Osteopathic diagnosis and treatment of lumboischialgia caused by impaired proprioception of feet

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Osteopathic Diagnosis and Treatment of Sciatica Induced by a Plantar Proprioception Violation

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RESUME

The objective of the research was to determine the role of postural disorders and plantar proprioception in the formation of sciatica. We examined 206 patients aged of 16 to 49 years with the syndrome of sciatica. All patients were performed: medical history, neurological examination, manual testing of the mobility of foot bones, lumbar vertebrae and the sacrum, postural examination, radiography, MRI, stabilographic study. As a result, the selective patients with sciatica were distributed to 3 experimental groups (EG): EG 1 - no plantar proprioception anomalies (n = 154), EG 2 - with abnormal plantar proprioception (n = 52). EG 2 was divided into 2 subgroups: EG 2a - the main group (n = 32) which complex treatment included manual (osteopathic) technique correction of position and mobility of plantar bones. EG 2b (n = 20) - the control group of patients without correction of position and mobility of the plantar bones. All patients received the medication. EG 2 patients in addition to medical therapy received specific manual (osteopathic) treatment, which included correction of the mobility of plantar bones.

Following the treatment the plantar ratio of patients of a main group ($p < 0.001$) significantly increased and practically unchanged in a control group ($p > 0.05$). The significant improvement in plantar proprioception of sciatica patients after application of manual techniques restoring the position and the mobility of plantar bones is represented. It reflects the normalization of the static-dynamic stereotype.

Keywords: posturology, stabilography, proprioception, sciatica, osteopathic correction.

SUMMARY

The aim of the study was to determine the role of postural disorders and disorders of plantar proprioception in the formation of lumbar ischialgia. A comprehensive examination of 206 patients aged 16 to 49 years with lumbar ischialgia syndrome was carried out. All patients underwent: taking anamnesis, neurological examination, manual testing of the mobility of the bones of the feet, lumbar vertebrae and sacrum, postural examination, X-ray examination, MRI, stabilographic examination. As a result of selection, patients with lumboischialgia were divided into 3 experimental groups (EG): EG 1 group - without abnormalities of proprioception of the feet (n = 154); EG 2 - with abnormal proprioception of the feet (n = 52). EG 2 was divided into 2 subgroups: EG 2a -

the main group (n = 32), the complex treatment of which included manual (osteopathic) techniques for correcting disorders of the position and mobility of the foot bones. EG 2b (n = 20) constituted the control group of patients who did not undergo correction of disorders of the position and mobility of the foot bones. All patients received medication. Patients from EG 2a, in addition to drug therapy, received specific manual (osteopathic) treatment, which included correction of impaired mobility of the feet bones.

After the treatment, the plantar coefficient significantly increased in patients of the main group ($p < 0.001$) and practically did not change in patients in the control group ($p > 0.05$). A significant improvement in plantar proprioception was shown in patients with lumbar ischialgia after the use of manual techniques for restoring the position and mobility of the foot bones, which is reflected in the normalization of the entire static-dynamic stereotype.

Keywords:posturology, stabilography, proprioception, lumboischialgia, osteopathic correction.

Introduction

The proportion of diseases of the peripheral nervous system is 50–80% of all neurological diseases [1, 10], and due to disability among them, diseases of the peripheral nervous system firmly occupy a leading place. Lumbar localization of pain syndrome occurs most often. Changes in the type of lumbar osteochondrosis are radiologically detected after 50 years in 50% of people, and after 70 - in 100% [8]. According to the WHO, two thirds of the world's population suffer from lower back pain [9].

Observations of recent years have shown that there is no direct relationship between the degree of degenerative-dystrophic changes detected by X-ray examination of the spine and the severity of pain syndrome [8, 10, 15].

According to modern data, postural disorders associated with pathology of large joints of the legs, refractive errors, vestibular disorders, which trigger a whole cascade of adaptive reactions leading to myofascial pain dysfunction, neurovascular and neurodystrophic manifestations, play an important role in the development of lumboischialgia. Until now, insufficient attention has been paid to this aspect of pathogenesis. One of the methods for detecting postural imbalance is stabilography [3, 11].

