

## Laboratory Evaluation of Procodile Q Endodontic Files

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### Introduction:

This study evaluated the cyclic fatigue resistance and cutting efficiency of 2 types of reciprocating files. SEM evaluation of files after fatigue failure, and cross-sectional design was also conducted.

### Materials:

Size #020, #025, #035 files: **Procodile Q** (Komet USA), **WaveOne Gold** (Dentsply Sirona),

Endo Motor + Handpiece: **Promark Endo Motor** (Dentsply Sirona) and **TUL-8M** handpiece (Dentsply Sirona) used with the **Wave One** (All Files) setting

### Methods:

**Cyclic Fatigue Resistance (n=10):** 10 files of 3 different sizes were tested as received. Canals precision milled into hardened stainless steel with 5 mm radius and 80° angle in the Dental Advisor Cyclic Fatigue Platform was used using the Wave One Gold setting for all files without irrigation. Time until fracture was recorded, and means with standard deviations reported in the results.

**Cutting Efficiency and Durability (n=5):** After practice and familiarization with the materials, canals were instrumented root canals of Endo-Training-Bloc (Ref: A0177, Dentsply Sirona) with light water irrigation to remove excess debris using a light pecking motion when resistance was felt. The working time to reach the apex was measured for each instrument in sequence and the sum of the working times for each file used was calculated for #020 to #035 files. The cutting rate was calculated by dividing the working time by the working length (10 mm) to the apex. Three canals were instrumented in sequence by each set of files. Microscopic evaluation under 40x magnification next to new files were conducted before continuing to detect the presence of unwinding.

### Results:

	Komet			Dentsply Sirona		
	Procodile Q			Wave One Gold		
	#20	#25	#35	#20	#25	#35
Cutting Rate, mm/s	0.72 (0.04)	1.02 (0.08)	1.03 (0.05)	0.65 (0.03)	0.85 (0.06)	0.82 (0.07)
Cutting Time, s	13.9 (0.7)	9.9 (0.8)	9.7 (0.5)	15.3 (0.8)	11.9 (0.8)	12.3 (1.0)
Full Sequence Time, s	33.5 (1.3)			39.47 (1.8)		
Cyclic Fatigue, s	450 (54)	435 (48)	377 (45)	228 (24)	147 (27)	116 (28)

**Cutting Efficiency and Durability Summary:** Overall cutting rate for **Procodile Q** was 16% faster than **Wave One Gold**. All Files survived past 2 canals. Significant unwinding was detected after the 3 canal instruments in three #020, three #025, and one #035 **Wave One Gold** files, and two #035 **Procodile Q** files.

**Cyclic Fatigue Resistance Summary:** **Procodile Q** files lasted between 197 % and 325% longer in the cyclic fatigue test than **Wave One Gold**.

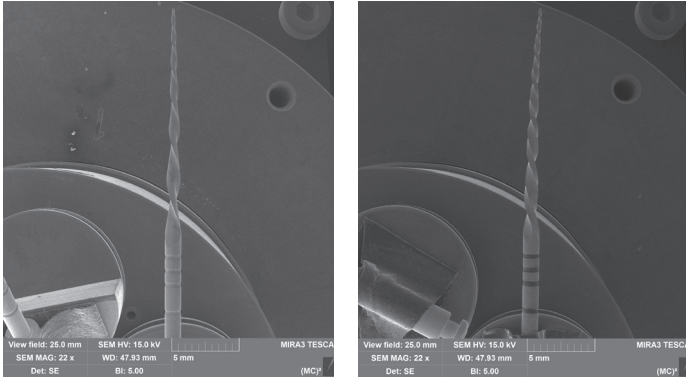


Fig 1. Full Length views of *Procodile Q* and *Wave One Gold* #025 primary files.

