

# Blended endodontic elegance and simplicity: the single twisted file preparation and matching RealSeal one obturator

Richard E. Mounce<sup>1</sup>

**T**he Twisted File (TF) (SybronEndo, Orange, CA, USA) system represents a quantum leap forward in endodontic capability over previous rotary nickel titanium (RNT) cleaning and shaping methods. This paper was written to describe the use of a single TF file (.08/25) and matching RealSeal One Bonded Obturator (RS1)\* in given root anatomies.

TF is manufactured from a proprietary process of heating, cooling and twisting of nickel titanium in the Rhombohedral crystalline phase configuration (an intermediate phase between austenite-the phase at rest and martensite-the phase present during function). TF stands in distinction to other RNT alternatives that are manufactured by grinding or produced using M-wire (Dentsply Tulsa Dental, Tulsa, OK, USA). Grinding during manufacture can produce microcracks and areas of metal roll over on the cutting flutes of the file. Microcracks and manufacturing defects are the focus of subsequent file fracture if the file is subjected to excessive torsion and cyclic fatigue.

A lack of these defects and metal roll over give TF the capabilities discussed below. TF possesses:

1) the capability to be used as a single file technique in many root anatomies assuming that the clinician wants to prepare a #25 master apical diameter.

2) dramatic cutting efficiency and flexibility compared to ground RNT files. For example, TF can prepare a .08 taper around a 90-degree curvature in approximately 3-4 insertions in a tooth that has been accessed correctly with a glide path.

3) empirically, in my hands, 3-4 times greater resistance to torsion and cyclic fatigue relative to ground files. Published studies bear witness to this empirical

experience.

4) the attributes of both canal shaping files and orifices openers. The TF system eliminates the need for orifice openers.

## Twisted File System Description

While this paper will describe the preparation of the canal with a single .08/25 TF and the use of a matching RS1 obturator, it is noteworthy that TF is available in 5 tapers and various tip sizes. These include: .12/25, .10/25, .08/25, .06/25/30/35, .04/25/40/50 in 23, and 27 mm lengths.

### Pack configurations at this time include:

- a) Large Apical Assorted (30/.06/23mm, 35/.06/23mm, 40/.04/23mm)
- b) Small Apical Assorted (25/.08/23mm, 30/.06/23mm, 35/.06/23mm)
- c) Small Assorted (.04/25, .06/25, .08/25) 23mm and 27mm
- d) Large Assorted (.06/25, .08/25 and .10/25) 23mm and 27mm

### TF is:

- a) colour-coded for easy identification. The top band shows the taper and the bottom band the ISO tip size.
- b) laser marked.
- c) triangular in cross-section, maximizing flexibility.
- d) safe-ended at its tip with a non-cutting pilot tip.
- e) made from one piece of metal, the handle is not crimped on the shaft of the instrument.

## Tactile Use of the Twisted File

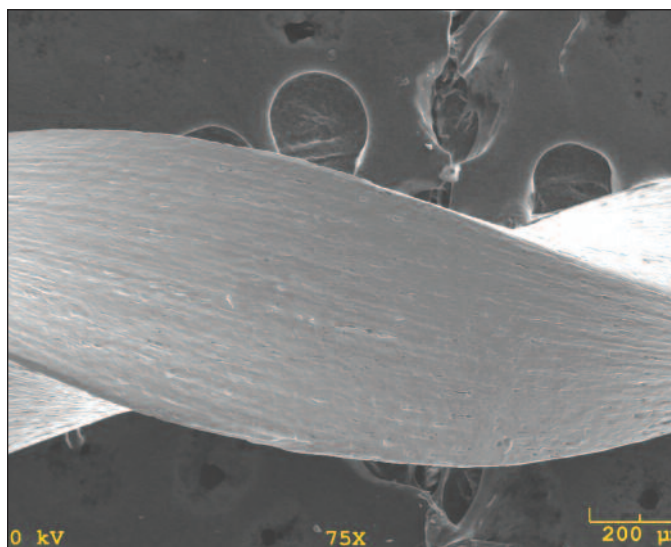
1) TF is inserted passively and gently. If excessive force is used in insertion, TF will unwind in proportion to the excessive force used. TF is far more ductile than files manufactured by grinding. Due to its greater ductility, if TF untwists, the case should be finished and then the

<sup>1</sup> DDS. Vancouver, WA, USA

**Corresponding author:** Richard E. Mounce, DDS  
E-mail: Lineker@comcast.net



**Figure 1: The Twisted File, .12/25, .10/25, .08/25, .06/25 and .04/25.**



**Figure 2: SEM showing how it is twisted in its manufacture and not cut across the grain structure.**

instrument discarded.

