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Protection Effects of Bioglass® and Pro-Argin® Layers Formed On Dentine

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06/09/2017

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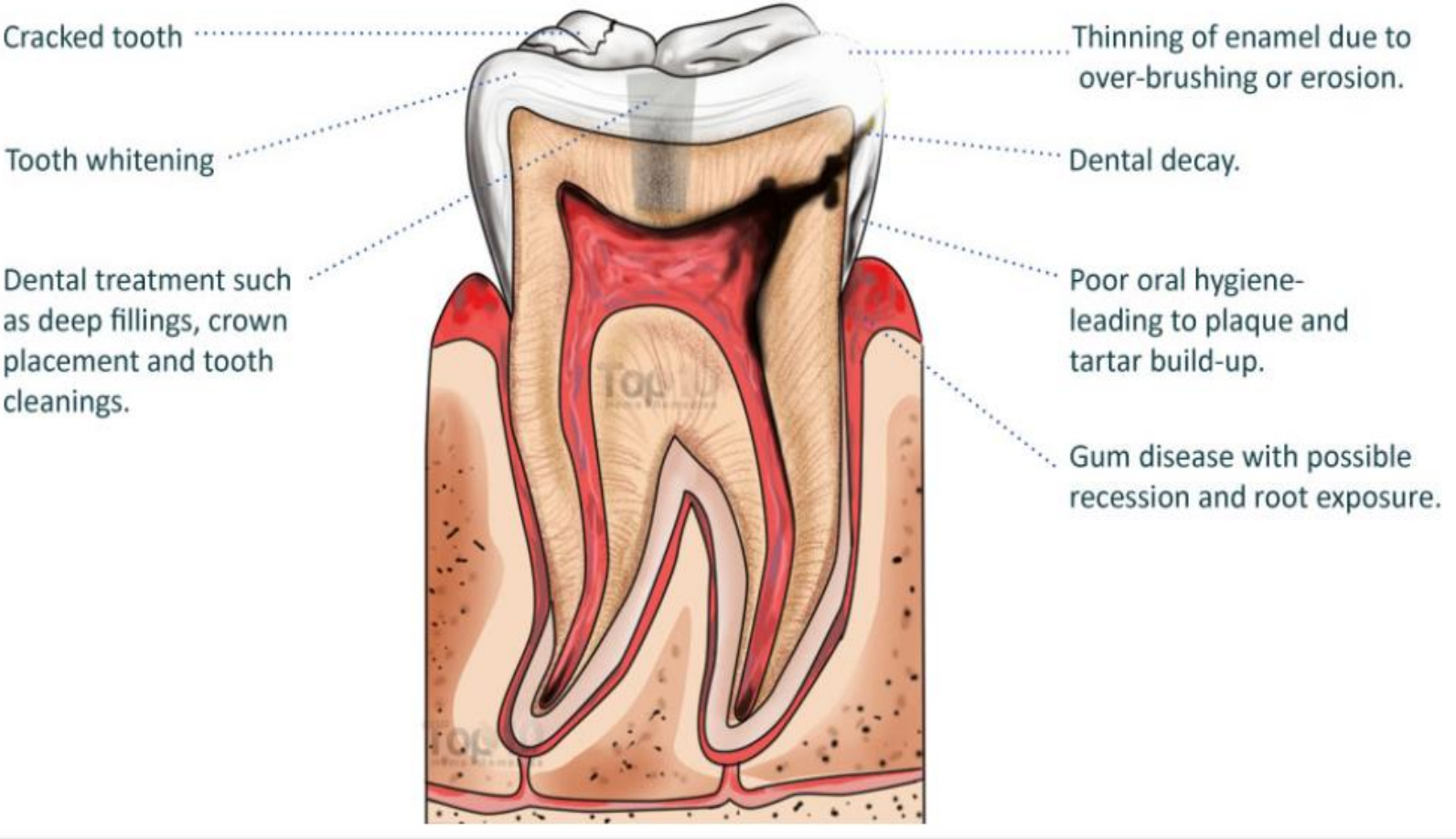
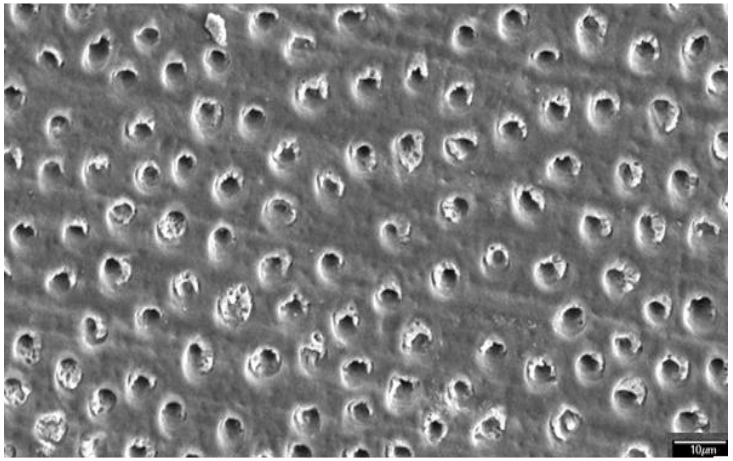
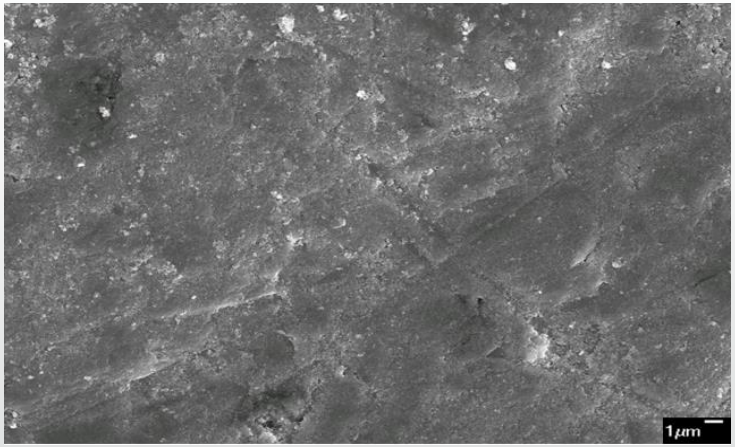
Common causes of sensitive teeth



