Effects of Incorporation of Hydroxyapatite on the Microhardness and Surface Roughness of Two Glass-ionomer Cements

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01 INTRODUCTION

- WHAT ARE GICs
- ADVANTAGES
- DISADVANTAGES
- MODIFICATIONS
- FUJI IX GP EXTRA – FUJI II LC
- HYDROXYAPATITE
- SURFACE PROPERTIES (SR, MH)

01 INTRODUCTION

To date, there is still lacking data about the impact of porous spherical HA micro-particles derived from the cuttlefish bone on the mechanical properties of GICs, and no data about effects on SR and MH properies.

01 INTRODUCTION

The aim of study

The objective of this study was to evaluate the effect of incorporation of 2, 5 and 10 wt% HA, derived from the cuttle fish bone by hydrothermal method to MH and SR properties of GICs.

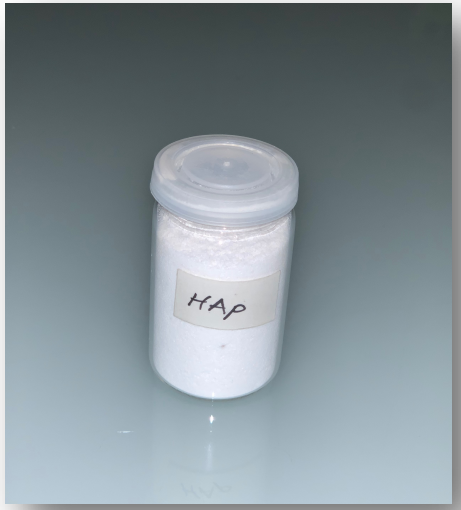
01 INTRODUCTION

The nul-hypothesis

The null hypothesis of this study was that there is no improvement in the VHN and SR properties of glass ionomer cement after the addition of HA.

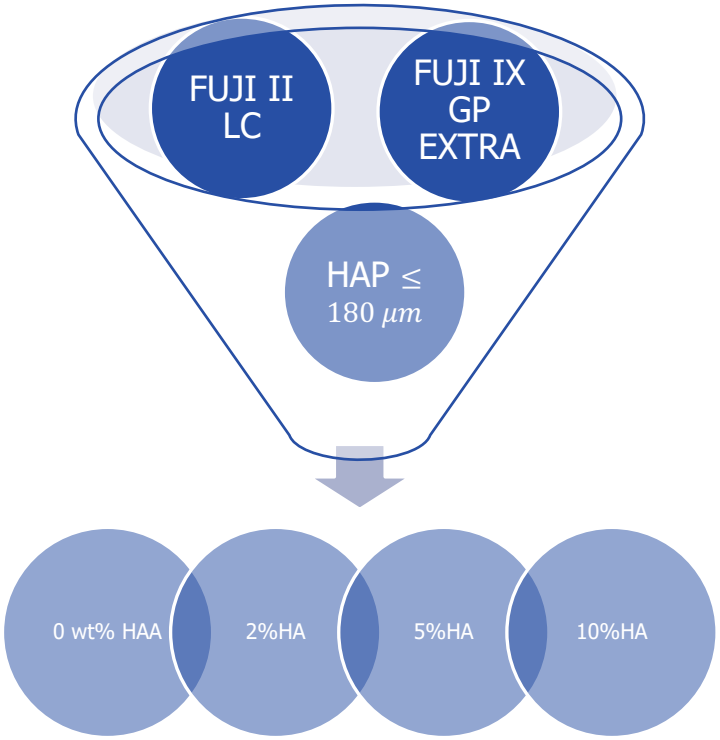
03 MATERIALS AND METHODS

Mixing HA and GIC



Rogina, A.; Antunović, M.; Milovac, D. Biomimetic design of bone substitutes based on cuttlefish bone-derived hydroxyapatite and biodegradable polymers. Biomed. Mater. Res. B Appl. Biomater. 2019, 107, 197–204.

02 MATHERIALS AND METHODS



n=10 per group

02 MATERIALS AND METHODS

- After mixing- material poured into syringe and immediately after in Teflon molds (cylindrical 8 x 2 mm, n=80)

- Specimens left to set/light cured
- Stored in distilled water at 37C for 7 days and then tested

02 MATERIALS AND METHODS

There were tested:

- Surface roughness: Contact type profilometer device (Perthometer M2, Mahr GmbH, Gottingen, Germany) Microstructure: Scanning Electron Microscope (SEM) (JSM-6400 SEM, JEOL, Tokyo, Japan), X100 magnifications.
- Microhardness: Digital microhardness tester (HMV-2, Shimadzu Corp., Kyoto, Japan).

