In vitro corrosion of metallic orthodontic brackets: Influence of artificial saliva with and without fluorides

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Editor's summary

Many nickel-free and reduced nickel content metallic brackets have been proposed, due to nickel sensitivity presented by some patients in orthodontic clinic. However, few studies have assessed the behavior of these brackets in the oral cavity, composed of many chemical substances, proteins and microorganisms at different temperatures, which often results in corrosion of metallic alloys. Therefore, the aim of this study was to evaluate the "in vitro" corrosion resistance of nickel-free and reduced nickel content metallic brackets immersed in artificial saliva with and without fluoride by means of scanning electron microscopy. Seventeen brackets for each trademark were analyzed, as follows: nickel-free brackets (Nickel-Free Morelli – Morelli, Sorocaba, Brazil), reduced nickel content stainless steel brackets with titanium nitride coating (Morelli Golden Line – Morelli, Sorocaba, Brazil), cobalt-chromium brackets (TP-Orthodontics, La Porte, United States) and titanium brackets (Dentaurum – Ispringen, Germany). These brackets were immersed in artificial saliva at 37°C for 7, 9 and 11 weeks (respectively groups 1, 2 and 3). In the group 4, the brackets were immersed in artificial saliva and fluoride for 11 weeks. For each group, four brackets were evaluated. The control group was comprised only one no-immersed bracket. The corrosion of the brackets was analyzed qualitatively by scanning electron microscopy (SEM), with increases from 200 to 500 times. Furthermore, the chemical composition of surface residues on the brackets was evaluated by SEM associated with an energy dispersive x-ray analyzer (EDS). Also the amount of ions released in the artificial saliva was measured by atomic absorption spectrophotometry. The results showed that all brackets demonstrated lower corrosion resistance in the fluoride presence. Titanium and nickel-free brackets presented good corrosion resistance. In titanium nitride coating brackets, oxides were verified on surface, probably due to defects resulting from the titanium nitrite coating. The lowest corrosion resistance was observed in cobalt-chromium brackets, probably because the weld between the base and body of these brackets and the heat treatment of this alloy. So, it was verified oxides and cobalt, chromium and silver on surface of cobalt-chromium brackets. On the other hand, there were no clear signals of the release of ions in all evaluated solutions. Thus the presence of fluoride promoted higher corrosion in all brackets. Despite the low corrosion resistance presented by cobalt-chromium brackets, there was no significant release of ions in all solutions of evaluated brackets.

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