

**Insight Into Endodontic Retreatment File System: A Review**

<sup>1</sup>Dr. Aboobacker Sidheeque, Post Graduate Student, Department of Conservative Dentistry and Endodontics, Yenepoya Dental College.

<sup>2</sup>Dr S. Vidhyadhara Shetty, Professor, Department of Conservative dentistry and Endodontics, Yenepoya Dental College.

<sup>3</sup>Dr Prathap M S, HOD, Professor, Department of Conservative dentistry and Endodontics, Yenepoya Dental College.

<sup>4</sup>Dr. Jeslee Ann Jose, Lecturer Department of Conservative dentistry and Endodontics, Yenepoya Dental College.

<sup>5</sup>Dr. Nishi Jayasheelan, Reader Department of Conservative dentistry and Endodontics, Yenepoya Dental College.

<sup>6</sup>Dr. Samreena, Post Graduate Student Department of Conservative Dentistry and Endodontics, Yenepoya Dental College.

**Corresponding Author:** Dr. Aboobacker Sidheeque, Post Graduate Student, Department of Conservative Dentistry and Endodontics, Yenepoya Dental College.

**Citation of this Article:** Dr. Aboobacker Sidheeque, Dr S. Vidhyadhara Shetty, Dr Prathap M S, Dr. Jeslee Ann Jose, Dr. Nishi Jayasheelan, Dr. Samreena, “Insight Into Endodontic Retreatment File System: A Review”, IJDSIR- April - 2022, Vol. – 5, Issue - 2, P. No. 16 – 22.

**Copyright:** © 2022, Dr. Justina David Joy, et al. This is an open access journal and article distributed under the terms of the creative commons attribution noncommercial License. Which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

**Type of Publication:** Review Article

**Conflicts of Interest:** Nil

**Abstract**

One of the primary goals of the secondary root canal therapy is the removal of previous filling material from the root canals in order to gain access to the apical constriction for cleaning and shaping, resulting in the eradication of microorganisms from the root canals, which, in turn, increases the success rate of secondary root canal therapy. Nevertheless, the removal of filling material such as gutta-percha and sealers are not easy. Insufficient cleaning and inadequate root filling are the two main factors leading to root canal failure. Moreover, teeth with untreated canals and complication of instrumentation such as ledges, perforation or fractured instruments may require retreatment before final coronal restoration.

**Keywords:** Teeth, Treatment, Endodontic.

**Introduction**

Preservation of teeth has constantly been of utmost concern to dental practitioners since ages. Also, in this developing era patients are more conscious about available treatment plan and its outcome.<sup>(1)</sup>

In the present-day picture, what knocks at the door of the endodontists are cases of failed endodontic management due to various reasons and its’ retreatment.<sup>(2)</sup>

Root canal system anatomy plays a significant role in endodontic success and failure. These systems contain branches that communicate with the periodontal attachment apparatus furcally, laterally, and often terminate apically into multiple portals of exit.

Endodontic failures can be attributable to inadequacies in shaping, cleaning and obturation, iatrogenic events, or re-infection of the root canal system when the coronal seal is lost after completion of root canal treatment.<sup>(3)</sup>

Regardless of the etiology, the sum of all causes is leakage and bacterial contamination.

With an advent of magnification and newer retreatment technologies, non-surgical retreatment procedures take care of mechanical failures, previously missed canals or radicular subcrestal fractures.<sup>(4)</sup> Retreatment procedures have enormous potential for success if the guidelines for case selection are respected and the most relevant technologies, best materials, and precise techniques are utilized.

Several techniques are described in endodontic retreatment for the removal of gutta-percha including rotary instruments, manual solvents and their associations which has been shown effective, safe, and time-saving.

