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Ethiopatogenesis, Rehabilitation, Profilacy, and Treatment Methods for Postinsult Survivors

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ABSTRACT

The majority of strokes (about 89%) are ischemic, 17% are intracerebral hemorrhages, and about 3% are subarachnoid hemorrhages. According to the European researches, for each 100 000 of the population there are 600 patients with consequences of stroke, and 60% of them are invalids. Due to the aging of the population, there is an increase in the incidence of stroke, which makes stroke prevention (including recurrent strokes) and rehabilitation of stroke patients an important medical and social problem.

Introduction: Arterial hypertension is the main cause of cerebral hemorrhage and some types of ischemic stroke. In arterial hypertension there is a risk of developing progressive vascular brain disease - hypertensive dyscirculatory encephalopathy, often leading to dementia. Arterial hypertension contributes to the development of atherosclerosis. At a diastolic BP of 105 mm Hg the risk of stroke is 10 times higher than in persons with a diastolic BP of 76 mm Hg.

General principles of arterial hypertension treatment include:

- ✓ Starting treatment with the lowest possible dose of one drug;
- ✓ If high doses of the initially selected drug are not effective enough or if side effects occur, switching to another group of drugs;
- ✓ use of long-acting drugs (24-hour effect with a single use);
- ✓ self-control of patients for the effectiveness of the ongoing treatment, especially in the selection of the dose of the drug (double measurement of BP at home);
- ✓ periodic daily monitoring of blood pressure (in the hospital or outpatient);
- ✓ Reducing the intake of table salt to 2 g/day.

It is recommended to reduce BP gradually by 10-15% of the initial level. When the patient adjusts to the new BP numbers (at first there may be weakness, mild dizziness), you should continue to reduce the BP cautiously and gradually to the optimal numbers.

Pathology of the main arteries of the head plays a certain role in the development of atherothrombotic (thrombosis or arterio-arterial embolism) and hemodynamic stroke subtype. In clinical practice, stenosis of a single vessel is rare; more often it is multiple MAG lesions. The

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critical value of total stenosis of all vessels is 40%. The nature of an atherosclerotic plaque plays a significant role in the development of arterial-arterial embolism: "unstable" plaques with an uneven surface, contributing to the formation of a parietal thrombus, with intramembolic hemorrhage have a high embologic potential. In asymptomatic stenosis of the internal carotid artery the annual risk of stroke development is 2%, in stenosis of 70% or more, combined with recurrent transient ischemic attacks in the same vascular system - 13% per year. The main method of correction is reconstructive surgeries: carotid endarterectomy and stenting, performed mainly for the purpose of primary stroke prevention. The indications for reconstructive surgeries are:

- 70% or more stenosis of the internal carotid artery;
- "unstable" atherosclerotic plaque in combination with single or multiple transient ischemic attacks or "minor" stroke (stroke with fully reversible neurological deficit) in the same vascular system. Hypercholesterolemia and other lipid metabolism disorders (increased low-density lipoproteins and decreased high-density lipoproteins, hypertriglyceridemia) contribute to atherosclerosis, which is, along with arterial hypertension, one of the main causes of stroke. Along with antiatherosclerotic diet patients are prescribed statins (simvastatin, atorvastatin, rosuvastatin are the means of choice) under control of blood lipids and liver enzymes.

Rehabilitation is a complex of measures (medical, pedagogical, psychological, etc.), aimed at restoring functions impaired by the disease and social adaptation of patients. The very possibility of restoring the impaired functions is based on the mechanisms of neuroplasticity. Neuroplasticity is understood as the ability of nervous tissue to structurally and functionally remodel itself after it has been damaged as a result of an illness or injury.

The main tasks of rehabilitation after a stroke are

- ✓ Restoration of impaired functions (motor, speech, cognitive, etc.);
- ✓ social and psychological readaptation;
- ✓ prevention of complications arising in the post-stroke period;
- ✓ prevention of repeated strokes.

