FOCUS ON: Endodontics

Clifford J. Ruddle, DDS, examines why glide path management is the key to successful endodontics and gives a sneak peek into its future.

Q: What is glide path management (GPM) and why is it critical for predictably successful endodontics?

A: GPM may be thought of as an endodontic procedure that typically utilizes small-sized, stainless steel (SS) hand files to negotiate, catheterize, and ultimately "secure" the full length of any given canal. A glide path is verified, and any portion of the canal is termed secure, when a small-sized hand file can slip, slide, and glide through a smooth and reproducible pathway. GPM is arguably the single most consequential clinical step that serves to influence predictably successful endodontics, since secured canals can then be mechanically shaped. Traditionally, well-shaped canals have been shown to hold an effective reservoir of irrigant that, upon activation, can penetrate, circulate, and clean into the uninstrumentable portions of a root canal system. More than 50 years of scientific and clinical evidence unmistakably substantiates that well-shaped canals promote 3-D disinfection and filling root canal systems.

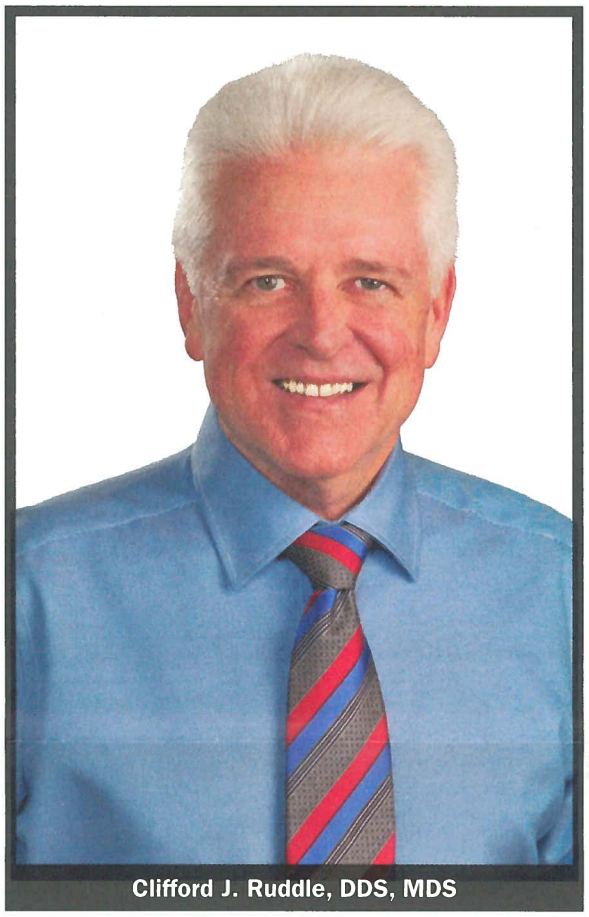
Q: What is the best way to perform GPM?

A: Following coronal and radicular access, there are 2 possibilities that exist when initiating GPM procedures:

First, in roots that hold anatomically shorter, wider, and straighter canals, a size 10 hand file will typically reach length after a few engaging and outward cutting cycles. When the apical one-third of a canal is negotiated, then working length is established, patency is confirmed, and a smooth, reproducible glide path is verified. When necessary, the terminus of any canal should be expanded to 0.15 mm to confirm sufficient space is available to safely accommodate the tip of any subsequently used shaping file.

The second GPM possibility is encountered in roots that hold anatomically longer, narrower, and more curved canals. In these instances, the inward movement of the size 10 file is oftentimes limited because the rate of taper of this file initially exceeds the rate of taper of the canal at this moment. Rather than using smaller-sized SS hand files in order to reach length immediately, a strategy may be utilized that focuses first on pre-enlarging the coronal two-thirds of a canal before attempting to negotiate the apical one-third of this same canal.