02 MATERIALS AND METHODS

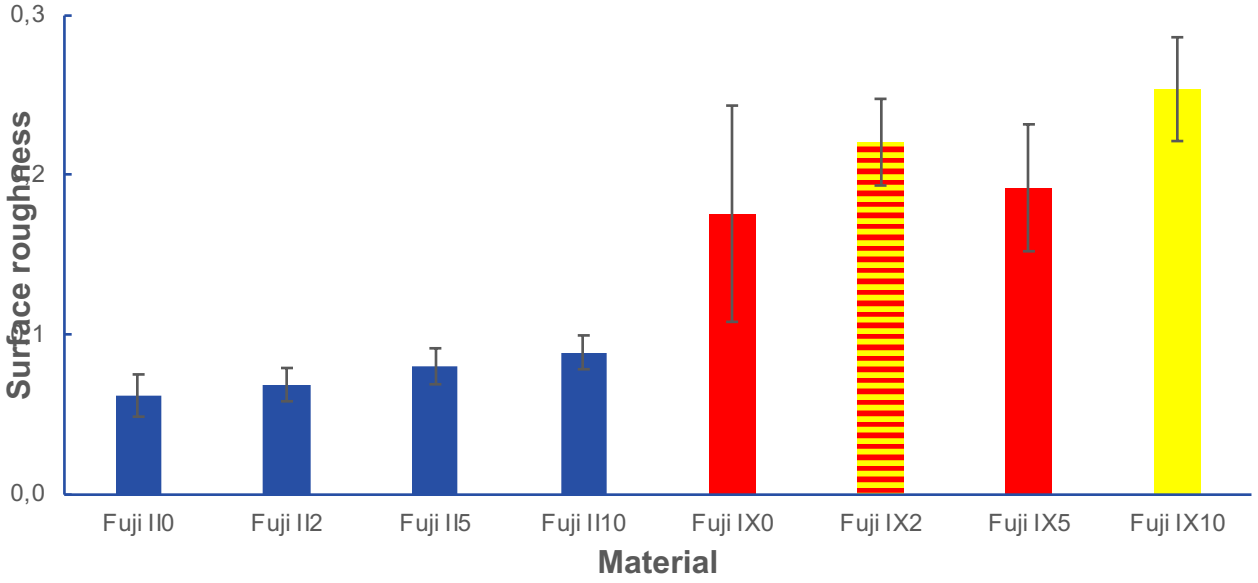
Statisctics:

- Descriptive analysis
- ANOVA and a post-hoc Tukey's test
- SAS statistical package
- p = 0.05.

02 RESULTS

Material	N	Mean (Ra)	Standard Deviation	95% CI Lower Bound	95% CI Upper Bound
Fuji II0	10	0.062	(0.011)	0.054	0.070
Fuji II2	10	0.069	(0.013)	0.059	0.078
Fuji II5	10	0.080	(0.010)	0.073	0.087
Fuji II10	10	0.089	(0.011)	0.081	0.097
Fuji IX0	10	0.176	(0.032)	0.153	0.199
Fuji IX2	10	0.221	(0.068)	0.172	0.269
Fuji IX5	10	0.192	(0.027)	0.173	0.212
Fuji IX10	10	0.254	(0.040)	0.226	0.282

