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## Research Article

# EVALUATION OF EFFICACY OF THREE DIFFERENT ROTARY SYSTEMS IN REMOVAL OF GUTTA-PERCHA FROM ROOT CANAL DURING RETREATMENT - AN IN VITRO CBCT STUDY

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### ABSTRACT

**Aim of the study:** The aim of this study was to evaluate the efficacy of protaper universal retreatment files, R endo files and Mtwo retreatment files in removal of gutta percha from root canal during retreatment. And also to compare time taken by these instruments for removing gutta percha from root canal.

**Methodology:** Thirty single rooted anterior and premolar teeth were selected. After disinfection of samples, crowns were decoronated to obtain uniform root sections of 15mm for all samples. The root canals were accessed and preparation was carried out using Protaper NiTi rotary system and obturation was done by cold lateral condensation. The obturated specimens were randomly divided into 3 groups with each group containing 10 samples. Obturation material in each group was removed with Protaper Universal Retreatment system (PTUR), R endo and Mtwo retreatment files respectively. Operating time was measured during procedure using timer. Post-operatively Cone Beam Computed Tomography (CBCT) was used to assess the percentage of residual filling material in the root canals. The results were evaluated statistically using One Way Anova and Post Hoc Tukey tests.

**Results:** PTUR and Mtwo files took significantly less time for gutta-percha removal than R-Endo files. R endo files showed significantly lower amount of remaining obturation material compared to PTUR and Mtwo. When compared to PTUR, Mtwo has less efficacy in removing gutta percha.

**Conclusion:** Within the limitations of this study, it was revealed that R endo files showed better retreatment efficacy than PTUR and Mtwo. R-Endo files required more time to remove root filling material than PTUR and Mtwo files. Complete removal of materials did not occur with any of the instrument systems investigated.

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### INTRODUCTION

The success of endodontic therapy has significantly improved in the last few decades due to the introduction of novel materials and techniques, but failure of therapy requiring retreatment still comprises a significant percentage of patients.<sup>1</sup>

Although root canal treatment has a high success rate of more than 90% when properly conducted, failures may occur, that are often associated with poorly treated canals, or variation in canal anatomy and also related to microbial factors.<sup>2</sup> Among these major factors associated with endodontic failure are the persistence of microbial infection in the root canal system and/or the periradicular area. It may be a consequence of insufficient cleaning, inadequate obturation or coronal leakage.

The endodontic failure cases can be treated in three ways: non-surgical retreatment, surgical retreatment or extraction. Among all these alternatives, non-surgical retreatment should be considered as the first choice of retreatment. Non-surgical retreatment includes thermal, mechanical, chemical, and combination of these three.<sup>3</sup> Various hand and rotary instruments have been used for gutta-percha removal, likely endodontic hand files, engine-driven rotary files, ultrasonic tips, and heat-carrying instruments. However, well-compacted obturation resists instrumentation, aiming at easy penetration of the instruments inside the obturated canal, the chemical solvents are elected and used as adjuncts to remove endodontic filling materials.

During retreatment procedure, conventional hand and rotary methods can cause apical extrusion irrespective of the

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technique used .so recently various rotary retreatment systems introduced for retrieval of obturation material.<sup>4</sup>The efficacies of re-treatment procedures can be assessed by the amount of residual gutta-percha and sealer on the root canal walls.

Hence this study focuses on comparison and evaluation of the efficacy of Protaper Universal Retreatment system, R endo files and Mtwo retreatment files in removing gutta-percha from root canal walls after instrumentation. And also compare time taken by this instruments

## MATERIALS AND METHODS

### Materials

- Protaper rotary files (Dentsply Maillefer)
- 5.25% NaOCl (Prevest Denpro Ltd )
- 17% EDTA (Anabond Stedman Ltd)
- Gutta-percha points (6%) (Dentsply Maillefer)
- Finger Spreaders (Dentsply Maillefer)
- Protaper universal retreatment file ( Dentsply Maillefer)
- R-endofiles (Micro-Mega, Besanc,on, France).
- Mtwo retreatment files(VDW, Munich, Germany)
- Timer
- Cone Beam Computed Tomography (CBCT)

### Methodology

Thirty freshly extracted single rooted non carious anterior and premolar teeth were collected and stored in 10% formalin solution for disinfection. Teeth with root fillings, resorbed teeth, fractured teeth ,carious teeth and teeth with developmental anomalies was excluded from this study. Crown of all teeth was decoranated to obtain uniform root length of 15 mm for all sample using diamond disc. Access cavity was prepared and Working length was determined using size 15 K-file .