### **Goals**

Endodontic nonsurgical retreatment is a comprehensive field and may be divided into the following categories: coronal disassembly, locating previously missed canals, removing obturation materials, negotiating blocks, bypassing ledges, managing transportations, repairing perforations, removing posts and broken instruments and disinfection of the canal.<sup>(5)</sup>

### **Rationale for retreatment**

Endodontic failures can be attributable to inadequacies in cleaning, shaping, obturation, iatrogenic events or reinfection of the root canal system when the coronal seal is lost after completion of root canal treatment.<sup>(6)</sup>

Leakage and bacterial contamination are the major reason of failure of endodontic treatment.

Non-surgical endodontic retreatment efforts are directed toward eliminating microleakage. The rationale for

retreatment is to remove the root canal irritants as a source of irritation of the attachment apparatus.<sup>(7)</sup>

The different methods used for the removal of obturating material are

- Chemical (chloroform, xylene, eucalyptol, orange oil, tetrachloroethylene, methoxyflurane, cinnamon oil, halothane, isoflurane, anise oil, almond oil, and turpentine oil),
- Mechanical (hand and rotary endodontic files),
- Physical (ultrasonic, heat, and laser),
- And finally, combination techniques (heat and endodontic files, endodontic files and chemicals, Paper points, and chemicals).

There are various studies reporting efficacy, cleaning ability, and safety of rotary nickel-titanium (NiTi) instruments. The most commonly used NiTi retreatment systems are ProTaper universal retreatment files, R-Endo® files, and MTwo® R files.<sup>(8)</sup>

### **Hand and Rotary Techniques for Removal of Gutta Percha**

#### **1. Hand instruments**

#### **2. Rotary instruments**

Gates Glidden drill/Peesoreamer

GPX gutta-percha remover

NiTi rotary instruments

#### **3. Specialized rotary instruments designed for retreatment**

ProTaper Universal retreatment instruments

R-Endo retreatment files

M two retreatment files

#### **Hedstroem File**

The Hedstroem file manufactured from a round tapered blank. A spiral groove is cut into the shank, producing a sharp blade. The probability of strong fracture can occur if a reaming action is used and the blades are engaged into the dentin for removing gutta-percha root filling.

**ProTaper retreatment files** have three different lengths, unique tapers, and diameters to sequentially remove obturating materials.

These files are D1 (cutting tip, size 30, 9% taper) used for coronal third,

D2 (noncutting tip, size 25, 8% taper) used in middle third, and

D3 (noncutting tip, size 20, 7% taper) used for apical third.<sup>(9)</sup>

**MTwo® retreatment files:** The Mtwo instruments have an S-shaped cross-section, an increasing pitch length in the apical–coronal direction. It consist of

R15/0.05 (tip size 15, 5% taper)

R25/.05 (cutting tip, size 25, 5% taper).

R-Endo system has a noncutting having tip sizes and taper as

R1 (25/08) used in coronal third,

R2 (25/06) used in middle third and

R3 (25,04) aids in obturating material removal from the apical third.<sup>(10)</sup>

Neoniti (Neolix, Chatres-la-Forêt, and France) is a single-file rotary system with the continuous rotation, used both for shaping and retreatment of root canal system.

It consists of one C1 (25/0.12) and three A1 (with #20, #25, and #40 tip sizes) files. It is manufactured using a newly developed wire-cut electrical discharge machining process.<sup>(11)</sup> These files undergo appropriate heat treatment that results in high flexibility and shape memory of this system.

WaveOne (Dentsply Tulsa Dental Specialties, Tulsa, OK) is a single-file reciprocating system, available in three different sizes, small (21/0.06), primary (25/0.08), and large (40/0.08).<sup>(12)</sup> It was reported that Wave One (25/0.08) reciprocating files, when used alone to remove

the root fillings; leave some residue within the root canal system.<sup>(13)</sup>

**RECIPROC® instruments**

Before commencing the retreatment procedure, the length of the canal is estimated with the help of a preoperative radiograph, adequately exposed and angulated. The retreatment procedure comprises 4 steps.

Step 1: removal of obturation material in the coronal third

The bulk of the gutta-percha in the coronal third of the canal should be removed with an appropriate instrument (e.g. electric heat carrier, ultrasonic tip).