The effectiveness of manual techniques for back pain has been noted by domestic authors [1, 5, 6, 7, 9, 12, 14], but only now, in connection with the emergence of new diagnostic approaches, it has become possible to more purposefully influence the postural component of the pathogenesis of lumbar ischialgia. The supporting function of the feet plays an important role in maintaining balance, the violation of which causes a number of muscle-tonic reactions, and with prolonged postural disorders, leads to the development of myofascial syndromes and non-physiological load on the intervertebral discs [2].

The aim of the study was to determine the role of postural disorders and

violations of plantar proprioception in the formation of lumboischialgia.

In this regard, the following tasks were set:

1. To identify the frequency and significance of postural disorders in patients lumboischialgia.

2. Determine the role of stabilographic examination to identify the causes postural imbalance in patients with lumboischialgia for the purpose of their further correction.

3. Clarify the indications and determine the effectiveness of manual (osteopathic) techniques on the foot for lumboischialgia in patients with postural disorders and plantar reception disorders.

Research methods

We carried out a comprehensive examination of 206 patients aged 16 to 49 years with lumbar ischialgia syndrome. The study did not include patients with a history of: oncological pathology (contraindication to manual therapy), verified herniated intervertebral discs, and patients with neurological signs of vestibular disorders.

All patients underwent stabilographic examination to detect imbalance and determine stabilometric criteria for impaired plantar proprioception [4].

As a result of the selection, out of the total number of examined patients, patients with lumboischialgia were divided into 3 experimental groups (EG):

EG 1 - without abnormalities of proprioception of the feet (n = 154); EG 2 - with abnormal proprioception of the feet (n = 52).

EG 2 was divided into 2 subgroups: EG 2a - the main group (n = 32), the complex treatment of which included manual (osteopathic) techniques for correcting violations of the position and mobility of the foot bones. EG 2b (n = 20) constituted the control group of patients who did not undergo correction of disorders of the position and mobility of the foot bones.

The majority of patients (63%) had lumboischialgia syndrome for 2–3 years, with exacerbations every 6–8 months.

The patients were distributed by age and sex as follows (Tables 1, 2). The following research methods were used:

1. Collection of anamnesis, analysis of its results.

2. Neurological examination.

3. Manual testing of the mobility of the bones of the foot.

4. Manual (osteopathic) diagnostics of mobility and position lumbar vertebrae and sacrum according to R. Caporossi (1998).

5. Postural examination was carried out according to the recommendations developed by the French Posturological Association (1986).

To clarify the type of imbalance, we performed an flexion test. The external rotators of the thigh were also tested using the stimulation of plantar proprioceptors according to the method [16] and the test of the index fingers according to [13], which revealed the side of increased tone of the extensors and external rotators.

Table 1

Distribution of patients by age and sex in EG 1

Число пациентов	Возраст, лет				Пол	
	< 20	20–29	30–39	40 и >	М	Ж
154 (100 %)	14 (1,6 %)	32 (20,7 %)	50 (32,4 %)	58 (37,6 %)	89 (57,8 %)	65 (42,2 %)

table 2

Distribution of patients by age and sex in EG 2

ЭГ2	Число пациентов	Возраст, лет				Пол	
		< 20	20–29	30–39	40 и >	М	Ж
ЭГ 2а	32 (100 %)	8 (25 %)	10 (31,2 %)	8 (25 %)	6 (18,8 %)	18 (56,2 %)	14 (43,8 %)
ЭГ 2б	20 (100 %)	6 (30 %)	6 (30 %)	4 (20 %)	4 (20 %)	12 (60 %)	8 (40 %)

During the stabilometric examination we used a stabilograph of the DYNATRONIC DYN 50 system, produced by the French company of the same name.

6. X-ray examination of the lumbosacral region spine (for all patients) and magnetic resonance imaging (selectively) were carried out to identify X-ray signs of osteochondrosis, organic lesions of the bone apparatus and to determine disc herniation.

7. Mathematical and statistical processing of the results of clinical studies were carried out on an IBM PC using the statistical program "Statistica for Windows" (version 5.1).

8. Collection of follow-up, analysis of its results.

Treatment methods

All patients received the following drug treatment: non-steroidal anti-inflammatory drugs: diclofenac, 3 ml / m up to 5 injections, and piroxicam, 20 mg 2-3 times a day orally after meals; vitamins: B1, B6, B12 / m for a course of 10 injections. In order to correct microhemorheological disorders: pentoxifylline (trental) 100 mg intravenous drip No. 3-7.

