

Endodontic Systems: A Survey

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For those who want to begin incorporating endodontics into their practices, check out the following resource to get started

Endodontics is a vast specialty. Product offerings range from canal lubricants and cleaners to medicaments, from engine-driven and hand files to sealers and cements. As much as we wanted to cover the massive array of endo products and techniques, we only had enough pages to focus on one area – endodontic systems. *Dentaltown Magazine* interviewed seven companies that manufacture endodontic systems to learn what makes each system on the market unique and how these companies can support general dentists who are interested in incorporating endodontics into their practices.

Respondent List

- Brasseler USA – Drs. Ken Koch and Dennis Brave, founders of Real World Endo
- Discus Dental – Dr. Greg Goldfaden, endodontist, Aventura, Florida
- Endo Technic – John Benz, director
- Essential Dental Systems, Inc. – Victoria Reina, marketing & sales manager
- Maximum Dental – Dr. A. Utku Ozan, Seacaucus, New Jersey
- Miltex – Dr. James Roane, endodontist, Norman, Oklahoma
- SybronEndo – Gregory Sabala, marketing communications manager
- Ultradent – Dr. Renato de Toledo Leonardo, author of the upcoming book *Endodontics: Technological Resources and Biological Concepts*

Please describe the unique features of your endodontic system.

Koch/Brave: The EndoSequence system is unique in that it is the first mechanized true reamer that stays centered in the canal. This is achieved through the use of alternating contact points (ACP). In addition to keeping the file centered, the ACPs reduce engagement and promote safety. Therefore, we are getting the benefits of a variable taper preparation (reduced engagement and torque) while maintaining all the advantages of a constant taper preparation (.04 or .06).

Goldfaden: It is well known that thorough debridement, irrigation and obturation of the apical third of the root canal is the most critical yet challenging aspect of root canal treatment. Smart Endodontics combines the very best in device designs and techniques for cleaning (LightSpeedLSX), irrigating (EndoVac) and obturating (SimpliFill) the root canal system.

LightSpeedLSX is unique with its short cutting blade and highly flexible non-cutting shaft. This allows the instrument to stay centered in the canal while going around the curves.

EndoVac is the first true apical negative pressure irrigation system. Attached to the chair-side Hi-Vac suction, a small diameter MicroCannula is placed at the very apical end of the root canal. This results in irrigant being drawn apically from the pulp chamber, through the 12-micro holes near the end of the MicroCannula and out of the tooth into the chair-side evacuation system.

SimpliFill, like its name implies, makes filling the canal simple and easy. SimpliFill's unique 5mm Apical Plug matches the diameter and taper of the LightSpeedLSX prepared canal. With a four twists of the handle, the carrier is removed and the apical third is sealed without leaving any metal or plastic carrier in the canal. If a post will not be placed, the HotShot device can be used to quickly backfill the remaining canal space to the orifice with warmed gutta-percha or Resilon material.



Discus Dental
LightSpeedLSX instrumentation system is the only endodontic instrument designed to create canal preparations that are Biologically Optimal. LSX instruments cut only where you need to cut, thoroughly cleaning the apical third without unnecessarily removing root structure coronally or in the mid-root, which can weaken the root. The LSX Nickel Titanium shaft delivers supreme flexibility and ultimate resiliency, allowing you to navigate even the most difficult curves without ledging or zipping. www.discusdental.com

Endo Solutions

Designed to supplement rotary nickel titanium files or for stand-alone endodontic procedures. Features: stainless steel, enhances tensile strength, patented non-ledging tip, 1mm graduated marks. A patented computer-controlled manufacturing process ensures consistency in size, flexibility and strength, giving these hand files greater capabilities to follow along the curve of the canal. www.endosolutions.net

Brasseler USA

The Brasseler USA RaCe design features one set of sharp cutting edges that alternate with a second set pitched at a different angle – two superior cutting edges in one rotary file. The helix angles of the instrument change automatically to constantly cut and remove debris from the canal walls. The result is a rotary endodontic file with the lowest working torque on the market, optimum operator control, reduced risk of metal fatigue and improved resistance to instrument separation. www.brasseler.com



Dentsply Tulsa

GT Hand Files demonstrate the same great features as the ProFile GT rotary instruments. So you can create a predetermined funnel shape more efficiently and in up to 60 percent less time than with traditional hand-filing methods. A 6mm diameter, pear-shaped handle is ergonomically designed to fit the shape of your fingers when gripping the instrument. www.tulsadental.com

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Endo Technic

The Endo Pulse (EP) will never break a file. It is not a rotary handpiece. It uses Vertical Reciprocation to replicate natural hand movement. EP will pathfind and enlarge all curved and calcified root canal treatment plus retreat gutta percha and Thermafil. It offers auto irrigation to lubricate canals and wash out debris. For more information, call 877-477-8899 or visit www.endotechnic.com.

