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Laser Regeneration of Nerve Injuries in Children

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Summary

The current research makes a systematic examination of the influence of Low Level Laser Therapy (LLLT) in the regeneration of nerves in children, diagnosed with facial asymmetry, brachial plexus, or radial nerve injuries. Thirty-one patients (no case of central paralysis) were randomly separated into two groups. Group 1 (16 patients) was treated using low-level laser radiation and group 2 (15 patients – the control group) was applied classical methods of treatment. Two diode lasers were used (670 and 830 nm wavelengths & 100 mW respectively 300 mW max. output power). All the children were followed closely with active and passive corrective exercises. The final analysis clearly indicates the validity of this new treatment technique, as 87.5% of the patients treated with laser displayed a complete recovery, reported to only 60.0% of the patients in the control group.

Introduction

Peripheral nerve palsies in newborns and infants are known to occur with a frequency between 2-6% of cases [1]. The causes of palsies are very diverse; those of central nervous system are rare. The most frequently observed nerve injuries are those involving the facial nerve and the brachial plexus. Usually, facial palsy is a peripheral paralysis that results from pressure over the facial nerve in utero, from efforts during labor, or from forceps during delivery. Facial asymmetry may be present at birth or may develop later, suddenly or gradually, unilaterally or bilaterally [2, 3]. LLL radiation actions on electrophysiological parameters of nerves [4], and represents a hope in treating these problems [5, 6, 7].

Materials and Methods

Thirty-one patients were randomly separated into two groups: group 1 (16 patients) was treated using low-level laser radiation, and group 2 (15 patients) was applied classical methods of treatment. In the present research both groups did not present any case of central paralysis, but the local traumatic etiology was the most frequently observed. At the newborns treated for facial asymmetry, the paralysis did not disappear spontaneously in a few days after delivery. See Table 1 for patient data.

Table 1

Features	Group 1 (n=16)	Group 2 (n=15)
Mean Age (months)	1.67	1.71
Sex		
Males	50.0% (8)	46.7% (7)
Females	50.0% (8)	53.3% (8)
Diagnosis		
Facial Asymmetry	62.5% (10)	60.0% (9)
Erb-Duchenne Paralysis	25.0% (4)	26.7% (4)
Radial Paralysis	12.5% (2)	13.3% (2)
Etiology		
Traumatic Injuries	56.3% (9)	60.0% (9)
Obstetrical Causes at Birth		
Other Emergency Injuries		
Acute Injuries	25.0% (4)	20.0% (3)
Acute Otitis Media		

Facial Neuritis		
Congenital Bell's Palsy	18.7% (3)	20.0% (3)
(Unknown Etiology)		

Group 1 received LLL therapy every other day, three times a week, 12 days per month, during a 3-month period. The clinical work has been performed with Med 700 (670nm, Lasotronic – Switzerland) and Maestro (830nm, Medicom – Czech Republic). The treatment parameters were: density of energy in range of 2.0 – 8.0 J/cm²; pulsed wave – 8.2 Hz, in IR domain. Every paralysis was treated following the trajectory of the nerve from its origins, applying the treatment in 10 - 20 irradiation points by contact mode. In the case of the facial nerve there was applied a density of energy of 8.0 J/cm² on its intaosseus trajectory. Group 2 was applied classical treatment. All the children were closely followed with active & passive corrective exercises. The integrity of the facial nerve was evaluated testing 10 muscular groups belonging to medial and lateral half of the face (See Figure 1). In this clinical test, points have been given for each muscular group, and then added, as follows: absence of contraction = 0 p, normal contraction = 3 p.

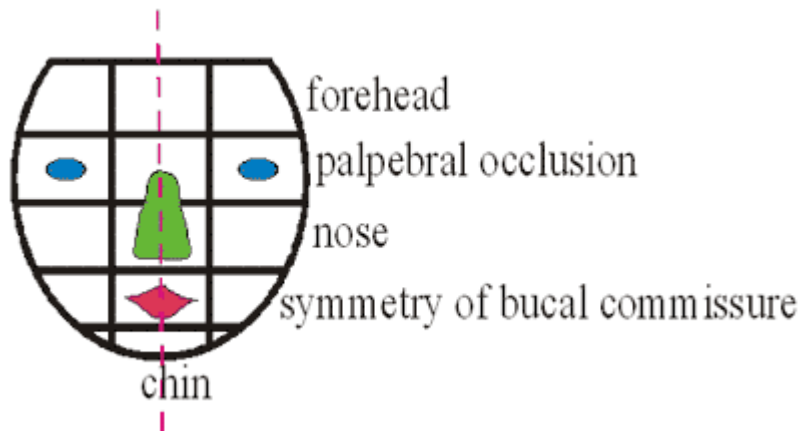


Figure 1.

Results and Discussions

The efficiency of LLLT was very good.

The improvement began after 12 sessions and the total recovery of function was observed at the end of treatment. Figure 2 displays the evolution of the motricity score in the tested patients, diagnosed with facial asymmetry.

