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Effect of Electrostimulation Applied on Bell's Palsy—A Systematic Review

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Abstract

Context: Bell's palsy (BP) is an idiopathic, acute peripheral-nerve palsy involving the facial nerve. BP patients usually present muscular hypotonia, altering the facial expression. These changes can lead to functional insufficiencies and psychological changes. Electrical stimulation (ES) can help prevent muscle atrophy, as well as promote tissue healing, contributing to recovery from facial paralysis. **Objective**: Review the effectiveness of the application of ES in the treatment of BP. **Data Sources**: The search was carried out in PubMed databases, searched using MeSH terms, Scopus and Academic Search Complete, in English, French and Portuguese. **Study Selection**: RCTs and clinical trials that have applied ES in patients with BP were considered for this study. **Data Extraction**: Two independent reviewers applied the selection criteria to the retrieved studies to limit the number to the final list. **Data Synthesis**: The initial search returned 324 articles, from which duplicates were eliminated (n = 134). A total of 181 articles were excluded based on title and abstract and 9 complete manuscripts were retrieved and assessed for inclusion meeting the eligibility criteria. In the end, 5 articles were included in this review. **Conclusions**: There is no strong evidence of the benefits of ES in Bell's palsy and further studies should be enrolled to clarify this. It seems acceptable to consider that stimulation on motor points and all the facial muscles is the most effective and appears that different forms of application of ES can condition the final results.

Subject Areas

Neurology

Keywords

Bell's Palsy, Electrical Stimulation, Facial Paralysis, Electrical Therapy

1. Introduction

Bell's palsy (BP) is an idiopathic, acute peripheral-nerve palsy involving the facial nerve, which supplies all the muscles of facial expression. The facial nerve also contains parasympathetic fibers to the lacrimal and salivary glands, as well as limited sensory fibers supplying taste to the anterior two-thirds of the tongue [1]. It is the most frequent diagnosis linked to facial nerve palsy/paralysis as well as the most frequent acute mono-neuropathy. It affects individuals of multiple ages and both sexes, with an annual incidence ranging from 11.5 to 53.3 per 100,000 persons across multiple populations [2].

Approximately 85% of the patients with Bell's palsy get complete recovery within about three weeks after the onset without any medical intervention or/and physiotherapy treatment, while 15% of these cases recover after 3 to 6 months of the onset [3]. In approximately 25% of patients with BP, moderate-to-severe facial asymmetry may persist, leading to long-term adverse consequences, which can be devastating for patients' psychological well-being and frequently impair their quality of life [2].

Given these dramatic consequences, treatment is often initiated in an attempt to decrease the likelihood of incomplete recovery and improve facial function.

Facial exercises, thermal methods, massage, electrotherapy, biofeedback or electrical stimulation, alone or in combination with any other therapy, are the treatments of choice in the rehabilitation of patients with BP [4].

A previous Cochrane analysis [4] reported a lack of high-quality evidence to support the use of these methods/approaches for treating BP in daily practice. They evaluated studies conducted with electrotherapy, exercises, biofeedback, manual therapy and laser, and concluded that only trials involving electrostimulation and exercise had the minimum methodological quality.

Concerning electrical stimulation, almost all the outcomes reported failed to show any statistically significant difference and no statistical differences were found in synkinesis or other complications in any of the trials [4]. Despite the accumulating research, incongruity exists between the study designs and the conclusions drawn from them, so evidence to support its use remains limited.

Despite the conflicting data and the difficulty to generalize the conclusions for the clinical setting, electrical stimulation continues to be included as a clinical intervention for BP nowadays [5] [6].

The purpose of this review is to develop a critical view concerning the application of electrical stimulation in the treatment of BP by analysing its efficacy and understanding if it can be a helpful tool with a substantial effect on clinical practice.

2. Methods

2.1. Data Sources and Searches

The electronic search using pre-defined search terms was restricted to English,

French and Portuguese language publications retrieved from the following databases: PubMed, Scopus and Academic Search Complete.

The initial research was limited to human studies published between 2000 and December 2020. Combinations of the following key words were used: "Bell's palsy", "electrical stimulation", "facial paralysis" and "electrical therapy". PubMed was searched using MeSH terms. The reference lists of retrieved articles were also screened for reports not identified through electronic searches.

