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POLYMORBID PATHOLOGY IN THE CITY OF MURMANSK IN PATIENTS WITH OSTEOARTHRITIS HAVING VARIOUS VITAMIN D LEVEL

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Abstract. According to the Territorial Body of the Federal State Statistics Service for the Murmansk Region, the incidence of osteoarthritis among the adult population is 46.57 per 1000 people. In order to identify the features of comorbid pathology in patients over 60 years of age with osteoarthritis who have vitamin D deficiency and insufficiency, 100 patients over the age of 60 years (cf. age 69.03 ± 2.34 years). All patients live in Murmansk; 85% of patients were women and 15% men. Research methods were used: questionnaire, clinical examination, determination of the level of vitamin D. It was found that in patients with osteoarthritis over the age of 60 years, 1/3 have vitamin D deficiency and more than 1/2 — vitamin D deficiency. In patients with osteoarthritis with vitamin D deficiency and deficiency, such comorbid pathologies as arterial hypertension, coronary heart, rheumatoid arthritis. In patients with vitamin D deficiency, compared with the group with vitamin D deficiency, the following were more often noted: type 2 diabetes mellitus, cancer, chronic obstructive pulmonary disease, and a history of acute circulatory disorders. Subjects with lower levels of vitamin D have more often geriatric syndromes such as: hearing impairment, dysphagia, constipation, urinary incontinence and pathology of the oral cavity. Patients with vitamin D deficiency in comparison with its insufficiency have a more pronounced radiological stage of the disease and the degree of dysfunction of the joint, which, in turn, increases the percentage of disability among these patients. Thus, vitamin D deficiency is one of the risk factors for a number of comorbid pathologies in osteoarthritis. In this connection, it is expedient to include vitamin D in the complex therapy of osteoarthritis in patients over 60 years of age.

Key words: vitamin D; osteoarthritis; elderly and senile patients; comorbid pathology.

ОСОБЕННОСТИ ПОЛИМОРБИДНОЙ ПАТОЛОГИИ У ПАЦИЕНТОВ г. МУРМАНСКА С ОСТЕОАРТРИТОМ, ИМЕЮЩИХ РАЗЛИЧНЫЙ УРОВЕНЬ ВИТАМИНА D

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Резюме. По данным Территориального органа Федеральной службы государственной статистики по Мурманской области, заболеваемость остеоартритом среди взрослого населения составляет 46,57 на 1000 человек.

С целью выявления особенностей полиморбидной патологии и некоторых гериатрических синдромов у пациентов старше 60 лет с остеоартритом, имеющих дефицит и недостаточность витамина D, было обследовано 100 пациентов в возрасте старше 60 лет (средний возраст 69,03 ± 2,34 года). Все пациенты проживали в г. Мурманске; 85% пациентов составили женщины и 15% — мужчины. Использовались методы исследования: анкетирование, клиническое обследование, определение уровня витамина D. Было установлено, что у 1/3 пациентов, страдающих остеоартритом в возрасте старше 60 лет, имеется дефицит витамина D и недостаточность витамина D — у более половины исследуемых. У больных с остеоартритом с дефицитом и недостаточностью витамина D наиболее часто отмечались такие полиморбидные патологии, как гипертоническая болезнь, сердечно-сосудистая патология, ревматоидный артрит. У пациентов, имеющих дефицит витамина D, по сравнению с группой с недостаточностью витамина D чаще отмечались: сахарный диабет 2-го типа, онкологические заболевания, хроническая обструктивная болезнь легких, острое нарушение кровообращения в анамнезе. Обследуемые с низкими показателями содержания витамина D имеют более часто гериатрические синдромы, такие как нарушения слуха, дисфагия, запоры, недержание мочи и патология ротовой полости. Пациенты, страдающие дефицитом витамина D, в сравнении с пациентами, у которых он был на недостаточном уровне, имеют более прогрессивную рентгенологическую стадию заболевания и выраженность нарушений функций суставов, что, в свою очередь, увеличивает процент инвалидизации среди указанных пациентов. Таким образом, дефицит витамина D является одним из факторов риска целого ряда полиморбидной патологии при остеоартрите. В связи с вышеуказанным, целесообразно включить витамин D в комплексную терапию остеоартрита.

