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Features of the Course and Treatment of Low Back Pain in Patients with Reduced Bone Mineral Density

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Summary. *Objective.* To investigate the features of the course, clinical manifestations and the effect of symptomatic slow anti-inflammatory drugs (SYSADOA) on the course of the disease in patients with low back pain and low bone mineral density.

Materials and methods. The study included 100 patients (60 women and 40 men) aged 34 to 80 years. Patients were divided into 3 groups depending on the index of bone mineral density (BMD). Peculiarities of the course and effectiveness of treatment were assessed using questionnaires VAS, Oswestry, Roland-Morris and McGill. Levels of nonspecific indicators of inflammation (ESR and CRP), cytokines (IL-1, IGF-1, NO), metabolic indicators (lipid, carbohydrate, liver markers) were also studied. "SPSS Statistics" software was used for statistical data processing.

Results. The research showed that patients with low bone mineral density had worse performance results on the VAS, Oswestry, McGill and Roland-Morris questionnaires compared to patients with normal BMD. Inflammatory rates such as ESR, CRP, IL-1, NO, IGF-1 were also worse in patients with low bone mineral density. The dynamics of questionnaires and inflammatory markers during treatment was better in patients with normal BMD.

Conclusions. Our study showed that patients with low bone mineral density had a more severe course of low back pain: more intense inflammation, worse psycho-emotional state, physical activity and quality of life compared to people with normal BMD. Moreover, patients with low bone mineral density had worse dynamics of SYSADOA treatment.

Keywords: low back pain, osteoarthritis, osteoporosis, mineral density of bone tissue, anti-inflammatory effect, SYSADOA.

INTRODUCTION

Today a considerable amount of attention is paid to the treatment of diseases of the musculoskeletal system associated with lesions of the skeletal system such as osteoarthritis and osteoporosis which by their prevalence compete with cardiovascular diseases and often lead to incapacity and disability. Osteoarthritis and osteoporosis are among the most common diseases in elderly patients; they significantly worsen the quality of life and even reduce the lifespan of patients [1]. The study of the relationship between osteoporosis and rheumatic diseases is of considerable interest not only for rheumatologists, but also for specialists in other branches of medicine [2].

Osteoarthritis of the knee and spine is a serious problem of modern medicine, as it leads to a significant reduction in the quality of life of patients, including young and middle-aged people, which is of great socio-economic importance to this problem.

Osteoporosis is a progressive systemic skeletal disease characterized by a decrease in bone mass and disruption of the structure (microarchitectonics) of bone tissue, which leads to increased bone fragility and the risk of fractures [3, 4]. This disease is a major public health problem affecting hundreds of millions of people worldwide [5].

For many years there has been a discussion about the relationship in the development of these diseases. There are different points of view. One of them suggests that in old and elderly age, osteoporosis can trigger the patho-

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genetic chain of osteoarthritis, and an alternative view is based on the fact that osteoarthritis and osteoporosis are nosological forms that are independent of each other [6].

Recent studies have shown that there are common and dependent interaction mechanisms between the bone and cartilage tissues [7]. Osteoblasts and chondrocytes have a common embryological origin with mesenchymal tissue (Fig.).

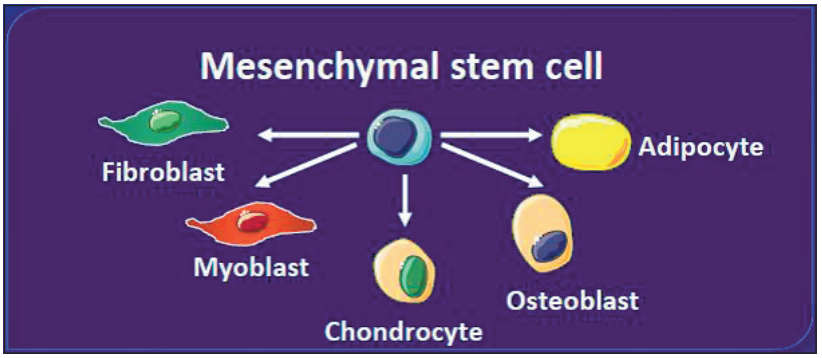

Fig. **Origin of connective tissue cells**

Low back pain (LBP) is the most common reason why patients seek help from the physician, family doctor, neurologist, rheumatologist, gynecologist, and others. LBP syndrome is pain localized in the lumbar spine (between the twelfth pair of ribs and buttocks). Low back pain is a widespread pathology that has reached epidemic proportions in countries with high economic levels [8].

