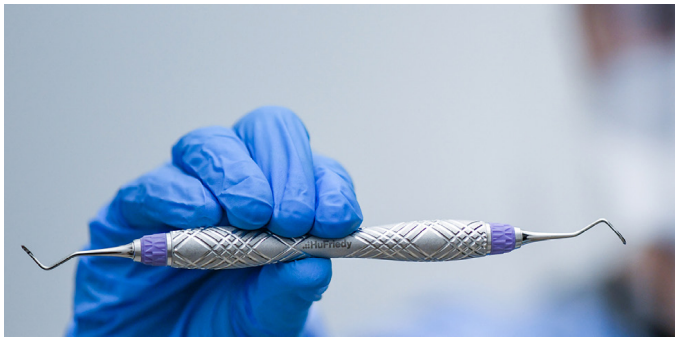


Sharpness and Wear Rate of Periodontal Curettes

Abstract

Effective periodontal debridement remains fundamental to the management of periodontal disease. Successful non-surgical periodontal therapy relies upon efficient removal of biofilm and calculus, which depends in part on the sharpness and edge longevity of periodontal instruments.

The purpose of this study was to evaluate several scaler brands on initial sharpness and edge retention characteristics. The study used standardized mechanical testing to evaluate multiple samples of various scaler brands for initial (out-of-box) sharpness and rate of wear (over 500 cycles). As part of this evaluation, a test protocol was developed by CATRA (Cutlery Allied Trades Research Association). Equivalent tests were performed on instruments from each manufacturer and data was compiled so that direct comparisons could be made. Results indicated significant measurable differences in cutting edge performance across instrument brands and types.



EverEdge 2.0 scalers continue to exhibit an intrinsic resistance to edge wear and thus expected to last significantly longer than alternative brands. Also, HuFriedyGroup EverEdge 2.0 exhibited superior initial sharpness compared to alternative brands. These scalers provided the most consistent out-of-box sharpness across each tested sample set.

Clinical Problem

Mechanical debridement to remove etiological and contributing factors, such as biofilm and calculus, remains the cornerstone of stabilizing the infection¹. The effectiveness of calculus removal is directly influenced by the blade sharpness². Variability in instrument quality can create challenges for clinicians during clinical use.

This paper presents standardized mechanical findings comparing the out-of-the-box initial sharpness and edge longevity of cutting edges among various periodontal instrument brands and types.

Evidence Review

Treatment planning guidelines emphasize the importance of mechanical instrumentation or the effective treatment of periodontal disease¹. Results from a systematic review and meta-analysis showed that effective hand instrumentation led to superior outcomes in pockets $\geq 6\text{mm}^3$. Instrument sharpness plays a key role in achieving better results during scaling, including greater accuracy, reduced clinician fatigue, reduced risk of tissue trauma, and a lower risk of burnishing calculus⁴.

Methodology

Laboratory testing was conducted by CATRA (Cutlery Allied Trades Research Association), a Sheffield, England laboratory founded in 1952 that specializes in independent evaluation of blade materials and cutting-edge performance.

Eleven sets of instruments (all H6/7 sickle scalers), from seven different manufacturers were submitted to CATRA for testing. All eleven sets were brand new, unopened scaler packages.

Instrument sharpness and wear rate were evaluated using CATRA REDS (Razor Edge Durability and Sharpness) testing platform under standardized laboratory conditions. Initial sharpness was determined by measuring the cutting force required for each blade to penetrate the controlled test media. For each instrument, all four blade edges were tested. Cutting forces were accurately measured in Newtons (N) with lower force values indicating a sharper edge and higher force values indicating a duller edge. The maximum measurable force was 17.0N. If a blade was dull and unable to cut the test media, a value of 17.0N was assigned and noted. Cutting edge wear rate was assessed over 500 wear cycles to simulate repeated calculus removal strokes, with wear defined as an increase in cutting force from baseline under identical testing conditions across all instruments.

