

THE CUMULATIVE EFFECTS OF LASER RADIATION IN THE TREATMENT OF CHRONIC BACK PAIN

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Abstract: This paper summarizes the results of a study accomplished in order to assess the benefits obtained by using lasers in the treatment of the painful syndromes of the lumbar spine. The study was conducted in the Children's Hospital Ambulatory of Botoșani, between 2003 and 2006, on two groups of patients with low back pain (LBP) and sciatic radiculopathies, selected on the basis of diagnosis, age and sex, allowing the composition of two comparable groups.

Cuvinte cheie: durere lombo-sacrată, laser, studiu

Rezumat: Această lucrare sintetizează rezultatele unui studiu efectuat pentru a stabili beneficiul terapiei cu laserului în tratamentul sindroamelor algice ale coloanei lombare (LBP). Studiul a fost realizat în Ambulatoriul de Specialitate al Spitalului de copii Botoșani, în perioada 2003-2006, pe 2 loturi de bolnavi cu LBP și radiculopatii sciaticice, selecționați după criteriile diagnostice, de vârstă și sex.

INTRODUCTION

Lasers are **artificial emitters of monochromatic and coherent** light, able to send a considerable amount of energy in small intervals of time, that can be focused into a point.

The therapeutic effects of laser depend on the following parameters: type of laser used (affecting reliability and cost), power (Watt) important for calculating the duration of the procedure, the wavelength of laser radiation (determining the effectiveness of the treatment), emission mode (continuous or pulsed) and the pulse rate.

The application of low intensity laser therapy reduces on short-term pain intensity by stimulating the release of beta-endorphins and improves blood flow, while on long-term or cumulatively, it increases cellular energy, regulates cell membrane potential and increases the rate of cell replication. In the category of long-term effects of laser therapy, the better nerve conduction is also included, facilitated by high levels of serotonin and acetylcholine, as well as the reduction of scar tissue by increasing collagen synthesis and increasing blood flow at the level of the affected area - the formation of new blood vessels.

The painful syndromes of the lumbar spine, lumbosacral particularly, affect different population groups (including those under pre-pubertal age and the young adults) causing disability and high medical costs. Low back pain syndrome can cause physical and mental discomfort.

In terms of etiopathogenesis, low back pain (LBP) may be mechanical, inflammatory, traumatic, metabolic, dystrophic.

PURPOSE

The purpose of the study is to evaluate the benefits of laser therapy in the treatment of the painful syndromes of the lumbar spine.

METHODS

Two groups of patients with LBP and sciatic radiculopathies were taken into the study, selected on the basis

of diagnosis, age and sex, allowing the composition of two comparable groups.

The patients selected for the study had a lumbosacral painful episode between 2003 and 2006, who came to the medical office for examination, on the request of the family physician or of the specialist) or on their own initiative. In order to apply the recovery programme, it was necessary to obtain the patients' consent.

The evaluation of the patients was done in the ambulatory surgery, on the onset of the algofunctional episode, at the end of the rehabilitation programme, as well as on the check up performed one month after the end of treatment.

The studied clinical and functional parameters were: anamnestic parameters (pain and functional impotence), clinical and functional parameters (static and dynamic rachidian syndrome, antalgic posture, paravertebral muscle contraction, static disorder, mobility, radicular syndrome, dural syndrome, fascial syndrome, psychological syndrome), muscle testing, neurological and walking assessment.

For an optimal progress monitoring and for a proper adaptation of the recovery programme regarding the clinical-functional status, scales were developed, such as the "test" scales that allow the recording and expression of the patient's condition under the form of a score. This allows the intra-patient comparison (in evolution) or the inter-patient comparison for the same disorder.

The treatment uses laser radiation known as "low level laser therapy" (LLLT) with a wavelength of 600-1000 nm and power density applications of 0.05 to 5 W/cm.

Treatment and recovery methodology used in the two study groups:

In this study, the component part that makes the distinction between the two groups is the recovery treatment methodology applied to patients. Thus, in both groups, pharmacological treatment and physiotherapy were applied, the difference is that in batch 1, physical laser treatment was also applied.

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Patients' group structure

The two batches (Batch 1 – study batch and Batch 2 – witness batch) include approximately 170 patients of both genders, aged between 19 and 30, with disorders of the lumbar spine.

