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RESEARCH ARTICLE

CONVENTIONAL VERSUS RESIN BASED FILLING MATERIAL: AN IN VITRO EVALUATION OF TIME EFFECTIVENESS OF TEETH RETREATED WITH ROTARY AND HAND INSTRUMENTS

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ABSTRACT

Introduction: To compare the amount of time required by rotary NiTi instruments and hand instruments in removing gutta-percha and resilon from root canal during retreatment.

Materials and Methods: Sixty human mandibular premolar teeth with straight root canals were prepared. Half of the teeth were laterally condensed with gutta percha and the other half with resilon. Each half was further divided into two groups with one of them retreated with hand hedstrom files and other one retreated with rotary protaper retreatment files. Retreatment time was calculated using a stopwatch.

Results: Rotary protaper retreatment files required significantly less time than hand hedstrom files in removing both gutta percha and resilon. Resilon was removed faster than gutta percha.

Conclusion: Rotary files were significantly faster in retreatment than the hand files. Also resilon showed better efficacy for instrumentation time during retreatment.

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INTRODUCTION

Endodontic retreatment by far has been the preferred treatment for the management of failed root canal therapy (Schirrmeister *et al*., 2006). The patients increasing expect to save their natural teeth and are often reluctant to have their teeth extracted that have guarded prognosis. The persistence of pathology and the microorganisms even after the completion of root canal treatment is one of the main concerns for failure (Nair *et al*., 1990). Hence for retreatment to be successful, the main objective should be to clear the canals of all the filling material and debris followed by further cleaning, shaping and filling of the root canal (Kvist and Reit, 1999; Mollo *et al*., 2012). Gutta percha is the most commonly used filling materials so far. Although the removal of gutta percha during retreatment is easy but at the same time it leaves residue on the canal walls regardless of the sealer and the technique of retreatment (Moshonov *et al*., 1994; Bramante and Betti, 2000). A variety of hand and mechanical systems along with ultrasonics and lasers have been used in the past for retreatment (Hulsmann and Stotz, 1997). This study used the rotary Protaper retreatment files (RPR) (Dentsply Maillefer, Switzerland) and hand Hedstrom file (H file) (Dentsply Maillefer, Switzerland) for retreatment. Inorder to overcome the shortcomings of gutta percha such as poor sealing property, another material under the name of Realseal containing Resilon and real seal sealer was introduced. The system forms monoblock with the root dentin, which helps in reducing the bacterial ingress in the root canal (Shipper *et al*., 2004). It performs in a similar manner to gutta-percha, has similar handling properties, and for retreatment purposes can be heat softened or dissolved with solvents (Marfisi *et al*., 2010). The purpose of this study was to compare the instrumentation time of hand and rotary systems in retreatement of teeth filled with gutta percha and resilon.

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MATERIALS AND METHODS

Sixty freshly extracted human single-rooted mandibular premolar teeth were collected. Blood and soft debris was washed away from the surface of the teeth by washing them under running tap water. All teeth were examined radiographically in order to rule out the teeth with open apices, calcified canals or chambers and internal resorption. Decuspidisation of teeth was done to standardize the reference points. Working length of all the teeth was taken with # 15 k-file. Instrumentation of the root canals was initiated with universal rotary protaper files (Dentsply Maillefer, Switzerland). The canals were prepared to an apical size F2

following the conventional crown down technique. 3% sodium hypochlorite and 17% ethylenediaminetetraaceticacid (EDTA) were used to irrigate the canals in between instrumentation. The final rinse was performed with EDTA. Absorbent points were used to set the canals free off the moisture. Half of the teeth (30) were then obturated by lateral condensation technique, with a 0.04 taper Gutta-percha cone (Dentsply Maillefer, Switzerland) and Zinc Oxide Eugenol sealer. And the other half teeth (30) were laterally condensed with 0.04 taper Resilon and Real Seal sealer (Sybron Endo Products, USA). Temporary material was used to seal the canal orifices. Specimens were then stored in 100% humid environment at 37°C for 2 weeks. Two dimensional images of the roots were obtained in buccolingual and mesiodistal direction. Division of the specimens was done into four groups of 15 teeth each. Group A and B had teeth obturated with Gutta percha. Group C and D had teeth obturated with Resilon.

Retreatment technique

After removing the temporary filling material from each canal, orange oil (RC prep) was left over the canal opening for 3 minutes in all the groups. Filling material softened and the path for further instrumentation was created. Now for group A and C, the root fillings were removed with Hedstrom file (Dentsply Maillefer, Switzerland). For group B and D, the root fillings were removed with rotary protaper retreatment files (Dentsply Maillefer, Switzerland). Reinstrumentation of the canals was then done in all the groups to increase the size of the original master apical file to two sizes larger (H file used in Group A and C and rotary Protaper in Group B and D). When the master apical file achieved the working length and there was no filling material covering the instrument, the preparation at that point was considered to be complete. The images of the root canals were repeated to confirm the completion of retreatment. The time required for removal of the filling material by hand and rotary files were calculated in seconds using a stop watch. The time included the time required to reach the working length and removal of filling material starting from first instrument until the completion of reinstrumentation. Whereas it did not include the time required to change the instruments, irrigation and radiographic examination.

