eISSN 2181-1326
9 772181 132009

CAJM

Central Asian Journal of Medicine

Tashkent Medical Academy Press

eISSN: 2181-1326

Scientific Journal

This journal had been publishing since 2018

4
2022

MINISTRY OF HIGHER AND SECONDARY SPECIALIZED EDUCATION OF THE REPUBLIC OF UZBEKISTAN

2030 | UZBEKISTAN RESEARCH ONLINE

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PROBLEMS WITH REDUCED BONE DENSITY IN SYSTEMIC SCLERODERMA

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ABSTRACT

Systemic scleroderma (SSD) is a chronic progressive connective tissue disease with an unknown etiology and clinically heterogeneous manifestations. It is based on 3 pathological processes: vasculopathy, cellular and humoral autoimmune condition and progressive visceral and vascular fibrosis in many organs. SSD disease is a reduction in the synthesis and accumulation of collagen in the skin (scleroderma) and other internal organs, especially in the connective tissue of the lungs, gastrointestinal tract (gastrointestinal tract), heart and kidneys. Vitamin D deficiency causes disturbance of calcium homeostasis and bone metabolism. Vitamin D deficiency leads to hyperthyroidism, bone loss and fractures. The article focuses on the importance of vitamin D in reducing bone density in patients with SSD and its early assessment.

Key words: systemic scleroderma, 25(OH)vitamin D3, calcium, osteoporosis, osteopenia, bone mineral density, densitometry.

INTRODUCTION

Systemic scleroderma (SSD) is a chronic and often progressive autoimmune inflammatory disease of the connective tissue of unknown etiology, with heterogeneous clinical manifestations, characterized by fibrosis of the skin and internal organs and widespread damage to blood vessels (vasculopathy) [1,2]. SSD disease is a decrease in the synthesis and accumulation of collagen in the skin (scleroderma) and other internal organs, especially in the connective tissue of the lungs, gastrointestinal system (gastro-intestinal), heart and kidney. In the early stages of the disease, it is manifested together with obvious signs of inflammation.

Over time, patients show signs of progressive structural and functional impairment of blood vessels and internal organs due to fibrosis. It should be noted that patients suffer from pulmonary fibrosis, pulmonary artery hypertension, and heart damage, as well as malnutrition, depression, osteoporosis, and ineffective treatment in late stages [3,4]. In SSD, three cardinal features develop: vasculopathy, cellular and humoral autoimmune process, and vascular and visceral fibrosis in many organs. According to the results of a meta-analysis, when studying the effect of vitamin D deficiency on the prognosis of SSD, it was concluded that the decrease in the amount of vitamin D in the body in the diffuse type does not affect the acceleration of the disease [7,8,14].

Deficiency of vitamin D causes disturbance of homeostasis of calcium and bone metabolism. Vitamin D deficiency leads to hyperthyroidism, bone loss and fractures. Vitamin D deficiency is a global public health problem.

There are 2 characteristic signs that evaluate bone strength: bone mineral density and a qualitative sign of tissue (architectonics). But at present, scientists evaluate the reduction of bone density as a risk factor rather than a sign of osteoporosis [9,10].

The pathogenetic classification of osteoporosis is very important for us:

1. Primary osteoporosis

• Postmenopausal (type I)
• Senile (type II)
• Adults Ideopathic osteoporosis in adults
• Juvenile idiopathic osteoporosis

2. Secondary osteoporosis (type III) [10,11,12]

Type III osteoporosis develops after medical intervention (for example, glucocorticoids, anticoagulants, anticonvulsants, barbiturates, thyroid hormones) and other conditions that cause rapid bone resorption or a decrease in its formation. Such conditions include: hunger, anorexia, nervous state, insufficient intake of calcium and vitamin D in the diet, gastrointestinal diseases, absorption of organic and mineral compounds from the intestinal wall, and various chronic inflammations that occur continuously. diseases, rheumatological joint damage, thyrotoxicosis, diabetes, a number of hereditary diseases, etc. [12].

Currently, due to the delay in the diagnosis of osteoporosis, the state of bone fracture in the patient is evaluated as the first symptom and aggravates the course of the main disease.

