Comparison of Luting Cement Solubility

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Abstract

- Evaluate and compare the solubility of Glass Ionomer (GI) and Resin Modified Glass Ionomer (RMGI) cements in sports drink solution
- RMGI cement had the overall lowest solubility at each storage time (5, 30, 60, and 180 minutes, $P < .001$)
- Both types of cements exhibited a degree of dissolution, RMGI cement showed lower overall solubility compared to GI cement in Gatorade solution
- Considering lowered pH of the oral cavity after consumption of food, RMGI may provide advantage over GI cement for dental restoration cementation

Introduction

- Luting cements fill the space between tooth & restoration, provide retention and prevents leakage
- Solubility is one of the most important factors in assessing the quality of luting cement that leads to success of restorations in terms of retention
- Sports drinks is one of the most frequently con sumed beverage
- Most frequently consumed sports drink in Unite d States is Gatorade, which has acidic pH 3
- Consumption of acidic beverage is related to number of dental implications including erosion and increase of solubility of dental cements

Objective

This study aims to evaluate and compare the solubility of GI and RMGI cements in pH 2.97 Gatorade sports drink

Methods

A solubility test was performed following the ISO 4049:2009.
- Solution: Gatorade Lemon Lime solution (22°C; pH 2.97)
- Dry 3 hours at room temperature using a desiccator prior to weighing

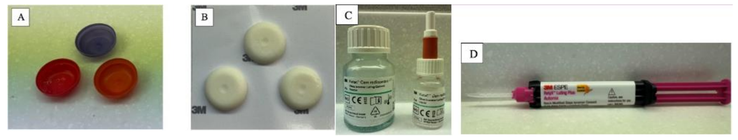

Figure 1. Materials used to fabricate GI and RMGI disks
A) Mold used to prepare GI and RMGI disks
B) 20mm x 3mm GI and RMGI disks
C) Ketac Cem GI cement powder and liquid
D) RelyX Luting Plus RMGI cement

Results

Table 1. Weight (mg) of GI and RMGI disks at baseline, 5, 30, 60, and 180 minutes after submersion in sports drink solution

	Type of cement	Baseline weight (mg)	Weight after 5 minutes (mg)	Weight after 30 minutes (mg)	Weight after 60 minutes (mg)	Weight after 180 minutes (mg)
Control (water)	GIC	1.4	1.4	1.4	1.39	1.38
Control (water)	GIC	1.4	1.4	1.4	1.39	1.39
Control (water)	RMGI	1.6	1.6	1.6	1.6	1.6
Control (water)	RMGI	1.6	1.6	1.6	1.6	1.6
	Type of cement	Baseline weight (mg)	Weight after 5 minutes (mg)	Weight after 30 minutes (mg)	Weight after 60 minutes (mg)	Weight after 180 minutes (mg)
Experimental group	GIC	1.4	1.39	1.38	1.38	1.35
Experimental group	GIC	1.4	1.4	1.38	1.38	1.35
Experimental group	GIC	1.4	1.4	1.39	1.39	1.36
Experimental group	GIC	1.4	1.39	1.39	1.37	1.35
Experimental group	GIC	1.4	1.4	1.39	1.39	1.35
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Experimental group	GIC	1.4	1.39	1.39	1.38	1.35
Experimental group	GIC	1.4	1.4	1.39	1.38	1.35
Experimental group	RMGI	1.6	1.6	1.6	1.6	1.58
Experimental group	RMGI	1.6	1.6	1.6	1.59	1.58
Experimental group	RMGI	1.6	1.6	1.6	1.59	1.58
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Experimental group	RMGI	1.6	1.6	1.6	1.59	1.58

Analysis

- RMGI demonstrated lower solubility than GI during all submersion periods
- Overall, it is observed that both GI and RMGI cements exhibited increase in solubility with longer period of submersion

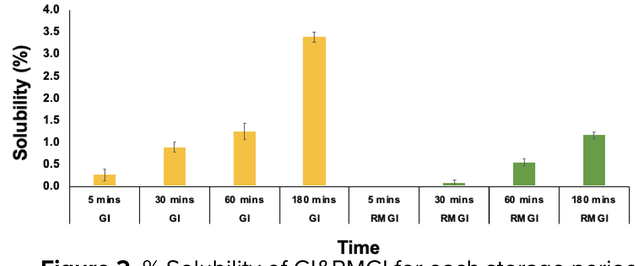

Figure 2. % Solubility of GI&RMGI for each storage period

Table 2. Two-way ANOVA statistical analysis

Source of Variation	Sum of Squares	degrees of freedom	Mean Square	Variation between sample means	P-value
Types of Cement	16.05	1	16.05	169.67	1.37E-18
Storage time	42.55	3	14.18	149.92	9.91E-27
Interaction	8.59	3	2.86	30.28	9.07E-12
Within	5.29	56	0.09		

Discussion

- Type of cement had statistically significant effect on solubility ($P < .001$)
- RMGI cement can limit diffusion of solvent into cement thanks to addition of resin matrix, exhibiting less solubility compared to GI cement

Conclusion

- pH of oral cavity after eating drops to acidic range (pH 5.5 – 6.5)
- RMGI may provide advantage over GI cements due to overall lower solubility in acidic conditions

References
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Acknowledgement: We thank Drs. Ping Zhang, Kimberly Carr, Janice Jackson, and Finn Pediatric Dental Clinic Staff for their support on my research.