

A COMPREHENSIVE APPROACH TO THE TREATMENT OF FACIAL NEUROPATHY IN CHILDREN

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Abstract: Current data on the prevalence of facial nerve neuropathy (FNN), averaging 20 cases per hundred thousand population and among the paediatric population, is the most frequent form of peripheral nervous system lesions. It accounts for more than 90% of all mononeuropathies occurring in childhood [1, 7, 9]. Despite the large number of scientific works, there are still open questions on the factorial results of etiopathogenesis and course of the disease in childhood. For example, the aspects of the virus in the onset and development of this disease are not fully understood.

Key words: neuropathies, facial nerve, children, age peculiarities.

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Introduction. The significance of stress factor in the development of facial neuropathy in children in children has been discussed for quite a long time, but no unified point of view has been developed so far. Age peculiarities, where early age is recognised in terms of the incidence of the disease [2, 6, 8]. The outcome and prognosis of the disease in children is more favourable than in adults, the number of complications, according to various researchers, can range from 5% to 50%. At the same time, there are many works devoted to recurrent cases of the disease. Recent studies, assert and prove the belonging of the vascular nature of the disease, taking into account the

increasing rate of children with cerebral strokes [3, 5].

In case of inappropriate approach to treatment, unfavourable outcomes of the disease are possible, which involuntarily increases the attention of others to the child or adolescent, subsequently affecting the general emotional background and psyche of children. In this regard, the search for the most adequate methods of predicting the outcome and treatment of NLD in childhood, allowing to minimise the frequency of unfavourable outcomes in children remains relevant at present [4, 10].

The diagnostic feature of FNN in children is a complex process, first of all, the age limitation of examination, then, the limitation of examination by neurofacial methods, respectively, the most informative for diagnosis, determination of the severity of the lesion and prognosis of the disease is the use of electroneuromyographic (ENMG) study, since the clinical picture of the disease in the acute period does not always allow obtaining objective information about the lesion of the facial nerve. The question of optimising the therapy of NSCLC in children is controversial. The possibilities of using many drugs and physiotherapy are limited, for example, whether hormonal and antiviral therapy should be used in the treatment of ALS in children. There are protocols for treatment, in the USA, children with FNN are not prescribed medication, the child simply remains under observation. It is known that the duration of prosoplegia and the degree of recovery of mimic musculature functions are in direct dependence on the depth of the nerve trunk lesion, therefore, there should be a non-orthodox approach to the therapy of FNN in children, it is necessary to take into account the age, hereditary affiliation, severity of paresis. The most important is the prevention of complications of facial nerve neuropathy and secondary contracture of mimic muscles (SCMM) with involvement of suprasegmental and segmental mechanisms, which is largely determined by therapeutic resistance. The validity of the role of the peripheral mechanism in the pathogenesis of facial neuropathy and complications in the form of contracture of mimic muscles determines the need to optimise pathogenetically justified therapeutic measures, which include biofeedback treatment method.

Purpose of the study: to evaluate the results and effectiveness of using biofeedback therapy in the complex of standard treatment in children with ALS.

Material and methods of the study. The study included 40 patients with FNN, who were in the Department of Paediatric Neurology, MK SamSMU from 2022 to 2023,

diagnosed with facial nerve neuropathy, aged from 10 to 18 years, girls prevailed (60%).

Initially, all children underwent clinical and neurological examination, where anamnestic information was studied in detail. Patients were additionally examined by an ophthalmologist, dentist, otolaryngologist, and paediatrician. In hospital, the children underwent traditional clinical and biochemical blood tests. Clinical and neurological examination included a thorough study of reflexes (afferent, effective) related to the facial nerve system; determination of sensitivity on the face, taste study, hearing study. The Roslera classification (degree of prosoparesis up to 5) was used to determine the nature of the paresis. The diagnostic choice of the study was the use of standard ENMG examination, including the study of bioelectric activity of mimic muscles on the side of the paresis; in addition, the method of stimulation EMG was used to determine the M-response, latency time, F-wave duration, the state of exteroceptive suppression. The method of electroneuroencephalography was used on admission to the hospital and at discharge, and a second control examination was carried out two months after discharge from the hospital.

Treatment of children with FNN was carried out in two directions, the patients were divided into two groups, group 1 (20 children) of which received standard traditional treatment (including dehydration, antiviral therapy, antibiotic therapy, drugs of metabolic-nootropic action; non-drug therapy ultraphonophoresis); group 2 (20 children), against the background of drug therapy, the use of biofeedback method (BOS-EMG) was carried out. In this method, bipolar electrodes were used, both on the healthy and affected side, under the doctor's control, the patient's sensations were recorded under the influence of feedback. The method allowed the patients to control the paretic muscles, a total of 10 sessions were performed, 20 minutes for each session. Statistical analysis was carried out on an individual computer, using Student's t-criteria (with mean and variance of mean

square ($M \pm SD$), where the degree of difference was considered reliable at the level of $p < 0.05$.

