

Ionophoresis and LASER applications in facial nerve palsy

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Abstract

Background and aim of the study. The aim of this article is to present the functional gain of the specific rehabilitation program in patients with facial nerve paralysis, irrespective of etiology, following a complex physiotherapeutic treatment, consisting of the combined application of ionophoresis and LASER.

Material and Method. We performed a retrospective analysis of 26 patients having their consent and The Teaching Emergency Hospital “Bagdasar-Arseni” (TEHBA) ethics Committee’s approval, N.O. 683/21.02.2019. The patients were admitted to the Neuro-Muscular Rehabilitation Clinic Division of TEHBA between April 2011 and March 2019. The patients were over the age of 18, diagnosed with facial nerve palsy and received physiotherapy consisting of the combined application of: ionophoresis with 1% potassium iodide, applied to positive electrode, preauricular, and the negative electrode, retroauricular, for 20 minutes and LASER, to the temporomandibular joint on the affected part, 4 points : radiant exposure per dose 3 J/cm², frequency 5 Hz, probe area 1 cm², power 62 mW, for 10 sessions and two sets of the same formula at the temporomandibular joint on the opposite side.

Results. From the etiological point of view, the study included an equal number of patients with peripheric facial palsy (PFP) and with central facial palsy (CFP), respectively 13 in each group. Overall, at least 1 patient in 2 had a positive response to physiotherapy. In the patients with PFP, 77% of patients responded to the treatment and 46% had complete remission. In the patients with CFP, only 30% responded to treatment and only one had complete remission. Approximately half of the patients did not have any adverse reactions (46%), while the rest showed temporary erythema (46%), or local tingling sensation over a variable period of time (8%).

Conclusion. Applying the combination of ionophoresis and LASER as physiotherapeutic treatment is particularly effective in peripheric facial nerve paresis. The method is safe and well tolerated, therefore we propose its use in this type of pathology.

Key words: *Laser therapy, facial nerve paralysis, ionophoresis,*

Introduction

This study has the approval of the Bioethics Committee number 683/21.02.2019. The aim of this article is to present the functional benefit of the specific rehabilitation program in patients with facial nerve paresis irrespective of etiology, following a complex physiotherapeutic treatment.

LASER Therapy

The frequency dependent action at the level of the mitochondria, the photonic absorption by the chromophores, causes the increase of the production of ATP by activating the respiratory chain -> this results in an important energetic load with an important role in the tissue repair processes (this is the main mechanism involved) (1,7,9). LASER therapy favors the release of neurotransmitters and

prostaglandin and it acts on the endoplasmic reticulum (ER), promoting protein synthesis in ER (1,4,12).

LLLT promotes neuronal regeneration by restoring functionality through the phenomenon of axonal growth; this effect is consecutive to that of energetic stimulation; metabolic photobiomodulation of the nerve cell and activation of the immune response is exerted at λ 810 nm, in the sense of integrating the de novo developed axonal structure into tissue morpho-functional activities (1,5,8). LLLT promotes vascular regeneration by promoting neoangiogenesis. It also activates microcirculation at the place of application (1,5,6).

Ionophoresis

Ionophoresis represents the electrotherapy method by which, using galvanic current, pharmacologically active substances in ionized form are introduced (1,10,11). Specifically, the hydrophilic coating of an electrode will be soaked with a drug substance, and the effects obtained will combine the specific effects of the CG with those of the pharmacologically active substance chosen (2,3,5).

In the case of CG application, at the site of application of the negative electrode (cathode) the following effects occur: alkaline reaction, vasodilation, anti spastic and decontracturant effect, myorelaxant, hyperemia, tissue hydraulic / hydration inhibition, excitostimulation (electrical excitation of the nervous structures, catelectrotonus) (1,2,4).

In the case of CG application, at the site of application the positive electrode (anode) produces the following effects: acid reaction, vasoconstriction, analgesia, anti-edema effect, resorptive, minimal hypertension, sedation (decreases nerve excitability, anelectrotonus) (1,2,4).

Soaking the hydrophilic coating of the negative electrode with 1% potassium iodide, has the effect of activating the nerve conduction. In combination with LASER therapy it causes neurobiotropic, regenerative effects (1,2,11).

Material and Method

We performed a retrospective analysis of 26 patients admitted to the Neuro-Muscular Clinic Division of the Teaching Emergency Hospital Bagdasar Arseni between April 2011 and March 2019.