Statistical analysis was performed for each brand and type. The average initial sharpness, variation of out-of-box sharpness, and average wear rate were determined for each instrument group.

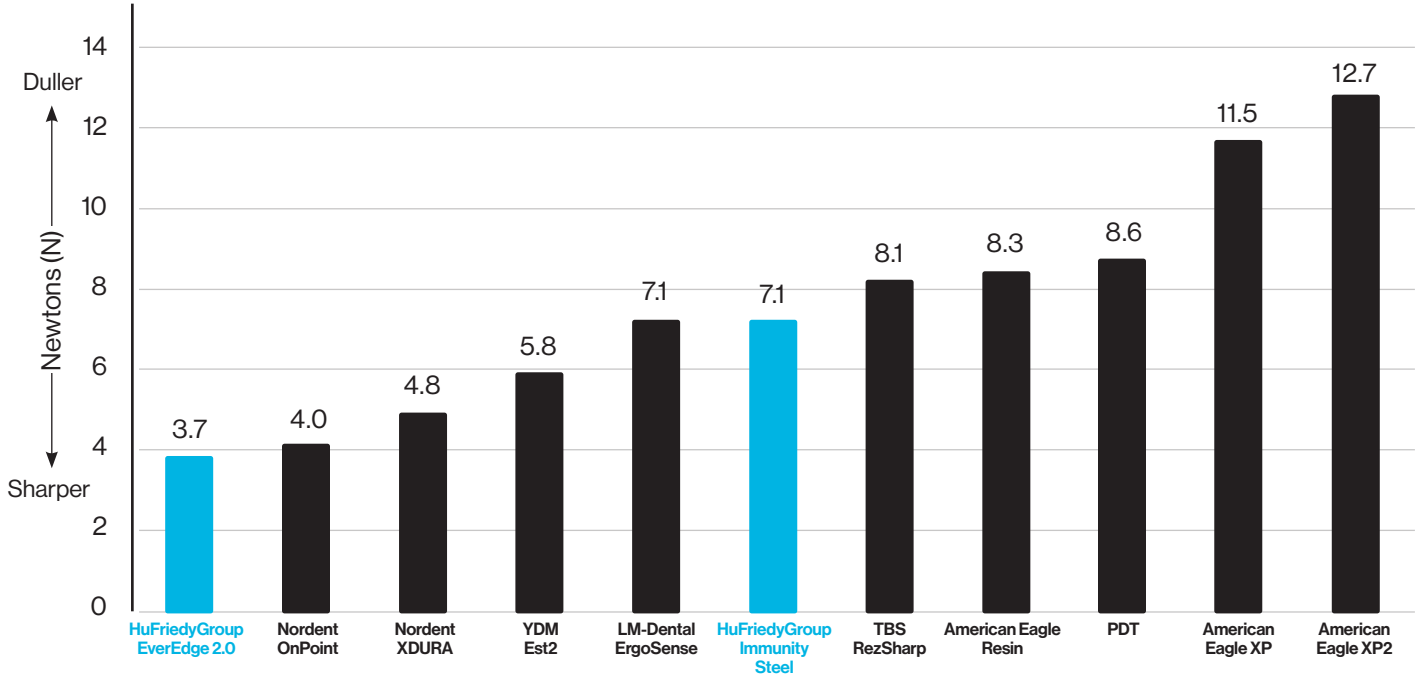
CATRA Results

1. Initial (out-of-box) Sharpness

HuFriedyGroup EverEdge 2.0 exhibited the best out-of-box sharpness of all brands. HuFriedyGroup Immunity Steel, a mid-tier option, exhibited equal or better sharpness compared to 3 other brands.

Figure 1:

Comparison of Initial (out-of-box) sharpness across instrument types



*See abbreviation key on last page

Table 1:

Initial (out-of-box) sharpness varied across the scalers as reflected by differences in cutting force (N=Newtons) required to penetrate the standardized test media.

