

Effectiveness of Electro-stimulation as a Treatment for Bell's Palsy: An Update Review

Ramos-Jimenez Arnulfo*, Jose Manuel Garcia-Rivera, Rosa Patricia Hernandez-Torres, Erik Holguin and Rafael Villalobos-Molina

Universidad Autonoma de Ciudad Juarez, Ciudad Juarez, Chihuahua, Mexico

*Corresponding author: Ramos-Jimenez Arnulfo, Universidad Autonoma de Ciudad Juarez, Ciudad Juarez, Chihuahua, Mexico, Tel: 52 656 6115945; E-mail: aramos@uacj.mx

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Abstract

Objective: To search for evidence that supports electro-stimulation as a treatment for Bell's palsy.

Methods: An update (2000-2014) review of randomized and controlled clinical trials (inclusion criteria) was done in the following databases: Cochrane, Ebsco, Elsevier, Google Scholar, Imbiomed, Medigraphic, PEDro and PubMed, with these keywords alone and combined: electro-stimulation, Bell's palsy, physiotherapy, facial paralysis, parálisis facial and electro estimulación.

Results: 3512 reports of electro-stimulation alone or combined with other therapies in humans were included, however only five met all inclusion criteria. Electro-stimulation alone or combined with other therapies gives no major benefits than conventional treatments for Bell's paralysis.

Conclusion: There is insufficient evidence to support electro-stimulation as an effective method to treat Bell's palsy.

Keywords: Rehabilitation; Physiotherapy; Peripheral facial paralysis

Introduction

Idiopathic peripheral facial paralysis or Bell's palsy is the most frequent cause of facial paralysis, and occurs in 15-30 persons per 100,000 per year [1]. In Mexico, according to the Ministry of Health there were 785,551 cases for the year 2007 [2]. This illness occurs without specific causes in individuals regardless of age and in both sexes; however, its incidence is higher around 40 years of age or over 65 years of age [2,3]. Treatments for this pathology are pharmacologic and physiotherapeutic, from which just the pharmacological forms of treatment have systematically shown better results when compared with controls or other treatments [4]. In contrast, the physiotherapeutic treatments like electro-stimulation (ES), despite of their actual common use are still controversial [5], and in many cases not recommended or show no positive results [1,6,7]. In addition, there are a few random and controlled studies that test the efficacy or not of ES [4,8,9]. Those uncontrolled reports, aside from their lack of scientific strictness show low or no therapeutic capacity at all; [10-12] one of them even shows the worsening of facial functioning when electrotherapy is applied [13]. In this regard, the last systematic review specifically focused on electrotherapy concluded that this treatment does not contribute benefits for patients with acute Bell's paralysis, but does so in chronic patients providing there is no denervation and there is persistence of facial muscular activity [5].

Given that today is still practiced the electro-stimulation as a treatment of Bell's paralysis, this work is carried out a systematic review of the literature published on the subject. For a better

understanding by the reader, it deals with general information about the pathology and the common form of electrotherapy used.

Bell's Palsy Pathology

Prevalence and associated causes to peripheral facial paralysis

Bell's palsy is the peripheral paralysis of facial muscles as a result of an acute lesion of the cranial nerve VII; since this cranial nerve par runs from reticular formation throughout the face, any lesion in its path affects if there is a loss in the sense of taste it may suggest that the lesion is close to where the chorda tympani begins in the facial bony canal; when the lesion is exclusively surrounding the mouth, affecting smiling and mastication it may suggest superior motor neuron damage; if the lesion affects the whole face then an inferior motor neuron might be involved, since the motor nuclei of the facial nerve might be damaged, or if the dysfunction is accompanied by a swollen zone at the parotids level, it may suggest cancer of the parotids gland.

Due to its sudden occurrence and the form it presents can be unilateral or bilateral, Bell's palsy can be diagnosed at first sight; however, for a precise diagnosis and in order to detect the possible causes, different tests are required besides physical examination, among them electromyography and electroneurography [14]. Furthermore, based on the patient's clinical history, and the degree and extent of impairment biochemical, radiography and otorhinolaryngology tests are recommended. The consequence of the lesion also depends on the lesion's site or the damaged nucleus (motor, parasympathetic or sensory); in this regard, hypomyotonia, hypermyotonia or synkinesis may occur which deteriorate facial

expression on one or both sides of the face, cause the patient to shed tears or suffer from dry-eye syndrome, to over salivate, incapacity to close or blink one or both eyes, pain in the ear or the area around it, hyperacusis, mastication problems and altered sense of taste [14]. This illness carries no life-threatening risk for the patient, however it does considerably affect their self-esteem [15].