Introduction

- Exposed dentine is at risk of further damage and wear through mechanical and chemical challenges
- Also result in sensitivity
- Protection of dentine is essential to prevent further damage and relief sensitivity
- Biactive glasses and pro-Argin form a layer on to the surface





Previous Work

- Properties such as hardness, modulus and abrasion resistance of the layer formed by toothpaste containing these two active ingredients is not understood

- Previous testing has been carried out in dry environment

- Have used microhardness testing: produce large indents to avoid substrate/ dentine influence

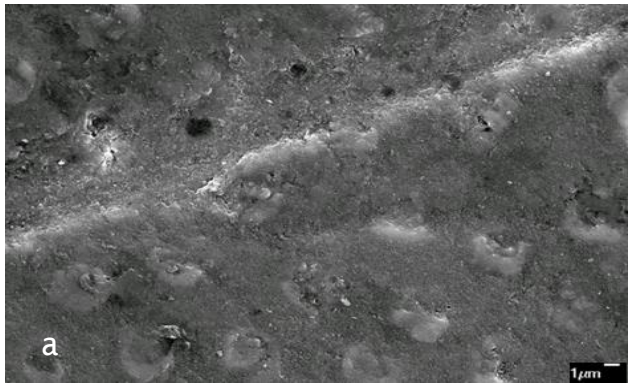
Objective:

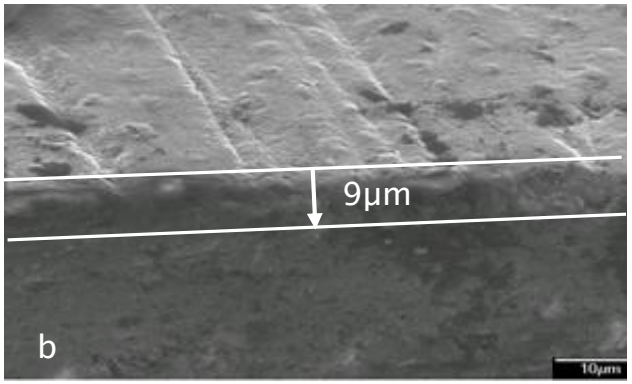
- Evaluate the protection offered on a nano-scale in a hydrated state

