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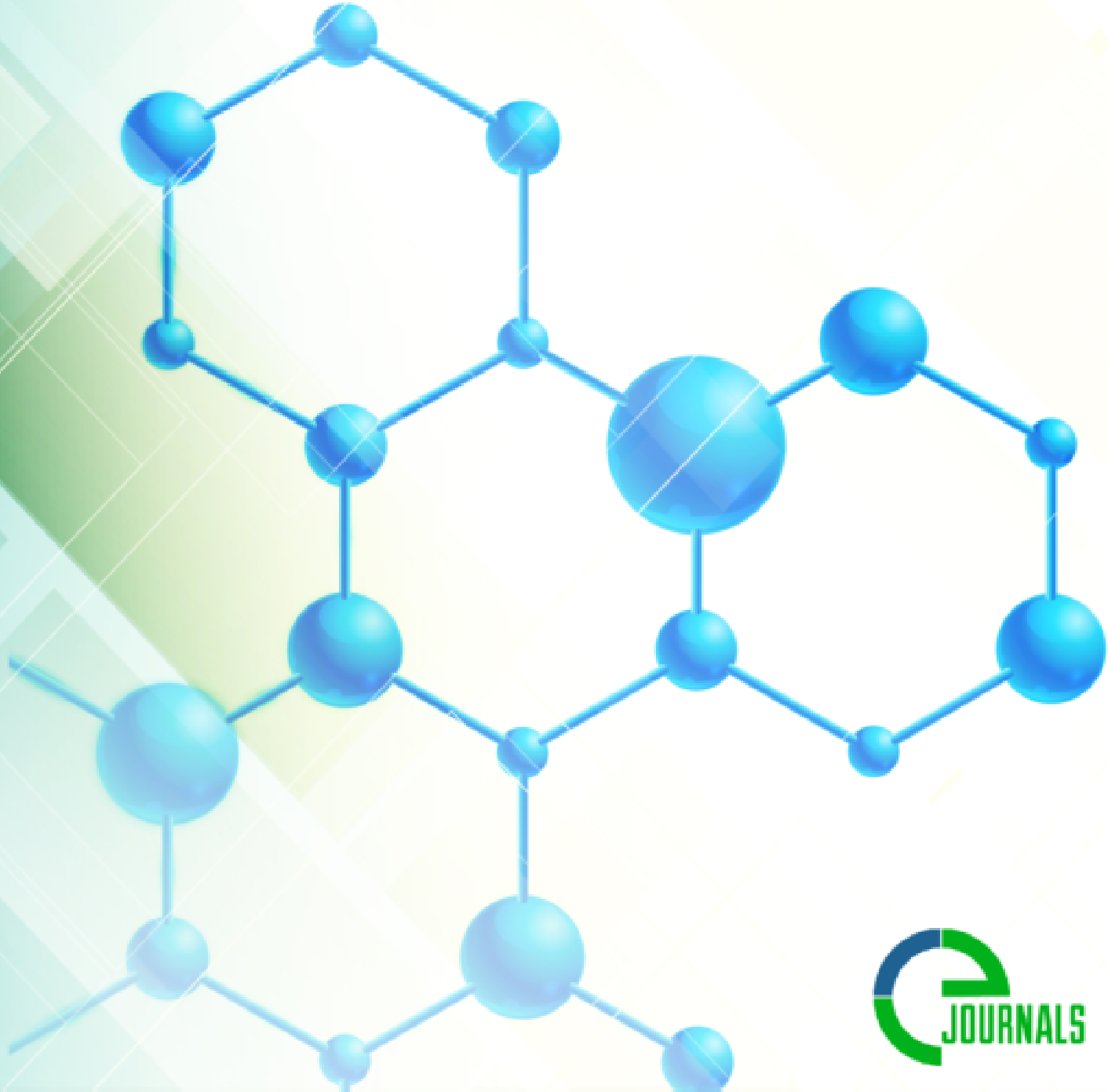

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ASSESSMENT OF MOTOR ACTIVITY IN CHILDREN WITH DISEASES OF THE PERIPHERAL NERVOUS SYSTEM USING A MODIFIED SCALE FOR ASSESSING THE DEGREE OF PERIPHERAL PARESIS

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Abstract: The aim of the study was to determine the information content and reliability of the proposed modified motor activity scale in patients with various acquired diseases of the peripheral nervous system.

