Parkinson's Disease and Bone Mineral Density: Preliminary Report

PARKİNSON HASTALIĞI VE KEMİK MİNERAL YOĞUNLUĞU: ÖN ÇALIŞMA

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Summary

Purpose: This study was planned to compare the osteoporosis as a risk factor for traumatic fractures in patients with Parkinson's disease (PD), with age and sex matched patients with primary osteoporosis.

Materials and Methods: We measured bone mineral density (BMD) at the lumbar spine (L2-L4) and femoral neck regions by Lunar DPX in 20 patients with Parkinson's disease who were being followed at our outpatient clinic. Sixteen age and sex matched subjects served as controls. Body mass index were evaluated in two groups. Serum levels of calcium, PTH and 25OH vitamin D were also assessed.

Results: The bone mineral densities of lumbar spine and femoral (neck) regions were 0.862±0.2 g/cm^2 and 0.665±0.2 g/cm^2 in patients, and 0.754±0.1 g/cm^2 and 0.685±0.1 g/cm^2 in controls respectively. There was no statistically significant difference between patients and controls regarding BMD. In addition, we divided patients into two groups according to Hoehn and Yahr disability index and we found that there was also no significant correlation between bone mineral density and disability index in the patient groups. There was no significant difference between groups concerning serum PTH, 25-OH-vit D, and calcium.

Conclusions: Although the limited number of patients, results suggests that bone mineral density as a risk factor for hip fracture in patients with PD is not different from primary osteoporotic patients.

Key Words: Bone mineral density, Parkinson's disease, Primary osteoporosis

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Özet

Amaç: Bu çalışma Parkinson Hastalığı (PH) tanısı alan bireylerde travmatik kırıklar için bir risk faktörü olan osteoporozun sıklığı ve klinik özelliklerini belirlemek ve yaş-cins uyumlu primer osteoporoz hastaları ile karşılaştırmak amacıyla planlandı.

Gereç ve Yöntem: Hastanemiz Nöroloji Kliniği Hareket Bozuklukları Birimi tarafından izlenmekte olan 20 hastada Lunar DPX cihazı ile femur boynu ve L2-4. lombar vertebralardan kemik mineral yoğunluğu (KMY) ölçüldü. Fizik Tedavi ve Rehabilitasyon Polikliniği Osteoporoz birimi tarafından primer osteoporoz tanısıyla izlenen 16 hasta kontrol grubu olarak değerlendirildi. Serum kalsiyum, parathormon (PTH) ve 25OH vitamin D düzeyleri ölçüldü.

Bulgular: Lomber vertebralar ve femur boynundan ölçülen KMY oranları hasta grubunda sırasıyla 0.862±0.2 g/cm^2-0.665±0.2 g/cm^2 ve kontrollerde 0.754±0.1 g/cm^2 ve 0.685±0.1 g/cm^2 idi. KMY açısından hasta ve kontrol grupları arasında belirgin fark saptanmadı. Ayrıca biz hastaları Hoehn and Yahr disability index skorlarına gore iki gruba ayırdık ve PH ağırlığı ile KMY arasında anlamlı korelasyon saptanmadı. Serum değerleri açısından da hasta ve kontrol grupları arasında anlamlı fark saptanmadı.

Sonuç: Hasta sayımız yeterli olmamakla birlikte sık düşme potansiyeli yüksek olan PH'lı olgularda kalça kırıkları için önemli bir risk faktörü olan osteoporozun, PH'lı olgularda primer osteoporotik bireylerden anlamlı farkı olmamakla birlikte daha geniş serilerde konunun araştırılmasının yararlı olacağı görüşündeyiz.

