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Original Article

Bone Mineral Density and 25-Hydroxyvitamin D Levels in Patients With Ocular Pseudoexfoliation Syndrome: A Case–Control Study

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Abstract

The objective of this study was to evaluate bone mineral density (BMD) and 25-hydroxyvitamin D (25(OH)D) levels in patients with ocular pseudoexfoliation (PEX) syndrome. Subjects with ocular PEX syndrome were included in the PEX group and subjects without PEX syndrome were defined as the control group. 25(OH)D levels were measured by chemiluminescence microparticle immunoassay method. BMD measurements were obtained from the femoral neck and lumbar spine by using dual-energy X-ray absorptiometry. The results were expressed as gram per square centimeter, *T*-scores (standard deviation compared to a healthy 30-yr-old male), and *Z*-scores (standard deviation compared to the subject's age). Independent *t*-test was used to compare the mean and medians of the groups. The PEX group consisted of 23 subjects with a mean age of 71.09 ± 2.02 yr and the control group consisted 46 subjects with a mean age of 67.04 ± 1.34 yr. There was no significant difference between the groups as regards the BMD measurements (gram per square meter), *T*-scores, and *Z*-scores. Both groups have low 25(OH)D, yet vitamin 25(OH)D levels were similar in the groups ($p > 0.05$). In the light of our results, although patients with ocular PEX have low BMD and 25(OH)D, BMD and 25(OH)D do not appear to be linked to ocular PEX syndrome in our study population.

Key Words: Exfoliation syndrome; osteomalacia; osteoporosis; vitamin D deficiency.

Introduction

Pseudoexfoliation (PEX) syndrome is a well-recognized late-onset disease characterized by the accumulation of microscopic granular amyloid-like protein fibers *(1)*. These deposits primarily accumulate in the eyes (Fig. 1). This condition is an age-related disorder and ocular PEX syndrome prevalence has been reported as approx 3.5%–5.7% in different populations *(2–4)*. Nonetheless, previous studies have established that PEX deposits have been found in a variety of extraocular locations such as skin, heart, lungs, liver, and kidney tissues. As such, PEX has been accordingly accepted as a systemic disorder *(5,6)*.

Regarding the association of musculoskeletal system disorders and PEX in the literature, there are limited data. Until now, the association between osteoarthritis and PEX has been reported *(7)*. 25-Hydroxyvitamin D (25(OH)D) levels in patients with exfoliation syndrome have also been studied, whereby vitamin D levels were similar between exfoliation syndrome and control subjects *(8)*. However, to the best of our knowledge, bone mineral density (BMD) in patients with PEX has not been studied yet. Accordingly, the aim of the present study was to evaluate the BMD and 25(OH)D levels in patients with ocular PEX syndrome.

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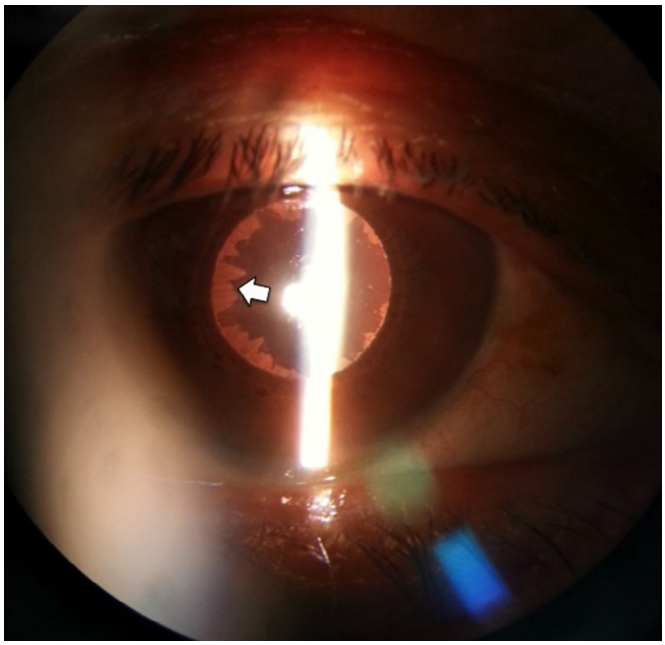

Fig. 1. Pseudoexfoliative (white dandruff-like) material on the anterior lens capsule (*white arrow*).