The sample included 70 children from 3 to 17 years old with the consequences of damage to the peripheral nervous system - natal plexopathy, polyneuropathy and mononeuropathy. An analysis of clinical and neurophysiological data was carried out, the degree of peripheral paresis was assessed using the MRC scale and a modified scale for assessing the degree of peripheral paresis, a correlation analysis of clinical and electroneuromyography data, data from the MRC scale and a modified scale was carried out. The reliability, specificity and sensitivity of the modified scale was assessed, the use of which contributes to a more accurate assessment of the degree of peripheral paresis, which in the future will allow the development of an individual rehabilitation program.

Keywords: consequence of birth injury of the brachial plexus, consequence of polyneuropathy, mononeuropathy, peripheral paresis, electroneuromyography, modified scale.

Peripheral neuropathy occurs as a component of several common and many rare diseases. It is heterogeneous in etiology, diverse in pathology and varying degrees of severity. The term peripheral neuropathy includes symmetrical polyneuropathy, single and multiple mononeuropathy, and radiculopathy. The purpose of non-drug treatment of peripheral neuropathies are: slowing down the development of degenerative-muscular degeneration; improvement of regional blood circulation, increase in muscle strength, performance and reserve capabilities of muscles; reducing the risk of injury (dislocations, sprains, fractures), joint diseases with the subsequent development of contractures; normalization of the patient's vegetative status [1,3,4].

In determining the tactics of non-drug treatment of peripheral neuropathy, EMG data help to establish the predominant type of peripheral nerve damage (axonal, demyelinating, mixed) and the patient's vegetative status [1,7]. But often in the acute period of the disease, especially in the initial stages, the above indicators do not differ from the normative ones, especially since, according to various authors, the normative indicators themselves are very variable [7,8,9].

Currently, the method for assessing the severity of paresis is the most common six-point scale for assessing muscle strength. There are various versions of this scale, the most commonly used study of muscle strength according to Lovett in various modifications. One test option for assessing muscle strength is the Medical Research Council Scale (R. Van der Ploeg et al., 1984). In 1978 V.O.Marks proposed a six-point scale for assessing muscle strength, which was later modified by L. McPeak (1996). However, the only difference between the test according to L. McPeak (1996) and M. Weiss (1986) is the verbal formulation of the degree of paresis: 0 points - paralysis, 1 - severe paresis, 2 - pronounced, 3 - moderate, 4 - mild and 5 points - no paresis. Also, the Scientific Center of Neurology of the Russian Academy of Medical Sciences developed a scale for assessing paresis (2005), and separately for the upper and lower limbs, the Orgogozo

scale (1989) [2,5,6,10]. The principle of assessment in these scales is the same - the volume of active movements performed, possible changes in the musculoskeletal system (scoliosis, deformities, contractures), hypo- or atrophy of the involved muscles, electrophysiological data are not taken into account. For this reason, we have modified the MRC scale, taking into account the above nuances.

The purpose of the study: to determine the information content and reliability of the proposed modified scale of motor activity in patients with various acquired diseases of the peripheral nervous system.

Research material. The study included 70 patients aged 3 to 17 years, inclusive, with the consequences of natal brachial plexopathy - 33 (47.14%), with neuropathy of the peroneal nerve - 22 (31.4%), with neuropathy of the sciatic nerve - 11 (15, 7%), with the consequences of polyneuropathy - 4 (5.7%). The mean age of the patients was 12.26±2.39 years, the disease duration was 4.3±1.1 years. There were 42 (60%) boys and 28 (40%) girls among them.

