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MINIMALLY INVASIVE METHODS OF TREATMENT IN THE SYSTEM OF INTEGRATIVE MEDICINE FOR VERTEBROGENIC PAIN

M.V. Shpagin[3], O.Yu. Gordeev[2, 3], T.R. Dnishev[2, 3], D.N. Nikitin[1], A.G. Suslov[3]
[1]*City Clinical Hospital № 39, Nizhny Novgorod, Russia*
[2]*Nizhny Novgorod Regional Clinical Hospital n.a. N.A. Semashko, Nizhny Novgorod, Russia*
[3]*Nizhny Novgorod State Medical Academy, Nizhny Novgorod, Russia*

Objective. Comparative evaluation of the effectiveness of epidural pharmacotherapy and epidural laser therapy of dorsalgia.
Material and Methods. Sixty patients with dorsalgia (Group A) were treated using epidural pharmacotherapy with non-steroidal anti-inflammatory drugs, and 20 patients (Group B) — using epidural laser therapy with apparatus of low-intensity laser radiation.
Results. In both groups, epidural therapy resulted in a significant ($p < 0.05$) improvement. Positive results were noted including a decrease in the severity of motor, sensory and vegetative-trophic disorders, ranging from minor changes in the pain character and in the area over which sensitivity disorders and paresthesias spread to complete regression of dorsalgia manifestations. However, clinical and neurological examination at discharge showed more significant improvement in Group A patients.
Conclusion. Positive results and absence of negative consequences allow recommending epidural therapy of dorsalgia for wide use in public health practice.
Key Words: dorsalgia, epidural pharmacotherapy, epidural laser therapy.

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Back pain is the second most frequent reason for visiting a doctor and the third most frequent cause (after respiratory diseases) of hospitalization. The cost of diagnosing and treating lumbar pain accounts for 8 billion dollars a year, while compensation for incapacity for work, disability and legal costs estimate about 14 billion dollars annually in the USA only [2, 10, 14]. According to the estimations of the European Community countries, the economic losses due to the primary headache are 50 billion euros per year [11].

Epidural analgesia, in which anesthetic is administered through an installed epidural catheter for a certain period of time, is widely used in medicine [4]. The difference between epidural pharmacotherapy and epidural analgesia is administration of not only local anesthetics into the epidural space but also non-steroidal anti-inflammatory drugs (NSAIDs) and hormonal drugs to treat aseptic inflammation of the nerve root [9, 18, 19].

However, administration of anesthetics and NSAIDs is accompanied by unpleasant subjective sensations suffered by patients in the form of numbness and weakness in the lower extremities. In addition, administration of anesthetics and steroid hormones causes changes in hemodynamics and sometimes even complications requiring medical management. High sensitizing ability of local anesthetics and NSAIDs is known. Therefore, epidural pharmacotherapy of dorsalgia is impossible in some patients.

The method of epidural laser therapy has been developed for pathophysiological therapy of back pain caused by aseptic inflammation of the nerve root [5]. The method of epidural laser application was used as a prototype in the treatment of aseptic epiduritis [3]. The idea of the developed method of epidural laser therapy is as follows: a sterile disposable light guide of a low-intensity laser radiation device is installed in the epidural space of the lumbar region under radiological control at the level of the damaged spinal nerve root. Low-intensity laser radiation with a wavelength of 0.63 μm and a power of 1.0 mW is applied for 20–25 min. A course of low-intensity laser radiation is performed through the light guide installed in the epidural space.

The objective of the study is comparative evaluation of the effectiveness of epidural pharmacotherapy and epidural laser therapy of dorsalgia.

Material and Methods

Clinical studies were conducted at the Department of Neurology and Neurosurgery of the Road Clinical Hospital at Gorky station of the Russian Railways and the Department of Neurology, Neurosurgery and Medical Genetics of Nizhny Novgorod State Medical Academy.

The results of treatment of 80 patients with severe pain in the lumbar region have been studied.

The main types of examination were clinical neurological, neurophysiological, clinical psychological, and neuroradiological. Informational and structural dynamics of the pain has been studied in detail.

Epidural pharmacotherapy with NSAIDs was used for the treatment of 60 patients (group A): 20 mg of tenoxicam (Texamen) was administered daily through an installed epidural catheter.

Epidural laser therapy using a low-intensity laser radiation apparatus "ALOK-1" was used to alleviate pain in 20 patients (group B). The course of epidural laser therapy included daily procedures of low-intensity laser radiation for 20–25 min each.

"Excel 7.00" tables and "Statistica 6.0" software were used for processing of the obtained results.

Results

Mean age of the patients was 42 ± 3 years. All patients were male. Medical history of the primary radicular pain ranged from 3 weeks to 7 years. In addition, 9 patients had medical history of 6.5 ± 0.5 weeks, and 31 people had medical history of 5.3 ± 1.4 years.