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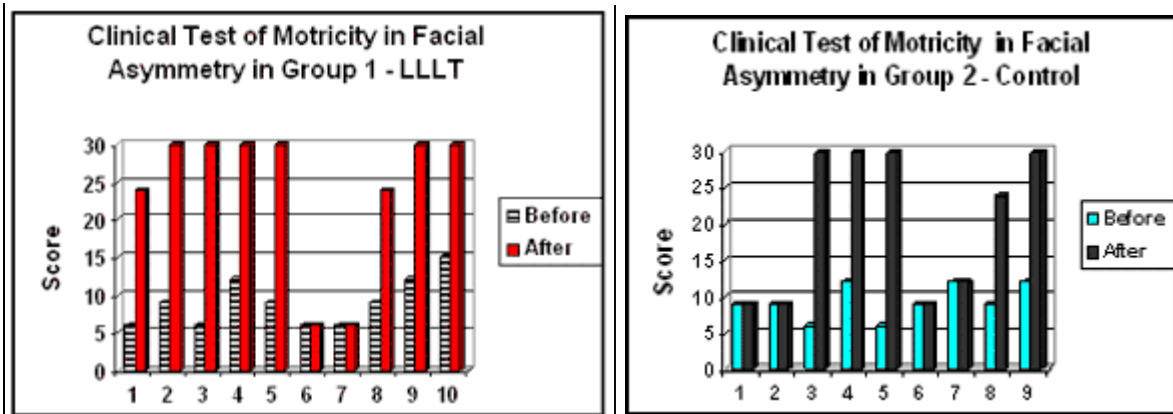


Figure 2

The recorded results showed that the response after the first stage of treatment was positive in 43.7% of the children in LLLT group, comparatively with only 13.3% of the patients in the control group. The final analysis proved that 87.5% of the patients treated with laser displayed a complete recovery, reported to only 60.0% of the patients in the control group (Table 2).

Table 2

Positive Response to Treatment	Group 1 (n=16)	Group 2 (n=15)
First Stage	43.7% (7)	13.3% (2)
Second Stage	31.3% (5)	20.0% (3)
Third Stage	12.5% (2)	26.7% (4)

The final outcome of the therapy related to the clinical forms of paralyzes showed that all patients suffering of radial nerve palsy and Erb-Duchenne paralysis from the laser group were totally recovered and those with facial asymmetry cured in a proportion of 80.0%.

In the control group 50% of the patients with radial paralysis were healed completely, while 44.4% of the facial asymmetry and 25% of the Erb-Duchenne paralysis subjects did not experience a complete recovery (Table 3).

Table 3

Complete Recovery		
Group 1 (n=16)	Group 2 (n=15)	
Facial Asymmetry	80.0% (8/10)	55.6% (5/9)

Erb-Duchenne Paralysis	100.0% (4/4)	75.0% (3/4)
Radial Paralysis	100.0% (2/2)	50.0% (1/2)
TOTAL	87.5% (14/16)	60.0% (9/15)

The positive evolution of two patients: one diagnosed with *Radial Palsy* and treated with LLL is displayed in Figure 3: a – before treatment, b – after treatment, c – after 10 months from the therapeutic trial; and the other one diagnosed with *Facial Asymmetry* is shown in Figure 4: a – before treatment, b – after treatment.

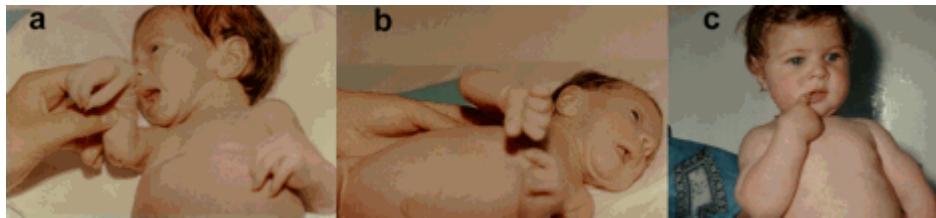


Figure 3.

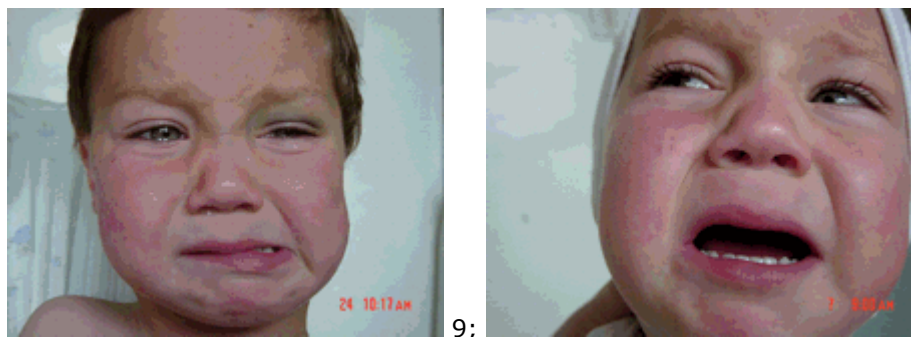


Figure 4.

Conclusions

The high efficacy rate in the regeneration of peripheral nerve injuries triggered by LLLT, especially in newborns and infants, clearly indicates the validity of this new treatment technique. More considerations could be offered regarding the future of nerve regeneration to help move this method into broader clinical applications.

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