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**Research Title:** Shaping Characteristics of ProTaper Gold, ProTaper NEXT and ProTaper Universal Systems in Curved Canals

**Summary:**

Introduction: This study evaluated the shaping characteristics of the ProTaper Gold system (PTG), and compared it with that of ProTaper Next (PTN) and ProTaper Universal (PTU) systems using micro-computed tomographic imaging (micro-CT).

Methods: Twenty-four mandibular first molars with 2 separate mesial canals were matched anatomically by micro-CT scanning (SkyScan1174v2; Bruker-microCT) with a voxel size of 19.6  $\mu\text{m}$ . Canals were prepared with PTG, PTU or PTN rotary systems (Dentsply Maillefer) to F2 or X2 instruments, respectively, and scanned again. Co-registered images were evaluated for 2- and 3-dimensional morphometric measurements of canal transportation, centering ability, untouched canal walls and remaining furcation dentin thickness. Data was statistically compared using Kruskal-Wallis and 1-way ANOVA tests ( $\alpha=5\%$ ).

Results: Overall, PTN showed significantly higher percentage values of static voxels than PTG and PTU systems ( $P<.05$ ). Surface area, perimeter and minor diameter were higher in the PTG and PTU groups than in the PTN group ( $P<.05$ ). No difference was observed in form factor, roundness, major diameter, aspect ratio, and SMI ( $P>.05$ ). PTG ( $0.11\pm 0.05$  mm) and PTN ( $0.09\pm 0.05$  mm) produced significantly less transportation than PTU ( $0.14\pm 0.07$  mm) ( $P<.05$ ), and percentage decrease in furcation dentin thickness was significantly lower for PTG ( $23.86\pm 7.69\%$ ) and PTN ( $23.90\pm 10.14\%$ ) than to PTU ( $33.55\pm 10.56\%$ ) ( $P<.05$ ).

Conclusions: PTG and PTN produced less transportation and maintained more furcation dentin than PTU. PTN had less canal wall contact than PTG and PTU, but all file systems were able to instrument moderately curved mesial root canals of mandibular molars without clinically significant errors.

**Publications:** The paper has been submitted to the Journal of Endodontics and is currently being revised based on reviewer comments.