Materials and Methods

- 30 dentine sample
- Divided in to three equal testing group
  - Sensodyne Repair and Protect: 5% Novamin
  - Colgate Pro Relief: 8% Arginine
  - BioMin: Fluoro-Calcium-Phospho-Silicate
- Brushed with respective toothpastes for 2 minutes, twice a day for 7 days
- Kept in artificial saliva (pH of 6.5) between brushing
  - Changed every 24hrs

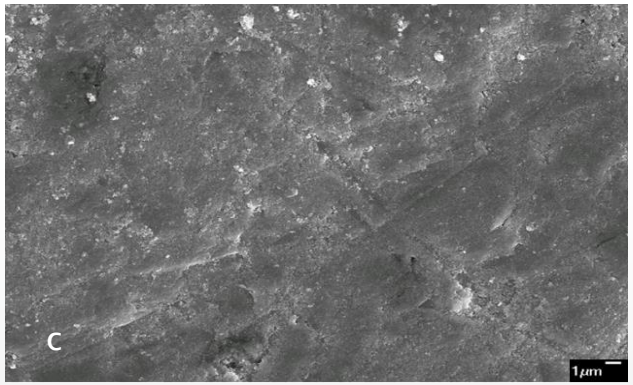
Pro-Argin surface

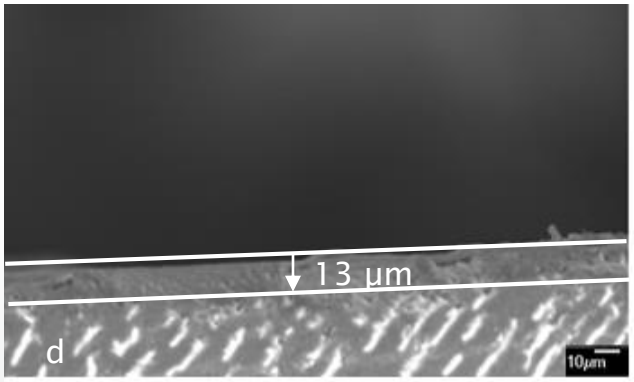




Pro-Argin cross section

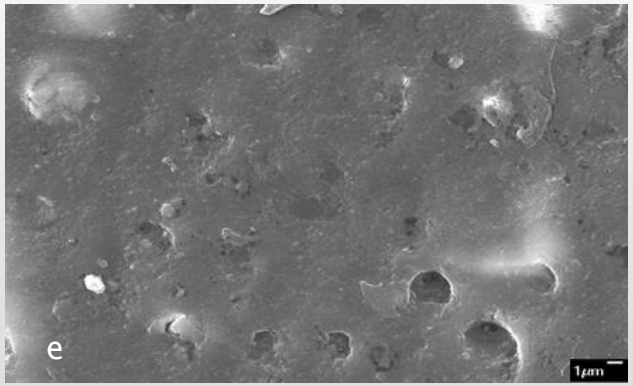