2.2. Inclusion and Exclusion Criteria

Articles were included in this review if:

1) Have been published in peer-review journal as a full article or an abstract with sufficient detail to extract the main attributes of the study;

2) Randomized Controlled Trial (RCT) and Controled Clinical Trial (CCT);

3) Used Electrical Stimulation in patients with Bell's palsy (Peripheril Facial Paralysis);

4) Age > 18;

5) Facial Paralysis with idiopathic aethiology.

The exclusion criteria were:

1) Data extraction not possible;

2) Control group did not include subjects with Bell's palsy.

2.3. Identification of Studies

Titles and abstracts of the retrieved articles were screened independently by RS and CO against the eligibility criteria: Potentially eligible studies were identified and their respective full reports obtained. Full reports were then assessed separately by the two authors against the eligibility criteria. Discrepancies in judgement were resolved by consensus with consulting of ALC. The percentage of agreement between both authors was calculated.

2.4. Assessment of Studies

Two authors (CO and ALC) independently evaluated the quality of the studies according to PEDro scale for RCTs and CCTs. Discrepancies were solved by consensus. PEDro scale is a valid measure for methodological quality of the studies and its scores can confidently be subjected to parametric statistical analysis 11.

2.5. Data Extraction, Synthesis and Analysis

One reviewer (CO) extracted relevant data from the included studies. These included information on:

- Sample characteristics;
- Intervention protocol;
- Outcome measures;
- Results and main conclusion.

3. Results

The initial search returned 324 articles, from which duplicates were eliminated (n = 134). A total of 181 articles were excluded based on title and abstract and 9 complete manuscripts were retrieved and assessed for inclusion by RS and CO, meeting the eligibility criteria (**Figure 1**). Therefore, 5 articles were included in this review [7] [8] [9] [10] [11]. The percentage of agreement between both reviewers was 92% and discrepancies were solved by consensus.

3.1. Assessment of Methodological Quality of Studies

Concerning external validity, all studies define and present inclusion criteria for participants. Related to internal validity, only three studies [7] [8] [11] randomized the sequence for the measurements. Blinding procedures for therapists and patients were absent in all the studies. Although important for overall methodological quality, fact remains that the type of protocol we are considering complicates rigorous blinding procedures. Regarding blinding of assessors, only two studies describe processes of blinding [8] [11]. Considering result reports, all studies present the results initially proposed in a clear and objective way. Effect sizes are not available in any of the retrieved studies.

3.2. Participants

The retrieved 5 articles included a total of 350 participants. Sample size varied between a minimum of 16 [8] and a maximum of 196 [7] participants.

