

Comparison of Apical Extrusion of Debris During Endodontic Retreatment Using Three Different Techniques

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ABSTRACT

Background: The aim of our in vitro study was to evaluate the amount of debris extruded apically during retreatment using Protaper retreatment files and Mtwo retreatment files and H file with solvent.

Materials and Method: Freshly extracted human 30 mandibular premolars were collected. Roots were prepared with hybrid technique and prepared teeth were then obturated with cold lateral condensation using gutta percha & zinc oxide eugenol sealer. All teeth were stored in the incubator at 37 degree Celsius and 100% humidity for 30 days. Preweight 1.0 ml of Eppendorf tube was used during the instrumentation procedure. 30 teeth were randomly assigned to 3 groups, 10 teeth in each. Gutta percha in all the three groups were removed with Protaper retreatment files, Mtwo rotary instruments and H files with tetrachloroethylene. Debris extruded, along with the irrigating solutions through apical foramina was collected in the Eppendorf tubes and incubator at 68 degree Celsius.

Results: The weight of the extruded debris was determined by subtracting the weight of the preweighed empty tubes from the weight of the tubes plus the dried debris. The mean weight of extruded debris was calculated for each group and then, analyzed statistically.

Conclusion: This is the graphical representation of the amount of extrusion of debris among three groups. It shows significant difference when we compare Protaper and H file and Mtwo with H file where as it shows non significant difference when we compare protaper and Mtwo.

Keywords: Retreatment, apical extrusion, debris, Mtwo retreatment files, Eppendorf tubes.

INTRODUCTION

In spite of the precautions taken and the mastery on endodontic procedures, failures are still bound to occur.^{1,2} In that case only two alternatives are left with the dentist either to sacrifice the tooth or to retreat it.³ The greatest difficulty encountered in such retreatment cases is due to removal of the

obturation.³ As there is a possibility of extrusion of obturating material and debris like dentin chips, necrotic tissue, microorganisms and intracanal irrigants to percolate into the apical area.⁴ Furthermore there are chances of creation of perforation or breakage of instrument in the canal.¹ The most commonly used obturating material is

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gutta percha with sealer and it is commonly removed with push-pull motion using hand instrument along with heat or solvents.⁶ In literature it has been mentioned that the instrumentation techniques using a push-pull motion tended to produce more extrusion of debris into the apical area than instrumentation techniques incorporating rotational force.⁷ The same may hold true for removal of obturation during retreatment.^{8,9}

As it is a well known fact that it is extruded debris which is responsible for flare ups during retreatment.^{4,10} For this reason more rotary instruments are being introduced into the market like Protaper, K3 System and now Mtwo retreatment files. So, the aim of this in vitro study was to compare the amount of extruded debris using two different rotary methods and hand instrument with solvent during retreatment. The aim of our in vitro study was to evaluate the amount of debris extruded apically during retreatment using Protaper retreatment files and Mtwo retreatment files and H file with solvent.

MATERIALS AND METHOD

SELECTION OF SAMPLES: 30 Freshly extracted human mandibular premolars were collected from various sources such as private clinics, dental colleges and hospitals. Mandibular premolars with single root canals, completely formed apices and root curvature not more than 10 degrees. They should not have cracks, open apices, root caries or root resorption.

PREPARATION OF THE SAMPLES

Roots were prepared with hybrid technique using size 30 at the apical third and size 50 at the coronal third. These prepared teeth were then obturated with cold lateral condensation using gutta percha & zinc oxide eugenol sealer and the teeth were divided into three groups of ten teeth each. All teeth were stored in the incubator at 37 degree Celsius and 100% humidity for 30 days.

PREPARATION FOR RETREATMENT:

Holes were created in the rubber stoppers with the help of heated instrument and the teeth were inserted into the holes and fixed with self-cure acrylic in order to create hermetic seal. Prewriteight

1.0 ml of Eppendorf tube with apical part of the root suspended within the tubes, and this assembly was then placed into the glass vial. The glass vial was filled with auto polymerizing acrylic resin to place the polyethylene tube firmly into the vial during the instrumentation procedure.