Patients from EG 1, who did not have signs of abnormal plantar proprioception in the analysis of the primary stabilogram, were not included in further stabilographic study and received traditional drug treatment.

Patients from EG 2a, in addition to drug therapy, received specific manual (osteopathic) treatment, which included correction of impaired mobility of the feet bones.

results

The overwhelming majority of patients in our study had a musculo-tonic form of lumbar ischialgia. Sensory disturbances (hypoesthesia, hyperesthesia) were found in 53.2% in EG 1, in 75% of cases in EG 2a and in 70% of cases in EG 2b. Vegetative manifestations (cold extremity, changes in the vascular pattern, sclerotomic pain, etc.) were observed in 23.3%, 18.75% and 20% of cases, respectively. Functional limitation (range of motion of the lower extremities, support function) were recorded in 85% in EG 1, in 81.3% - in EG 2a and in 80% - in EG 2b. Thus, according to the data of neurological examination, the composition of patients in

the main and control groups was similar.

Postural disorders were identified in all patients with lumbar ischialgia syndrome.

In EG 1, the balance disorder was distributed as follows: 98 patients (63.6%) had an ascending type of balance disorder, 18 patients (11.6%) had a mixed type, 38 patients (24.6%) had a descending type. The hip rotator test was positive on the right in 65% and on the left in 35% of patients. When the plantar proprioceptors were stimulated in this group of patients, the alignment of the tone of the external rotators of both limbs was not observed. The overwhelming majority of patients from EG 2a and EG 2b (96.2%) had an ascending type of balance disorder. In 30 (93.75%) patients from EG 2a and 19 (99.9%) from EG 2b, it was revealed that the projection of the vertical Bare on the support polygon was close to the leg (which had no history of impaired foot bones mobility).

The tone of the external rotators of the femur in the overwhelming majority of patients from EG 2a and 2b - 96.2% (31 patients from EG 2a and in all patients from EG 2b), was increased from the side of the leg that did not have impaired mobility of the foot bones. In the same patients, upon stimulation of plantar proprioceptors, an equalization of the tone of the external rotators of both extremities was observed.

In 29 patients from EG 2a (92.9%) and 19 patients from EG 2b (99.9%), the standing index finger test was positive, in the rest of the patients from these groups the index finger test was positive while sitting. Also, in 30 patients from EG 2a (93.75%) and 18 patients from EG 2b (90%), the flexion test was positive while standing, in the rest of the patients - in a sitting position.

Thus, the data obtained indicate that postural disorders are detected in all patients with lumboischialgia. In patients from EG 2a and EG 2b, a similar nature of postural disorders in the form of an ascending type of imbalance and positive tests characterizing the effect of proprioception of the feet on muscle tone was revealed.

When analyzing the dynamics of neurological parameters after the treatment, we noted that the pain syndrome was arrested in 30 patients from EG 2a (93.75%) and persisted in 2 patients (6.25%). In EG 2b, the pain syndrome was relieved only in 16 out of 20 patients (80%). Muscle-tonic syndrome was not detected in EG 2a after treatment, and in EG 2b it persisted in 2 out of 16 patients (treatment efficiency is 87.5%). Sensory disturbances were arrested in EG 2a in 20 out of 24 patients (83.3%) and in EG 2b - in 5 out of 14 patients (71.4%).

Functional limitations of mobility of the lumbosacral spine disappeared in 100% of patients from EG 2a and in 14 of 16 patients (87.5%) from EG 2b.

As a result of the examination of patients from EG 2a and EG 2b, 7 variants of disturbance of the position of the foot bones were revealed (Table 3).

Table 3

Variants of violation of the position of the bones of the foot

Дисфункция костей стопы	Основная группа		Контрольная группа	
	n	%	n	%
Переднее смещение большеберцовой кости	8	25	4	20
Переднее смещение таранной кости	4	12,5	4	20
Передне-внутреннее положение таранной кости	8	25	4	20
Задне-наружное положение таранной кости	6	18,75	2	10
Верхнее положение ладьевидной кости	4	12,5	4	20
Верхнее положение кубовидной кости	2	6,25	0	0
Верхнее положение первой плюсневой кости	0	0	2	10

When testing the position of the foot bones after treatment, it was determined that as a result of osteopathic correction, it was normalized in all patients of the main group (100%) and remained unchanged in all patients in the control group.