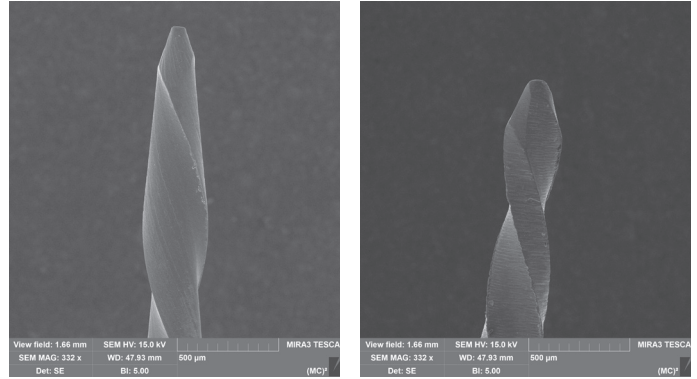


Fig 2. Magnified views of tip design

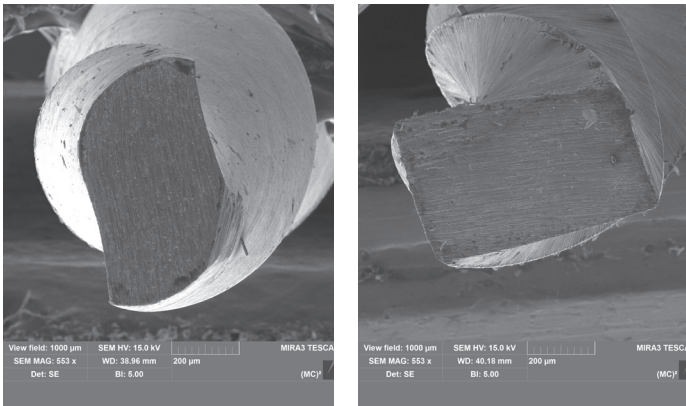


Fig 3. Cross-sectional views of #035 medium files. *Wave One Gold* files feature a parallelogram design with  $\sim 85^\circ$  cutting edge resulting in more of a scraping mode of instrumentation. *Procodile Q* files feature a more acute cutting angle with a  $\sim 106^\circ$  cutting edge.

