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EFFICACY OF PROTAPER R RETREATMENT FILES IN REMOVAL OF ROOT CANAL FILLING MATERIAL OBTURATED BY THREE DIFFERENT METHODS: AN IN VITRO STEREOMICROSCOPIC ANALYSIS

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ABSTRACT

The most commonly used root canal filling material is gutta-percha,as a core material in conjunction with a sealer. There are many different root canal obturation techniques but no one technique has been identified which is clearly superior. Due to advances in technology, transition is now taking place from cold lateral compaction of gutta percha to newer warm techniques like warm vertical technique of obturation. The proper removal of root canal filling materials placed by various techniques from inadequately prepared and filled canals is the major part of most root canal retreatments. NiTi rotary files are very effective and efficient for removing gutta percha. Sixty single rooted mandibular premolar divided into 3 groups obturated by lateral compaction, continuous wave compaction and single cone obturation are retreated by ProTaper retreatment files. Root canal filling remnants on longitudinal sections of each tooth were evaluated using stereomicroscopy. Lateral compaction group showed the highest mean remaining gutta percha coated walls (51%), which was significantly higher than those in the other groups. It was be concluded that Protaper universal retreatment files produce comparatively clean canals obturated by cold lateral obturation, although not completely clears canal of gutta percha obturated by lateral compaction, single cone or continuous wave compaction techniques.

Keywords: NiTi rotary files

Introduction:

Obturation of a root canal should result in a complete seal from the coronal aspect to the apex preventing the entry of microorganisms and fluid. The most commonly used root canal filling material is gutta-percha, as a core material to seal the apex in conjunction with a sealer which fills the voids and wet the dentinal walls.[1]It is the most widely used material for obturation of root canals since it is relatively inert, nontoxic and biocompatible. Silver points and resin based core filling materials, Resilon core are used very infrequently.[2,3]Among the different chemical types and various commercial formulations like ZnO-eugenol based Roth, Resin based AH Plus, Glass ionomer based Ketac-Endo, Silicone based RoekoSeal, Calcium hydroxide based Sealapex,AH plus is the most frequently used sealer.[2] It is an effective root canal sealers, displaying acceptable biocompatibility

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insolubility and dimensional stability.[4,5] There are many different root canal obturation techniques but no one technique has been identified which is clearly superior. Lateral compaction of root canals can be very effective in most cases producing a cold-welded, non-uniform mass of gutta-percha (GP) cones in the canal leaving space filled with sealer. However, it may be difficult if not impossible in severely curved, dilacerated, or bayonet canals. Due to advances in technology, transition is now taking place from cold lateral compaction of gutta percha to newer warm techniques like warm vertical technique of obturation.[6] Canals are commonly finished with a 0.04 or 0.06 taper rotary file, due to the taper created in the canals single cone obturation techniques are also prevalent.[4, 6] Infection secondary to root filling procedures is the principle cause of apical periodontitis and endodontic failure. The main causes of endodontic failure, making retreatment necessary, are insufficient cleaning and inadequate obturation.[7]The proper removal of these materials from inadequately prepared and filled canals is the major part of most root canal retreatments. Removing filling materials can be time consuming and challenging but has an important clinical impact so that instruments and irrigants may gain access to the entire root canal system, thus promoting better cleaning.[8,9]Several techniques can be used to remove the gutta-percha, including the use of stainless steel hand files ,nickel-titanium (NiTi) rotary instruments ,heat-bearing instruments ,ultrasonic instruments and lasers.[10-15] With good case selection, NiTi rotary files are very effective and efficient for removing gutta percha. The blades of these nickel titanium instruments engage softened gutta percha and effectively auger this material out of a root canal space.[16]However, all retreatment techniques leave residual debris in the canal walls after reinstrumentation.[17,18]For rotary removal of gutta percha, the ProTaper Retreatment instruments (D1-D3, Dentsply Tulsa Dental) at approximately 500-750 RPM are, recommend as greater rotational speed is necessary to create the friction and heat necessary to thermo soften gutta percha. [19,20] There is limited information about the removability of root canal filling material by these different techniques for retreatment purpose .There are very limited studies which have investigated the effectiveness of the new ProTaper universal retreatment instruments in the removal of obturating material during endodontic retreatment. So we have undertaken this study with the aim to evaluate the efficacy of these retreatment files in removing gutta percha obturated by three different techniques.

