THE MECHANISMS OF BACK PAIN FORMATION AND PATHOGENETIC TREATMENT

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Abstract. The author describes a new version of the pathogenesis of pain in the spine where the pain occurs during stimulation of bone receptors in conditions of circulatory disorders of bone tissue. The method for the recovery of the microcirculation is developed by interstitial electrostimulation. The complete elimination of back pain was proved in 90% of patients.

Keywords: interstitial electrostimulation, back pain, pain pathogenesis, spinal osteochondrosis.

Introduction. Back pain is the most common complaint among adults. Thus, the duration of incapacity for work increases each year. This indicates that the quality of treatment does not become better. The new methods of treatment are created, but they are based on the old approaches and are the analogues of existing ones. These methods do not create a significant improvement of quality care.

Modern radiation diagnosis often does not correspond to the clinical picture. However, pathophysiological and functional changes can be detected long before the appearance of pain [5]. Reasons of pain appearance do not often associated with hernial protrusion [4, 12].

Recent decades physiologists explored new important players in the pathogenesis of the disease. Previously it was believed that the source of pain was the compression of the nerves exiting the spine bone, then the tension of the muscles. Many believe that periosteum is the reason of the formation of reflexory pain syndrome. In recent years, a lot of data have been accumulated to argue that the source of pain is the bone itself with its osteoreceptors that belong to the sympathetic nervous system [13].

Pathogenesis of the nidus formation, both in spinal bone and trigger zones, can be represented by follows. The initial changes in degenerative diseases of the spine firstly happen in the bony tissue as a local osteoporosis with destruction of trabecula of bone [7], the stagnation of blood in the venous system [11] and intraosseous pressure and increase [8, 9]. Bone tissue contains a lot of osteoreceptors and irritation of them occurs with poor blood circulation. They react to the decrease of the partial pressure of oxygen in the bone vessels [5]. It is proved that the worse blood circulation in bones, the more pain intensity [1, 8]. Later, the changes cover the periosteum and the swelling occurs. Pathology in vertebral bone progresses slowly, often it takes over the years. Pain manifestations are localized in bones, causing pain on palpation.

An important clinical feature of process progression is the involvement of muscles. The secondary reflex tension arises and muscular-тонic syndrome forms. The irritation of osteoreceptors increases progressively, and then through a sinuvertebral nerve it affect the spinal nerves. The process of pain spread on periphery is performed by sclerotomic part of the nerve, to vertebrae symptomatic nerves. As a result, it breaks the trophism of bones in the limbs in the affected area of the sclerotome, which causes structural changes and additional pain.

Poor blood circulation in the bones is the initial link both for dystrophic phenomena in the intervertebral discs and for all the joints. As it is known, the nutrition of hyaline cartilage takes place by diffusion from the bone tissue of the vertebral bodies. Even small disturbances of direct arterial blood supply of bone leads to a drastic reduction of diffusion process of nutrients in the cartilage matrix. Interruption of this nutrition is the basis for the emergence of biochemical abnormalities, and degenerative phenomena in the intervertebral discs [6].

We have revealed with the help of a needle-radiography and polargraphy that metabolic processes in the limb bones depend on the intensity of pain syndrome in spinal bone. Severe pain weakens blood circulation and microcirculation in the bones in the area of innervation of the vertebral nerve of the [1]. Poor circulation is an important factor in the occurrence of bone pain.

According to the described pathogenesis, treatment should be aimed at improving the circulation in bone tissue. Attempts to apply the known medicines for cardiovascular therapy did not give a significant effect. This happened due to the slow perfusion of drugs into the bone, which lead to greater concentration of them in the soft tissues than in bone. The second reason for the insufficient effect was a weak response of the vascular wall of bone blood vessels on antispasmodic drugs.

Physiotherapy treatment according to the known data is also ineffective. The skin is a barrier to the passage of the different types of energy within the body. Thus, the electric current is attenuated by skin cover in 200–500 times [3, 10]. The weakened current does not reach the bone. The bone is covered with endplates with a high resistance. Therefore, the current bypasses the bone through the conductive paths.

Thus, the interruption of circulatory in bone tissue is an important pathogenetic link. Therefore, the aim of our work was to develop an effective method of treatment based on this pathogenesis.