Anahtar Kelimeler: Kemik mineral yoğunluğu, Parkinson Hastalığı, Primer osteoporoz

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Parkinson Disease (PD) is a significant cause of falls and reduced mobility in the elderly. Fractures occur as a result of falls and reduced bone mass and may be the cause of fractures (1-3). Especially hip fractures were reported in patients with PD. Hip fractures are associated with more deaths, disability and medical costs than all other osteoporosis related fractures combined. Many reports have indicated low BMD of the lumbar spine and hip joint (4). It has been also suggested

that women are more likely to sustain fractures than men (5-7). Yamada et al found that osteoporosis and fractures are common in female patients with PD (8). Patients with hip fracture have lower bone mineral density (BMD) in PD and bone mineral density also correlates with disease severity (1-3). Authors also suggested that vitamin D deficiency may play a role in reduced bone mass in PD (3). Vitamin D deficiency may be a result of immobilization and reduced exposure of sunlight (1,2). Sato et al. reported that increased serum 1,25 OH vitamin D3 with treatment may reduce the risk of hip fracture (2).

Ishizaki et al. found osteopenia of the second metacarpal bone in 53.6% of female patients with PD and in 26% of male patients with PD (1). However bone changes and calcium metabolism in PD have not been fully examined in PD.

This study was aimed to compare the osteoporosis as a risk factor of traumatic fractures in patients with PD, with age and sex matched patients with primary osteoporosis. We also correlated BMD of patients according to Hoehn and Yahr (HY) stage in order to determine about the risk of the reduced bone mineral density in patients with PD.

Subjects and Methods

Twenty patients (10 women, 10 men) diagnosed as PD and 16 (9 women,7 men) age and sex matched primary osteoporotic patients (T<- 2.5, according to WHO criteria) were enrolled in the study.

Patients with a history of any drugs or disease known to effect bone metabolism, trauma, and patients with a previous history of no vertebral fracture also were excluded. We assessed patient with PD according to Hoehn and Yahr scale (11). Patients were divided into two groups according to functional independence: group I was 11 patients in HY stage I and II, and group II was 9 patients in HY stage III to V. All of the patients were receiving levodopa treatment at least one-year duration when they were studied.

Body mass index, serum total calcium, vitamin D (25 OH D3), parathyroid hormone (PTH), osteocalcin, and serum calcium level were also assessed for all subjects. The level of calcium (normal value: 8-10 mg/dl) in serum was determined by calorimetric assay with endpoint determination in Roche diagnostics (Modular system instrument, o-cresophtalein complexone method, cat .no: 1730240). The quantitative determination of intact PTH (normal value was 20-60 pg/dl) in serum was analyzed with electrochemiluminescence immunoassay (Elecsys PTH Immunoassay, Elecsys 1010/ 2010 systems, cat no 1972163, Roche Diagnostics, Mannheim, Germany). 25-OH vitamin D3 (normal value: 10-40 ng/dl) were assess with RIA (UK). On the basis of previously reported data, the serum 25-OHD concentration was defined as deficient when lower than 10 ng/ml (5).

DEXA (Lunar-DPX) was used to assess the BMD at lumbar (L2-4) and femoral (neck) regions in both patients and controls.

The statistical tests were performed using SPSS 9.0 version software package. Data were represented as the mean ±SD. Means were compared using independent sample t-test for two groups. Group differences of data were tested by Pearson- chi-square analysis. One–way analysis of varience (ANOVA) was used to assess the differences between patients . Pearson's rank correlation coefficient was calculated.

Results

Clinical characteristics of all subjects are shown in Table 1. No significant differences were observed between patient groups and controls, except duration of illness (p=0.001). All the female patients were at postmenopausal period. The mean duration of menopause was 10.2±5.3 years for patients and 10.5±6.4 years for controls.

The mean BMD of lumbar (L2-L4) and femoral (neck) region were low in both groups of patients and controls but there was no statistically significant difference between PD patients and controls (p=0.268, p=0.624). There was no sta-

