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Study the Possible Action of Soft Laser on the Histological Structure of the Plasma Cell in the Lymph Node of Mice

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Abstract: ***Purpose: The aim of this presented work is to prove that soft laser may alter the histological structure of the plasma cell of the lymph node of laser groups of mice in order to create an immune response. Materials and Methods: Twenty four normal adult male of Swiss albino mice were used in this experimental work. They were aged two months and body weight 38-46gm. These mice were divided into three groups (n=8 each). The first group of mice was used as normal control group. Both second and third groups of mice were considered as laser groups and exposed to laser irradiation for 20 and 25 minutes once daily respectively during the entire periodof exposure to laser irradiation (nine days). Laser of gallium arsenide with a wavelength of 904nm was used in this work.After sacrificing all the mice including control group and laser groups, sections of lymph nodes were prepared by using a routine procedure. Histological evaluation of the overallsections of the lymph nodes was performed by light microscopy, and photographs were made at special magnification. Results:Obvious alterations were observed in the histological structure of the plasma cell of the lymph node of the laser groups such as increased size of the cell and multiplication of the nucleus. These alterations were more obvious in the plasma cell of the lymph node of the third laser group of mice in comparison with the alterations of the plasma cell of the lymph node of the second laser group of mice. Conclusion: Soft laser was a useful tool in altering the architecture of the plasma cell of the mice lymph node, and indicated that the time of exposure to laser irradiation was successful in making altered architecture of the plasma cell respectively.***

Keywords: Soft laser, Plasma cells of the lymph node, Histological alterations, Mice.

1. Introduction

Lymph nodes (LN) are organs consisted of several different types of immune cells which distributed strategically throughout the body, these cells are extremely important in inducing the immune response (1). Immune cells such as T-cells, B-cells, natural killer (NK) cells and antigen presenting cells (APC) are the major types of the immune cells that present in the lymph nodes (1). Lymph nodes (LN) are characterized by having specialized postcapillaryvenules that called high endothelial venules (HEV) which enable the circulating lymphocytes in the blood to enter directly the lymph nodes (2, 3). The lymphoid lobule represents both structural and functional unit of the LN, and the size of the LN isa good marker for the number of lymphoid lobules that differs from a few to many thousand (1).

The LN composed of the cortex that has germinal centers which includes B-cell area and interfollicular cortex which includes T-cells. The paracortex of the LN has a deep cortical unit which includes T-cells. Antigen presenting cells (APC) are directed to be in both paracortex and interfollicularcortex of the LN. The medulla is mainly consisted of channels and blood vessels that drain the LN (4). B-cells can act as antigen presenting cells (APC) to T-cells (5). Moreover, the components of the immune system are also locating at other parts in the body, for example, Kupffer cells in the liver, alveolar macrophages in the lung, mesangial cells in the kidney, and microglia in the brain. The skin has immune system (SIS) which includes Langerhans cells that represent antigen presenting cells (APC) (6).B-cells which originate and mature in the bone marrow are carried by the blood to the secondary lymphoid structures, they proliferate in case of activation, and then differentiate into plasm cells which secrete antibodies (7, 8).

It must be observed that low level laser therapy (LLLT) has many terms. It is called "cold laser", "soft laser", "biostimulation", "photobiomodulation", "low intensity laser therapy", "low energy laser therapy", "laser phototherapy (LPT)", "laser therapy", and "non-ablative irradiation" (9, 10, 11, 12). At the present time, LLLT is used as part of physical therapy in many countries of the world. In addition to using LLLT mainly for wound healing and pain relief in the past, LLLT has medical applications that broadened to include diseases such as stroke, myocardial infarction, and degenerative or traumatic brain disorders (13).

The aim of our presented experimental work was to prove whether soft laser aided in altering the structure of the cells of lymph node of mice such as plasma cells in order to create an immune response to these cells.