To clarify the diagnosis and the level of localization of the lesion, an EMG and ENMG study was performed on the ulnar (C8-Th1), median (C6-Th1) and axillary (C5-6), tibial (L4-S1) and peroneal (L4-S1) nerves. The analysis of SPI and M-response from the studied nerves was carried out. ENMG was carried out on an electroneuromyograph Neuron-Spectrum-micro manufactured by Neurosoft (Russia). Supramaximal stimulation of the studied nerve was performed with rectangular electrical impulses (stimulus duration 0.2 ms). Recording of M-responses and assessment of their latencies with the assessment of SPI by motor fibers was carried out with m. abductor pollicis brevis, m. abductor digiti minimi, m. deltoideus, with m. extensor digiti brevis, m.flexor digiti brevis from the upper .abductor hallucis, extensor digitorum brevis from the lower extremities. The active electrode was applied to the belly of the muscle, the reference depending on the nerve under study: n.medianus - on the proximal phalanx of the thumb, n.ulnaris - on the proximal phalanx of the little finger, n.radialis - on the back surface of the metacarpophalangeal joint of the second finger, n.axillaris - tendon of the deltoid muscle at the point of attachment to the humerus, n.musculocutaneus - on the tendon of the biceps muscle in the elbow bend, n.tibialis and n.peroneus on the outer surface of the metacarpophalangeal joint of I and V toes, respectively.

Table 1.
Age and gender distribution of patients

	4-7 y. o	8-14 y.o	15-17 y.o	Total
boys	9(21.4%)	22(52,4%)	11 (26,2%)	42 (60%)
girls	8 (28,6%)	15 (53,6%)	5 (17,9%)	28 (40%)
Total	17 (24,3%)	37 (52,9%)	16 (22,9%)	70 (100%)

Informed consent was obtained from each parent for the study. Statistical analysis was carried out using the SPSS 22 for IBM software package and Excel 2008 Microsoft office. Mean values (M), median (Me) and square deviation of mean error (m), mean values difference (t) were calculated. The difference is significant at $P<0.05$. Calculated α -Cronbach's coefficient to determine the reliability of the scale.

Research results and discussion. Clinical manifestations of the consequences of natal plexopathy were characterized by signs of damage to both the brachial plexus and the spinal cord. Which was manifested by the presence of torticollis (3; 9.1%), asymmetry of the shoulder girdle (5; 15.2%), tension of the cervico-occipital muscles (9; 27.3%).

In 21 (63.6%) patients with plexopathy, scoliosis of the cervicothoracic region of 1-2 degrees was observed. Horner's syndrome was observed in 3 (9.1%) patients and signs of pyramidal insufficiency in 11 (33.3%) patients, which were manifested by anisoreflexia of tendon reflexes, the presence of pathological reflexes on the side of the lesion. Hypotrophy of the muscles of the upper limb of the affected side, autonomic disorders, and hypoesthesia were observed in all patients, depending on the nerve or brachial bundle involved in the pathological process. Patients had a predominantly right-sided lesion (21; 63.6%). Brachial plexus lesions of the Erb-Duchene type were observed in 14 (42.4%), Dejerine-Klumpke type in 8 (24.2%), and total plexopathy in (11; 33.3%) patients. The degree of paresis according to the MRC scale was 2.75±1.89 points.

The electroneuromyogram showed suffering in the nerves examined, and to a greater extent in the axillary nerve. A more severe lesion of the axillary nerve can be explained by its greater predisposition to trauma in the armpit, where the greatest traumatic force occurs when the child is pulled by the armpits. In addition, the axillary nerve passes behind a. axillaris together with a. circumflexa humeri posterior through for. quadrilaterum, formed by muscles and the humerus, which causes its compression when the handle is thrown back during childbirth. According to the electroneuromyogram data, mainly the axonal type of damage was determined (21; 63.6%), in 12 (36.4%) the mixed type of damage. At the same time, F-wave block from 15 to 72% at the level of the affected nerve was observed in all patients, which indicates the involvement of the spinal cord in the pathological process (Table 2).

Table 2.

