



Evaluation of Wear Resistance of Coating Materials on GI Restorative

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OBJECTIVES

EQUIA Forte Coat form thinner layer and have higher mechanical property from EQUIA Coat (G-Coat Plus).

The coating on glass ionomer (GI) restorative expects enhancement of mechanical property of the cement in early stage of setting, and long-term durability of the cement.

The requirements for the coating will be two properties. One is the coating form thin-layer. If there is thick-layered coating on occlusal surface, patient will feel uncomfortable.

The other is high wear resistance. While the coating remains on cement surface, cement will not be damaged.

The purpose of this study is to evaluate wear resistance of coating materials using toothbrush wear test and hardness value using micro vickers hardness test.

METHODS

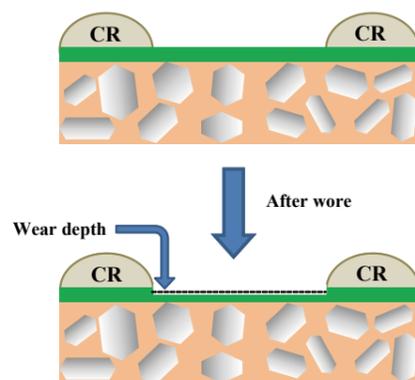
Materials

The materials used in this study are shown in the table.

Filling Material (Lot No. Shade)	Coating Material (Lot No.)	Abbreviation	Manufacturer
EQUIA Forte Fil (1504011 A2)	EQUIA Forte Coat 141101	EQF	GC
Fuji IX GP EXTRA (1411271 A2)	G-Coat Plus 1405201	EGC	
Ketac Molar Aplicap (533549 A3)	Scotchbond Universal 526323	KMS	3M
	Ketac Glaze 547839	KMG	
Riva Selfcure (B1411171EG A3)	Riva Coat 130565	RSC	SDI

Test method

I. Toothbrush wear test



GI Restorative materials were filled into acrylic mold. These specimens were coated with corresponding to table. After coating, these specimens were partially protected by flowable composite resin (CR). After protecting, specimens were subjected to 100000 cycles (200 gram load) of toothbrush wear test against the coatings surface in toothpaste (White and White : Lion Corp.) diluted by distilled water (toothpaste : water = 1 : 3).

To observe cross section, the specimens were sliced (thickness about 1mm). These specimens were freeze dried. After freeze drying, wear depth of specimens from protected interface were measured by HITACHI Scanning Electron microscope SU-70.

II. Surface hardness test

Coating materials were coated on glass plate. And then, these specimens were cured by LED light (G-light prima II, 1200mW) according to IFU of each coatings.

After curing, these specimens were measured with micro vickers hardness machine (SHIMADZU: HMV-G21DT).

Surface hardness test conditions
Load: 2.942N
Retention time: 5s

RESULTS and DISCUSSION

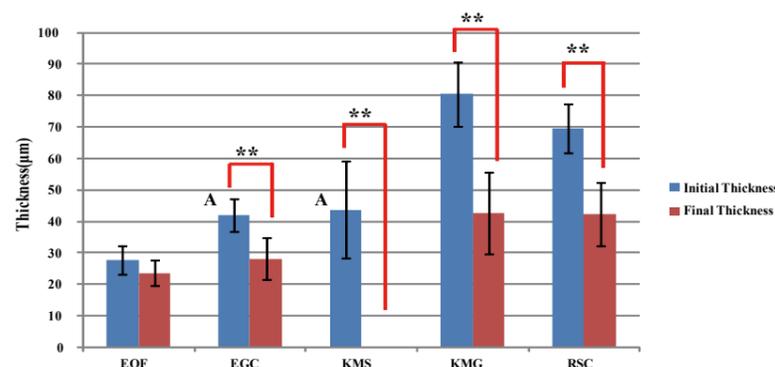


Figure 1. Thickness of initial and final of each coating materials.

** means significantly difference (p < 0.01) (n = 45)

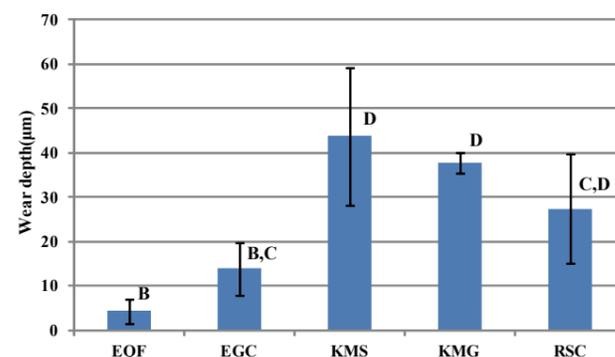


Figure 2. Wear depth of each coating materials

(n = 45)

