THE THERAPEUTIC EFFECT OF THE HIGH INTENSITY LASER ON LOW- BACK PAIN SYNDROM

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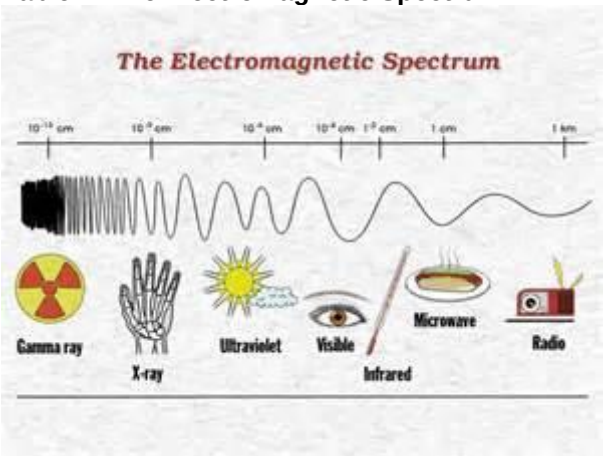
Abstract: ***Laser beam is used for medical application for about 5 decades. In this period, low intensity laser is extremely popular as physical therapeutic modality. The latest research and clinical experiences show multiplied therapeutic effects using high intensity laser. A study performed on a group of 20 patients from November 2012 to April 2013 demonstrates the analgesic effect for high intensity laser on low-back pain.***

Keywords: high intensity laser, therapeutic effect, analgesia

1. INTRODUCTION

All of the wave lengths from the light radiation are used as physical therapeutic modalities in different type of pathologies: Rheumatology, Neurology, Orthopedics, Dermatology, Stomatology etc. (Table 1)

Table 1: The Electromagnetic Spectrum



All the therapeutic physical modalities using the light radiation are called phototherapy.
The word ''LASER' 'stands for **L**ight **A**mplification by **S**timulated **E**mission of **R**adiation.
The first theoretical postulated on a laser beam were laid by Albert Einstein in the early twentieth century but the first laser unit was not constructed until 1960. The medical application of laser light followed soon after: E.Mester introduce the stimulative effect of laser and he conducted his experiment in the late 1960s. Since then, this type of treatment underwent great technical development. Classified according to their wave length and maximum output in 1M,2,2M,3R,3B and 4,laser light sources used in medicine are: low intensity laser(3B) and ,after the recent research, high intensity laser(4).Increasing the power and dosage using the class 4 lasers the therapeutic effect can be multiplied and compare to low intensity laser therapy ,have the ability to penetrate into almost unlimited depth of the body.
The high intensity laser therapy is a non-invasive therapy and the biological effect are mainly influencing the muscular system, the peripheral nervous system, the circulatory system and the conjunctive tissue and the skin. The effects are analgesic, biostimulation, antiphlogistic, antioedematous, increasing the local circulation and the intracellular activities of many enzymes, improve glucose utilization and oxygen circulation.
The high intensity laser is a new kind of laser therapy used in Romania, and it's therapeutically benefits are beginning to be evaluated in clinical studies.
There is little evidence in the medical literature in the last two decade like placebo double blinded studies to evaluate the physical modalities effects in therapy.

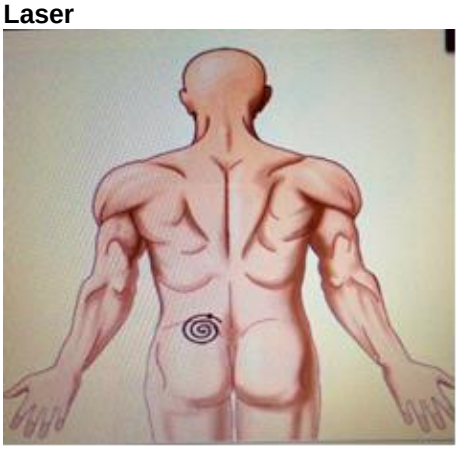
2. MATERIAL AND METHODS

From November 2012 to April 2013 we selected 20 patients with low-back pain syndrome in the Rehabilitation Department to the Colentina Clinical Hospital of Bucharest.216 (630) patients had been evaluated by our Department in this period.
Inclusion criteria: age between 20-65, no major recent surgeries or trauma, no major organ illnesses, no pregnancy, menstruation, skin type I, II, III, or IV, according to Fitzpatrick photo typing scale (skin dark brown and skin black was excluded), pain syndrome with the following characteristics: acute, localized to low back, recent, nociceptive type of pain, with paretic radiculopathy.
There was used a Czech device: BTL-6000 High Intensity Laser, 12w, 1064 nm (figure 1).

