Clinical Use of the ESX® File System.

Endodontic instrumentation continues to improve through the introduction of new instruments and techniques. There are currently multiple file systems on the market, each with their own unique way of achieving canal instrumentation. The new endodontic NiTi rotary instrumentation system ESX® (BrasselerUSA, Savannah GA) is an advanced rotary file system that aims to improve two specific instrumentation challenges: 1. System Simplicity and 2. Cutting Efficiency using less files. In addition, this robust instrumentation system is complemented by an effective, simple, and inexpensive obturation system[1,2]. This combination of a simple, efficient instrumentation and obturation system makes predictable endodontic therapy accessible to all clinicians performing root canal therapy.

The **ESX® System**, was inspired by the original EndoSequence® system [3,4,5]. The core design features of both ESX and EndoSequence files, namely their triangular cross section, their patented Alternating Contact Points™ (ACP), and the electropolished [6] NiTi metal wire remain the same (figure 1). Both File systems utilize a recommended speed of 500-600 RPM and a torque control value of 1.5-2.2 N/cm. However, there are three significant differences between the two file systems:

1. The ESX® file has incorporated a new and patented Booster-Tip™ (figure 2,) which helps guide the file while simultaneously reducing canal ledging.
2. The use of a unique operator motion called Single Stroke & Clean (SSC)™ which drastically reduces torque exerted on each file.
3. A more efficient protocol requiring less files to achieve the same results.

The 3rd feature is only possible since the ESX® file takes full advantage of the the first two described features. The combination of the Booster Tip™ and the SSC motion™ allows the ESX® file and its associated technique, to be more efficient than its predecessor EndoSequence File®. Let's briefly discuss these two main features.

The **Booster-Tip™** (also known as BT,) is present on all four ESX® Finishing Files (25, 35, 45, 55, all in 0.04 taper.) The presence of a Booster Tip is designated on ESX® Files by a notch on the handle (Figure 3). The BT-Tip utilizes flat transition angles from the rounded non-cutting tip to advance to the triangular shank, thus creating six cutting edges and a narrower tip. This change in tip design creates a doubling of the cutting edges at the tip. This combination helps create a guiding element to the tip with the benefit of reduced potential for ledging. The combination of this guiding tip and a new theory of an operator file motion based on the chip-space, namely the Single Stroke & Clean (SSC)™technique, allows the clinician to move between greater incremental file sizes, thus reducing the number of files required to instrument any given root canal.

The **Single Stroke and Clean™** operator motion recommended for each ESX® file, significantly reduces the torque exerted on each file in the series. The Single Stroke and

Clean™technique, or SSC for short, involves utilizing each ESX® rotary file for one engagement and filling of the flutes, followed by its immediate removal and cleaning of the file. The theory is based on removing the accumulated debris in the file's chip space after each and every stroke, thus clearing the file for unrestricted cutting during the next ensuing stroke. This single stroke action followed by wiping is recommended on every file used in this system, Scouts, Expeditor, and Finishing Files. The combination of the Booster tip and SSC allow us to forge a simpler and more efficient Basic Protocol for the use of ESX® Files compared to their predecessors.

The **Basic ESX® File System** (figure 3) consists of a 15/.05 Expeditor, and finishing files 25, 35, 45, & 55/.04. The protocol for the Basic ESX® instrumentation system is to hand instrument the canal to the full Working Length to a size 15/02 file, and then to proceed to use the Expeditor file (15/05) down to the same Working Length using the SSC motion. Depending on the level of engagement experienced by the Expeditor on its journey down to length, a decision is made about which finishing file is appropriate. If significant engagement is met, then a size 25 finishing file is used to the same Working Length using the SSC™ motion. A size 35/.04 is used as the Master Finishing File when the Expeditor experiences moderate engagement to length, and a size 45 is used when the Expeditor experienced minimal engagement to length. A size 55 is also provided for cases where the operator feels inadequate cleaning after the size 45 Finishing File has reached the apex.

Following instrumentation, irrigation, and disinfection, matching size ESX® BC (Bioceramic) coated gutta percha cones are recommended along with Hydraulic Condensation utilizing BC Sealer®[1, 2] (BrasselerUSA) to obturate the root canal and achieve a seal.