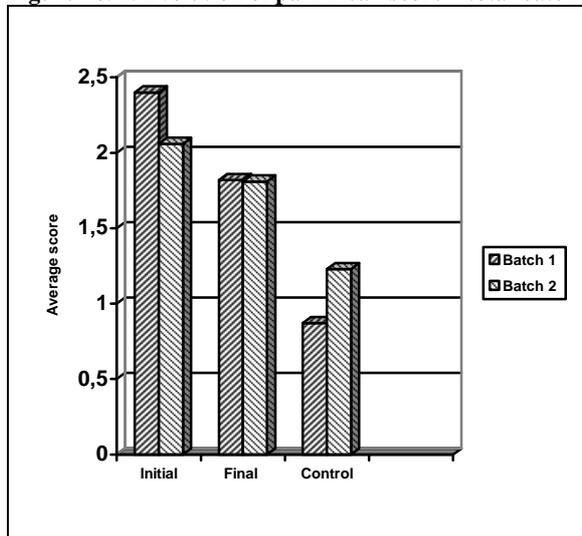
By applying the χ^2 test for the comparison of the batches according to diagnosis groups and age groups between males and females, there were no significant statistical differences.

Having in view these characteristics, regarding the age and gender distribution, average age, and the diagnosis group in the two batches, we may consider that these meet the requirements of a randomized study, allowing comparing the results that will be obtained.

RESULTS

Pain. The evolution of the mean pain score that includes assessments of pain intensity using the visual analogue scale (VAS), pains in orthostatism, in different static positions, when moving, at physical effort, is shown in table no. 2.

Figure no. 1. Evolution of pain mean score – total batch



Physical dysfunctions. The evolution of the score of the cumulated physical dysfunctions is presented in table no. 3.

Table no. 1. Structure of batches according to gender and diagnosis groups

Batches/Diagnosis	Radiculopathies	LBP	Sequela HD operated	Total	
Batch 1	Female	39	48	2	89
	Male	50	32	1	83
Total	89(51,74%)	80(46,51%)	3(1,75%)	172(100%)	
Batch 2	Female	44	39	2	85
	Male	34	47	4	85
Total	78(45,88%)	86(50,58%)	6(3,54%)	170(100%)	

Table no. 2. Evolution of the pain mean score in batch 1 and batch 2

Batches	No. of cases	Mean scores			Score difference (initial-final)	Score difference (initial-control)	Statistical significant (p-value)
		initial	final	control			
Batch 1	172	2,40	1,82	0,87	0,58(24,16%)	1,53(63,75%)	p=0,001 ES
Radiculopathies	89	2,74	2,00	1,09	0,74(27%)	1,65(60,21%)	p=0,001 ES
LBP	80	2,00	1,57	0,58	0,43(21,5%)	1,42(71,5%)	p=0,001 ES
HD-operated	3	3,00	3,00	2,33	0,00	0,67(21,33%)	p=0,001 ES
Batch 2	170	2,06	1,81	1,23	0,25(12,13%)	0,83(40,29%)	p<0,001 ES
Radiculopathies	78	2,13	1,85	1,35	0,28(13,14%)	0,78(36,61%)	p<0,001 ES
LBP	86	2,00	1,77	1,13	0,23(11,5%)	0,87(43,5%)	p<0,001 ES
HD-operated	6	2,17	2,00	1,67	0,17 (7,83)	0,5(23,04%)	p<0,001 ES

Disabilities. The evolution of disabilities score is presented in table no. 4.

Figure no. 2. Evolution of physical dysfunctions score – total batch

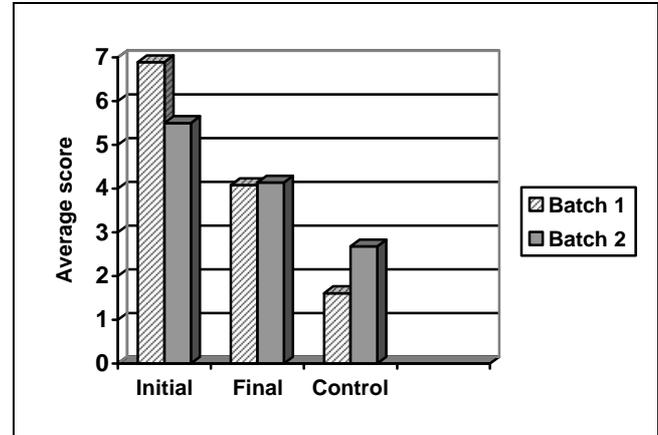
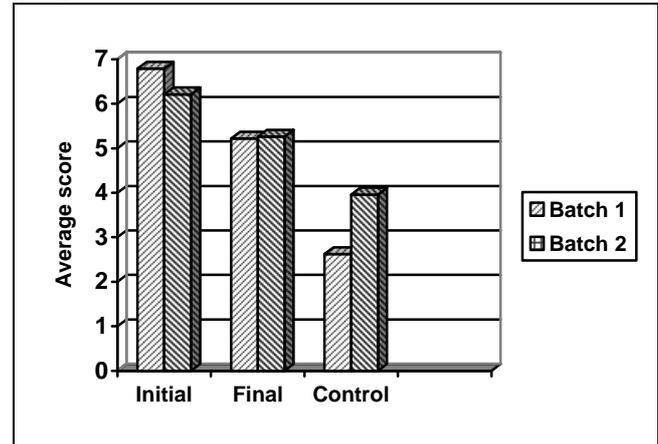


