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Effectiveness of Patient Combined Physiotherapeutic Treatment with Discogenic Radiculopathy of Lumbosacral Part of Spine

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ABSTRACT

The article presents the results of a clinical examination and physiotherapeutic treatment of 110 patients of working age with discogenic radiculopathy of the lumbosacral spine. They presented the results of an optimized treatment system for the patients with the consistent use of low-intensity bioresonant infrared laser therapy (with the wavelength of λ = 0.85 μm), endonasal electrophoresis with 2% solution of thiamine chloride (B1), the number of 10 procedures in alternation with drug electrophoresis of caripazine (karipain) solution introduced by sinusoidal modulated currents (SMT-phoresis) to the lumbosacral department, in the amount of 10 procedures every other day. Prior to the application of the physiotherapeutic complex developed by the authors, the patients revealed initially low linear blood flow velocity in the veins of the epidural plexus within the area of discogenic radiculopathy (L4 - L5 and S1). The proposed physiotherapeutic complex allows to normalize microcirculation in the corresponding area and increase the effectiveness of pain syndrome treatment during discogenic radiculopathies of the lumbosacral department of spine.

KEY WORDS: Discogenic Radiculopathy of the Lumbosacral Department, Physiotherapeutic Treatment, Vascular Endothelial Risk Factor.

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INTRODUCTION

In the world, especially in highly developed countries, they revealed the increase of spine degenerative-dystrophic diseases. The incidence rate of discogenic radiculopathy among people of working age occupies the leading place and one of the most common complications of dorsopathy of the lumbar spine is intervertebral hernia (Kukushkin et al., 2011; Veselovsky & Bilalova, 1989; Khabirov & Khabirova, 2018). Currently, the progressive growth of degenerative pathology of spine is considered not so much from the perspective of aging, but rather within the framework of genotypic and structural disorder paradigm in neuroglial, connective tissues. Phenotypically significant lifestyle factors, such as overweight, decreased physical

activity, poor nutrition, prolonged being in an uncomfortable position, are primarily reflected in the functional state of the lumbosacral spine, where severe pain syndrome develops, which reduces the life quality among working-age patients (Kukushkin et al., 2011; Veselovsky & Bilalova, 1989; Ivanichev, 2007; Khabirov & Khabirova, 2018; Van Boxem et al., 2010; Kawakami et al., 1998; Mroz et al., 2014; Chiu et al., 2015). It was found that metabolic and vascular changes, including those in epidural venous and arterial vessels, correlate with the functional changes of vascular endothelial risk factor (VEGF-A) and nociceptive pain (Ivanichev, 2007; Khabirov & Khabirova, 2018). At that, pharmacologically low-load physiotherapy methods are crucial during the development of patient treatment algorithm at discogenic radiculopathy (Ponomarenko, 2013; Ushakov, 2013; Eslami & Sarlak, 2018). Scientific data of recent years indicate the multifaceted pathogenesis of this pathology, where in addition to degenerative, autoimmune-inflammatory, compression-vascular, metabolic disorders, the role of the vascular component is high (Kukushkin et al., 2011; Veselovsky & Bilalova, 1989; Ivanichev, 2007; Khabirov & Khabirova, 2018; Gowda & Kumar, 2018; Bagheri et al., 2018; Chemetova et al., 2017). From the abovementioned it follows that the study of the dynamics of these parameters has not been widely considered before and after the use of complex physiotherapeutic treatment in order to increase the effectiveness and reduce the risks of neurovascular disorders in the lumbar. Numerous studies have shown that physiotherapeutic treatment can not only reduce nociceptive activity, but also stop the progression of fibro-cartilage and bone degeneration of the lumbar, which is associated with the pathogenic direction of many physical factors (Ponomarenko, 2013; Ushakov, 2013; Chang et al., 2017; Waheed & Kafaei, 2018). At the same time, remission is achieved by eliminating the pain lesion and muscle triggers, reducing edema around the affected disc and restoring microcirculation in the pathology zone.

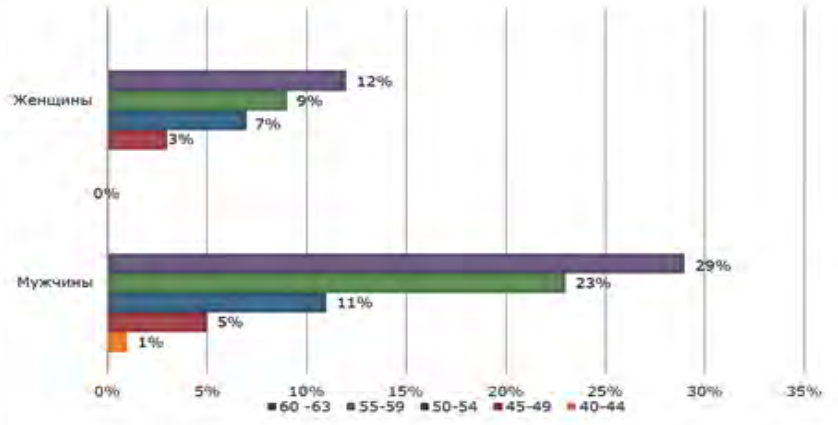
It should be noted that the appearance of modern diagnostic equipment, including optical coherence tomography, allows us to assess the degree of endovascular damage in the area of pronounced nociception before and after the use of complex physiotherapeutic treatment, which was the aim of our study among the patients with discogenic radiculopathy of the lumbosacral spine.