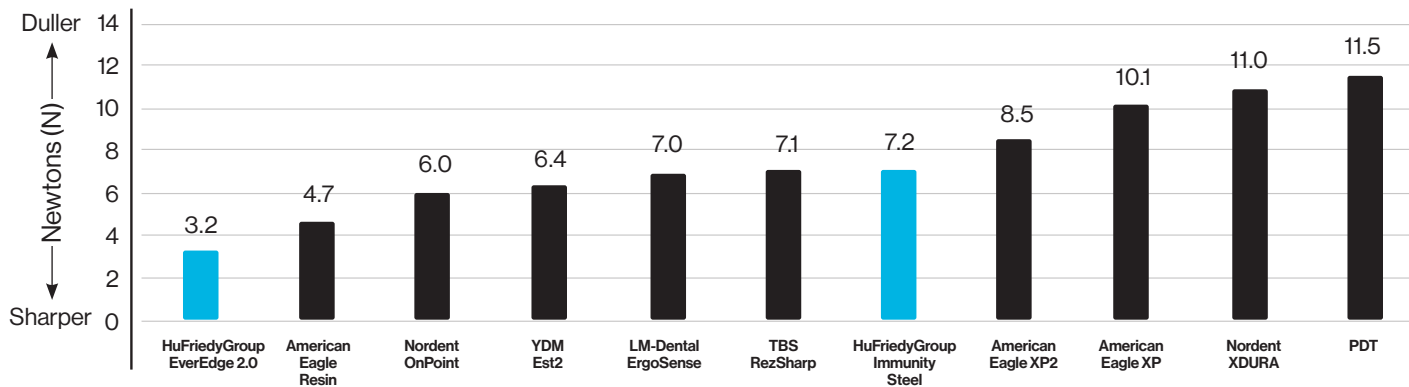
Initial Blade Sharpness	Instrument Type	Cutting Force (N)	Scaling Force
Higher	HuFriedyGroup EverEdge 2.0	<3.9	Low
Middle	HuFriedyGroup Immunity Steel	4.0 - 7.9	Moderate
	Nordent OnPoint		
	Nordent XDURA		
	YDM Est2		
	LM ErgoSense		
Lower	TBS RezSharp	8.0-17.0	High
	American Eagle Resin		
	PDT		
	American Eagle XP		
	American Eagle XP2		

* Categorization of CATRA results determined by Dr. Silky Sharma

Consistency of the Initial (out-of-box) Cutting Edge

CATRA testing evaluated the consistency of out-of-box sharpness for each instrument blade within each type. Several scaler types exhibited a wide variation of out-of-box sharpness, with one type, for example, ranging from 5.5 N to over 17.0N. Lower values indicate greater consistency in out-of-box sharpness. Inconsistent out-of-box sharpness may be due to a variety of manufacturing factors including poor angulation set-up during sharpening, improper sharpening technique or improper pressure applied along the blade edge.