Figure 1: BTL-6000 High Intensity Laser (Colentina Clinical Hospital, Bucharest, 2013)

The device has a Laser Unit, a Footswitch control and a Hand piece witch is precisely applied on treatment area in two phases, at every session: phase I-Analgesia, and phase II-Biostimulation.
The group of patients followed an individualized medical prescription with 10 sessions of a single application of high intensity laser per day at the painful area of low back.
For the phase I-Analgesia, the application was made by using continuous circular movements (figure 2).

Figure 2: Phase I-Analgesia application in low back pain of BTL-6000 High Intensity Laser



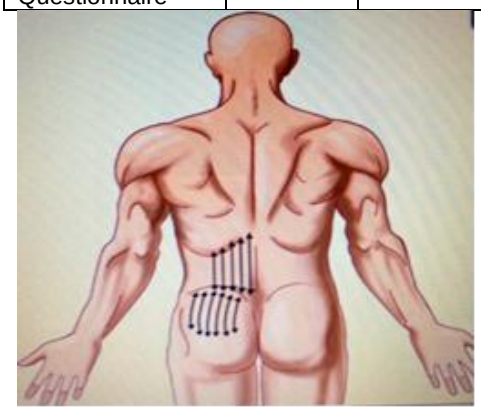
The device was manual set to the program L-7125 with power 10w, frequency 25 Hz, dose of 10J/cm2, wave Leigh 1064 nm, area to be treated 25 cm2, for 1min and 40 seconds (Figure 3).

Figure 3: BTL-6000 High Intensity Laser Display (Colentina Clinical Hospital, Bucharest, 2013)

After the finish of application, the device was manual set for the phase II-Biostimulation. In that case, the application was made by using continuous movements (figure 4)

Figure 4: Phase II-Biostimulation application in low back pain of BTL-6000 High Intensity Laser

PARAMETERS	INITIAL	FINAL	Improved
VAS	7,9	5,0	36,70 %
ROM	28 grades	15 grades	46,42%
Contracture	1,5	0,9	40%
Sleep Disturb	0,9	0,49	45,5%
Quality of life	1,4	0,8	42,85%
Oswestry Low Back Pain Disability Questionnaire	49% Severe disability	27% Moderate disability	44,89%



The device manual settings was to the program L-7126,with power 6 dose of 100J/cm2, wave Leigh 1064 nm, area to be treated 25 cm^2, for 6min and 56 seconds (Figure 5).

Figure 5: BTL-6000 High Intensity Display (Colentina Clinical Hospital, Bucharest, 2013)

We registered a group of parameters that can illustrate the evolution of pain (analgesic effect) at the first patient's evaluation and at the final patient's evaluation after 10 daily session of therapy: the intensity of pain using the Visual Analogic Scale VAS(0=absence,10=worst pain),the intensity of functional disability using Oswestry Low Back Pain Disability Questionnaire (notification in average obtained after 10 section of questions about how the low back or leg pain is affecting the patients' ability to manage in everyday life), for each the deficit in joint range of motion in grades (ROM), presence/absence of local contracture of the muscle paravertebral of the lumbar column(notification 0=absence,1=presence,2=intense), presence/absence of sleep disturbances caused by pain(same notifications as for contracture),change in better way of quality of life(same notifications as for contracture).

Results: After 10 session of daily therapy we obtained the following results in average values as it is show in Table 2.

Table 2: Results

The sensation of pain improved in average with 36,70%, but1 patient still had a very little reduction in pain. The range of motion for the lumbar column improved in average with 46,42% but 1 patient had a little reduction of the deficit. The contracture improved in average with 40% and just 1 patient maintain the same contracture after 10 therapeutic session. The improvement of functional disability with 44,89% is well correlated with sleep disturbances, improved in average with 45,5%,and with the improvement of the quality of life that is 42,85%,allowing the patient to continue his normal life.

Discussion: evaluating the analgesic effect is one of the most difficult task to be proved for a therapeutic effect of a certain type of physical modality. The studies are using between 3 and 7 parameters beside the VAS to evaluate this effect. We chose 5 parameters, including the quality of life, the VAS and Oswestry Low Back Pain Disability Questionnaire. The results are better than we expected but the group of patients is too small to draw significant conclusion.

Conclusions:

1. The analgesic effect of the high intensity laser for low back pain in daily sessions is demonstrated by the evolution of all registered parameters, including the disability improvement.
2. The significant improvement of the contracture of paravertebral muscles suggested that the mechanism of miorelaxation cannot be only an indirect one, produced by interrupting the vicious circle (pain-contracture-pain), but also can be a direct effect of the muscle fibers biostimulation.
3. For the quantitative appreciation of the analgesic effect further evaluation is necessary on larger study groups.

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