

COMPARATIVE STUDY OF MAGNETOTHERAPY ACTION IN SKIN DAMAGES

Research Article

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Abstract

BACKGROUND: Magnetic is a pulsed electromagnetic field that induces the formation of other electromagnetic fields perpendicular to their place of incidence, is a therapeutic resource of physiotherapy used for tissue repair. **OBJECTIVE:** The study exposes the effects of Magnetic the healing process of diabetic rats. **METHODS:** This was an experimental study with a sample of 30 rats, weighing between 100 and 160 g were divided into 5 groups, where each animal received on his back the application of Magnetic. There uninjured control group, without application and without diabetes with immediate sacrifice (G1); control with injury without application and without diabetes sacrificed 48 h (G2); 48h without diabetes treated and sacrificed 48 hours (G3); control with injury without application and sacrificed 48h diabetes (G4); treated with injury, with application with diabetes and sacrifice 48h (G5). **RESULTS:** Histological analysis showed that the G1 did not change in G2 presented mild granulation, edema, inflammation and the presence of neutrophils in the G3 observed the presence of marked granulation, lots of blood vessels and connective tissue and the formation of new vessels in the G4 edema, dense crust with neutrophils and bleeding and G5 area little edema, inflammation, presence of micro vessels, monocytes and potted red blood cells. **CONCLUSION:** Therefore, it was revealed that the healing process was accelerated by the application of Magnetic.

Key word: Repair, Skin, Wound, Therapy

INTRODUCTION

The wound healing means a coordinate cascade of cellular and molecular events that interact to occur repaving and reconstruction of the tissue. As initiate of the cicatrization, that it occur by the tissue lost, from which the physiological system separates a repair of a injurious event to the organism (MANDELBAUM; DISANTIS; MANDELBAUM, 2003).

The healing has, through the years, deserved double attention, mainly in relation to the factors that delay or difficult these process. The factors that difficult the repair are an ambient more or less contaminated in which occurred the wound, the deficit nutritional state, systemic disorders associated as the diabetes, radiotherapy, chemotherapy and immunosuppressed drugs use (MARTINS, et al. 2006).

The wound healing in diabetic occur with difficulty due to the blood perfusion compromised, avoid oxygen, nutrients and antibiotics property supplied. This do with that the initial stages of tissue repair stayed disorganized, producing to the process of tissue regeneration be slow (PINTO, ANJOS, LOPES, et al. 2009).

Almost half a century, several researches has dedicated special attention to the problem of the cicatrization on diabetes people, manly ones that occurred in the inflammatory phase, that it is characterized by vascular and cellular events, with leucocytes, macrophages and fibroblasts decrease, alterations that decreased the collagen synthesis increasing the possibility of infections (BRINGS, ZHANG, CHOONG et al., 2015).

Due to the uncomfortable and the clinical repercussion caused by exacerbation of the inflammatory process, the physiotherapy act in the reduction of these clinical signals through of therapeutic resources, as magnetotherapy that promoted anti-inflammatory or pro-inflammatory effects, and accelerating the process of regeneration and reshuffle of the tissues (DUTTON, 2006).

The magnetotherapy consists in one of therapeutic resources of the physiotherapy used for the promotion of the tissue repair process. It is of an electromagnetic pulsed field that promotes the formation of new electromagnetic fields, perpendicular to the incidence local (STAUD, 2011).

The effects to cellular level have a normalization of the membrane potential and stimulated the cellular mechanism, acting as anti-inflammatory and analgesic (MARKOV, 2007).

It was observed a relevant inflammatory diseases and acute lesions prevalence on diabetic human beings, producing socioeconomic losses, associated to the several comorbid generated physical and functional restrictions due to the more time of cicatrization. The present study offer aids to the scientific community, promoting the grounding for the use of the magnetotherapy as a resource of routine in the physiotherapy. Therefore, a new study in these area implies in benefits for the society, proposing a bigger understand about the effects of the magnetic field on different phases of inflammatory process in the search of promote a return to the functional and productive working activities in less time.

MATERIAL AND METHODS

These research characterized as an experimental study using 30 *Wistar* rats (*Rattus Norvegicus albinus*), male, random selected, 100 to 160g, sustained during the experimental protocols between 22 to 27 °C with control illumination and in the biological cycle with photo-period of 12 hours, individual gages which they received water and food.

They were divided into 5 groups, which each treated group received the magnetotherapy application in his back.

All rats were submitted the 12 hours fasting time, anesthetized by the use of Zoletil 50mg by intramuscular injection, in the calculated dose, according with the weight of the animal (50 to 75 mg/kg).