Medical history data on pain syndrome was collected by studying informational and structural dynamics of pain. Sharp stabbing pain (6.5 ± 0.5 points) was prevalent in the patients with up to 3-month history of pain syndrome. Other pain manifestations with this nature of the pain syndrome were minimal (burning, 2.2 ± 0.4 points; tingling 2.1 ± 0.5 points; hypoanalgesia, 3.3 ± 0.4 points; muscle spasms, 2.1 ± 0.5 points). The parameters of sharp stabbing pain decrease with duration of the disease (up to 3.1 ± 0.4 points for more than 5-year medical history). At the same time, the parameters of dull pain (8.4 ± 0.4 points for more than 5-year medical history) and vegetovascular components of the pain syndrome (burning, 6.3 ± 0.2 points; tingling, 5.2 ± 0.4 points; hypoanalgesia, 6.2 ± 0.4 points; muscle spasms, 5.1 ± 0.4 points in more than 5-year medical history) increase.

Volume of movements and the degree of spine mobility in the lumbosacral region with the torso inclined forward, backward, and sideways were assessed in the patients. A decrease in the movement volume in the lumbosacral region was noted in all patients (2.9 ± 0.7 points). Restriction of flexion/extension was observed most frequently, in which restricted mobility was found in several planes and equaled to 5.05 ± 0.82 cm. Asymmetry of the period of single support with a 7.6 ± 4.2 % decrease in the duration of the period of single support at lesion side was noted in all patients during gait analysis by visual examination of walking.

The main criterion for assessing radicular syndrome is scoring of the severity of prolapse symptoms: 1 point for mild (subclinical) motor or sensitive impairment in the innervation zone of one or two roots without vegetative trophic dysfunction; 2 points in case of moderate motor and sensitive impairment, mild vegetative trophic manifestations in the innervation zone of one or two roots; 3 points for severe motor, sensitive, and vegetative-trophic impairment in the innervation zone of one or two roots. The shared distribution of these scores indicates that every second examined patient had 2-point lesion of the nerve root (53.3 % of patients), 1-point lesion (26.7 %), and 3-point lesion (20.0 %). The severity of Lasegue symptom was 2.22 ± 0.28 points in both groups.

All patients underwent a psychological examination, including analysis of the level of anxiety and depression, as well as the quality of life. Analysis of the level of anxiety and depression revealed subclinical anxiety/depression in 66.7 % of patients, while 13.3 % of patients had no anxiety/depression. A total of 20.0 % of patients developed clinical manifestations of anxiety and depression against prolonged radiological history. A reliable relationship was established between pain syndrome index and the level of anxiety/depression. Moreover, the severity of vital activity impairment according to Oswestry Disability Index correlated with the pain syndrome indexes ($r = +0.92$, $p < 0.05$). Thus, the obtained data reflected the presence of a stable psycho-emotional component of dorsalgia, which resulted in severe impairment of vital activity.

Hospitalization terms were 5.8 ± 0.2 and 10.2 ± 0.8 bed-days in group A and B, respectively. The tolerability of epidural therapy was satisfactory in both groups.

Significant ($p < 0.05$) improvement was noted in both groups after epidural therapy. Positive results were expressed in a decrease in the degree of motor, sensory and vegetative-trophic disorders, which ranged from minor changes in the nature of pain and the area of impaired sensitivity and paresthesia to complete regression of dorsal manifestations. However, clinical and neurological examination showed a more significant improvement in group A patients at discharge.

Pain syndrome decreased to 2 points according to the VAS scale in 48 (80 %) group A patients on the first day after the beginning of epidural therapy. No acute pain was observed on the third day in all patients of this group. A significant reduction in the pain syndrome (up to 3 points according to the VAS) was noted on the 5th day in 17 (85 %) patients of the group B.

The acute component of the pain syndrome was absent in both groups at discharge. Dull pain was evaluated as 1.0 ± 0.2 points on average in group A and 2.5 ± 0.5 points in group B. The vegetovascular component of the pain syndrome was slightly lower in group A than in group B. A decreased restriction of movements (0.50 ± 0.21 points in group A and 0.70 ± 0.18 points in group B) and an increase in the degree of mobility (9.10 ± 1.85 cm in group A and 8.30 ± 1.74 cm in group B) was noted in both groups. Reduction in the level of anxiety and depression was significant in group A: 3.8 ± 1.2 points; while it was 4.9 ± 1.6 points for group B).

Despite numerous studies, there is no consensus on the various aspects of the pathogenesis of chronic pain. This phenomenon is described by relative theories. The leading theory in the Western countries is the "gate pain control" the-

ory of the Canadian neurophysiologist Melzack [17] and the theory of neuromatrix [15, 17]. According to this theory, the presence of a certain number of risk factors corresponds to a specific rate of the development of chronic pain. Numerous studies established the following risk factors for chronic pain in the back:

– pain syndrome;
– dissatisfaction with working conditions;
– pain in other parts of the body;
– pain radiating to the leg;
– restricted movements of the spine in more than two planes;
– patient's gender.

In case if the examination reveals no more than two risk factors, then chronic pain develops in less than 6 % of cases. In the presence of three and four factors, chronic pain develops in 27 % and 35 % of the cases, respectively. Chronic pain develops in 70 % of cases when five or more factors are identified [19].