The Basic ESX® Protocol will address the vast majority of routine clinical cases; however, when experiencing more challenging cases with significant curvatures or calcifications (when achieving a size 15/.02 prior to the use of the Expeditor is difficult,) an **Advance ESX® Protocol** is recommended. The advanced protocol utilizes three additional files prior to the use of the Expeditor™ (Figure 4.) The ESX® Orifice Opener (20/.08) and two ESX® Scout Files (15/.04 & 15/.02), alone or with hand instrumentation to sizes 8 or 10 will do some "Pre-Expeditor" instrumentation in oder to achieve the required 15/.02 shape to Working Length (prior to the employment of the Expeditor).

The simple and logical progression of the Basic and Advanced ESX® instrumentation protocols are a product of the superior manufacturing quality of the established EndoSequence File along with the combined addition of two new features: an advanced Booster Tip™ Technology and a new, logical, and safe Single Stroke and Clean™ operator motion that makes the new ESX® File system both efficient and simple for clinicians performing root canal therapy with Basic or Advanced Protocol (Figure 5,6)

References

1. Koch K, Brave D, Nasseh A., Bioceramic Technology: Closing the Endo-Restorative Circle, Part I, *Dentistry Today,* 2010 :29:100-5
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3. Koch K,Brave D, Real World EndoSequence File *Dent Clinics of North America* 2004;48:159-182
4. Koch K, Brave D. The EndoSequence File: A guide to clinical use. *Compend Contin Educ Dent.* 2004;25:811-813
5. Koch K, Brave D. Endodontic Synchronicity *Compendium* March 2005 26 (3): 218-224
6. Anderson M, Price J, Parashos P. Fracture Resistance of Electropolished Rotary Nickel-Titanium Endodontic Instruments *Journal of Endodontics* Oct 2007;33:1212-1216

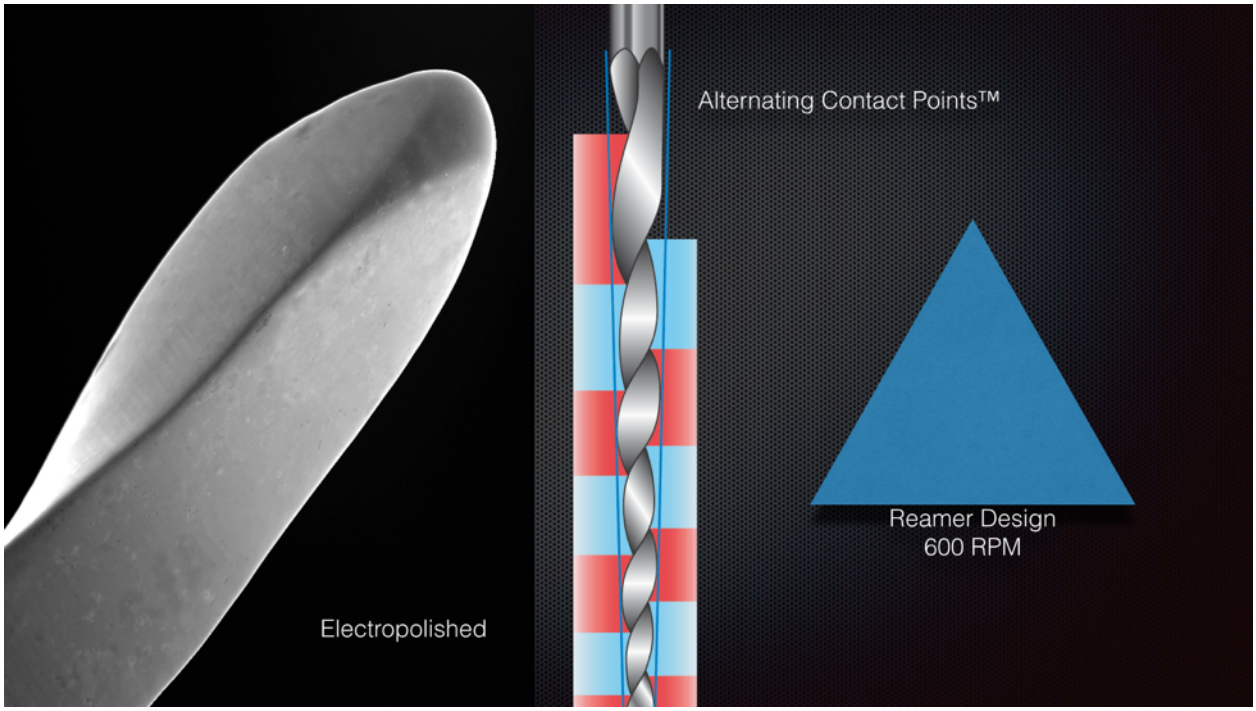

Figure 1: Both the EndoSequence® & ESX® system share an electropolished, constant taper file with Alternating Contact Points, Triangular Cutting Cross Section, and a recommended RPM of 500-600 with Torque control between 1.8-2.2 N/cm.

