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Effect of 820nm Diode Laser on Some Hormones and Enzyme Concerning with Wound Healing and Skin Loss Sealing

A thesis
submitted to the Department of Biology, Faculty of
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Summary:-

The objective of this study is to investigate the effect of Low Level Laser Therapy L.L.L.T. on cell proliferation of epithelial and connective tissue in the healing of incised cutaneous wounds or lost skin flaps and to determine the adaptive response of cells to irradiation with laser from the physiological point of view depending on the laboratory determination using the Eliza for the hormones which greatly interlace with wound healing processes.

The experiment was conducted on twenty adult white New Zealand male rabbits with 1.5 -2 Kg body weight each, they were divided into two groups with 10 rabbits each : group 1 (induced wound group) and group 2 (lost skin group).

The animals of the first group underwent a surgical operation on the lateral aspect of the left thigh; a surgical wound with 7cm length was made and then closed with stitches of simple interrupted sutures using surgical silk 3-0. while the 2nd group operation involved removing of a whole thickness skin square graft of (1x1 cm) dimensions.

The site of the operation in all the animals was treated with antibiotic spray then the animals were injected with systemic antibiotics: penicillin (1000 iu/kg. B.W.) and streptomycin (10mg/kg. B.W.) i/m for three subsequent days after the operation.

The animals of each group were divided into two subgroups (control and treated with laser irradiation). The laser used was diode 820nm wave length, with maximum output of 200 mW, density 8J/cm², pulsing frequency 1-10 Hz.

Irradiation began after the operation and continued for 5 days in the animals of the induced wound subgroup and seven days in the skin loss subgroup animals with 1.2 minute /session daily. Irradiation with the laser was done by directing the beam (1cm) distance from the wound or around the square area of the lost skin.

Blood samples were collected at days (0, 1, 3 and 7) from the animals of the first group and (1, 3, 7 and 10) in the animals of the second group. The samples were taken from the marginal ear vein from all the animals and sent for examination with Eliza to determine the levels of Prostaglandin E₂ (PGE₂), Prostaglandin F₂ α (PGF₂ α), Growth hormone (GH) and cyclic Adenosine Monophosphate (c AMP).

Results of the current study revealed a highly significant increase in the levels of PGE₂, PGF₂ α , GH and cAMP in the samples of the treated subgroups as compared with those of the control one; there was rapid stabilization of the hormonal status.

We can conclude that the treating of the surgical wounds and skin disorders with low level laser radiation was useful and efficient because the primary healing was promoted and accelerated. The process ending in the 4th. postoperative day in case of the surgical wound group, and 9th. postoperative day in the skin loss group.

The results obtained from this study should be attributed to the improvement of rheological properties of blood, increase blood capillary, blood flow, reduced vascular resistance and vascular tone which lead to increasing the motion and outflow of fluids from the interstitial spaces into the lymphatic system, Energy is needed to activate certain processes in the cell to trigger the aforementioned sequence of pathways which in turn promote regeneration and accelerate wound healing.

We tested the results statistically using SPSS regression test and found that the results of the Eliza test for the hormones showed significant variations in the values of PGE2,PGF2 α ,cAMP and GH, between the two subgroups of the 1st. group, $P > 0.05$,

It was also found that the values of hormonal assessment of PGE2, PGF2 α , cAMP, GH and the diameter of the skin defect for the animals of the 2nd. group showed significant variations between the two subgroups $P > 0.05$.