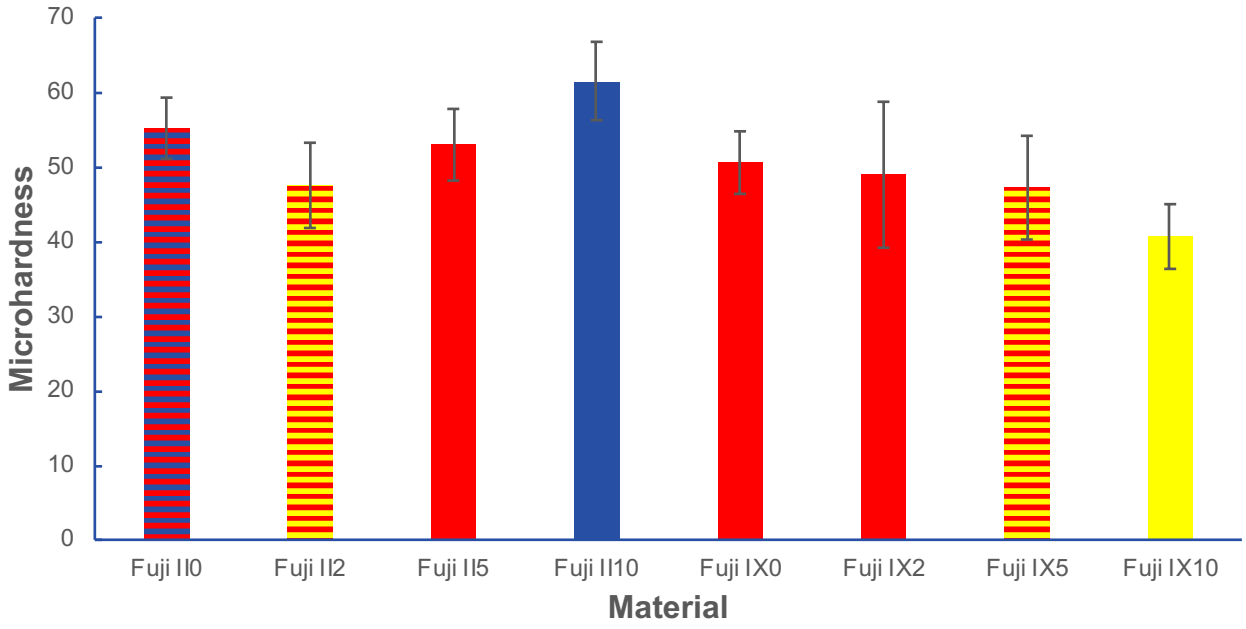
02 RESULTS


0,3
0,2
0,1
0,0
Surface roughness
Fuji II0
Fuji II2
Fuji II5
Fuji II10
Fuji IX0
Fuji IX2
Fuji IX5
Fuji IX10
Material