When analyzing the dynamics of the position and mobility of the sacrum and lumbar vertebrae, we found that the torsion of the sacrum "to the left along the left axis" after the treatment was not recorded in patients from EG 2a (before treatment it was recorded in 6), and in EG 2b it was noted in 2 patients (before treatment - in 4).

The torsion of the sacrum "to the right along the right axis" after the treatment was recorded in one patient of the main group (before treatment it was recorded in 4), in the control group there was no dynamics. The torsion of the sacrum "right / left" after the treatment was recorded in 4 patients of the main group (before treatment it was recorded in 14), and in the control group - in 6 (before treatment it was observed in 10). The torsion of the sacrum "left / right" after the treatment was recorded in 2 patients of the main group (before treatment was recorded in 8), in the control group there was no dynamics.

Restriction of lumbar vertebrae mobility in flexion (FRS) after treatment was observed in 4 patients from EG 2a (efficiency 83%) and in 12 patients from EG 2b (treatment efficiency 14.28%). Restricted mobility of the lumbar vertebrae in extension (ERS) after treatment was observed in 2 patients from EG 2a (efficiency 75%) and in 4 patients from EG 2b (treatment efficiency 33%) (diagram 1).

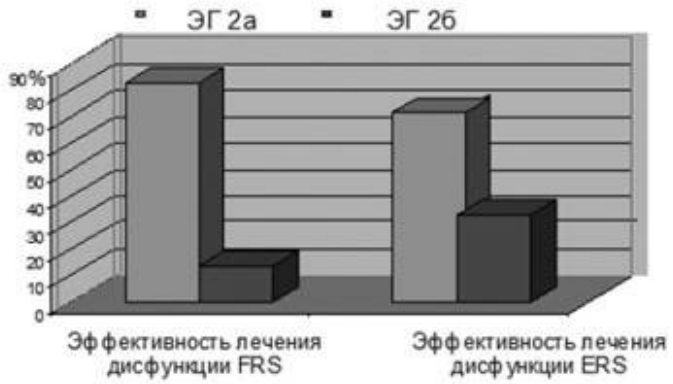

Diagram 1. The effectiveness of treatment of limited mobility of the vertebrae in dysfunctions of FRS and ERS.

It is known that any change in the muscle tone of the lower limb entails a change in the entire chain of postural muscles and a change in the position of various body segments. Such changes may be associated with disorders of plantar proprioception. With external or internal rotation of the foot, the normal oscillations of the pelvis in the horizontal plane become asymmetric. This leads to static overload of the muscles that abduct or adduce the thigh. Simultaneously with this, an inevitable rotation occurs in the lower lumbar spine, which, in our opinion, can affect the development of degenerative lesions of the corresponding discs and the development of lumbar ischialgia.

Evaluating the dynamics of the indicators of postural clinical examination after the treatment, in EG 2a we observed the harmonization of the static-dynamic stereotype in 28 (87.5%) patients. In 4 patients from EG 2a, we regarded the test for assessing the position of the patient's body relative to the vertical Bare as incomplete harmonization. In EG 2b, 12 patients (60%) experienced incomplete harmonization of the static-dynamic stereotype, and 8 patients (40%) retained the ascending type of balance disorder. The tone of the external rotators of the femur leveled off in 28 patients from EG 2a (87.5%). In 4 patients, slight asymmetry of tone persisted (predominance on the part of the healthy leg). In 12 patients of the control group (60%), there was a tendency towards harmonization of the tone of the external rotators of the thigh. In 8 patients (40%), tone asymmetry persisted.

