

The GTX rotary system

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Nearly fourteen years ago, Dr L. Stephen Buchanan introduced the concept of greater tapered canal shaping and the GT ProFile rotary endodontic system to the world of endodontics. The GT brand is one of the most successful endodontic products in history and has a loyal following amongst clinicians around the world. The original GT ProFile rotary system (DENTSPLY Tulsa Dental Specialties) was also the first NiTi instrument to be part of a comprehensive system-based approach to endodontic treatment. For the first time, predictable and consistent canal shapes could be achieved, followed by a size-matched obturation system, and finally a size-matched post-placement system. The system-based approach of the GT system is brilliant because the paper points, gutta-percha cones, obturators and posts all fit the canal shape produced by the GT rotary instruments. Dr Buchanan and DENTSPLY recently advanced the proven GT ProFile system with the introduction of the GTX rotary system. Below is a technical review of the design features and benefits of the new GTX rotary system.

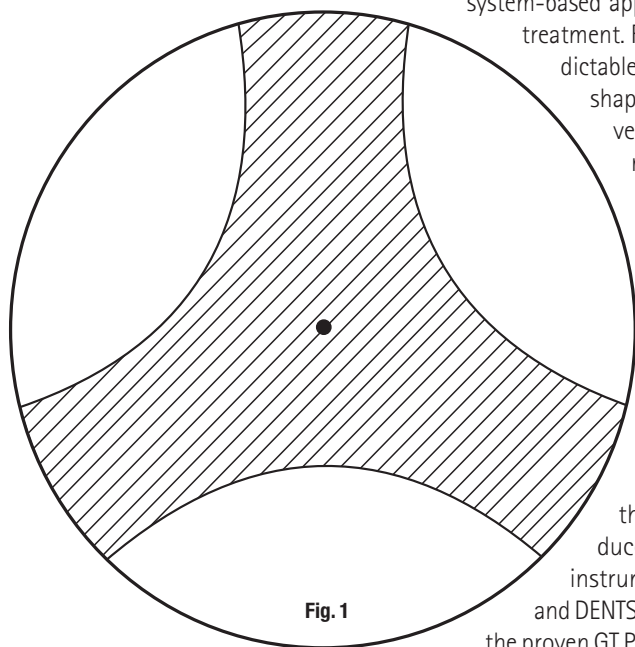


Fig. 1

Fig. 1 | File cross-sectional view showing a radial landed cutting edge design—the radial land is the portion of the file that trails the cutting edge and contacts the radial arc.

Variable radial land width

Radial landed cutting edges are the only blade design proven to maintain the original canal path and therefore prevent canal transportation. Figures 1 and 2 illustrate the difference between a radial landed cutting edge and a non-radial landed cutting edge. In Figure 1, the radial land portion is the portion of the file that trails the cutting edge and contacts the radial arc. It is the trailing radial surface that limits lateral cutting forces in a curved canal and prevents canal transportation.

Figure 2 shows a non-radial landed triangular cross-section with only the apices of the triangle contacting the radial arc. The non-radial landed cutting blade design in Figure 2 is more likely to transport a curved canal. Similar to the original GT system, the new GTX instruments have radial landed cutting edges.

Newer manufacturing technology has allowed for the radial land width to change over the length of the instrument. The variable radial land width feature of GTX allows for thinner radial lands and enhanced cutting efficiency in areas where canal transportation is less likely. Wider width radial lands are used in areas in which canal transportation is more likely to occur. The outcome is improved cutting efficiency without compromising safety. Along with radial landed cutting edges, GTX has the same rounded tip design as the original GT files. This feature is critical to preventing ledge formation and transportation.

Desired features in a NiTi rotary instrument

In order to appreciate the attributes of the GTX system, we must understand what is desired in a NiTi rotary system. Resistance to breakage, preventing canal transportation, conserving coronal dentine, creating good apical taper, and efficient cutting are what I look for in a rotary instrument system. Until now, clinicians had to choose between safe, flexible, radial landed instruments and faster cutting non-radial landed instruments. GTX design features, such as variable radial land width, 1 mm maximum flute diameters, safe-ended tip configuration, open-spiralled flute geometry and M-Wire, have produced an endodontic instrument that is both safe and efficient.

Maximum flute diameter

The 1 mm maximum flute diameter is the best feature of the original GT system and has been retained in the new GTX instruments. Maximum flute diameter is defined as the largest diameter of the instrument fluting. It occurs at the most coronal aspect of the instrument's taper. A conventional tapered instrument has a continuous taper for 16mm and the maximum flute diameter is different for different instrument sizes. For example, a conventional size 30 tip 0.06 tapered instrument has a maximum flute diameter of 1.26 mm, which is a diameter 26% larger than that of a 30 tip 0.06 tapered GTX instrument. All instruments in the GTX system have a maximum flute diameter of 1 mm regardless of the tip size or taper.

