

Improve Your Root Canal Preparations with Adaptive Motion Technology



During root canal preparations, clinicians may experience a variety of challenges. However, there are several difficulties that have the potential to be solved using adaptive motion technology, including file separation and file “pull-in” effect.

Common Challenges of Root Canal Preparation

File Separation:

Studies have found cyclic fatigue to be the primary cause of file separation. It accounted for 50 to 90 percent of mechanical failures in one study.^{1,2} When a rotating file goes around a curve it is essentially flexing back and forth quite rapidly. This motion weakens the metal (cyclic fatigue) and, if continued long enough, can cause the instrument to separate.

Torque (twisting) is the other major cause of file separation. Conventional, ground-fluted NiTi files are limited in elasticity and flexibility, and the process of grinding flutes across the grain structure produces micro-fractures that make the file less durable. This can cause unexpected separation, which can even happen before the clinician is able to remove the file from the canal.

Loss of Control:

Imagine using a wood screw with a power screwdriver: When the screw engages, it pulls itself into the wood. This same occurrence happens with most rotary endodontic files, giving the clinician a feeling of being “sucked in” and having lost control.

Debris Extruded Apically:

In a 2012 study, researchers found “reciprocating files produced significantly more debris compared with... rotary systems.”³ The reciprocating motion of systems similar to WaveOne® pushes significant amounts of debris through the apex, which can result in post-operative inflammation and pain.

What is Adaptive Motion and How Does it Protect Against File Separation?

We know rotary motion is constant clockwise rotation while reciprocation refers to clockwise and counterclockwise rotation. So what is meant by adaptive motion?

Adaptive Motion relies on a patented feedback algorithm that changes the motion of the file based on the applied load (stress). When the file is doing minimal work—when there is no stress on the file—the motion is purely rotary (clockwise rotation only). When the file begins to cut more dentin, the motion begins to “adapt” from pure rotary to reciprocation (clockwise and counterclockwise rotation). This action disengages the file from grabbing too much of the canal wall.

The more stress felt on the file, the more the motor adapts to offset the stress, thus avoiding a stress level that might normally unwind or fracture the file.

Adaptive motion helps clinicians overcome risk of file separation and improve control.

TF Adaptive System from Kerr Endodontics uses the same proven technology and design as Twisted Files and is the only system that uses adaptive motion.



Adaptive Motion Helps Prevent File Breakage

TF Adaptive helps clinicians avoid the risk of file fracture in two important ways: Adaptive motion results in resistance to cyclic fatigue (expanding the lifespan of files) and adaptive motion lessens the twisting stress on the file as well.

Adaptive motion helps reduce cyclic fatigue when it switches from a rotary to reciprocation motion. In a 2012 study, researchers found “all reciprocating systems groups showed significant increase in time to failure when compared with group 5 (continuous rotation).”⁴

Second, the crystalline structure produced by R-phase technology allows the Twisted File to possess a greater range of elasticity, making it more resistant to fracture — allowing for greater stress tolerance and improved safety. Adaptive motion serves to relieve the twisting (torsion) stresses on the instrument thus making it very resistant to failure due to excessive twisting forces.

Patented TF files have superior strength (two-to-three times more resistant to cyclic fatigue than other NiTi files)⁵ and flexibility (70 percent more flexible than other NiTi files)⁵ while maintaining high durability, making for an easy, confident experience. Incredible as it may sound, TF Adaptive makes an already excellent TF file (Twisted File) even better.

“Of all the teeth I have worked on with TF - about 4,000 - I have not separated a single file with the TF Adaptive System using Adaptive Motion.”

- Dr. Gary Glassman

Adaptive Motion Puts Clinicians in Control

Most of the newer motors currently used with endodontic files have incorporated a torque control feature. However, the TF Adaptive System takes it one step further; it uses the Elements Motor with Adaptive Motion Technology to offer reflexive torque control.

Unlike typical torque control, reflexive torque control actually adapts to the user's technique—resulting in extreme control. The system first rotates the file clockwise and, depending on the load on the file (how hard one pushes), the system reacts and adapts to a counter-clockwise, reciprocating motion. The harder one pushes, the more the system reacts. This reduces file stress and avoids the “screw-in” effect some dentists experience with some rotary systems.

“Adaptive Motion takes the TF Adaptive Files in a new motion that puts the operator in total control of the file rather than the file being in control of you,” Dr. Gary Glassman says.

He has found that other file systems can actually pull you into the canal once the shaping begins, resulting in a loss of control. “You don't get that here,” he says. “You are able to work your way down the root canal to the apical terminus in a very safe manner.”



TF Adaptive and Adaptive Motion Technology Results In Exceptional Debris Removal

In **“Comparison of the Extrusion of Dentin Debris Using a New Instrumentation,”** a study written by David E. Jaramillo, DDS, and Raydolfo Aprecio, MO, the amount of dentinal debris extruded through the apical foramen by means of three instrumentation techniques was measured. The three techniques included were: step back hand filing; WaveOne®; and the new TF Adaptive. The manual step-back hand filing technique extruded the largest amount of debris, followed by WaveOne®. TF Adaptive, however, extruded the least, half that of WaveOne® and only one-third compared to hand filing.⁶

Because apical extrusion of infected debris to the periradicular tissues is considered one of the possible factors related to the occurrence of postoperative pain and inflammation,⁷ TF Adaptive may result in less post-operative pain associated with apical extrusion when compared to the other techniques tested.

Bottom Line

Following much research and experimentation, it is now known that Adaptive Motion can improve the dentists experience by reducing the risk of file breakage, putting the clinician in control of the file, and extruding less debris apically.

Adaptive Motion technology and the TF Adaptive file design can result in fewer broken files, a confident and efficient procedure and a better experience for both the dentist and patient.

TF Adaptive Starter Kit

EVERYTHING YOU NEED IN ONE KIT

Get started with TF Adaptive with the following components.

- Elements Motor with 8:1 Contra Angle handpiece
- 6 packs of assorted 23mm NiTi Files: Small/Medium/Large
- 4 packs of assorted 27mm NiTi Files: Small/Medium/Large
- 2 packs of #8, #10 & #15 K-File Stainless Steel Hand files
- LA Axxess™ 2.0 Bur Kit
- EndoRing



TF Adaptive Starter Kit
MFG#: 815-1535

**Contact us to learn more about
the new TF Adaptive System!**

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¹ Li UM, Lee BS, Shin CT, Lan WH, Lin CP. Cyclic fatigue of endodontic nickel titanium rotary instruments: static and dynamic tests. J Endod 2002;28:448-51

² Parashos P, Gordon I, Messer HH. Factors influencing defects of rotary nickeltitanium files after clinical use. J Endod 2004;30:722-5

³ Burklein, Sebastian Dr med dent and Schafer, Edgar Prof Dr med dent. Apically extruded debris with reciprocating single file and full sequence rotary instrumentation systems. J Endod 2012;38:850-852

⁴ Gambarini, Gianluca DDS, MSc, PhD and Giansiracusa Rubini, Alessio DDS, MSc. Influence of different angles of reciprocation on the cyclic fatigue on nickel titanium endodontic instruments. J Endod 2012;38:1408-1411.

⁵ Data on file, Sybron Dental Specialties, Inc. Data from Gambarini G., Garala M. Cyclic fatigue and flexibility testing.

⁶ Jaramillo, D. and Raydolfo, A. (2013) Comparison of the Extrusion of Dentin Debris Using a New Instrumentation. Internal study on file.

⁷ Gambarini, et all, European Journal of Inflammation, Vol 10, no. 1, 99-103, 2012

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