As a result of neuroimaging studies conducted by a professor from Northwestern University of the United States, a cortical network of acute pain perception centers has been established: primary and secondary centers of the somatosensory cortex (SI and SII), anterior cingulate cortex (ACC), insular cortex (IC), prefrontal cortex (PFC), thalamus (Th), and cerebellum (CB). Prolonged pain syndrome was shown to result in activity shift from the parietal and cingulate cortex to the prefrontal area, which manifests itself in the predominance of cognitive assessments of the condition (prefrontal cortex) accompanied by a decrease in the emphasis on sensory properties (somatosensory cortex), which is confirmed by clinical and psychological examination of pain perception in these patients [12, 13].

The studies of Russian scientists have made a great contribution to the study of the nature of pain. Academician G.N. Kryzhanovsky [1] proposed the theory of the pathological algic system (PAS): novel pathological relationships of the altered neurons are formed in chronic pain syndrome against prolonged pain (nociceptive) impulses from the damaged tissues. The so-called generator of pathologically enhanced excitation acts at the local level, while pathological algic system acts at the system level. Thus, the theory by Kryzhanovskii unites the theories of Melzack and Apkarian into a single process, while such multi-level nature of involving central and peripheral structures of the nervous system determines clinical polymorphism and requires an integrative approach to the treatment of pain.

Developing the theory of Kryzhanovsky, Academician N.N. Yakhno [10, 11] substantiated the concept of a dysfunctional component of pain, in other words, the development of chronic pain determines the dysfunctional component of pain developed due to disruption in the relationship between the systems of nociception and antinociception.

Scientists V.D. Troshin and V.M. Nazarov from Nizhny Novgorod presented the informational and structural theory of pain in the early 2000's. [6]. According to this theory, pain is the psychoneurophysiological (integrative) state of an organism developed due to pain (nocial) signals that are formed in the peripheral and central nervous systems as a result of the action of superstrong damaging stressors causing functional and organic changes in organs and tissues. V.D. Troshin hypothesized that the cause of the chronic pain is the movement of nociogenic structures in the sensory-algic system of a human. As a result of long-term studies of the features of sanogenesis and pathogenesis of chronic dorsalgia on the basis of the informational and structural theory of pain, the group of authors from Nizhny Novgorod made a discovery of the phenomenon of migration of the nociogenic zone in the sensory-algic system of the human body in the development of pain syndromes [7].

A system of regional-integrative therapy of chronic pain was developed based on the discovered phenomenon of nociogenic zone migration: invasive disabling of nociogenic structures by invasive pharmacotherapy or surgical denervation is advisable in formation of the nociogenic zone in nociogenic structures. Various methods of neuropharmacotherapy and neuromodulation should be used in case of formation of the nociogenic zone in inaccessible structures of the nervous system. Methods of pain psychotherapy [8] should be also applied when pain migrates to the cortical structures [12, 13].

Thus, the system of regional-integrative pain therapy includes three interrelated manipulations: psychotherapy, neuropharmacotherapy, and physiotherapy.

Conclusion

Epidural methods are effective in the treatment of dorsalgia. Epidural pharmacotherapy and epidural laser therapy showed good results in the form of a decrease in the qualitative and quantitative characteristics of pain. However, these results were obtained in shorter terms with the use of epidural pharmacotherapy, and the efficiency characteristics are higher. Therefore, we first recommend using epidural pharmacotherapy in the treatment of acute or chronic dorsalgia.

The obtained positive results and the absence of negative consequences allow us to recommend epidural therapy of dorsalgia for wide use in practical public health administration.

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Address correspondence to:
Shpagin Maksim Vladimirovich
Nizhny Novgorod State Medical Academy,
Minin and Pozharsky sq., 10/1, Nizhny Novgorod, 603005, Russia,
shpagin-maksim@rambler.ru

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Maksim Vladimirovich Shpagin, MD, PhD, teaching assistant, Nizhny Novgorod State Medical Academy, Nizhny Novgorod, Russia, shpagin-maksim@rambler.ru;
Oleg Yuryevich Gordeev, internship doctor, Nizhny Novgorod Regional Clinical Hospital n.a. N.A. Semashko, Nizhny Novgorod State Medical Academy, Nizhny Novgorod, Russia, ol.gordeew1993@yandex.ru;
Timur Ruslanovich Dnishev, internship doctor, Nizhny Novgorod Regional Clinical Hospital n.a. N.A. Semashko, Nizhny Novgorod State Medical Academy, Nizhny Novgorod, Russia, mr.timur90@bk.ru;
Denis Nikolayevich Nikitin, head of the Neurosurgical Department, City Clinical Hospital No. 39, Nizhny Novgorod, Russia, nikden82@rambler.ru;
Aleksandr Gennadyevich Suslov, MD, PhD, teaching assistant, Nizhny Novgorod State Medical Academy, Nizhny Novgorod, Russia, suslov99@mail.ru.