Corrosion Behavior of Two cp Titanium Dental Implants Connected by Cobalt Chromium Metal Superstructure in Artificial Saliva and the Influence of Immersion Time

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In this study, we investigate the effect of connecting two similar cp titanium implant fixtures and the immersion time on the electrochemical behavior of these implant fixture system using Straumann® (Institute Straumann, Basel, Switzerland) coupled with cobalt chrome framework in artificial saliva. The two implant fixtures had the same composition, diameter, length and surface treatment. The corrosion measurements were carried out using open-circuit potential, cyclic potentiodynamic polarization, electrochemical impedance spectroscopy, and chronoamperometric current-time measurements. The surface morphology and the elements analysis for the corroded samples were investigated using scanning electron microscope and energy dispersive X-ray analyzer. The effect of prolonging the period of immersion time on the corrosion of the couple in the saliva from 1 to 24 and further to 48 h before measurements was also reported. It has been found that the tested implant system has high passivation against corrosion and the intensity of its uniform corrosion increases with increasing the immersion time in the artificial saliva from 1 to 24 and further to 48 h. This was confirmed by the remarkable increase in the values of corrosion current and the decrease in the polarization resistance values over time. On the other hand, the severity of pitting corrosion was noticed to decrease with time, which was indicated via decreasing the area of hysteresis loop and shifting the values of the protection potential to more positive direction.

Keywords: corrosion, dental implant systems, EIS, polarization, Straumann®, titanium alloys

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