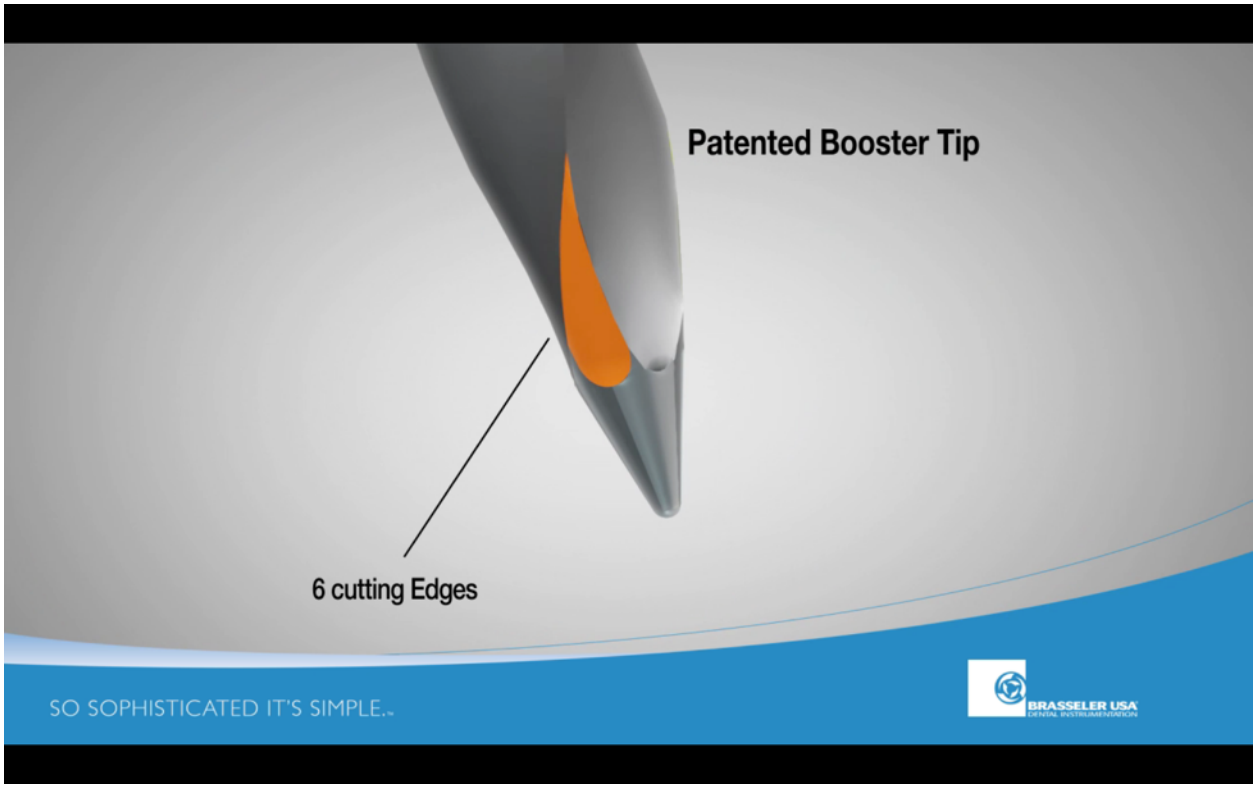

Figure 2: The Booster Tip design has flat, shaved off transition angles that helps narrow the file tip and create a guiding mechanism for the file to work down canals already prepared to a size 15/.05 (The ESX® Expeditor™ size).