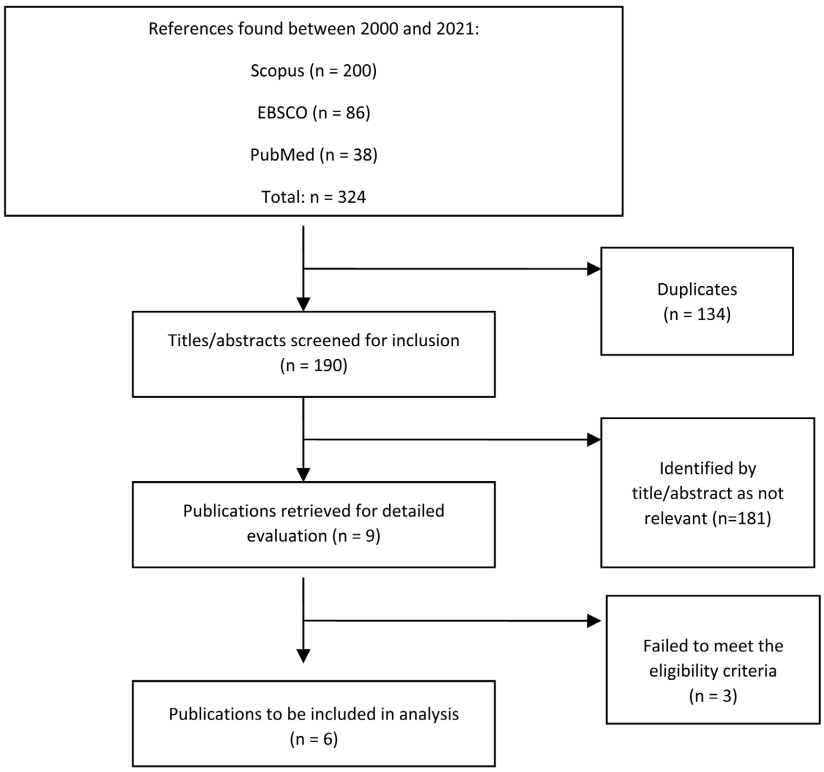

Figure 1. Flow chart for the systematic review.

3.3. Inclusion Criteria for Participants

Most of the studies established inclusion criteria based on the diagnosis of Bell's palsy with early onset [7] [8] [9] [11], from 48 hours [11] to 30 days [7] [8]. Only one study did not refer to the time after the onset of Bell's palsy [9].

With the exception of one study [8] all of them mentioned the absence of other medical problems, such as cerebrovascular disease or central nervous system disease [7] [9] [10] [11].

One study defined inclusion criteria patients whose facial nerve states were evaluated clinically with House-Brackmann Scale (HBS) functional grading system [9].

One other (10) established a grade of less than 4 on the HBS and a score higher than 20 on the Sunnybrook facial nerve grading system (SB) as criteria to be included in the study.

3.4. Outcome Variables and Measurement Instruments

All studies used the House Brackmann (HB) Scale to collect data regarding facial palsy. One study [10] used the Sunnybrook (SB) scale in addition to the House Brackman Scale and Tuncay *et al.* (2015) [11] added the Facial Disability Index scores and Latency and amplitude of compound muscle action potentials (electrophysiologic outcome measures).

3.5. Type of Stimulation Program

Two studies [7] [8] used transcutaneous electrical nervous stimulation (TENS) to perform the stimulation to facial muscles.

One study [9] used galvanic current as electrical stimulation and the remaining studies [10] [11] only refer to stimulation programs. One study also uses Faradic current on the study [7].

Alakram (2010), on his study defined TENS with pulsed setting and frequency of 10 Hz, a pulse width/ duration of 10 microseconds [8]. The intensity used was determined on the first consultation of the patient, by stimulating the unaffected side to see what intensity was needed to obtain a minimally visible contraction of the muscles targeted. The intensity was increased as required. Each muscle group (orbicularis oculi, orbicularis oris, zygomaticus major) was stimulated separately for 10 minutes in a total of 30 minutes.

One other study [9] applied ES to the motor points of eight muscles innervated by facial nerve (m. frontalis, m. corrugator supercilii, m. orbicularis oculi, m. levator labii alaeque nasii, m. nasalis, m. levator labii superioris, m. orbicularis oris, m. depressor labii inferioris) with 100 milliseconds intermittent galvanic current for motor point treatment, 30 times as 3 rounds to each point, and at a current intensity as to obtain minimal contraction.

Kim (2015), in his study, programmed the stimulator frequency at 20 Hz with rectangular, monophasic spikes with a sub-threshold pulse (average 1/4 1.4 mA, 10 ms) [10].

The surface electrode was placed on the main branch of the facial nerve at the tragal pointer as a cathode, and on the intra-temporal area around the stylo-mastoid foramen as an anode.

The current was increased until the patient was able to feel the stimulation and then decrease to just below the sensory threshold.

Tuncay (2015) chose to apply a monophasic waveform having 100 msecs of pulse duration, 300 msecs of interpulse interval, and a pulse rate of 2.5 pulses/sec [11].

A 3 cm^2 anode was placed over each muscle, and a 7 cm^2 cathode was placed over the proximal part of ipsilateral arm.

ES was applied to each of 11 facial muscles to evoke three sets of 30 minimal contractions.