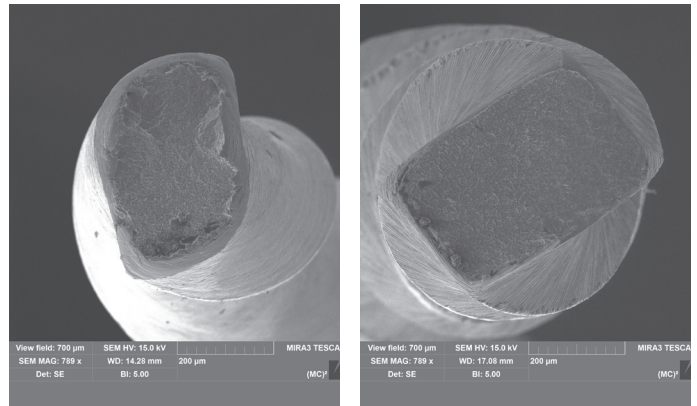


Fig 4. Size 020 Small files after cyclic failure

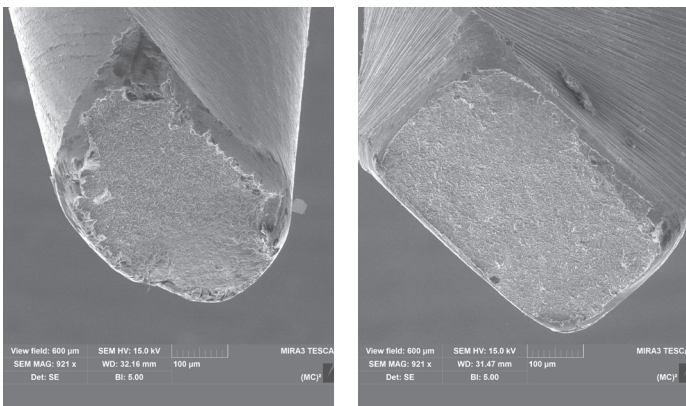


Fig 5. Size 025 Primary files after cyclic failure

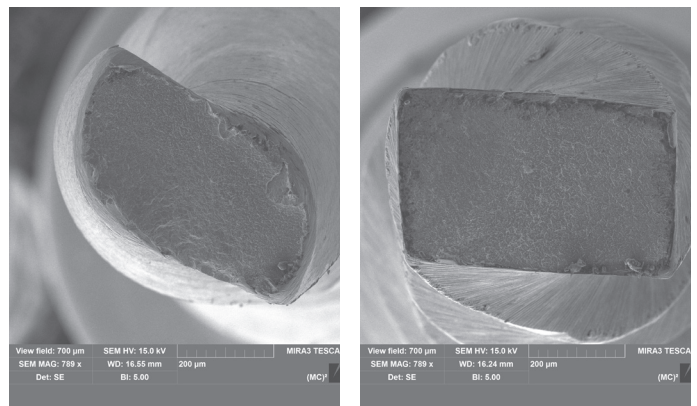
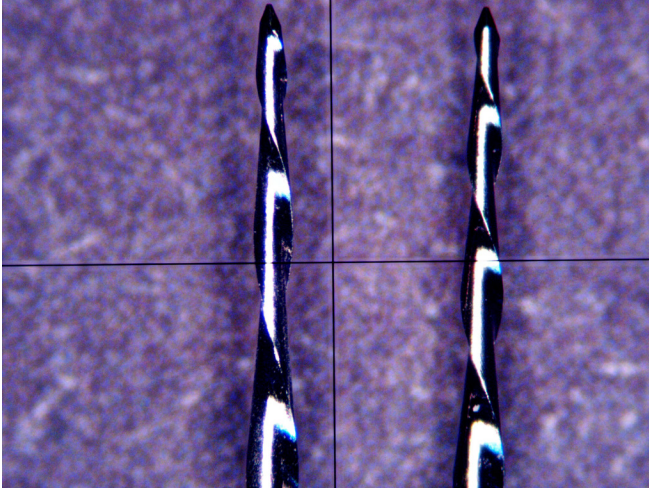
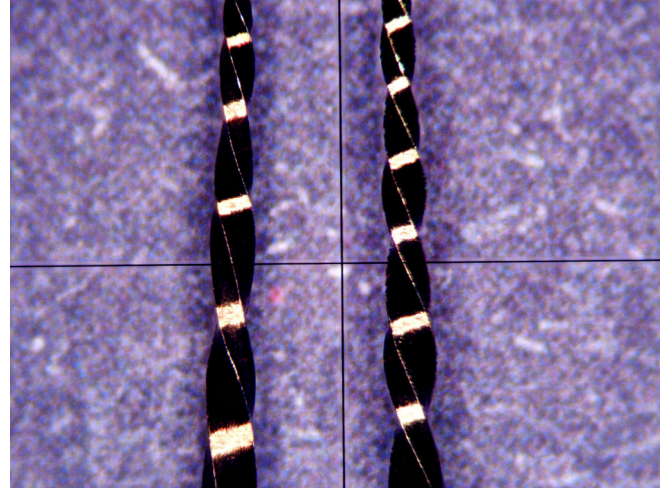


Fig 6. Size 035 Medium files after cyclic failure

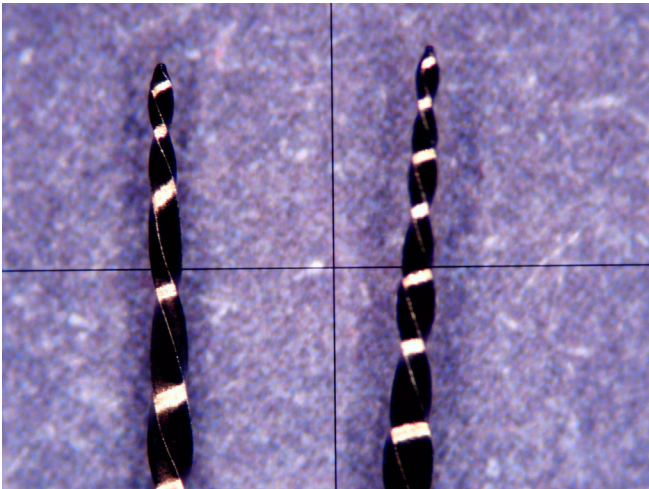
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**Fig 7.** Procodile Q 035 File with slight unwinding after 3rd canal (unused file on right for comparison)



**Fig 8.** Wave One Gold 020 File with unwinding after 3rd canal



**Fig 9.** Wave One Gold File 025 with unwinding after 3rd canal



**Fig 10.** Procodile Q removes a large amount of debris after use.