Cleaning and shaping of the canal was carried out using Protaper NiTi rotary system and the canals were enlarged up to file size no F2 . During instrumentation, all the canals were irrigated with 5.25% NaOCl ,17% EDTA and finally with saline . The canals were then dried with paper points and the obturation was done by cold lateral condensation. After . cavity sealed with cavitt all samples were stored at room temperature for 30 days to allow complete setting of the sealer.

### Retreatment technique

The obturated specimens were randomly divide into 3 groups with each group containing 10 samples

#### Group 1 Protaper universal retreatment file

Protaper universal retreatment files were operated with a speed and torque- controlled electric motor (X-SMART Dentsply Maillefer) at a torque of 3Ncm and a constant speed of 400 rpm.. Protaper D 1 (size 30,length 16mm) file was used to remove obturation material from coronal portion of the root canal, where as the middle and apical third of the canals were instrumented using protaper D2 (size 25,length 18mm)and protaper D3 files (size 20,length 22mm) respectively by a brushing action with lateral pressing movements. Protaper D3 file was taken to the working length.

#### Group 2 R endo files

R-Endo instruments (Rm, Re, R1, R2, R3) were used in a gentle in-and-out motion on canal walls at speed of 300 rpm . The Rm file was used first, and then 2-3mm of obturation material was removed using Re file. R1 and R2 were used to remove coronal one-third to two-thirds of obturation . Finally R3 was used at the working length for complete removal of filling material from the root canal,

#### Group 3 Mtwo retreatment files

In this group obturating material was gradually removed with R1( 15/.05 )and R2 (25/.05) files, respectively, in a brushing action with lateral pressing movement at a speed of 300 rpm and a torque of 1.2 N cm

### Operating Time

The operating time which elapsed from initial gutta percha removal with first instrument until original working length reached was recorded as T1.The time required to achieve satisfactory gutta percha removal after reaching the working length was recorded as T2. Gutta percha removal considered as satisfactory when no residual gutta percha and sealer were seen on the instrument flutes or in the irrigation solution .The total time for re treatment was the sum of T1 and T2 . Time for instrument changes was not included.

### Cone Beam Computed Tomography Procedures and Evaluation

All specimens were placed on wax sheet and mounted for CBCT exposure using bar for chin rest and all the specimens were exposed. The images were reconstructed and analyzed using NNT viewer software and the amount of filling material was calculated using with AutoCAD soft ware The percentage of remaining obturation material on canal walls was calculated with the following equation:

Area % of remaining obturation material =  $\frac{\text{Area of remaining obturated material}}{\text{Area of canal wall}} \times 100$

## RESULTS

**Table 1** Overall Comparison between the groups for time (Kruskal Wallis test)

	N	Minimum	Maximum	Mean	P value
Pro Taper	10	1.2	1.4	1.29±0.07	
M two	10	1.40	2.10	1.61±0.24	<0.001
R-Endo	10	1.57	2.45	2.18±0.26	

**Inference:** Overall there is significant difference between the groups

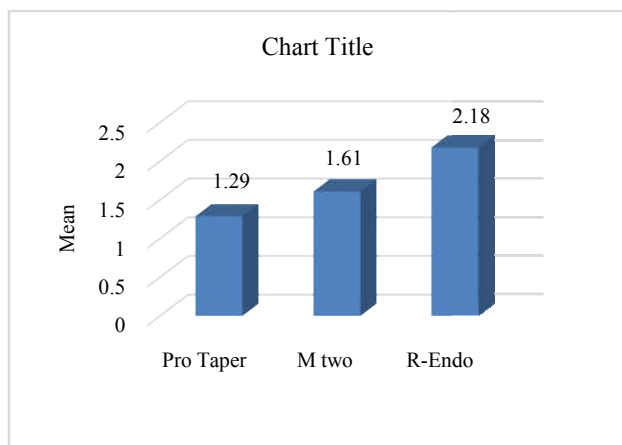


Figure 1 Comparison between the groups for time

Table 2 Intergroup comparison (Mann-Whitney U test)