Table 1. Characteristics of patients and controls

Variable	Controls (n=16)	Group I (n=11)	Group II (n=9)	p
Age (year)	65.3±5.9	64.5±6.7	66.4±5.9	0.13
Gender (M/F)	7/9	6/5	4/5	0.591
Duration of illness (yr)	–	7.2±6.4	9.2±8.4	0.001*
BMI (kg/m^2)	25.2±4.6	27.2±4.2	26.5±6.0	0.644
Lumbar BMD (g/cm^2)	0.754±0.1	0.857±0.2	0.867±0.2	0.268
T score	-2.53±0.1	-2.52±0.1	-2.50±0.1	0.264
Femur BMD (g/cm^2)	0.685±0.1	0.689±0.1	0.646±0.1	0.624
T score	-2.65±0.2	-2.72±0.2	-2.74±0.	0.645
PTH (pg/ml)	56.6±20.3	45.8±11.3	45.5±25.6	0.531
25 OH $vitD_3$ (ng/ml)	18.0±10.2	14.28±10.3	20.11±13.0	0.585
Ca (mg/dl)	9.2±5.3	9.0±2.4	9.1±3.5	0.650

* Significant difference ($p<0.05$)

Table 2. Characteristics of patients with Parkinson's disease

Variable	Male (n=10)	Female (n=10)	p
Age (year)	67.5±7.6	66.0±5.2	0.431
BMI (kg/m^2)	25.5±1.9	28.2±7.0	0.01
Duration of illness (year)	8.7±9.0	8.0±6.1	0.238
Lumbar BMD (g/cm^2)	0.819±0.1	0.806±0.2	0.285
T score	-2.510.1	-2.65±0.1	0.280
Femur (neck) BMD (g/cm^2)	0.685±0.1	0.645±0.1	0.442
T score	-2.71±0.1	-2.75±0.1	0.550
25 OH vit D_3 (ng/ml)	20.6±13.5	14.5±9.9	0.462
PTH (pg/ml)	47.7±37.8	43.0±27.7	0.276
Calcium (mg/dl)	9.5±0.1	9.1±2.4	0.230

statistically significant difference between groups regarding PTH, 25-OHD and serum calcium**.** No differences were observed between men and women for age, duration of illness, BMD, Hoehn and Yahr stage, serum level of PTH, serum concentration of 25 OH D and serum total calcium. However, Body mass index was lower in men than women (p=0.01). There was no correlation between BMD, PTH, 25 OH D, serum calcium, duration of illness, age, BMI and Hoehn and Yahr stage in two patient groups.

Discussion

In the present study we found that, bone mineral density was not different in PD patients than controls at femoral (neck) region and lumbar spine region. We also assessed BMD according to HY disability scale in two patient groups and we found no significant difference between groups regarding BMD. Kao et al reported that BMD in lumber spine is low in PD patients with high HY (6). However we suggest that only HY scale is not sufficient to evaluate the severity and rate of osteoporosis in PD patients. Other risk factors and determinants should be kept in mind such as ambulation status, sex, age, gender, genetics, nutritional habits, life style and peak bone mass and body weight. Also exposure to sunlight and dietary intake are important as the determinants of the BMD (1-3).

Since vitamin D levels have shown seasonal fluctuations, serum levels of patients and controls were measured during the same season. Sunlight deprivation due to immobilization and decreased dietary intake of vitamin D may be the causes of vitamin D deficiency and also low BMD (6,7). In the present study, we did not find any significant difference between patients and controls regarding 25-0HD levels. It may be related with nutritional habitués and exposure to sunlight .

It has been also suggested that prolonged survival may contribute to low bone mass and increased risk of fracture (3-6). In the present study, the duration of illness was significant in two patient groups despite insignificant finding concerning bone mineral density, we may suggest that, patients in group II are more prone to developing osteoporotic fracture as a result of the long standing of illness.

It has been reported that hip fractures occur frequently in elderly PD patients of both sexes (7,8). In addition, PD patients are prone to falls (3,6). It has been also shown that PD patients with hip fractures have lower BMD than controls at hip region (9-13). However, we could not find any statistically significant difference of BMD of femur in patients than controls. Therefore, further follow-up of these patients is needed to evaluate for risk of osteoporotic fracture in future.

It was concluded that PD patients like osteoporotic patients are prone to falls and immobilization-causing osteoporosis with hip fractures is also aggravated by other determined factors. Despite small number of patients in this preliminary study and insignificant finding regarding bone mineral density between groups, we suggest that, bone-strengthening agents may be taken into account as a standard therapy by measuring BMD in Parkinson such as primary osteoporosis for preventing osteoporotic fractures.

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