OBJECTIVE OF THE RESEARCH

Assessment of the risk of osteoporosis and decreased bone mineral density due to vitamin D deficiency in systemic scleroderma and consequent calcium

metabolism disorders in bones. The following tasks have been set to achieve the planned goal.

1. Assessment of Vitamin D content in blood in SSD patients.

2. Assessment of bone changes in patients with SSD using ultrasound densitometry.

3. Assessment of the effect of vitamin D metabolism disorders and duration of the disease on bone mineral density in SSD.

MATERIALS AND RESEARCH METHODS

42 patients with a diagnosis of SSD (according to ACR/EULAR classification) who were undergoing inpatient treatment in the departments of cardiorheumatology and rheumatology of the multidisciplinary clinic of the Tashkent Medical Academy and were registered in the arthrology clinic participated in the study. Age ranged from 24 to 68 years [13,9]. The selected patients did not have signs of vascular, liver or kidney diseases in clinical or laboratory tests, coagulopathy was not detected, did not take oral or transdermal estrogen, progesterone, androgen or other steroids, did not take bisphosphonates affecting bone metabolism. 4 (4.4%) of them are men and 38 (95.6%) are women, the duration of the disease is 6.5 (4.6) years, the number of those currently taking corticosteroid drugs is 8 (19.1%), previously 4(9.5%), never took 30(71.4%), patients did not take vitamin D drugs at all, 29(69%) of patients had gastrointestinal damage, 13(31 In %) MIT damage was not detected.

The following clinical classification (Table 3), diagnostic criteria (ACR/EULAR 2013) (Table 4) and the mRSS (modified Rodnan Skin Score) scale were used to evaluate the degree of skin damage in SSD diagnosis. All patients underwent complete clinical examinations and laboratory analyses. Skin lesions were assessed using the mRSS scale. In this case, with the help of fingers, a fold is formed on the skin in 17 areas of the patient's body, and the thickness is assessed. If minimum 20 points out of 51 points are collected, 9 points (score) are given according to the diagnostic criteria. This means that enough points have been collected for diagnosis.

When assessing bone density using densitometry, the paw part of the patient's body was selected and the results were expressed in T and Z criteria.

Laboratory studies are necessary to determine the level of the main metabolites of vitamin D in the blood. It is preferable to submit on an empty stomach at least 4 hours after the last meal, there are no mandatory requirements. Alcohol and fatty foods should be excluded 12 hours before the study. 1-2 hours before blood donation, smoking is refused, juice, tea, coffee are not consumed

(water can be drunk). It is recommended to rest and relax 15 minutes before donating blood.

RESEARCH RESULTS

When assessing skin damage according to mRSS according to the obtained clinical analysis:

Table 1.

Score	≤5	5−10	>10
n	9	13	20

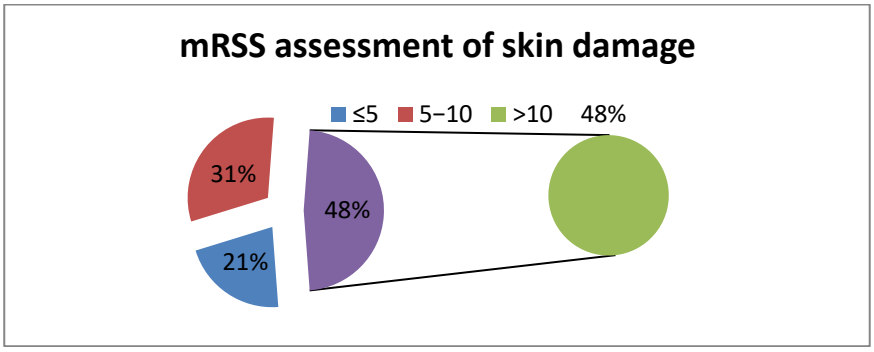

Figure 1.

When patients were evaluated for skin damage by the method of determination of finger skin stiffness (mRSS): in 20 (48%) of the study participants, this indicator was higher than 10, in 13 (31%) it was in the range of 5-10, in the remaining 9 (21%) and less than 5 points were given in one.

Blood samples were taken from all patients participating in the study, and 25(OH) Vitamin D3 in the blood was evaluated (Table 2).