Novamin surface

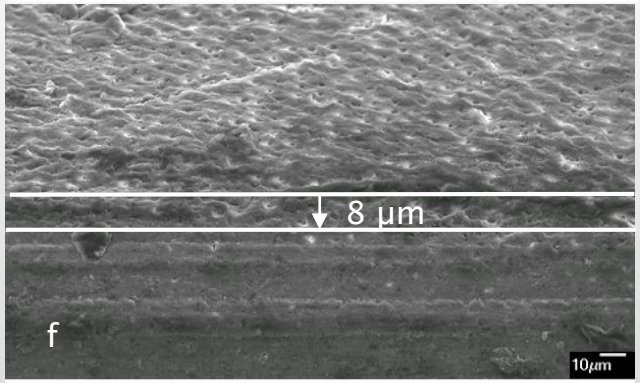




Novamin cross section

BioMin surface

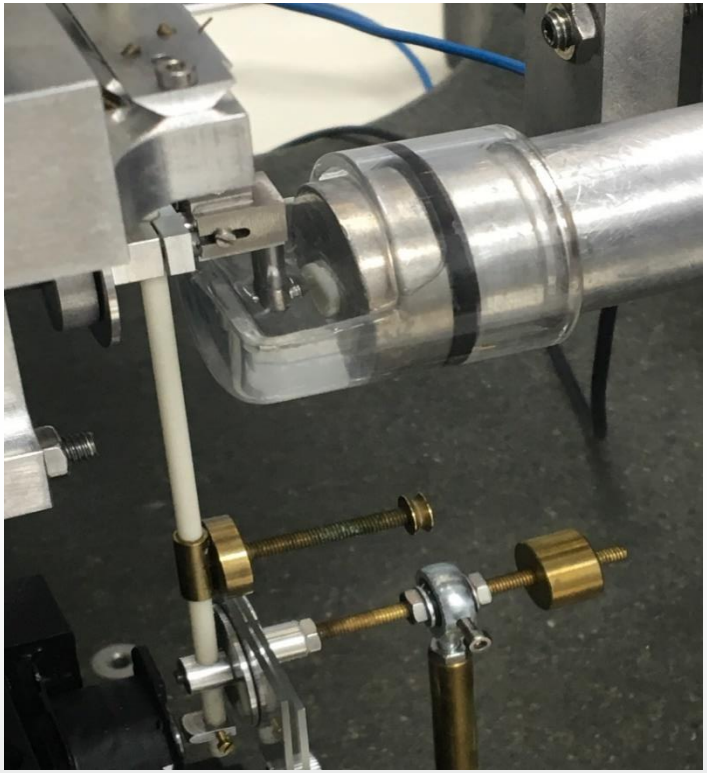




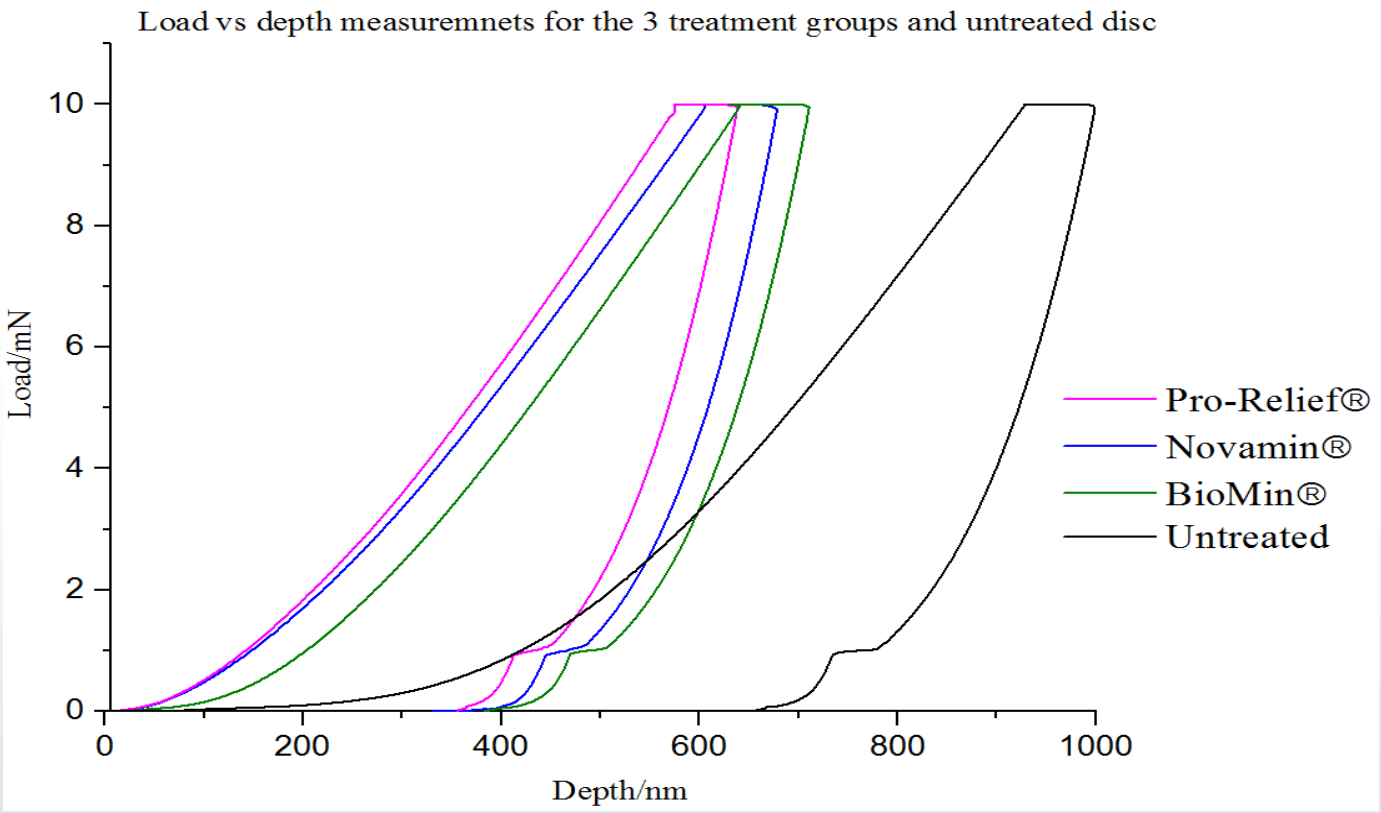
BioMin cross section

Material and Methods

- Dentine discs were characterised by using nanoindentation (NI)
- Measurements taken before and after brushing
- 20 indents per disc
- 10 mN load
- 5µm spherical diamond tip
- 700nm maximum depth of penetration
    - 10% rule: Ratio of maximum indentation depth to layer thickness must be no more than 10%