Ключевые слова: витамин D; остеоартрит; пациенты пожилого и старческого возраста; полиморбидная патология.

INTRODUCTION

Low vitamin D levels are a global problem for people of all ages. The current insufficient vitamin D supply of the Russian population is due to the low level of its synthesis and insufficient intake with food [1]. Vitamin D deficiency is characterized by extremely adverse health consequences [2].

Studies of vitamin D deficiency conducted in recent years show a high prevalence of deficiency in elderly patients. Thus, vitamin D deficiency among the elderly population in Europe was found in 47% of women and 36% of men. In Asian countries it was in 80% of the population [3]. In our country, the frequency of vitamin D deficiency among elderly and senile people is 86.4% [4].

In the elderly, low vitamin D levels increase the risk of fractures due to increased bone resorption and decreased bone mineral density [4]. Vitamin D deficiency in the elderly also affects muscle tissue, physical activity and general geriatric status. Vitamin D supplementation reduces the risk of falls, improves muscle tone, and also reduces the severity of cognitive impairment and improves overall health, and is therefore essential for vitamin D-deficient elderly people with senile asthenia [5].

In the development of vitamin D deficiency, the climatic and geographical features of the region of residence play a major role. Vitamin D deficiency is widespread in northern latitudes and especially in the Arctic region [6, 7].

Vitamin D deficiency is a leading factor in the development of osteoarthritis. It can be one of the etiologic factors of a number of other chronic non-infectious diseases, autoimmune and oncologic. The presence of vitamin D deficiency is also associated with a more severe course of various chronic diseases [8].

Osteoarthritis is the most common joint disease in the elderly and old age, which is accompanied by disability in the population [9].

According to the official data of the Territorial Department of the Federal State Statistics Service in the Murmansk region, the incidence of osteoarthritis among adults is 46.57 per 1000 people [11].

Currently, the problems of tactics of management of patients with concomitant pathology are of great relevance.

The literature contains data on polymorbidity of osteoarthritis with diseases of the cardiovascular system (arterial hypertension) and gastrointestinal tract [13]. At the same time, there are very few studies that describe the features of polymorbid pathology in patients depending on vitamin D deficiency, which is important in the selection of drugs with a favorable safety profile in osteoarthritis in combination with polymorbid pathology.

AIM

To identify the features of polymorbid pathology and some geriatric syndromes in patients over 60 years old

suffering from osteoarthritis with vitamin D deficiency and insufficiency.

MATERIALS AND METHODS

The study included 100 patients diagnosed osteoarthritis, who were under outpatient treatment and observed in outpatient clinics in Murmansk. The patients' age ranged from 60 to 80 years (mean age was 69.03±2.34 years), of which 85% were women and 15% were men.

The study was performed in accordance with the standards of good clinical practice and the principles of the Declaration of Helsinki. The study protocol was approved by the Ethical Committee of the Northern State Medical University. Written informed consent was obtained from all participants before inclusion in the study. The study was conducted as the patients applied for it.

All patients had a confirmed diagnosis of osteoarthritis according to the clinical recommendations of the Association of Rheumatologists of Russia (2021).

Questionnaire data (socio-demographic indicators), clinical examination, determination of vitamin D levels, assessment of the radiologic stage of the disease and the degree of joint dysfunction were used. During clinical observation, the presence of chronic non-infectious diseases such as arterial hypertension (AH) [19], coronary heart disease (CHD), chronic cardiovascular insufficiency (CVI) [20], acute cerebral circulatory failure (ACF) — according to the neurologist's report, type 2 diabetes mellitus (DM) [21], rheumatoid arthritis (RA) [22], gastric or duodenal ulcer (DU) [23], cancer — according to the oncologist's report, chronic obstructive pulmonary disease (COPD) were assessed in patients [24].