Data Values (Normals)

1. <10 ng/ml - severe deficiency
2. <20 - deficiency
3. 20-30 - failure
4. 30–100 is an adequate level (target values for correcting vitamin D deficiency are 30–60)
5. 150 - can have a toxic effect

Table 2.

25(OH)Vitamin D3	<10 ng/ml	<20 ng/ml	20-30 ng/ml
n	11	13	18

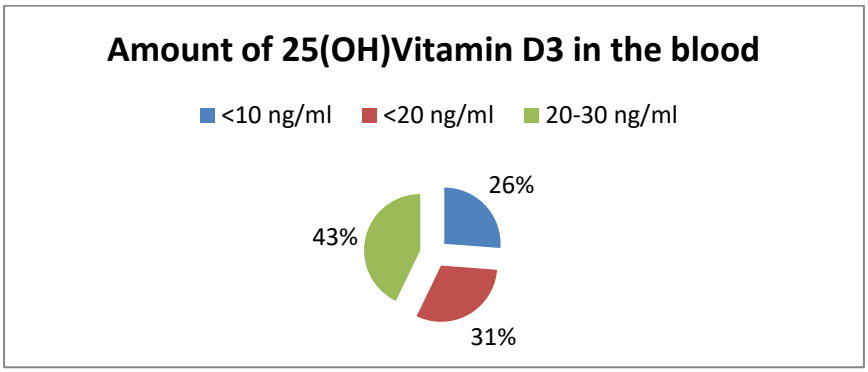

Figure 2.

The lowest level (<10 ng/ml) was found in 11 (26%) patients. Normal values (20-30 ng/ml) were found in 18 (43%). Deficiency (<20 ng/ml) was detected in the remaining 13 patients (31%).

"SONOST 3000" ultrasound densitometer portable device was used to evaluate the bone tissue of the research participants.

Densitometry results recommended by the WHO working group used the T-criterion. T-criterion is the amount of SD bone mineral density that is below the mean and below the peak bone mass of young (30-35 years) subjects of the respective sex. T-criterion does not depend on age, it decreases simultaneously with the decrease in bone mass with age.

WHO has developed the following diagnostic criteria for assessing bone density:

1. Normal bone density is higher than the mean (SD) during the age-related "peak" of bone mass in women (T-criterion is higher than 1);

2. Osteopenia - during the "peak" period of bone mass in women decreased by 1-2.5 SD compared to the average of this indicator (T-criterion -1 to -2.5 SD);

3. Osteoporosis - bone mineral density that is at least 2.5 SD less than the average of this indicator during the "peak" period of bone mass in women. Currently, a decrease in T-criterion - more than 2.5 SD is a generally accepted definition of osteoporosis.

According to the results of T score, 24% (10) =<-2.5, 33% (14) ≥-2.5, and 43% (18) ≥-1 of the research participants (Table 3).

Table 3.

T-score	≥(-1)	≥(-2,5)	<(-2,5)
n	18	14	10

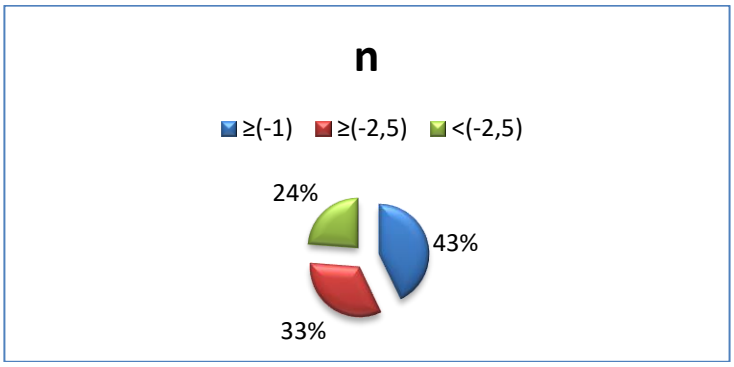

Figure 3.

So, according to the results, it was found that 18 (43%) patients had normal bone mineral density, 14 (33%) had decreased bone mineral density, i.e. osteopenia, and 10 (24%) patients had bone mineral density at the level of osteoporosis. (Table 4).

Table 4.

