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RESEARCH ARTICLE

COMPARISON OF APICAL DEBRIS EXTRUSION DURING RETRIEIVAL OF GUTTAPERCHA USING MANUAL, ROTARY AND RECIPROCATING SYSTEM- AN IN VITRO

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ABSTRACT

Aim: The aim of this study was to measure the apical debris extrusion during retreatment using three different techniques.
Method: Forty five single rooted anterior teeth were selected for the study that were decoronated and were root canal treated. Access was restored with composite resin. Teeth were placed in eppendorf tubes and sealed. They were weighed before and after retreatment. Teeth were then subjected to retreatment and they were divided into 3 groups Group I: retreatment using Hfiles, Group II: retreatment using protaper retreatment files, Group III: retreatment using reciproc files.
Results: The results were subjected to Analysis of variance (ANOVA) to find the significance of study parameters. The amount of apical debris extrusion was found to be least in Group III. There was no clinical significance between Group I and Group II. There was a statistically significant difference between Group III in comparison to Group I and II.
Conclusion: Present study showed that the amount of apical debris extrusion was least for reciprocating engine driven technique of retreatment when compared to the hand file (H-file) and rotary technique for retreatment endodontics.

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INTRODUCTION

Due to increased emphasis on preservation of teeth, there has been a rise in endodontic retreatment in failed endodontic therapy (Schirrmeister *et al*., 2006). Many reasons have been associated with endodontic failure. Most common being persistence of bacteria in the root canal system, due to improper cleaning and shaping procedures, inadequate obturation or an improper coronal seal (Sjogren *et al*., 1990). A nonsurgical approach is a preferred treatment over a surgical approach for retreatment in endodontics, despite its success rate. Re-establishing health of periapical tissues is the main goal of nonsurgical root canal retreatment (Schirrmeister *et al*, 2006). The most commonly used root canal filling material is gutta-percha with sealer (Gorni and Gagliani, 2004). During the instrumentation various filling materials, dentin chips and microorganisms from the root canal can enter into the periapical area causing postinstrumentation pain or flare-up (Seltzer and Naidorf, 1985). Several techniques have been used for retreatment that includes files, burs and various automated devices that are generally preceded by softening of filling materials with solvents or heat (Friedman *et al*., 1989). Various instrumentation techniques used for retreatment causes varied amounts of apical debris extrusion (VandeVisse and Brilliant, 1975). The purpose of present investigation was to evaluate and compare in-vitro the amount of debris extruded apically from teeth which was root canal treated teeth and retreated using hand instrumentation, engine driven retreatment rotary files and reciprocating retreatment files.

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MATERIALS AND METHODS

45 single rooted, single canal anterior teeth were selected for this study. The teeth were cleaned with an ultrasonic scaler and washed with sterile solution. Preoperative radiographs were taken to verify the presence of a single straight canal. Coronal access was prepared using a high speed bur and water spray. The canal patency was estimated using a no.10 k-file (Dentsply Maillefer) and working length was estimated at apical foramen. The samples were standardized to a working length of 15mm by decoronating the teeth using diamond disks under coolant. (Fig 1) Chemomechanical preparation of teeth was carried out using step-back technique. An apical preparation was maintained at size 45 k file (Dentsply Maillefer) followed by a step-back with 50 and 55 k file (Dentsply Maillefer). Standardized irrigation protocol was followed. Obturation was done with 2% gutta-percha (Dentsply Maillefer) and AH plus sealer (Dentsply Maillefer) using lateral condensation technique.

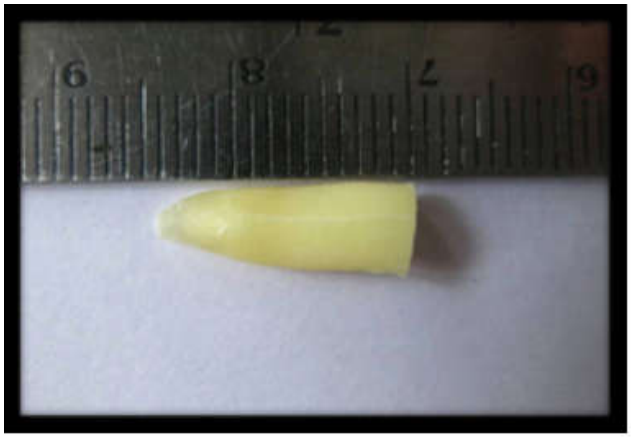

Fig. 1. Decoronated sample

Coronal 2mm was sealed using composite resin restoration until retreatment procedure was started. All the teeth were stored at 37°C in 100% humidity environment for 2 weeks to allow complete setting of the sealer.

Teeth were then randomly divided into 3 groups of 15 samples each

- Group I: retreatment using Hfiles
- Group II: retreatment using protaper retreatment files
- Group III: retreatment using reciproc files

Teeth were placed in eppendorf tubes and sealed. These were then weighed before starting of the treatment on digital weighing scale (Fig 2). The access restoration was removed with a high speed bur. Gutta-percha from coronal third was removed with gates glidden drill no.2 and 3. A drop of solvent (Endosolv-E, Septodont) was placed in the canal to soften the gutta-percha before further reinstrumentation of the canal.

