Surface Modification of Titanium Implants for Improved Tendon Adhesion

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Titanium is the primary material for orthopedic implants due to its high strength and biocompatibility. Surface modifications that allow for effective osseointegration are well known, however such metal prosthetics are not conducive to soft tissue and tendon adhesion. Here, we address this problem by coating the surface of titanium or tantalum plates with polypyrrole (PPy), polydopamine (PDAm) or a combination of the two polymers (PPy-PDAm). PPy, PDAm, and PPy-PDAm surface coatings can be fabricated via chemical and/or electrochemical polymerization. The chemical polymerization requires the addition of a dopant and an oxidant. Here, ammonium persulfate was used. The electrochemical polymerization by way of oxidative polymerization. PDAm is formed through electrochemically induced self-polymerization of dopamine (DAm). The two monomers can be copolymerized, both electrochemically and chemically. This copolymerization produces a film with both electrical conductivity and better adhesion to the metal substrate than just the PPy films. All coatings were characterized by scanning electron microscopy, contact angle measurements, and the sticky-tape method for adhesion. Biological testing was also conducted to measure cell adhesion and proliferation on each polymer film, as well as extracellular matrix production.