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College of Dentistry

The Effect of Nano Strontium Substituted Hydroxyapatite and Nano Fluorapatite Coating on Commercially Pure Titanium Implants (Biomechanical and Histological Study)

A Thesis

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Abstract

Background: Dental implants are considered a unique treatment alternative for the replacement of missing dentition. There is a strive for materials which increase bone formation in bone implant interface and improve osseointegration to offer immediate loading directly after placement with decreased time.

The aim of the study: Evaluation of the influence of coating commercially pure titanium (cpti) implant with nano strontium substituted hydroxyapatite (SrHA), nano fluorapatite (FA), and mixture of them on the strength of bone-implant interface after two and six weeks of implantation in rabbit tibia by torque removal test , and histological test .

Materials and methods: Commercially pure titanium rod was used to prepare 80 screws that were divided into machined surfaces (commercially pure titanium), coated with nano strontium substituted hydroxyapatite, coated with nano fluorapatite, and coated with mixture (50% of nano strontium substituted hydroxyapatite and 50 % of nano fluorapatite). The dip coating process was used for producing a homogenous coating layer. Biomechanical and histological assessments were completed after 2 and 6 weeks of implantation.

The surface characteristics of the coating materials (in vitro study) were assessed by the optical microscope, thickness measurement, x-ray diffraction analysis and scanning electron microscope with energy-dispersive x-ray spectroscopy.

Results: The results revealed that the mean removal torque value for the mixed groups were significantly greater when compared with commercially pure titanium group, nano strontium substituted hydroxyapatite group, and nano fluorapatite group after 2 and 6 weeks. There was more new bone formation around the screws for the mixed group for both healing intervals.

Conclusion: Mixing nano strontium substituted hydroxyapatite and nano fluorapatite was more effective in increasing torque mean values, in addition to

higher bone formation after 2 and 6 weeks as a result of combined effect of strontium and fluoride in the coating.