Essential Dental

The Endo-Express Reciprocating Handpiece and the SafeSiders reamers make rotary irrelevant. Eliminate the fear of fracture associated with crown-down systems and the typical shortcomings of the step-back process. Unlike rotary, reciprocation prevents binding. Excessive force is never needed. Replace instruments because they dull and not because you fear they will break. Available for a significantly lower price than rotary systems. www.edsdental.com



Miltex

Miltex's selection of hand files are available in all types: K-type files, Hedstrom files, reamers, barbed broaches; and are offered in both stainless steel and nickel-titanium options. Our Hi-5 files are great for calcified or small canals since their unique strong and stiff pentagonal cross section facilitates easy penetration. The revolutionary Liberator rotary nickel-titanium files feature a patented straight blade design and manufacturing process that minimizes ledging and transportation, allowing the Liberator files to provide an unprecedented level of safety and control. www.miltex.com



Benz: Endo Pulse (EP) uses vertical reciprocation (not rotation) to completely eliminate torque and never separate a file. The Master Files float freely (up to 90 degrees) to stay self-centered in the canal. EP irrigates as it files to lubricate canals and wash away debris. The Set Flow system allows sodium hypochlorite to be added to the EP as it files. Endo Pulse will negotiate curved, calcified canals to working length. It is also a retreatment machine.

Reina: Compared to all other systems, the approach we developed has a series of unique features with a description of some of the benefits below:

1. The system is comprised of a series of relieved k-reamers. There are several benefits to a relieved reamer.
 - a. They engage the canal walls less than k-files or any file for that matter because they have fewer flutes.
 - b. They are more flexible than k-files because they are less twisted than k-files and they have a thinner cross section due to their relieved design.
 - d. A cutting tip is incorporated which can pierce tissue rather than impact it.
 - e. The flat produces two vertical columns of chisels with one cutting in the clockwise direction while the other cuts in the counterclockwise direction.

Roane: Liberator NiTi instruments employ a unique design with no spiral of their cutting edges. This design places the rate of shaping directly under the clinician's control. Thus a pecking motion is not required and the instruments can be advanced slowly forward with an outward clearing motion every millimeter or so of depth.

Sabala: When clinicians talk, SybronEndo listens. Our doctors requested a rotary NiTi file that separated less, cut better and was more flexible than the competition. Twisted Files (TF) are strong enough to cut ideal file paths confidently, yet flexible enough to do it efficiently. TF is twisted, not ground making it far more durable than traditional files. We also recently launched Real Seal One Bonded Obturators (RS1). RS1 is the next generation in carrier-based delivery systems. All of the components of RS1 – sealer, filler and core – are resin-based materials and bond with each other to reduce the chances of coronal leakage causing root canal procedures to fail.

Leonardo: Root canal instrumentation can be performed with hand or mechanized instruments. If the professional decides to perform with hand instrumentation, the majority of the cases can be solved. Once he/she decides to perform with mechanized instrumentation, it is imperative to point out that a single mechanized system can't solve every case. In consideration of what has been stated, when asked what my preferred system is, I would select the Anatomic Endodontic Technology (AET) System by Ultradent.

AET includes a hand piece, which adjusts to a micro or electric motor that provides reciprocating 30-degree motion. This reciprocating motion is less aggressive than rotary with respect to dentin and affords great control while avoiding file separation. Used with the Ultradent micro-motor, it has an internal water spray that keeps canals wet and flushes debris. It also has a push-button chuck, which makes it easy to insert and adjust the files to a correct working length. The Endo-Eze AET system uses K-files (similar to stainless steel files) with small diameters (.10, .13mm), non-standard tapers (.0025, .0035, .0045, .0060mm/mm), a round tip and variable helicoidally angle that provides an efficient and safe root canal preparation, without the risk of transportation and fracture.

