely removed the root filling material from root canals. However, HYFLEX CM/ PROTAPER GOLD instruments removed more GP when compared to HYFLEX CM/ WAVEONE GOLD instruments. WAVE ONE GOLD files took less time in completing procedure when compared to PROTAPER GOLD files.

Keywords: Rotary, Reciprocation, Retreatment.

INTRODUCTION

The success of nonsurgical root canal retreatment depends on the complete evacuation of endodontic materials to allow efficient cleaning, shaping, and filling of root canal system. The major factors associated with endodontic failure are the persistence of microbial infection in the root canal system and/or the periradicular area.¹ Removal of guttapercha can be obtained with several

techniques such as solvents, K-type or Hedstrom files, Gates Glidden drills, heat pluggers, ultrasonic technique, and lasers. Additionally, rotary instruments can also be used, such as the inflexible XGP drills, the canal finder, or more recently flexible rotary nickel-titanium (NiTi) files in a slow-speed handpiece.²

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Recently Ni-Ti retreatment rotary files have been introduced which have proved to be efficient and require less time when compared to hand instrumentation. ProTaper retreatment files have been used as an alternative to hand files for retreatment cases because of their easy and efficiency in removing gutta-percha.³ Various authors have reported that ProTaper retreatment files alone leave around 10%-35% of the root fillings after their use. Therefore, use of supplementary files is recommended. Thus this study aims in finding a file which in conjunction with retreatment files will remove maximum amount of gutta percha.²

MATERIAL AND METHODS

A total of 32 freshly extracted mandibular premolars with single canal were collected. Coronal structure of teeth was removed and made of equal length 16 mm. Access opening was done and canals were prepared using HYFLEX CM till 0.4%. Canals were obturated with warm lateral condensation of gutta-percha with AH Plus sealer, and allowed to set for 30 days at 37°C and 100% humidity. After 30 days the teeth were cleaned with PROTAPER RETREATMENT FILES for removing gutta-percha and then divide in to two groups.

Group A -Teeth were reshaped using WAVE ONE GOLD till 20.07(n=16)

Group B- Teeth were reshaped using PROTAPER GOLD till F1 (n=16)

Irrigation with 10ml of 3% NAOH solution was carried out in all the teeth.

The teeth were sectioned bucco-lingually and photographs were taken and the remaining area containing gutta-percha was calculated using Image J software

Evaluation of percentage of residual filling material and operating time

- The area of the canal and the residual filling material was recorded, and the percentage of remaining of filling material on canal walls was calculated with the following equation¹

$$001 \times \text{Iretetam gnillit gninimam} \text{ to eeta} = \text{Iretetam gnillit gninimam} \text{ to } \delta^0 \text{ eeta}$$

$$\text{Iretetam gnillit gninimam} \text{ to eeta}$$

- Operating time – total retreatment time was recorded in minutes and seconds with a stopwatch.

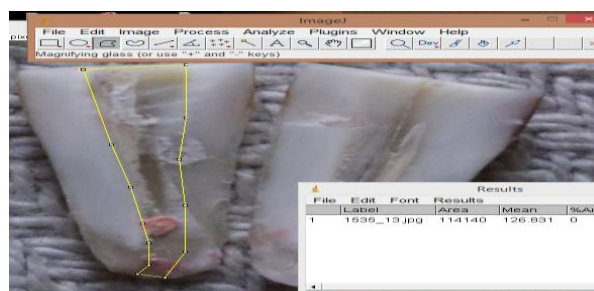


Fig 1: Measuring total area of the root canal.

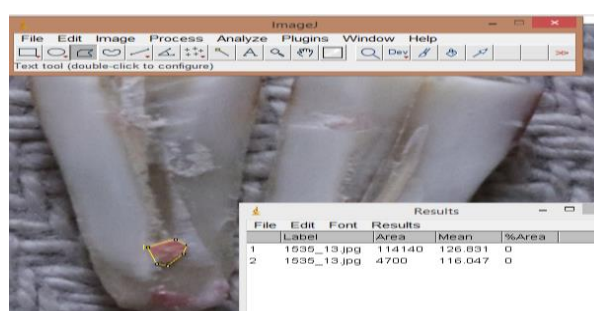


Fig 2: Measuring area of remaining filling material.

STATISTICAL ANALYSIS

Data analysis was done using T tests and Mann-Whitney Test

Table 1: Comparison shown in amount of gutta-percha remaining in canals between Group A and Group B.