Figure no. 3. Evolution of physical disabilities score – total batch



CLINICAL ASPECTS

Table no. 3. Evolution of the general score of the physical dysfunctions in batches 1 and 2 per diagnosis groups

Batches	No. of case	Mean scores			Score differences (init-final)	Score differences (ini-control)	Statistical significant (p-value)
		initial	final	control			
Batch 1	172	6,89	4,08	1,61	2,81(40,78%)	5,28(76,63%)	p=0,001 ES
Radiculopathies	89	8,31	4,19	2,51	4,12(49,57%)	5,80(69,79%)	p=0,000120 ES
LBP	80	5,20	3,83	0,38	1,37(26,34%)	4,82(92,69%)	p=0,001 ES
HD-operated	3	9,00	8,00	7,67	1,00(11,11%)	1,34(14,88%)	p=0,263024 NS
Batch 2	170	5,50	4,14	2,68	1,36(24,72%)	2,64(48%)	p<0,001 ES
Radiculopathies	78	5,51	4,35	3,35	1,16(21,05%)	2,16(39,20%)	p=0,000254 ES
LBP	86	4,59	3,98	2,43	0,61(13,28%)	2,16(47,05%)	p<0,001 ES
HD-operated	6	6,00	4,00	2,83	2,00(33,33%)	3,17(52,83%)	p<0,001 ES

Table no. 4. Evolution of disabilities score in batches 1 and 5 per diagnosis groups

Batches	No. of cases	Mean scores			Score differences (init-final)	Score differences (initial-control)	Statistical significant (p-value)
		initial	final	control			
Batch 1	172	6,79	5,22	2,62	1,57(23,12%)	4,17(61,41%)	p=0,001 ES
Radiculopathies	89	7,16	5,96	3,20	1,20(16,75%)	3,96(55,30%)	p=0,001 ES
LBP	80	6,35	4,34	1,89	2,01(31,65%)	4,46(70,23%)	p=0,001 ES
HD-operated	3	7,67	7,00	5,00	0,67(8,73%)	2,67(34,81%)	p=0,001 ES
Batch 2	170	6,21	5,26	3,96	0,95(15,29%)	2,25(36,23%)	p<0,001 ES
Radiculopathies	78	6,38	5,54	4,19	0,84(13,16%)	2,19(34,32%)	p<0,001 ES
LBP	86	6,05	5,01	3,76	1,04(17,19%)	2,29(37,85%)	p<0,001 ES
HD-operated	6	6,67	5,83	4,67	0,84(12,59%)	2,00(29,98%)	p<0,001 ES

DISCUSSIONS

Regarding the assessed parameters, we can make the following comparisons:

1.The pains in our study were reduced by 24% in batch 1 and by 12% in the witness batch 2.

2.Physical dysfunctions are frequently mentioned and indicate an improvement by 40% in the batch 1 and by 24% in the witness batch 2.

4.Disabilities are assessed in recent studies and are considered an important indicator of the efficacy of the recovery programme applied. In our study, an improvement of 23,12% in the batch 1 and of 15% in the witness batch 2 has been observed.

CONCLUSIONS

The results of applying the laser treatment on the first group, recorded after two weeks of treatment show an improvement in all assessed clinical-functional parameters, which is statistically significant and higher in comparison with those obtained in the witness batch.

At check-up, one month after the end of treatment, it was observed that the results of using laser radiation in the treatment of lumbar spinal pain syndromes are highly superior to those obtained as a result of applying the classical treatment, which are also much improved as against the moment of ending the treatment, certifying thus, that laser treatment has a cumulative component that cannot be neglected.

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