



THE EFFECTIVENESS OF PHYSICAL REHABILITATION COMPLEX FOR FACIAL NERVE PALSY

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Abstract

The issue of treatment and rehabilitation of patients with facial nerve palsy is still unresolved. An essential role in functional recovery of the facial nerve during its lesion can play physical rehabilitation methods.

The objective – to establish the effectiveness of the physical rehabilitation complex for facial nerve palsy.

Methods. 40 patients with severe facial nerve dysfunction (grade V of House-Brackmann facial nerve grading system). Treatment was carried out in accordance with existing regulatory documents. The complex of physical rehabilitation included morning hygienic gymnastics, vocal gymnastics, mimic gymnastics, therapeutic massage of the neck and collar zone, paraffin wax applied to the affected face side, therapeutic facial massage, therapeutic massage of the hairy part of the head, ultra high frequency electric field (UHF) to the facial nerve branching zone and face self-massage. The course of the treatment and rehabilitation required 10-12 procedures of each physiotherapeutic procedure carried out daily.

Results. After 14 days of physical rehabilitation, in 60% of cases (24/40) a moderate severe dysfunction is recorded, and in 40% of cases (16/40), a moderate facial nerve dysfunction is observed with all patients initially diagnosed with a severe nerve dysfunction. The symmetry of nasolabial folds, normal lachrymation and salivation also rehabilitate.

Conclusions. The use of a complex of physical rehabilitation including vocal gymnastics, mimic gymnastics, massage and instrumental physiotherapy can significantly improve the clinical conditions of patients with facial nerve palsy.

Key words: facial nerve palsy, physical rehabilitation, gymnastics, massage, paraffin, ultra high frequency electric field.

Introduction

The facial nerve (lat. *nervus facialis*) innervates all facial mimic muscles and middle ear stapedius muscle, most of the exocrine glands of the head (the lacrimal gland, the nasal and oral mucosa, salivary glands (except the parotid gland), is responsible for taste sensitivity of the anterior 2/3 of the tongue, provides the sensitivity of a small area of the ear canal [6]. Frequent hypothermia, infection, intoxication, injuries can cause the dysfunction of the facial nerve, resulting in paralysis of the nerve. For the first time, this condition was described in 1836 by Scottish physiologist Charles Bell that is why it is named after him – Bell's palsy [1; 15].

Speaking about children diseases, facial nerve palsy occupies the first place among dysfunctions

of the cranial nerves [2; 8], and in a list of adults' diseases – second place [2]. Frequent contraction of a disease in childhood is explained by the anatomical structure of the facial nerve [2; 5]: 1) the immaturity of the fallopian canal, through which the facial nerve emerges from the temporal bone under the skin, resulting in an increased risk of traumatising the nerve among children compared with adults; 2) the immaturity of the mastoid of the temporal bone, which makes this nerve less protected from injuries.

Now it is believed that the viruses play a significant role in the occurrence of facial nerve palsy. Thus, the researches of recent years claim that there are increased titers of antibodies to herpes simplex virus, Epstein-Barr virus, influenza,



adenoviruses in blood serum of these patients. As a rule, hypothermia is considered as the provocative factor of the development of this dysfunction [7].

For a long time, the pathogenesis of the facial nerve palsy was explained by several theories (vascular, inflammatory, and others) [9]. Now facial nerve palsy is considered as a variant of a tunnel syndrome. Recently, researchers have stopped on a certain scheme of changes occurring in this condition: “ischemia – swelling – compression” or “primary ischemia – swelling – compression – secondary ischemia”. The development of the inflammation and swelling causes compression and ischemia of the facial nerve. The demyelination and secondary degeneration of nerve fibers are the results of a prolonged and severe compression of the nerve fiber [7; 8; 14].

Clinical manifestations of the disease depend on the degree of lesion of the facial nerve. The main clinical manifestation of a facial nerve palsy is a paresis or a paralysis of mimic muscles of the corresponding half of the face. This leads to facial asymmetry in its various manifestations. In addition, ophthalmologic symptoms (the eye cannot close due to the paralysis of the orbicular muscle of the eye, lacrimation) and salivation due to paresis of the orbicular muscle of mouth may appear on the affected side [1; 8; 11].

Facial nerve palsy treatment is a complex process that does not always end successfully. Thus, the traditional treatment of this dysfunction results in a complete recovery or significant improvement in case of only 60-75% of patients. After treatment of the facial nerve palsy in 10-25% of cases there is incomplete recovery of the function of mimic muscles, in 18% of cases there is an evident cosmetic defect, and in 16-32% of cases a postneuritic contracture is observed [3; 11]. It leads to serious physical and psychological problems related to a person's face defect (asymmetry), salivation and other symptoms that significantly affect the quality of human life. Therefore, the issue of treatment and rehabilitation of patients with facial nerve palsy is still unresolved. An essential role in functional recovery of the facial nerve during its lesion can play physical rehabilitation methods.