Bone mineral density status	normal	osteopenia	osteoporos
n	18	14	10

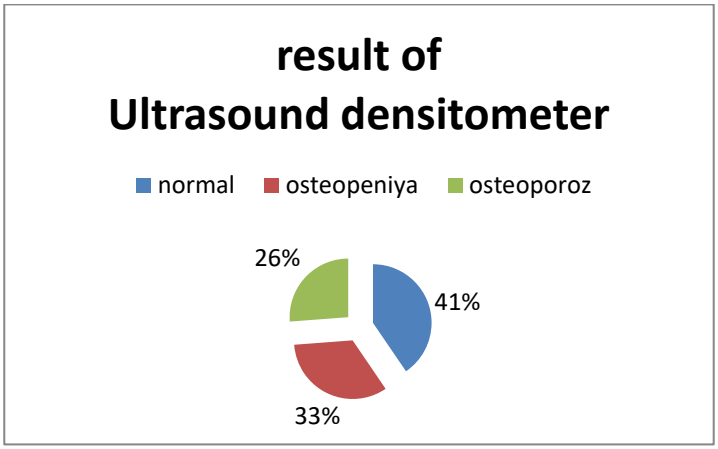

Figure 4.

DISCUSSION OF OBTAINED RESULTS

Our study included patients with clearly formed SSD, and this allowed us to analyze in detail the most important factors of bone mineral density. In most of the selected patients, the gastrointestinal system is damaged, and skin damage is in the first place. No damage to other organs was observed in the selected patients. This situation is important for us to rule out the effects of other damaged organs in the reduction of bone mineral density. Our gastrointestinal system and skin cover are of particular importance when we receive Vitamin D from the outside. Therefore, SSD develops from the early stages of the disease when the damage to these areas is precisely. But not all of the patients had damage to the gastrointestinal system, and this situation allowed us to find out the effect of this system on the decrease in

the amount of Vitamin D in the body. Until now, studies have shown glucocorticosteroids, widely used as anti-inflammatory agents in autoimmune diseases, to be the main cause of bone mineral density decline. But we know that bone mineral density depends not only on calcium metabolism, but also on Vitamin D metabolism, which ensures its absorption. The main symptom of SSD is skin damage, as well as damage to the mucosa of the gastrointestinal system.

In order to find out how these conditions affect the metabolism of Vitamin D, we evaluated the amount of vitamin D in the blood of selected patients and also evaluated the bone mineral density of these patients.

So, according to the obtained results, it was found that 18 (43%) patients had normal bone mineral density, 14 (33%) had decreased bone mineral density, that is, osteopenia, and 10 (24%) patients had bone mineral density at the level of osteoporosis.

So, the amount of 25(OH)Vitamin D in the blood taken from SSD patients was divided into 3 different levels, i.e. insufficient, insufficient and sufficient. Analyzing the results, we can see that 25(OH)Vitamin D level is lower than normal in 57% of patients. But if we consider these indicators separately, the deficiency of 25(OH) Vitamin D in the blood was found in 21% of patients. However, the duration of diagnosis of SSD in our selected patients is different, so it was necessary to determine the duration of the disease. The average duration was 6.5 years. But 52% of patients who developed the disease in less than 5 years. In this case, we can see that the amount of Vitamin D in the blood is related to the duration of the disease. (Fig. 5) To be more specific, it was found that there is an inverse correlation between the change in the amount of 25(OH)Vitamin D in patients and the duration of the disease. r=-0.88 (strong inverse association)