Group	Mann-Whitey U value	P value
ProTaper vs M two	0.000	<0.001
Pro Taper vs R-Endo	0.000	<0.001
M two vs R-Endo	5.0	<0.001

**Inference:** There is significant difference between the groups when compared between two groups

Table 3 Overall Comparison between the groups for remaining (Kruskal Wallis test)

	N	Minimum	Maximum	Mean	P value
Pro Taper	10	3.2	3.9	3.58±0.19	<0.001
M two	10	4.02	4.63	4.22±0.21	
R-Endo	10	2.9	3.5	3.13±0.21	

**Inference:** Overall there is significant difference between the groups

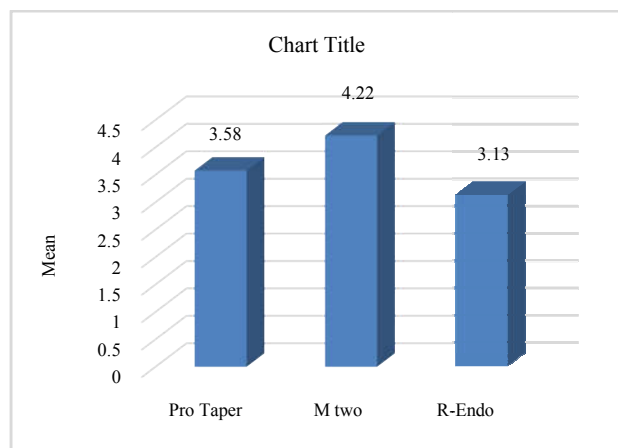


Figure 2 Comparison between the groups for area of remaining obturation material

Table 4 Intergroup comparison (Mann-Whitney U test)

Group	Mann-Whitey U value	P value
Pro Taper vs M two	0.000	<0.001
Pro Taper vs R-Endo	5.5	<0.001
M two vs R-Endo	0.000	<0.001

**Inference:** There is significant difference between the groups when compared between two groups

## DISCUSSION

An endodontic therapy is a sequence of treatment for the infected pulp of a tooth which is associated with pulp and/or periapical pathosis. This results in the elimination of infection and protection of the decontaminated tooth from future microbial invasion.<sup>5</sup>

An initial endodontic treatment is considered a failure when the tooth is associated with persistent periapical radiolucency of any size and this requires a surgical or nonsurgical retreatment. In retreatment, various methods have been used to remove gutta-percha from root canal which include endodontic hand files, ultrasonic instruments, laser, heat carrying or engine driven rotary files.<sup>6</sup> However, well-compacted obturation resist the instrumentation, and may cause incomplete removal of gutta-percha and sealer. This limit the access to apical foramen and impairs root canal disinfection and reshaping.<sup>7</sup> So different Chemicals such as chloroform, eucalyptol, xylene, orange oil, turpentine and halothane were used as solvents to soften gutta percha and facilitate its removal.<sup>8</sup>

The concept that gutta-percha solvent might reduce the time required for removal of the old canal filling material, But the chemically softened gutta-percha can easily be forced into complex canal anatomy (isthmuses, cul de sacs, lateral canals & irregularities) that are not touched by the instruments.<sup>9</sup> This challenges the removal of filling and also require more time.

The conventional use of hand instruments for removal of obturation material required more time and was tedious. Hand files are more rigid and stiffer, their use at working length may result in complications like ledge and zip formation, transportation and perforation. Therefore rotary system was introduced for retreatment which are faster in removing the material from root canal system.<sup>10</sup> Rotary retreatment file system plasticizes obturation materials by the heat produced by friction on rotation and the specific flute design tends to pull the gutta-percha in to the file flute making the removal of obturation material more efficient.<sup>11</sup> The use of rotary NiTi instruments in root canal retreatment may decrease patient and operator fatigue.

In this study three rotary retreatment systems were used, Protaper retreatment file system, Mtwo retreatment file system and R endo retreatment system.

