# File selection: Why geometry matters most

**Author**_ Dr L. Stephen Buchanan, USA

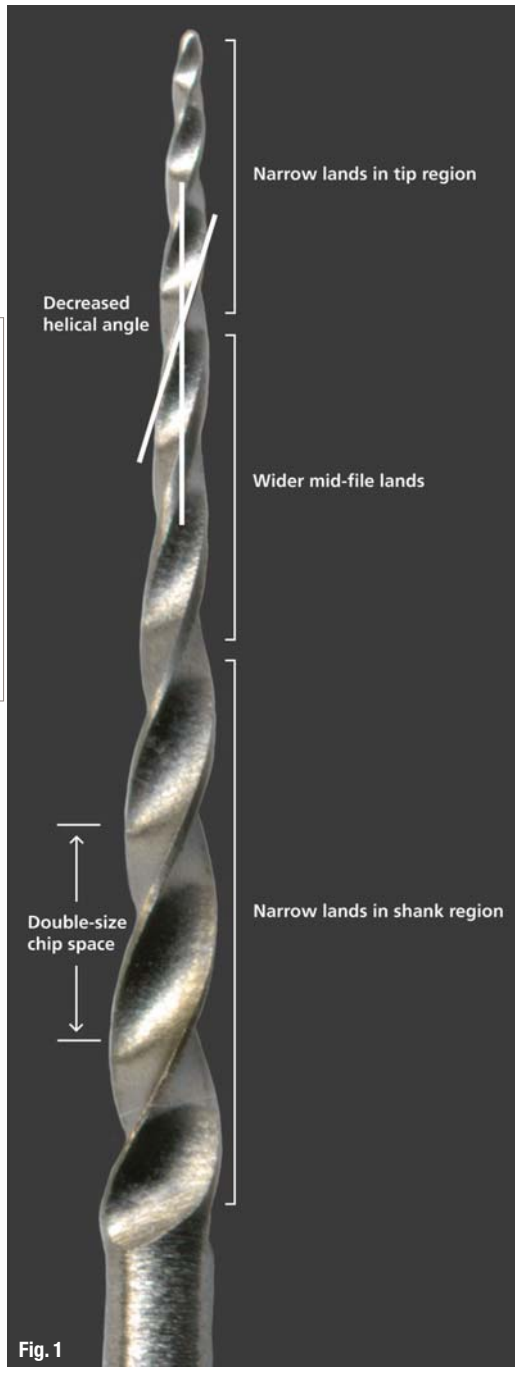



**Fig. 1**_GT Series X File. Note the maximum shank diameter at 1 mm, the radiused tip, the consistent, wider blade angle and the variable-width lands. At the tip and shank ends, the land widths are half the size of the lands in the middle region of the flutes, allowing rapid cutting without transportation.


**Fig. 2**_Micro-CT reconstruction of curved canals shaped in a mesial root of a mandibular molar, comparing outcomes in the apical third with rotary files of radiused vs. aggressive tip geometry. Note the canal on the right showing severe transportation (aggressive tip) and the canal on the right following the original canal path as the canal terminates (GTX-radiused tip).

**Figs. 3 & 4**_Maxillary and mandibular molar shaped using 1–3 GTX files in each canal. Notice the fidelity to the original canal path.

**_Shortly after the excitement** of the rotary file revolution wore off, the next frontier in shaping technology became the search for faster cutting efficiency. This is logically similar to our continuing search for increasingly faster computers.

However, experienced clinicians started seeing overfills from transportation, shortened canals, apical ripped canal termini, over-shaped coronal regions and cyclic fatigue failures that hadn't occurred with their safer, slower files. The first-order question in file selection became: safe or fast? Landed-blade instruments with radiused-tip geometry were much safer, in terms of avoidance of transportation, but non-landed blades with aggressive cutting tips were faster cutting.

The advent of GTX Files with M-Wire has eliminated the difficult decision between safety and speed. They are the first rotary shaping instruments that deliver speed of cutting with safety from transportation and breakage (Fig. 1).

M-Wire, a new rhombohedral-phase NiTi metal used in GTX Files, has radically improved the files' resistance to cyclic fatigue. While R-phase (the sweet spot between austenite-phase and martensite-phase NiTi) will become the new industry standard for addressing cyclic fatigue, it will never solve the problem of dangerous file geometries.

The radial lands on GTX Files have been optimised by varying the width of these lands along the length of the file. This geometrical change vastly improves cutting efficiency without derangement of the canal path, a claim that no file set without lands can make (Fig. 2). Furthermore, the decreased flute angle has significantly increased GTX File's flexibility compared with other landed instruments, simultaneously doubling the chip space between the flutes for a longer cutting time before clogging.

Another important design feature of GTX Files is their limited maximum flute diameter. Keeping the


Fig. 3

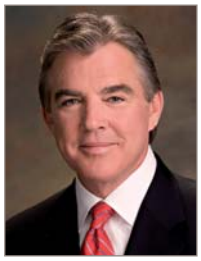

Fig. 4

cutting flute diameters limited to 1mm controls the amount of coronal enlargement during the shaping procedure, which is critical to the maintenance of the structural integrity of roots and to the avoidance of strip perforation.

All of these innovations in design geometry have resulted in a file set that typically cuts the ideal shape in most canals with one to three instruments and in as little time as 30 to 45 seconds (Figs. 3 & 4). That's why geometry matters._

## _about the author

roots



**Dr L. Stephen Buchanan** is a Diplomate of the American Board of Endodontics and a Fellow of both the International College of Dentists and American College of Dentists. Clinicians interested in his DVD series, *The Art of Endodontics*, and his hands-on laboratory workshops in Santa Barbara, USA, can call +1 800 528 1590 (US and Canada) or +1 805 899 4529 (for international calls).

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