We also determined the presence of age-associated conditions: pelvic organ disorders (urination, defecation), eye and hearing organs, swallowing problems (clinical recommendations of the Russian Association of Gerontologists and Geriatricians, 2020). In addition, the results of radiologic studies of joints (stage of osteoarthritis disease) and joint dysfunctions were assessed (clinical recommendations of the Russian Association of Rheumatologists, 2021).

Vitamin D levels were determined using HPLC-MS/MS (high-performance liquid chromatography with tandem mass spectrometry) method. The analyzed material was blood serum. Norms: less than 20 ng/mL — vitamin D deficiency, 20–30 ng/mL — vitamin D insufficiency, more than 30 ng/mL — normal vitamin D level. The study included patients who had not previously received vitamin D therapy (Russian Association of Endocrinologists, 2016).

The results were processed using statistical software SPSS Statistics (version 23.00, license Z125-5301-14). Data distribution was evaluated using the Kolmogorov–Smirnov test. To analyze the results, we used the parameters of descriptive statistics, Mann-Whitney U-criterion to compare the mean values of two independent samples, and the χ^2 test to evaluate differences in frequency of occurrence.

RESULTS

Vitamin D levels in patients with osteoarthritis older than 60 years of age (Figure 1) were found to be below target values in the majority of 92% (vitamin D deficiency or insufficient levels (20-30 ng/mL)). More than 1/3 of patients (33.0%) had vitamin D deficiency (< 20 ng/mL), and only 8% of patients had normal vitamin D levels (>30 ng/mL), which indicates the urgency of the problem of vitamin D insufficiency for patients in this group.

It was found that female patients with vitamin D insufficiency or deficiency accounted for 84.85%, while male patients accounted for 15.15% of cases.

Due to the fact that in our sample the number of individuals with normal vitamin D content was insufficient for statistical analysis, further analysis was performed in groups with vitamin D deficiency (severe vitamin D insufficiency) and mild vitamin D insufficiency. Thus, group 1 consisted of 33 patients (35.86%) with vitamin D deficiency (severe vitamin D insufficiency), group 2 consisted of 59 patients (64.14%) with mild vitamin D insufficiency.

Analysis of polymorbid diseases in two groups (patients with severe vitamin D deficiency (group 1) and mild vitamin D insufficiency (group 2)) (Fig. 2) showed that patients with osteoarthritis in both groups 1 and 2 most often had such concomitant pathologies as hypertension, CHD, RA, DM, oncological diseases, COPD, ACF in anamnesis.

In group 1, the frequency of concomitant polymorbid pathology in patients was distributed as follows: AH was present in all patients, DM was observed in more than 1/2 of subjects, CHD was present in almost 1/2 patients, and RA was present in less than 1/2 patients. A history of ACF was found in almost every second patient, 2/5 had a history of CVI, and oncologic diseases were present with the same frequency. COPD was observed in 2/5 of patients, every fourth patient had ulcer.

In the 2nd group of patients the incidence of chronic non-infectious diseases was distributed as follows: AH — in 9 out of 10 patients, more than 1/2 of patients had CHD, also more than 1/2 of patients had RA, every third patient had CVI and ulcer, every fourth patient had DM, oncological diseases were present in 1/6 patients, ACF in anamnesis was found in every tenth patient, COPD was noted less frequently — only in 3% of patients.

Analysis of differences between groups 1 and 2 showed that DM (χ^2=17.759, p=0.000), cancer (χ^2=14.612,

p=0.000), COPD (χ^2=36.125, p=0.000), and a history of ACF (χ^2=28.072, p=0.000) were more frequent in group 1 compared to group 2. At the same time, RA was significantly more frequent in group 2 compared to group 1 at the trend level (χ^2=2.001, p=0.101).