After those 18 animals were submitted to the intraperitoneal injection of estreptozotoxine (Sigma) 110mg diluted in 2 ml of sodium citrates buffer 0.01mol with acid pH of 4.5 on calculated dose, according with of animal weight that it was 0.25 ml means.

After one hour and half it was offered water and after more 30 minutes the food. In the first 48 hours it was offered glucose solution (2.5% and 5%) replacing the water and the glucose level was monitored until the 72 hours.

The glycaemia was realized with the use of the Advantage machine (Roche), to the confirmation of the Diabetes, 72 hours after the administration of the estreptozotoxine (STZ). The blood was obtained through the tail of the animals and dropped in the reagent tape and the data was obtained with the Glucometer. It was considered diabetics the rats with the glycaemia values was equal or superior the 200 mg/dl (Figure 1).

After 10 minutes of anesthetic application it was realized the trichotomy in the back of the animal, following of local sterilization with clorexidine 2%, it was done the surgical incision of 2cm², on dorsal region in 24 animals.

In 24 hours after the lesion, it was initiated the use of magnetotherapy, which utilized the parameters of 20 mT, 50 Hz and time of 30 minutes of application in each session.

The collected data were analyzed quantitatively after 24 hours of fixation and the samples were sent to the pathology laboratory for histological routine process. The samples were putted in paraffin blocks, cute in rotate microtome with 4 micrometers (Tricometer of Masson) and stained by hematoxylin and eosin techniques.



Fig 1: Blood withdraw for glycaemia determination

After the construction of the blades, they have been examined by three examiners blindly, in Olympus optic microscope. Microphotographs were done with digital camera fixed through the microscope, 40, 100 and 400x of magnitude.

It was realized the qualitative analyses, through of color photos with the HE technique for observation of inflammatory cellular response.

All the procedures are summarized in table 1.

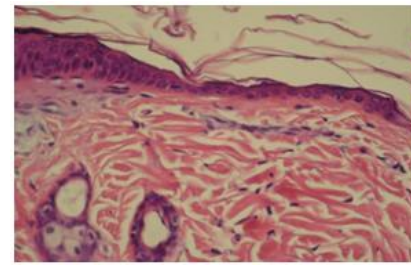
Table 1: Detailed specifications of experimental and control groups

GRO UP	S	INTERVENTION	SACRIFICE
G1	6	CONTROL N/LESION N/APPLICATION N/ DIABETES	48h
G2	6	CONTROL W/LESION N/APPLICATION W/ DIABETES	48h
G3	6	TTO 48H W/ PEMF W/ DIABETES W/ LESION	48h AFTER TREATMENT
G4	6	CONTROL W/ LESION W/ TTO W/ DIABETES	48h
G5	6	TTO 48H W/ PEFM W/ DIABETES W/ LESION	48h AFTER TREATMENT

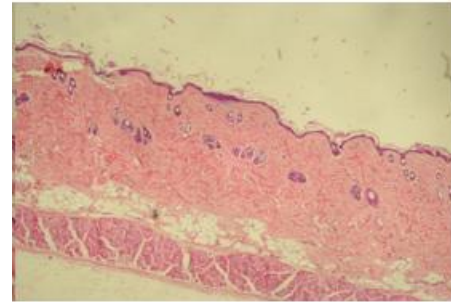
S=subjects; N=without; W=with; h=hour; TTO= Treatment; PEMF= Pulsed Electromagnetic Fields

RESULTS

The control no injurie group, no application and without diabetes (G1) were sacrificed immediately, is showed in the figured 2. In witch it is note that not presented alteration in the epithelial tissue. It is sustaining their fibers organized and regularly disposes, without the presence of an inflammatory cell, edema or cicatrice tissue.



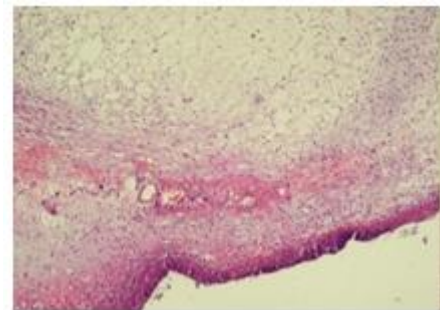
A



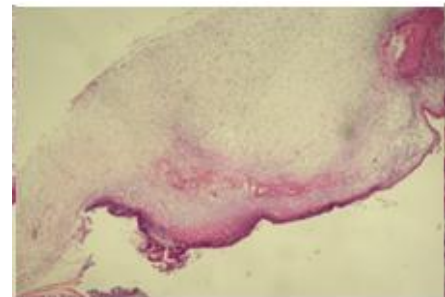
B

Fig 2: A: Normal tissue, no lesion. (Photomicrography, 40x, HE). B: Normal tissue, no lesion. (Photomicrography, 100x, HE).