As mentioned, the causes for this illness are unknown but it is associated to hypercholesterolemia, hypertension, diabetes, infections, poisoning, genetic syndromes, neoplasias and musculoskeletal and neurological lesions [14]. Regarding its treatment, it is recommended that it begins within the first 72 h of the appearance of symptoms [2]; however, due to its negative effects on the self-esteem it is very common for patients not to attend appointments or to delay treatment, making this illness a chronic one and harder to treat [7,15]. Despite these situations, between 70-80% of patients completely recover in about three weeks even without treatment, but the other 20-30% may suffer further episodes still after treatment [2,11,14]. Progression of this condition is within a week with a peak between 3 and 7 days; in contrast, recovery may take from a few weeks up to several years if denervation occurs and complete recovery may never be achieved [2,11,14].

Therapeutic categories

Persons with acute Bell's palsy usually recover completely without any treatment [7,16]. However, treatments for Bell's palsy include monotherapy and polytherapy: drug combinations (mainly corticosteroids and antivirals) and/or physiotherapy [thermotherapy, massage and facial movements, ultrasound, acupuncture and electrotherapy (this last one is the most controversial among physicians and physiotherapists)], and even a psychological approach [2]. Electrotherapy is commonly used for to treat musculoskeletal disorders and rarely for neuromuscular ones, its main purpose to reestablish facial control and movement in Bell's palsy and when

denervation occurs, to delay muscular atrophy; it is also useful to diminish pain, muscle weakness and to facilitate facial movement [17,18]. Electrotherapy involves the passing of electric current that could be galvanic (continuous) or faradic (pulsating) of 0.2-100 Hz commonly used frequencies during 10-30 min, [17,18] depending of the lesion type. In the case of denervated muscles 5 to 10 unidirectional and rectangular pulses per day with 30 to 300 ms pulse duration, and 4 or more seconds between pulses are used [17]. There is also a combined therapy with acupuncture, called electro-acupuncture, frequently used by Chinese physicians and physiotherapists [19]. Accordingly, we aimed to update a review on ES efficacy for the treatment of Bell's paralysis.

Methods

The inclusion criteria of this update review were clinical randomized and controlled reports about of electro-stimulation as a treatment for Bell's palsy, published in English and in Spanish languages from 2000 to 2014. Manuscripts repeated as exclusion criteria. We searched the following databases: Cochrane, Ebsco, Elsevier, Google Scholar, Imbiomed, Medigraphic, PEDro and PubMed; with the following separately or combination keywords: electro-stimulation, Bell's palsy, physiotherapy, facial paralysis, parálisis facial and electro estimulación.

Results

We found a total of 3512 papers without repetitions about Bell's palsy and the above-mentioned keywords; subsequently for a second screening we selected only randomized controlled trials using ES alone or combined with other therapies. With these criteria we found 54 reports, and after reading them only five met all the above inclusion and exclusion criteria (Table 1).

Authors	Study design	Sample	Intervention	Results and conclusions
Dalla et al. [11]	Retrospective review of cases. Patients were follow-up for 12 months after onset of the paralysis.	102 patients with Bell's palsy in three groups	Control: 29 subjects with neurapraxia without rehabilitation treatment.	Patients on both groups completely recovered in 20 days.
			Experimentals: 73 subjects with axonotmesis, 38 were treated with ES/FE and 35 with FE.	No difference in time nor in quality of recovery between treatments
Narin and Barutçua [9]	Controlled random clinical trial	18 subjects in groups of six	Control: temporal muscle reconstructive surgery	Experimental groups showed better facial symmetry both static and dynamic than controls groups.
			Experimentals: surgery plus ES at: 1) 7 days, or 2) 21 days. Faradic type ES (100 Hz) 20 min/day. Evaluated by photography, and videorecording	
Alakram and Puckree [8]	Random clinical trial	16 subjects in two experimental groups (8 vs 8)	Group 1: conventional treatment (5 min heat, 10 min massage and 10 min facial exercise.	No difference was observed between treatments (p=0.36).
			Group 2: as in group 1 plus 30 min ES. Treatment once per week during 4-12 weeks until 80% recovery. Treatment started within 30 days of lesion appearance.	
Manikand a-n [23]	Random clinical trial	56 subjects (15-60 years old), in two experimental groups (28 vs 28)	Group 1: treated with ES plus conventional exercise. Group 2: treated with FE.	FE better improved symmetrical movements, but not synkinesis
			Treatment: 3 times per day, 6 days per week, during 3 months	

Dalla et al. [10]	Retrospective review of cases	65 subjects (18-78 years old). Two experimental groups	Group 1: 28 subjects treated with facial massage.	ES/FE- treated patients improved clinically, with lower synkinesis than massage- treated (p= 0.003)
			Group 2: 37 subjects treated with ES and feedback exercise (ES/FE). Treatment of 1-2 times per week during 1 year	

Table 1: Clinical studies for treating Bell's palsy using electro-stimulation (ES) alone or combined with feedback exercises (FE) and conventional treatments.