Result of the study. In accordance with the goal, children who were in hospital with the diagnosis of facial nerve neuropathy underwent a comprehensive examination, including clinical and neurological examination, examination of specialists: ophthalmologist, otolaryngologist, dentist, paediatrician; instrumental examination - ENMG; laboratory methods of research.

Of all examined children with FNN, left-sided lesions were observed in 53, 4% of cases. Repeated manifestation of the disease was detected in 9%, mostly in boys. There was a history of hereditary predisposition in three cases. 37% of patients sought medical help in hospital on the 1st-2nd day of the onset of the disease, the rest were hospitalised on the 5th-7th day of the onset of the disease. The cause of the disease was mainly attributed (according to parents) to colds (acute respiratory viral infections); to hypothermia after sports activities; in girls, the reason was a visit to a salon for hair cutting. Clinical symptomatology consisted of acute onset of prosoparesis on one side of the face (complaints of facial misalignment). According to the classification, the patients had grade 2 paresis in 15% of cases, grade 3 in 61% of cases, and grade 4 paresis in 24% of cases; where, grade 4 was marked by severe (almost complete) paralysis, with absence of mimic movements, grade 3 by severe paresis with barely visible mimic movements, and grade 2 by moderate paresis, with preservation of eye closure (eyelash symptom). Some children noted that before the development of paresis, there was a feeling of "crawling of goosebumps", twitching of the eye, soreness in the area of the outer ear. A change in taste on the anterior 2/3 of the tongue, in parallel with the excretion of tears and saliva was noted in 5% of children (showing a lesion above the n. petrosus major). Hyperacusis was found in 19% of cases (corresponding to a lesion above the n. stapedijs). The remaining cases, in the

majority, were detected in the distal segment of the fallopian canal.

Table 1. Level of blink reflex of the 1st component (amplitude and duration) in children

Blink reflex index	paresis side	Healthy side
Latency, ms	12	10
Amplitude, mV	0,1	0,6
Duration, ms	5,8	8,3

* - Reliable differences of indicators on the side of paresis with the contralateral side $p < 0.05$

The level and nature of paresis was revealed by comparison of the amplitude of stimulation EMG on each side, and accordingly, the percentage of lesions according to EMG data was noted. Thus, 8% of patients had 100%, 90% - 44.8%, 80% - 39.4%, less than 70% - 7.8%. All these indices corresponded to the level at the patients' admission. At the same time, (motor factor) M-response responded to stimulation in all children, regardless of the level of paresis at 100%, where the reliability was $p < 0.01$. In the case of M-response latent distance, there was a prolongation of the period on the paretic side compared to the healthy side, where the reliability is $p < 0.01$. The prolonged change on the M-response side, on the paretic side, shows a high level of increase, where the reliability is $p < 0.05$. The study of F-wave parameters during stimulation in 53%, in the examined children at hospital admission, the response was blocked, in the other children, statistically noted a decrease in mV amplitude, where the difference between the sides, had a $p < 0.001$.

As noted, all children were treated, with patients divided into two groups, 1- medication (standard) and physiotherapy with phonophoresis (with hydrocortisone); 2- medication (standard therapy) and the use of biofeedback on the EMG machine.

At the end of inpatient treatment, there was a difference between the two groups, where group 1 had significantly lower therapy

dynamics and recovery rates than group 2. Group 2 children had a high recovery rate, with Roslera's classification of the severity of the

disease, the first degree being 80%, and in 20% of cases the second degree, with no signs of contracture.