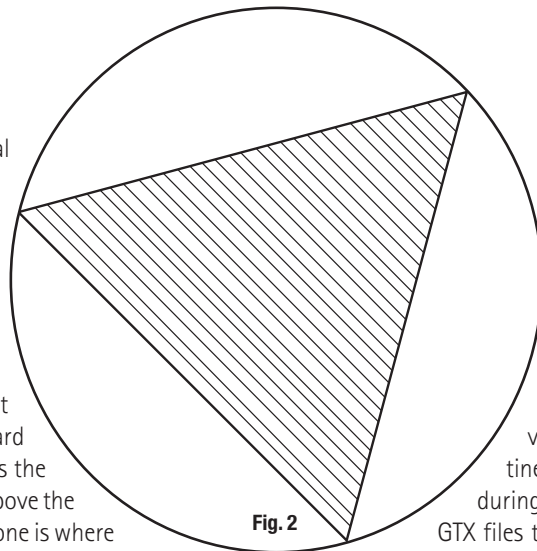


Fig. 2 File cross-sectional view showing a non-radial landed cutting edge design: in this design, only the cutting edge contacts the radial arc.

At a time in which canal shapes are moving in the direction of more conservative coronal diameters, the GTX 1 mm maximum flute diameter preserves tooth structure in this region of the canal. The most important area of the tooth with regard to vertical root fracture is the 1 mm region below and above the crestal bone. This 2 mm zone is where the GTX 1 mm maximum flute diameter is most beneficial, which is the reason that I feel it is such an important feature.

Since implants are the comparative treatment against which endodontic treatment is now measured, the bar for endodontic treatment is much higher than it once was, and conserving tooth structure and preserving the structural integrity of the tooth are critical for long-term success—not only long-term success for the treated tooth, but also long-term success for endodontics. If I look back at the canal shapes I was creating ten years ago, I see a significant improvement in the amount of dentine I am saving apical to the pulpal floor. The 1 mm maximum flute diameter of the GTX system automatically preserves canal dentine in the area most critical for maintaining the structural integrity of the tooth.

M-Wire NiTi

GTX files are the first rotary instruments to use a new type of NiTi wire known as M-Wire. M-Wire NiTi, the raw material used to manufacture GTX files, was developed by Dr Ben Johnson of Tulsa in Oklahoma. M-Wire is manufactured using a proprietary wire-drawing method, which produces a more favourable molecular arrangement of the NiTi alloy matrix. Multiple studies demonstrate that M-Wire is superior to traditional NiTi 508 in both flexibility and cyclic fatigue resistance. Increased flexibility means there are fewer lateral cutting forces applied to the canal in areas of curvature, which results in less lateral transportation of the canal. Cyclic fatigue resistance means the instrument is less likely to separate in areas of canal curvature. M-Wire is the most significant improvement to endodontic instrumentation since NiTi was introduced over two decades ago.

Increased flute space and reduced core diameter

When you first look at a GTX file, you notice that the flutes are spaced farther apart and there are fewer spirals on the instrument. This feature is the

helical angle. The helical angle for GTX is greatly reduced compared to original GT files. The reduced helical angle produces a more stretched out fluting geometry. The space between flutes is increased, thereby providing more space for dentine shavings to accumulate during use. This feature allows for GTX files to be used in the canal for more revolutions before the flutes fill with debris. Along with increasing the flute space, the reduced helical angle creates a more efficient cutting angle for the rotating blade edges to engage the dentine. This is the same reason reamers are more efficient in rotary action than files.

In order to increase flexibility further, the new GTX system has a reduced core diameter. The reduced core diameter is partly a consequence of the reduced helical angle and increased flute space. Core diameter is the single most important factor affecting instrument flexibility. The reduced core diameter of the GTX instruments offers a flexibility advantage over the original GT system.

End result

The advances in instrument flute geometry and metallurgy incorporated into the new GTX system have created a superior cutting instrument, while maintaining the inherent safety and system-based approach of the original GT system. From a clinical standpoint, fewer files are needed to produce the final canal shape. At a time in which cutting speed is what many clinicians desire, it is refreshing to see Dr Buchanan and Dentsply take a deliberate approach to maintaining the safety level for which the original GT file system is known. Holding true to radial lands and a safe-ended tip design are what distinguish the GT brand from all the others.

about the author

roots



Dr Chris J. Lampert received his certificate in Endodontics from Boston University and is a full-time practicing Endodontist in Portland, Oregon. Dr Lampert is a Specialist Member of the American Association of Endodontists, the American Dental Association and the Oregon Dental Association. He can be contacted at lampertendo@gmail.com.