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Demineralization Inhibitory Effect of Bulk Fill Glass Hybrid Restorative Material

Presentation Number: 2586

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Objectives

EQUIA Forte HT (EFHT; GC) is a bulk-fill glass hybrid restorative material that can be used as an amalgam alternative. This study aimed to evaluate inhibitory effect of EFHT on tooth demineralization and compare it with other bulk-fill materials.

Methods

EFHT, Stela (ST; SDI), and 3M Filtek One Bulk Fill Restorative (FOBFR; Solventum) were used as test materials. The following two tests were performed:

Demineralization test: Cavity (3mm diameter, 2mm depth) was created on the bovine enamel surface and filled with test materials. The surface was polished with #1200 SiC paper. The exposed area was defined with a 5mm diameter hole sticker around the cavity. Samples were immersed in demineralization solution (0.1M lactic-acid buffer, pH4.5) at 37°C for 18hours and cut into 1mm thick sections. Samples were evaluated using Transverse Microradiography (TMR). Demineralization depth and amount of mineral loss were calculated using the mineral profile of the deepest demineralized area in the enamel surrounding the restoration (n=8). Data were analyzed with Kruskal-Wallis and Dunn tests (p<0.05, p-value adjustment: Hochberg).

Fluoride ion release test: Test materials were filled in an acrylic mold (7mm diameter, 2mm depth) and immersed in demineralization solution at 37°C for 18 hours. Fluoride ion in the demineralization solution was measured with fluoride selective electrode (n=3). Data were analyzed with ANOVA and Tukey-Kramer test (p<0.05).

Results

Mean (SD) values are presented in the table. EFHT showed significantly lower demineralization depth and mineral loss compared to other materials. EFHT also exhibited higher fluoride ion release, showing that materials with higher fluoride release tend to have greater demineralization inhibition effect.

Conclusions

EFHT as an amalgam alternative has a high demineralization inhibition effect and can significantly reduce the risk of secondary caries in bulk-fill restorations.

Results of demineralization depth, mineral loss, and fluoride ion release.

Tast Materials	EFHT	ST	FOBFR
Demineralization depth [μm]	0 (0) ^a	38 (10) ^b	36 (7) ^b
Mineral loss [% $\cdot \mu\text{m}$]	257 (101) ^a	515 (183) ^{β}	1020 (329) ^{γ}
Fluoride ion release [$\mu\text{g}/\text{cm}^2$]	485 (118) ^A	70 (13) ^B	7 (2) ^B

Dissimilar letters in the column indicate significantly different values.

Financial Interest Disclosure: The presenter and all co-authors are employee of GC Corporation.



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Introduction

As of 2025, the use of dental amalgam is being gradually phased out in the EU[1]. As alternatives, GC recommends resin composite and glass hybrid restorative materials. The glass hybrid restorative, **EQUIA Forte HT Fil (EFHT)**, is a direct restorative material with excellent fluoride release properties. Therefore, EFHT is expected to show greater demineralization inhibitory effect than resin composite. This study aimed to evaluate the demineralization inhibitory effect of EFHT in comparison to other bulk filling materials.



EQUIA Forte® HT
Bulk fill glass hybrid restorative system

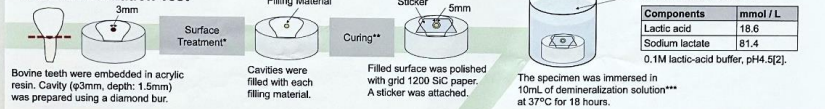


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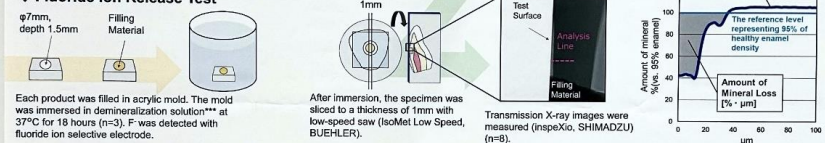
Materials and Methods

