Do Chlorhexidine and Probiotics Solutions Provoke Corrosion of Orthodontic Mini-implants? An In Vitro Study

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Purpose: The aim of this study was to explore the surface roughness and hardness of the implant head of orthodontic mini-implants made from different alloys before and after their in vitro exposure to agents for prevention of gingivitis, mucositis, and peri-implantitis: chlorhexidine and probiotics. Materials and Methods: Three types of commercially available mini-implants were tested: 316 stainless steel, titanium Grade 5, and titanium Grade 23 (both Ti–6Al–4V alloys with the same atomic weight percentage of Ti, Al, and V, with the difference being in maximal reduction of O₂ in Grade 23 to 0.13% of atomic weight). They were immersed in three experimental solutions: artificial saliva, saliva with probiotic bacteria Lactobacillus reuteri, and saliva with oral antiseptic chlorhexidine (CHX). Samples were immersed for 28 days, thermocycled, then stored in an incubator at 37°C. Surface roughness and microhardness on five samples of each of the three implant types were measured by atomic force microscopy and the Vickers method, respectively. Results: Exposure of titanium implant Grade 5 to probiotics significantly increased roughness compared with other media (P < .005). Exposure to CHX significantly increased the roughness of steel implants (P < .05). Neither saliva, probiotic, nor CHX altered microhardness of titanium implants significantly. In steel implants, the exposure to CHX and probiotics decreased microhardness compared with unexposed implants (P < .031), but not in comparison to saliva. Conclusion: Probiotics seem to increase roughness of titanium mini-implants, while CHX seems to increase roughness of steel mini-implants. Only stainless steel implants had an altered, decreased hardness after exposure to CHX, although the same was found after their exposure to saliva. For patients undergoing orthodontic treatment with temporary anchorage units, CHX could be recommended for titanium, and probiotics for stainless steel mini-implants in oral-hygiene maintenance. Int J Oral Maxillofac Implants 2019;34:1379–1388. doi: 10.11607/jomi.7392

Keywords: biomaterials, biomechanics, microbiology

Orthodontic mini-implants are screw-like temporary anchorage devices used to facilitate orthodontic treatment and provide the nearest to the ideal absolute anchorage. They are most often made of titanium, and their diameter is 1.3 to 2 mm with a length of 6 to 10 mm.¹ They are inserted into the bone for an average of 1 year, during which time their head, protruding out of the bone and gingiva, is exposed to corrosive processes induced by biochemical processes and microbial ecosystem of the oral cavity.² Their stability is of critical importance to nullify the unwanted tooth movement, and is achieved by controlling biomechanical factors such as quality and mass of the bone, screw design, method of insertion, and loading.³⁻⁷ Commercially available mini-implant materials are mostly commercially pure (cp) titanium, two titanium alloys with aluminum and vanadium,