2) TF is always in motion either being inserted or withdrawn, but never held stationary in the canal.

3) TF is inserted to resistance and withdrawn. This motion cuts approximately 5 mm of dentin per insertion.

4) The flutes of TF are wiped after every insertion. Irrigation and recapitulation should follow every insertion.

5) Insertion is continuous, controlled, and takes approximately 2-3 seconds. TF is not pumped into the canal like a toilet plunger. Such use can lock the tip and cause instrument fracture. A single TF file is not taken repeatedly to the same depth in the canal. Such a motion will remove excessive dentin, risk instrument fracture and provides no benefit to the shaping process.

6) SybronEndo recommends 500 rpm for TF.

7) Any electric motor can power TF. TF can be used with or without torque control and auto reverse.

### Clinical Use of the Twisted File

1) Cleaning and shaping with TF is divided into two components, the final taper prepared throughout the canal (from the orifice to the MC) and the preparation of the master apical diameter. This final taper, before apical enlargement, might be considered the "basic preparation." If the clinician wishes to stop the preparation at a #25 master apical diameter, the .08/25 TF is the only file required and the entire preparation (basic preparation and apical diameter) is achieved with a single TF file.

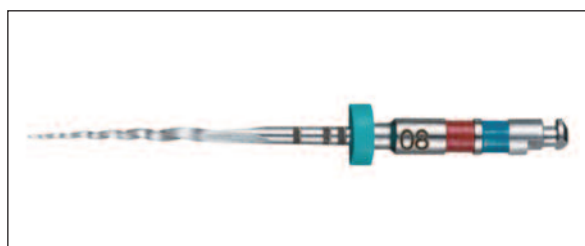
2) Anticipating the correct final canal taper is vital to prevent iatrogenic events. Preoperatively evaluating root morphology determines the final expected TF taper and

estimated master apical diameter. Simple canals are generally indications for larger TF tapers throughout the entire root. A .08 taper throughout the length of the root allows optimal irrigation, cone fit and obturation relative to smaller tapers. Roots that will allow a .08 taper include larger ones such as the palatal root of an upper molar and medium-sized roots (bicuspid and the mesial roots of lower molars). Highly curved and calcified roots are generally prepared to a .08 TF taper depending on the risk of strip perforation and long-term vertical fracture from dentin removal, root morphology dependent.

3) Pre-operatively the clinician should determine an estimate of the true working length i.e. determine an estimated working length (EWL) before accessing the tooth or placing files below the orifice(s).

4) After achievement of profound anesthesia, under the rubber dam, straight-line access should be achieved, all canals located and the cervical dentinal triangle removed.

5) If the orifice(s) are open and easily negotiated, .08/25 TF is placed into the coronal third of medium sized roots (bicuspid and the mesial root of a lower molar). Opening the orifice at this stage in the process provides optimal



**Figure 3: The Twisted File, .08/25**



Figure 4 - 6: RS1 Obturators, RS1 Verifiers, RS1 Oven & RS Self Etch.

irrigation and debris removal as early as possible. It also allows unrestricted access for hand K Flex\* files and the subsequent TF instruments that will be used.

6) All canals must be negotiated with hand K Flex files to the EWL first before bringing the .08/25 TF into the canal below the coronal third. When the first hand K Flex file reaches the apex, an electronic apex locator should be used to determine the position of minor constriction of the apical foramen (MC), i.e. the true working length (TWL). After TWL determination, the clinician should work from the smallest hand K Flex file that reaches the TWL to a #15 hand K Flex file (create a glide path). The glide path is the minimal enlargement of the canal needed to allow safe and reproducible TF insertion. Some canals will possess this #15 hand K Flex file diameter naturally and others will require that it be created. In any event, all spaces within the root should be negotiated first with small (#6-15) hand K Flex files to assure that the canal path is open and patent where TF enlargement will occur. The glide path can be made manually and/or with the reciprocating M4 safety handpiece attachment.\*

7) If the canal will passively allow a single .08/25 TF to be advanced to the TWL through multiple insertions, the clinician can do so. TF is not forced to achieve length in the canal. Apical TF movement is incremental and passive. An average root will allow the .08 TF to reach the apex in no more than 3-4 insertions.