Deviation of the main ENMG parameters for the studied nerves in patients with the consequences of birth injuries of the brachial plexus relative to normal values

Nerves	Deviation of M-response amplitude, %	Deviation of SRV, %	Residual latency deviation,%
Median	-56,4±12,4	-46,7±10,2	60±11,4
Elbow	-48,2±9,1	-32,9±15,3	53,4±1,9
Axillary	-79,1±11,9	-38,4±14,7	44,7±5,4
Radiation	-44,1±3,7	-41,1±9,8	68,9±3,1
Musculoskeletal	-25,3±7,7	-34,3±11,5	70,4±10,2

The average age of patients with neuropathy of the peroneal and sciatic nerve was 12.6±2.3 years, the duration of the disease was 2.1±0.9 years. These neuropathies had a traumatic genesis. In the clinical picture of neuropathy of the peroneal nerve, hypotrophy and hypotension of the peroneal muscle groups, valgus deformity of the limb (14; 63.6%), loss of sensation in the area of innervation of this nerve (16; 72.7%), hyperpathic pain in the area of the fingers were noted. legs (8; 36.4%), vegetative disorders (19; 86.4%), gait on the affected limb was "steppage". There was limited dorsiflexion of the foot and toes. The degree of paresis according to the MRC scale was 3.1±1.99 points. ENMG revealed the axonal type in 12 (57.1%) patients, the demyelinating type in 4 (19.05%), and the mixed type in 16 (76.2%) children. An increase in the latent period was noted in all patients.

In patients with neuropathy of the sciatic nerve, along with hypotrophy of the muscles of the distal parts of the lower limb, a decrease in sensitivity was observed along the posterior surface of the lower leg, while 6 (54.5%) patients had hyperpathic pain in the area of the sole and fingers. Vegetative disorders - marbling of the skin, cooling of the affected limb, impaired trophism of the nails, hyperhidrosis and hypertrichosis. Ankle joint contracture was observed in 9 (81.8%) patients. The Achilles reflex was not elicited. In 13 (39.4%) patients with neuropathy of the peroneal and sciatic nerve lasting more than 2 years, scoliosis of the lumbar spine and some increase in lumbar lordosis were noted. In 6 (54.5%) patients, a pathological position of the lower extremities was observed - "heel foot". ENMG showed a mixed type of lesion in 5 (45.5%) patients, an axonal type in 4 (36.4%), and a demyelinating type in 2 (18.2%) patients. The degree of paresis according to the MRC scale was 2.1±1.53 points. An increase in the latent period of the M-response along the peroneal and tibial nerves, a decrease in both amplitude and speed indicators were also noted.

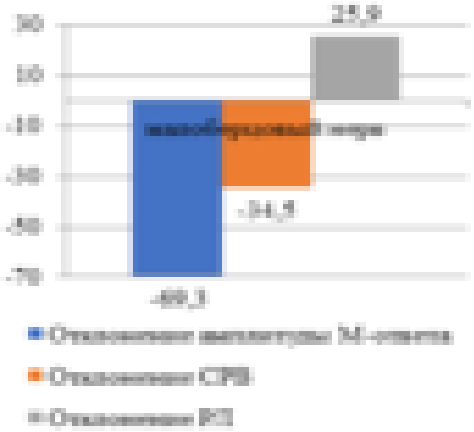

Fig.1. Deviation of ENMG parameters in relation to normal values in patients with neuropathy of the peroneal nerve (%).

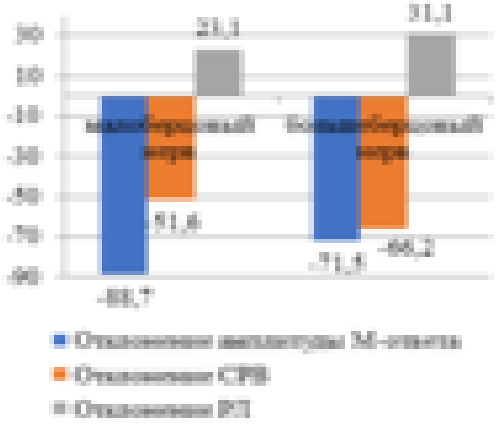

Fig.2. Deviation of ENMG parameters in relation to normal values in patients with sciatic nerve neuropathy (%).

