

# Rotary Nickel Titanium Instrumentation Revolutionized: The Twisted File

*Richard E. Mounce, DDS*

Like the advent of the surgical operating microscope (SOM), rotary nickel titanium (RNT) instrumentation and warm obturation techniques, there are watershed moments of transition where the specialty takes a significant step forward. Such is the advance made with the introduction of the Twisted File (TF) (SybronEndo, Orange, CA, USA) for endodontic canal preparation. The file is unsurpassed in its cutting efficiency, fracture resistance, tactile control, and the efficiencies gained from its use. TF is a new paradigm in endodontic canal preparation because there is no file available at this time that has TF's functionality, safety and efficiency (Figs. 1-3).

A proprietary process of heating, cooling and twisting makes TF possible. TF is not ground against the material's natural

grain structure to create the cutting edges. Such grinding creates microcracks that can be future failure points due excessive to torsion and cyclic fatigue. The heating and cooling process that the

A proprietary process of heating, cooling and twisting makes TF possible.

nickel titanium is subjected to optimizes its molecular phase structure that ultimately gives TF its qualities. The molecular phase structure that allows TF to be twisted is known as R phase. Utilization of the R phase of nick-

el titanium phase transition overcomes limitations of ground file technology and opens up new opportunities for file design, increased surface hardness and fracture reduction. TF is made from one piece of nickel titanium, enhancing structural integrity and reducing much of the "wobble" that is associated with some other files. TF is made triangular in cross section by twisting the nickel titanium during the R phase of its handling.

TF comes in two lengths, 23 and 27 mm, one tip size (at this time), #25, and 5 tapers (.12, .10, .08, .06 and .04). TF has laser markings that can be used in lieu of rubber stoppers if the clinician desires. The "Large" pack configuration contains .10, .08 and .06 instruments and the "Small" pack configuration has .08, .06 and .04 files. TF can be used Crown Down and in many cases in a Single File

technique, depending on the root being treated. TF is color coded both in the file packaging and to distinguish each TF with regard to its taper and tip size. Generally the “Large” pack will be used in canals that are more open, straight and easily negotiable. Generally, the “Small” pack will be used in smaller, more curved and challenging anatomy.

TF will be introduced and discussed in this paper through a series of frequently asked questions:

**1) Why is TF a new paradigm in canal enlargement?**

**How does TF provide better control and technical proficiency during a procedure?**

As mentioned, TF can be used Crown Down and as a Single File system. While virtually any anatomy can be treated Crown Down, some roots may not allow Single File technique. This said, many root anatomies will allow a single TF file to create the entire preparation. This is the first instrument ever that has possessed this flexibility and functionality. Neither of these strategies is inherently superior to the other. Whether the clinician uses Crown Down or the Single File method is a matter of personal preference if the canal will allow it passively.

RNT instruments and concepts, while far preferable to Gates

Glidden drills and hand files, still had drawbacks: lack of fracture resistance, the need for blending the canal thirds to create a continuous taper, lack of cutting efficiency, “screwing in” etc. TF has virtually eliminated these shortcomings. Used Crown Down, the file is taken into the canal from larger tapers to smaller (.12, .10, .08, etc). As a single file technique, many canals will allow a single TF to reach the TWL and create the whole preparation, anatomy and taper dependent. For a Single File TF preparation, many canals can be taken a .08 and .10 taper throughout their length with a single TF. What is difficult to express in words and what must be experienced first hand is to appreciate the ease with which TF can track a canal and when used appropriately, how simple and easy it is to reach TWL with the TF system, be it with one file, two or usually at most three.

TF provides better control, because if it is used with the correct touch (to be described), it can be used confidently with fewer insertions (because of its cutting efficiency) and with less fracture risk. The quality of the result can only improve with such capability.