The remaining study [7] developed a four group design with Group A receiving conventional therapy, group B receiving transcutaneous electrical nerve stimulation (TENS), group C receiving faradic current stimulation and group D receiving TENS + faradic current. Transcutaneous electrical nerve stimulation was applied under these parameters: Pulse rate: 100 Hz, stimulation time: 30 seconds, polarity: +, sweep: 1 Hz, sweep time: 1second, ramp up: off, ramp down: off and time rest: off. The intensity was increased gradually to produce a minimally visible contraction of the muscles of the affected side (visible muscle twitching). Two electrodes were used in stimulation (6 × 8 cm diameter), one on the area between the upper part of the zygomatic bone and lateral aspect of the eyebrow while the other was placed on the area between the lower part of the zygomatic bone and mentalis muscle.

3.6. Program Protocol, Duration and Frequency

Three studies [8] [9] [11], applied Electrical Stimulation combined with traditional therapy—hot pack, massage and facial exercises.

The remaining two have a different study protocol. Kim (2015), in his protocol defines a group of medical treatment alone and another one with drug treatment plus SCLES. [10] Abdelatief (2020) applies different treatments to each of the 4 groups of the study: conventional therapy, TENS, Faradic current stimulation and TENS plus Faradic current [7].

Guzelant (2014) established a treatment program of 20 sessions, performed 5 days a week, in which the ES was discontinued after the active movements started in mimic muscles. The control group treatment only included a home program exercise [9].

Other study [11] defined a daily program of ES, over 3 weeks, combined with physical therapy, 5 days a week.

In Alakram (2010), treatment has a weekly frequency, plus a three times daily home program exercises, and was conducted for a maximum of 3 months after onset of Bell's palsy or until the patient recovered a minimum of 80% on HS [8].

Kim (2015) mentioned that low-frequency-impulse electrical stimulation (SCLES) started before 2 weeks from onset of facial palsy and keep continuing

until after 2 months from onset of facial palsy [10].

No information about program frequency was found in Abdelatief's study [7]. Concerning duration of the program, the study only referred that all patients were assessed at initial treatment (after 2 weeks of onset), after one month of treatment, and at the end of the study (after 2 months).

3.7. Comparisons and Outcome

From the 5 retrieved studies (**Table 1**), one [7] compared ES against Farradic current, a combination of ES with Farradic current and conventional therapy.

Another one [10] compared ES against no other physical treatment.

Two studies [8] [11] compared ES plus conventional therapy against conventional therapy alone.

One study [8] found there is no statistically significant difference in rate of recovery between the experimental and control group measured by the House Brackmann Facial Nerve Grading Scale (HBS) although it indicates that the individual rates in the experimental group were higher than that of the control group.

Guzelant (2014) found significant improvement in clinical recovery in the comparison between pre-treatment HBS, and 6th week ($p = 0.01$) and the 6th month ($p = 0.05$) HBS for the experimental group [9].

A significant difference was also detected in between HBS obtained in 6 weeks after the end of the treatment and HBS obtained in the 6th month ($p = 0.06$).

No significant difference between the pre-treatment HBS and the 6th week HBS were found for the control group ($p = 0.16$).

One study [10] found electrical stimulation showed a trend toward earlier recovery, although results were not statistically significant ($p > 0.05$). Tuncay *et al.*, 2015 found posttreatment HB scores, indicating the clinical state, were better within the experimental group than control group [11].

Facial Disability Index (FDI) scores, representing functional status, improved significantly in both groups after the therapies, but posttreatment scores in the experimental group were statistically higher than in the control group.

Volitional movement of the facial muscles improved substantially in both groups, motor latencies in the frontalis and orbicularis oris muscles were significantly shorter and the amplitude of compound muscle action potentials (CMAP) amplitudes of these muscles were significantly increased, in experimental group.

One study [7] found no difference between all groups on Grades II, and III, however, TENS and Faradic current showed a noticeable effect on grade IV, V, VI of HB scale from at least a month after the application. Therefore, it concluded that the application of TENS and Faradic current appear to be safe methods in Treating Bell's palsy as they reduce the severity of its symptoms, especially in the early stages, with a preference for applying TENS over Faradic current alone or with TENS.

Table 1. Studies content summary.