The consequences of polyneuropathy of infectious origin were observed in 4 patients, while the average age of patients was 8.4±1.9 years. The duration of the disease was 3.1±0.75 years. Hypotrophy of the distal muscle groups of the upper and lower extremities, the absence of tendon and periosteal reflexes, hypoesthesia of the polyneuropathic type, and valgus deformity of the lower extremity were clinically noted. The degree of paresis according to the MRC scale was 2.7±0.8 points in the upper limbs and 1.8±0.44 points in the lower limbs. The ENMG study showed a decrease in speed and amplitude indicators to a greater extent in n.medianus and n.peroneus. In all patients with the consequences of polyneuropathies, a demyelinating type of lesions was noted (Table 3).

Deviation of the main ENMG parameters for the studied nerves in patients with the consequences of polyneuropathy relative to normal values

Nerves	Deviation M-response amplitude deviation	Deviation % NRV deviation	Deviation % Residual latency deviation, %
Medial	-51,1±7,8	-86,5±19,1	41,1±1,4
Elbow	-22,9±6,7	-57,3±14,1	43,2±10,4
Axillary	-34,7±9,9	-56,7±10,8	34,6±9,3
Radiation	-51,1±10,8	-45,6±7,7	28,4±8,11
Musculoskeletal	-44,8±8,6	-55,1±11,3	33,6±4,7
Peroneal	-44,7±9,2	-82,1±9,2	47,6±9,3
Tibial	-38,6±11,3	-68,1±8,4	39,1±10,1

It should be noted that the parameters of the electroneuromyogram were significantly distinguishable from normal values ($P<0.001$).

We have evaluated motor activity, i.e. degree of paresis using the MRC scale. The severity of paresis directly correlated with the amplitude of the M-response and the speed of the impulse from the nerves under study, and inversely correlated with residual latency (Table 4).

Table 4
Correlation of the MRC scale with the amplitude of the M-response and CRV

	M-response amplitude	CRV
Sequelae of brachial plexopathy	0,65*	0,74*
Sequelae of polyneuropathy	0,86*	0,54*
Neuropathy of the peroneal nerve	0,68*	0,85*
Neuropathy of the sciatic nerve	0,78*	0,82*

According to our modified scale for assessing the degree of damage to the peripheral nervous system, the presence of hypotension, malnutrition and its degree, muscle strength, from 0 to 4 points, the presence of sensory disorders, the state of tendon reflexes, ENMG data, the presence of scoliosis, the presence of recurvations and contractures are taken into account. in the joints. Depending on the severity of the symptoms, each symptom is assigned a certain percentage score and ultimately determine

the degree of pathology, which varies from I to IV degree, where the more severe the process, the higher the degree of pathology.