LBP most often develops at the age of 20 to 50 years, with the most pronounced pain observed at the age of 50–64 years. Between the ages of 20 and 64, 24% of men and 32% of women suffer from back pain. Unfortunately, 12–26% of children and adolescents also complain of low back pain [8].

There are primary and secondary syndromes of LBP. Primary syndrome is pain in the back caused by dystrophic and functional changes in tissues of the musculoskeletal system (arcuate joints, between the vertebral discs, fascia, muscles, ligaments) with possible involvement of adjacent structures (nerve roots, nerves). The most common cause of primary BNS syndrome is osteochondrosis of the spine. Causes of secondary BNS syndrome can be: congenital anomalies (spondylolisthesis), injuries (vertebral fractures, protrusions of intervertebral discs), inflammatory diseases of the spine (reactive arthritis, ankylosing spondylitis), spinal tumors, infectious lesions of the spine (tuberculosis, tuberculosis), diseases of the genitourinary system, projection pain in diseases of the internal organs [9].

Table 1. **Characteristics of the examined patients**

Indicator	Group
Number of patients	100
of them:	
men	40
women	60
Middle age, years	57.00 (IQR 51.00–68.00)
Average body mass index, kg/m^2	30.00 (IQR 25.50–35.50)
Patients with:	
Normal weight	20
Excessive weight	30
Obesity 1	24
Obesity 2	18
Obesity 3	8
Number of patients who had:	
Normal BMD	32
Osteopenia	38
Osteoporosis	30

The main objectives of the treatment of primary BNS syndrome are: reduction of pain, delayed progression of degeneration of cartilage of the intervertebral disc and intervertebral joints, improving the functional activity of the spine [8]. Modern methods of treatment for BNS include physiotherapy, medication, acupuncture, and exercise [10].

Algorithm for the treatment of osteoarthritis developed by the European Society for Clinical and Economic Aspects of Osteoporosis and Osteoarthritis (ESCEO) recommends Symptomatic Slow-Acting Anti-Inflammatory Drugs for the treatment of OA (SYSADOA). Symptomatic slow-acting drugs of SYSADOA include glucosamine, chondroitin, diacerein, and unsaponifiable soy / avocado compounds, which are confirmed by varying degrees of clinical efficacy [11].

OBJECTIVE

To investigate the features of the course, clinical manifestations and the effect of Symptomatic Slow Anti-Inflammatory Drugs (SYSADOA) on the course of the disease in patients with low back pain and low bone mineral density.

MATERIALS AND RESEARCH METHODS

The study was conducted on the basis of the therapeutic department No. 1 of the Kiev City Clinical Hospital No. 7. The study included 100 patients (60 women and 40 men) aged from 34 to 80 years. Patients were divided into 3 groups depending on the index of bone mineral density (BMD). Group 1 included patients with OA and normal BMD, Group 2 included patients with osteopenia, and Group 3 included patients with osteoporosis. General characteristics of the examined patients are presented in Table 1.

Criteria for inclusion of the examined:

1. Presence of primary LBP syndrome.
2. Men and women aged 30–80 years.
3. Before beginning of the study, patients have being suffering from pain for at least 15 to 30 days, and general

symptoms of the disease have been observed for at least six months.

4. Patient consent to participate in the study.

Exclusion criteria for subjects:

1. Refusal to participate in the study.

2. Presence of characteristic radiological signs of vertebral fractures.

3. Hypersensitivity to the studied drugs.

4. Age up to 18 years.

5. Pregnancy and lactation.

6. Mental illness.

7. Presence of malignant neoplasms.

8. Untimely laboratory and instrumental methods of research.

Research methods:

1. General clinical: collection of complaints and anamnesis, objective examination, questionnaires (filling in adapted VAS, Oswestry, McGill, Roland-Morris questionnaires).