Methods of treatment. We have found experimentally [1] that the electric current improves blood circulation in bone and is a good stimulus for bone receptors. In order to the electric current can reach the bone, a metallic conductor in the form of needle was used. Sterile needle is applied to the acantha of the affected spine bone and make a special
electrical current. Current characteristics were developed taking into account the parameters of natural bioelectric current flowing through the nerves. Therefore, the developed electric current is close to the physiological characteristics. This is a low frequency and complex modulated pulse current. The new method of treatment is called as interstitial electrostimulation [1]. The equipment provides interstitial electrical procedures. The procedure is painless and comfortable, and is used for adults and children. The absence of complications allows to use the method in outpatient practice.

Special needle (disposable) is introduced to the depth of the skin prior to contact with the acanthal of affected spinal bone, the passive electrode is placed on the affected limb. To current is transferred through the needle for 15–20 minutes. The sequential treatment of two spine bones is possible. Course of treatment depends on the number of involved spinal bones and pain points on the limb bones. Usually, the course consists of 4–6 procedures.

**Research material.** 324 patients with spinal osteochondrosis of different localizations (cervical, thoracic and lumbar) were examined and treated. Each of these categories of patients was divided into 2 groups. One of these groups was the principal, where the treatment was carried out using the method of interstitial electrostimulation. The other group was a control group with a traditional modern complex treatment (medicatell therapy, massage, stretching, reflexotherapy). Selection of patients was performed by method of envelopes. The results were comprehensively analyzed in groups. All the patients underwent clinical examination, radiography, computer tomography, rheography and polarography of spine, ultrasonic Doppler examination, electrometric study of pain, biomechanical study of the functions of the spine and limbs.

**Results and discussion.** Full management of vertebrogenic pain syndrome in is achieved in 85–90 % of hospitalized patients and 92–95 % in ambulatory patients. Traditional methods of pain relief helped to manage pain syndrome in 36 % and 39 %. Remote results of treatment were studied. It is determined that the duration of remission for more than 3 times exceed the period of traditional complex treatment. Timing of treatment using interstitial electrostimulation are reduced by 2.5 times.

The application of intratissual electric stimulation helped to reduce the period of temporary incapacity up to 11.2 ± 2.4 days, for the control group with traditional treatment – 25.3 ± 3.2 days (p <0.01).

Relapses within 2 years after intratissual electric stimulation were observed in 5 % of cases in the control group in 16–19% of patients. Complications of treatment were not observed. The method proved to be effective not only for elimination of referred pain, but also for the recovery of peripheral nerves.

The underlying mechanisms of therapeutic action are explored. 1. Overall reflex mechanism is implemented through the central nervous system and promotes the development of opiatalike analogize substances. 2. Local action is to improve the blood circulation in bone tissue. Method of interstitial regeogy and polargraphy of bone tissue has proved that this effect leads to a local restoration of blood circulation and microcirculation in the affected vertebra and periostem. 3. In this method, a new mechanism of action via peripheral nerves to the patient limb arises. We have proved that under physiological intratissual electric stimulation the current excites the nerve cell structures and restores impaired function as in nerve trunks so in synaptic connections.

**Conclusion.** Thus, an important basis of pain syndrome in the spine is the primary interruption of blood circulatory in bone tissue. Specially developed method of interstitial electric stimulation effectively improves blood circulation and microcirculation of the spine bones being a pathogenetic effect.

Elimination of pain syndrome at interstitial electric stimulation occurs over 90 % of the cases, the term of remission increases by 3 times or more during the reduction of treatment period by 2.5 times. Complications were not observed.

**СПИСОК ЛИТЕРАТУРЫ**


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О МЕХАНИЗМАХ ФОРМИРОВАНИЯ БОЛИ В СПИНЕ
И ПАТОГЕНЕТИЧЕСКОМ ЛЕЧЕНИИ

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Аннотация. Автор описал новый вариант патогенеза боли в позвоночнике, где боль появляется при
раздражении костных рецепторов в условиях нарушения кровообращения костной ткани. Разработан метод
восстановления микроциркуляции путём внутритканевой электростимуляции, полное устранение боли в спине
dоказано у 90 % больных.

Ключевые слова: внутритканевая электростимуляция, боль в спине, патогенез боли, остеохондроз по-
звоночника.