Protaper Retreatment file system was developed to overcome the drawback of Protaper rotary finishing files specifically for retreatment purposes. PTUR system comprises three retreatment files (D1,D2,D3) for each third of the root canal. These instruments have a convex triangular cross-section along with three progressive tapers and length enabling the file to cut not only gutta-percha but also superficial layer of dentin during obturation material removal

R-ENDO comprises a stainless steel Rm handfile and four NiTi instruments. Rm files used to break the hard layer of filling material. R-Endo instruments are machined into a round blank and their cross-section is characterized by three equally-spaced cutting edges, and the instrument has neither radial lands nor an active tip. This design facilitates the R-Endo files for the removal of gutta-percha from the root canal. This system has sufficient rigidity to remove material from the root canal.<sup>12</sup>

Mtwo retreatment files consists of two files R1 and R2 with active cutting tip .. They have an S-shaped cross-section as do the files of the basic sequence, but a shorter pitch length to enhance the advancement of the file into the filling material . The characteristic design feature with a cutting tip and a constant helical angle, ensure the instrument's easy progression into the gutta-percha filling, without the need to exert pressure.<sup>13</sup>

Present study shows that PTUR and Mtwo files took significantly less time for gutta-percha removal than R-Endo files. This is in accordance to the studies conducted by Akansha garg *et al* which showed that presence of the active cutting tip which helps in initial penetration and progression into gutta-percha by PTUR and Mtwo files. . Also in this study ProTaper files were significantly faster than Mtwo instruments for gutta percha removal.<sup>14</sup> This is in accordance with study conducted by Emre Iriboz *et al* , they concluded that ProTaper files were significantly faster than Mtwo instruments in terms of the mean time of retreatment and time required to reach working length.<sup>15</sup>

Various methods have been used in endodontic research to evaluate the efficacy of root filling removal including radiography and digitized images. Other technique include splitting the teeth longitudinally and visualizing them using a stereomicroscope or by using images obtained with a camera and image analyzer software. Each of used techniques had its limitations.<sup>16</sup>

Recently Computed Tomography (CT) scan has been used because it enables a three dimensional evaluation of the root canal system before and after filling. Patel *et al* said that CBCT has been specifically designed to reproduce undistorted 3-D information of the maxillofacial skeleton including the teeth and their surrounding tissues, with a significantly lower effective radiation dose compared to CT.

Result of the present study revealed that R endo files show better removal of gutta percha from root canal than PTUR and Mtwo files . This is in accordance to the studies conducted by Yadav *et al* and Al haddadi *et al* 2016. According to Yadav *et al* , this efficiency of R endofiles due to three equally spaced cutting edge and its circumferential filing action. The file design provides lesser core structure so that flexibility is improved and also files centered within the canal especially at the apical third.<sup>17</sup> Dadresanafer *et al.* in 2011 found that less cutting efficiency of Protaper was due to its convex triangular cross section of the D series files, which reduces the contact area with the canals.<sup>18</sup>

Considering lesser efficiency of Mtwo files compared to Protaper retreatment file and R endo files, studies by Schafer *et al.* in 2006 and Tasdemir *et al.* in 2008 concluded that increased amount of residual material in the canals of Mtwo retreatment group is attributed to its single length penetration with its high and fast cutting efficiency attained by its special design feature – S shaped cross section, increased pitch length in the apical coronal direction, positive rake angle with two cutting edges.<sup>19,20</sup>

Present study also show comparatively better removal with Protaper retreatment file system than Mtwo retreatment file system. This is in accordance to the studies conducted by

Tasdemir *et al.* in 2008 and Khedmat *et al.* in 2016 which showed a higher efficacy of Protaper retreatment file systems. According to these authors, this efficiency of PTUR is considered due to the difference in design feature of PTUR copared to Mtwo systems. Protaper retreatment file system has a specific flute design, which enables it to cut the superficial dentin along with the cutting of obturation material . The progressive taper from of D1to D3 files (.07 to .09 ) which makes the file system to shape specific areas of canal without any instrument fatigue.<sup>19,21</sup>

## CONCLUSION

Within the limitations of this in-vitro study, it showed that all the instruments left residue of obturation material inside the root canal. Fast removal of obturation was by PTUR followed by mtwo and R endo and best removal was by R endo followed by PTUR and mtwo .

