

The Concept, Symptoms, Mechanism of Development and Treatment of Dorsopathy

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Annotation: Dorsopathy is a clinical syndrome characterized by back pain in combination with other neurological disorders. The development of dorsopathy is associated with inflammatory or degenerative-dystrophic processes occurring in the spine or surrounding muscles.

Keywords: dorsopathy, osteochondrosis, degenerative-dystrophic processes.

Introduction. The review gives the concept of dorsopathy (osteochondrosis), its symptoms, the mechanism of pain syndrome development and the formation of a herniated disc. The results of scientific research on various technologies of conservative therapy of dorsopathies are highlighted: drug, physiotherapy, various blockades (radicular, epidural, lumbar sympathetic ganglia, etc.), biodynamic correction, acupuncture (reflexotherapy), pharmacopuncture, contrast thermal therapy. The causes of unsuccessful analgesia in chronic pain syndrome, the results of the search for alternative ways of introducing analgesics into the body are shown. This is a local transcutaneous (percutaneous) administration of drugs, in particular, laserophoresis, as a method of conducting complex biologically active substances into the internal environment of the body using low-intensity laser radiation. Treatment of dorsopathy is represented by medicinal methods - the use of nonsteroidal anti-inflammatory drugs (diclofenac, ibuprofen, pyroxicam, indomethacin, nimesulide, etc.) and analgesics (tramadol, benzodiazepines, anxiolytics, muscle relaxants - midocalm, baclofen, tizanidine). The possibilities of anticonvulsant drugs such as carbamazepine, novocaine blockades, muscle relaxants, tricyclic antidepressants are highlighted. The characteristic of local internal discoradicular decompression on mechanotherapy devices is given. The possibilities of bioresonance therapy and local administration of the chondro-protector Alflutop, the need for treatment of psychoemotional stress, the duration of which determines the likelihood of developing psychosomatic and somatoform disorders, are shown. Data on the high efficiency of treatment of patients with underwater horizontal spinal traction with underwater phototherapy, as well as methods - transcranial electrical stimulation, kinesiotherapy, extracorporeal shock wave therapy, magnetotherapy, ozone therapy and EHF puncture are presented. It is shown that it is necessary to introduce new mathematical methods for evaluating the dynamics of functional systems in order to choose the optimal methods for the treatment of dorsopathies.

The concept of dorsopathy (osteochondrosis) of the spine combines the pathology of intervertebral discs, ligaments, joints, vertebrae themselves, periosteal tissue of joints, periarticular tissues. The symptoms are caused by the spastic state of the muscles around the vertebral motor segment, injury to blood vessels, nerve roots, etc. At the same time, dystrophic and degenerative changes develop in the intervertebral disc, its dehydration, a decrease, up to complete loss, of elastic properties, a sharp decrease in the cushioning function. The modified bullet-shaped nucleus is displaced into the intervertebral space, since the fibrous ring bounding the nucleus first becomes fibrous, which leads to protrusion, and subsequently to its rupture (prolapse, hernia) [8, 9].

Treatment of uncomplicated dorsopathy is mostly conservative. Treatment of a herniated intervertebral disc (HMPD) can be conservative and surgical. In cases of rapidly developing circulatory disorders in

the spinal cord or spine, rapid progression of the symptoms of GMPD, as well as pronounced pain syndrome, surgical treatment is indicated. In cases of ineffective conservative therapy for 2 months or more, surgical intervention is performed. Conservative therapy includes: medication, physiotherapy, various blockades (radicular, epidural, lumbar sympathetic ganglia, etc.), biodynamic correction, acupuncture (reflexotherapy), pharmacopuncture, contrast thermal therapy [1].

In dorsopathies with pain syndrome, the interaction of the nociceptive and antinociceptive systems is disrupted. At the same time, a key role belongs to the deficiency of downward inhibitory effects, which is mediated by genetic, endocrine and environmental factors, which contributes to the formation of central sensitization, increased nociceptive impulses at various levels of the central nervous system [2].

The presynaptic effect of endogenous opiates reduces the release of dopamine, acetylcholine, substance P, and prostaglandins. Adenylate cyclase functions are inhibited, cAMP formation is reduced and the release of mediators into the synaptic cleft is inhibited. Norepinephrine inhibits nociceptive impulses at the segmental and stem levels. This effect is realized when interacting with α -adrenergic receptors. With pain, stress, the sympathoadrenal system is activated; tropic hormones, uv-lipotropin and uv-endorphin, and enkephalins are mobilized. Stress increases the formation of serotonin, which inhibits the effect of substance R. The occurrence of pain in dorsopathy is explained by mechanical irritation of nerve roots coming from the spinal cord and giving rise to the peripheral nervous system. The infringement of nerve endings by fragments of intervertebral discs or bone outgrowths developing in connection with osteochondrosis causes pain syndrome. Analgesia in chronic pain syndrome due to dorsopathy is complicated by contraindications to painkillers, with the risk of adverse events. The use of nonsteroidal anti-inflammatory drugs (NSAIDs) is often complicated by erosive and ulcerative lesions of the stomach and duodenum. Rational anesthesia is due to the need to select optimal doses of analgesics with altered pharmacodynamics and pharmacokinetics, if patients do not comply with the multiplicity and dosage of drugs [4]. The oral route of administration of analgesics is unfavorable in older age groups. This leads to the search for alternative methods of analgesia [10].