On the basis of many years of experience, the main principles of rehabilitation have been developed;

- ✓ early start;
- ✓ duration and systematicity;
- ✓ Complexity, multidisciplinary and individualization of rehabilitation activities;
- ✓ active participation of the patient and his/her family in rehabilitation.

Cardiogenic embolism is one of the main causes of ischemic stroke. Atrial fibrillation (atrial fibrillation) ranks first among the causes of cardiogenic embolism. In addition to rhythm disturbances, cardioembolism can be caused by other heart diseases that contribute to thrombus formation in the heart cavity: acute myocardial infarction, postinfarction cardiac aneurysm, rheumatic valve disease, mitral valve prolapse, endocarditis. It is proved that anticoagulants (warfarin) in patients with atrial fibrillation reduce the risk of stroke by 70%, while taking only acetylsalicylic acid - only by 20%. Doses of anticoagulants are adjusted for international normalized ratio (INR), which must be monitored periodically (every 4-8 weeks). Recently, a new effective anticoagulant has appeared - direct thrombin inhibitor dabigatran (Pradaxa), which, unlike warfarin, does not require monitoring.

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In other pathogenetic subtypes of ischemic stroke, continuous administration of antiplatelet antiplatelet agents is necessary to prevent recurrent stroke. Acetylsalicylic acid (ASA) is the most widely used antiplatelet antiplatelet agent. Research of employees of Research Institute of Neurology of RAMS, headed by Z.A. Suslina, has proved for the first time the efficiency of small doses of ASA: 1 mg per 1 kg of weight per day. Now it is generally accepted an optimum dose of 75-100 mg per day which can be increased to 150 mg during the first days of ischemic stroke.

Early rehabilitation-a large multidisciplinary randomized controlled trial AVERT showed that early mobilization (in the first 14 days after stroke), including training to sit in bed, stand and walk, resulted in reduced mortality and dependence on others in the first 3 months after stroke, reduced frequency and severity of complications and adverse events, improved quality of life by the end of the first year.

The main objectives of early motor rehabilitation are:

- ✓ early activation of patients;
- ✓ prevention of the development of pathological conditions (spastic contractures, arthropathies) and complications (thrombophlebitis, bedsores, congestion in the lungs);

Restoration of voluntary movements. Studies conducted at the Research Institute of Neurology of the Russian Academy of Medical Sciences [20] have shown that in the first hours after stroke development, along with positional treatment, passive therapeutic exercises, and selective massage, patients can be prescribed neuromuscular stimulation of the paretic arm muscles. Currently, for the verticalization of patients are widely used turntables, with the help of which you can gradually transfer patients to the vertical position (necessarily under the control of pulse, blood pressure and ECG) without much effort on the part of the staff. In parallel with the activation of patients and their gradual transfer to the vertical position, exercises are used to develop voluntary movements in the paretic limbs. Rehabilitation measures to restore speech should begin with the acute period: first in the neurological department, then in the rehabilitation hospital, upon discharge from which - in the outpatient clinic or at home. Speech rehabilitation is more lengthy than motor rehabilitation due to the complexity of organizing the speech function, and can last 1-2 years (in some cases, more than 2 years), which is why patients with aphasia are shown repeated inpatient rehabilitation courses. At the outpatient stage of rehabilitation, exercises are conducted 40-60 minutes 2-3 times a week. The possibility of implementing this principle arises only when staged rehabilitation is well organized. The following model of rehabilitation after a stroke is the most rational:

- ➢ 1st stage of rehabilitation - start already in the neurological department, where the patient is delivered by ambulance;
- ➢ The 2nd stage - rehabilitation in a specialized rehabilitation hospital (rehabilitation unit of the hospital where the patient was initially admitted, or a rehabilitation center);
- ➢ the 3rd stage - outpatient rehabilitation in a polyclinic (some regional polyclinics have rehabilitation departments) or in a rehabilitation center. Complexity means the use in the rehabilitation process of all the rehabilitation technologies available for a given rehabilitation facility. For motor disorders, this means therapeutic exercises, massage, electrostimulation, the use of new robotic technologies, classes to restore walking and self-care. Multidisciplinarity means that representatives of different disciplines (professions) participate in rehabilitation as a single rehabilitation team. Working together, the team members help the patient reach his or her maximum potential. A rehabilitation team may include the following specialists:

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- the treating neurologist -the team leader;
- Rehabilitation nurses to provide care and assistance to the patient;
- A speech therapist and aphasiologist - a specialist in rehabilitation training of patients with speech, reading, and writing disorders;
- Specialist in therapeutic gymnastics;

A specialist in everyday rehabilitation, who helps the patient to restore self-care and other everyday skills;

- Physiotherapist, who performs various physical procedures if necessary: electrical stimulation for paresis, paraffin therapy (for spasticity), analgesic electrical procedures;
- A psychologist, who conducts classes for memory and attention disorders, and conducts psychotherapy classes for psychological and social adaptation. Rehabilitation therapists have established that the success of rehabilitation depends to a large extent on the activity of the patient and his family members, his relatives and loved ones. This is connected with the fact that the main role in rehabilitation is played by the learning process. And here, as at school, there may be capable and less capable, active and inactive "students". Helping the patient to learn lessons well in remedial gymnastics classes, in classes to restore speech is an important task not only for specialists in remedial education, but also for relatives and friends of the patient. Reduced activity is often associated with the development of various pathological conditions after a stroke, such as apathy (indifference), reduced attention, underestimation of one's illness (anosognosia), asthenia (general weakness, fatigue), depression (lowered, depressed mood, negativism (negative attitude towards treatment and rehabilitation measures). Family members and friends can play a major role in overcoming the patient's reduced activity, and they can do additional ("home") exercises together with the patient, teach him or her the skills of walking and self-care, restore speech in their free time (in the evenings and on weekends). Medical therapy is an important part of the treatment of post-stroke patients. It consists of 3 main directions:
- prophylactic treatment taking into account the underlying disease and risk factors for stroke, the task of which is to prevent recurrent strokes, development and progression of chronic cerebral vascular disease;
- pathogenetic treatment, aimed at reducing the destructive processes that occur in the brain after a stroke and in chronic cerebral vascular disease, against which stroke often develops;
- Syndromic treatment of stroke consequences: cognitive, speech, emotional disorders, muscle spasticity, pain syndrome.
- causes exacerbation of gastric and 12 duodenal ulcers and ulcerative colitis even with low doses and even when taking the above mentioned drugs, although in a much smaller percentage of cases. As A.L. Vertkin et al. (2009) showed, erosions were found in the stomach and 12 duodenum in 22.5% of patients receiving Cardiomagnil. While in the group of patients treated with ThromboAss there were 65% of such patients. The authors attribute this to the fact that magnesium hydroxide, a component of Cardiomagnesil, adsorbs hydrochloric acid, reduces the proteolytic activity of gastric juice, has an enveloping effect on the gastric mucosa, and binds bile acids.
- The number of hemorrhagic strokes increases while taking ASA.

Most authors believe that resistance to ASA increases with time. Even at the very beginning of taking ASA resistance can range from 5 to 40%, and 20% have a paradoxical reaction (increase in platelet aggregation capacity while taking aspirin). The following causes of resistance