Materials and Methods

Study Design and Participants

The present study was set as case–control and analytic study. Subjects with ocular PEX syndrome were included in the PEX group (n) and subjects without PEX syndrome who were admitted to the outpatient clinic of our hospital between April 2015 and August 2015 were defined as the control group (2n). Time period was defined as the spring–summer period to dismiss the seasonal changes in the 25(OH)D levels. Exclusion criteria were previous treatment for osteoporosis or treatment with vitamin D, thyroid and other endocrine disorders, chronic renal or liver disease, corticosteroid use, immobility, stroke and other neurological diseases, rheumatic disorders, consumption of more than 2 cups of coffee and more than 3 alcoholic drinks per day, smoking, malignancy, malabsorption, weight loss, and severe lung or cardiac disorders.

The current study was approved by the local ethics committee. All subjects were informed and consented to participate in the study.

Data Collection

Clinical and demographic features of the subjects, including age, body mass index, concomitant disorders, and laboratory levels, were recorded. 25(OH)D levels were measured by chemiluminescence microparticle immunoassay method (imprecision was <10% within laboratory coefficient of variation). Venous blood samples were obtained after a 12-h overnight fast. BMD measurements were obtained from the femoral neck and lumbar spine by using dual-energy X-ray absorptiometry. The results were expressed as gram per square centimeter, *T*-scores (sd compared to a healthy 30-yr-old male), and *Z*-scores (sd compared to the subject's age).

Statistical Analysis

SPSS version 16 (SPSS Inc., Chicago, IL) was used for the statistical analyses. Data were expressed as mean ± standard deviation. Categorical variables were compared with chi-square test. Independent *t*-test was used to compare the mean and medians of the groups after checking if the variables were normally distributed. A p value of 0.05 was set as statistically significant.

Results

A total of 69 patients were included in the present study. The PEX group consisted 23 subjects with a mean age of 71.09 ± 2.02 yr and the control group consisted 46 subjects 67.04 ± 1.34 yr. Demographic and clinical features of the subjects are summarized in Table 1. There were no significant difference between the groups with respect to age, body mass index, and diabetes mellitus ($p > 0.05$). However, there was a significant difference between the groups with regard to gender and hypertension ($p < 0.05$).

BMD levels of the subjects are shown in Table 2. There was no significant difference between the groups as regards the BMD measurements as (gram per square centimeter), *T*-scores, and *Z*-scores. Laboratory parameters are shown in Table 3. Both groups have low 25(OH)D, yet vitamin 25(OH)D levels were similar in the groups ($p > 0.05$). When the unilateral and bilateral PEX subgroups were compared, no significance difference was found with respect to the BMD values (all >0.05).

Table 1
Clinical and Demographic Features of the Groups

Variable	PEX group (N = 23)	Control group (N = 46)	p value
Age (yr)	71.09 ± 2.02	67.04 ± 1.34	0.11
Gender, n (%)			
M	11 (47.8)	9 (19.6)	0.26
F	12 (52.2)	37 (80.4)	
BMI (kg/m^2)	25.75 ± 3.7	27.43 ± 3.99	0.99
PEX, n (%)			
Unilateral	7 (30.4)	0	—
Bilateral	16 (69.6)	0	
HT, n (%)	7 (30.4)	28 (60.9)	**0.03**
DM, n (%)	3 (13)	6 (13)	0.73

Note: Bold p value denotes significance.

Abbr: BMI, body mass index; DM, diabetes mellitus; F, female; HT, hypertension; M, male; PEX, pseudoexfoliation.