Figure 2:
Variation in initial sharpness by instrument type

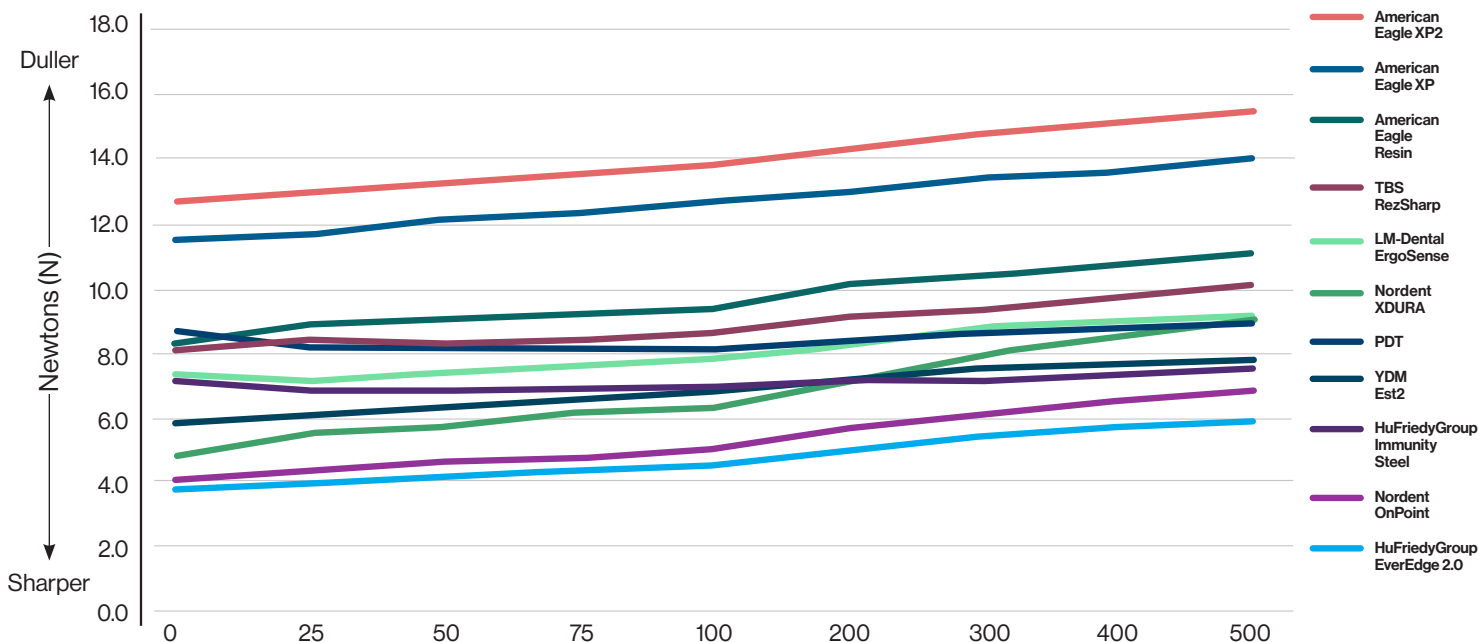


HuFriedyGroup EverEdge 2.0 showed the lowest variation in out-of-box sharpness with a narrow range of only 3.2N.

Wear Rate

The rate of blade wear is dependent on the material used and should be linear in nature. All instruments were evaluated for wear over 500 testing cycles. Measurement was in Newtons. Lower numbers (N) indicate greater wear resistance and longer lasting cutting edge insert.

Figure 3:
Comparison of average wear rate measured across 500 cycles. Lower wear (measured in Newtons) and a stable, linear curve indicate greater cutting-edge retention (or wear resistance).



To start out sharp and stay sharper longer, an instrument should exhibit a low initial force to cut the test media along with a low variance of cutting force over 500 cycles.

Figure 3 on the previous page indicates the range of sharpness among various instrument types with HuFriedyGroup EverEdge 2.0 starting out with the lowest force at 3.7N (the sharpest) and remained producing the lowest force throughout the 500 cycles. American Eagle XP2 required the most initial force and exhibited the highest force needed to cut the test media throughout the 500 cycles. Nordent XDURA initially required moderate force at 4.8N but experienced the greatest increase in force required to cut the test media, ending 500 cycles at 9.1N (variance = 4.3N). Table 2 provides details by instrument type.