2. Laboratory: cholesterol, blood glucose, bilirubin, ALT, AST, creatinine in the blood, CRP, IL-1, IGF-1, NO.

3. Instrumental: X-ray examination of the spine, ultrasound densitometry.

4. Methods of biomedical statistics.

RESULTS AND DISCUSSION

After analyzing the intensity of back pain among three groups of patients, it was noted that patients with reduced BMD had statistically significantly more pronounced pain than patients with normal BMD (Table 2). At the same time, patients with osteoporosis experienced more intense pain than with osteopenia.

Using the Oswestry questionnaire, we assessed the patients' quality of life. Based on the results obtained (Table 2), it is clear that the worst quality of life is in cases of osteoporosis (37.0 (IQR 21.25–53.50)) and osteopenia (25.0 (IQR 17.50–28.50)) compared to normal BMD (18.5 (IQR 7.50–23.75)).

The patients' psycho-emotional state was assessed using the McGill questionnaire. The study revealed a statistically significant difference between three groups: in cases of normal BMD 9.0 (IQR 3.25–11.50), with osteopenia 10.0 (IQR 8.00–13.00), and osteoporosis 15.0 (IQR 12.00–17.75). According to the study, it was noted that the psychosocial state was worse in cases of reduced BMD, especially in cases of osteoporosis (Table 2).

Assessing the indicators of the Roland-Morris questionnaire, a statistically significant difference was found in

Table 2. **Intensity of pain depending on BMD**

Indicator	Group 1 normal BMD (n=32)		Group 2 osteopenia (n=38)		Group 3 osteoporosis (n=30)	
	Me	IQR	Me	IQR	Me	IQR
VAS back, mm (0–100)	20.00	6.00–54.75	45.00*	39.00–50.00	69.00**	60.50–81.25
Oswestry (0–60)	18.50	7.50–23.75	25.00*	17.50–28.50	37.00**	21.25–53.50
McGill (0–20)	9.00	3.25–11.50	10.00*	8.00–13.00	15.00**	12.00–17.75
Roland-Morris (0–18)	5.50	3.00–8.75	8.00*	5.50–10.00	12.00**	10.00–14.00

*The reliability of the differences p<0.05

**The reliability of the differences p<0.05 in comparison with Group 2

Table 3. **Immunological indicators depending on the reduction of BMD**

Indicator	Group 1 normal BMD (n=32)		Group 2 osteopenia (n=38)		Group 3 osteoporosis (n=30)	
	Me	IQR	Me	IQR	Me	IQR
IL-1, pg/ml	18.00	11.00–37.50	27.00*	3.00–40.50	31.73*	19.75–54.17
NO, mol/l	2.80	1.70–6.00	3.80	2.00–6.70	5.80**	2.85–8.36
IGF-1, ng/ml	589.00	502.00–600.00	524.00*	363.50–585.00	519.00*	449.00–600.00
CRP, mg/l	4.00	4.00–6.00	6.00*	6.00–8.00	17.00*	6.00–23.25
ESR, mm/hr	13.00	8.25–17.00	14.00	10.00–18.00	20.50*	15.00–24.25

*The reliability of the differences p<0.05

**The reliability of the differences p<0.05 in comparison with Group 2

Table 4. **Biochemical indices depending on BMD**

Indicator	Group 1 normal BMD (n=32)		Group 2 osteopenia (n=38)		Group 3 osteoporosis (n=30)	
	Me	IQR	Me	IQR	Me	IQR
Bilirubin, mol/l	14.00	12.00–17.00	16.20	13.450–19.400	17.75	12.93–21.20
ALT, U/l	22.00	18.00–27.75	22.00	18.00–28.00	23.50	18.75–29.00
AST, U/l	24.00	20.00–28.00	23.00	20.00–25.50	26.00	20.75–32.75
Creatinine, mol/l	94.50	88.00–100.75	94.00	88.00–97.50	99.50	91.50–107.25
Cholesterol, mmol/l	5.55	4.95–5.78	5.75	5.20–6.33	4.80	4.25–5.45
Glucose, mmol/l	5.05	4.65–5.50	5.20	5.05–5.60	5.30	4.60–5.60

Table 5. **Dynamics of articular indices in cases of OA with diacerein treatment**