If a single .08/25 TF file technique is not possible, 2 TF files (.08/25 and .06/25) are all that are required to prepare a canal, even one of significant curvature. As an alternative to the single file technique, if the clinician wishes to enhance the master apical diameter beyond a #25 tip size, they can do so by subsequently inserting the .06/30, .06/35 and .04/40 TF etc.



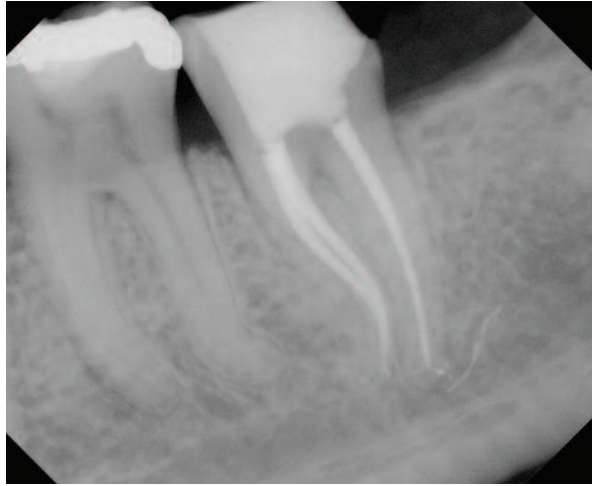
### Bonded Obturation and The Importance of Coronal Seal

*(This section on bonded obturation is largely adapted from an article that appeared in Dental Town in October 2009, used with permission)*

Gutta percha (GP), while the time honored “gold standard” for endodontic obturation, has limitations. GP has maintained its utility over the decades since its introduction into dentistry because of its relative lack of toxicity, biocompatibility, and ability to be thermosoftened, economy and ready availability. It neither bonds to sealers nor to dentin. GP, in and of itself, does not provide a barrier to bacterial movement along the canal. Bacteria that challenge GP as a result of coronal leakage can and does migrate along its length unobstructed from crown to apex. There is evidence in the endodontic literature that GP degrades clinically over time, especially in the presence of apical periodontitis.<sup>1</sup>

GP depends almost entirely on the presence of a coronal seal to prevent bacterial contamination, as GP, over the long-term, forms no barrier to its apical migration. Clinically, there is a direct correlation in the endodontic literature between adequate post endodontic restoration and long-term clinical success. Adequate coronal seal increases clinical success.<sup>2-5</sup>

RS has been described as “a thermoplastic synthetic



**Figure 7 and 8: Clinical cases treated in the manner described using a single .08/25 TF to prepare the basic preparation and obturated with RS One Bonded Obturators (SybronEndo, Orange, CA, USA).**

resin material based on the polymers of polyester and contains a difunctional methacrylate resin, bioactive glass and radio opaque fillers. RS sealer contains UDMA, PEGDMA, EBPADMA and BisGMA resins, silane treated barium borosilicate glasses, barium sulfate, silica, calcium hydroxide, bismuth oxychloride with amines, peroxide, photo initiator, stabilizers and pigment. RS Primer is an acidic monomer solution in water. RS is non-toxic, FDA approved and non mutagenic. With its radio opaque fillers, RS is a highly radio opaque material. The sealer is resorbable.<sup>6</sup> RS is available in two forms, as master cones and in the form of RS1. RS master cones are trimmed, fit and used just as GP master cones are. RS master cones look, handle and are retreated exactly as GP master cones.

RS1 and RS act to fulfill the primary functions of a root canal obturation material:

1) to stop or minimize the movement of periapical tissue fluids into the canal and/or the movement of bacteria from within the canal toward the apex.

2) to act as a barrier to coronal microleakage and prevent secondary infection of the canal.

3) to make the root stronger. There is evidence in the endodontic literature (although not conclusive) that RS will strengthen roots and minimizes the risk of vertical root fracture.

RS has been tested extensively in the endodontic literature. The preponderance of findings in scientific refereed journals in in-vitro<sup>7-11</sup> and in-vivo<sup>12-13</sup> studies has shown RS to resist coronal leakage to a statistically significant degree greater than GP. Clinical case studies with limited recall periods published thus far have shown that RS is better or equal to GP with regard to clinical success in the measure time periods, but no worse.<sup>14-15</sup> RS

has been proven biocompatible in the endodontic literature.<sup>17-19</sup>

The RS1 system has:

1) a .04-tapered obturators made of polysulfone that is surrounded by RS.

2) #20-90 tip sizes.

3) an oven that is custom designed with regard to heat and time for the various RS1.