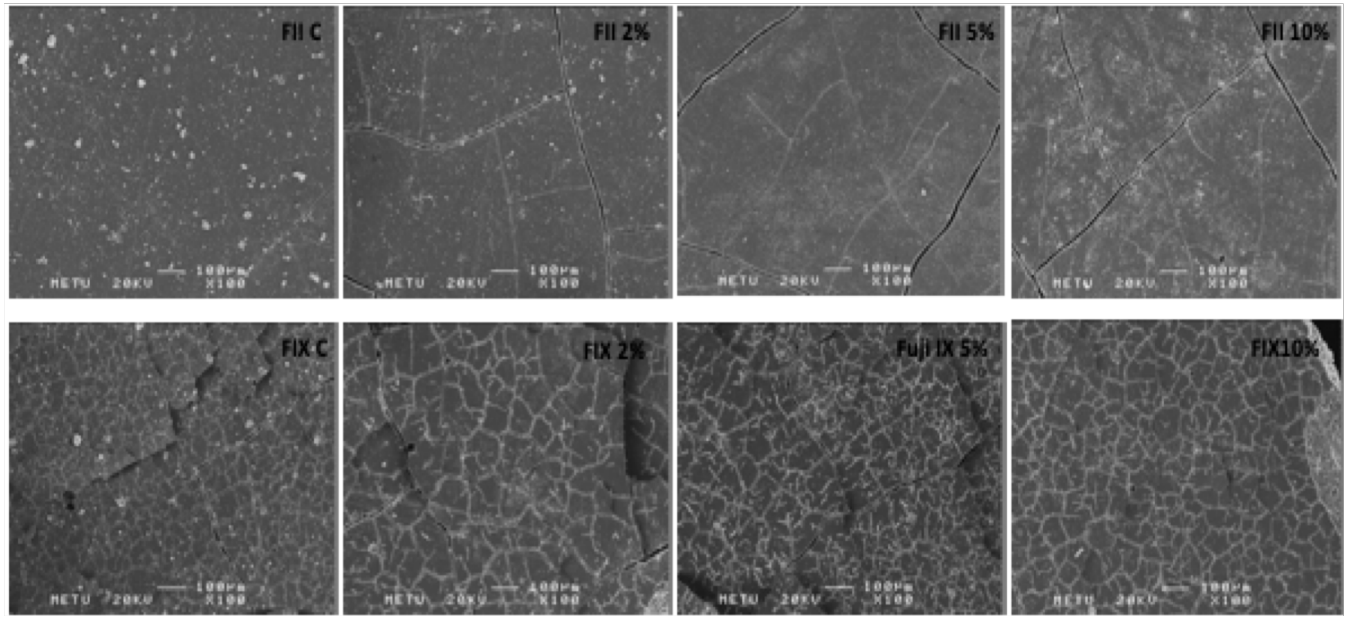
02 RESULTS

Material	N	Mean (MH)	Standard Deviation	95% CI Lower Bound	95% CI Upper Bound
Fuji II0	10	55.2	(5.3)	51.4	58.9
Fuji II2	10	47.5	(4.1)	44.6	50.5
Fuji II5	10	53.0	(5.7)	48.9	57.0
Fuji II10	10	61.5	(4.8)	58.1	64.9
Fuji IX0	10	50.6	(4.3)	47.5	53.7
Fuji IX2	10	48.9	(4.2)	45.9	51.9
Fuji IX5	10	47.2	(9.8)	40.2	54.2
Fuji IX10	10	40.7	(7.0)	35.7	45.6

02 RESULTS


70
60
50
40
30
20
10
0
Microhardness
Fuji II0
Fuji II2
Fuji II5
Fuji II10
Fuji IX0
Fuji IX2
Fuji IX5
Fuji IX10
Material

02 RESULTS



02 DISCUSSIOJN

- Marine derived HA partices influenced SR and MH.
- SR of Fuji II did not significantly increase after the addition of HA particles, while in Fuji IX it was significantly higher in Fuji IX 10 wt% HA group than in the group without HA particles added.
- The addition of HA particles reduced MH of Fuji IX, but not significantly, while MH in Fuji II 10%wt HA was higher than in the group without the addition of HA particles.

- Nul hypothesis was thus rejected.

- Nano-HA-filled materials vs micro-HA

- SR values for Fuji II were significantly lower in comparison to the values for Fuji IX = study of Hoda S. Ismail et al.

02 DISCUSSIOJN

- Yli Up et al. reported that the MH of GICs decreased as the amount of hydroxyapatite increased= our study. Contrary to that, they showed that the hardness values of conventional GICs were higher than light-cured glassionomers.

- In the earlier study, the group with 10 wt% HA had improved mechanical properties.

- Few investigations are concluding that 5 wt% HA resulted in improved mechanical properties, such as compressive strength and MH.

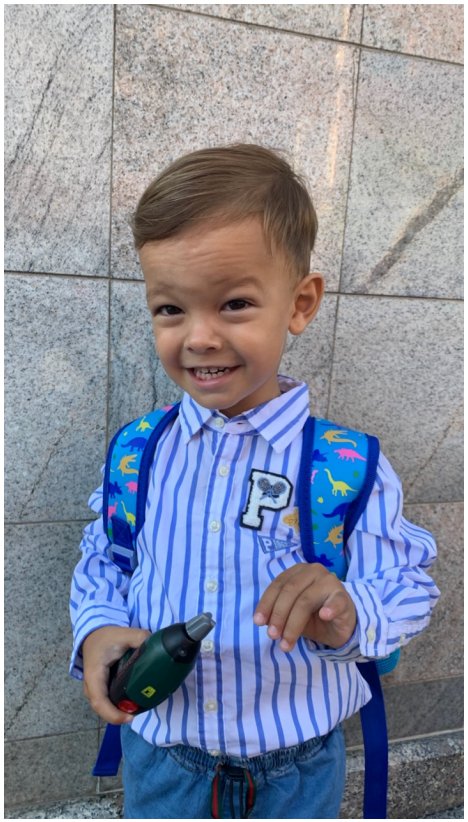
05 CONCLUSION

- The addition of micro-HA derived from cuttlefish bone to the powders of Fuji IX and Fuji II did not improve the SR, indeed, the SR increased compared to groups without HA added.
- The addition of HA decreased MH in all groups except the group Fuji II 10 wt% HA, where was obtained the highest MH value.
- Limitations of in vitro studies, the generalizability of results to the clinical setting must be done with caution.
- Future studies are required to assess the effects of the addition of 10 wt% HA on the physical and chemical properties of RMGIC, Fuji II LC.

Thank you for your attention!

”Success is no accident. It is hard work, perseverance, learning, studying, sacrifice and most of all, love of what you are doing or learning to do.”
Pele

“Mum, I can fix GIC’s weak mechanical properties!’



„Education is an admirable thing, but it is well to remember from time to time that nothing that is worth knowing can be taught.”
Oscar Wilde