Product Name	EQUIA Forte HT Fil	Stela capsule	Filltek One Bulk Fill Restorative
Code	EFHT	ST	FO
Manufacturer	GC	SDI	Solventum
Surface Treatment*	Cavity Conditioner (GC)	Stela Primer (SDI)	GC Etchant (GC)+Scotchbond Universal Plus Adhesive (Solventum)
Curing**	37°C, 90%R.H. for 1 hour	37°C, 90%R.H. for 1 hour	20 s light cure

◆ Demineralization Test

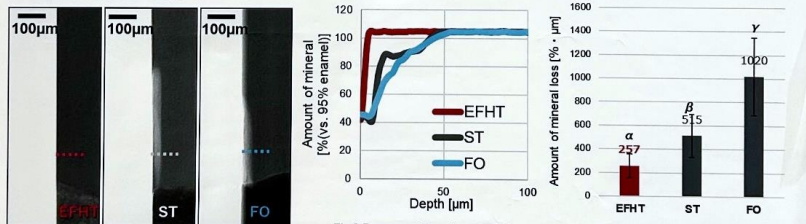


◆ Fluoride Ion Release Test

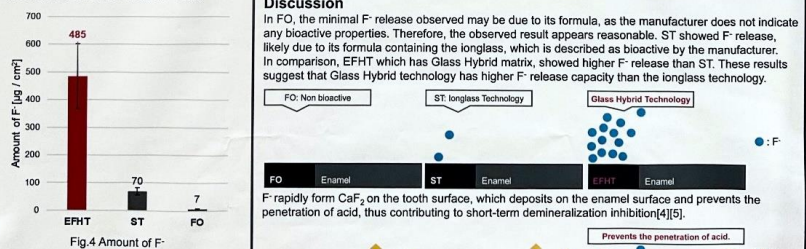


Results and Discussion

◆ Demineralization Test



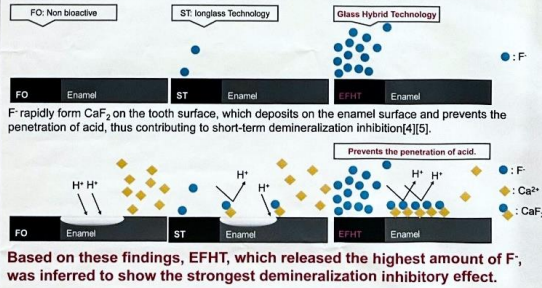
◆ Fluoride Ion Release Test



- Amount of mineral loss followed the order: EFHT<ST<FO.
- Amount of F- followed the order: FO<ST<EFHT.
- The results showed that the trend in mineral loss was the opposite of that in fluoride ion release.

Discussion

In FO, the minimal F- release observed may be due to its formula, as the manufacturer does not indicate any bioactive properties. Therefore, the observed result appears reasonable. ST showed F- release, likely due to its formula containing the longglass, which is described as bioactive by the manufacturer. In comparison, EFHT which has Glass Hybrid matrix, showed higher F- release than ST. These results suggest that Glass Hybrid technology has higher F- release capacity than the longglass technology.



Based on these findings, EFHT, which released the highest amount of F-, was inferred to show the strongest demineralization inhibitory effect.

Conclusion

EFHT as an amalgam alternative has a **high demineralization inhibitory effect** and can significantly reduce the risk of secondary caries in bulk-fill restorations.

COI Disclosure Presenter and co-authors are employees of GC R&D.

References

- [1] Regulation (EU) 2024/1049 (2) Bor Shium Lee, et al., Prevention of enamel demineralisation with a novel fluoride-impregnated surface composition and depth profile, Scientific Reports, 2015. [3] Alkneza Sadi, et al., Longitudinal Assessment of Subsurface Artificial Root Caries Lesions by Optical Coherence Tomography in Comparison with Transverse Microhardness, Proc. of SPIE - The International Society for Optical Engineering, 2012. [4] J.M. Ten Cate, P.P. Dijkstra, Influence of fluoride in solution on tooth demineralization. I. Chemical data. Caries Research, 1983. [5] J.O.B. Featherstone, Prevention and reversal of dental caries: role of low level fluoride, Community Dentistry and Oral Epidemiology, 1999.