Discussion and conclusions

All 206 patients with lumboischialgia examined by us had imbalances, confirmed by changes on stabilograms. The surface area of the statokinesiogram was increased ($p < 0.01$) in patients of all groups. The plantar coefficient was also significantly reduced ($p < 0.01$) in patients from EG 2a and EG 2b. Before the start of treatment, the "X-average" indicator, characterizing the average position of the projection of the center of gravity on the horizontal plane along the left-right axis (on the stabilogram - the abscissa axis) and normally tending to zero, had values that went beyond the normal range in all patients ($p < 0.001$). Moreover, at

in patients with pathology of the right foot, the center of pressure was to the left of the ordinate, and in patients with pathology of the left foot, to the right. Thus, patients always leaned on their healthy leg, which confirms the law of "plantar baroreceptors" [16].

The “Y-average” indicator, which characterizes the average position of the projection of the center of gravity on the horizontal plane along the sagittal axis (on the stabilogram - the ordinate axis), did not significantly differ from the standards proposed by the French Posturological Association ($p > 0.05$).

Before treatment, the surface area of the statokinesiogram was increased in patients from the study and control groups ($p < 0.01$). The plantar coefficient was also significantly reduced in all patients ($p < 0.001$).

When analyzing the dynamics of the studied indicators, we found that: the "X-average" indicator in the patients of the main group had a tendency to harmonization ($p < 0.05$), and in the control group patients did not change significantly. Harmonization of the patient's center of gravity oscillations along the abscissa axis corresponds to greater stability of the spinal column and, in particular, the lumbar and sacrum in the sagittal plane, which, in our opinion, contributes to a decrease in lumbar orthostatic lateroflexia and an early relief of neurological symptoms. The “Y-mean” indicator did not significantly change in both groups.

When determining the statokinesiogram, performed by placing a soft rubber mat under the feet, its surface area normally increases. When examining a patient on a stabilograph on a soft layer and without it, the ratio of the obtained areas is expressed by the plantar coefficient. By calculating the plantar coefficient, we can talk about the degree of influence of plantar reception on balance, that is, on the one hand, identify patients in whom the imbalance is caused by altered foot reception, and, on the other hand, evaluate the effectiveness of the therapy.

The area of the stabilogram, assessed by us without the use of a mat, after the treatment, significantly decreased compared to the initial one in patients of both groups (main group - $p < 0.001$; control group - $p < 0.01$). The decrease in the surface area of the stabilogram in the patients of the main group in quantitative terms was more significant, which indicates a more accurate functioning of the postural system, after the application of manual techniques for restoring the position and normalizing the mobility of the foot bones.

Despite the fact that the area of the stabilogram, assessed using the mat, after the treatment did not differ significantly from the initial one in both groups ($p = 0.07$), the plantar coefficient significantly increased in patients of the main group ($p < 0.001$) and practically did not change in control group patients ($p > 0.05$) (diagrams 2 and 3).

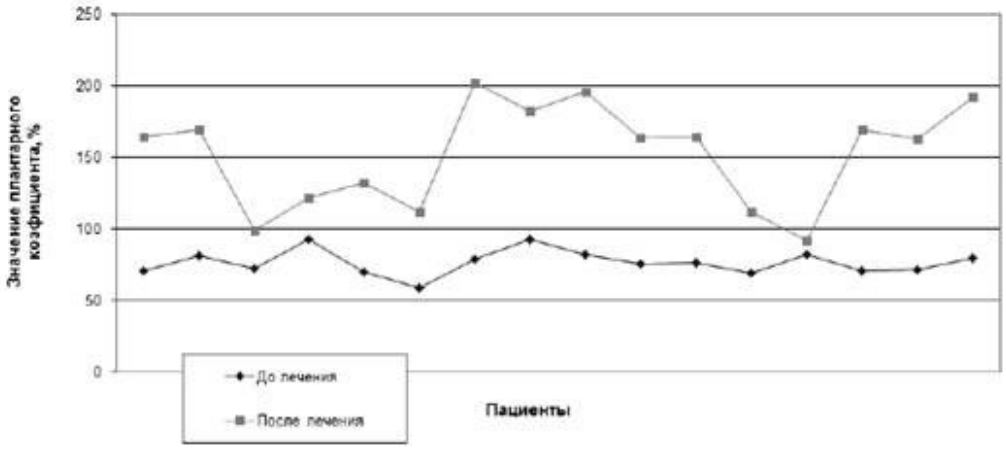

Diagram 2. Change in plantar coefficient in patients from EG 2a in the background treatment.