We analyzed the occurrence of age-associated conditions in patients with osteoarthritis (Fig. 3), which showed that hearing disorders, dysphagia, constipation, urinary incontinence, and oral pathology were significantly more common in group 1. Visual impairment, urinary incontinence and hearing impairment were common in 3/5 patients, constipation was common in almost 1/2 patients, dysphagia was common in 2/5 patients and 1/3 had oral pathology. In the 2nd group such disorders as visual disturbances were more frequently noted, typical for more than 1/2 patients, urinary incontinence was typical for 2/5 patients, hearing disturbances were noted for 1/3 patients, and every fifth patient had constipation.

Patients in group 1 compared to group 2 were more likely to have hearing impairment (χ^2=20.612, p=0.000), dysphagia (χ^2=35.526, p=0.000), constipation (χ^2=16.130, p=0.000), urinary incontinence (χ^2=12.511, p=0.000) and oral pathology (χ^2=10.528, p=0.002).

To analyze the radiological stage of osteoarthritis and joint dysfunction, 2 groups of patients were sampled (Table 1).

More progressive radiologic stage of the disease was noted in the 1st group of patients. Comparative analysis showed that 66.7% of patients in group 1 and 50.8% in group 2 had III and IV radiologic stage of osteoarthritis (χ^2=5.255, p=0.022). Stage II of the disease was present in 1/3 of patients in group 1 and 1/2 of subjects in group 2, i.e. stage II of the disease was more frequently observed in group 2 (χ^2=5.291, p=0.022).

In terms of severity of joint dysfunction, the groups differed at the trend level in that degree III was more frequent in group 1 compared to group 2 (χ^2=3.125, p=0.078).

Table 2 shows the functional impairment scores of patients with osteoarthritis over 60 years of age in different vitamin D content groups.

Patients in group 1 compared to group 2 had higher values for radiologic stage of disease (p=0.000) and degree of joint dysfunction (p=0.000).

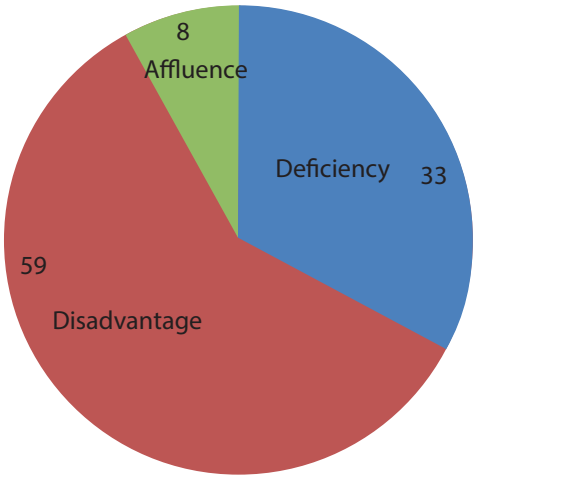

Fig. 1. Occurrence of different vitamin D levels in patients with osteoarthritis over the age of 60 (%)