Research Objects and Methods

The aim of our work is to develop a system for optimized treatment of patients of working age with discogenic radiculopathy of the lumbosacral spine, based on the consistent use of low-intensity bioresonance infrared laser therapy (with the wavelength of λ = 0.85 μm), endonasal electrophoresis of 2% solution of thiamine chloride (B1), carried out in alternation with drug electrophoresis of caripazine (caripain) solution injected with sinusoidal modulated currents (CMT phoresis) into lumbosacral region.

They performed the study of 110 patients of working age with discogenic radiculopathy of the lumbosacral spine. The distribution of patients by gender and age is shown in the diagram (Figure 1).

According to the topical principle, degenerative-dystrophic lesions of spine, nervous and vascular systems are divided into two groups: vertebral and extravertebral. Vertebral



мужчины - males / женщины - females

Fig. 1: Distribution of patients by gender and age

syndromes are those associated with the lesions in various structures of the vertebral-motor segment. Extravertebral disorders are the disorders in the nervous, muscle and vascular systems. The clinical syndromes of the studied patients are shown in the diagram (Figure 2). The percentage of the characteristic syndromes of lumbosacral radiculopathy are presented: pain, sensory, motor, vascular and trophic disorders.

The concentration of VEGF-A was determined by enzyme-linked immunosorbent assay (ELISA) using Thermoscientific analyzer (USA) according to a standard calibration curve with an initial concentration of 2000 pg/ml and the dilution range from 15.6 to 1000 pg/ml.

Discogenic radiculopathy among the patients of working age was treated with the developed physiotherapeutic complex, which included the use of low-intensity bioresonance infrared laser therapy (with the wavelength of λ = 0.85 μm), endonasal electrophoresis of 2% solution of thiamine chloride (B1). The amount of treatment made 10 procedures in alternation with drug electrophoresis of caripazine (caripain) solution injected with sinusoidal modulated currents (CMT-phoresis) into the lumbosacral region (10 procedures), performed every other day, taking into account modern scientific data on the pathogenesis of discogenic pathology based on neurodegeneration targets and correlation links of vascular endothelial risk factor and linear blood flow velocity (LBFV) in the epidural vessels of the lumbar spine. The control group consisted of 48 patients with discogenic radiculopathy who did not receive low-intensity bioresonance infrared laser therapy, endonasal electrophoresis of 2% solution of thiamine chloride (B1), carried out in alternation with drug electrophoresis of caripazine (caripain) solution injected with sinusoidal modulated currents (CMT phoresis).

RESULTS AND DISCUSSION

Prior to the application of the developed physiotherapeutic complex, initially low linear velocity of blood flow in the veins of the epidural plexus within the area of discogenic radiculopathy (L4 - L5 and S1) was revealed in all patients of working age (n = 110). The initial averages of LBFV at the level of the vessels of the epidural venous plexus (L4 - L5) before physiotherapy treatment made 12.2 ± 1.9 cm/sec., and at the level of S1 - 10.9 ± 1.6 cm/sec., which is lower as compared with the physiological norm among the people of similar age without discogenic radiculopathy, respectively: 6.1 ± 0.6 cm/sec. ($p < 0.01$) and 4.8 ± 0.5 cm/sec. ($p < 0.05$). Visual analogue scale (VAS) before treatment was 7.8 ± 1.7 points. After applying the developed physiotherapeutic complex, the patients with discogenic radiculopathy demonstrated the increase of blood flow rate by 3.4 ± 0.3 cm/s, in radicular veins up to 17.3 ± 2.8 cm/s. ($p < 0.001$), which was highly significant than among patients in the control group on the background of standard therapy with pain syndrome reduction by VAS up to 2.7 ± 0.6 points.

боль - pain / нарушение чувствительности - sensory impairment / нарушение двигательной функции - impaired motor function / сосудистые расстройства в зоне патологии - vascular disorders in the pathology zone / трофические расстройства в зоне патологии - trophic disorders in the pathology zone

Fig. 2: Clinical symptoms of discogenic radiculopathy of the lumbosacral spine.

CONCLUSION

The data of our study showed that the developed physiotherapeutic complex can significantly reduce the pharmacological and financial burden on people of working age with discogenic radiculopathy, improve blood flow in this area and increase the effectiveness of severe pain removal.

SUMMARY

Currently, not only phenotypically significant factors have been studied (excess body weight, decreased physical activity, poor nutrition, static load, micro and macro injuries), but also the genotypic risks of radiculopathy development (ischemic and atherosclerotic disorders in the epidural vein system, impaired functions of vascular endothelial factor, impaired transmission of nerve impulses along radicular structures, metabolic changes in the central nervous system, etc.), which generally increase the importance of treatment method optimization for degenerative disorders and radiculopathies of the lumbosacral spine, aimed at hernia formation prevention and the pharmacological load reduction.

We have developed the system for optimized treatment of patients of working age with discogenic radiculopathy of the lumbosacral spine, based on the consistent use of low-intensity bioresonant infrared laser therapy (with the wavelength of $\lambda = 0.85$ μm), endonasal electrophoresis of 2% solution of thiamine chloride (B1), and 10 procedures carried out in alternation with drug electrophoresis of caripazine (caripain) solution injected with sinusoidal modulated currents (CMT phoresis) into lumbosacral region, in the amount of 10 procedures performed every other day. The proposed physiotherapeutic complex allows to normalize the linear blood flow velocity in the epidural vessels of the lumbar spine and improve the treatment of pain during discogenic radiculopathies of the lumbosacral spine.

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