学術情報

#0054

Evaluation of hardness increase of GIC restorative surface in saliva

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Objective

Increasing of surface hardness of Glass Ionomer Cement (GIC) in saliva is one of unique phenomenon.
The aim of this study was to evaluate the surface hardness of new experimental GI filling system.

Methods

Materials

Fillng materials
- ◆Fuji IX GP EXTRA (F9E)
- ◆EFI-300 (EQUIA Forte Fil)

Coating materials
- ◆G-COAT Plus (GCP)
- ◆EQC-107 (EQUIA Forte Coat)

Test method

Filling materials were filled into acrylic mold (7mm in diameter, 2mm in depth).
Then, The specimens were stored in the chamber (37℃, 100%R.H.) for 1 hour.
After stored, those speciments were stored in distilled water or human saliva at 37℃.
The storage solutions were changed once a week.
After 0, 1, 4, 7, 14, 28, 35, 42 and 63 days, surface hardness of each materials were measured with micro vickers hardness machine (SHIMADZU: HMV-G21DT).
For XSC, XWC, ESC and EWC: specimen were coated after surface hardness measurement.
The coatings were removed from the GI surface before measuring vickers hardness.
The specimens were re-coated before immersion to storages from 0 to 28 days.
28 days after, all specimens were immersed in the solutions without coatings.
The datas were analyzed by one-way ANOVA and Tukey's test ($P < 0.01$).
Codes list in Table 1.

Table 1.

Fillings	F9E				EFI-300			
Storages	D.W.		Saliva		D.W.		Saliva	
Coatings	-	GCP	-	GCP	-	EQC-107	-	EQC-107
Specimens	XW	XWC	XS	XSC	EW	EWC	ES	ESC

Results and Discussion

Micto Vickers Hardness Test

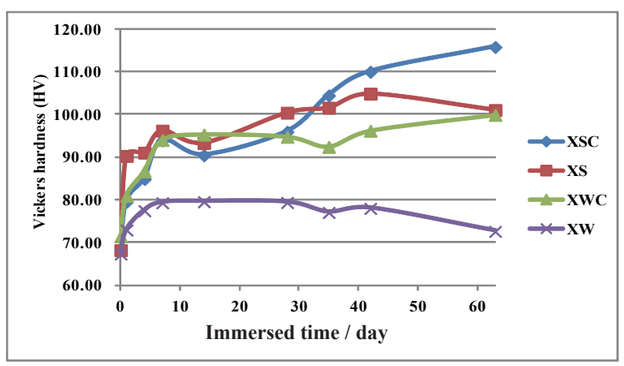

Figure 1. Vickers hardness value changing of the F9E

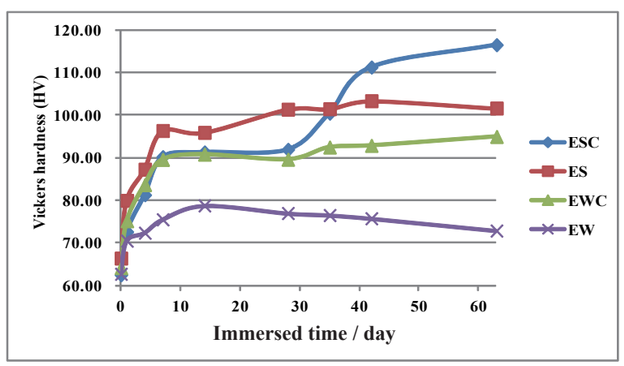

Figure 2. Vickers hardness value changing of the EFI-300

Energy dispersive X-ray Spectrometry

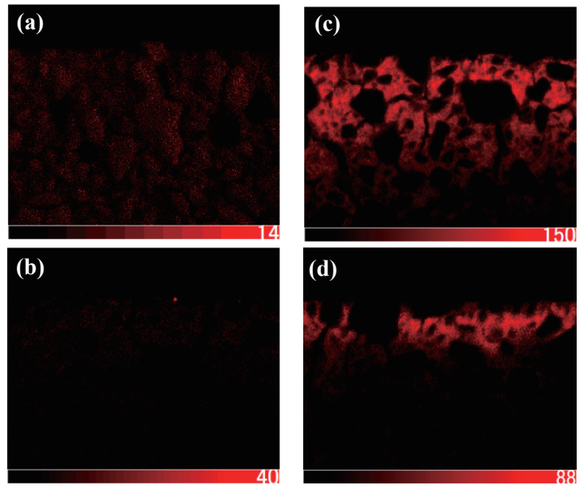

Figure 3. Position of Calcium (a) XW, (b) XWC, (c) XS, (d) XSC

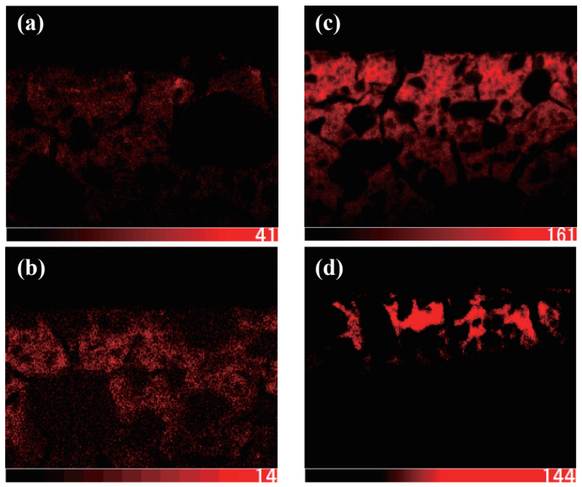

Figure 4. Position of Calcium (a) EW, (b) EWC, (c) ES, (d) ESC

These results are occured by ion equilibrium. Ions move high concentration to low. But coatings inhibit ion migration.

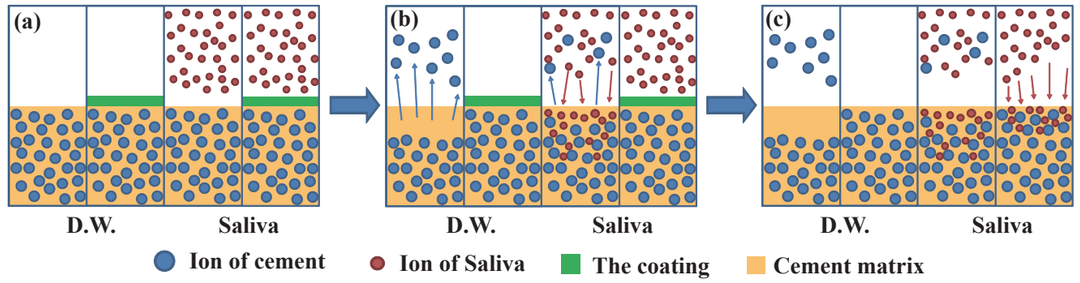

Figure 5. Model of surface hardness change mechanism (a)before soaking, (b)early setteng stage, (c)after the coating removed about 30 days

With the coating during early setting stage(b), cement could spend ions for GI reaction which include cement matrix inside. Once early GI reaction settled, the coatings are removed(c). In saliva, cement will uptake more ions such as calcium and start secondary maturation.
But, in case of D.W, secondary maturation was not found. It is because of D.W. don't include ions whitch enhance surface hardness. However, GI reaction proceeded enough to keep ions cement.

Conclusion

This research indicated that there is a good benefit to coat the GI surface at early setting stage.
It is because unique phenomenon was found, that is, secondary surface hardness jump was occured.
These results indicate that EQUIA and EQUIA Forte Systems are ideal process for advancing GI reaction.