Fig 1: Setup For Retreatment.

A 23 gauge needle was inserted in the rubber stopper next to the fixed root to equalize the external and internal pressures. The operator was shielded from seeing the root apex during the instrumentation by placing the rubber dam over the vial.

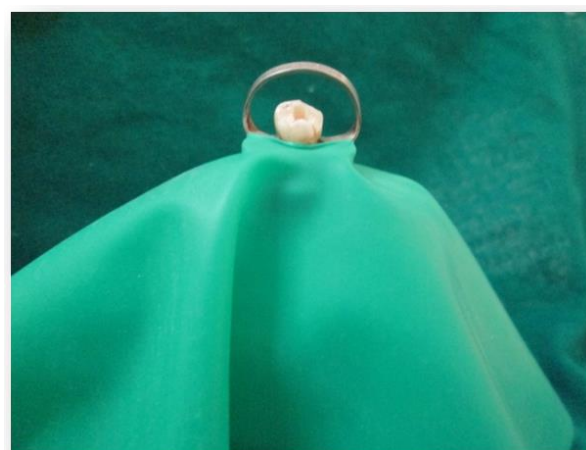


Fig 2: Rubber Dam Placement Over Setup

GROUPING OF SAMPLES: Thirty teeth were randomly assigned to 3 groups, 10 teeth in each.

Group 1 – Protaper retreatment files

Group 2 –Mtwo files

Group 3 – H files with solvent

Gutta percha in all the three groups were removed with Protaper retreatment files, Mtwo rotary instruments and H files with tetrachloroethylene.

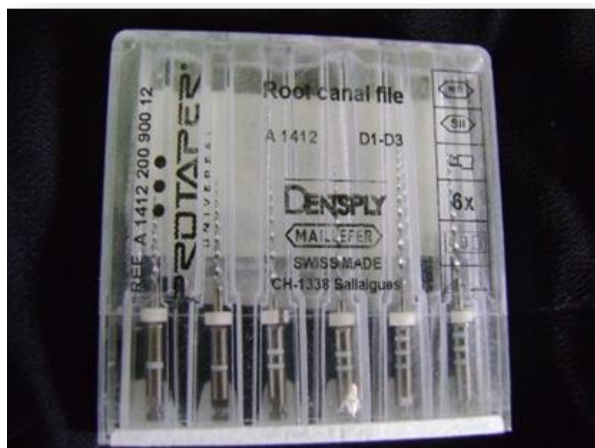


Fig 3: Protaper retreatment files.



Fig 4: Mtwo retreatment files



Fig 5: H File with Solvent.

RETREATMENT PROCEDURE:

1. PREPARATION WITH PROTAPER RETREATMENT FILES :

Protaper retreatment files were used as per manufacturer's instruction.

2. PREPARATION WITH Mtwo RETREATMENT FILES :

M-two Ni-Ti rotary instruments were used as per manufacturer's instruction.

3. PREPARATION WITH H FILES WITH SOLVENT:

In this group we have used H files with tetrachloroethylene solvent.



Fig 6: Retreatment Procedure.

DESICCATION AND WEIGHING

All canals, regardless of the system used, were irrigated with total volume of irrigant used was 20 ml /tooth. Retreatment was considered to be complete when no debris of gutta percha /sealer was visible on the instrument surfaces and the canals were smooth. Debris extruded, along with the irrigating solutions through apical foramina was collected in the Eppendorf tubes. The tubes were removed from the glass vials and stored in the incubator at 68 degree Celsius to evaporate the moisture completely.

The tubes were then allowed to cool in the container having silica gel for 30 minutes. Weighing of the tubes was then carried out on the same electronic balance. The weight of the extruded debris was determined by subtracting the weight of

the preweighed empty tubes from the weight of the tubes with the dried debris. The mean weight of extruded debris was calculated for each group and statistical analysis was performed.