One of the alternative ways of introducing analgesics into the body is the method of local transcutaneous (percutaneous) administration of drugs. This method may be limited due to physiological skin aging, degenerative processes, etc. The technology that increases the transcutaneous permeability of drugs is laserophoresis, as a method of conducting complex biologically active substances into the internal environment of the body using low-intensity laser radiation through activation of the transmembrane mechanism of transfer of biologically significant substances. Improvement of percutaneous permeability during laserophoresis can be achieved by pre-ionization of biologically active substances. Low-intensity laser radiation (LILI) prepares cell membranes for active transport, improves blood and lymph microcirculation in blood vessels. This leads to an improvement in the work of the so-called "muscular heart" and activation of local and systemic circulation [11]. The treatment of dorsopathy is represented by medicinal and non-medicinal methods. The leading is the use of nonsteroidal anti-inflammatory drugs (NSAIDs) - diclofenac, ibuprofen, piroxicam, indomethacin, nimesulide, celecoxib, lornoxicam, nimesulide, and analgesics (tramadol, benzodiazepines, anxiolytics, muscle relaxants - midocalm, baclofen, tizanidine). Anticonvulsants are used that affect the central mechanisms of pain formation, in particular carbamazepine. Novocaine blockades are carried out, providing analgesic, decongestant and antispasmodic effects.

The use of muscle relaxants can be represented by the following prescribing schemes: tiza-nidine (sirdalud) - from 2 mg 3 times a day to 8-12 mg / day in 3 doses; tolperizone - 300-450 mg / day in 3 doses, baclofen - 5 mg 2 times a day with an increase in dose, if necessary, every 5 days to 30 mg/day. Muscle relaxants promote positive dynamics, improving the long-term prognosis, reducing the likelihood of recurrence of pain syndrome. In chronic cases, antidepressants with their own analgesic activity are added. Amitriptyline (50-75 mg/day), duloxetine (60-120 mg/day), venlafaxine (75-150 mg/day), milnacipram (50-100 mg/day) are used [7]. After removal of the primary source of nociceptive impulses, reflex musculotonic syndrome may regress. Drug therapy also includes drug

correction of sleep disorders, therapy for depression and chronic fatigue. Tricyclic antidepressants (TCAs), in addition to the antidepressant effect, also help to improve sleep. Low levels of serotonin and norepinephrine correlate with the occurrence of depression, chronic fatigue and muscle pain. The use of TCA, such as amitriptyline, helps to reduce these symptoms. In the treatment of dorsopathy, the effectiveness of pregabalin at a dose of 600 mg / day has been proven, subject to long-term use, about 12 months, as well as milnacipram at a dose of 100-200 mg / day. To correct sleep disorders, reduce anxiety, it is possible to add benzodiazepines to treatment. Zopiclone and zolpidem are used to correct insomnia. In general, in the treatment of dorsopathy of vertebrogenic etiology, complex methods and treatment regimens can be considered the most effective, since the causes and mechanisms of dorsopathy development can be combined and overlap. If psychoemotional factors or increased excitability of the brain centers are involved in the development of pain, then targeted exposure only to the musculoskeletal system will not give the necessary and sustainable result. Therefore, recently, a role has been noted in the development of complex pain management techniques aimed at eliminating not only peripheral sources of pain impulses, but also at restoring central and psychological factors that, of course, take part in the chronization of pain syndrome [9]. Studies have been conducted to study the possibility of replacing acupuncture options for reflexotherapy of dorsopathies with non-invasive technologies - thermal acupuncture effects on biologically active points. The mechanisms of contrast thermal acupuncture have been investigated and its clinical effectiveness in the restorative treatment of dorsopathy has been proven, which is not inferior to classical acupuncture, and in a number of positions surpasses it [8].

In recent years, local internal discoradicular decompression has been successfully used on mechanotherapy devices. With the help of DRX systems, the painful segment is mobilized without affecting the rest of the spine. These systems have permits issued by Roszdravnadzor. The technique "Local internal discoradicular decompression in the treatment and rehabilitation of patients with degenerative-dystrophic diseases of the spine" was approved, registered and recommended for doctors by the Scientific Council of the Russian Academy of Medical Sciences for Restorative Medicine, Physical Therapy and Sports Medicine in March 2013. A DRX program has been developed that performs periodic loading and unloading of the disk, which helps to increase the hydration of the disk. In this case, the traction effect on a specific intervertebral disc occurs without involving other segments in the traction of the discs. This ensures maximum localized force and negative pressure in the area of the pulposus nucleus of the pathologically altered disc. A negative pressure is created in the cavity of the disc, which helps to reduce its protrusion and increase the flow of fluid from the hyaline cartilage of the end plates of the vertebral bodies into the pulposus nucleus. Thus, the rehydration of the disc is ensured. At the same time, stepwise and cyclic stretching of the vertebral bodies helps to reduce injury to muscles and ligaments [2]. The treatment of patients with dorsopathy at the lumbosacral level has been tested by combining bioresonance therapy and local administration of the chondroprotector Alflutop. The study established the high effectiveness of the proposed therapeutic approach. This fact is confirmed by a distinct improvement in the indicators of the physical and mental condition of patients, significantly surpassing the characteristics of the compared treatment groups in this respect [4].