The secret to pre-enlargement is to use a size 10 SS hand file to manually reproduce and secure a partial length of any given canal. The secured portion of a canal can then be mechanically pre-enlarged with any appropriate shaping file. A pre-enlarged canal facilitates negotiating the apical one-third of this same canal. Once the canal has been fully negotiated and secured to 0.15 mm, this portion of the canal can now be prepared according to the clinician's shaping philosophy.



Clifford J. Ruddle, DDS, MDS

Q: Is there a connection between GPM and endodontic failure?

A: Failure to secure canals to their terminal extents compromises 3-D disinfection and filling root canal systems. Breakdowns in GPM encourage preparation errors such as blocks, ledges, perforations, and broken instruments. Further, iatrogenic events result because there is a general lack of knowledge that the size 15 hand file is 50% larger in diameter at D0 than the size 10 file. This design problem is exacerbated by failing to carry the size 10 hand file to the terminus of a canal, not confirming patency, and inadequately working the size 10 file until it is super loose. Finally, the deficiencies of the size 15 SS file are further magnified when using a dangerous inward cutting motion.

Q: Have there been any technological advances in recent years to make the challenge of GPM easier, faster, better?

A: Yes, many dental companies have launched multifile systems dedicated to GPM. Dentsply Sirona and DENTSPLY Maillefer have recently launched a unique *single*, progressively tapered, and mechanically driven NiTi file, termed ProGlider. Through heat treatment technology, this metallurgically enhanced NiTi file has been shown to provide considerable improvement in flexibility and the resistance to cyclic fatigue. This single file can create a significantly larger tapered pathway than any other dedicated multifile sequence. However, it is important to note that any given canal *must* first be manually reproduced, catheterized, and secured with a size 10 hand file before using any dedicated mechanical glide path file(s).

Fortuitously, it has been shown that these mechanically driven glide path files are able to follow a previously secured canal easier, faster, and more predictably compared to using a manual and more dangerous size 15 SS file. This category of dedicated files is currently used to expand or *pre-shape* any given canal prior to utilizing greater tip diameter and tapered shaping files. Importantly, dedicated mechanical glide path files have been shown to significantly reduce procedural chairtime, while decreasing postoperative pain and flare-ups.

Q: What will be the future of GPM?

A: In the future, regardless of whether the decision is to minimally or fully prepare canals, GPM will typically be performed using *only one mechanically driven* file, period. Yet, for this to occur, Dr. Ghassan Yared first recognized that any file design or metallurgy selected must be utilized in accordance with the *endurance limit concept* (EndL). By definition, the EndL of any given design and material is the level of stress and strain a file can endure for a minimum of one million cycles without breaking. Fortuitously, this value can be calculated for any file utilized to negotiate, catheterize, and secure canals, regardless of their length, diameter, or curvature.

Guided by Yared's work, Prof. Pierre Machtou and I had a prototype motor programmed to produce ultrashort *unequal* bidirectional angles where the engaging/disengaging angle is 6°/1°. Further, we identified a small-sized file that provides high resistance to bending through a thermal hardening process. With the convergence of the EndL concept, a prototype motor, and a metallurgically enhanced file, the immediate future of GPM will forever change. Stay tuned for an exciting, new GPM technology that will enable dentists to safely and quickly negotiate, catheterize, and secure virtually any given canal.

Dr. Ruddle is founder and director of Advanced Endodontics, an international educational source, and maintains a private practice in Santa Barbara, Calif. He is an assistant professor of graduate endodontics at Loma Linda University and University of California (UC), Los Angeles; an associate clinical professor at UC, San Francisco; and an adjunct assistant professor of endodontics at University of the Pacific, School of Dentistry. As an inventor, he has designed and developed several instruments and devices that are widely used internationally. He is well known for providing superb endodontic education through his lectures, clinical articles, training manuals, videos, and DVDs. He can be reached toll-free at (800) 753-3636 or via the website endoruddle.com.