## References

1. Marfisi K, Mercade M, Plotino G, Duran-Sindreu F, Bueno R, Roig M. Efficacy of three different rotary files to remove gutta-percha and Resilon from root canals. *Int Endod J.* 2010.
2. Marques da Silva B, Baratto-Filho F, Leonardi DP, Henrique Borges A, Volpato L, Branco Barletta F. Effectiveness of ProTaper, D-RaCe, and Mtwo retreatment files with and without supplementary instruments in the removal of root canal filling material. *Int Endod J.* 2012;45(10):927-932.
3. Fenkçi IV, Maternal Fizyoloji. Kadın Hastalıkları ve Doğum Bilgisi, Öncü Basımevi A (2004): 161-9.
4. Mollo A, Botti G, Principi Goldoni N, *et al.* Efficacy of two Ni-Ti systems and hand files for removing gutta-percha from root canals. *Int Endod J.* 2012;45(1):1-6.
5. Wilcox LR, Krell K V., Madison S, Rittman B. Endodontic retreatment: Evaluation of gutta-percha and sealer removal and canal reinstrumentation. *J Endod.* 1987;13(9):453-457.
6. Bhat SV, Suvarna NI, Shetty KH, Varma KR. Comparison of efficiency of gutta percha removal in retreatment using protaper retreatment files, RaCe instruments with and without H files-an ex vivo evaluation. *Endodontology.* 2010;22(2):33-43.
7. Só MV, Saran C, Magro ML, Vier-Pelisser FV, Munhoz M. Efficacy of ProTaper retreatment system in root canals filled with gutta-percha and two endodontic sealers. *Journal of endodontics.* 2008 Oct 1;34(10):1223-5.
8. Yadav HK, Yadav RK, Chandra A, Thakkar RR. The effectiveness of eucalyptus oil, orange oil, and xylene in dissolving different endodontic sealers. *J Conserv Dent.* 2016;19(4):332-337.
9. Rödig T, Hausdörfer T, Konietzschke F, Dullin C, Hahn W, Hülsmann M. Efficacy of D-RaCe and ProTaper Universal Retreatment NiTi instruments and hand files in removing gutta-percha from curved root canals—a micro-computed tomography study. *International endodontic journal.* 2012 Jun; 45 (6):580-9.
10. MED SS, Luca DD, Pagavino G. Innovations in Shaping and Cleaning the Root Canal System.

11. Madlabane D. The efficacy of rotary and manual instruments in root canal debridement (Doctoral dissertation).
12. Evaluation of efficiency of three NiTi instruments in removing gutta-percha from root canal during retreatment - An in vitro study *Materials and Methods* :
13. Madarati AA, Al-Nazzawi AA, Sammani AMN, Alkayyal MA. The efficacy of retreatment and new reciprocating systems in removing a gutta-percha-based filling material. *J Taibah Univ Med Sci.* 2018;13(5):452-458.
14. Garg A, Nagpal A, Shetty S, Kumar S, Singh KK, Garg A. Comparison of Time Required by D-RaCe, R-Endo and Mtwo Instruments for Retreatment: An in vitro Study. *J Clin Diagn Res.* 2015;9(2)
15. Iriboz E, Sazak Ovecoglu H. Comparison of ProTaper and Mtwo retreatment systems in the removal of resin-based root canal obturation materials during retreatment. *Aust Endod J.* 2014;40(1):6-11.
16. Marfisi K, Mercade M, Plotino G, Duran-Sindreu F, Bueno R, Roig M. Efficacy of three different rotary files to remove gutta-percha and Resilon from root canals. *Int Endod J.* 2010;43(11):1022-1028.
17. Chakravarthy Y, Divya V. Efficacy of a new retreatment system ( R ENDO ) in root canals obturated with gutta-percha using two different eugenol free sealers - An in vitro comparative study. 2016;3(November):933-938.
18. Dadresanfar B, Iranmanesh M, Mohebbi P, Mehrvarzfar P, Vatanpour M. Efficacy of Two Rotary NiTi Instruments in Removal of Resilon/Epiphany Obturants. Vol 7.; 2012.
19. Tasdemir T, Er K, Yildirim T, Celik D. Efficacy of three rotary NiTi instruments in removing gutta-percha from root canals. *Int Endod J.* 2008;41(3):191-196.
20. E. Schafer ME& TD. : Comparative study on the shaping ability and cleaning efficiency of rotary. *Int Endod J.* 2006;39:203-212.
21. Khedmat S, Azari A, Shamshiri AR, Fadae M, Bashizadeh Fakhari H. Efficacy of ProTaper and Mtwo Retreatments Files in Removal of Gutta-percha and GuttaFlow from Root Canals. *Iran Endod J.* 2016;11(3):184-187.

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