	N	Mean	Std. Deviation	T value	P value
VAR00002	16	4.93	1.02	2.31	0.03*
VAR00003	16	2.71	0.46		

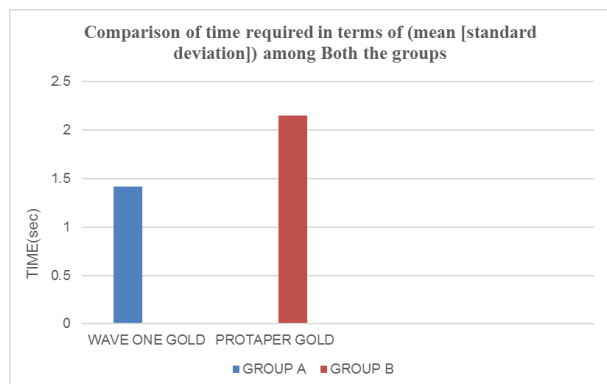
(VAR00002= GROUP A, VAR00003 = GROUP B)

RESULTS

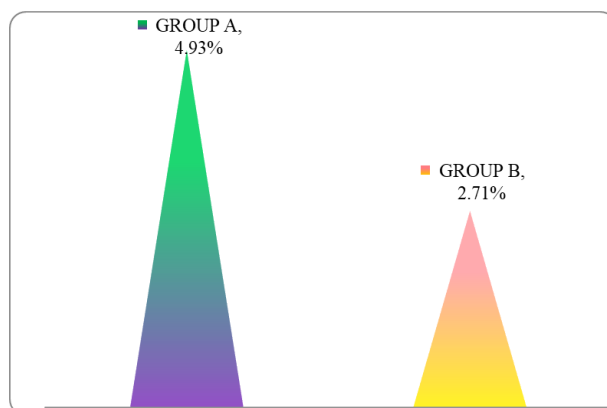
Results revealed that **less amount of gutta percha** was found in canals treated with PROTAPER GOLD.

WAVE ONE GOLD took **less time** in completing procedure when compared to ProTaper gold. Although complete removal of gutta percha was not evident with any of the files. No evidence of file fracture was found.

Graph 1: Comparison of time required between groups.



Graph 2: Difference shown in amount of gutta percha remaining in canals.



DISCUSSION

The complete removal of root canal filling material to regain access to the apical foramen to facilitate the sufficient cleaning and shaping of entire root canal system results in successful endodontic retreatment. In failed endodontic cases, obturating material harbor's necrotic tissue and bacteria which is responsible for periapical inflammation. Human single-rooted mandibular premolar teeth with oval canals were chosen since they represent a major challenge for performing endodontic retreatment. High anatomical variability exists with respect to the shape, size, and dimensions of these teeth.¹

The ProTaper universal retreatment system was used for retreatment in this study. This system can

remove large amounts of gutta-percha through spirals running around the instruments, which produce both cutting and softening actions. The negative cutting angle and the absence of radial land exert a cutting action as opposed to a planing action on the gutta-percha.⁴ Pawar AM et al found that retreatment files alone are not capable of removing gutta-percha, thus there is a need of supplementary files of complete removal.²

Ni Ti rotary instruments differ from each other by designs. The differences in the designs can be listed as different taper, cutting edge, grooves and tip designs, file motion and these might influence the efficacy of Ni Ti rotary instruments.⁵⁻¹² The method of examining the residual filling material by taking the 400x magnification photographs after longitudinal bisection of roots and the method of assessing with computer software, due to its practical applicability and low cost and because it is still used in the studies carried out, this method was presented.^{13,14} It also provides the opportunity for three dimensional examination according to the radiographs.

WaveOne reciprocating file and Protaper gold rotary file systems were used for further gutta-percha removal as well as for reshaping in respective groups after Protaper retreatment file as they differ in file design and file motion. Reciprocating systems such as WaveOne produce a broader motion in the counter-clockwise direction yet shorter in the clockwise direction, keeping the file more centered in the canal. The cross-section of WaveOne GOLD is a parallelogram with an 85-degree active cutting edge with alternate one and two point contact.⁹ The WaveOne GOLD file engages 150 degrees CCW and 30 degrees CW, turning 360 degrees after three cycles of reciprocation.¹⁵⁻¹⁹

Ajinkya M Pawar et al conducted a study on efficacy of the Self-Adjusting File versus WaveOne in removal of root filling residue and found wave one files to be less effective as our study.² The ProTaper systems have a progressive taper and a modified guiding tip. ProTaper Gold's convex triangular cross-section and progressive taper enhance cutting action while decreasing rotational friction between the blade of the file and dentin therefore, greater cutting efficiency is achieved.²⁰⁻²³ Their design also favors debris removal and prevent the instrument from screwing into the dentinal walls of the canal.²⁴

M. Hülsmann V. Bluhm conducted a study on cleaning efficacy of rotary files and found ProTaper files to be most effective.²⁵

CONCLUSION

Within the limitations of this in vitro study, neither retreatment protocol was able to render root canals free of obturation material. However, ProTaper gold files removed more obturation material in single-rooted, oval-shaped canals. Further studies are required for confirming the hypothesis of this study.

CONFLICTS OF INTEREST

The authors declare they have no potential conflict of interests regarding this article.

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