RESULTS

Samples were instrumentation according to division of groups:

Group A - ProTaper Retreatment file

Group B - Mtwo Retreatment file

Group C - H file with solvent

The weight of the extruded debris was determined by subtracting the weight of the preweighed empty tubes from the weight of the tubes plus the dried debris. The mean weight of extruded debris was calculated for each group and then, analyzed statistically. Table I

Table 1: Groups when analysed using Oneway ANOVA.

group	Protaper	Mtwo	H file
Mean	442.7900	447.2980	451.0300
Standard deviation	+13.36429	+14.54831	+10.05930

It shows a significant difference between these groups when analysed using **Oneway ANOVA**. For the comparison between three groups for the post weighed extruded debris gain **post hoc test** was performed.

Table 2: Post Hoc Tests shows comparison between three groups.

Main group(I)	Comparing group(J)	Mean Difference (I-J)	Sig.
A	B	.08600	.787 ^{NS}
	C	-.43300(*)	.007*
B	A	-.08600	.787
	C	-.51900(*)	.001*
C	A	.43300(*)	.007*
	B	.51900(*)	.001*

NS= Nonsignificant; *p<0.01

This is the graphical representation of the amount OF extrusion of debris among three groups. It shows significant difference when we compare Protaper and H file and Mtwo with H file where as it shows non significant difference when we compare protaper and Mtwo.

DISCUSSION

According to the literature the success of root canal treatment is almost 91.45 %.¹ The rest percentage failure cases may be retreated by non surgical or surgical treatment. The success of retreatment ranges from 40-100%.³ This variable outcome is due to different factors such as age of the patient, type of teeth, the presence of alteration in the natural course of root canal, the technique used to remove the existing filling material, and possibility to repair pathologic or iatrogenic defect and the possibility of removing the coronal restoration to assess the pulp chamber.^{1,3,11,12} For the successful retreatment it is mandatory to remove the commonly used gutta percha and sealer completely to uncover the remnants of necrotic tissue or bacteria that might be responsible for endodontic failure.^{13,14}

The histological consequences of apical extrusion have also been analyzed by number of researches.⁴ Seltzer et al reported that even sterile dentin debris in the periapical area was associated with persistent inflammation leading to distended and oedematous apical collagen fibers.¹⁵ Retreatment protaper files are used with brushing motion in crown down manner at the cervical, middle and apical 3rd respectively. The D1 file has active tip which facilitate the penetration of the subsequent files i.e. D2 and D3. The non-cutting tips of D2 and D3 reduces the incidence of ledging, perforation and stripping during the removal of filling material.³

M-two Ni-Ti rotary instruments have S-shaped cross-section. They include two instruments with variable tip sizes ranging from #15 and #25, with tapers .05 and .06 respectively. The M-two is used in single length method in which all the instruments were used till working length In M-two files because the distance between the cutting blades increases from the instrument tip to the shaft, the progressive pitch and absence of radial

lands produce less debris. This reduces the risk of apical extrusion.¹⁶

This in vitro study was conducted using mandibular first premolar because their canals are straight, they are often flattened mesiodistally but this factor was not considered in the study. Fairbourn et al determined that the inclusion of parameter such as canal angle, canal size, foramen area and morphology may not have been necessary since these covariates had no significant influence on the quantity of debris extruded.¹⁷

As expected all the retreatment methods showed apical extrusion which is a considered a problem with all canal instrumentation techniques. However weight of debris extruded in Protaper retreatment and Mtwo file technique as compared to H-file with solvent were lesser. Xiangya Huang et al performed a study with similar results where Protaper retreatment files extruded less amount of debris as compared to H-files and K-flex file.⁵

The is partially in accordance of with the work done by Uezu MK et al. who compared the efficacy of ProTaper retreatment files and ProTaper Universal in the retreatment of mandibular premolars. No significant difference was found in the amount of apical extrusion.¹⁸

CONCLUSION

- 1) Apical extrusion was present regardless of retreatment method used in all the three groups included in study.
- 2) Study concluded that Mtwo retreatment files showed best results with least apical extrusion followed by protaper and H files with solvent.
- 3) Statistically the results for Mtwo and protaper was non significant but when Mtwo and protaper were compared with H files, results were significant.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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