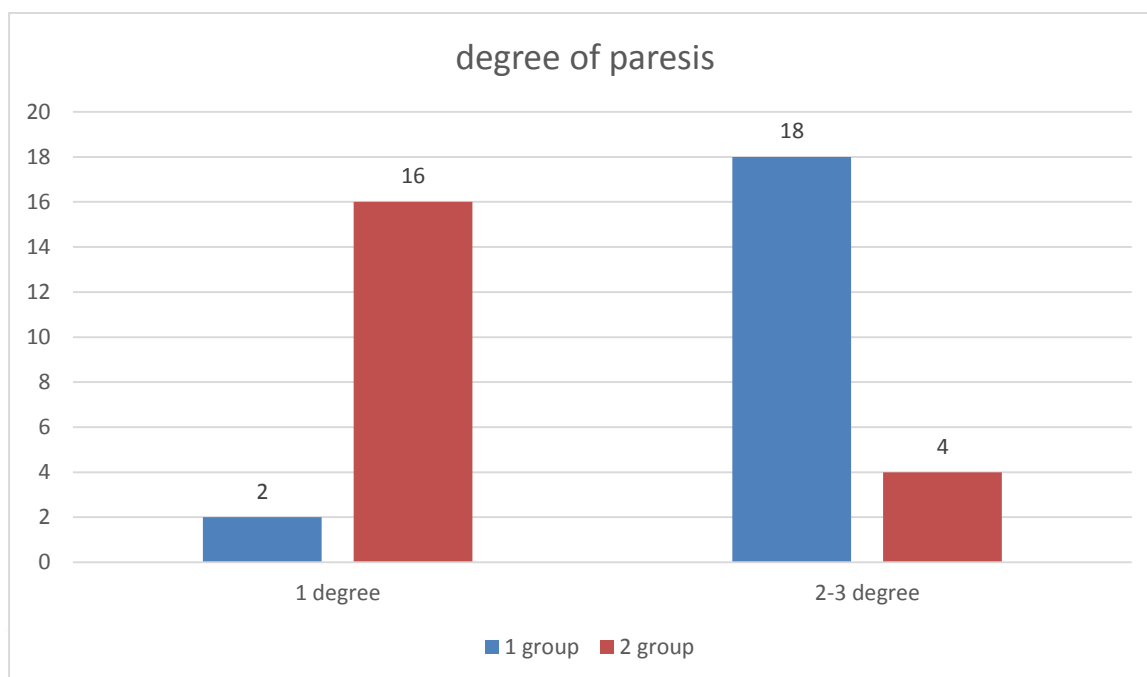


Figure 1. Rate of paresis after treatment of FNN in children

Table 2. M-response amplitude index before and after treatment

Index	before treatment mV	After treatment mV	Gain in mV values
2 group	0,75	1,53	0,9
1 group	0,79	1,10	0,4

* - reliable differences between groups at $P < 0.05$

If, on admission to hospital, in patients with FNN there was no difference between the signs of paresis by nature and severity, where $p > 0.05$, then at the end of treatment, the significant difference between the groups was $p < 0.05$, as only 40% of children of group 1 at discharge had recovery of mimic muscles, which is much lower than in group 2.

Table 3. Level of blink reflex before and after treatment of FNN in children

indicators	before treatment mV	After treatment mV	Gain in mV values
1 group	0,1	0,4	0,10
2 group	0,1	0,6	0,4

* - reliable differences between groups at $P < 0.05$

Comparison of pre- and post-treatment ENMG parameters showed the following results. On admission, children of both groups had similar changes in the amplitude of M-response, while at discharge there was an increase in the amplitude of M-response and significant

differences between the groups, where $p < 0.05$. It should be noted that the study of the blink reflex (mr), was determined by the preservation of the motor response, which proves the inclusion of afferent links in the pathomechanism of FNN disease, with such a

change noted in 46% of cases. In other cases, the situation was with a decrease in duration (mr) and amplitude on the prosoparesis side. At the moment of discharge from the hospital, the amplitude (mr) and duration significantly increased, with higher values in group 2 patients, where the reliable results of differences were $p < 0.05$. Consequently, the analysis of the obtained results, showed the effectiveness of the proposed treatment, a combination of medication and biofeedback method, good results on the restoration of mimic muscles, without signs of contracture in children with the disease FNN, while it was proved the need to monitor the process of therapy by electroneuromyographic parameters.

Conclusions: According to the obtained results, it was found that the main place in the structure of FNN disease in children is occupied by idiopathic form, which accounts for more than 90%. When assessing the results of clinical forms, the following features were revealed: in more than 80% of cases there is a medium and severe lesion of the facial nerve, corresponding to the III-IV degree of paresis according to the Rosler classification, with a high percentage of 73%, the pathomechanism of the clinical picture corresponds to the lesion of the facial nerve in the lower part of the Fallopian canal.

In children with FNN disease, changes in ENMG parameters on the intact side with prosoparesis were noted, indicating a special neurophysiological state of the facial nerve on the side opposite to prosoparesis. Motor M-response at stimulation of the trunk of the facial nerve has an index of preservation irrespective of the degree of paresis, according to the parameters of amplitude and duration, which correspond to the signs of axon- and myelinopathy. The F-response parameters have a level of blocking, the data of the response parameter in cases of its preservation speak about the facial nerve lesion throughout its entire length with the reaction of facial motoneurons.

The proposed therapy for children with FNN disease, in the complex of drug treatment with the use of biofeedback method allows to achieve restoration of mimic muscle function in 80% of cases, without complications in the form of contracture. In order to objectively assess the severity of facial nerve damage in FNN and control treatment, it is advisable to repeat the study of ENMG from the beginning of the disease and in the dynamics of therapy.

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