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***Evaluation of the Effect of Glow Plasma Nitriding of  
Commercially Pure Titanium Dental Implant on  
Osseointegration Through Mechanical and  
Histomorphometric Analysis***

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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 or early loading after placement in addition to eliminate the waiting period which is usually uncomfortable and disturbs patients.

**Aim of study:** To evaluate the effect of plasma nitride treatment of screw shaped commercially pure titanium dental implant on bond strength at bone implant interface by torque removal test and histomorphometric analysis after 2 and 6 weeks in comparison to non treated one .

**Materials and methods:** Commercial pure titanium plates and screws were plasma nitrided for 10h using glow plasma nitride apparatus . X-ray diffraction (XRD) analysis , scanning electron microscope examination were carried out on the nitride surfaces of the plates ,contact angle measurement (Wettability) was done by applying drop of saline and blood on the nitrided surface and compared to control.

The femur of 10 white New Zealand rabbits were chosen as implantation sites. The femur of each rabbit received two screws, one plasma nitride treated and one non treated and a total of 40 screws were implanted. Torque removal test was performed(by digital torque meter) to measure bond strength between implant and bone, after 2 and 6 weeks healing periods. For each period of time 18 screws were tested for the torque required to remove the implant from the bone and 2 screws were kept for histological examination.

**Results:** The results revealed that the mean removal torque values for the plasma nitride treated implants was significantly higher than the non treated implants and over the two periods of time. There was an increase in the bond strength (torque value) of bone-implant interface with time . The torque removal force for plasma nitride implants after 2 and 6 weeks was (30.22, 59.56 N.cm ,respectively) and for non treated implants after 2 and 6 weeks were ( 23.61,56.11N.cm, respectively) and new bone formation ratio for plasma nitride treated implants after 2 and 6 weeks(3.36, 4.72 , respectively) and for non treated after 2 and 6 weeks(1.56, 3.04, respectively).

**Conclusion:** Plasma nitriding of Cp Ti screws significantly increased the torque removal value and new bone formation ratio at 2 and 6 weeks compared with the non treated implant .*Dental implant, Osseointegration, Digital torque meter*