Table 2:

Instrument Type	Avg. Initial Sharpness Force	Test Cycles (Force in Newtons (N))								Change in cutting force over 500 cycles
		25	50	75	100	200	300	400	500	
American Eagle XP (replaced by XP2)	11.5	11.7	12.1	12.3	12.7	13.0	13.4	13.6	14.0	2.5
American Eagle XP2	12.7	13.0	13.2	13.5	13.8	14.4	14.8	15.1	15.5	2.8
American Eagle Resin	8.3	8.8	9.0	9.2	9.3	10.1	10.4	10.7	11.1	2.8
LM-Dental ErgoSense	7.1	7.1	7.4	7.6	7.8	8.2	8.7	8.9	9.1	2.0
Nordent OnPoint	4.0	4.3	4.6	4.7	5.0	5.6	6.0	6.5	6.8	2.8
Nordent XDURA	4.8	5.4	5.7	6.1	6.3	7.2	7.9	8.5	9.1	4.3
PDT	8.6	8.1	8.1	8.1	8.1	8.4	8.6	8.8	8.9	0.3
TBS RezSharp	8.1	8.4	8.3	8.4	8.6	9.1	9.3	9.7	10.1	2.0
YDM Est2	5.8	6.1	6.4	6.6	6.8	7.2	7.5	7.6	7.8	2.0
HuFriedy-Group EverEdge 2.0	3.7	3.9	4.1	4.3	4.5	5.0	5.4	5.7	5.9	2.2
HuFriedy-Group Immunity Steel	7.1	6.8	6.8	6.9	6.9	7.1	7.1	7.3	7.5	0.4

Summary and Conclusions

- HuFriedyGroup EverEdge 2.0 demonstrated the greatest initial sharpness among the evaluated instruments, requiring up to 71% less initial cutting force compared to other instruments.
- HuFriedyGroup EverEdge 2.0 also showed the lowest variation in initial cutting force, indicating the most consistent out-of-box sharpness.
- After 500 strokes, HuFriedyGroup EverEdge 2.0 demonstrated up to 62% lower cutting force relative to other instruments tested over the same number of cycles.
- Nordent XDURA exhibited the highest increase in force (4.3N) needed to penetrate the test media over 500 cycles, indicating an increased wear rate throughout the test.
- American Eagle XP2 exhibited both the highest initial force needed to penetrate the test media (12.7N) and the highest force at 500 cycles (15.5N) indicating lowest initial sharpness and higher wear progression insert.

Clinical Takeaways

- Periodontal scaler types vary significantly in sharpness and cutting-edge wear rate.
- A sharper cutting edge requires less lateral pressure.
- Wear resistant instruments maintain their cutting edge across repeated strokes.
- Sharper and wear resistant instruments may improve clinician efficiency and reduce fatigue, increase patient comfort, and avoid burnishing of calculus.

References:

¹Sanz, M., Herrera, D., Kerschull, M., Chappel, I., Jepsen, S., Beglundh, T., Sculean, A., Tonetti, M.S., et al. (2020). Treatment of stage I-III periodontitis – The EFP S3 level clinical practice guideline. *Journal of Clinical Periodontology*, 47(S22), 4-60.

²Vyprynyuk, K., & Chitlall, A. (2022, February 17). Maintain the sharp cutting edge of periodontal instruments. *Dimensions of Dental Hygiene*.

³Zhang, X., Hu, Z., Zhu, X., Li, W., & Chen, J. (2020). Treating periodontitis-a systematic review and meta-analysis comparing ultrasonic and manual subgingival scaling at different probing pocket depths.

⁴Boyd LD, Mallonee LF, Wyche CJ, Halaris JF. Wilkins' *Clinical Practice of the Dental Hygienist*. 13th ed. Burlington, Massachusetts: Jones and Bartlett Learning; 2021.

Instruments Used During Testing:

Manufacturer	Type	SKU
American Eagle	7XPX	AESH6-7XPX
American Eagle	7XPXE	AESH6-7XPXE
American Eagle	7X	AESH6-7X
LM-Dental	ErgoSense	146-147 ES
Nordent	OnPoint	OPN67
Nordent	XDURA	RENSN67
Paradise Dental Technologies	R110	R110 H6-7
TBS	RezSharp	TBSH67
YDM Corporation	Est2	33301
HuFriedyGroup	EverEdge 2.0	SH6/79E2
HuFriedyGroup	Immunity	SH6/76



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