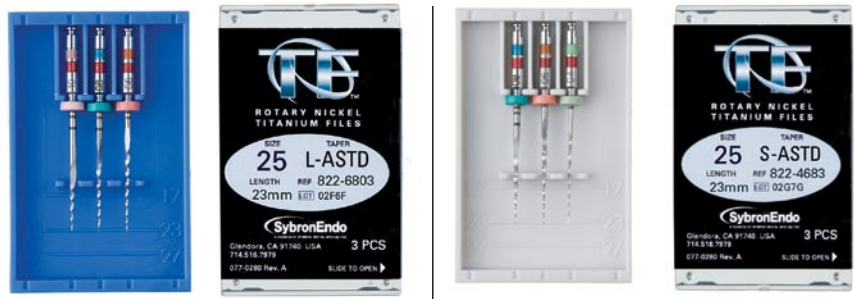
**2) How significantly has TF reduced the risk of separation?**

If used correctly (as described),

TF will reduce instrument fracture dramatically, almost to zero. TF is inherently difficult to fracture. Like any RNT file, TF may fracture if the file is grossly abused. This said, the margin of safety with TF is far greater than with any other file I have ever used. If used as recommended, TF fracture is operator dependent, not because of an inherent materials or design flaw. TF is a very robust file with excellent tactile control and a minimal learning curve.

**3) What does this level of reduced separation risk mean for endodontist and general dentists?**

Reduced fracture rates translate to confidence, predictability, ultimately better clinical results and greater profitability. While ideally TF should represent the same thing for both endodontist and GP’s, the reality may be different. For the GP’s, this will be the first instrument that simplifies treatment, i.e. takes the mystery and mythology out of the process of shaping root canal systems. Use of TF is simplified because the tapers do not need to be blended. For example, if the chosen taper is .10 at the orifice, often, this taper can be taken to the apex, irrespective of the curvature of the canal.



FIGURES 1-3—The Twisted File (SybronEndo, Orange, CA, USA)



**FIGURE 4**—Clinical case treated with a single TF file.



**FIGURE 5**—Clinical case treated with two TF files.



**FIGURE 6**—Clinical case treated with three TF files.

TF should be used with:

- a) a gentle continuous and controlled motion of insertion.
- b) frequent irrigation and recapitulation.
- c) correct apical pressure (the pressure one would use with a #2 pencil).

In addition, TF should be used:

- a) wiping the flutes of the file after every use
- b) with a constant vertical motion, either coronally or apically, but never leaving TF stationary around a curvature
- c) with insertion that lasts 2-3 seconds and that minimizes engagement to 1-3mm of dentin per insertion.
- d) without repetitively taking the same TF file back to the same length. Once a TF progresses to a given length in the canal, undue pressure is not placed on the file to attempt to move apically. If the file will move apically in the next insertion beyond where it was initially, the clinician can do so, but the canal will dictate if this is possible. If the same taper will allow further apical movement, after irrigation and recapitulation, the clinician can do so. If the same file resists apical advancement, a smaller TF can be used, moving Crown Down, i.e. larger tapers to smaller.

TF is the first instrument that

will allow a GP to create the entire preparation for many canals with one, two or three files and do so with the safety TF provides. In essence, endodontics just got infinitely simpler for the vast majority of clinicians doing root canals (i.e. the general dentists). With TF, the canal preparation does not need to be blended, as was the case with hand files and Gates Glidden drills and with RNT instrumentation systems that rely on varying tip sizes and tapers.

To expand briefly on the concept above, if, for example, the .10 TF will allow insertion to the minor constriction (MC) of the apical foramen, in several repeated insertions, the canal preparation is complete (unless the clinician wants to create a larger apical diameter and gauges the canal). This Single File technique is a huge advance over the previous larger number of steps and files that might be required. If the clinician does gauge the canal, after TF preparation, and wants to create a larger apical diameter, the tuning required will be minor.

For the endodontist, TF will be a revelation. TF is smooth, efficient and makes not only the experience of using it more enjoyable but shortens treatment time because fewer files will be needed and there are no exceptions to where it can be used.

#### ***4) How does the cutting efficiency of TF differ from existing RNT files?***

TF cuts very efficiently, more like a controlled hot knife through butter than the typical paradigm where a RNT file resists cutting and pressure must be placed on the file to make dentin shaping occur.