5 retrieved studies	No. 1	No. 2	No. 3	No. 4	No. 5
Author	Alakram & Puckree (2010)	Guzelant *et al.* (2014)	Kim & Choi (2015)	Tuncay *et al.* (2015)	Abdelatief (2020)
Type of study	CCT	CCT	RCT	RCT	RCT
Sample (n)	**Experimental (n = 8)** Age—38.6 17.7 Time from onset of Bell's palsy until medication (days)—0.5; Time from onset of Bell's palsy until physiotherapy (days)—14.1 **Control (n = 8)** Control group: Age—41.4 16.5. Time from onset of Bell's palsy until medication (days)—0.9; Time from onset of Bell's palsy until physiotherapy (days)—12.5.	rehabilitation program (n = 12) home exercise program (n = 6) no significant difference between ages.	GE: 30 patients (46.5 ± 16.3) were treated with prednisolone or/and acyclovir plus electrical stimulation within 7 days of the onset of symptoms. - GC: 30 patients (49.17 ± 18.2) were treated with only prednisolone or/and acyclovir as a control group.	**Experimental Group (n = 28)** **Control Group (n = 32)** Experimental group, 16 (57.1%) patients had no axonal degeneration and 12 (42.9%) had axonal degeneration, compared Control group—17 (53.1%) had no axonal degeneration and 15 (46.9%) patients had axonal degeneration. Mean age, 44.8 T 17.6 Baseline House-Brackmann and Facial disability Index scores similar between groups.	196 participants (94 males and 102 females)' with unilateral Bell's palsy divided randomly into four groups with forty-nine patients.
Protocol	• TENS pulsed setting and frequency of 10 Hz, a pulse width/duration of 10 microseconds • Intensity used was to obtain a minimally visible contraction (orbicularis oculi, orbicularis oris, zygomaticus major) was stimulated separately for 10 minutes in a total of 30 minutes.	ES applied to motor points of eight muscles (m. frontalis, m. corrugator supercilii, m. orbicularis oculi, m. levator labii alaeque nasii, m. nasalis m. levator labii superioris, m. orbicularis oris, m. depressor labii inferioris) 100 milliseconds intermittent galvanic current for motor point treatment, 30 times as 3 rounds to each point, and at a current intensity as to obtain minimal contraction.	The stimulator frequency was 20 Hz with rectangular, monophasic spikes with a sub-threshold pulse (average 1/4 1.4 mA, 10 ms). electrode placed on the main branch of the facial nerve at the tragal pointer as a cathode, and on the intra-temporal area around the stylomastoid foramen as an anode. current increased to just below the sensory threshold.	Monophasic waveform having 100 msecs of pulse duration, 300 msecs of interpulse interval, and a pulse rate of 2.5 pulses/sec. A 3 cm^2 anode was placed over each muscle, and a 7 cm^2 cathode was placed over the proximal part of ipsilateral arm ES was applied to each of 11 facial muscles to evoke three sets of 30 minimal contractions.	TENS with Pulse rate: 100 Hz, stimulate time: 30 seconds, polarity: +, sweep: 1 Hz, sweep time: 1 second, ramp up: off, ramp down: off and time rest: off. intensity increased to produce a minimally visible contraction Two electrodes), one on the area between the upper part of the zygomatic bone and lateral aspect of the eyebrow while the other was placed on the area between the lower part of the zygomatic bone and mentalis muscle.

Continued

Criteria	Patients diagnosed with Bell's palsy by a neurologist or otolaryngologist referred for physiotherapy with less than 30 days' post onset.	Inclusion Criteria: - no diagnosis of cerebrovascular disease in history; - informed about PFP and protection methods - recommended self-massage and educated about muscle function and mimic.	Inclusion criteria 1) within 1 week of onset of facial palsy, 2) less than grade 4 on the House-Brackmann facial nerve grading system (HB) and a score higher than 20 on the Sunnybrook facial nerve grading system (SB), 3) no other medical or psychological problems. Exclusion criteria: 1) participation in other therapies for facial nerve damage, 2) other causes such as tumor, infection, and infarction, 3) a greater than 90% degree of denervation on electroneuronography 4) pregnancy, 5) cardiac pacemaker, 6) excessive perspiration.	Criteria for inclusion were: 1) new onset of idiopathic facial paralysis within 48 hrs and; 2) either sex in the age group of 18 to 79 yrs. excluded if: had central nervous system disease, diabetes mellitus, varicella zoster virus infections, and recurrence of facial paralysis; were noncompliant and not presenting for follow-up visits.	Inclusive criteria for this study: patients with less than 30 days post-onset of Bell's palsy lower motor neuron lesion Exclusive criteria patients with bilateral affection of Bell's palsy or Any sensory impairment in the area of electrode placement, Pregnant women, upper motor neuron lesion and diabetic.
Program duration/ frequency	- once a week, 5 minutes of heat, 10 minutes of massage, and 10 repetitions of exercises. Experimental group was then treated with an additional 30 minutes of electrical stimulation At home, all patients were instructed to do 10 repetitions of each exercise, three times daily.	Information not available.	One group (as a control) received drug treatment alone, and the other group (as an experimental group) received drug treatment plus SCLES.	Group 1 (n = 28): received physical therapy including hot pack, massage to the facial muscles, and facial expression exercises via a mirror, five times/week over 3 wks. Group 2 (n = 32) received ES daily in addition to the same physical therapy provided to group 1.	The session started by electrical stimulation followed by exercises and finished by infrared, massage and vibration to reduce lactic acid accumulation. Group A received conventional therapy, group B received TENS group C received faradic current stimulation. group D received TENS + faradic current.