Step 2: removal of obturation material in the body of the canal

Gutta-percha obturation material can then be easily removed from the canal with the R25. The silicone stopper is set on the R25 at 2/3 of the estimated canal length. The R25 is introduced into the canal with a slow in-and-out pecking motion without pulling the instrument completely out of the canal. The amplitude of the in-and-out movement should not exceed 3-4 mm.<sup>(14)</sup>

Only very light pressure should be applied. The instrument will advance easily in the obturation material and the canal in an apical direction. After a maximum of three in-and-out movements, or when more pressure is needed to make the instrument advance further in the canal, or when resistance is encountered, the instrument is pulled out of the canal to clean the flutes. The canal is copiously irrigated with sodium hypochlorite. The R25 is used in the same manner until it has reached 2/3 of the estimated working length as indicated by the stopper on the instrument. The instrument is then removed from the canal; the canal is irrigated. A gutta-percha solvent (e.g. eucalyptus oil) may have to be used as required to allow the R25 to advance in the canal.

Step 3: working length determination and removal of obturation material in the apical third

Step 4: increased apical enlargement

An additional apical enlargement may be required; it can be accomplished easily with the R40 or the R50 instrument. They can be used in a brushing motion against the lateral walls of the canals to remove any residual filling material.

Different reciproc file system is:

- Reciproc
- Reciproc blue
- Wave one
- Wave one gold

### **R-Endo (Micro-Mega)**

R-Endo instruments are made up from a round blank, and their cross-section is characterized by three equally spaced cutting edges. The instruments neither have radial lands nor active tip. These instruments are recommended to be used at a speed of 300-400 rpm along with gutta-percha solvent. <sup>(15)</sup> The R-Endo retreatment kit, consists of a series of six files named as Rm, Re, R1, R2, R3 and Rs.

**Rm FILE:** is a stainless steel 25/.04 hand instrument with a 17 mm working length. The file is used to break the hard layer of filling material.

**Re FILE:** is a 25/.12 NiTi file with a 15 mm working length. It is used for eliminating the dentine overhang and flaring the access space in order to increase the solvent quantity. <sup>(16)</sup>

**R1 FILE:** is a 25/.08 NiTi file with a 15 mm working length. This file is designed for removal of filling material from the coronal-third.

**R2 FILE:** is a 25/.06 NiTi file with a 19 mm working length. This file is designed for removal of filling material from the middle-third of the root canal.

**R3 FILE:** is a 25/.04 NiTi file with a 23 mm working length. This is to be used in the last for removal of filling material from the apical- third of the root canal.

**Rs FILE:** is a 30/.04 NiTi file with a 15 mm working length. This instrument is designed to be used in cases that require further enlargement of apical diameter of the root canal.

### **EdgeFile® XR Retreatment NiTi Rotary files<sup>(17)</sup>**

The instrument is made of nickel-titanium alloy. All files are constant tapered.

### **Important points to remember:**

1. Use an electric hand piece.
2. Operate rotary files at 300-500 rpm (revolutions per minute).
3. Straight-line access is imperative for proper rotary file use and endodontic re-treatment.
4. Use light to medium apical pressure on the files with the chamber flooded with a root filling solvent.
5. Clean the flutes frequently and at least after removing the files from the canal.
6. Irrigate the canals and chamber with a root filling solvent frequently throughout the procedure.
7. Take each rotary file to length only one time and for no more than one second.
8. In apical areas and curved canals exercise caution.
9. Rotary files are single patient use devices.

**Ultrasonics** are essential in retreatment cases, post removal, and in performing precision microsurgery. Sonics are designed to vigorously energize intracanal irrigants. They are also a significant advancement in disinfection and improves debridement and the disruption of the smear layer and biofilm.

### **Discussion**

The main success of endodontic retreatment relies on the complete removal of root canal filling material to regain access to the apical foramen to facilitate the sufficient

cleaning and shaping of entire root canal system. In failed endodontic cases, obturating material harbor's necrotic tissue and bacteria which is responsible for periapical inflammation. Hence, complete removal of the obturating material is necessary to reduce the microbial burden within the canal.<sup>(18)</sup>

Conservative access designs in which some chamber roof and pericervical dentin are preserved, minimizing the mesiodistal and buccolingual extension of the cavity.