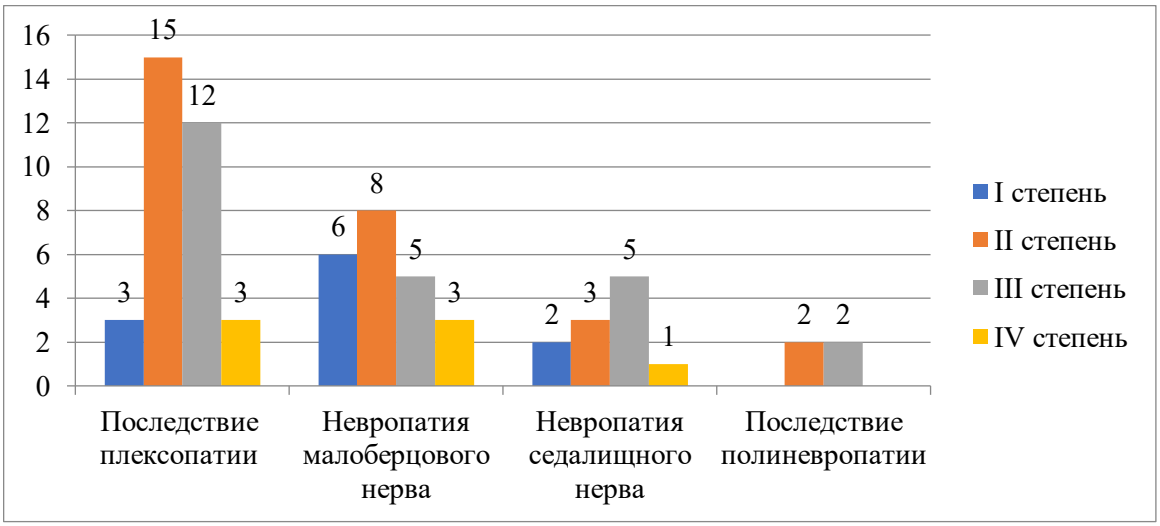

Figure 3. Degrees of peripheral paresis in patients (abs).

The results of assessing the degree of peripheral paresis according to the modified scale showed that II and III degrees of damage prevailed among the examined patients.

Корреляционный анализ усредненных показателей MRC шкалы и модифицированной нами шкалы показал высокую достоверную корреляционную связь (r=0,89; p<0,001). Диагностическая чувствительность данной шкалы составила 85,2%, специфичность - 74,3%. Результат ?-коэффициента Кронбаха составил 0,69, что соответствует удовлетворительному уровню внутреннего постоянства шкалы.

Conclusion. Given the above, the proposed modified scale for assessing motor activity, which allows determining the degree of peripheral paresis, helps to determine the rehabilitation potential of patients, and thus the creation of an individual rehabilitation program, which will contribute to the social and psychological adaptation of patients in society. Given the small sample size in the study, in the future it is planned to expand it to include flaccid paresis associated with spinal cord injury in the study group.

Used literature.

1.Bogolyubov V.M. Medical rehabilitation. 3rd ed. book. 2. M.: BINOM; 2010.

2.Diagnostic scales and tests in neurorehabilitation. A guide for doctors / Bulekbaeva Sh.A., Lisovsky E.V., Rizvanova A.R., Daribaev Zh.R. // Astana: JSC "Republican Children's Rehabilitation Center", 2015. -146p.

3.Evtushenko S.K., Shaimurzin M.R., Evtushenko O.S. Neuromuscular diseases in children: the problem of early diagnosis and current medical and social rehabilitation (literature review and our own observations). International neurological journal, ISSN 2224-0713 N? 5(59), 2013 pp. 13-31.

4.Zhivolupov S.A., Rashidov N.A., Samartsev I.N., Yakovlev E.V. Modern ideas about the regeneration of nerve fibers in injuries of the peripheral nervous system / Bulletin of the Russian Military Medical Academy. 3(43) - 2013. -p.190-198.

5.Features of clinical and diagnostic manifestations in children with acute polyneuropathy / Gaibiev A.A., Dzhurabekova A.T., Shomurodova D.S. / Re-health journal No. 2. 2 (6), 2020, -S. 63-67.

6.Tests and scales in neurology: a guide for doctors / ed. A.S. Kadykova, L.S. Manvelov. M., 2015. 224 p.

7.Ehler E., Ridzo? P., Urban P. Ulnar nerve at the elbow - normative nerve conduction study // J.Brachial Plex.Peripher.Nerve Inj.- 2013.- Vol.11.8(1).- P.2.

8.Garg R., Bansal N., Kaur H. Nerve conduction studies in the upper limb in the malwa region-normative data // J. Clin. Diagn. Res.- 2013.- Vol. 7, no. 2.- R. 201-204/.

9.Mittal P., Shenoy S., Sandhu J. S. Effect of different cuff widths on the motor nerve conduction of the median nerve: an experimental study // J. Orthop. Surg. Res.- 2008.- No. 9, vol. 3. - R. 1.

10.Orgogozo J.M. Evaluation of treatment in ischaemic stroke patients // Amery W.K., Bousser M.G., Rose F.C. (eds). Clinical trial methodology in stroke. - London: Balliere Tindall, 1989. - P. 35-53.