2. Materials and Methods

This experimental paper was performed by using twenty four normal adult male of Swiss albino mice. They were aged two months and body weight 38-46gm. These mice were divided into three groups (n=8 each).The first group of mice was used as normal control for comparative purposes with the other groups of mice. Both second and third groups of mice were considered as laser groups which anaesthetized and exposed to laser irradiation for 20 and 25 minutes once daily respectively during the entire period of exposure to laser irradiation (nine days). The beam of laser of gallium arsenide (GaAs) with a wavelength (lambda = 904 nm) was directed to the cervical lymph nodes of the target mice (laser groups). The object was one centimeter distant from the laser source. The arrangement of time of exposure to laser irradiation and the entire period of

exposureto laser irradiation for each laser group of micewaslisted as in the following table:

Table 1: Arrangement of Both Time of Exposure to Laser Irradiationand the Entire Period of Exposure to Laser Irradiation for Laser Groups of Mice

Group	Number of mice	Time of exposure to laser irradiation	Entire period to laser irradiation
First (normal control)	8	---	---
Second (laser group)	8	20 minutes once daily	nine days
Third (laser group)	8	25 minutes once daily	nine days

At the end of the entireperiodof exposureto laserirradiation, all the mice including the control group and laser groups were sacrificed and their lymph nodes were rapidly obtained. Sections of lymph nodes were prepared by using a routine procedure for histological study. Histological evaluation of the overall sections of the lymph nodes was performed by light microscopy, and photographs were made at special magnification.

3. Results

The overall results of this study exhibited that soft laser induced alterations in the histological structure of the plasma cells as an immune respone due to laser stimulation, these alterations could be summarized as in the following table:

Table 2: Alterations in the Histological Structure of the Plasma Cell in the LymphNode of Mice Caused by Soft Laser

Number of mice per group= 8			
Group	Time of exposure to laser irradiation	Entire period of exposure to laser irradiation	**Histological structure of the plasma cell**
First (normal control)	---	---	Unaltered architecture of the plasma cell
Second (laser group)	20 minutes once daily	Nine days	• Obvious increasing in size of the plasma cell • Multiplication of the nucleus was also obvious
Third (laser group)	25 minutes once daily	Nine days	Both increasing is size of the plasma cell and multiplication of the nucleus were more obvious in comparison with the second laser group of mice

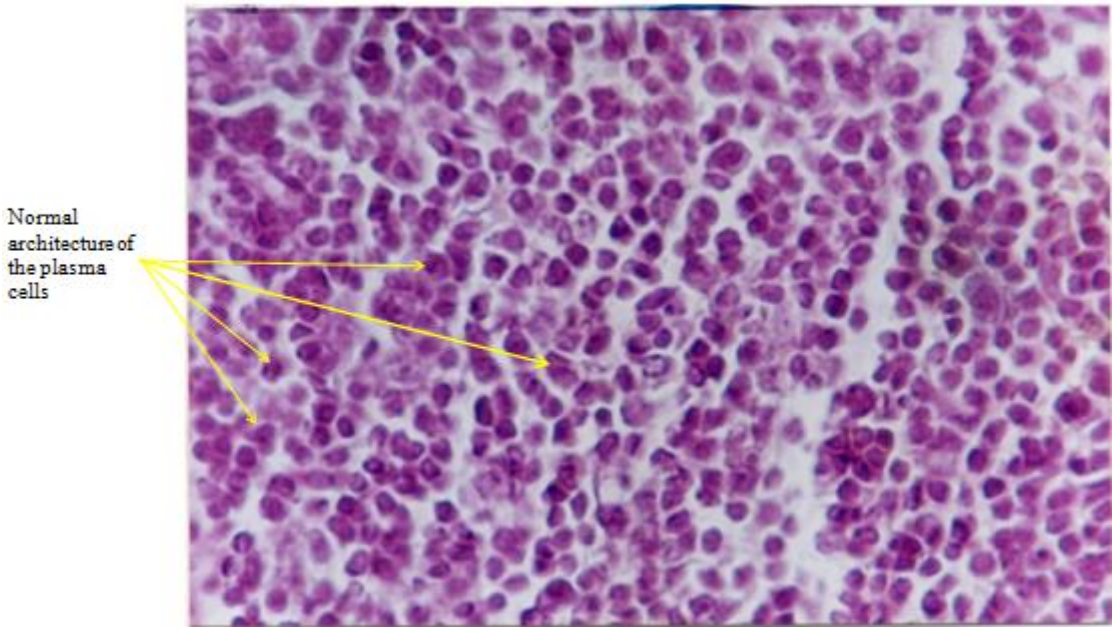

Figure 1: Histology of lymph node of the first normal control group of mice showing normal architecture of the plasma cells. Sections stained with hematoxylin and eosin. Original magnification X40.

