BONE MINERAL DENSITY CHANGE IN RELATION TO THE PHYSIOLOGICAL VALUES OF THYROID HORMONES

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Abstract: Physiological concentrations of thyroid hormones are necessary for skeletal development, the clinical trials indicating that euthyroid status is essential for a normal bone turnover, for a normal mineralization and for maintaining the optimal bone strength. The aim of the study was to observe the influence of the physiological values of FT4 on bone mineral density. We studied a total number of 650 patients, with and without thyroid pathology, divided into three groups and three age groups, in whom we dosed the thyroid hormones; bone mineral density was measured by the DEXA method. We analyzed the influence of FT4 on bone mineral density, we followed if there is a correlation between its physiological values and the T score independent of TSH. According to our study results and of the existing data in the literature, the idea that there is a direct relation between FT4 and the degree of bone demineralization can not be supported.

INTRODUCTION

The thyroid hormones, important homeostatic regulators are lipophilic hormones, poorly soluble in water, and in blood flow, at a rate of over 95%, are bound to transport proteins: thyroglobulin, transteritina and other lipoproteins. Thyroid hormone receptors are part of many nuclear hormone receptors and function as transcription factors, together with co-regulator proteins. The last two decades research has shown that thyroid hormones, through receptors affect the bone remodelling process through direct effects on osteoblasts, the increase of osteoclasts activity is most likely the consequence of coupling the bone turnover.

The two types of thyroid receptors TRα and TRβ, with their subclasses have different actions: TRα mediates the long-term effects of chronic changes in thyroid hormones and TRβ mediates the acute effects produced by the transient changes in the levels of thyroid hormones. (8)

PURPOSE

The purpose of this study was to identify the relation between the changes in FT4 values in the euthyroid interval and the changes in bone mineral density in the patients with thyroid pathology.

METHODS

The study included 650 patients, aged between 50-70 years old, with and without thyroid pathology, divided into three groups: with total or partial thyroidectomy, with thyroid pathology, under hormone replacement therapy and the control group.

The data were collected between 2008 and 2012; the patients were selected based on inclusion and exclusion criteria and were within the Ambulatory Endocrinology and Recovery I Clinic of the Clinical County Emergency Hospital of Sibiu.

The patients were evaluated clinically (anamnesis), by ultrasound and biologically (hormonal dosage); bone mineral density was performed at the level of the lumbar spine using the energy x-ray absormetry method – DEXA.

The measurement of bone mineral density was assessed in accordance with osteoporosis screening guidelines. The results obtained following DEXA were classified in the three groups according to the WHO staging: T score < -1 or osteopenia; T score < -2.5 or osteoporosis.

The biological assessment has been made by FT4 and TSH dosage through the chemiluminescence technique with IMMULITE device; the normal values range between 0,89-1,79 ng/dl for FT4 and 0,4 -4 μIU/ml for TSH.

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RESULTS

The study is a retrospective one and analyzes a sample of 131 patients with total and subtotal thyroidectomy, a group of 257 patients with thyroid pathology and a control group of 262 patients without thyroid pathology, but with changes in bone mineral density (osteoporosis and osteopenia). All three groups were divided into three age groups: 50-59 years old, 60-64 years old, 65-70 years old.

The origin environment is preponderantly urban - 80%, compared to those coming from the rural areas 20%, the distribution on the three age groups (50-59 years old, 60-64 years old, 65-70 years old) being similar proportionally; the average age of the analysed population being of 58.47 ± 5.53 years old.

The patients were analyzed taken into account the study groups and the age groups, according to the value of FT4 hormone, which normally ranged from 0.89 to 1.79 ng/dl and which was divided into two subintervals: one to the lower limit of the normal values 0.89 to 1.1 ng/dl, the other to the upper limit of the normal values 1.1 to 1.79 ng/dl. We have also studied the relation between FT4 values and bone mineral density measured by the DEXA method.

The distribution of FT4 with normal values per study groups and age groups was as follows: in the age group of 50-59 years old, the proportion of patients with normal FT4 was of 89.5% (340 cases out of a total of 380), distributed as follows: 20% in the operated group, 45.6% in the unoperated group and 34.4% in the control group.