It is unnecessary to increase rotational speed to make TF perform at higher efficiency while cutting. The file does not “screw in” but rather efficiently shapes dentin and channels the debris out of the canal. This debris channeling is a function of the flute width and depth becoming larger moving from the tip to the handpiece end of the file. In essence, there is more room for debris to be held in the flutes until they can be wiped than would be present in a highly symmetrical cross design with regard to flute width and depth. SybronEndo recommends rotation of TF at 500 RPM. TF can be used with any electric motor. I use it with the Elements Motor (SybronEndo, Orange, CA, USA) at 900 RPM with the torque control turned off. SybronEndo further recommends TF as a single use instrument, I generally use TF in 3-5 canals. The number of uses will be modified by the curvature of the roots, the character of the dentin, the number of

insertions and the number of rotations the file will have had in the canal as well as whether any deformations on the file have occurred through previous use. If the TF is deformed, it should be discarded. TF can be used to remove gutta percha in retreatment as well as remove pastes and aid in retreatment of carriers.

When cutting with TF, chips of dentin usually are found in the wider flutes nearer the handpiece end. In other words, while the instrument can cut near its tip end (even though TF has a non cutting pilot tip) i.e. the 3-4mms at the tip of the instrument does not generally have debris on it. This demonstrates that TF cuts away from the tip. As a result, aside from the fracture resistance provided by the using R phase technology and twisting, the cutting mechanism present clinically reinforces safety. In my clinical experience with TF, there has been virtually no tendency for the file tip to lock in the canal.

**5) How does this breakthrough technology significantly lower the number of files used per case?**

Because TF cuts efficiently, the number of files needed to reach TWL (i.e. the minor constriction of the apical foramen) is reduced considerably. For Single File TF technique, generally a .08 or .10 taper is used. If either of these tapers does not easily track to length when used individually, in combination, these tapers can be then used Crown Down. Clinically, this means that if a .10 TF will not advance through the entire length of the canal without undue pressure, the clinician would select a .08 TF and move Crown Down to advance the desired taper to TWL, if it can be done so passively. Alternatively, if a .10 TF or .08 TF can alone be

used passively to TWL through multiple insertions, the clinician can do so and achieve a Single File TF preparation.

Whether TF is used Crown Down or as a single file, it is vital that TF be preceded by the creation of a glide path with hand K files, especially if the canal is not already to the minimal size of a #15 hand file. The creation of a glide path can often be made more efficiently with the aid of a M4 Safety handpiece (SybronEndo, Orange, CA, USA) in narrow calcified and severely curved roots relative to using hand files alone.

**6) How will TF affect the treatment of severely curved root canals?**

As a benefit of the heating, cooling and twisting of the metal, TF can negotiate virtually any curvature. It is very difficult to envision the clinical case that would require hand files to be preferred over TF in the apical third. When preparing extremely curved and calcified root canal spaces, the clinician might first enlarge the canal to a smaller taper (.04) and then increase the taper to .06 or possibly even .08. For even the most severely curved canals, after the glide path is created to the MC, the .04 TF should drop to the TWL without undue pressure.

Wide, straight, long, and open canals generally can generally be enlarged to greater tapers along their length (.10, .08). Shorter, curved, and smaller roots can generally be enlarged to smaller tapers (.08, .06, .04). Achieving these tapers and negotiating around severe curvatures is a function of using TF correctly (as described) and made possible by TF's attributes. Gentle pressure, a glide path, minimal engagement, copious irrigation and

recapitulation and a continuous and controlled motion are all key principles to bring out the best features of TF.

**7) How has TF changed the patient's experience, chair time, and comfort?**

TF should make the patients experience more pleasant through:

- a) reduced chair time (via greater TF efficiency). TF will reduce the number of files needed, make the preparation simpler to execute and enhance obturation quality (excellent shapes are simple to obturate, the converse is true).
- b) less fracture and iatrogenic events of all types.
- c) reproducible and ideal preparations that will enhance microbial control through improved irrigation and debris removal. Maximizing all of these variables is certainly consistent with improved clinical success (Figs. 4-6).

A new breakthrough technology has been introduced that represents a quantum leap forward in endodontic canal enlargement. The Twisted File (SybronEndo, Orange, CA, USA) is the first file that can be used Crown Down and/or as a Single File instrument in many cases and do so with unparalleled safety and cutting efficiency.

I welcome your feedback. **OH**

@ARTICLECATEGORY:594;



*Dr. Mounce lectures globally and is widely published. He is in private practice in Endodontics in Vancouver, WA, USA. Dr. Mounce offers intensive customized endodontic single day training programs in his office for groups of 1-2 doctors. For information, contact Dennis at 360-891-9111 or write RichardMounce@MounceEndo.com.*