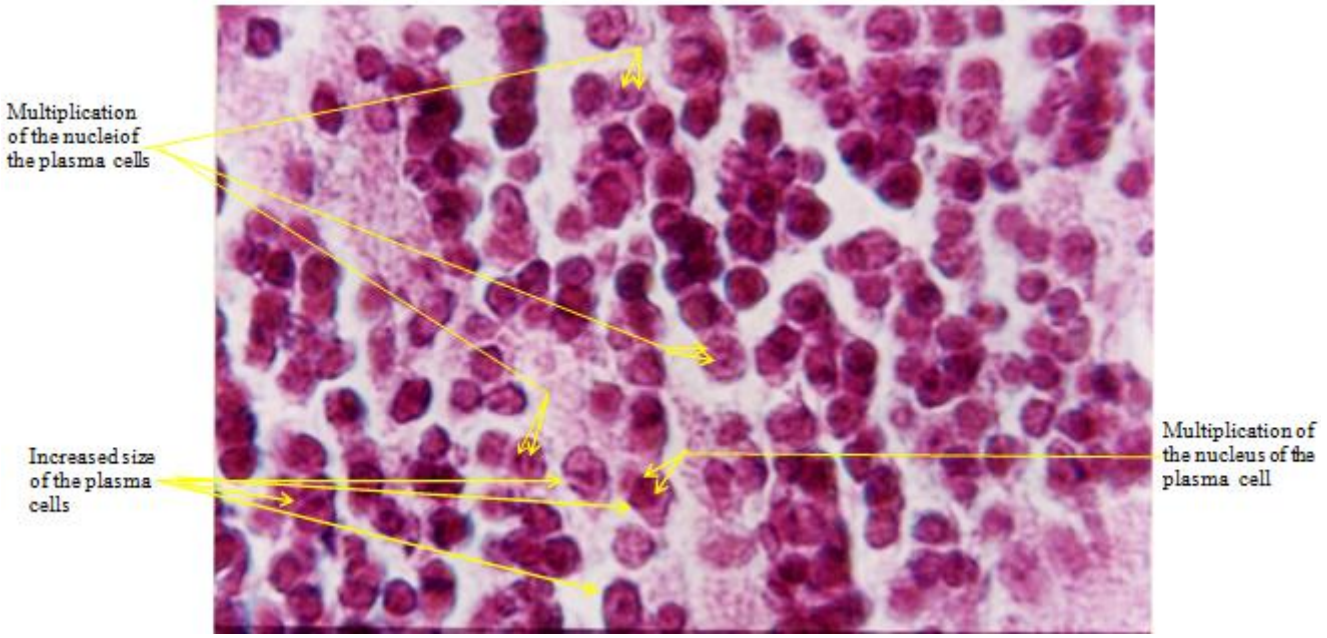

Figure 2: Histology of lymph node of the second laser group of mice showing obvious alterations in the architecture of the plasma cells such as increased size and multiplication of the nucleus. Sections stained with hematoxylin and eosin. Original magnification X40