<sup>(19)</sup> The advantage of using a CEC design during retreatment in premolars is increased fracture resistance of the tooth along with effective reinstrumentation. A CEC access design in multirouted teeth has greater potential for sufficient space, allowing easier retrieval of gutta-percha because the access would be larger. Moreover, the teeth which are indicated for retreatment usually would have received crowns after the initial root canal treatment, further weakening the root canal treated tooth. This fact further supports the importance of CEC in cases of retreatment as it preserves the compromised tooth structure by its conservative design.<sup>(20)</sup>

ProTaper retreatment file removed gutta-percha fastest when compared to other rotary systems due to their specific flute design.<sup>(21)</sup> The file not only cut gutta-percha but also the superficial layer of dentin during the root filling removal. Other features are progressive tapers of D1, D2, and D3 files which make it possible to shape specific sections of a root canal with one file. The flute design and rotary motion cut the large amount of gutta-percha around the instrument and direct it toward the orifice.<sup>(22)</sup>

The better performance of MTwo® file is attributed to the design of instrument. It has S-shaped cross-section, an increasing pitch length in the apical-coronal direction, cutting tip, and with positive rake angle. It does not

require crown-down instrumentation sequence. Further, these files have sharp blades that help the file to cut through canal and reach the apical end-point while by passing the obturating material. These findings were in accordance with other study, wherein MTwo® file performed better as it has a small core diameter and better chip removal capacity with increased chip space that can result in great cutting ability.<sup>(23)</sup>

With the RECIPROC® system, the forward and reverse angles set on the motor were selected in order to eliminate the possibility of fracture from binding and to reduce the incidence of fracture from torsional fatigue. These specific angles are crucial to the safety of the RECIPROC® system.<sup>(24)</sup> Consequently, the preparation of curved and narrow canals with only one RECIPROC® instrument is safe.

### **Conclusion**

This article has identified a variety of techniques to successfully retreat endodontically failing teeth. It should be recognized certain endodontically failing teeth are not amenable to successful retreatment. In these instances, the various interdisciplinary treatment options can be thoughtfully considered to ensure each patient is best served. However, as the potential for health associated with endodontically treated teeth becomes fully appreciated, the naturally retained root will be recognized as the ultimate dental implant.

### **References**

1. Ruddle CJ. Nonsurgical retreatment. *J Endod.* 2004 Dec;30(12):827-45.
2. Fatima K, Nair R, Khasnis S, Vallabhaneni S, Patil JD. Efficacy of rotary and reciprocating single-file systems on different access outlines for gutta-percha removal in retreatment: An in vitro study. *J Conserv Dent.* 2018;21(4):354-358.