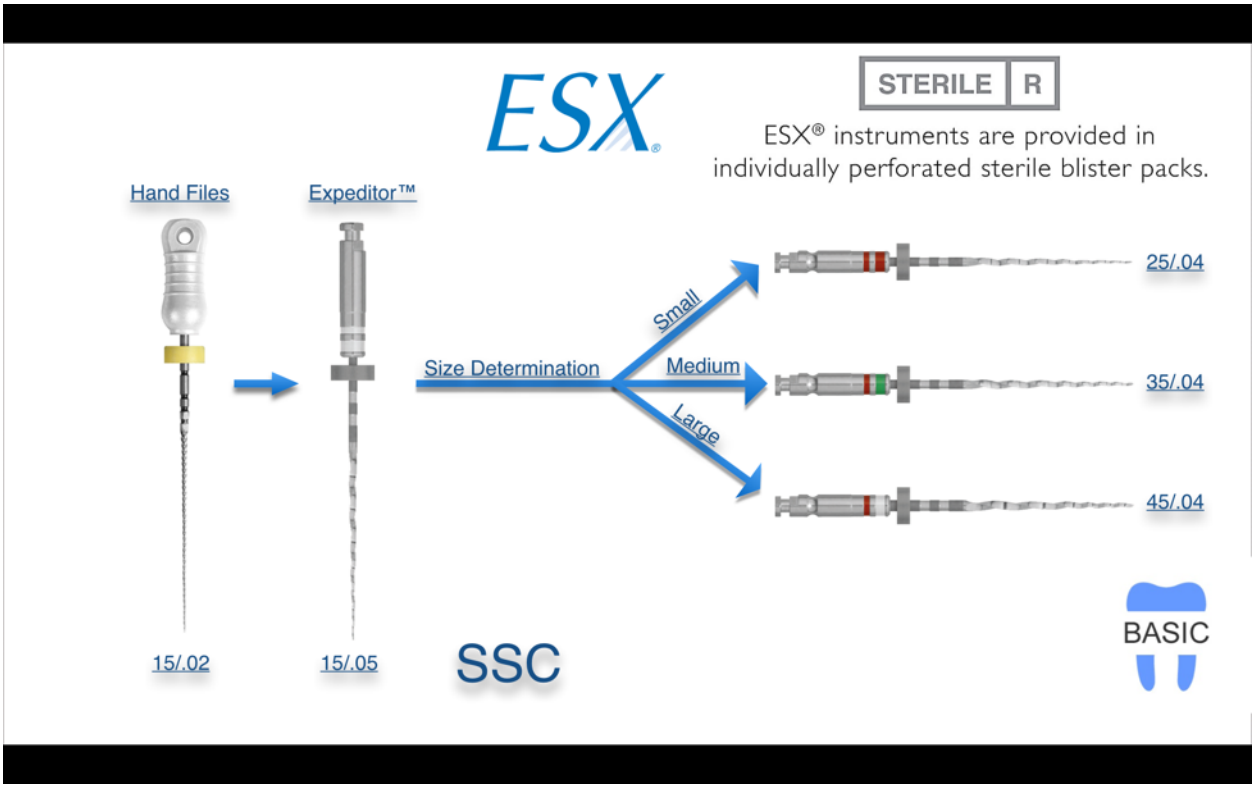

Figure 3: Shows the Basic ESX® Technique algorithm.