Continued

Outcome measurement	The House-Brackmann Facial Nerve Grading Scale (HB) was used to assess the severity and monitor the changes.	Functional response to treatment was assessed by the House-Brackmann scale grading system. HBS evaluations were performed in pre-treatment and 6th week post-treatment and long-term 6th month visits of the patients.	House-Brackmann (HB) and Sunnybrook (SB) scales.	House-Brackmann scale and Facial Disability Index scores Latency and amplitude of compound muscle action potentials (electrophysiologic outcome measures).	House Brackmann (HB) Scale no.
Results	individual rates in the experimental group were higher than that of the control group, however, there was no statistically significant difference.	Significant improvement observed from the 6th week in the comparison between pre-treatment HBS, and 6th week ($p = 0.01$) and the 6th month ($p = 0.05$) HBSs of the patient group participated in rehabilitation program. A significant difference was also detected in between HBS obtained in 6 weeks after the end of the treatment and HBS obtained in the 6th month ($p = 0.06$) patients treated with home exercise program: showed a significant difference between the pre-treatment HBS and the 6th month HBS ($p = 0.005$).	The initial average score on the HB scale was not different between the two groups (3.46; experimental group, 3.47; control group). However, 2 weeks after the onset of palsy there was a significant difference in HB scores, which persisted for 6 months. However, these differences were not significant at 4, 10, and 12 weeks (independent-sample t-test: $p > 0.05$).	Posttreatment HB scores, indicating the clinical state, were better in group 2 than in group 1. FDI scores, representing functional status, improved significantly in both groups after the therapies, but posttreatment scores in group 2 were statistically higher than in group 1. Volitional movement of the facial muscles improved substantially in both groups, Motor latencies in the frontalis and orbicularis oris muscles were significantly shorter and the CMAP amplitudes of these muscles were significantly increased, in group 2.	In group B, there was a statistically significant improvement in grade IV, V, and VI compared to groups A, C, and D while there was no statistically significant difference among the four groups on grade II and III.
Effect-Sizes	ES = 0.33	Data presentation unable to calculate.	ES = 0.22.	**Frontalis Amplitude → ES = 0.18 Latency → ES = 0.09 Orbicularis oris Amplitude → ES = 0.08 Latency → ES = 0.12.**	Data presentation unable to calculate.

Continued

Conclusion	Predominant motor electrical stimulation did not add to nor deter progress. Electrical stimulation also proved to be a safe treatment intervention. Further work is required to establish the efficacy of this treatment in a larger group of patients in the acute stage of recovery from Bell's palsy.	The recovery time is faster in the patients treated with the rehabilitation group that includes electrical stimulation. Therefore electrical stimulation therapy is an acceptable effective method for the treatment of facial paralysis.	SCLES appears to affect the early neural regenerative stages by preventing Wallerian degeneration in the area proximal to the injured site.	The addition of 3 wks of daily electrical stimulation shortly after facial palsy onset (4 wks), improved functional facial movements and electrophysiologic outcome measures at the 3-month follow-up in patients with Bell palsy.	TENS has a noticeable effect on grade IV, V, VI of HB scale from at least a month after the application, the application of TENS and faradic current appear to be safe methods in treating Bell's palsy as they reduce the severity of its symptoms, especially in the early stages, with a preference for applying TENS over faradic current alone or with TENS.