3. Purba R, Sonarkar SS, Podar R, Singh S, Babel S, Kulkarni G. Comparative evaluation of retreatment techniques by using different file systems from oval-shaped canals. *J Conserv Dent.* 2020 Jan-Feb;23(1):91-96.
4. Kapoor V, Paul S. Non-surgical endodontics in retreatment of periapical lesions - two representative case reports. *J Clin Exp Dent.* 2012;4(3):e189-e193.
5. Torabinejad M, Corr R, Handysides R, Shabahang S. Outcomes of nonsurgical retreatment and endodontic surgery: a systematic review. *J Endod.* 2009 Jul;35(7):930-7.
6. Purba R, Sonarkar SS, Podar R, Singh S, Babel S, Kulkarni G. Comparative evaluation of retreatment techniques by using different file systems from oval-shaped canals. *J Conserv Dent.* 2020 Jan-Feb;23(1):91-96.
7. Fariniuk LF, Azevedo MAD, Carneiro E, Westphalen VPD, Piasecki L, da Silva Neto UX. Efficacy of protaper instruments during endodontic retreatment. *Indian J Dent Res.* 2017 Jul-Aug;28(4):400-405.
8. D'Costa, Vivian & Bangera, Madhu & Stevens, Sunil. (2016). Non Surgical Retreatment in Endodontics- A Case Study.. *International Journal of Advanced Research.* 4. 773-778.
9. Jafri Z, Ahmad N, Sawai M, Sultan N, Bhardwaj A. Digital Smile Design-An innovative tool in aesthetic dentistry. *J Oral BiolCraniofac Res.* 2020 Apr-Jun;10(2):194-198.
10. Varri S, Chukka RS, Bolla N, Kavuri SR, Kumari S. Endodontic retreatment: Rotary versus hand instrumentation: An in vitro study. *J NTR Univ Health Sci* 2012;1:116-9.
11. Schirrmeister JF, Meyer KM, Hermanns P, Altenburger MJ, Wrbas KT. Effectiveness of hand and rotary instrumentation for removing a new synthetic polymer-based root canal obturation material (Epiphany) during retreatment. *Int Endod J.* 2006 Feb;39(2):150-6.
12. Cordeiro KF, Silva DF, Filho IDJ, Castro FPL (2018) Current Protocols for Endodontic Retreatment: A Review. *J Odontol* 2: 111-6.
13. Ruíz-Piñón M, Gancedo-Gancedo T, Castelo-Baz P, Lorenzo-Pouso AI, Martín-Cruces J, Martín-Biedma B. Retreatment in endodontics with plastic core obturators. A new technique. *AustEndod J.* 2021 Dec;47(3):672-678.
14. Salehrabi R, Rotstein I. Epidemiologic evaluation of the outcomes of orthograde endodontic retreatment. *J Endod* 2010; 36: 790–2.
15. Schirrmeister JF, Wrbas KT, Schneider FH, Altenburger MJ, Hellwig E. Effectiveness of a hand file and three nickel-titanium rotary instruments for removing gutta percha in curved root canals during retreatment. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2006; 101: 542–7.
16. Prada I, Mico-Munoz P, Giner-Lluesma T, Mico-Martinez P, Collado-Castellano N, Manzano-Saiz A. Influence of microbiology on endodontic failure. Literature review. *Med Oral Patol Oral Cir Bucal* 2019; 24: 364–72.
17. Setzer FC, Boyer KR, Jeppson JR, Karabucak B, Kim S. Long-term prognosis of endodontically treated teeth: a retrospective analysis of preoperative factors in molars. *J Endod* 2011; 37: 21–5.
18. Fracchia DE, Amaroli A, Angelis NDE et al. GuttaCore Pink, Thermafil and Warm Vertically compacted guttapercha retreatment: time required and quantitative evaluation by using ProTaper files. *Dent Mater J* 2020; 39: 229–35.

19. Kosti E, Lambrianidis T, Economides N, Neofitou C. Ex vivo study of the efficacy of H-files and rotary Ni-Ti instruments to remove gutta-percha and four types of sealer. *Int Endod J* 2006; 39: 48–54.
20. Rossi-Fedele G, Ahmed HM. Assessment of root canal filling removal effectiveness using micro-computed tomography: a systematic review. *J Endod* 2017; 43: 520–6.
21. Duncan HF, Chong BS. Removal of root filling materials. *Endod Topics* 2011; 19: 33–57.
22. Royzenblat A, Goodell GG. Comparison of removal times of thermafil plastic obturators using profile rotary instruments at different rotational speeds in moderately curved canals. *J Endod* 2007; 33: 256–8.
23. Frajlich SR, Goldberg F, Massone EJ, Cantarini C, Artaza LP. Comparative study of retreatment of Thermafil and lateral condensation endodontic fillings. *Int Endod J* 1998; 31: 354–7.
24. Beasley RT, Williamson AE, Justman BC, Qian F. Time required to remove guttacore, thermafil plus, and thermoplasticized gutta-percha from moderately curved root canals with protaper files. *J Endod* 2013; 39: 125–8.