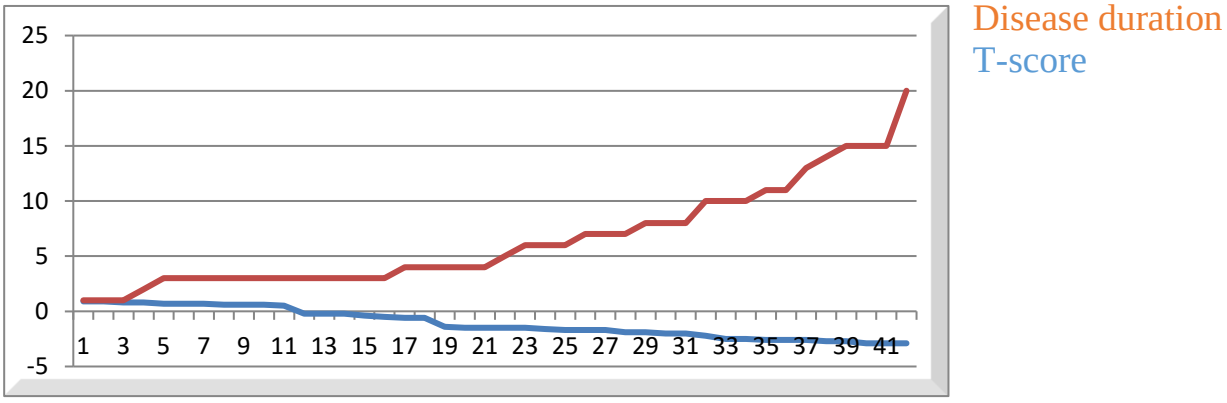

Figure 5.

Ultrasound densitometry analysis was performed in selected patients. The results were as follows: the average result of T-score was equal to -1.09. This

generally corresponds to the state of osteopenia. But if we take a closer look, bone mineral density is normal in 43% of patients, and bone mineral density is decreased in 57% of patients. (Figure 6) This situation shows that there is a correlation between the number of patients whose blood level of 25(OH)Vitamin D is lower than normal and the T-score obtained in the result of ultrasound densitometer analysis. r=0.9 (strong positive correlation)

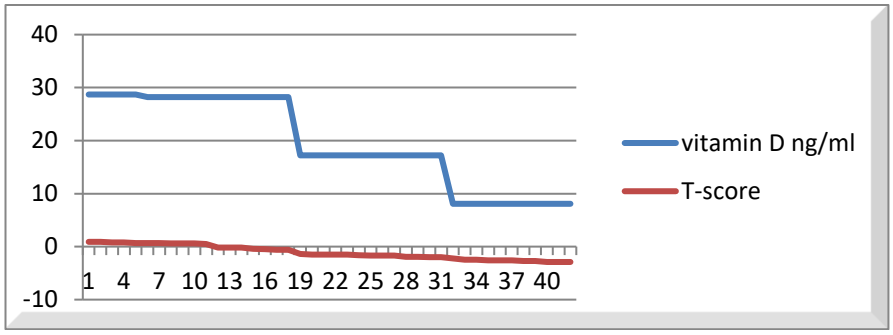

Figure 6.

Also, the correlation between the decrease in bone mineral density and the duration of the disease was strongly inverse (r=-0.8). (Fig. 7)

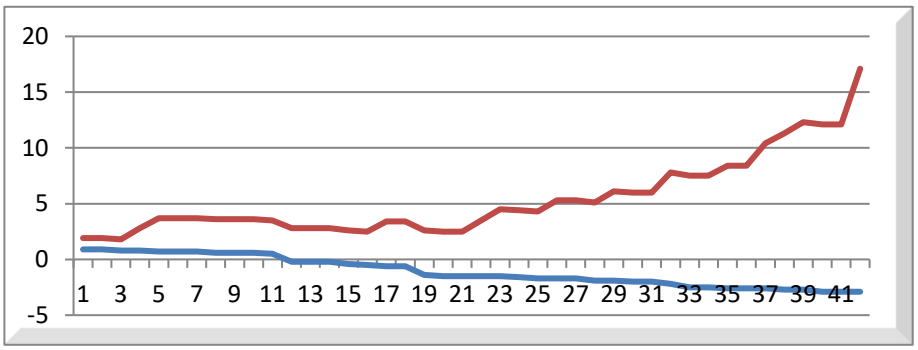

Figure 7.

According to the ultrasound densitometer analysis of the patients, 24% of the patients were assessed as having osteoporosis at the level of bone mineral density.

The average result was 15.4 when the skin damage level of the selected patients was assessed using the mRSS scale. But in 48% of patients, mRSS result is higher than 20, which means that the degree of skin damage is high (Figure 8).