Overall, from the retrieved studies, two [9] [11] found statistically significant improvement in experimental groups, while three remaining studies found improvement, yet not statistically significant [7] [8] [10].

4. Discussion

The effect of electrostimulation in Bell's palsy still remains unclear once the lack of consensus among studies is relevant. The popular and long-established practice of electrically stimulating facial muscles rendered paralyzed or paretic by Bell's palsy is likely grounded in the simple observation that visible contractions can be electrically evoked in these muscles and the underlying assumption that "induced exercise" would be beneficial [12].

All the retrieved studies present positive results considering the application, however only two [9] [11] show statistical significance and, even those, with very small effect sizes. It is important to notice that the results concerning Guzelant *et al.* (2014) reported statistical significance when considering the comparison between pre-treatment and 6 months evaluation, only, leading to consider the role of the spontaneous improvement associated with this problem [9].

Peitersen (2002), in a study of 2500 patients reported that 64% of patients will have "regained normal function" within 3 months [3].

However, considering the rationale underlying the application of ES, it should be acceptable to consider if recovery does not ensue within 3 months, the necessity of introducing electrotherapy as a form of treatment increases. Although it has been noted previously that the facial muscles do not tend to atrophy as quickly as other muscles due to their different physiological make up [13], it may also be acceptable to delay the use of TENS during this early stage unless the prognostic factors indicate a more unfavourable outcome [14].

The heterogeneity of the studies protocols and inclusion criteria may be relevant to the lack of objective conclusions on the subject. Most of the studies compare a combination of electrostimulation with a conventional program against conventional therapy alone; however, the conventional program is not always the same. On the other hand, one study compares stimulation against nothing and another one compares several possibilities of electrotherapy against conventional therapy as a control group.

Also relevant for discussion are differences concerning type of program. The lack of consensus on the choice of current and its parameters does not allow the definition of the best practice related to this subject.

Because of the basic electrophysiology of nerve fibers, "induced exercise" necessitates use of relatively long pulse durations that will satisfy the prolonged chronaxies of denervated muscle fibers (pulse durations of at least 1 millisecond, but often 10 - 40 milliseconds and even up to 200 milliseconds are reported) [12]. Alakram (2014) and Abdelatief (2020) as well as Kim (2015) refer to the use of long pulse stimulation, however Kim applies a stimulation under motor limit, only in sensorial limits [7] [8] [10]. These ES parameters applied in the last study are likely safer than those used in the other clinical trials but which could not induce contractions in muscle fibers affected by Bell's palsy [12]. Electrical stimulation at motor threshold as applied by Kim (2015) would not elicit contractions in wholly denervated muscles; therefore, this stimulation almost certainly elicited contractions only in those muscles supplied by healthy motor nerves of the face [12].

Another aspect to consider concerning research protocols is related to the positioning of the electrical stimulation. While some studies [9] [11] apply the stimuli to the motor points of the muscles, some apply in a generical form [7] [10] and one other only applied stimulation in three of the facial muscles.

The results associated to different forms of electrical stimulation application may be conditioning of a global conclusion because of heterogeneity, however, analysing our results, it seems to be acceptable to consider that stimulation on motor points and on all the facial muscles is the most effective.

Another important aspect concerning protocol is related to comparison against home exercises in which the patient's compliance is very important and may be a source of bias in this type of study.

In summary, although it seems acceptable to consider the use of electrical stimulation in this pathology, it is not clear the extent of benefit it brings to patients, more so if condition is acute. Also remains the need to research ideal protocols to apply in order to uniformize and potentiate the use of the electrical stimulation.

5. Conclusion

More studies need to be developed to allow definite conclusions and lead to the definition of more objective guidelines and protocols to apply in clinical prac-

tice. Although it seems probable that ES may be considered an important tool, particularly in more chronicle periods of the condition, more research is needed with solid methodological grounds and more homogeneous protocols to define the extent of benefit to consider.

Conflicts of Interest

The authors declare no conflicts of interest.

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