FEATURES OF BONE METABOLISM IN PATIENTS WITH DIABETIC OSTEOARTHROPATHY OF VARIOUS STAGES

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ANNOTATION

In this article, the authors studied the features of bone metabolism in 67 patients with type 2 diabetes and with diabetic osteoarthropathy of various stages. The levels of 25-hydroxyvitamin D 3 were significantly lower in patients of all 4 x groups (average age 70 ± 12 years) than in the control group (27.2 ± 6.2 ng / ml).

It should be noted that 34 (50.7%) of patients with diabetic pope ulcers had a severe deficiency of 25-hydroxyvitamin D 3 with levels below 10 ng / ml.

Only 13% of patients, the level of 25-hydroxyvitamin D 3 exceeded 20 ng / ml. In addition, secondary hyperparathyroidism was found in 26% of patients, and at 12.5% of patients a hypocalcemia was revealed.

A negative correlation was established (R = -0.241) (p <00,1) between the classification of Armstrong and the status of 25-hydroxyvitamin D 3.

The authors concluded that patients with diabetic foot syndrome complicated by Stop Charcot are susceptible to high risk of 25-hydroxyvitamin d3 and calcium deficiency. Any patient with the diabetic foot syndrome should take measurement of the level of 25-hydroxyvitamin D 3 and obtain prophylactic treatment when reduced indicators are detected.

Keywords: type 2 diabetes mellitus , Sharko foot, bone metabolism, markers.

RELEVANCE

Type 2 diabetes mellitus (DM2) is the metabolic disorder with the highest prevalence and incidence worldwide.

In 2019, the International Diabetes Federation (IDF) reported the prevalence of diabetes in 463 million people worldwide, of which approx. 95% suffer from type 2 diabetes. IDF estimates that this number will rise to 700 million by 2045.

Type 2 diabetes is associated with numerous complications such as micro- and macrovascular pathologies, nephropathy, neuropathy, and changes in bone homeostasis. The latter is often referred to as diabetic bone disease associated with an increased risk of fractures and subsequent impaired fracture healing, rich in complications [1, 2].]. Indeed, a large British study involving over 2800 patients identified diabetes as one of the main risk factors for delayed healing of non-union fractures [3]. Bone mineral density (BMD) is usually low in type 1 diabetics. Despite an increased risk of fractures, most authors describe an increased BMD in patients with type 2 diabetes mellitus [4, 5], which indicates a low quality of the bone matrix. Diabetic foot syndrome and Charcot's osteoarthropathy are the most frequently described representatives of diabetic bone diseases affecting approx. every 5th diabetic during the first 5 years of illness [6]. In 20% of cases, this leads to amputation of the affected limb [7].] which is the main cause of non-traumatic amputations in developed countries. Most of the long-term therapeutic cost for diabetics is in the treatment of these bone diseases [8]. There is evidence that early adjustment of therapy may not only reduce ocular, renal, or nervous system complications [9], but may also have a positive effect on the progression of diabetic bone disease. To obtain such information, advanced model systems are required [10].

Despite advances in the study of the mechanisms and clinical manifestations of pathological changes in bone tissue in diabetes mellitus, there is still no consensus on the nature, frequency, and causes of skeletal changes under controlled hyperglycemia.

The most likely explanation for the inconsistency in the assessment of bone lesions in diabetes mellitus is the heterogeneity of the examined patient population, the use of various methods for assessing the state of bone tissue.

Until now, there is no consensus on the role of biochemical markers of bone remodeling, the study of which would allow diagnosing osteoarticular pathology in the early stages and finding a differentiated approach to the treatment of this category of patients.

All of the above motivated the present study.

The purpose of the study is to study the features of bone metabolism in patients with diabetic osteoarthropathy of various stages.

MATERIAL AND METHODS OF RESEARCH

67 patients (prospectively) with type 2 diabetes and Charcot's foot were examined in the period of 2021 at the RSSPMC of Endocrinology, in the department of diabetic foot.

All observed patients were divided into 4 groups:

1 gr - patients with acute stage of Charcot's foot with type 2 diabetes - 16 patients,

group 2 - patients with subacute Charcot foot - 18 patients,

group 3 - patients with chronic stage of Charcot's foot - 20 patients,

Group 4 - patients with Charcot foot complications - 13 patients

The control group consisted of 20 healthy individuals.