Materials and methodology

Sixty single rooted sound human mandibular premolar teeth with curvatures less than 10^0, which were extracted for orthodontic reasons. After standard access cavity preparation, the working lengths were established and recorded by passing a 10 K file beyond apex and then adjusting the length for each sample. Working length was established 1 mm short from the point a#10 K-file was visualized at the apex. ProTaper-Universal rotary files (Dentsply, Maillefer, Switzerland) were used to clean and shape root canals to size F3. The irrigation protocol employed 2.5% sodium hypochlorite (NaOCl) between each file, followed by treatment with a 17%EDTA solution for one minute. Canals were then dried with sterile paper points. Teeth were randomly divided into three groups with 20 samples in each group. The root canals were obturated with cold lateral compaction technique with ISO#30 gutta-percha cone and AH Plus sealer along with accessory cones in group 1. In group 2 Master GP cone size F3 was coated with AH Plus sealer and slowly inserted inside the canal till the full working length. For samples in group 3 the continuous wave compaction technique was used. A #30 /0.06 taper gutta percha cone was placed to WL. The tip of the master gutta percha cone was coated with sealer and it was placed in the canal. A System-B heat source (SybronEndo), was used to down pack and adapt the gutta percha to the canal walls and packed with condensers. Then the remaining coronal root canal system is backfilled with System B endodontic Fill unit. Access cavities were sealed temporarily with Temp Fill.

Removal of the primary root canal filling material was performed using PTUR instruments with the aid of gutta solve solvent. Retreatment files were operated with a low speed in a sequential crown-down manner using a brushing motion with lateral pressure using a 16:1 reduction gear hand piece with an electric motor (X-Smart; Dentsply, Baillaigues, Switzerland).D1 file (#30/0.09) was used for initial penetration and removal of filling in the coronal third of the root canal, then 0.2 ml chloroform solvent was placed in the reservoir space prepared by D1 and left for 2 min to soften the gutta-percha, then it was removed by D2 and D3. D2 file (#25/0.08) was used up to the middle third and finally D3 file (#20/0.07) was used up to full working length. Complete removal of the filling material was obtained when full working length was achieved and then confirmed radiographically. Finally, apical preparation was performed with ProTaper instruments F3 (#30/0.09).

Evaluation of root canal filling remnants using steromicroscopy:

Two longitudinal grooves parallel to the long axis of the root were made in the buccal and lingual aspects of each sample in each group. then roots were cleaved into two longitudinal halves using a plastic instrument to expose root interior.[12]They were then inspected visually and the root half with more filling remnants was inspected under a stereomicroscope (Olympus, SZX9, Tokyo, Japan) with ×25 magnification. Images were made of each half. The percentage of the area of the canal to the total area covered by sealer and gutta-percha were measured by Auto CAD 2007.

Figure 1: Showing cleaning of canal after retreatment with different files

Statistical analysis

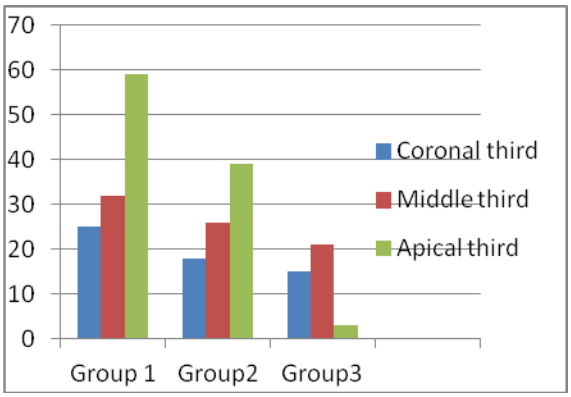
Statistical analysis was performed by means of Two-way ANOVA, Kruskal-Wallis test (P-value). Level of significance was set at P=0.05.

