

## THE EVALUATION OF THE LOW LEVEL LASER THERAPY IN SURGICAL WOUND MANAGEMENT

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**Abstract.** Surgical wounds are open traumatic lesions as a result of operations on skin and mucous. The wound treatment cost in terms of finance and time is relatively high; the complete wound healing lasts 3 weeks. To minimize this periode of healing of surgical wound and suppression some secundar effect, therapeutic methods and drug are used in post-operative process. One of these method is Low Level Laser Therapy (LLLT). LLLT has been used for treatment of wounds for over two decades in many medical centers of the world. However, despite such wide clinical usage, there is still controversy regarding the efficacy of LLLT in the treatment of wounds. Many laser systems, different laser parameters and irradiation conditions, and a great variety of treatment protocols lead to these conclusions. The goal of this paper is to present our evaluation of LLLT role in surgical aseptic wound management based on the hematologic exem, histologic exem and biochemical blood analysis using SCL-TR laser system.

# The evaluation of the low level laser therapy in surgical wound management

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**Objective:** The goal of this paper is to present our evaluation of LLLT using a SCL laser system (INOE 2000, Bucharest, Romania, P=15 mW,  $\lambda=635$  nm) in surgical aseptic wound management based on the hematologic exam, histologic exam and biochemical blood analysis

## Materials and methods:

**Animals:** Fifteen clinical healthy rabbits (Big Belgian Hare strain) weighting more than 2 kg where used in this study. The animals have been divided in 2 groups: experimental group (10 rabbits) and control group (5 rabbits). An incision was carried down through skin, subcutaneous tissue and underlying muscle on a distance of 8 cm. After the incision the wound was approximated with surgical silk interrupted suture

**Laser Irradiation:** A laser system SCL-TR (INOE 2000) emitting at 635 nm with a power of 15 mW was used.

After 1 hour from surgery, the animals from the first group were irradiated with laser radiation at  $\lambda = 635$  nm, P = 15 mW, texp = 180 s.

**Treatment evaluation:** The efficacy of LLLT has been evaluated by:

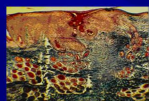
- hematologic exam: the following data were collected: red blood cell count (RBC), white blood cell count (WBC), platelets count, average red blood cell volume (VEM), haemoglobine concentration (Hb), hematocrite (Ht), average red cell haemoglobine (HEM).
- histological examination – at the end of the irradiation period, biopsie were taken.
- biochemical blood examination was done on serum samples and the following data have gathered: serum glucose, blood urea, alkaline phosphatase, ALAT, ASAT, Gamma glutaminy transpherase.



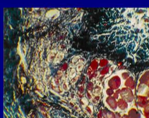
## Results:

### 1. Histological examination

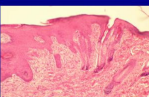
➤ the histological examination on fragments of tissue harvested at 7 days postoperatively has shown a complete forming of the dermic scarr and reepitheliazation of the wound



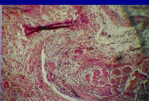
➤ in the deep dermis it can see scarr connective tissue made of young collagen and lacking hair follicles. In the papillary dermis the nets of elastine and reticulin fibers are regenerating, the fibroblasts being situated in the papillary dermis, under the basal membrane. In the deep dermis the skin muscle is replaced by scarred connective tissue



➤ the epitheliazation is a process that ends after 7 days of laser therapy, the basal and the spinous layers are completely restored

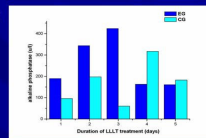


➤ in the deep dermis blood and lymphatic vessels are formed, increasing the circulation of blood and the lymphatic drainage



### 2. Blood chemistry

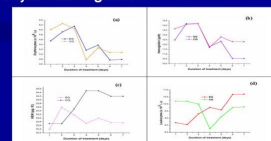
has shown variations within normal range for both the irradiated group and the control one. Glucose, blood nonproteic nitrogen and the liver enzymes have shown normal results for the species.



### 3. The hematologic exams

have watched the red blood cell count and other eritrocytic parameters (VEM, HEM, Hb, Ht) in the experimental and the control groups.

- the eritrocyte count has shown high levels starting the 3rd postoperative day, levels that maintain during the whole experiment, though not above the normal range.
- haemoglobine levels are high in the second and third postoperative days as well as the average eritrocyte haemoglobine



**Conclusion:** Treating the aseptic surgical wounds with LLLT proved to be useful and efficient because the primary healing was stimulated, the process ending in the 10th postoperative day. The biochemical blood examination showed normal enzyme levels in both groups, with the exception of alkaline phosphatase, which showed increases of 100 to 200 % above physiological limits in the experimental group. It was also histologically proven that the epitheliazation and dermis repair are accelerated in the treated group. All these data have shown LLLT to be effective in the treatment of surgical wounds