



COMPARATIVE EFFICACY OF THREE DIFFERENT RETREATMENT FILE SYSTEMS IN REMOVING GUTTA PERCHA DURING ENDODONTIC RETREATMENT: AN IN VITRO STEREOMICROSCOPIC STUDY.

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ABSTRACT

Endodontic retreatment is indicated when initial procedure has failed and the problem can be corrected by improving root canal debridement and filling. Mostly they are filled with gutta-percha, with array of sealers. For successful retreatment, the removal of the this endodontic filling material is essential. Newer nickel-titanium rotary instruments can facilitate the removal of gutta-percha in the canal. Three new NiTi rotary systems, which the manufacturers assign specifically for retreatment, have been introduced commercially i.e. Endo, Mtwo and ProTaper R. The aim of our study is to compare their canal cleaning efficacy for endodontic retreatment of canals filled with gutta percha and AH Plus. Thirty roots were retreated with each of these file systems. After removal of the filling material teeth were sectioned and evaluated under stereomicroscope. Results revealed that Protaper R achieves better cleaning of gutta percha from canals and exhibited the better outcomes at the cervical, middle and apical thirds. This group was statistically different from groups both MTwo and R endo groups. Hence, it is concluded that ProTaper R is better option for root canal filling material removal in orthograde retreatment.

Keywords: Mtwo and ProTaper R

Introduction:

Teeth which are symptomatic and /or have periodontal disease that appears after the endodontic treatment or exhibits a non-healing radiographic lesion, then decision is to be made between the retreatment and extraction. Endodontic failures must be carefully evaluated so that a decision can be made among non-surgical retreatment, microsurgical retreatment or extraction followed by implant prosthesis. a diligent examination of the suspected tooth must be performed to gather information so that the proper treatment can

be rendered.¹ The causes of endodontic failure is multifaceted, but a statistically significant percentage of failure are related to inadequate obturation.² Endodontic retreatment is indicated when initial procedure has failed and the problem can be corrected by improving root canal debridement and filling.³ Now a days obturated canals are rarely filled with solid materials such as silver points and Thermafil obturators. Mostly they are filled with semisolid materials such as gutta-percha, pastes, and cements. For a successful orthograde retreatment, the removal of the endodontic filling material, such as gutta-

percha, is essential to allow access to the canals for a successful debridement and re-obturation of the root canal system. There are several techniques for removing gutta-percha and sealer from filled root canals using manual files, burs, and automated devices, generally preceded by the softening of the filling material with different solvents or heat.⁴⁻⁷ Various techniques for removal of gutta percha range from simple K or H files to lasers with or without a solvent. Researchers have reported that the newer nickel-titanium rotary instruments can facilitate the removal of gutta-percha in the canal.⁸⁻¹⁰ The use of NiTi Rotary instruments have the advantage of removing gutta-percha as well as shaping the root canals in an under-prepared tooth, simultaneously.¹¹ Other advantages of rotary instruments are the non-utilization of potential carcinogenic products and the elimination of possible apical extrusion of gutta-percha by excessive dissolution of this material.¹² Although the use of rotary instrumentation is easier and faster, effective cleaning of the entire root canal system is still a challenge. However, Several authors agree that complete removal of filling material from the root canals with rotary instruments is not possible and almost all retreatment techniques leave residual debris in the canal walls after reinstrumentation.^{12,13,14,15} Recently, three new NiTi rotary systems, which the manufacturers assign specifically for retreatment, have been introduced commercially i.e., R-Endo (Micro-Mega, Besancon, France), Mtwo Retreatment Instruments (VDW, Munich Germany.¹⁵/.05 and 25/.05) and ProTaper R (Dentsply, Tulsa, Tulsa, OK). The aim of our study is to compare their canal cleaning efficacy for endodontic retreatment of canals filled with gutta percha and AH Plus.

Materials and methodology

Ninety human single-canal mandibular premolars extracted for orthodontic reasons were selected for this study. Samples were decoronated at the cemento-enamel junction using a high speed carbide bur and mounted in acrylic blocks. The canals were instrumented using a crown-down technique with ProTaper

Universal NiTi rotary instruments. Master apical file was F3 for all canals. Alternative irrigation with 2ml of 2.6% NaOCl and Normal saline was done between each file size. The smear layer was removed by irrigating with 5ml of 17% EDTA then by 5 ml of 2.6 % NaOCl. The canals were then dried to receive gutta-percha /AH plus sealer as the obturation material to the exact working length. Then accessory cones were laterally compacted. Each canal orifice was sealed by Cavit temporary filling (ESPE, Germany). The specimens were radiographed in buccolingual and mesiodistal directions to confirm the adequacy of the root canal obturation. All roots were left in a humid environment at 37⁰C 100% relative humidity for six months. Fifty samples were randomly divided into three groups of 25 each teeth for desobturation by three different retreatment files. Mtwo retreatment group (n =25 teeth): using the Mtwo R2 instrument at a speed of 280 rpm and a torque of 1.2 Ncm, a brushing action was performed against the canal walls in a crown-down direction until the working length was reached. Final apical preparation was then performed using Mtwo instrument (#40/.04taper) at a speed of 280 rpm and a torque of 1.6 Ncm. R-Endo retreatment group (n = 30 teeth); Rm SS hand file used with ¼ turn; at a speed of 350 rpm. Re to remove the first 2-3 mm of the filling. R1 and R2 used to one third and two thirds of the working length. R3 and Rs used at the working length with a circumferential filing movement from the apical third to the coronal third. An Rs HERO Shaper files no 40/0.04 taper (Micro Mega Besancon, France) was used as a finishing file to the full length of the canal. The ProTaper R group (n = 30 teeth); ProTaper retreatment instruments (D1, D2, D3) of which the tapers and tip diameters are equivalent to size 0.09/0.30mm, 0.08/0.25mm, and 0.07/0.020mm, respectively were used sequentially in a crown-down technique. Apical enlargement was performed with finishing file F3. Removal of filling material was judged completed when the working length was reached with no gutta percha or sealer on the last instrument used.