Indicator		Normal BMD (n=26)		Osteopenia (n=24)		Osteoporosis (n=15)	
		Me	IQR	Me	IQR	Me	IQR
VAS back, mm (0–100)	Before treatment	29.00	12.00–65.50	56.50	45.00–62.00	69.00	54.00–76.00
	After treatment	18.50* (-36%)	6.50–52.00	43.00* (-24%)	35.50–48.75	65.00* (-6%)	51.00–74.00
Oswestry (0–60)	Before treatment	16.50	11.75–22.25	19.00	16.00–24.25	38.00	26.00–47.00
	After treatment	10.50* (-36%)	7.50–15.50	15.50* (-18%)	12.00–19.50	38.00	24.00–44.00
McGill (0–20)	Before treatment	9.50	4.00–11.50	11.00	9.00–14.50	13.00	9.00–16.00
	After treatment	5.50* (-42%)	2.00–8.50	7.50* (-32%)	6.00–11.00	12.00	9.00–16.00
Roland-Morris (0–18)	Before treatment	6.00	3.25–8.75	8.00	5.25–11.00	12.00	8.00–13.00
	After treatment	4.00* (-33%)	1.25–5.75	5.50* (-31%)	4.00–7.75	9.00* (-25%)	6.00–11.00

*The reliability of the differences p<0.05

Table 6. **Dynamics of BMD parameters in cases of OA with diacerein treatment**

Indicator	Before treatment		After treatment	
	Me	IQR	Me	IQR
Normal BMD, g/cm^2 (n=26)	1.07	0.96–1.13	1.09*	1.01–1.12
Osteopenia, BMD, g/cm^2 (n=24)	0.85	0.82–0.88	0.87*	0.84–0.91
Osteoporosis, BMD, g/cm^2 (n=15)	0.65	0.56–0.73	0.67	0.59–0.72

*The reliability of the differences p<0.05

Table 7. **Dynamics of immunological parameters in cases of OA with diacerein treatment**

Indicator		Normal BMD (n=26)		Osteopenia (n=24)		Osteoporosis (n=15)	
		Me	IQR	Me	IQR	Me	IQR
CRP, mg/l	Before treatment	4.00	4.00–6.00	7.50	6.00–9.00	12.00	6.00–18.00
	After treatment	3.00* (-25%)	2.00–4.00	6.00* (-20%)	5.00–6.75	10.00* (-17%)	5.00–16.00
ESR, mm/hr	Before treatment	10.00	7.00–12.00	12.00	10.00–18.00	19.00	15.00–24.00
	After treatment	6.00* (-40%)	6.00–9.00	9.00* (-25%)	7.25–16.50	18.00* (-5%)	12.00–22.00
IL-1, pg/ml	Before treatment	20.00	14.00–26.50	26.00	9.00–41.50	45.00	19.00–64.00
	After treatment	12.00* (-40%)	6.75–20.50	14.50* (-44%)	7.00–31.75	38.00* (-16%)	18.00–55.00
NO, mol/l	Before treatment	2.40	1.80–3.45	3.18	2.00–4.48	4.60	3.60–6.50
	After treatment	1.55* (-35%)	1.10–2.13	2.30* (-28%)	1.00–4.00	3.50* (-24%)	2.00–4.50
IGF-1, ng/ml	Before treatment	458.00	393.50–542.50	345.00	219.00–479.50	425.70	237.00–489.00
	After treatment	600.00* (+31%)	535.00–600.00	474.00* (+37%)	257.50–557.75	452.00* (+6%)	350.00–511.00

*The reliability of the differences p<0.05

the patients of the three groups (Table 2). Patients from Group 1 had the best results (5.5 (IQR 3.00–8.75)), the results were worse in Group 2 (8.00 (IQR 5.50–10.10)), and the worst results were in Group 3 (12.00 (IQR 10.00–14.00)). This means that the level of vital activity in cases of reduced BMD is significantly worse than in cases of normal BMD.

After analyzing the indicators of the inflammatory process between patients with normal and with lowered BMD, a statistically significant difference between these indicators was found. As can be seen from Table 3, the most pronounced inflammatory process was observed in cases of osteoporosis, as evidenced by higher levels of ESR, CRP, IL-1, NO, and reduced levels of IGF-1. The inflammatory process was less pronounced in cases of osteopenia than in patients with normal BMD.

As for the biochemical blood parameters of the examined patients, there was no statistically significant difference between the three groups of the examined patients (Table 4).