Considering the special role of the skin in vitamin D metabolism, there should be a correlation between blood levels of 25(OH) Vitamin D in patients. The result was: r=-0.69 (inverse mean correlation)

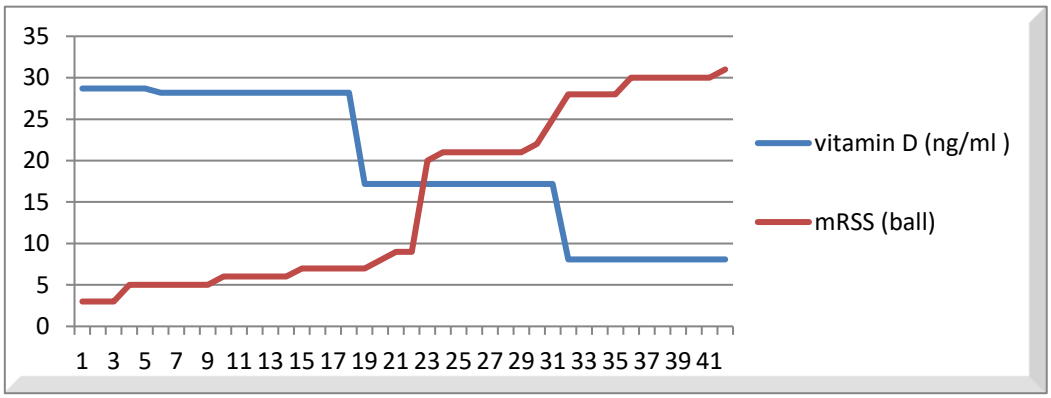

Figure 8.

Taking into account that bone growth begins to lag behind its resorption after 30-35 years of age, it is necessary to emphasize age-related changes in our patients (Fig. 9). Among the selected patients, the average age is 45 years. The correlation between the age of the patients and the result of the ultrasound densitometer performed on them had a weak inverse relationship. (r=-0.21)

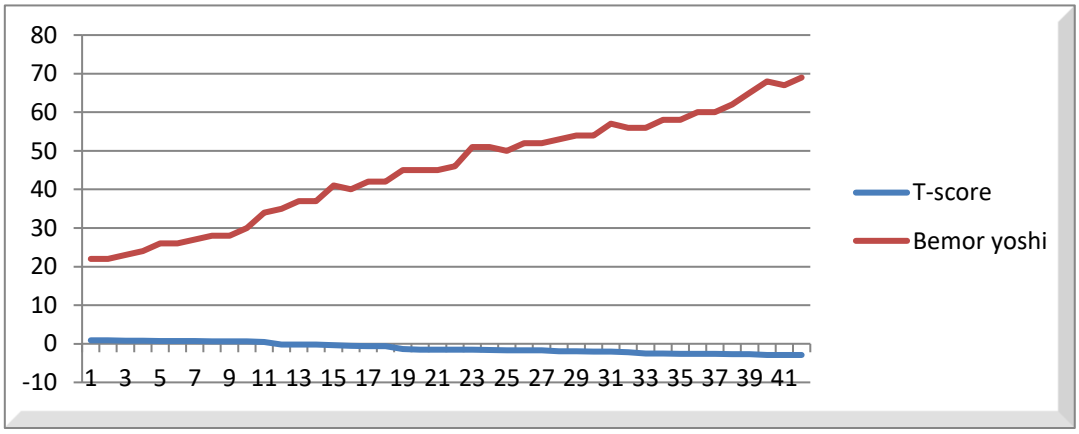

Figure 9.

CONCLUSION

1. Serum 25(OH) Vitamin D levels in SSD patients were found to be lower than normal, and this condition was found to be associated with damage to organs affecting vitamin D metabolism. It has been confirmed that the extent of damage to the skin and gastrointestinal system directly affects the amount of Vitamin D in the body.

2. Taking into account that many factors affect bone mineral density, according to the conclusion of the ultrasound densitometer analysis conducted in SSD patients, bone mineral density is low, and with this condition, the amount of 25(OH) Vitamin D in the blood, as well as the duration of SSD disease correlation gap between

3. In SSD patients, due to damage to the skin, its ability to synthesize vitamin D decreases - in most patients, the mucous membrane of the gastrointestinal

system is damaged as a result of the disease, both of these conditions increase depending on the duration of SSD.

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