Sectioning and imaging

After removal of the filling material, the roots were grooved longitudinally in a buccolingual direction into two halves with a diamond disk and then split with a chisel. Two root sections were examined at apical, middle and coronal end and analysed for gutta percha sealer

distribution by stereomicroscope. Using the ruler tool of the IOB software (Olympus), area of gutta percha sealer was measured and recorded. The regions with remaining filling material at each third were demarcated with the lining and the area was measured in mm², in each third and in the entire root canal.



Figure 1: Representative image showing gutta percha coated canal walls at coronal, middle and apical thirds

Statistical analysis

Data was processed and analysed with the SPSS 20.0 software (SPSS, Inc., Chicago, IL, USA.) Data was analysed with Kruskal-Wallis and the Pearson correlation test was performed to see the differences between the groups, using a 5% significance cut off ($P < 0.05$).

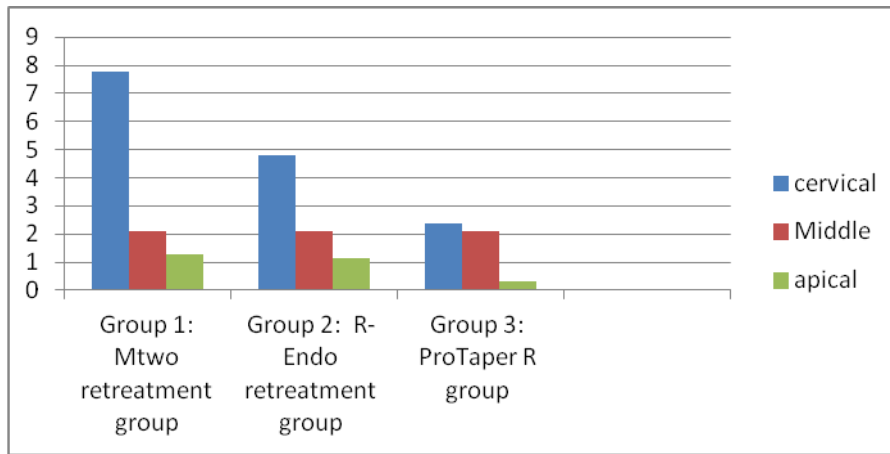
Table 1: Showing mean area covered by gutta percha at three different levels after retreatment by three file systems.

Groups	Section examined	Number (n)	Mean (SD)
Group 1: Mtwo retreatment group (n = 30 teeth)	cervical	10	7.78(2.82)
	Middle	10	2.10(1.76)
	apical	10	1.26(0.78)
Group 2: R-Endo retreatment group (n = 30 teeth)	cervical	10	4.82(2.23)
	Middle	10	3.40(1.18)
	apical	10	1.16(0.36)
Group 3: ProTaper R group (n = 30 teeth)	cervical	10	2.36(1.45)
	Middle	10	1.15(1.28)
	apical	10	0.32(0.58)

Results

Results revealed that Protaper R achieves better cleaning of gutta percha from canals and exhibited the better outcomes at the cervical, middle and apical thirds. This group was statistically different from groups both MTwo and R endo groups. R endo achieves better

cleaning than Mtwo but the difference is statistically insignificant. Cleaning of gutta percha is better at apical levels in all the groups. There was significant difference ($p < 0.01$) in the mean values of remaining filling material among all thirds.



Graph1: Showing comparative GP removal between different groups

Discussion

Non-surgical endodontic retreatment is the initial treatment of choice for the management of endodontic failures and preferred to surgical treatment due to the pain and discomfort involved in surgical procedures. The procedure requires the removal of the original root canal filling, further cleaning, and refilling.^{16, 17} Various obturation materials used are pastes and cements, semisolid materials, and solid materials. Retreatment has been addressed frequently with respect to techniques of removing the various filling materials from root canal.¹⁸ The teeth were flattened coronally and the working length of each root canal was standardized at 18 mm so that varying lengths could not exert influence on the results, which was followed in previous study.¹⁹ A solvent was used to remove gutta percha as solvents aid in faster and easier filling removal.²⁰ Different techniques have been used to evaluate the remaining filling material: radiographs, clearing techniques and digitized images, operating microscopes and scanning electron microscopy. More recently micro-CT has been used by many researchers.^{21,22,23} We have used stereomicroscope for evaluation because of its clear imaging of residual gutta percha, higher magnification and ease of sectioning and use. The AutoCAD 2004 software gave the exact area of the remaining debris in the root canal. In the current study, all groups had some amount of remaining debris. This is in accordance to previous studies in which completely clean canal walls were not

produced by any of the techniques investigated.^{24, 25} The results of our study show that Protaper R achieves better cleaning of gutta percha from canals and exhibited the better outcomes at the cervical, middle and apical thirds which is statistically significant from both MTwo and R-endo files. R-endo removes gutta percha from canals better than Mtwo but the difference is statistically insignificant. Cleaning of gutta percha is better at apical levels in all the groups. These results are in concordance with those of Das et al.²⁶ but opposite to studies by Bhagavaldas MC et al.²⁷

Conclusion

On the basis of the results of the present study it appears that Protaper R achieves better cleaning of gutta percha from canals and exhibited the better outcomes at the cervical, middle and apical thirds.

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