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Biomechanical Effect of Nd: YAG Laser Ablation on Commercially Pure Titanium Dental Implant (in vivo)

A thesis submitted to the council of the College of Dentistry at the University of Baghdad, in partial fulfillment of the requirements for the degree of Master of Science in Prosthodontics Department

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Abstract

Background: A lot of studies have been done on dental implant that aim to facilitate bone formation and enhance osseointegration and hence reduce the unloading period which may last for 3-6 months render the patient be disturb and uncomfortable .

Aims of the study: This study aims to evaluate the effect of topographical modification produced by Nd: YAG laser ablation on commercially pure Titanium implant on removal torque to break implant–bone interface as well as evaluate histological osseointegration after 2 and 4 weeks of implantation .

Materials and methods: A pilot study was done to select suitable energy of Nd: YAG laser, according to roughness measurement and SEM(scanning electron microscope) feature of cpTi surface. Thirty six screw like implants were prepared from cp Ti. Eighteen implants were ablated with Nd: YAG laser to get optimal uniform roughness, and the other 18 implants were left un-ablated . The screws were implanted in rabbit tibia, each rabbit tibia received 2 implants; one ablated implant (as an experimental) and the other un-ablated implant (as a control).After 2 and 4 weeks of implantation, the removal torque value was measured to evaluate the bone-implant interface strength and histological analysis was also performed using one implant for each group and interval period.

Results: The results revealed that laser produced repeatable standardized surface ablation with favorable roughness (1.36 μm). There was high significant increase in removal torque of the laser ablated implant when compared with the non ablated implant .Histologically, laser ablation improved osseointegration between implant and bone there was qualitative bone improvement in response

to laser modified (ablated) implant and development of mature bone characterized by well-developed Haversian canal within the boney thread.

Conclusion: Ablation of cp Ti implants with Nd.YAG laser was efficient in enhancing removal torque value and provided favorable surface for better osseointegration when compared with the non-ablated screws.