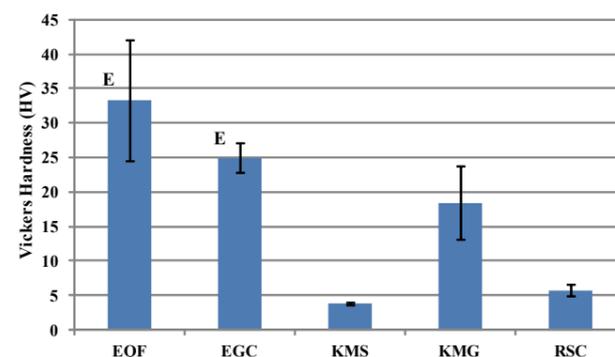


Figure 3. Surface hardness value of each coating materials

(n = 25)

Statistical Analysis
1. Tukey's Test (p < 0.01)
Same alphabet means no significantly difference.
2. t-test (p < 0.01)
Compared initial thickness with final thickness in each materials.

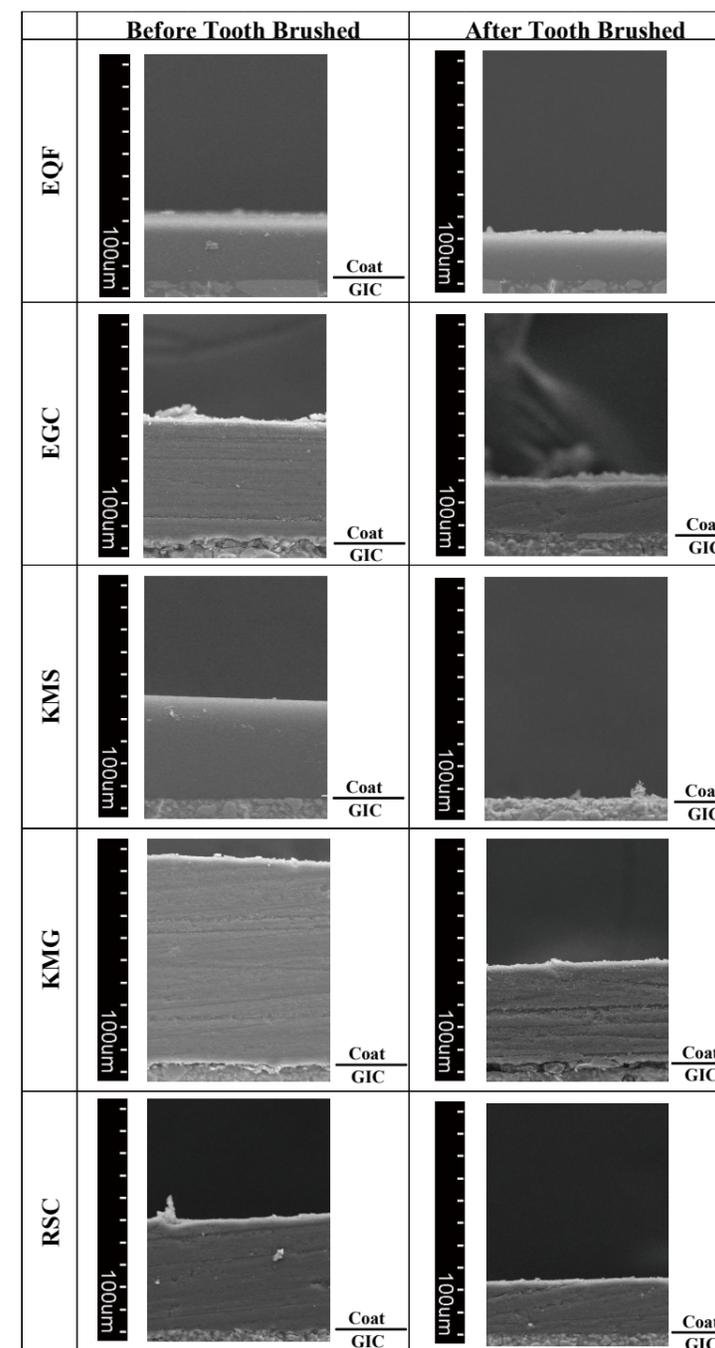


Figure 4. Pictures of cross section of each specimens

CONCLUSIONS

This study indicated that EQUIA Forte Coat(EQF) will form thin layer and have high wear resistance. It will meet the requirement for coating material. In clinical case, it is expected that EQUIA Forte Coat is superior to other coating materials.

KMS completely wore out. KMG and RSC wore out about half of their initial thickness. Wear resistance and surface hardness of EQF and EGC were very higher than others (Fig. 1, 2 and 3). It is because unpolymerized layer didn't present by EQF and EGC. Additionally, EQF includes the new multi functional monomer. So, smallest wear depth was shown by EQF. In other wards, EQF is highest wear resistance of each materials.