General criteria for inclusion in the retrospective study

- patients diagnosed with facial nerve palsy (regardless of etiology)
- patients over 18 years old
- patients who have been treated with physiotherapy (ionogalvanization and LASER) for facial nerve palsy
- patients who performed 10 sessions of physiotherapy (5 days a week, Monday to Friday, Saturday and Sunday break).

General criteria for exclusion from the retrospective study

- patients diagnosed with facial nerve palsy regardless of etiology under the age of 18,
- patients who were NOT treated with physiotherapy (ionogalvanization and LASER) for facial nerve palsy

The physiotherapy treatment received by the patients **Ionophoresis** with 1% potassium iodide, applied as follows:

- negative electrode, preauricular, dimensions of 2/2 cm, the coating impregnated in KI 1%
- positive electrode, retroauricular, dimensions of 5/5 cm

Application time of 20 minutes

Intensity: vibration

I threshold = $4 \times 0,15 = 0,6$ mA

LASER at the level of the affected temporal-mandibular joint 4 points: radiant exposure per point (dose) $3j / \text{cm}^2$, frequency 5 Hz, probe area 1 cm^2 , power 62 mW, 1 minute application per point (neuralgia formula, BTL device) for 10 sets and at the level of the contralateral joint 2 points, the same formula.

Evaluation criteria

A. *Epidemiological criteria*: Age, Distribution by sex, urban or rural provenance.

B. *Criteria for evolvability, clinical, functionality*

I. The type of facial paresis

- 1) Central: within the pyramidal syndrome in conditions such as: stroke (hemiplegia, central facial paresis) or Craniocerebral trauma (central facial paresis)
- 2) Peripheral (Bell): of different etiologies, idiopathic, a frigore

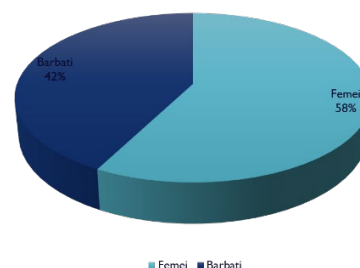
II. Type of drug therapy received:

- 1) neuroprotective,
- 2) anti-inflammatory (steroid and non-steroidal) and neuroprotective

C. *Physiotherapy criterion*: Adverse reactions to treatment

Being a retrospective analysis of the evolution of patients with facial nerve palsy, we did not use comparative tests of statistical discrimination, but descriptive analysis of the patients studied: averages and percentages.

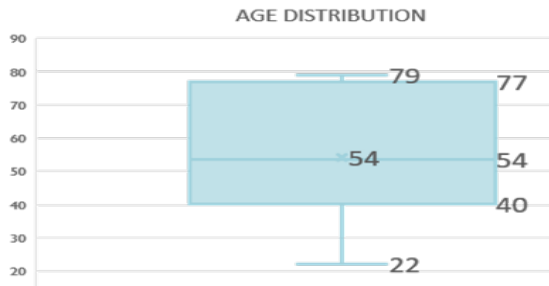
Demographic analysis



Patients treated with physiotherapy for facial appearance have approximately similar sex

distribution, with a slight predominance of women (58%) versus men (42%).

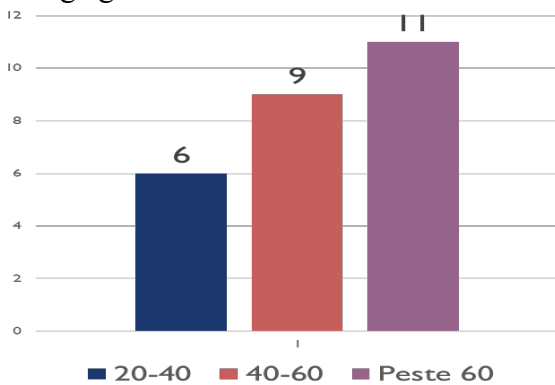
responded to treatment of which 7 (27%) completely recovered at the end and 6 (23%) only partially recovered.



In the studied group we observed that:

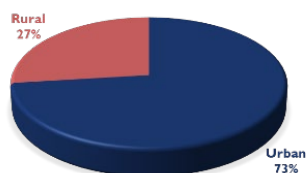
- the minimum age is 22 years
- the maximum age is 79 years
- the average age is 54 years
- the median age is 54 years

The age group distribution shows that the percentage of patients with facial paresis is higher with increasing age.



