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P57 - Fluorine uptake into human enamel surface from fluoride-containing sealing materials during cariogenic pH cycling

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For prevent the caries and the hypersensitivity dentin, sealing materials with/without fluoride were applied on the tooth. Fluoride contains sealing materials also made the acid resistant layer made from the sealing materials were physically protected the acid attack. Fluoride in the tooth structure will prevent the acid attack. This study evaluated the demineralization prevention and fluorine (F) uptake into human enamel of sealing material using an automatic pH cycling. Five 150 μ m sections were prepared from each tooth. Fluoride containing sealing materials (i.e. "MS coats F"(MSF)) and fluoride free sealing materials (i.e. "Hybrid coats 2"(HI)) were used in this study. Each material was applied to the original tooth surface and cut surface were covered with sticky wax. The automatic pH-cycling (pH6.8 - pH4.5) simulated daily acid challenges in the oral cavity was carried out for 4 weeks. Caries progression was analyzed using the difference of integrated mineral loss (Δ IML) calculated from transverse microradiography (TMR) taken before and after 4 weeks pH-cycling. The fluorine and calcium distributions in the carious lesion in each specimen were evaluated using PIGE (Proton Induced Gamma Emission) technique at TARRI (Takasaki Advanced Radiation Research Institute), Japan. The surface margin of enamel was defined as the 5% of calcium concentration point. 1000 μ m \times 1000 μ m area at the surface of enamel was scanned and constant width region at an arbitrary position in the area was analyzed. The average amount of F in the outer 70 μ m of each specimen was obtained.

The Δ IML of MSF and HI are significant lower than control. From the PIXE analysis of the fluorine uptake in the enamel surface, MSF only showed significant difference than HI and control. These results suggest that the MSF will make the acid resistant layer and provide fluoride into the enamel surface. HI and MSF prevent the demineralization both. The fluoride existence in the enamel surface suggested that MSF will prevent the demineralization, even if the layer was removed, in clinical. The PIGE and PIXE techniques were useful in understanding the benefit of fluorine by fluoride-containing sealing material for preventing caries.

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