When evaluating the effectiveness of diacerein treatment in the three study groups, it was found that in cases of normal BMD and osteopenia, back pain was statistically significantly more reduced compared to patients with osteoporosis, whose indices changed insignificantly (Table 5). Also, from the data above, it can be seen that in cases of normal BMD and osteopenia there is a significant improvement in the psycho-emotional state, quality of life and life activity in comparison to patients with osteoporosis.

The study of the dynamics of indicators of BMD in the three groups revealed a statistically significant increase in indicators in cases of normal BMD and osteopenia, while in cases of osteoporosis, the indicators did not change significantly (Table 6).

The study revealed a statistically significant difference between ESR, CRP and immunological parameters (IL-1,

NO, IGF-1). However, the best dynamics was observed in patients with normal BMD, worse in patients with osteopenia, and the worst in patients with osteoporosis (Table 7).

CONCLUSIONS

1. As a result of the study it was shown that patients with reduced BMD have a more severe course of low back pain.
2. It was revealed that in cases of osteopenia, pain in back was more pronounced compared to normal BMD, and in osteoporosis, it was much greater compared to normal BMD and osteopenia.
3. Patients with reduced BMD have a significantly worse psycho-emotional state, quality of life and vital activity, compared to patients with normal BMD.
4. It is proved that in cases of reduced bone mineral density, there is a more intense inflammatory process (according to the ESR, CRP, IL-1, NO, IGF-1) than in cases of normal BMD.
5. The dynamics of treatment with SYSADOA was worse in patients with osteopenia compared to patients with normal bone mineral density, and it was the worst in patients with osteoporosis.
6. The use of symptomatic slow-acting anti-inflammatory drugs, namely diacerein, in cases of OA led to an increase in BMD and changes towards normalization of immunological parameters. Positive effect was more pronounced in cases of normal BMD and osteopenia while in cases of osteoporosis, immunological parameters did not change significantly.
7. Conclusion: in cases of OA with osteopenia, diacerein can be limited, and in cases of osteoporosis, it is desirable to include anti-osteoporotic drugs in the treatment.

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APATINĖS NUGAROS DALIES SKAUSMĄ PATIRIANČIŲ PACIENTŲ LIGOS EIGOS IR GIJIMO SĄSAJOS SU KAULŲ MINERALIZACIJOS TANKIU

Santrauka

Tikslas. Įvertinti ligos eigą, klinikinį pasireiškimą ir simptominio gydymo priešuždegiminiais vaistais efektyvumą pacientams su apatinės nugaros dalies skausmu, kuriems nustatytas žemas kaulų mineralizacijos tankis.

Tiriamieji ir tyrimo metodai. Tyrime dalyvavo 100 pacientų (60 moterų, amžiaus vidurkis – 57 (34–80) metai), kurie pagal mineralinį kaulų tankį buvo suskirstyti į tris grupes. Gydymo eiga ir efektyvumas vertinti naudojant VAS, Oswestry, Roland-Morris ir McGill klausimynus. Taip pat buvo vertinami nespecifiniai uždegimo rodikliai (ENG ir CRB), citokinai (IL-1, IGF-1, NO), medžiagų apykaitos (lipidų, angliavandenių, kepenų žymenų) rodikliai. Duomenys apdoroti naudojant „SPSS Statistics“ programinę įrangą.

Rezultatai. Pacientai, kurių mineralinis kaulų tankis buvo žemas, blogiausiai vertino būklę VAS, Oswestry, McGill ir Roland-Morris klausimynais, taip pat šios grupės pacientų uždegiminiai rodikliai buvo blogesni. Savijautos ir uždegiminių rodiklių dinamika gydymo eigoje buvo geresnė tiems pacientams, kurių kaulų mineralinis tankis buvo normalus.

Išvados. Pacientai, kurių kaulų mineralinis tankis yra žemas, jaučia stipresnį apatinės nugaros dalies skausmą, jų psichinė ir emocinė būsena, fizinis aktyvumas ir gyvenimo kokybė yra blogesnė, lyginant su tais, kurių kaulų mineralinis tankis – normalus. Šiems pacientams gydymas simptominiais vaistais nuo uždegimo padeda silpniau.

Raktažodžiai: nugaros skausmas, osteoartritas, osteoporozė, kaulų mineralinis tankis, priešuždegiminis poveikis, SYSADOA.

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