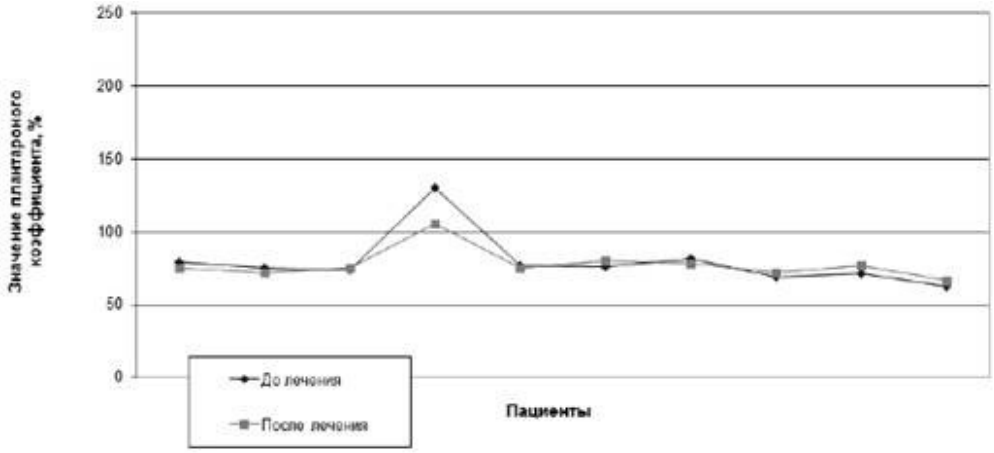

Diagram 3. Change in plantar coefficient in patients from EG 2b in progress treatment.

These results allow us to conclude about a more significant increase in the surface area of the stabilogram using a mat in patients of the main group. Thus, it can be argued that the proprioception of the feet of patients with lumbar ischialgia improved after the use of manual (osteopathic) techniques for restoring the position and normalizing the mobility of the foot bones. This ultimately affected the normalization of the entire static-dynamic stereotype, contributing to the improvement of the biomechanics of the lumbar vertebrae and sacrum and the early relief of neurological symptoms. On the contrary, in patients who did not undergo manual (osteopathic) correction, plantar proprioception did not change, and there was no sufficient harmonization of the static-dynamic stereotype,

Our work shows that the plantar coefficient is the most accurate objective stabilographic indicator characterizing violations of the static-dynamic stereotype caused by abnormal plantar proprioception. In addition, studies have shown that the use of stabilography

makes it possible to judge the degree of influence of plantar reception on balance, that is, on the one hand, to identify patients in whom the imbalance is caused by altered foot reception, and, on the other hand, to evaluate the effectiveness of the therapy.

The data of the follow-up examination, carried out after 1 year, show a persistent positive effect of the complex of drug treatment in combination with the osteopathic correction of dysfunctions of the foot bones in patients with lumbar ischialgia syndrome with impaired proprioception of the feet (Diagram 4).

Diagram 4. Frequency of exacerbations of the disease in patients with the syndrome lumboischialgia in groups.

conclusions

1. In all patients with lumbar ischialgia syndrome, combined with abnormal plantar proprioception, violations of the static-dynamic stereotype are revealed.

2. The use of stabilography makes it possible to judge the degree of influence plantar reception for balance, that is, on the one hand, to identify patients in whom the imbalance is caused by altered foot reception, and, on the other hand, to evaluate the effectiveness of the therapy.

3. The plantar ratio is the most accurate objective a stabilographic indicator characterizing violations of the static-dynamic stereotype caused by abnormal plantar proprioception.

4. There is a significant improvement in plantar proprioception in patients with lumboischialgia after using manual techniques to restore the position and mobility of the foot bones, which is reflected in the normalization of the entire static-dynamic stereotype, contributing to the improvement of the biomechanics of the lumbar vertebrae and sacrum and the early relief of neurological symptoms.

5. Postural disorders caused by abnormal plantar proprioception, have a direct causal relationship with the formation of lumboischialgia in this group of patients.

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Mokhov, D.E. Osteopathic diagnosis and treatment of lumboischialgia caused by impaired proprioception of the feet / D.Ye. Mokhov, S.V. Novoseltsev // Traditional medicine. - 2011. - No. 2 (25). - P.34-40.