

Cutting Performance Comparison of FG 330 EdgeDental Carbide Burs

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Biomaterials Research Report

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EDGE DENTAL
SPECIALTIES

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Introduction:

This study compares the cutting efficiency and durability of **FG 330 Carbide Burs** and provides a visual SEM comparison of the bur products before and after cutting. A custom bur test jig utilizing an electric handpiece and a specimen carriage that holds the substrate while the carriage is pulled into the rotating bur is used to perform the testing. The system is driven by a universal test machine crosshead that was programmed to deliver a constant force when pulling the carriage.

Experimental Design:

Materials and Equipment:

DENTAL ADVISOR Bur Testing Platform

Intramatic Lux 2 Electric Handpiece and Intra Lux KL 701 Motor (Kavo Kerr) operated at 150K RPM

Macor® substrates, 20 mm x 20 mm x ~7mm thick (depth of cut, ~1.4 mm)

FG 330 Carbide Burs: FG330 [Lot: 1183807] (EdgeDental), Alpen Carbide 330 FG [Lot H56144] (Coltene/Whaledent Inc.), Midwest FG330 [Lot 10458606] (DENTSPLY Sirona), Meisinger Singles 330 [lot R22611] (Meisinger)

Repetitions: 5 identical burs of each product tested, with 5 passes for each bur (100 mm of cutting)

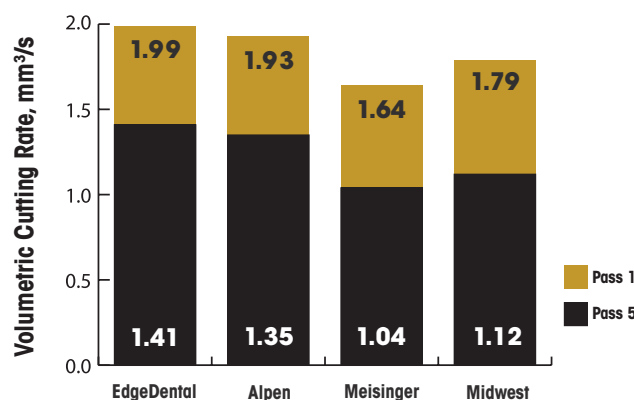
Methods:

The bur test machine is composed of an electric handpiece driving the test burs while positioned over a carriage holding the Macor® test specimens. The carriage holding the specimen is moved into the rotating bur by a cable connected between it and the cross-head of a universal test machine (Instron 5866) operated in load control. A dry run without cutting was performed before every bur to measure the friction inherent in the system and the load zeroed to 0 +/- 0.05 N over the total length of travel. The applied load was held constant at 1.0 N as the Macor® specimen was moved against the bur. The electric handpiece was operated at 150k RPM with a deionized water spray.

Due to differing bur lengths of approximately 0.5 mm from shortest to longest, spacers were made to raise the Macor® specimen holding platform to equalize the depth of cut for each specimen. Depth of cut was set at 1.4 +/- 0.2 mm. The depth of cut of each pass was measured with a micrometer attached to a binocular microscope at 10X magnification on each end of the cut Macor® slabs and averaged. Microscopic images were captured on the ends of cut specimens and the cross-sectional area measured using the depth of cut and ImageJ software (NIH). Average volume of cut per mm of depth of cut was calculated from 3 measurements of area for each bur. Cutting volume was calculated by the cross-sectional area x 18 mm of linear cutting distance. The volumetric cutting rate was calculated by dividing the cutting volume by the time measured to cut from 2 to 20 mm for each repetition. The mean volumetric cutting rate and standard deviations are reported in the results.

SEM images of a new bur taken directly out of the package and ultrasonically cleaned used burs were taken with a Tescan MIRA3 microscope at the Michigan Center for Materials Characterization.