Of the 67 patients, there were 42 men and 25 women. Average age: men was 69.12 years, women - 68.15 years. The duration of type 2 diabetes ranged from 17 to 25 years

RESEARCH METHODS INCLUDED

biochemical (bilirubin, direct, indirect, lipid spectrum, ALT, AST, PTI, coagulogram, blood sugar, glycated hemoglobin, urea, creatinine, GFR, calcium, alkaline phosphatase, parathormone, vitamin D3, blood and instrumental : ECG, MRI of the feet, dopplerography of the main vessels of the legs, ultrasound of the internal organs, DECA, fundus.

Statistical calculations were carried out in the Microsoft Windows software environment using the Microsoft Excel-2007 and Statistica version 6.0, 2003 software packages. The obtained data are shown as M±m, where M is the mean value of the variation series, m is the standard error of the mean value. The significance of differences between independent samples was determined by the method of Mann-Whitney and Student.

RESEARCH RESULTS

Table 1 shows the distribution of patients by sex and age.

Table 1. Distribution of patients by sex and age

Age, years	Number of men				Number of women			
	1 gr	2 gr	3 gr	4 gr	1 gr	2 gr	3 gr	4 gr
30-44	-	-	-	-	-	-	-	-
45-59	4	7	5	2	1	2	1	2
60-74	7	3	8	5	4	6	6	4
75 and older	-	-	-	-	-	-	-	-
Total: n = 67	11	10	13	7	5	8	7	6

As can be seen from Table 1, most of the patients were aged 60 to 74 years - 42 (62.7%), while the number of men was more: 42 men and 25 women.

The next step in our research was to study the parameters of carbohydrate metabolism (Table 2).

Table 2. Comparative characteristics of parameters of carbohydrate metabolism in patients by groups

Indicator	1 group	2 group	3 group	4 group	control
fasting glycemia, mmol/l	9,21±4,29*	7,47±2,15*	8,12±2,23	11,2±3,14**	4,3±0,3
OGTT, mmol/l	11,53±3,05*	9,11±3,33*	10,14±2,3*	10,1±2,12*	6,7±0,05
HbA1c, %	11,83±2,1**	9,38±1,4*	9,21±1,2*	12,8±1,21**	4,3±0,6

Note: OGTT is an oral glucose tolerance test, p is the significance of differences in groups compared with control. At the same time, *p<0.05 **p< 0.001

As can be seen from Table 2, there were significant violations of carbohydrate metabolism in all groups, which indicates the state of decompensation in these patients.

Our main task was to study the biochemical and hormonal parameters of bone metabolism in the compared groups of patients with Charcot's foot (Table 3).

Table 3. Comparative characteristics of biochemical and hormonal parameters of patients by groups

Indicator	1 group	2 group	3 group	4 group	Control
calcium, mmol/l	1,3±0,04*	1,2±0,08*	2,04±0,07	1,7±0,04*	2,25±0,03
PTH, pg/ml	71,3±9,7	72,8±10,7	104,6±12,9*	105,8±9,8*	76,7±12,3
Vit Dz, ng/ml	12,6±3,3**	11,2±4,2**	10,5±4,1**	11,3±4,8**	27,2±6,2

Note: PTT - parathormone - significance of differences in groups in comparison with control. At the same time, *p<0.05 **p< 0.001

As shown in Table 3, 25-hydroxyvitamin D3 levels were lower (12.6±3.3 ng/mL, p<0.001, 11.2±4.2 ng/mL, p<0.001, 10.5±4, 1 ng/ml, p<0.001, 11.3±4.8 ng/ml, p<0.001) in patients of all 4 groups (mean age 70±12 years) than in the control group (27.2±6, 2 ng/ml).

Of note, 34 (50.7%) patients with diabetic foot ulcers were severely deficient in 25-hydroxyvitamin D 3 with levels below 10 ng/mL.

Only 13% of patients had 25-hydroxyvitamin D3 levels above 20 ng/mL. In addition, secondary hyperparathyroidism was found in 26% of patients (in groups 3 and 4), and hypocalcemia was detected in 12.5% of patients.

CONCLUSIONS

Patients with diabetic foot syndrome complicated by Charcot foot are at high risk of 25-hydroxyvitamin D3 and calcium deficiency. 2. Any patient with diabetic foot syndrome should have their 25-hydroxyvitamin D 3 measured and receive prophylactic treatment if decreased values are found.

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