

Influence of the Gallium Arsenide Laser and Gallium Aluminum Arsenide Laser and healing ointment on blood leukocytes in wistar rats after cutaneous wounds

Gonçalves, RV.^{1*}; Matta, SLP.¹; Novaes, RD.¹; Vilela, EF.¹; Pinto, MVM.²

¹Department of Cellular and Structural Biology – Federal University of Viçosa, Viçosa MG, Brazil

²Department of Physiotherapy – University Caratinga

*e-mail: reggysvilela@yahoo.com.br

The search for a suitable approach in the treatment and prevention of skin wounds is old. There is still a high rate of these injuries especially in individuals lying in the hospital environment and in elderly [1], in spite of several studies and more investments in this area. The closing of wounds occurs through the process of healing, which is characterized by a series of biochemical and cellular events by which the body tends to repair the damaged tissue. This process demands a complex interaction among cells, also of cells with extracellular matrix and blood vessels [2,3]. Failures in the process of healing often occur in the early stages of tissue repair, with noticeable reduction of fibroblast proliferation and angiogenesis [3]. In addition, some products derived from essential fatty acids such as Dersani[®] ointment, which presents linoleic acid in its composition, are commonly used to stimulate tissue regeneration and to increase the speed of wounds closure [3]. In addition, different types of low-intensity lasers are being used with the objective of promoting the reduction of healing time and improve the quality of the neofomed tissue [3,4]. There is evidence that different therapeutic approaches used in the treatment of skin wounds are able to influence the immune system. There are reports that laser therapy can change the production of circulating leukocytes, which indicates possible immunomodulatory effect of biologic stimulation by light. In this context, the aim of this study was to evaluate the effect of the arsenide gallium-aluminum laser (GaAsAl), arsenide of gallium laser (GaAs), and healing ointment Dersani[®], used to treat skin wounds induced in rats, on the count of blood leukocytes. Thirty ten-week-old male Wistar rats weighing 324 ± 19 g were used. Five wounds of 12mm diameter were produced on the dorso-lateral region of the animals after trichotomy. To perform the surgical wounds, animals were anesthetized by intraperitoneal administration of ketamine (60 mg/kg body weight) and xylazine (10 mg/kg body weight). The diameter of wounds was measured by analog caliper, and depth of incision was up to the exposure of the dorsal muscle fascia. After receiving the wounds, animals were randomly divided in four groups of 6 animals each, as follows: Group 1: animals treated with the laser GaAs (4J/cm²); Group 2: treated with the laser GaAsAl (30J/cm²); Group 3: treated with the laser GaAsAl (60J/cm²); Group 4: treated with Dersani[®] ointment; Group 5: control, wounds cleaned with saline 0.9%. All treatments were initiated 6 hours after the completion of wounds and repeated once daily during 20 consecutive days (duration of experiment). The animal blood was collected in the first and last day of the experiment through puncture of the tail venous plexus. The blood was stored with anticoagulant (EDTA) and hematocrit was performed. The total count of leukocytes was performed using a Neubauer camera and blood smear was prepared for differential counting of the same, using Giemsa staining. In the present study, statistical difference was observed in the number of monocytes and neutrophils. Regarding the number of other leucocytes analyzed, no differences were seen. Blood samples from group Dersani[®] presented significantly higher ($p = 0.019$) number of monocytes, compared to the other groups (Figure 1). On the amount of neutrophils, the animals in the group treated with saline showed significant increase ($p = 0.015$), which was not observed in other groups (Figure 2). Our results indicate that the ointment Dersani[®] shows influence on the immune system, particularly on the elevation of circulating monocytes. Furthermore, the increase in the number of neutrophils in the group treated with saline indicates a possible installation of an infectious process, since these cells are important cellular defense against invading microorganisms [4]. In relation to groups treated with the laser, no increase in the number of leukocytes corroborate previous studies [5], who described the use of low-energy laser as a therapeutic modality that has been used to and sterilization of wounds and control of bleeding.

References

- [1] L. Blanes, S. Duarte, J. Calil, L. Ferreira, Rev Assoc Med Bras 50 (2004) 182-187.
- [2] S. Werner, R. Grose, Physiol Rev 83 (2003) 835-870.
- [3] S. Maldebaum, E. Santis, M. Maldebaum, An Bras Dermatol 78 (2003) 393-410.
- [4] I. Garavello-Freitas, V. P. Baranauskas, C. Joazeiro. M. Padovani J Photochem Photobiol 70 (2003) 81-89.
- [5] A. Júnior, R. Oliveira, R. Farias, L. Andrade, M. Aarestrup, An Bras Dermatol 81 (2006)150-156.

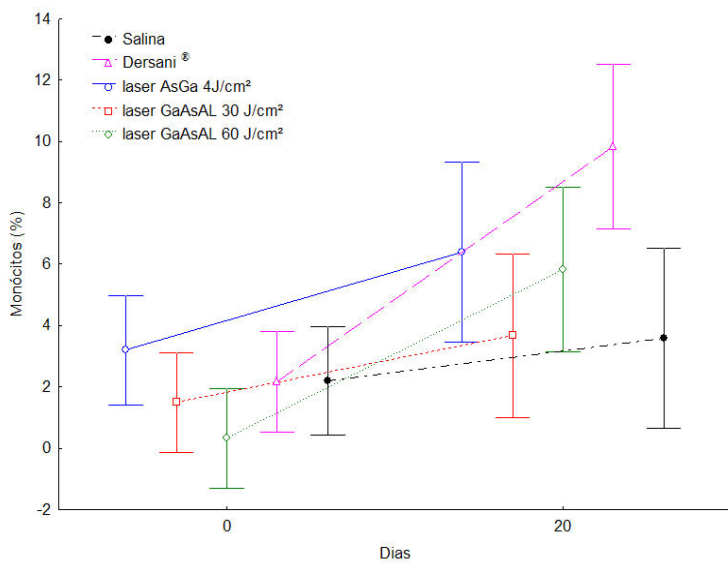


Figure 1 – Results of analysis of average values of the count of monocytes of animals in relation of time and treatment with saline, Dersani® and different types and intensities of laser.

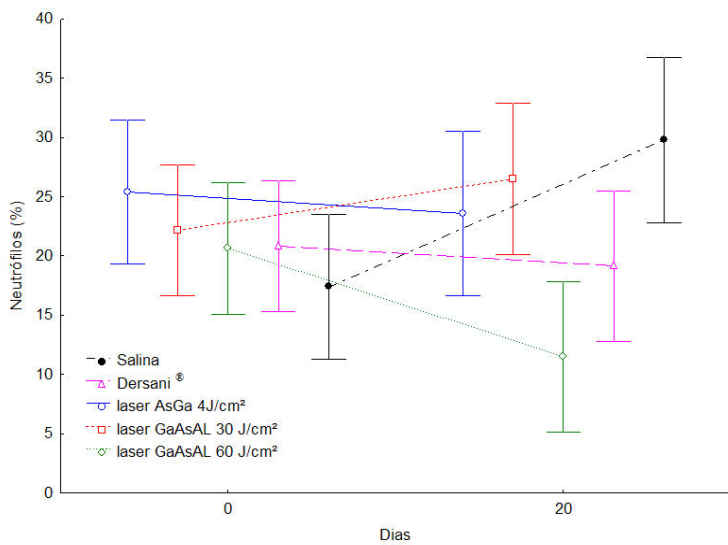


Figure 1 – Average values of count of neutrophils in animals as a function of time and treatment with saline, Dersani® and different types and intensities of laser.