In the age group of 60-64 years old, 91.8% of the cases (145 of 158) were within the euthyroid FT4. Their distribution was as follows: 11% in the group of the operated patients, 29.7% corresponding to the unoperated group of patients and 59.35 in the control group.

For the age group of 65-70 years old, the incidence of cases with FT4 normal was of 91.8% (101 of 110), their distribution being as follows: 18.8% in the operated group, 23.8% in the unoperated group of patients and 57.4% in the control group. Towards the lower limit of the normal interval of FT4, within the group of operated patients, we had 32 cases (20.5%), 80 cases (51.3%) in the group of unoperated patients and 44 cases (28.2%) in the control group, all of them in the age group of 50-59 years old.

For the age group of 60-64 years old, the patients’ repartition was as follows: 7 cases (13.2%) in the operated group, 18 cases (34%) in the unoperated group of patients and 28 cases (58.8%) in the control group. In the age group of 65-70 years old, the repartition was as follows: 8 cases (23.5%) in the operated group, 7 cases (20.6%) in the unoperated group and 19 cases (55.9%) in the control group.

Regarding the upper limit of the FT4 euthyroid, in the age group of 50-59 years old, we had 36 patients (20.2%) of the operated group, 74 patients (41.6%) in the unoperated group and 68 patients (38.2%) in the control group.

The age group of 60-64 years old includes: 9 patients (10.2%) in the operated group, 25 patients (28.4%) in the unoperated group and 54 patients (61.4%) in the control group. The age group of 65-70 years old includes: 11 patients (16.4%) in the operated group, 17 patients (25.4%) in the unoperated group and 39 patients (58.2%) in the control group.

We also analyzed the situations where the FT4 was above the upper limit (> 1.79 ng/dl) and below the lower limit (< 0.89 ng/dl) of the normal values. 2 patients had elevated FT4 within the operated group, 14 patients in the unoperated group. In the case of low FT4, 26 patients are in the operated group and 20 patients in the unoperated group. We noticed whether bone mineral density measured by the DEXA method and expressed by the T-score was influenced under euthyroid conditions (normal FT4, TSH normal). In the age group of 50-59 years old, 51.6% of patients had osteopenia, the majority belonging to the unoperated group (54.4%); corresponding to the age group of 60-64 years old, 49.2% were still with osteopenia and in the age group of 65-70 years old, 55.1% were in the same situation (p = 0.004).
If the value of FT4 is at the lower limit, we talk about osteopenia in the age group of 50-59 years old, 55.9% of the study patients, in the age group of 60-64 years old, 52.4% and in the age group of 65-70 years old, 55.6%, the increased weight occurring in each age group of the operated group (p = 0.047).

If FT4 value is at upper limit, we also talk about osteopenia in all groups and in all age groups, within the group of unoperated. It was followed that it also is more expressed compared to the control group of patients and those operated and, in the age group of 50-59 years old (p = 0.004).

We analyzed the situation when FT4 is at the lower limit of the normal values and TSH is increased, the results were as follows: 74.3% of the patients of the age group of 50-59 years old had osteopenia, with a share of 77.8% in the unoperated and 70.6% in the operated group. Regarding the patients of the age group of 60-64 years old, a total of 63.6% had a T score corresponding to osteopenia, 75% in the operated group and 57.1% in the unoperated group. For the age group of 65-70 years old, 50% had osteopenia, of which 66.7% were in the operated group and 33.3% in the unoperated group (p = 0.85).

It was followed the situation when FT4 was at the upper limit of the normal values and TSH is increased, in the age group of 50-59 years old, 34.6% had osteopenia, 23.1% had osteoporosis; in the age group of 60-64 years old, 57.1% cases had osteopenia and in the age group of 65-70 years old, 60% had osteoporosis.

Regarding the association of FT4 at the upper limit and low TSH, osteopenia occurred in 69.2% of patients within the age group of 50-59 years old, in 71.4% of those aged between 60-64 years old and in 66, 7% of those aged between 65-70 years old.

**CONCLUSIONS**

The present research does not emphasize significant changes of bone mineral density in case FT4 is at the upper or lower limits of the normal values.

A significant correlation has been observed between the age of the patients and bone mineral density and not between the TSH variations above the normal limits.

**REFERENCES**