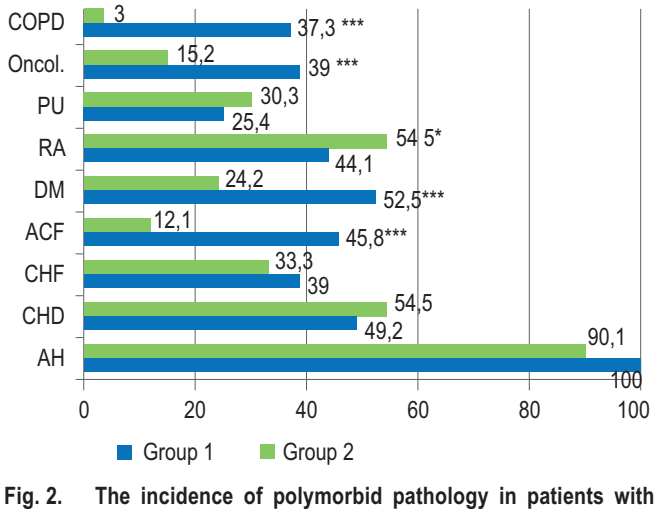

Fig. 2. The incidence of polymorbid pathology in patients with osteoarthritis over the age of 60 years with different levels of vitamin D (%). Group 1 — patients with vitamin D deficiency (severe vitamin D deficiency); Group 2 — patients with mild vitamin D deficiency. Note: the significance of the differences between the groups according to criterion χ^2 at ***p < 0.001, *p < 0.10

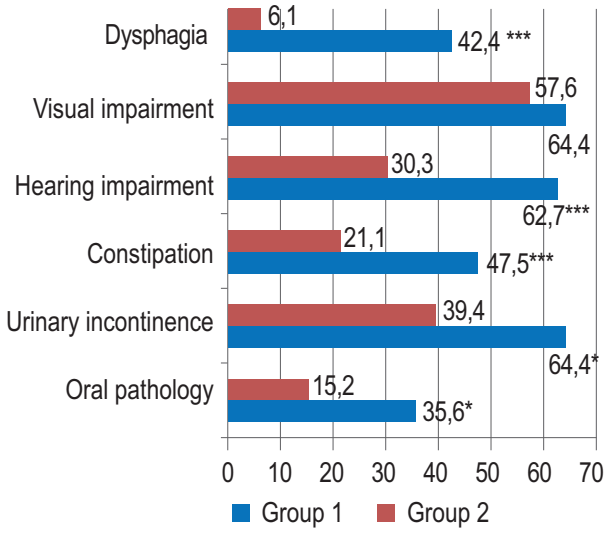

Fig. 3. The incidence of geriatric disorders in patients with osteoarthritis with different levels of vitamin D (%). *Note:* the significance of the differences between the 1st and the 2nd groups according to the criterion χ^2 at ***p < 0.001, *p < 0.05

Table 1

Incidence of functional disorders in patients with osteoarthritis over the age of 60 years in different vitamin D groups (abs. amount, %)

Indicators	Severity of violations	Group 1, N=33		Group 2, N = 59		Reliability of differences by the criterion χ^2
Radiological stage of the disease	Stage II	11	33,3	29	49,2	χ^2=5,291 (p=0,022)
	Stage III	18	54,5	27	45,7	
	Stage IV	4	12,2	3	5,1	
Degree of joint dysfunction	The 1st degree	3	9,1	8	13,6	
	The 2st degree	16	48,5	33	55,9	
	The 3st degree	14	42,4	18	30,5	χ^2=3,125 (p=0,078)

Note: reliability of differences between groups p=0.022, p=0.078.

DISCUSSION

Analysis of the results showed that 92% of patients with osteoarthritis over 60 years of age had deficiency or insufficient levels of vitamin D. It is worth noting that the study was conducted in the North of Russia in the Murmansk region. Most likely, the low level of vitamin D in patients is associated with a small number of sunny days per year in Murmansk and low average annual temperature, which do not allow to provide irradiation of sufficient skin surface for biosynthesis of the optimal amount of vitamin D.

We found that in elderly patients with osteo-arthritis with vitamin D deficiency and insufficiency such polymorbid pathology as AH, CHD, RA was most often observed. Our data are similar to the results of a study by other authors [13], who talk about the high frequency of polymorbidity of osteoarthritis and AH, but, unlike these authors, our study did not reveal a high frequency of gastrointestinal pathology in osteoarthritis.

At the same time, our results are somewhat different from those obtained earlier in another study on a sample of elderly and senile patients [14]. The similarity consists in the presence of AH in all patients over 60 years of age. In the previous study, it was found that the most frequent pathology in elderly patients was gastrointestinal (81.43%), muscular and skeletal (77.14%) and endocrine (77.14%) diseases. Probably, the revealed differences can be explained by the peculiarities of the sample and specificity of polymorbidity of osteoarthritis. Thus, CHD in osteoarthritis was noted more often than in the sample of patients without it (59% vs. 41%), a similar trend was observed in RA (49% vs. 8%).