Results

Results for the remaining gutta percha coated walls are shown as percentage of each wall in all groups and is presented in Table 1. The Group 1 i.e., lateral compaction group showed the highest mean remaing gutta percha coated walls (51%), which was significantly higher than those in the other groups ($p < 0.001$). There were no significant differences among the other two groups ($p > 0.05$). Comparison of obturating material in different areas by using unpaired test shows minimum mean value in coronal area in all three groups, indicating that ProTaper R files are more efficient removing the obturating material in the coronal area of dentin surface with statistically non-significant difference between coronal & Middle areas(p= 0.284, Not significant) and statistically significant difference between Coronal & Apical thirds.(< 0.001 Significant)

Table1: Mean (SD) residual root canal filling material area/canal area ratio as percentage obtained in the coronal, middle and apical third and also in the total canal.

Group	Sample number	Coronal third	Middle third	Apical third	Total
Group 1	N=20	25	32	59	40
Group2	N=20	18	26	39	21
Group3	N=20	15	21	33	18



Graph 1: Showing comparison between different groups

Discussion

Various techniques have evolved to remove filling material from the canal such as the use of hand, rotary, reciprocating, heat-carrying instruments, chemical agents, ultrasonic device, and laser.[10-13,15] Recently, ProTaper universal retreatment files (Densply Tulsa Dental) have been introduced which are designed specifically to remove obturating material from root canals. The claimed advantages of rotary instruments are maintenance of canal shape and shorter working time.[16]The cleaning ability of Protaper universal retreatment files depend on the characteristics of the convex triangular cross sectional design of the instruments. The negative cutting angle and the absence of radial lands permit a cutting action rather than a planning action. Protaper-R file D1 incorporates a cutting tip to facilitate initial penetration into the filling material. D2 and D3 each have non cutting tips and are used to take away material from the middle and apical thirds. Many obturating materials, techniques and sealers have been developed over years. Lateral compaction of gutta-percha is a commonly used method for obturation and is regarded as a reference when considering other obturation techniques.newer obturation techniques like continuous wave compaction and warm vertical compaction are now in vogue due to many advantages.[17,18] All three obturating techniques selected for the study are gutta-percha based. In the current study, all groups had some amount of remaining debris, in concordance with the results shown by Takahashi et al and Giuliani V et al.[19,20] The method of evaluating the remaining root-filled obturating materials after retreatment was done using stereomicroscope which allows visualization of root/dentin surface and imaging facility. Longitudinal cleavage of teeth may result in displacement of the filling debris to be evaluated and compromise the accuracy of the measurements.[21] Observation of samples shows that Protaper R files are not able to completely remove the root filling material obturated by different techniques. These results are in agreement with those o Siotia J and Hegde et al.[17,22] Reason may be that the Epoxy resin-based sealers adhere better to the dentin walls, making their removal with rotary instruments difficult. Lateral compaction technique showed the highest mean remaining gutta percha coated walls (51%), which was significantly higher than continuous wave compaction and single cone obturation techniques, which is suggestive of non-uniform and poorly cold welded nature of gutta percha in this technique of obturation.[22] Comparison of obturating material in different areas by using unpaired test shows minimum mean value in coronal area in all three groups, indicating that ProTaper R files are more efficient removing the obturating material in the coronal area of dentin surface with statistically non-significant difference between coronal & Middle areas(p= 0.284, Not significant) and statically significant difference between coronal and apical thirds. These results of our study are in concordance with those of Siotia J et al and Bramente et al.[23]

Conclusion

Within the experimental limitations of the our study, it can be concluded that Protaper universal retreatment files produce comparatively clean canals obturated by cold lateral obturation,although not completely clears canal of gutta percha obturated by lateral compaction, single cone or continuous wave compaction techniques. it was also concluded that ProTaper R showed the best efficacy towards coronal third of canal.

