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The ProTaper Technique

Shaping the Future of Endodontics

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There have been significant advancements in the development of NiTi rotary instruments in recent years. This evolution is driven by market demand and the continuous improvement in the manufacturing process. Dentists have increasingly identified the features they deem essential on the endless journey towards a more perfect file. These features include flexibility, efficiency, safety, and simplicity. The ProTaper system has been designed to provide these features; consequently, its entrance into the marketplace has had a profound effect.

The ProTaper NiTi files (Dentsply Maillefer; Ballaigues, Switzerland) represent a revolutionary generation of instruments for shaping root canals (Fig. 19.1).¹⁴ This chapter will review the ProTaper geometries, then describe the ProTaper concepts, techniques and finishing criteria that may be utilized to fulfill the mechanical and biological objectives for shaping canals. Learning the ProTaper concept will lead to discovery then appreciation for this six instrument set, comprised of just three Shaping and three Finishing files (Fig. 19.2).

PROTAPER GEOMETRIES

The following will describe the ProTaper geometries and specific features that make these Shaping and Finishing files remarkably unique.

The Shaping Files

Shaping File # 1 and Shaping File # 2, termed S1 and S2, have purple and white identification rings on their handles, respectively. The S1 and S2 files have D_0 diameters of 0.17 mm and 0.20 mm, respectively,

and their D_{14} maximal flute diameters approach 1.20 mm (Fig. 19.3). The Auxiliary Shaping File, termed SX, has no identification ring on its gold-colored handle and, with a shorter overall length of 19 mm, provides excellent access when space is restrictive. Because SX has a much quicker rate of taper between D_1 and D_9 , as compared to the other ProTaper Shaping files, it is primarily used, after S1 and S2, to optimally shape canals in coronally broken down or anatomically shorter teeth. The SX file has a D_0 diameter of 0.19 mm and a D_{14} diameter approaching 1.20 mm (Fig. 19.4).



Fig. 19.1. This endodontically treated mandibular second bicuspid demonstrates a smooth flowing dilacerated preparation, apical bifidity and the ProTaper advantage (Courtesy of Dr. Fabio Gorni; Milano, Italy).

Progressively Tapered Design

A unique feature of the ProTaper Shaping files is each instrument has multiple “increasing” percentage tapers over the length of its cutting blades. This progressively tapered design serves to significantly improve flexibility, cutting efficiency, and safety.³ Fortuitously, a progressively tapered design typically reduces the number of recapitulations needed to achieve length, especially in small diameter or more curved canals. As an example, the SX file exhibits nine increasingly larger tapers ranging from .035 to .19 between D_1 and D_9 , and a fixed .02 taper between D_{10} and D_{14} . The S1 file exhibits twelve increasingly larger tapers ranging from .02 to .11 between D_1 and D_{14} . The S2 file exhibits nine increasingly larger tapers ran-



Fig. 19.2. ProTaper files represent a revolutionary progression in flexibility, efficiency, safety and simplicity for preparing root canals.

ging from .04 to .115 between D_1 and D_{14} . This design feature allows each shaping file to perform its own “crown down” work. One of the benefits of a progressively tapered shaping file is that each instrument engages a smaller zone of dentin which reduces torsional loads, file fatigue and the potential for breakage.⁶

The Finishing Files

Three Finishing files named F1, F2 and F3 have yellow, red and blue identification rings on their handles corresponding to D_0 diameters of 0.20 mm, 0.25 mm, and 0.30 mm, respectively. Additionally, F1, F2, and F3 have fixed tapers between D_1 and D_3 of .07, .08, and .09, respectively (Fig. 19.5). However, unlike

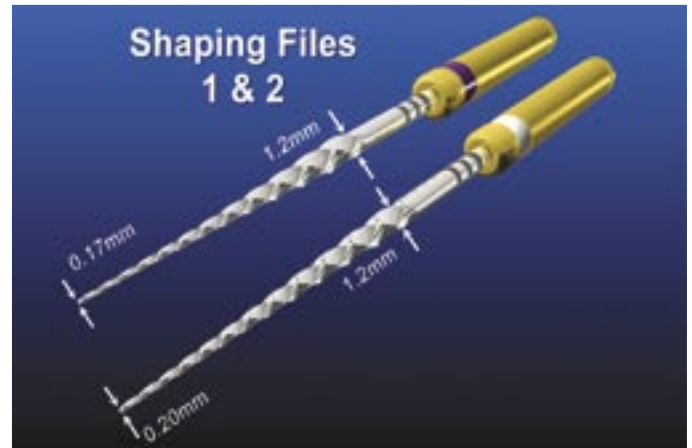


Fig. 19.3. S1 and S2 each have progressively larger tapers over the length of their blades allowing each instrument to perform its own crown-down work.

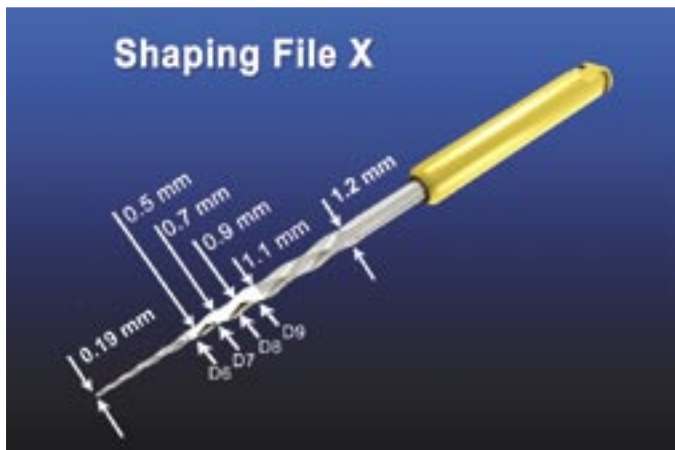


Fig. 19.4. Shaper X has 9 increasingly larger tapers ranging from .035 to .19 and is used in a brushing motion to cut dentin, between D_6 and D_9 , on the outstroke.



Fig. 19.5. The finishing files have variable D_0 diameters and tapers, and blend the deep shape into the middle one-third of the canal.