4) a corresponding size verifier to tell the clinician the required RS1 size that should be utilized. Before attempting to insert a given RS1, the clinician should find the size verifier that can be inserted to the true working length passively. The verifier that provides this ease of insertion is the correct RS1 for the given canal.

### Clinical Considerations in Bonded Obturation

1) The canal is prepared with TF using a single .08/25 TF as described in canal anatomy that allows such enlargement as described elsewhere in this article.

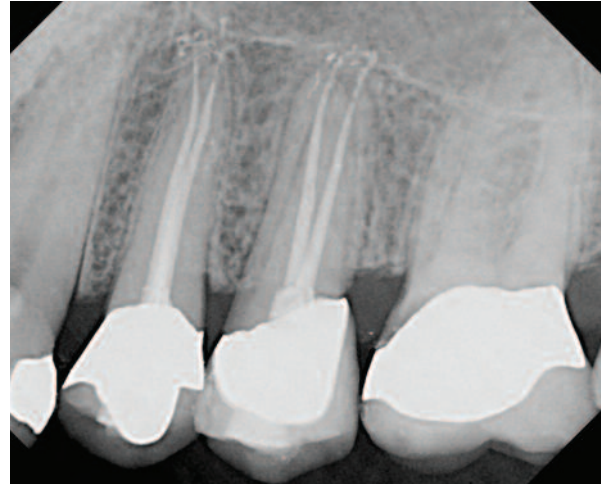
2) Both RS master cones and RS1 are used after the smear layer has been removed as described below.

3) RS self-etching sealer is used for obturation. In both cases, a thin sealer film thickness is used. Sealer is not allowed to pool in the canal. Sealers other than the RS self-etching sealer are not recommended for use with RS obturation.

RS1 have several characteristics that distinguish them from existing warm GP carrier based obturation products. These include:

1) All RS1 are dissolvable in GP solvents such as chloroform in all sizes.

2) RS1 can be shredded out of a canal at 900-1200 rpm with TF, although caution is advised. After the removal of



**Figure 9 and 10: Clinical cases treated in the manner described using a single .08/25 TF to prepare the basic preparation and obturated with RS master cones via the SystemB technique. (SybronEndo, Orange, CA, USA).**

the bulk of the obturator, the tags of polysulfone that remain can often be removed with Hedstrom files or dissolved from the canal.

3) The obturation is bonded throughout the entire obturation due to the chemical similarity of the self-etching sealer, RS core material and polysulfone obturator.

4) RS1 provides clinicians using cold obturation techniques a simple and efficient means to provide both a warm obturation as well as a bonded one. Warm obturation will move a heat-softened mass of RS into the narrowing cross sectional diameters of the prepared canal, in essence to thermally replicate the internal anatomy of the root. RS1 are simple in concept and application. Clinicians who are using warm carrier based GP devices will be able to quickly adapt to RS1 and yet provide a bonded obturation with its advantages.

### #25 RS1 Obturation After .08/25 Twisted File Preparation

1) After the smear layer has been removed and the canal dried, the RS self-etching sealer is applied. The smear layer is removed with a 2-minute rinse of a liquid EDTA solution such as SmearClear.\*

2) A size verifier is used to tell the clinician the ideal RS1 size. The size verifier that fits passively to the apex is the correct ISO tip size RS1 for insertion, in this case a #25 RS1.

3) RS Sealer is applied in the canal. Sealer is not allowed to pool in the canal. It is applied and then dispersed to leave only a minimal film thickness.

4) After the oven has been allowed to heat up for the appropriate time, the #25 RS1 is placed into the RS

Oven.\* Once the correct heating period takes place, the obturator is taken out of the oven and inserted into the prepared canal within 6 seconds. RS1 should slide easily and passively to the true working length.

5) The excess portion (handle) of the RS1 extending beyond the orifice can be removed either with heat or a bur. The Elements Obturation Unit\* makes an excellent heat source for such removal.

6) Either using a heat source such as the EOU or any of the drills that accompany post kits makes post space.

### FAQ:

#### 1) Can I cure RS with a curing light?

RS sealer is dual cure. The depth of cure will be several mm from the occlusal surface. The self-etching RS sealer will self-cure in 40 to 60 minutes.

#### 2) How can I control extrusion of sealer at the apex with RS1?

Extrusion is minimized by:

- precise apical control in preparation.
- correct determination of true working length
- correct speed and depth of RS1 insertion to the MC.
- using the correct amount of sealer and having a thin sealer thickness before insertion.