References

1. John Whitworth Methods of filling root canals: principles and practices Endodontic Topics 2005, 12, 2–24
2. D Ørstavik Materials used for root canal obturation: technical, biological and clinical testing Endodontic Topics 2005, 12, 25–38
3. Cornelis H. Pameijer, Osvaldo Zmener Resin Materials for Root Canal Obturation. Dent Clin N Am 54 (2010) 325–344
4. Miletic´ I, Jukic´ S, Anic´ I, eljezic´ D, Garaj-Vrhovac V, Osmak M. Examination of cytotoxicity and mutagenicity of AH26 and AH Plus sealers. Int Endod J 2003: 36: 330–335.
5. McMichen FR, Pearson G, Rahbaran S, Gulabivala K. A comparative study of selected physical properties of five root-canal sealers. Int Endod J 2003: 36: 629–635.
6. Samuel I. KratchmanDent .Obturation of the root canal system Clin N Am 48 (2004) 203–215
7. Briggs PF, Scott BJ. Evidence-based dentistry: endodontic failure—how should it be managed? Br Dent J 1997;183:159–64.
8. Hepworth MJ, Friedman S. Treatment outcome of surgical and nonsurgical management of endodontic failures. J Can Dent Assoc 1997;63:364-71.
9. Gorni FGM, Gagliani MM. The outcome of endodontic retreatment: a 2-yr follow-up. J Endod 2004;30:1-4.
10. Imura N, Kato AS, Hata GI, Uemura M, Toda T, Weine F. A comparison of the relative efficacies of four hand and rotary instrumentation techniques during endodontic retreatment. Int Endod J. 2000;33(4):361-6.
11. Schirrmeister J, Hermanns P, Meyer K, Goetz F, Hellwig E. Detectability of residual Epiphany and gutta-percha after root canal retreatment using a dental operating microscope and radiographs–an ex vivo study. Int Endod J. 2006;39(7):558-65.
12. Khalilak Z, Vatanpour M, Dadresanfar B, Moshkelgosha P, Nourbakhsh H. In Vitro Comparison of Gutta-Percha Removal with H-File and ProTaper with or without Chloroform. Iran Endod J. 2013;8(1):6-9.
13. Wilcox LR. Endodontic retreatment: ultrasonics and chloroform as the final step in reinstrumentation. J Endod. 1989;15(3):125-8.
14. Ruddle CJ. In: Nonsurgical retreatment. Cohen S BR, editor. St Louis, MO: CV Mosby; 2002. pp. 875-930
15. Vidučić D, Jukić S, Karlović Z, Božić Ž, Miletić I, Anić I. Removal of gutta-percha from root canals using an Nd: YAG laser. Int Endod J. 2003;36(10):670-3.
16. Hammad Mohammad, Alison Qualtrough and Nick Silikas Three-dimensional Evaluation of Effectiveness of Hand and Rotary Instrumentation for Retreatment of Canals Filled with Different Materials. Journal of Endodontics, Nov 2008;34:11
17. Siotia J, Acharya SR, Gupta SK. Efficacy of ProTaper Retreatment System in Root Canals Obturated with Gutta-Percha Using Two Different Sealers and GuttaFlow. Int J Dent. 2011;2011:676128.
18. Gu LS, Ling JQ, Wei X, Huang XY. Efficacy of ProTaper Universal rotary retreatment system for gutta-percha removal from root canals. Int Endod J. 2008;41(4):288-95.
19. Takahashi CM, Cunha RS, de Martin AS, Fontana CE, Silveira CF, da Silveira Bueno CE. In vitro evaluation of the effectiveness of ProTaper universal rotary

retreatment system for gutta-percha removal with or without a solvent. Journal of Endodontics. 2009;35 (11): 1580–1583.

20. Giuliani V, Cocchetti R, Pagavino G. Efficacy of ProTaper universal retreatment files in removing filling materials during root canal retreatment. Journal of Endodontics. 2008;34(11): 1381–1384.
21. Dall'Agnol C, Hartmann MS, Barletta FB. Computed tomography assessment of the efficiency of different techniques for removal of root canal filling material. Brazil Dent J. 2008;19(4):306-12.
22. Hegde V, Murkey L. Evaluation of residual root canal filling material after retreatment of canals filled with hydrophilic and hydrophobic obturating system: An in vitro scanning electron microscopy study. Endodontology 2017; 29:47-52.
23. Bramante CM, Fidelis NS, Assumpção TS, et al. Heat release, time required, and cleaning ability of Mtwo R and ProTaper universal retreatment systems in the removal of filling material. J Endod. 2010; 36(11):1870–1873