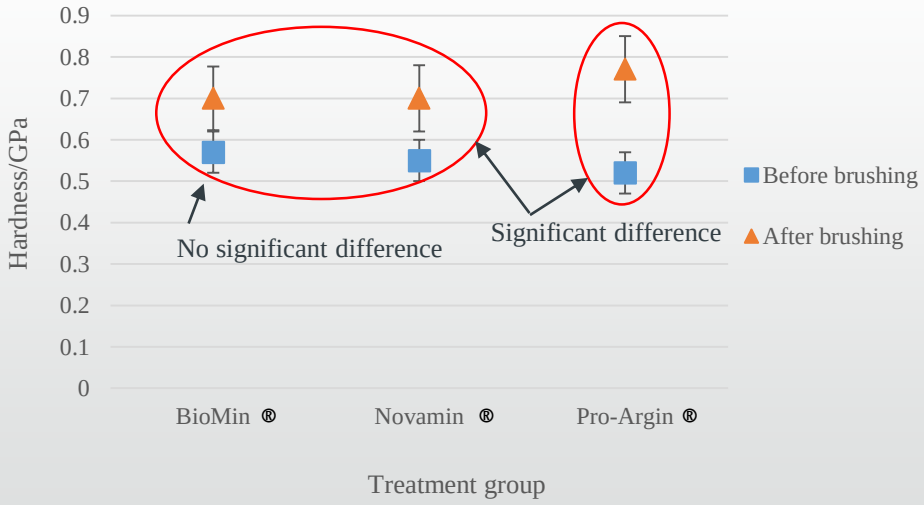


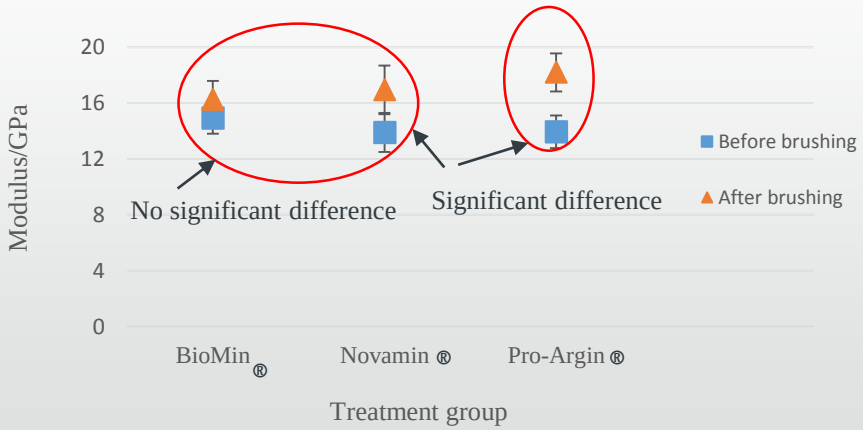
Nanoindentation



Nanoindentation

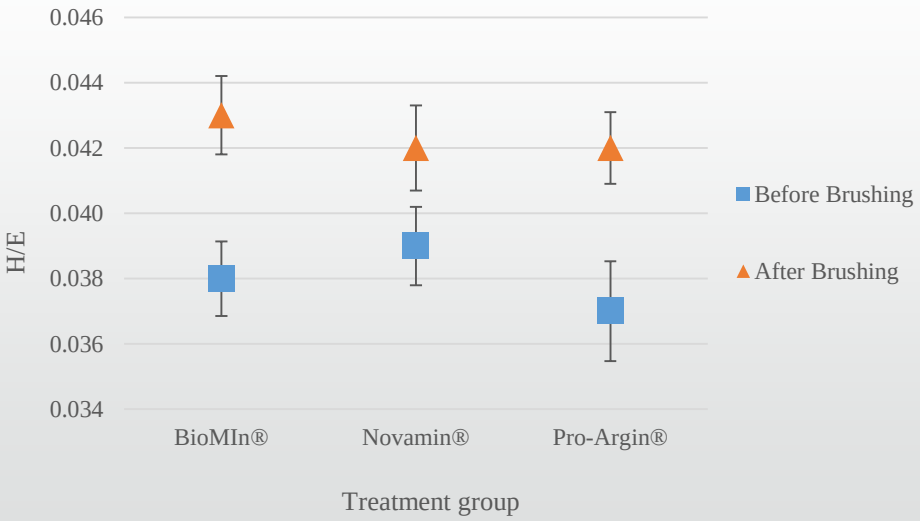
	Hardness/GPa		Modulus/GPa	
Treatment group	Dentine	After brushing	Dentine	After brushing
Pro-Argin	0.52 (±0.05)	0.77 (±0.08)	13.95 (±1.78)	18.20 (±1.37)
Novamin	0.55 (±0.05)	0.71 (±0.08)	13.90 (±1.40)	16.95 (±1.74)
BioMin	0.57 (±0.05)	0.70 (±0.07)	14.93 (±1.41)	16.27 (±1.36)

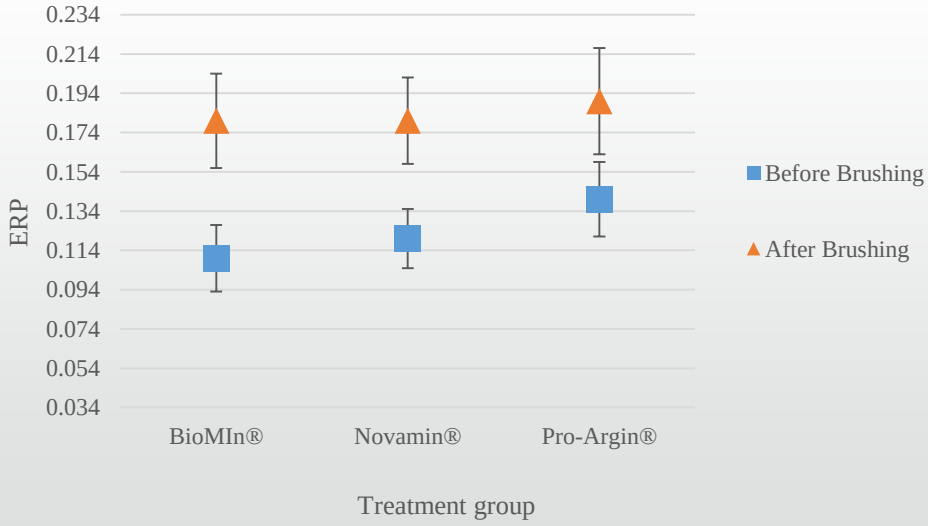




Nanoindentation

	Hardness/Modulus		Elastic recovery parameter ERP	
Treatment group	Dentine	After brushing	Dentine	After brushing
Pro-Argin	0.037 (±0.003)	0.042 (±0.003)	0.141 (±0.019)	0.191 (±0.027)
Novamin	0.039 (±0.002)	0.042 (±0.001)	0.123 (±0.015)	0.184 (±0.022)
BioMin	0.038 (±0.002)	0.043 (±0.001)	0.114 ±(0.017)	0.182 (±0.024)





Summary

- All 3 toothpastes formed layers which were harder than dentine
- Pro-Argin® formed a significantly harder and stiffer layer
- May offer the best protection against damage
- No significant difference between NovaMin® and BioMin®
- There was no significant difference in H/E ratio or ERP for all 3 groups which indicates the 3 layers will have a similar abrasion resistance
  - BioMin slightly higher –possibly better abrasion resistance

Acknowledgments

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Professor Robert JK Wood

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