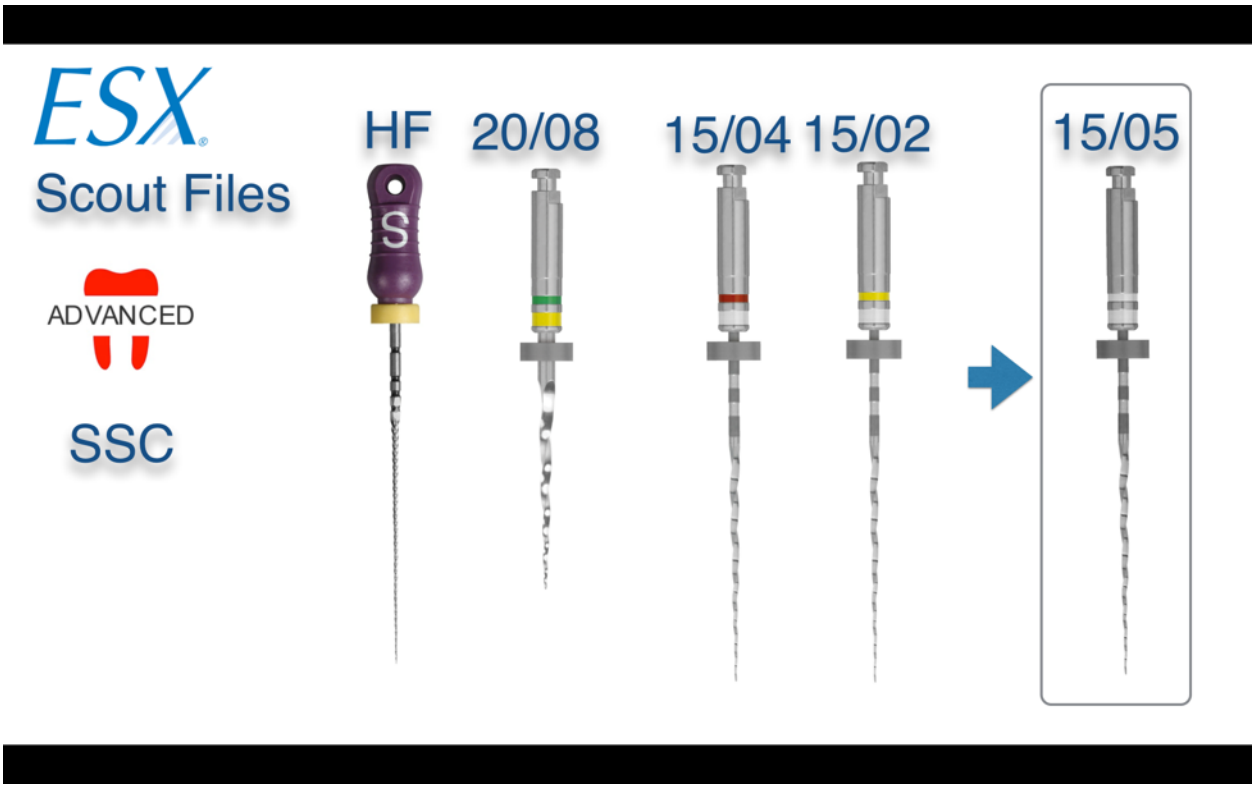

Figure 4: Shows the Advanced ESX® Technique.

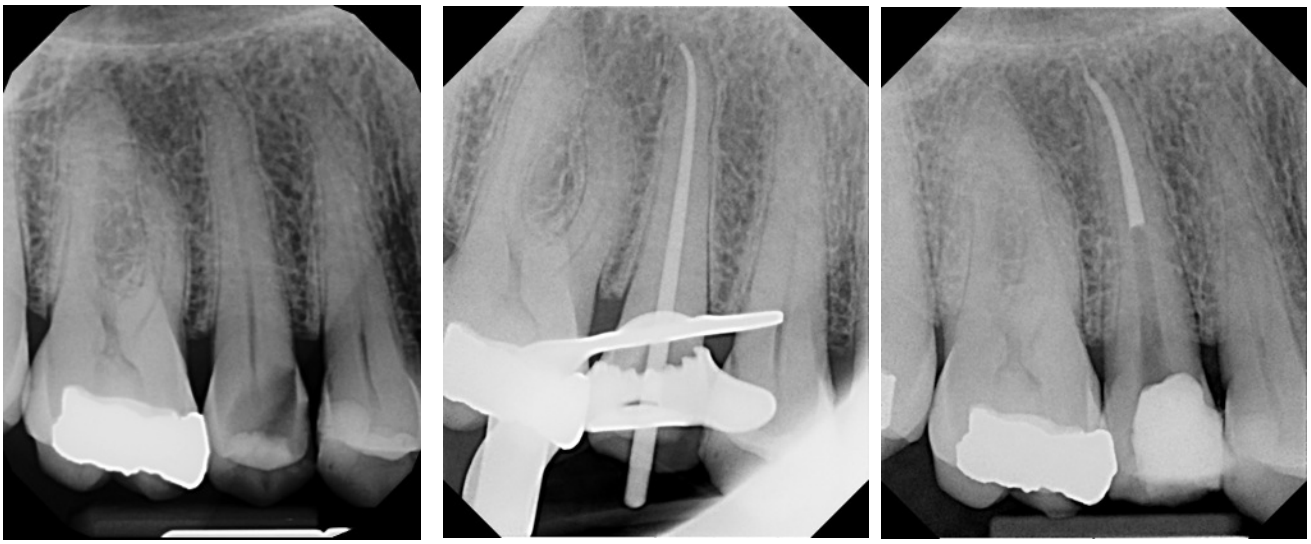

Figure 5: Shows an average Clinical case completed with the Basic ESX® Protocol using a total of 2 ESX® Files (Exepditor + 45/.04) in conjunction with the Single Stroke and Clean (SSC)™ motion. (Orifice opener was also used during access).

Figure 6: Shows a more challenging Clinical Case. Pre-Expeditor™ Instrumentation using the ESX® Orifice opener and Scout files (15/.04 and 15/.02) prior to moving to the Basic ESX® Technique.