#### 3) Can I use my existing oven with RS1? Can I use different sealers with RS and RS1?

"No" to both questions. The working temperatures for RS are lower than for GP. The RS ovens operate at 175-180 degrees C. The sealer is chemically compatible with the RS and RS1. These products are not designed to be used with other sealers.

#### 4) What technique modifications are required to bond obturation?

The only required modification from existing GP techniques is the need to remove the smear layer detailed above. Using a self-etching sealer, with either RS master cones or RS1, the techniques are identical to those employed with GP.

#### 5) Does my canal preparation need to change to use RS1?

No, canal preparation is exactly the same using either RS master cones or RS1.

This paper has described one method of canal preparation for clinicians who wish to create a #25 apical preparation and match the preparation with a bonded RS1 obturator. The technique described is efficient, predictable and simple in design and application. It represents a dramatic elevation in endodontic capability relative to the use of ground RNT files and GP.

\*SybronEndo, Orange, CA, USA

*Disclosure: Dr. Mounce reports no financial interest in the products described.*

*This report was sponsored by SybronEndo*

#### References:

1. C. Maniglia-Ferreira, et al. Degradation of trans-polyisoprene over time following the analysis of root fillings removed during conventional retreatment. *Int Endod J.* 2007 Jan;40(1):25-30.
2. Lazarski, et al. Epidemiological evaluation of the outcomes of nonsurgical root canal treatment in a large cohort of insured dental patients. *JOE* 2001 Dec;27(12):791-6.
3. Salehrabi R, et al Endodontic treatment outcomes in a large patient population in the USA: an epidemiological study. *JOE* 2004, Dec;30(12):846-50.
4. Tilashalski, et al Root canal treatment in a population-based adult sample: status of teeth after endodontic treatment. *JOE* 2004, Aug;30(8):577-81.
5. Aquilino, et al. Relationship between crown placement and the survival of endodontically treated teeth. *JPD* 2002, Mar;87(3):256-63.
6. Mounce RE, Glassman, G, Bonded Endodontic Obturation, Another Quantum Leap Forward for

Endodontics, Oral Heath Canada, July 2004, p 13-22.

7. Silveira, et al Negative influence of continuous wave technique on apical sealing of the root canal system with Resilon. *J Oral Sci* June 2007 Jun;49(2):121-8.

8. Bodrumlu, et al Apical leakage of Resilon obturation material *J Contemp Dent Pract.* Sept 2006 2006 Sep 1;7(4):45-52.

9. Tunga U, Bodrumlu E. Assessment of the sealing ability of a new root canal obturation material. *J Endod.* 2006 Sep;32(9):876-8. Epub 2006 May 6.

10. Aptekar, et al Comparative analysis of microleakage and seal for 2 obturation materials: Resilon/Epiphany and gutta-percha. *J Can Dent* April 2006 Apr;72(3):245.

11. Stratton, et al A fluid filtration comparison of gutta-percha versus Resilon, a new soft resin endodontic obturation system. *J Endod.* 2006 Jul;32(7):642-5.

12. Leonardo MR, et al. Root canal adhesive filling in dogs' teeth with or without coronal restoration: a histopathological evaluation. *J Endod.* 2007 Nov;33(11):1299-303.

13. Shipper G, et al. Periapical inflammation after coronal microbial inoculation of dog roots filled with gutta-percha or resilon. *J Endod.* 2005 Feb;31(2):91-6.

14. Two- and four-year outcome of biologically-based treatment protocol of endodontically treated teeth filled with Resilon. Prospective outcome of endodontic treatment performed in private practice by a single clinician using a standardized protocol with Resilon as the filling material; 2 and 4 year follow-up results. Debelian G. Oslo, Norway. In-manuscript.

15. Cotton, TP, et al. A Retrospective Study Comparing Clinical Outcomes after Obturation with Resilon/Epiphany or Gutta-Percha/Kerr Sealer Volume 34, Issue 7, Pages 789-797 (July 2008)

16. Testarelli L, et al. Sealing ability of a new carrier-based obturating material. *Minerva Stomatol.* 2009 May;58(5):217-22.

17. Merdad, et al Short-term cytotoxicity assessment of components of the epiphany resin-percha obturating system by indirect and direct contact millipore filter assays. *JOE* January 2007 Jan;33(1):24-7.

18. Onay, et al In vivo evaluation of the biocompatibility of a new resin-based obturation system. *OOO* July 2007 Sep;104(3):e60-6.

19. Key, et al Cytotoxicity of a new root canal filling material on human gingival fibroblasts *JOE* August 2006 Aug; 32(8):756-8.