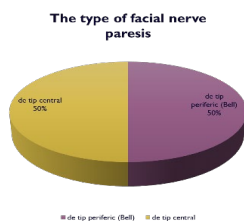
In the studied group, the patients from the urban area predominate: 19 (73%) versus 7 (27%) from the rural area.

Patient origin	Studied lot
Urban	19
Rural	7
Total	26



We observe that in the studied group we have an equal number of central and peripheral type paresis 13:13 (50% vs. 50%).

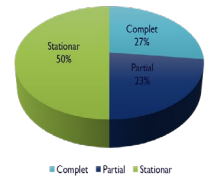
The type of facial nerve paresis	
Peripheral (Bell)	13
Central	13



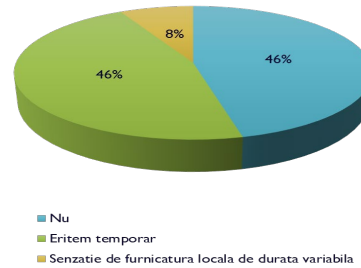
Results

We observe that half of the patients (50%) of the entire study group had a response following hospitalization. At least one in two patients

Remission of facial nerve paresis	PFP	CFP
Complet	7	1
Partial	6	2
Stationary	13	10

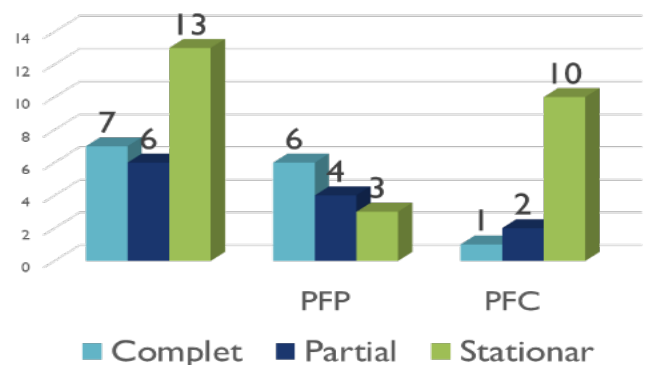


Adverse reactions to treatment



We observed that several patients with peripheral facial palsy (PFP, 6 patients) recovered compared with those with central facial palsy (1 patient). Better results are obtained for patients with peripheral facial palsy (PFP).

Results



Peripheric facial paresis (PFP)

We note that in the case of patients with PFP, a good response was obtained at the end of the hospitalization in the patients who have associated physiotherapy with neuro-protective and anti-inflammatory treatment.

Physiotherapy response	Full recovery	Partial response	Stationary
No associated drug treatment	1	1	0
Neuroprotective	2	3	3
Anti-inflammatory and neuroprotective	3	0	0
Total	6	4	3

Central facial paresis (CFP)

We observed that patients with CFP did not receive any anti-inflammatory drugs, and good responses were obtained even in patients not treated with medication.

Physiotherapy response	Full recovery	Partial response	Stationary
No associated drug treatment	1	0	0
Neuroprotective	0	3	10
Anti-inflammatory and neuroprotective	0	0	0
Total	1	3	10

Adverse reactions to treatment

We observed that only less than half of the patients had no adverse reactions (46%) while the rest had at least temporary erythema (46%), or sensation of local tingling of variable duration (8%).

Physiotherapy response	Full recovery	Partial response	Stationary
No associated drug treatment	1	0	0
Neuroprotective	0	3	10
Anti-inflammatory and neuroprotective	0	0	0
Total	1	3	10

Discussions

- We asked the question of the efficiency of the association between the physiotherapy treatment with the anti-inflammatory and neuroprotective treatment.
- It seems to be the winning solution for peripheral facial nerve palsies because most patients who have recovered have had this therapeutic plan.
- In contrast, in patients with central type facial lesions, we observed that they did not receive any anti-inflammatory drugs, and good responses were obtained also in the patients who were not treated medically, which highlights the role of the applied physiotherapy.

Conclusions

1. The combination of ionogalvanization and LASER is a useful and effective method for treating facial nerve palsy, one of two patients responding to treatment.
2. Physiotherapy treatment combined with drug treatment (anti-inflammatory, neuroprotective) is preferable in peripheral type facial
3. The combination of ionogalvanization and LASER in the facial nerve palsy is a safe method in terms of its tolerance.

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