Pain syndrome in dorsopathies is an unconditional source of psychoemotional stress, and the duration of its course determines the likelihood of developing psychosomatic and somatic disorders [11]. During the examination, patients with dorsopathy have complaints of depressed mood, loss of interests and feelings of pleasure; There are also frequent additional complaints of decreased appetite, sleep disorders, impaired cognitive functions, difficulty concentrating, short-term memory disorders, sleep disorders (intermittent, shallow sleep, difficulty falling asleep, increased motor activity during sleep and frequent awakenings).

The physiological basis of stress is the well-studied physiological mechanisms of adaptation, formed as a result of the interaction of the hypothalamic-pituitary-adrenal, hypothalamic-pituitary-reproductive and GABA-dopaminergic systems. At the same time, the interaction of syntoxic and catatoxic adaptation programs modulated by endogenous and exogenous syntoxins (including fertile

factors) and catatoxins is carried out, which determines the possibilities of therapeutic and rehabilitation measures for pain syndrome caused by dorsopathy [7].

The high efficiency of treatment of patients with underwater horizontal spinal traction with underwater phototherapy has been revealed. In 30-50% of cases, regression of HMPD of the lumbosacral spine with protrusion into the spinal canal up to 13 mm averaged 96.2%. In cases with GMPD protrusion into the spinal canal up to 5 mm - 98.7%. In patients treated with physiotherapy in combination with medication, the regression of GMPD was noted in 61.6% and 49%, respectively. In patients treated with medication, the same magnitude of regression of herniated discs was observed only in 46.7% and 45.7% of cases, respectively. It was revealed that the repeatability within three years after the treatment of patients with the restorative technology of underwater spinal traction with underwater phototherapy was 0.5%. At the same time, the percentage of relapses in those treated with medication and medication with physiotherapy was 46.1 and 33.9%, respectively [17].

It was found that the maximum effect of changing the absorption spectra of water is observed when it is irradiated with polychromatic visible and infrared polarized (PVIP) light from the Biopton device passing through a fiber-optic cable underwater for 4 minutes, as well as for 15 minutes when irradiated with water from a distance of 10 cm above water. In this case, water is activated, followed by the formation of special water structures (OSV) with a high antioxidant effect. The maximum effect is achieved after 26 minutes when exposed to water with PVIP light for four minutes through a fiber-optic cable under water while saturating it with carbon dioxide. After such exposure to water, or after fifteen minutes when irradiated above water from a distance of 10 cm, according to the results of infrared (IR) spectroscopy of water, there is a significant increase in absorption. This confirms the effect of the aftereffect of radiation. It has been shown that blood plasma, like water, absorbs PVIP light, while in the absorption spectra of water under fixed temporary irradiations, pronounced absorption bands at 1217, 1209 cm^{-1} are observed, corresponding to the absorption bands of immunomodulatory, anti-inflammatory and antiviral drugs. After exposure to PVIP water with light, changes in the spectra of valence vibrations of $\sim 3100 \text{ cm}^{-1}$ appeared in the spectra of raman. The greatest increase in the intensity of this band and a more pronounced manifestation of the shoulder on the high-frequency wing of this band ($\sim 3,300 \text{ cm}^{-1}$). According to evanescent IR spectroscopy, it was found for the first time that after exposure to the skin with PVIP light, light transmission increases from 600 cm^{-1} to 900 cm^{-1} , that is, the upper stratum corneum layer turns out to be dried, and the deepest layer (after removing ten layers of skin) becomes hydrated. After skin removal and irradiation with fiber optic cable, these phenomena were not observed. It was also found that after 10 minutes of exposure to the skin with water, previously irradiated for 10 minutes with PVIP light through a fiber-optic cable, and directly on the skin, its hydration increased [16]. Начали широко применяться способы - транскраниальной электростимуляции, кинезитерапии, экстракорпоральной ударно-волновой терапии, магнитотерапии, озонотерапии и КВЧ-пунктуры [5].

Conclusions: Thus, in recent years, all measures of restorative medicine have been considered from the point of view of the provisions of the third global paradigm based on the theory of chaos and self-organization of complex systems (complexity). The use of stochastic methods of mathematical evaluation of the results of studies conducted during rehabilitation has shown their insufficient reliability, while the presentation of these results in the form of dynamics of quasi-tractors allows for early and more accurate assessment of changes in the human body. The introduction of new mathematical methods for assessing the dynamics of functional systems is promising in choosing the optimal methods for the treatment of dorsopathies.

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