Results: FG 330 Carbide Bur Cutting Rates



Macor®
Ceramic Substrate



Customized cutting platform

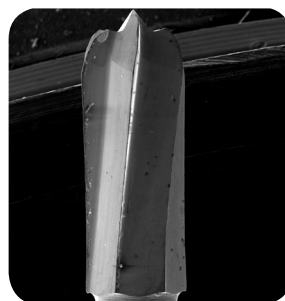
FG 330 Carbide Burs				
	EdgeDental	Alpen	Meisinger	Midwest
Pass	Volumetric Cutting Rate, mm ³ /s			
1	1.99 (0.16)	1.93 (0.13)	1.64 (0.11)	1.79 (0.11)
2	1.83 (0.20)	1.74 (0.12)	1.48 (0.12)	1.64 (0.13)
3	1.67 (0.21)	1.58 (0.15)	1.31 (0.14)	1.49 (0.16)
4	1.55 (0.23)	1.46 (0.11)	1.21 (0.19)	1.31 (0.20)
5	1.41 (0.28)	1.35 (0.14)	1.04 (0.18)	1.12 (0.23)
Overall Average	1.69 (0.29)	1.61 (0.24)	1.34 (0.25)	1.47 (0.29)
Decrease in cutting rate after 5 passes, %	29.2	30.2	36.6	37.7

Cutting rates are shown with means and standard deviations. Midwest and Meisinger burs had a larger drop in cutting rates after 100 mm of cutting (37.7% and 36.6%) than EdgeDental and Alpen burs (29.2% and 30.2%).

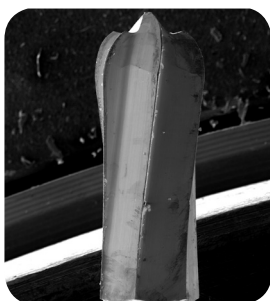
Conclusion:

EdgeDental FG 330 carbide bur demonstrated an above average cutting rate and higher durability compared to similar carbide burs on the market.

Fig.1: Visual Comparison of New vs Used **FG 330 Burs**



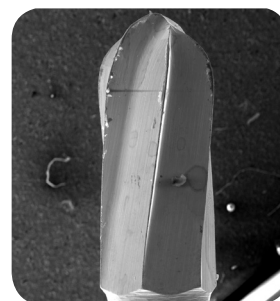
EdgeDental New



EdgeDental Used



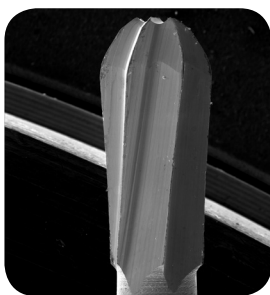
Meisinger New



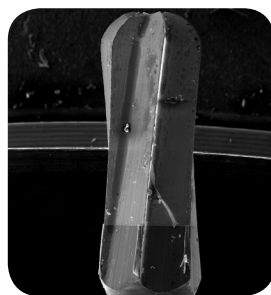
Meisinger Used



Alpen New



Alpen Used

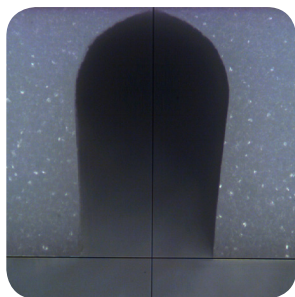


Midwest New

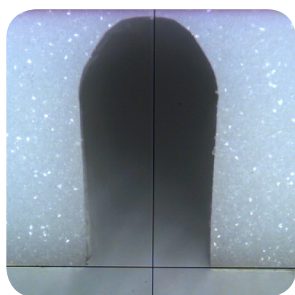


Midwest Used

Fig.2: Comparison of the cutting profile of the tested burs.



EdgeDental



Alpen

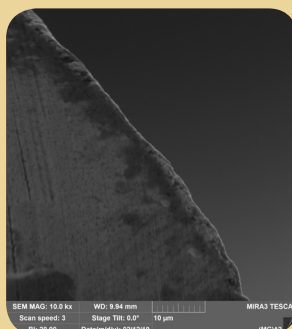


Meisinger



Midwest

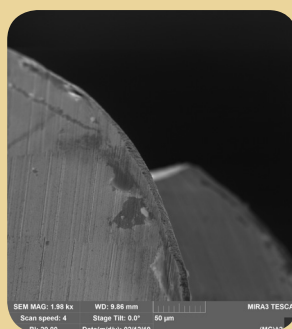
Fig.3: High magnification images of cutting edges before and after use of an EdgeDental Bur showing moderate wear of cutting edges



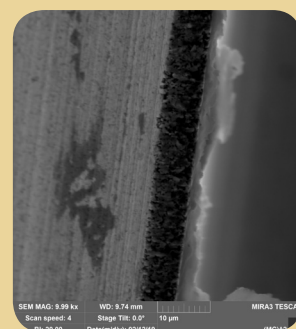
EdgeDental New



EdgeDental New



EdgeDental Used



EdgeDental Used



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