Discussion

According to the searched literature there is insufficient evidence to support electrotherapy effectiveness when applied as a monotherapy, nor when combined with other procedures to treat Bell's palsy. In recent studies on the use of electro-stimulation besides being insufficient, only one report, where electrotherapy was used alone, showed positive results when compared to the control not-treated group [9]. These authors applied the procedure during 21 days after reconstructive surgery of the temporal muscle, showing that patients subjected to ES had better facial symmetry both static and dynamic, than the control groups. From the same study, due to the total segmentation of the facial nerve and its possible reconstruction, ES was applied to prevent muscular atrophy and to preserve completely the metabolic and contractile functioning, while waiting for neuronal regeneration [9].

Most of the studies where ES was used to treat denervated muscles were performed on animals or in muscles bigger than facial muscles, such as the quadriceps, gastrocnemius and soleus; in addition, there is a lack of precision regarding the current type, duration and frequency of the stimuli that may favor better results or avoid greater damage [18,20]. Even so it is stated that if electrotherapy is used for denervated muscles, its application must begin as soon as facial reconstruction is done [18].

In two other studies where massage therapy, ES and feedback exercises (FE) in front of a mirror were applied to individuals with different neuronal damage, greater benefit was found when ES and FE were used compared to massage therapy; 10 or no difference when ES plus FE vs FE alone were compared [11] moreover, 29 subjects with neuropraxia from this last study completely recovered in one year without any treatment, i.e., ES was not used in addition to the FE therapy meaning that ES was not necessary. Feedback exercise and its benefits over the other treatments might be due to its selective recruitment on motor units observed during these exercises, and thus producing better control of facial movements. Electrostimulation/FE or FE alone have proven to be equally effective in other studies after neuromuscular learning, and retraining after traumatic or joint lesions [5,21,22] Besides Dalla's group findings [10] Alakram and Puckree [8] as well as Manikandan [23] did not report benefits when comparing electrotherapy vs conventional or FE treatments. Alakram and Puckree [8] found a higher recovery percentage when electrotherapy was added to the conventional treatment; however, due to the variance in the results no statistical significance was obtained ($30 \pm 12\%$ vs $38 \pm 18\%$, $p=0.36$). The main concerns in the Alakram and Puckree [8] study are: 1) low number of participants per group (8 vs 8), 2) low number of electrotherapy sessions and scattered sessions (3 months, once a week), and 3) no control group, since it has been observed that conventional treatments, including just facial exercise could be successful [1]. Moreover, when there is a control group the differences could be significant [9]. In contrast, Manikandan [23] reported that FE

vs. conventional therapy plus electrotherapy gave better results in symmetry and facial movements control; however, it was not true to diminish synkinesis. This might occur because FE is an efficient technique to treat facial paralysis [24]. Currently at least in Mexico, ES is applied in a general and unspecific way to improve mobility of facial muscles, although it is meant to only stimulate the paretic musculature in an uncontrolled manner; however, if ES is indiscriminately applied it is difficult to know its possible therapeutic role in the specific lesion's site, since the facial nerve path is ramified. As a consequence of this possibility, it is not known whether stimulation of muscles before the contact of nerves to the facial region, such as the stylohyoid, the digastric or the auricular muscles, may generate a positive therapeutic response or to cause other impairments following the stimulation of different nerves. It is probable that ES if applied together, i.e., electromyography and electroneurography studies, and more specifically to restore or get facial expression and function back (such as mastication, blowing, blinking eyes, smiling, sucking, and others) even by stimulating secondary muscles such as the stylohyoid, the digastric or the auricular muscles, the benefits could improve. We conclude that ES alone or combined with other therapies gives no major benefits than conventional treatments for Bell's paralysis, indeed, the benefits could be even lower.

Key Messages

What is already known on this topic: ES is still used as treatment for Bell's paralysis; however, there are inconsistent and contradictory results.

What this study adds: There are few controlled studies that show a minimal usefulness of ES for treating Bell's palsy; then, more controlled studies with scientific strictness on this topic are needed.

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