The objective – to establish the effectiveness of the physical rehabilitation complex for facial nerve palsy.

Methods

The research base was Kyiv City Clinical Hospital № 18. 40 patients with facial nerve palsy: 22 men (55%) and 18 (45%) women took part in the survey. The age of the survey sample varied from 48 to 65 years and on average it was ($M \pm \sigma$) $57,45 \pm 8,12$ years. All patients underwent a comprehensive study, which included an interview and an examination. The House-Brackmann grading system was used to estimate the severity of facial nerve injury [10; 12]. The establishment of a diagnosis and treatment of patients was carried out by physicians in accordance with the existing normative documents.

Results

The initial conditions of the examined patients with facial nerve palsy were characterized by the following abnormalities: the eye could not close completely in accordance with the side of the neuritis of the facial nerve, there were barely visible movements of the facial muscles, asymmetric face in rest, no movement of the forehead. All patients at the time of admission to the hospital in-patient department had the same severity of dysfunction to the facial nerve, namely severe dysfunction, which corresponds to the grade V of House-Brackmann facial nerve grading system.

In addition to standard treatment, the means of physical rehabilitation were used. In general, they were aimed at restoring the normal tone of the mimic muscles, the function of one or the other eyelid, increasing the overall tone of the body. For this purpose, a complex of physical rehabilitation was developed, which consisted of various forms of physical therapy (PT): morning gymnastics, vocal gymnastics, gymnastics for facial muscles, therapeutic massage, self-massage; as well as the physiotherapy.

The task of the PT was to rehabilitate the individual muscles movements of the face on the affected side and to establish the maximum symmetry between the healthy and the affected sides of the patient's face. For this purpose, special exercises were used, aimed at performing the simplest movements of the mimic muscles. Initially, vocal gymnastics was performed: articulation movements of the lips were used to pronounce sounds like [a], [oo], [ee], [o], etc., and then to pronounce several



syllables – “ma-ma-ma-ma”, “chu-chu-chu-chu”, “mi-mi-mi-mi” and others like that. Difficult to pronounce sounds such as [b], [v], [p], [f], [z] in combination with the sounds [s] and [oo] were recommended for self-practicing in front of the mirror. The criterion for restoring of the normal lip compression was the ability of the patient to whistle at exhalation and to pucker the lips.

Then the gymnastics for mimic muscles was performed, the special exercises of which included: the raising and lowering of the brow ridge, the puffing of the cheek without and with the resistance, the closure and opening of the eye, the puckering of the lips for whistling, the putting out the tongue, the baring of the teeth, the raising and “the frowning” of eyebrows, the sucking in the cheeks with closed mouth. Initially, these exercises were performed by patients with the help of hands, and then independently in front of the mirror, up to 5 times per day. The rehabilitation therapist was guiding their performance, in order to avoid the formation of pathological conditioned stimulus. The tempo of exercise was slow or moderate. Each exercise at the beginning of the course was repeated 10-15 times, then the number of repetitions increased every day up to 3-5 and gradually accounted for 30-40 times. As the amplitude of independent movements and the force of contraction of the paretic muscles were increasing, the help of the hands in the exercise was reducing. At the same time, the fatigue of the affected muscles was avoided. Exercises for mimic muscles interchanged health-promoting activities and breathing exercises.

In order to maintain the muscle tone on the side of the lesion, the therapeutic massage of the neck and collar zone, face and hairy part of the head was given in addition to physical exercises.

At first, the therapeutic massage of the neck and collar zone was performed. The massage of sternocleidomastoid muscles included stroking, rubbing, fulling.

After that, a face massage was performed. The patient sat with a mirror in his or her hands, and the massage therapist sat in front of him. The massage therapist saw the whole patient’s face, giving directions on performing special exercises during the massage. The patient performed the recommended exercises during the massage procedure, watching their accuracy using a mirror. The massage started

from the forehead with the stroke movements performed by the palmar surface of the fingers, and then a spiral fulling in the direction from the middle line to the temples was performed. The orbicular muscle of the eye was massaged on the upper edge of the middle line from the outside, and on the lower edge – in the opposite direction. The massage of the cheeks was performed in the direction from the edge of the lower jaw up to the nose. The massage of the upper lip, nose and chin was also performed from the bottom upwards that is from the angle of the mouth to the nose, from the tip of the nose to the bridge of nose and from below the edge of the lower jawbone to the corner of the mouth. Each type of the massage was repeated 5-8 times. The massage of the mimic muscles of the healthy side of the face in the front, around the eye-pit, lips, cheeks and neck included stroking, rubbing, pressing and pinching, and also involved vibration and manual percussion performed by the palmar surface of the fingers.

Further massage was performed on temporal areas, ear auricles and hairy part of the head. At that time the patient was in a sitting position in an armchair with a head supported by the headrest, with maximum relaxation of the muscles of the body and hands. The massage of temporal areas and ear auricles – stroking, rubbing, fulling of the ear auricles; the massage of the hairy part of the head – stroking and rubbing by rake strokes and by palms.