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development are distinguished: low bioavailability (low adherence to treatment, insufficient dose, poor absorption from the gastrointestinal tract, etc.), functional state of platelets (rapid renewal of circulating platelet population, insufficient suppression of TxA2 formation, etc.).), platelet interaction with other blood cells, genetic polymorphism of GP IIb/IIIa and collagen receptors, COX-1 and COX-2 enzymes, as well as smoking, elevated cholesterol levels, exercise, etc. Other scientists, such as T. Grosser et al. (2013), who conducted a study on volunteers, deny the presence of stable resistance to ASA. According to their data, insufficient effectiveness of ASA in inhibition of COX in platelets may be associated with reduced bioavailability of the drug and its variable absorption when taking enteric forms of ASA. Another active antiaggregant is clopidogrel. Clopidogrel also has a hypolipidemic effect, which favorably influences the atrombotic activity of the vascular wall [19]. Dipyridamole is a drug that has anti-aggregation effect, vasodilatation action. Dipyridamole is used in a dose of 150-400 mg per day (in two doses). The effectiveness of the combination of aspirin and dipyridamole has been established. The combined preparation (250 mg of aspirin and 200 mg of dipyridamole) is used twice a day.

Researchers of NCS RAMS [19] recommend the following tactics of antiplatelet therapy in the acute period of ischemic stroke:

- ✓ Early start (within the first 48 hours);
- ✓ Thereafter, long-term (practically lifelong) intake (especially in patients simultaneously suffering from CHD, atherosclerosis of peripheral arteries, atrial fibrillation);
- ✓ testing for individual tolerance to various antiaggregants.

Pathogenetic treatment includes 2 main groups of drugs:

- ✓ antioxidants;
- ✓ neuroprotectants (cerebrolysin, citicoline).

Oxidative (oxidative) stress is one of the leading links of nerve tissue damage in the acute and chronic stages of stroke. Ischemia causes imbalance of cell energy metabolism and formation of reactive oxygen species, which interact with phospholipid structures of neuronal and intracellular biological membranes. The end products of lipid peroxidation contribute to the dysfunction and death of nerve cells [5, 14]. One of the cytoprotective drugs with antioxidant action is Mildronate (Meldonium), a structural analogue of gamma-butyrobetoin, which is a competitive inhibitor of gamma-butyrobetaine hydroxylase.

The pharmacological action of the drug is based on reducing the concentration of free carnitine and reducing the intensity of carnitine-dependent oxidation of fatty acids in the mitochondria. At the same time, on the one hand, transport of activated non-oxidized forms of fatty acids into cells is limited, and on the other hand, their intracellular accumulation is delayed. In response to this change in metabolic processes, cell damage is prevented, ATP transport from mitochondria to consumption sites remains possible, and glycolysis, which uses chemically bound oxygen for energy production, is activated. Thus, under the action of Mildronate, the cells are protected in conditions of ischemia. Biochemical basis for therapeutic action of Mildronate is its antioxidant activity: Mildronate significantly reduces oxidative damage of lipoprotein structures, restores the activity of endogenous antioxidant system. Among the mechanisms of action of Mildronate, not related to the inhibition of carnitine biosynthesis, should be noted its membranotropic effect [30]. In the acute (first 21 days) and early recovery period of stroke (up to 6 months) Meldronium (Mildronate) is used intravenously by 500 mg drops of 200-250 mg (on saline) 1-2 times a day for 10-14 days, after which the drug is taken orally by 500-1000 mg a day. The total course of treatment is 4-6 weeks. In chronic disorders of cerebral circulation the drug is prescribed by 500 mg per day, the total duration of therapy is also 4-6 weeks. Repeated courses of treatment are

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possible (usually 2-3 times a year). Courses during the early recovery period may be repeated. Alongside with psychological correctional studies with an aphasiologist for speech disorders (aphasia is observed in 36% of stroke patients, dysarthria in 13% of patients) and studies with a neuropsychologist for post-stroke cognitive disorders (cognitive disorders of varying severity are observed in 87.4% of post-stroke patients), medication therapy plays an important role in the rehabilitation of these patients. First of all, traditional nootropic and neurotrophic therapies are used:

- piracetam (Nootropil, Lucetam) - is used at the beginning of the course in the form of intravenous injections (5.0-20% solution daily for 20-30 days) or when cognitive impairment is evident - in the form of intravenous drops (up to 6-12 g daily for 2-4 weeks), and then 2.4-4.8 g/day (in 2-3 sessions) for several months. Only long-term and intensive therapy can achieve a significant effect.
- Cerebrolysin has proven to be highly effective in a number of international placebo-controlled trials. Cerebrolysin is given as intravenous injections (5.0 daily for 30 days) or intravenous drops of 10.0-20.0-30.0 (depending on the severity of cognitive impairment) on saline (course of 20-30 injections). It is reasonable to repeat the course of Cerebrolysin 2-3 times a year [4].
- Phenotropil is a nootropic drug that has a pronounced anti-asthenic effect, has a direct activating effect on the integrative activity of the brain, promotes memory consolidation, improves concentration and mental performance, facilitates learning, increases the rate of information transfer between the cerebral hemispheres, increases the resistance of brain tissue to hypoxia and toxic effects, has anticonvulsant effect and anxiolytic activity, regulates the activation and inhibition of the brain. It is administered orally, the average daily dose is 200 mg. Duration of treatment - up to 3 months. At post-stroke speech and cognitive disorders it is widely applied means influencing cholinergic system: choline alphascerate; on glutamatergic system: akatinol memantine - antagonist of NMDA-receptors; possessing a wide spectrum of action vasoactive and nootropic drug vinpocetin (cavinton). A significant percentage of patients (66.9%) suffer from post-stroke depression (PID). According to the ICD-10 criteria, a distinction is made between major and additional symptoms of depression.

Apathy and asthenia are among the post-stroke syndromes that adversely affect the patient's social adaptation and quality of life. To reduce the severity of apathy and asthenia, long-term courses of piracetam, cerebrolysin, phenotropil, noben, magnesium B6, and brain-enhancing drugs (mexidol, mildronate, citoflavin) are used for many months. Post-stroke pain syndrome (PPSS) is a special problem in the rehabilitation of post-stroke patients. Epidemiological studies conducted in recent years have demonstrated that CPPS develops in an average of 3-8% of all stroke cases. According to D. Bowsher (1995), each year in Great Britain CPPS occurs in 2000-6000 stroke patients. In the USA, according to M. Segatore (1996), there are about 30,000 patients with CPIBS.

Promising methods of further development of motor rehabilitation are:

- Method of forced forced forced movement of the paretic arm (with moderate and mild paresis) with simultaneous fixation for several hours (with a bandage) of the healthy arm;
- mirror therapy;
- The use of a mechanical stimulator for the support zones of the foot (in the rhythm of walking);
- Axial loading suit ("Regent");

Introduction and improvement of computerized and other high-tech methods (ERIGO,

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LOROMAT, ARMEO systems);

- Introduction and improvement of virtual reality methods and brain-computer interface.

The anticonvulsants of choice for CPPS are carbamazepine (finlepsin) 400-600 mg/day, clonazepam 4-6 mg/day, pregabalin (lyrica) 150-300 mg/day, gabapentin (tebantin) up to 1800 mg/day. Transcranial electrostimulation method (TES) is used as an additional analgesic therapy. The basis of TCES effect is activation of endorphin structures of antinociceptive system. The studies by Sashina M.B. et al. (2003, 2004) show, that the effect of SCES application together with medical therapy in patients with CPPS is more significant than drug therapy only.

Conclusions: Thus, pain syndromes are one of the essential factors complicating rehabilitation measures after stroke. First of all, people who have had a stroke have a sense of loss. This is the loss of their health. This condition is extremely difficult for patients, because they need to learn again and acquire the skills of self-care. In addition, they experience fear of death. A person who has had a stroke will be afraid of having it again for a long time. Fear of death is directly related to fear of the future. Such people fear they may be powerless for life and worry that they will be a burden on their family. In this connection, the patient definitely needs the help of a psychologist.

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