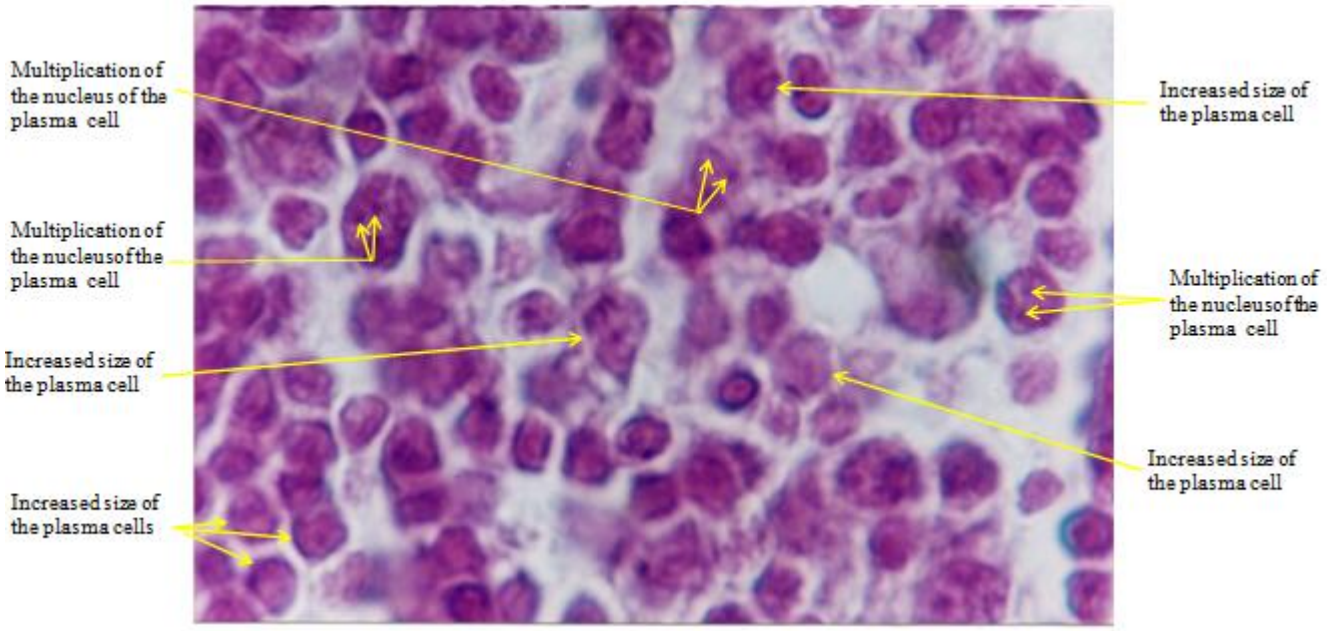

Figure 3: Histology of lymph node of the third laser group of mice showing more obvious alterations in the architecture of the plasma cells such as increased size and multiplication of the nucleus. Sections stained with hematoxylin and eosin. Original magnification X40

4. Discussion

Histological evaluation of the stained histology sections of the lymph nodes of both second and third laser groups of mice performed by light microscopy proved that soft laser has the ability to elicit cellular changes in the plasma cell of the lymph node of the mice. Besides, the first normal control group of mice was used as a marker for comparison with both second and third laser groups of mice (Figure 1).

In the second irradiated group of mice, the histology of the lymph node of the second laser group of mice (figure 2) showed that the effects of soft laser on the structure of theplasma cell were obvious because soft laser revealed a considerable activity in thehistological structure of the plasma cell that led to increasing in the size of the cell and multiplication of the nucleus due to stimulatory character of the laser (time of exposure to laser irradiation was 20 minutes once daily and the entire period of exposure to laser irradiation was nine days), whereas, the histology of the lymph node of the third laser group of mice showed more obvious alterations in the histological structure of the plasma cell which include both increasing in size of the cell and multiplication of the nucleus (time of exposure to laser irradiation was 25 minutes once daily and the entire period of exposure to laser irradiation was nine days) in comparison with the histology of the lymph node of second laser group of mice (Figure 3).

The alterations that occurred in the architecture of the plasma cell were gradual due to the increasing in time of exposure to laser irradiation from 20 to 25 minutes once daily for second and third laser groups of mice respectively (Table 2). It could be said that soft laser aided in altering the architecture of the plasma cell for the benefit of increasing the immune activity of the plasma cell in the lymph node of mice. The most important point here that has given rise to much controversy is to understand deeply the necessity of using soft laser in creating immune response which may consider as corner stone for assessing the proliferation of the cell in the field of studying many biological processes (14). Also, we monitored that the laser used in this experimental work induced a plasma cell activity when the entire period of exposure to laser irradiation was 9 days, whereas, it was mentioned elsewhere that the exposure duration to laser irradiation did not exceed 10 days (15).

Finally, soft laser is an effective through stimulatory mechanisms becauselaser energy is absorbed by inter-and intra-cellular targets, which brought about a secondary stimulation of the tissue (16).Secondary stimulation may consider as production of structural alteration in the plasma cell such as increased size and multiplication of the nucleus.

5. Concluding Remarks

- Our experimental work gave encouraging results including alterations in the architecture of the plasma cell caused by soft laser and that will illustrate current ideas about creating an immune response which will adda newinformation about the proliferation of the cell.
- In our work, the time of exposure to laser irradiation was sufficient to cause alterations in the architecture of the plasma cell which may consider as positive alterations.

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