This type of massage was performed after warming the affected half of the face with the paraffin wax.

The paraffin wax, heated to 40 °C, was put to the affected area of the face for 15 minutes. Under the layer of warm paraffin wax the flow of metabolic processes in the facial tissues is accelerated, the blood circulation improves, the lymphatic outflow is intensified; finally, the excessive fluid, metabolic-waste products and the like are eliminated.

In addition, the patients performed self-massage: to put the thumb behind the cheek of the opposite side of the affected one and lightly stretch it, and with the rest of the fingers simultaneously perform a fan-like fulling of the muscles of the cheek and the orbicular muscle of mouth.

In order to achieve anti-inflammatory effect, improvement of blood and lymph circulation in the muscles of the face, to improve the facial nerve conduction, an ultra high frequency electric field



(UHF) was applied to the facial nerve branching zone [4]. For the UHF therapy the apparatus (UHF–80–3) was used.

Method of the procedure: the patient was placed on the chair; the electrode was fixed with a small gap above the affected face area. At a power of 20-30 W, the patient experienced a slight thermal effect. The procedure lasted 10 minutes. The course

of treatment included 12 procedures that were performed daily.

The list of the components of the physical rehabilitation complex, the number of procedures and the duration of their implementation are given in Table 1. The sequence of procedures of the physical rehabilitation complex was the same as described in Table 1.

Table 1

Physical rehabilitation complex for facial nerve palsy

Physical rehabilitation treatment	Number of sessions	Duration of sessions	Total duration	Setting
Morning hygienic gymnastics	1	10 min	10 min	Hospital ward
Vocal gymnastics	1	20 min	20 min	Therapeutic physical training room
Mimic gymnastics	1	20 min	20 min	Therapeutic physical training room
Therapeutic massage of the neck and collar zone	1	20 min	20 min	Massage room
Paraffin wax	1	15 min	15 min	Physical therapy treatment room
Therapeutic facial massage	1	20 min	20 min	Massage room
Therapeutic massage of the hairy part of the head	1	20 min	20 min	Massage room
Ultra high frequency electric field	1	10 min	10 min	Physical therapy treatment room
Face self-massage	2	20 min	40 min	Hospital ward

After the course of the physical rehabilitation complex, the following changes were identified among the patients. After 7 days of implementation of physical rehabilitation complex in case of 8 (20%) patients there was no apparent shift in the clinical condition in accordance with the House-Brackmann facial nerve grading system; in case of 24 (60%) patients the degree of facial nerve dysfunction changed from grade V to grade IV (moderate severe dysfunction of the nerve) and 8 (20%) patients experienced the change in the degree of facial nerve dysfunction from grade V to grade III (moderate dysfunction of the nerve).

After 14 days of treatment and physical rehab, all patients experienced significant changes in their health. After the implementation of the physical rehabilitation complex, 24 (60%) patients were reported to have a moderate severe dysfunction of the nerve (Grade IV of House-Brackmann facial nerve grading system), 16 (40%) patients were diagnosed with a moderate dysfunction of the nerve (Grade III of House-Brackmann facial nerve grading system).

The mentioned results of the physical rehabilitation effectiveness are given in Table 2.

Table 2

The dynamics of the severity of patients' facial nerve dysfunction based on the results of physical rehabilitation

The degree of the severity of facial nerve dysfunction, grades	Number of patients					
	Before the rehabilitation		On the 7 th day of rehabilitation		On the 14 th day of rehabilitation	
	Total	%	Total	%	Total	%
V	40	100	8	20	0	0
IV	0	0	24	60	24	60
III	0	0	8	20	16	40

The analysis of the results of physical rehabilitation on separate symptoms showed the following: after 14 days of the physical rehabilitation complex, there was a positive dynamics of changes in one or another health index among all patients. In 100% cases (40 individuals) of patients the symmetry of nasolabial folds, a normal lachrymation and salivation rehabilitated; in 60% cases (24/40) of patients the taste sensitivity of the anterior 2/3 of the tongue was restored to normal; in 40% cases (16/40) of patients the symmetry of the eye fissure and frontal folds was improved; 40% (16/40) of patients could already whistle and bare the teeth, and 20% (8/40) of patients – to pucker the lips.

Conclusions

The use of the physical rehabilitation complex, which includes morning hygienic gymnastics,

vocal gymnastics, mimic gymnastics, therapeutic massage of the neck and collar zone, paraffin wax applied to the affected face side, therapeutic facial massage, therapeutic massage of the hairy part of the head, electric field applied to the facial nerve branching zone and face self-massage, permits to get good results: in 60% of cases (24/40) a moderate severe dysfunction, and in 40% of cases (16/40) – a moderate facial nerve dysfunction with all patients initially diagnosed with a severe nerve dysfunction. Also, it makes possible the rehabilitation of the symmetry of nasolabial folds, lachrymation and salivation.

Conflict of interest

The author claims that there is no conflict of interest.

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