

**EFFECTS OF LOW ENERGY LASER
IRRADIATION ON BONE HEALING
AROUND INTRAOSSEOUS TITANIUM
IMPLANTS IN EXPERIMENTALLY
DIABETIC RABBITS**

(Morphometric and Histological Evaluations)

A Thesis

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Abstract

The present study was aimed to shorten the healing period for implantation in experimentally diabetic rabbits.

One hundred and fifty four machined surface Iraqi implants were inserted in 77 Alloxan induced diabetic rabbits (2 implants in each rabbit). Sixty six of these screws were plasma sprayed (TPS) so that to get surface roughness to influence osseointegration.

The experimental animals were divided as follows:

Group A: (11 rabbits) Diabetic (no insulin treatment), received machined surface titanium implants.

Group B: (11 rabbits) Diabetic (no insulin treatment), received machined surface titanium implants and received laser irradiation.

Group C: (11 rabbits) Diabetic (no insulin treatment), received TPS implants.

Group D: (11 rabbits) Diabetic, treated with insulin, and received machined surface titanium implants.

Group E: (11 rabbits) Diabetic, treated with insulin, received machined surface titanium implants, and laser irradiation.

Group F: (11 rabbits) Diabetic, treated with insulin, and received TPS implants.

Group G: (11 rabbits) Diabetic, treated with insulin, received TPS implants and laser irradiation.

The low energy diode laser (wavelength 904 nm, continuous beam) was given for two weeks starting from the day of the operation directly for 15 minutes/session and one session daily (4.5 Joules per session).

After 4, 6, 18 weeks healing period. One of the screws then unscrewed with a torque gauge, and the peak torque required to shear off the implants was recorded. Then the animals were sacrificed 3 or 4 rabbits (for each period) from each group

and the decalcified sections of the bone around the implants were studied histomorphologically. The image analysis computer system was used for the morphometric analysis, which was bone area of the 8 threads around the implant on each side and number of osteocytes in the first three threads on each side.

The result revealed that the rabbits with uncontrolled diabetes showed delay skin wound healing, delay in osseointegration, bone formation and bone maturation around the implant. This delay in the uncontrolled diabetic rabbits improved by using TPS implants or by irradiation of the implant site by low-energy laser.

Rabbits with controlled diabetes showed improved skin wound healing, delay in osseointegration, slight improvement in bone formation and maturation around the implant.

Bone formation and maturation in controlled diabetic rabbits was improved by using TPS implants or by irradiation of the implant site or by both (which was the optimal result obtained in this study).

Removal torque test (as an indication for the osseointegration) showed a dramatic increase with the presence of TPS and laser irradiation.

It can be concluded that diabetes affecting negatively osseointegration and bone healing around titanium implant which be improved by the use of TPS implants together with laser irradiation with the necessity of controlling the blood glucose level.