After the use of stainless steel files, I make a hybridization using Ni-Ti Files 25.08, 25.06, 25.04 – crown down to safely shape the root canal.

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SybronEndo

Highlighted by its innovative TF and K3 Files, SybronEndo's Preparation line provides a wide array of methods to instrument your canal.

Whether it be ISO tapers or orifice openers, hand files or rotary, crown-down or step-back, SybronEndo is your quality endo solutions provider. www.sybronendo.com

Ultradent

A key component of the AET system is a new generation of stainless steel files that provide greater strength and cutting efficiency than traditional Endodontic instruments. This strength, when combined with the oscillating motion of the hand-piece, greatly reduces the chance of file separation. Endo-Eze AET files are packaged in sturdy, autoclavable, plastic containers, eliminating the need for an "endo tub." www.ultradent.com



If a dentist has hesitation about changing techniques, what is the best approach to make a smooth transition?

Benz: Pick a product based on common sense for their need. Consider the long-term economics as well (what will product refills cost?). Practice on extracted teeth first and later the patient. Don't get frustrated the first time you use it. Have your assistant put it out every time you do RCT. Many systems have high learning curves.

Leonardo: Certainly, choose a safe technology, take courses related to new technologies, learn everything related to the system, pay good attention to qualified literature (not opinions) and train exhaustively in extracted teeth before starting to use in patients.

Goldfaden: Smart Endodontics has developed a four-level training system as a way of progressing from theory to practical application at whatever pace the dentist is comfortable. The four levels are: I. Theory, Science and Concepts; II. Hands-on In-vitro Practice; III. Hands-on In-vivo Training; and IV. On-going Clinical Support. Discus Dental employs dentists practicing Smart Endodontics throughout the USA and Canada to offer their experience in mentoring dentists interested in learning and applying Smart Endodontic techniques.

Roane: To change techniques, one must realize that he/she is relatively an expert in the old but a novice in the new. Beginning efforts are best practiced using extracted teeth in case unexpected difficulties are encountered. Each system has a difference in feel and may require vastly different pressures to initiate shaping. By practicing on extracted teeth one can experiment and develop a feel for the new system without risk of injury to a patient. Remember the system does not make the clinician, but rather provides methodology for treatment, which might be less difficult and more efficient.

Ozan: The best approach to make a smooth transition is by ongoing continuing education. There are many dental seminars popping up everywhere; make sure that the seminar you attend has lecturers who actually employ the methods they teach in a real world setting.

What is your method for selecting your MAF size? Is it generally the same for all teeth?

Roane: I use three primary MAF sizes based upon a root bulk and average foramin diameter. For small diameter roots I use a size 25 file, for a medium bulk root I use a size 30 MAF, and for large bulky roots I use a 35 MAF. These sizes are increased if the file fails to meet resistance as it is slowly rotated in the foramen. These sizes have been employed for more than 40 years and have provided greater than 90 percent successful repair for students and clinicians alike.

Sabala: At SybronEndo, we believe that it is important to preserve as much natural dentition as possible. To that end, MAF size really depends on the natural size and shape of the root canal. We have an exciting new addition to our Twisted Files line with new apical sizes. Using Twisted Files, our research shows that most canals can be effectively finished using a .06/30, .06/35 or .04/40 file.

We recommend that an apical gauging technique be used to determine what size the root canal system should be finished to.

Leonardo: The MAF depends on the anatomical/pathological conditions of the root canal. It is directly related to the apical instrument (AI) that is the first instrument that reaches the tooth length and met with resistance during root canal negotiation. Generally, MAF is five instruments greater than AI in cases of vital pulp treatment and six instruments greater than AI in non-vital pulp therapy.

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“Practitioners must know their RCT limitations and do good case selection. Know when to refer out to your endodontist. Single-visit endo is possible depending on the doctor, the case and equipment used.”

– John Benz, Endo Technician

Do you routinely use/trust results from an electronic apex locator?

Sabala: Precise diagnostics of the tooth and location the apex are important steps for successful endodontic treatment. SybronEndo offers two outstanding units for locating the apex; the Elements Diagnostic Unit and the Mini Apex Locator. The EDU provides precise auditory and graphical readings to identify the apex. This unit also includes a vitality scanner. Our Mini Apex Locator delivers the power of apex location in the palm of your hand and offers a new level of accuracy at an affordable price.

