Acidic pH resistance of grafted chitosan on dental implant

Abstrak

Over the last decade, access to dental care has increasingly become a service requested by the population, especially in the case of dental implants. However, the major cause of implant failure is an inflammatory disease: peri-implantitis. Currently, the adhesion strength of antibacterial coatings at implant surfaces remains a problem to solve. In order to propose a functionalized implant with a resistant antibacterial coating, a novel method of chitosan immobilization at implant surface has been investigated. Functionalization of the pre-active titanium (Ti) surface was performed using triethoxysilylpropyl succinic anhydride (TESPSA) as a coupling agent which forms a stable double peptide bond with chitosan. The chitosan presence and the chemical resistibility of the coating under acid pH solutions (pH 5 and pH 3) were confirmed by FTIR-ATR and XPS analyses. Furthermore, peel test results showed high adhesive resistance of the TESPSA/chitosan coating at the substrate. Cytocompatibility was evaluated by cell morphology with confocal imaging. Images showed healthy morphology of human gingival fibroblasts (HGF-1). Finally, the reported method for chitosan immobilization on Ti surface via peptide bindings allows for the improvement of its adhesive capacities and resistibility while maintaining its cytocompatibility. Surface functionalization using the TESPSA/chitosan coupling method is noncytotoxic and stable even in drastic environments as found in oral cavity, thus making it a valuable candidate for clinical implantology applications.