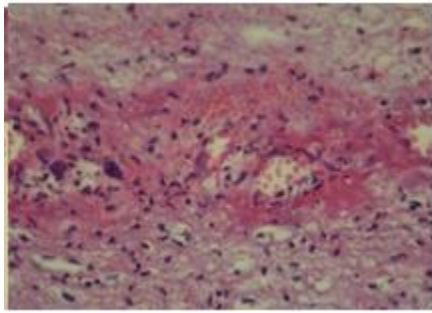
The control group with lesion (G2) without treatment, without diabetes and sacrificed with 48 hours, it is showed on figures 3 (A, B e C). In the 3A, it showed discreet tissue of granulation, in the 3B edema and light inflammatory process, and in the 3C a presence of neutrophils.



A



B



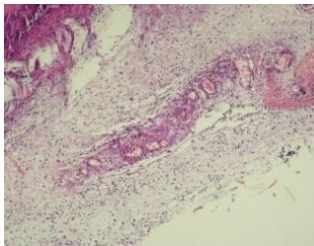
C

Fig 3: A: Skin lesion, discrete presence of granulation tissue (Photomicrography, 40x, HE). B: Edema and inflammatory process (Photomicrography, 100x, HE). C: Presence of neutrophils (Photomicrography, 400x, HE).

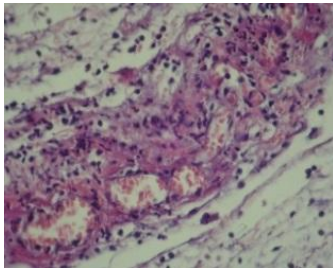
The third group, with lesion, application, without diabetes and sacrificed with 48 hours, is showed in the figure 4 (A, B, C e D). The presence accentuated of granulation tissue in the 4A image, increase quantity of blood vessels and of conjunctive tissue in the 3B and the vessels new formation in the C.

The fourth group (G4) which is the control with lesion, without application, with diabetes and sacrificed with 48 hours, it is showed in the figure 5 (A e B). It was observe edema, dense rind with neutrophils and hemorrhage presence.

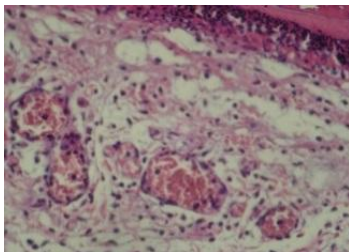
The fifth group (G5), diabetics, with lesion, application and sacrificed in 48 hours, it is showed in the figure 6 (A, B, C, D e E). It was observe area with less edema, manly in relation to the rind, discreet inflammatory reaction, and presence of micro-vessels, monocytes and vessels with erythrocytes.



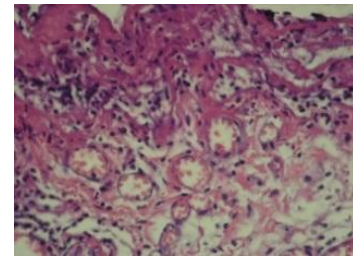
A



B

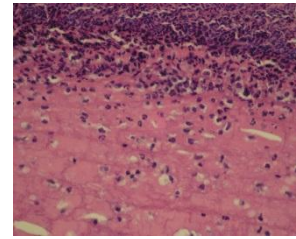


C

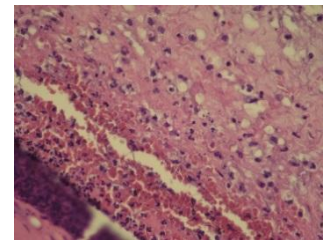


D

Fig 4: A: Accentuated granulation tissue (Photomicrography, 40x, HE). B: Great quantity of blood vessels and conjunctive tissue (Photomicrography, 400x, HE). C: New formation of vessels in the granulation tissue (Photomicrography, 400x, HE). D: Youth /onjunctive tissue loss(Photomicrography, 400x, HE).



A



B

Fig 5: A: Edema, dense crust with neutrophils (Photomicrography, 400x, HE). B: Hemorrhage (Photomicrography, 400x, HE).

DISCUSSION

In the epithelial tissue, the cells are tightly fixed in layers called epithelium. The extracellular matrix is rare and it is a fine layer of basal blade, which occupied a space below to the epithelium. We observed that the layer of the epithelial cells lining cavities and all the free surfaces of the body such as the human skin. The specialized junctions between the cells permit that the epitheliums make barriers that not permit the water movement, solvent and that the cells between the organism compartments. The epithelium frequently localize under a layer of conjunctive tissue. This combination, for this time, it could be connected to the others tissues, like the muscles forming big functional unites denominated organs (IOZZO, 1988), contributing with the findings of the control group 1 without lesion, without diabetes and treated as observed in the figures 2A e 2B.

