Torque removal test of strontium chloride and hydroxyapatite coated commercially pure titantium implant complemented with histomorphometric analysis (a comparative Study)

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Abstract

Introduction: The new trend of implants is to find materials which accelerate bone formation in bone implant interface and improve osseointegration to provide immediate loading right after placement and eliminate waiting period which is uncomfortable and disturbs patients.

Aim of study: To evaluate the effect of strontium chloride coating of screw shaped commercially pure titanium dental implant on bond strength at bone implant interface by torque removal test and histomorphometric analysis in comparison to hydroxyapatite coating .

Materials and methods: Electrophoretic Deposition Technique (EPD) was used to obtain a uniform coating layer on commercially pure titanium screws . In order to examine the coating surface ; X-ray diffraction (XRD) analysis ,coating thickness measurement and microscopical examination were carried out on the coating surfaces of the commercially pure titanium.

The tibia of 10 white New Zealand rabbits were chosen as implantation sites. The tibia of each rabbit received two screws, one strontium chloride coated and one hydroxyapatite coated and a total of 40 screws were implanted. Torque removal test was performed to measure bond strength between implant and bone, after 2 and 6 weeks healing periods. For each period of time 16 screws were tested for the torque required to remove the implant from the bone and 4 screws were kept for histological examination.

Results: The results revealed that the mean removal torque values for the strontium chloride coated implants was significantly higher than the hydroxyapatite coated

implants and over the two periods of time. There was an increase in the bond strength (torque value) of bone-implant interface with time . In addition, the histomorphometric analysis showed increased new bone formation ratio in response to the strontium chloride coated screws ,characterized by proliferation of osteoblast cells and a maturation of bone.

Conclusion: Commercially pure titanium implant coating with strontium chloride was more efficient in increasing bond strength at bone implant interface than hydroxyapatite , which was demonstrated by higher torque removal force(for HA after 2 and 6 weeks 17.87±1.5 ,21.06± 2.8 respectively and for $SrCl_2$ after 2 and 6 weeks 43.75±9.63 , 53.62 ±3.62 respectively) and new bone formation ratio at the 2 periods of time weeks and 6 weeks after implantation.