Koch/Brave: Yes, absolutely. We particularly like the PAL (Precision Apex Locator) because of its accuracy and ease of use.

Goldfaden: Yes. Over the years these devices are much improved. However, the reading from a foramen locator should be considered “close approximations”. The flexible non-cutting shaft and short blade of LightSpeedLSX provides incredible feedback and thus it can be used to confirm WL based on tactile feedback.

What are your criteria for single visit endo vs. multiple visits?

Goldfaden: With Smart Endodontics single-visit treatment should be the norm, with a few exceptions. Research indicates that when canals can be properly cleaned and sealed well in the first visit, a second visit is not going to add much value. Before attempting single-visit endodontics, be sure you are using a technique that has the research to back it up! Many techniques don't reach this high standard. If not, multiple visits with interappointment medicaments should be utilized. Some of the exceptions to single-visit treatment are:

1. Cellulitis.
2. Acute apical abscess requiring incision and drainage.
3. Periradicular periodontitis with severe pain to touch.
4. A weeping canal that cannot be dried.
5. Difficult cases that extend beyond appointment time and patients tolerance.

Leonardo: This is a very contentious topic in endodontics. In cases of vital pulp therapy, if there is enough time, the anatomy of the root canal is not very complex and if patient collaborates, root canal treatment can be performed in a single visit. If not, in maximum two visits, using UltraCal by Ultradent as temporary dressing for two weeks. In non-vital pulp cases, and re-treatments, endodontics must be performed in two visits, using UltraCal as temporary dressing for two weeks.

Benz: Practitioners must know their RCT limitations and do good case selection. Know when to refer out to your endodontist. Single-visit endo is possible depending on the doctor, the case and equipment used.

Koch/Brave: We try to do single visit endodontics in most cases with the exceptions being: posterior mandibular teeth that are non vital with a lesion, but were quiescent and that suddenly became symptomatic (pain and/or swelling). Additionally, any tooth where we cannot stop drainage after instrumentation. Silver point retreatment cases that present as symptomatic teeth. Chronically left open teeth and finally any tooth that time is a factor to complete the treatment.

Do you still use hand files during endo? If so, which ones? If not, why?

Roane: I use hand files in all cases. I use Flex-R files because they have a biconical tip shape. They can bypass ledges and penetrate calcifications effectively. Some canal are so calcified that 08 hand files have a difficult time penetrating. Hand files may be used in a variety of methods, which greatly enhance our treatment possibilities. If I did not have hand files, many calcified teeth could not be treated nonsurgically.

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“A general dentist should perform endodontics when it is in the best interest of his patient. That is when he can predict a successful outcome because he has done so repeatedly in the past under comparable clinical circumstances.”

*– Dr. James Roane,
endodontist*

Ozan: I use hand files and rotary. If coronal flaring is not done properly, the infected pulp will not be removed properly. The hand files I use depend on the tooth I work on. However, on an average tooth the hand files, I use are #8, #10, #15, #20 and #25.

Goldfaden: Yes, of course we still need to use k-type and h-type hand files to prepare the canal before rotary instrumentation begins. H-type (Hedstrom) files #15, #20 and #25 are used during the access phase to move the orifices laterally in the process of creating straight-line access. K-type files, up to a size #20, are used to create a glide path for rotaries to reach working length.

Sabala: SybronEndo offers a complete line of stainless steel hand files for all canal types including; k-Files, k-Flex, Triple-Flex, Reamers, Pathfinders and Hedstrom files. Locating the canal, achieving patency and creating a glide path can all be done efficiently and effectively with the proper hand file technique. When used in conjunction with our oscillating M4 Safety Handpiece, doctors can reduce hand fatigue while maintaining tactile control of their hand file.

Why should a general dentist perform endodontics?

Goldfaden: Endodontics can be a very rewarding and enjoyable challenge for the doctor while at the same time it provides a very valuable service to your patient. It's like most challenging things in life, when you have very little experience it can be intimidating and frustrating. Yet, if you keep learning and practicing it can be one of those procedures you most look forward to each day. I recommend using the case assessment form developed by the American Association of Endodontists (visit AAE.org) to assess whether or not a case should be referred to an endodontist. Remember the motto, “When in doubt, send it out.”