The surgical intervention in the animals of the control group 2, it was the responsible for all findings of the optic microscopy in this group as edema, inflammatory process (figure 3B), tissue of granulation (figure 3A), and neutrophils (figure 3C). The inflammation is a mechanism of defense characterized as self for conjunctive tissues by depend of the vessels to lead to the injured areas the defense agents that they act in the surgical lesion (CONSOLARO, 2009).

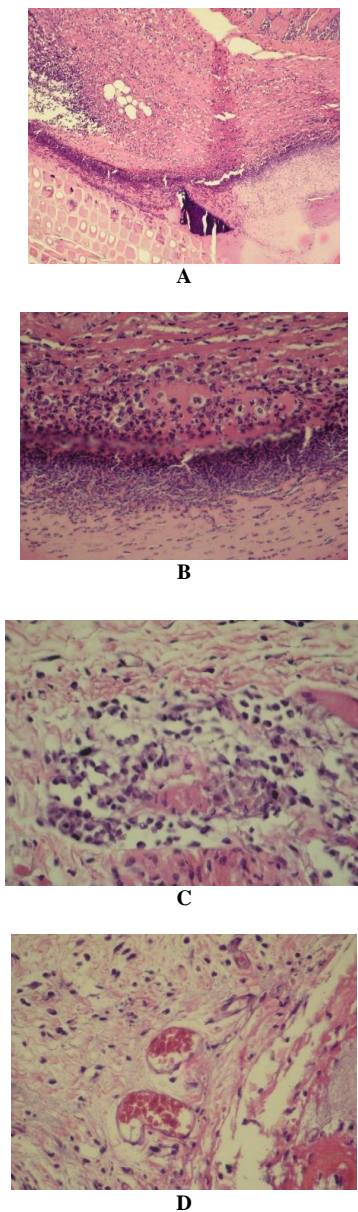


Fig 6: A: Small area with edema and discrete inflammatory reaction (Photomicrography, 100x, HE). B: Less edema above the crust (Photomicrography, 400x, HE). C: Monocytes (Photomicrography, 400x, HE). D: Vessels with erythrocytes, presence of microvessels (Photomicrography, 400x, HE).

The inflammatory or exudative phase begin after the lesion, with fibrin network formation and the migration of neutrophils, lymphocytes and, more later, the macrophages, it have the objective to remove devitalized tissues. The proliferative phase is responsible for the formation of the tissue of granulation, that also it was founded in the group 2 (MANDELBAUM, DISANTIS, MANDELBAUM, 2003).

Comparing the group 3 with the group 2 that it was not received treatment it was note an inflammatory phase higher and the beginning of the angiogenesis that it occur at the same time to fibroplasia, when the new vessels will support formation of the new matrix (MANDELBAUM, DISANTIS, MANDELBAUM, 2003) that they were founded in the figure 4B, and the new formation of vessels in the figure 4C.

Various local and systemic factors can to delay or to impede the cicatrization, as: inadequate nutritional support, tissue oxygenation deficit, infection, necrosis, dry environment, injury size, patient age, immunosuppression and decrease of the

proteins of the insulin signalization via (BREM, TOMIC-CANIC 2007; KOLLURU, BIR, KEVIL, 2012), as in the diabetic animals of the group 4 (That is the control with lesion, without application, with diabetes).

In the figure 5 (A and B) there edema, a dense crust with neutrophils and presence of bleeding, considering the presence of diabetes can infer that triggered the hemorrhagic aggravated by surgical incision and the others findings are due of inflammatory process.

Analyzed the figures 6A, 6B, 6C and 6D it was found an area of little edema, especially in relation to the crust, a discrete inflammatory reaction, monocytes, micro-vessels and vessels with erythrocytes.

During the repair process, the proliferative phase has three subphases. The group 5 of the research that it is diabetic it was treated and it was found in the second subphase, that it is the fibroplasia, in which occur fibroblasts proliferation and production of collagen, elastin and others proteins. And also the third subphase that is the angiogenesis, that occur at the same time of the fibroplasia, where it rise the vessels to nutrition of the new tissues (MANDELBAUM, DISANTIS, MANDELBAUM, 2003).

To oppose the group 4 with the group 5, it was realize that the treatment with the magnetotherapy accelerated the tissue repair process and the angiogenesis of the group 5, according with the study of Markov (2009), the contraire it was observed in the group 4 that despite it was in the proliferative phase it showed a bleeding.

CONCLUSION

Therefore, it was revealed that the healing process was accelerated by the application of Magnetic. It was suggest that it will do a qualitative analysis.

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