According to I.B. Belyaeva et al. [15], a special role in the development and progression of osteoarthritis is attributed to systemic metabolic disorders, such as obesity and DM, which can modify the natural course of local inflammatory reactions in the joint [15]. It follows that the presence of DM in patients with osteoarthritis significantly worsens the course of the disease.

Table 2

Mean values of functional impairment indicators in patients with osteoarthritis over 60 years of age in different groups (points)

Indicators	The 1st group	The 2nd group	Mann–Whitney U-test
Radiologic stage of the disease	3,03 ± 0,11	2,27 ± 0,06	0,000
Degree of joint dysfunction	2,54 ± 0,08	2,01 ± 0,09	0,000

Note: the significance of the differences between the 1st and the 2nd groups is p=0.000.

Vitamin D deficiency is a risk factor for a number of polymorbid diseases. Analysis of our results showed that in group 1 compared to group 2 such diseases as DM, oncologic diseases, COPD, ACF in anamnesis were more frequently observed. The obtained results are generally consistent with the data of other authors. Thus, according to A.F. Verbovoy et al. [16], vitamin D deficiency is associated with the risk of cardiovascular diseases, obesity, diabetes, COPD.

In the elderly, low vitamin D levels are associated with osteoporosis, falls and fractures, DM, cancer, cerebrovascular disease, sarcopenia [17], and increased risk of cardiovascular mortality [18].

Our patients with lower vitamin D levels are more likely to have such geriatric syndromes as hearing impairment, dysphagia, constipation, urinary incontinence and oral pathology. The identified features suggest that patients over 60 years of age with osteoarthritis with lower vitamin D levels are more likely to have geriatric syndromes, which is consistent with the findings of a study by other authors [5].

Patients with vitamin D deficiency in comparison with its insufficiency in a greater percentage of cases have a

more severe radiological stage of the disease and more pronounced impairment of joint function, which, in turn, increases the percentage of disability among patients with vitamin D deficiency.

Thus, vitamin D deficiency is one of the risk factors for a number of polymorbid pathologies in osteoarthritis. Taking into account the identified features is important in the selection of highly effective drugs with a favorable safety profile in osteoarthritis in combination with polymorbid pathology. There is a need to include vitamin D in the complex therapy of osteoarthritis in elderly patients.

CONCLUSION

1. 1/3 of patients with osteoarthritis over 60 years of age have vitamin D deficiency and more than 1/2 of patients have vitamin D insufficiency. In patients with osteoarthritis with vitamin D deficiency and insufficiency, such comorbidities as hypertension, ischemic heart disease, and rheumatoid arthritis were most often noted. Type 2 diabetes mellitus, oncologic diseases, chronic obstructive pulmonary disease, acute circulatory failure in the history were more frequently observed in patients with vitamin D deficiency compared to the group with vitamin D insufficiency.

2. Patients with lower vitamin D levels were more likely to have geriatric syndromes such as hearing impairment, dysphagia, constipation, urinary incontinence, and oral pathology. Patients with vitamin D deficiency compared to those with vitamin D insufficiency have a more pronounced radiological stage of disease and degree of joint dysfunction, which in turn increases the rate of disability among these patients.

ADDITIONAL INFORMATION

Author contribution. Thereby, all authors made a substantial contribution to the conception of the study, acquisition, analysis, interpretation of data for the work, drafting and revising the article, final approval of the version to be published and agree to be accountable for all aspects of the study.

Competing interests. The authors declare that they have no competing interests.

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Consent for publication. Written consent was obtained from the patient for publication of relevant medical information within the manuscript.

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Конфликт интересов. Авторы декларируют отсутствие явных и потенциальных конфликтов интересов, связанных с публикацией настоящей статьи.

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