Ozan: Unlike general dentistry where everyone is a potential patient, endodontic treatment is not something every patient may need. However, internal marketing definitely works. As time progresses, it is not uncommon for a patient to return for a second or third root canal treatment; it is equally gratifying when a patient refers family or friends. It is also very common for a patient to come back and get other services provided by the local dentist. Endodontics is not only the most profitable segment of dentistry but also a real practice builder.

Leonardo: With the exception of re-treatments, complex anatomy teeth and special patients (diabetes, heart disease, difficult to isolate tooth...) general dentists (if well trained) can perform endodontics.

Roane: A general dentist should perform endodontics when it is in the best interest of his patient. That is, when he can predict a successful outcome, because he has done so repeatedly in the past under comparable clinical circumstances. The general dentist also is needed today as there are not enough endodontists to provide all the required care. Thus it is necessary for the general dentist to provide treatment where they can do so without harm.

Benz: Endodontics is part of basic dental school instruction and is not difficult to perform with today's technologies. GPs do 85 percent of RCT today. There are not enough endodontists to do all of it and they are there for the most difficult cases and GP errors. Keeping endo in your office will make your patients happier and be a good profit source for your practice.

Obturation methodologies also vary among the different systems available. What is your system's approach and why?

Reina: We start with a simple premise, if we put material into the canal at room temperature it will warm to body temperature and expand about 1.75 percent in the process.

The cement is applied with a bidirectional spiral that prevents the cement from extruding over the apex as the canals are flooded. Combined with a prefitted point that is also well coated, excellent hydraulic forces are applied to the cement already in the canal when the master point is inserted.

Roane: I obturate using a gutta-perch point custom fitted to the apical one third of the canal including the foramen. This provides for closure beginning at the apical origins of the canal. This custom fitted point is coated with a zinc oxide based sealer, i.e. Kerr pulp canal sealer, and replaced to the measured depth. That GP point is then heated and condensed towards the foramen using a System B fitted with a Roane tip. The coronal two thirds of the canal are free of gutta-percha following this down pack. Next the canal is generously coated with more sealer and the body of the canal filled with bulk gutta-percha from an Inject-R-Fill.

Koch/Brave: The obturation options are multiple with EndoSequence. These include regular laser verified gutta percha as well as Activ GP which uses laser verified glass ionomer coated cones. A significant new material development is EndoSequence BC Sealer (which is a bioceramic cement). The BC Sealer allows for a true single cone technique (based on the synchronicity between the canal preparation and the laser verified master cone).

Sabala: Today, we offer a full range of advanced equipment and consumable the most popular obturation systems; bonded obturation, lateral condensation, warm lateral condensation and continuous wave condensation. Our Elements Obturation Unit (using RealSeal) and our new Real Seal 1 Bonded Obturation systems are warm lateral condensation systems which we believe create a three-dimensional fill in the root canal.

Leonardo: The main reason for endodontic failure is leakage. The most used technique to fill root canal is lateral condensation with gutta percha and zinc oxide Eugenol-based sealers. These sealers and cones have no bonding to dentin and crown restorative material permitting leakage. In order to avoid this leakage and failure, a monobloc system made of resin, can bond to dentin and restorative crown material. This will avoid leakage. Moreover, this resin must be biocompatible. These statements lead us to use the EndoREZ system that fulfill all these statements, once it is not cytotoxic, is biocompatible, bonds to dentin and is easy to use.

Goldfaden: Obturation, while important, is not the be-all-end-all of root canal treatment. Clean the canal as best as you can and then seal it. I'm completely convinced that the primary cause of endodontic failure is when we jump the gun by filling a "dirty" canal. SimpliFill was developed to address the difficulty with filling the apical third of the canal. The SimpliFill Apical Plug is made to match the exact size and taper of the LightSpeedLSX prepared canal. Pushing the SimpliFill Plug to working length is accomplished by the use of a stainless steel carrier. Unlike other carrier-based systems, the carrier is completely removed from the canal once the Apical Plug is in place at working length. The hydraulic force caused by pushing the Apical Plug to working length moves the sealer into the dentinal tubes, lateral canals, and apical deltas. This is aided by the open spaces cleared by effective irrigation with EndoVac. If post space is desired, the post is placed coronal to the 5mm long SimpliFill Apical Plug. Otherwise, if a post will not be placed, the remainder of the canal can be quickly and easily filled with warm gutta-percha or Resilon by using the HotShot Backfill Gun. ■