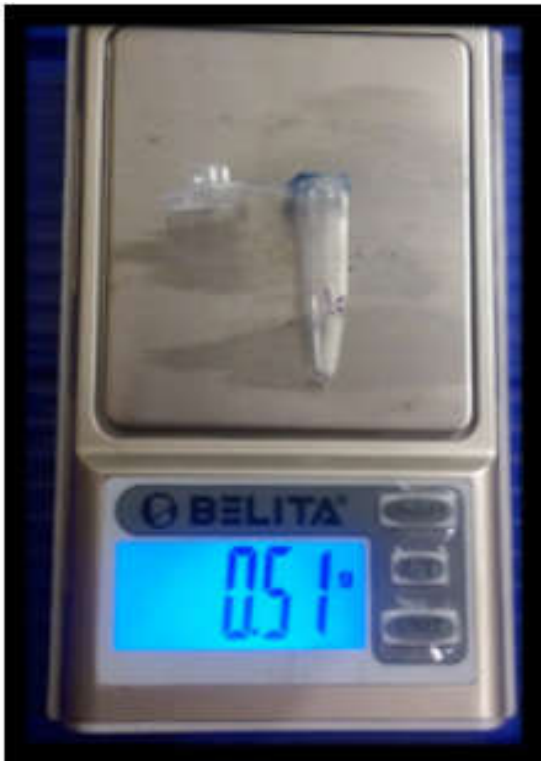

Fig 2: Sample sealed in eppendorf tube and weighed

Group I: H-files

The root canals were reinstrumented with H-files to the original working length to size no.50. After reaching the working length step back was done with k file size no 55 and 60 to 1mm short of working length.

Group II: Protaper Universal Retreatment files

D1, D2 and D3 protaper instruments were used for retreatment. Crown down technique was used till D3 reached the working length. After retrieval of gutta-percha each sample was reprepared with Pro Taper Universal Rotary Shaping (S1, S2) and Finishing files (F1, F2, F3) till they reached the working length. The instruments were used in Wave One (Dentsply Maillefer) high torque electric motor at a speed of 500-700 rpm

Group III: Reciproc retreatment files

Guttapercha was initially removed using R25 at 2/3 the canal length. A slow in and out pecking motion, with the amplitude not exceeding 3-4mm. Later the instrument was advanced further to the working length. An additional enlargement was done with R50 instrument. This instrument was used in brushing motion against lateral walls of the canal. A total volume of 20ml of 2.5% sodium hypochlorite solution which was delivered from a 30gauge needle during reinstrumentation. After irrigation the canals were dried with the paper points. Each instrument was discarded after use in 5 canals. Single operator prepared all the samples. The samples along with the eppendorf tubes were again measured on the digital scale.

RESULTS

The results were subjected to Analysis of variance (ANOVA) to find the significance of study parameters between the three groups (Table 1)

Table 1. mean value of apical debris extrusion

Results for apically extruded debris	Group I	Group II	Group III	P value
Apically extruded debris (mean value)	1.01±0.16	0.93±0.23	0.29±0.22	<0.001

There was no clinical significance between Group I and Group II. The amount of apical debris extrusion was found to be least in Group III. There was a statistically significant difference between Group III in comparison to Group I and II.

DISCUSSION

Many potential factors affect the outcome of success of endodontic treatment. Success mainly depends on elimination and prevention of root canal infection. In cases of root canal treatment failures (Akhil, 1988), removal of contaminated root canal obturating material is the main goal of retreatment (Stabholz and Friedman, 1988). Various instrumentation techniques used for endodontic retreatment causes apical debris extrusion (VandeVisse and Brilliant, 1975). Extensive studies have been done to check for apical extrusion of debris because of its clinical relevance (Seltzer and Naidorf, 1998). A study done previously compared the apically extruded debris between hand instrumentation and engine driven nickel titanium instruments.

It was noted that step-back instrumentation produced significantly more debris than the two engine-driven nickel–titanium techniques (Lightspeed and ProFile Series 29) and the balanced force technique (Reddy and Hicks, 1998). In this study the H-file technique of retreatment was found to have highest amount of apical debris extrusion. This could be because of filing action of the instruments that acts as a piston, which causes irrigating solution and debris through the apex. This also explains the less amount of extrusion in engine driven and balance force techniques (Brown *et al*., 1995). Smaller amount of debris and irrigants are extruded by using engine driven instruments because the rotary and reciprocating motion of the files causes the debris to direct towards orifice avoiding compaction in the root canal (Beeson *et al*., 1998). Reciproc R50 file is a single instrument which has an 'S' shaped cross section. It has large and deep flutes which is very effective in engaging more of gutta-percha. It is used in brushing action against the lateral wall which is one more contributing factor in reducing the amount of apical debris extrusion. In a previous study it was found that reciprocating technique was a fastest method of retreatment compared to rotary and hand filing technique (Gorni and Gagliani, 2004).

Conclusion

Under the limitations of this study it was found that the amount of apical debris extrusion was least for reciprocating engine driven technique of retreatment when compared to the hand file (H-file) and rotary technique for retreatment endodontics. There was a statistically significant difference in favor of reciprocating technique when compared to other two techniques of retreatment.

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