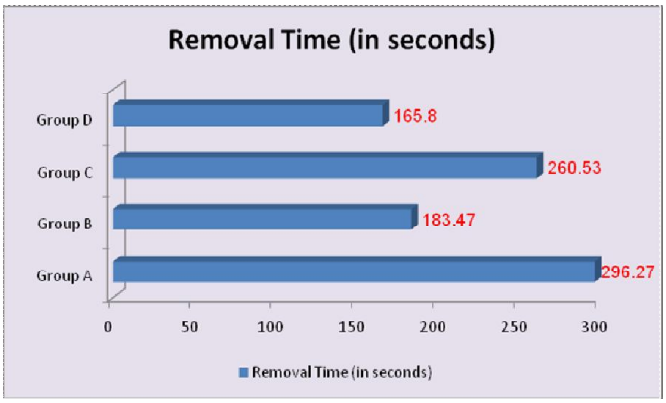
Statistical analysis was performed with one-way ANOVA and student t-Test at $P < 0.01$.

RESULTS

The table depicts the mean time taken (in seconds) for retreatment of teeth in different groups. The mean time taken varied from 165.80 (Group D) to 296.27 (Group A) seconds. Based on one way Analysis of variance, significant differences were found in all the groups.

Groups	Mean	SD
Group A	296.27	5.34
Group B	183.47	6.78
Group C	260.53	9.90
Group D	165.80	6.57
CD (p= 0.05)	5.37	

Accordingly, the rotary Protaper retreatment files (165.80 and 183.47 secs) had better efficacy in removing filled material than the hand file (260.53 and 296.27 secs). Also, Resilon (165.80 and 260.53 secs) was removed significantly faster than gutta percha (183.47 and 296.27 secs).



DISCUSSION

For a successful endodontic retreatment, every bit of existing filling material and the debris should be removed in a short span of time (Gergi and Sabbagh, 2007). NiTi rotary instruments have been proved to be efficient and safe in removing the filling material during retreatment (Masiero and Barletta, 2005). Resilon, a polymer based root canal filling material has the property of bonding to the dentin wall also known as Resilon Monoblock System. The present in vitro study was intended to assess the ability of rotary protaper retreatment files and hand files for removing gutta percha and resilon from root canals in retreatment cases as quickly as possible. According to the present study, the RPR files were faster in retreatment than the H files. Cleanliness of the canals after retreatment was judged by radiographs as well as by seeing the samples under the Surgical Operating Microscope. The operating microscopes are proved to provide better detection of residual filling material in retreated teeth (Schirrmeister *et al*., 2006a). The reason for the RPR files to remove the filling material faster is based on their design (Gu *et al*., 2008). D1, D2 and D3 have three progressive tapers and lengths. Hence enable the instruments to cut superficial layer of dentin along with removal of the filling material. Also some degree of frictional heat is produced by rotary movement of instruments which might plasticize the filling material and thus making it less resistant and easy to remove (Betti and Bramante, 2001). In this study, Resilon showed better results with operating time as compared with Gutta percha. Resilon was removed significantly faster than Gutta percha. The reason could be that Resilon has a lower melting point and a higher molecular weight than Gutta percha, so when subjected to heat, Resilon exhibits higher flowability than Gutta percha which might have contributed to the quicker removal of Resilon using heat generated from rotary files running at high rpm (Ezzie *et al*., 2006). This is in accordance with the studies done by Ellie Ezzie (2006), de Oliveira (de Oliveira *et al*.,2006) which also concluded that Resilon is removed faster than Gutta percha.

In the present study, 3% Sodium hypochlorite and 17% EDTA were used for 15 seconds as irrigating solutions. Sodium hypochlorite happens to be the best available root canal irrigant

because of its antibacterial and organic tissue dissolving properties (Torabinejad *et al*., 1990). But in case of teeth filled with Resilon, the final flush was done with 17% EDTA followed by a rinse with 5ml of saline solution. This was done as sodium hypochlorite was thought to interfere with the polymerization of Resilon. According to the study by Mitzi D 2001, oxidizing action of NaOCl leads to the oxidation of some component in the dentin matrix that is critical for the interfacial initiation of polymerization.

Conclusion

- Rotary protaper retreatment files are more time saving and faster as compared to hand hedstrom files.
- Resilon showed better efficacy for the working time as compared to gutta percha.

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