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Height Loss in Women Caused by Vertebral Fractures and Osteoporosis

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Abstract

Background: To investigate women, with height loss of more than three cm, without earlier diagnosed spinal fractures, for osteoporosis and vertebral fractures.

Methods: Consecutively enrolment of women aged 50–85 years with a height loss of three cm or more. 80 women with a mean age of 70 years old (51–84) were recruited. Determination was made of bone mineral density (BMD) with DXA technique on hip, lumbar spine and whole body. Lateral spine radiographs were performed on thoracic and lumbar spine.

Results: Mean height loss was 5.2 cm. Smaller vertebral fractures were diagnosed in 45% (n=36). All had osteopenia or osteoporosis on BMD measurements, and there were significant differences in T-score for hip and lumbar spine and in BMD, for the hip in subjects with and without vertebral compression.

Conclusions: Women with height loss without knowledge of earlier spinal fractures could be suspected for osteoporosis and vertebral fractures

Introduction

Height loss is common in elderly people and is rarely investigated for osteoporosis unless symptoms of pain. Elderly women, in Sweden and Norway have the highest known prevalence of vertebral and hip fractures (1,2). The life time risk of sustaining a clinically diagnosed vertebral fracture in Swedish women is estimated to 15%, which is only a subset of all vertebral fractures revealed in a radiographic examination (3,4).

Vertebral fractures are often silent and gradually result in height loss with several centimetres without patients seeking medical advice. Therefore this illness will be diagnosed late, and essential treatment could be delayed with high risk of new vertebral or other fragility fractures (5)

Vertebral fractures increase the risk for mortality and health consumption and might lead to decreased lung function, back pain, depression and decreased ADL function, and increased fracture incidence in both men and women (6–8). Fractures can arise with different degrees of shorter height. Prevalence studies of vertebral fractures have shown frequencies of 20–30% in men and women with mean ages of 63 and 64 years (9) and of 25% in 85-year-old women (10). It is still unclear how usual this is in women with height loss without considerable symptoms, not being investigated and given the right diagnosis.

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The purpose with this study was to investigate women, with a history of height loss of three cm or more, for osteoporosis and vertebral fractures. We decided to make determinations with whole body dual-energy-x-ray absorptiometry (DXA), together with conventional X-ray of the spine in order to determine the prevalence of osteoporotic spinal fractures in this group.

Material and methods

The investigation was performed in the area of Mölnlycke Primary Health Care Centre comprising about 15000 inhabitants. There are about 2300 women between 50–85 years old living in the district and in this age group 100 were recruited with advertisements in the community press. All, that had decreased more than three cm in height since they were 25 years old without earlier medical diagnose, were consecutively enrolled. Height at 25 years of age was based on personal knowledge, and the participators answered a questionnaire regarding earlier height, smoking habits, earlier fractures, heredity or use of corticosteroids. Control measurements of their height loss together with actual weight and body mass index were done at the Primary Health Centre before inclusion in the study. 120 women were willing to participate after reading the advertisement. 98 fulfilled inclusion criteria of height loss of more than three cm. Fourteen subjects could later not take part due to social reasons and of the remaining 84, four could not perform all investigations due to other diseases, why 80 completed the study.

Measurements of bone mineral density were done with whole body DXA (Hologic 4500 A) at the Osteoporotic Clinic in Göteborg with determination of hip, lumbar spine and whole body.

X-ray examinations were performed with the thoracic and lumbar spines projections (lateral spinal radiographs) to identify spinal fractures. The results were assessed by experienced radiologists.

The criterion for osteoporosis, assessed by World Health Organisation (WHO), was used, which means a T-score of < –2.5 standard deviations (S.D.) of a young female population measured in lumbar spine or hip for osteoporosis and a T-score of –1.0 – –2.5 S.D. for the diagnose of osteopenia (11).

Blood tests for s-calcium were analysed at the Clinical Chemical Laboratory, Sahlgrenska University Hospital, to detect cases of primary hyperparathyroidism.

The Ethics Committee at the University of Göteborg approved the study and informed consent was obtained from each subject before participation.

Data analysis

Means and standard deviations were used for descriptive purpose, t-test for unpaired data was used together with Pearson's chi square test and p-values less than 0.05 were considered to be significant. Pearson's correlation coefficient was used for correlation calculations.

Table 1. Mean values of T-score and BMD (bone mineral density, g/cm^2)

	n	T-score	S.D.	n	BMD	S.D.
Hip	77	–1.323	1.122	76	0.815	0.136
Back	79	–1.497	1.553	79	0.890	0.174
Whole body	77	–2.066	1.147	77	0.924	0.099

Results

The participation rate was 80 women in the study who all were tested with s-calcium. Complete measurements with DXA were performed in 76 subjects. Hip prosthesis (3 subjects), personal reasons, other diseases and technical problems made complete investigations impossible for four patients.

Four of the 80 women had earlier visited a doctor for suspicion of osteoporosis. One had suffered a hip fracture treated with calcium and D-vitamin and three had been given corticosteroids for asthma and rheumatic disease in periods without treatment for osteoporosis or performance of spinal X-ray. None of them had vertebral compressions. The mean age of the group who completed the measurements was 70 years with a range of 51–84 years. Ten were smokers. Their height loss compared to 25 years old was from three cm to eleven cm with a mean value of 5.2 cm and a median value of 5 cm. X-ray of thoracic and lumbar spine could be performed in 80 patients and compressions of the thoracic and lumbar vertebras were diagnosed in 36 (45%) of the patients. The fractures were in a majority, smaller wedge-shaped ventral compressions. The rest of the subjects (44/80) had in a mostly findings of spondylosis and disc degeneration, explaining their height loss. The mean height loss for subjects with vertebral compressions (n=36) was 5.3 cm (range 3–11 cm) compared with 5.0 cm (3–8 cm) for the other 55% (n=44) without demonstrated vertebral compression. The differences were not significant. T-score and BMD determinations could be performed in 76–79 subjects with lumbar, hip and whole-body DXA (three had hip prosthesis) and the results are shown in Table 1. Mean values of T-score for all subjects corresponded to osteopenia in accordance with the WHO criteria (T-score –1.0 – –2.5 S.D.).

In the group with X-ray demonstrated vertebral compressions (n=36) 14 subjects had lumbar spine T-scores corresponding with osteoporosis (T-score < –2.5) compared to eight in the group without fractures (n=44).

There were ten individuals of the DXA hip measurements with vertebral fractures who were osteoporotic against two without fractures and among the results from DXA whole body determinations there were 14 with osteoporotic values against 13 without vertebral fractures. T-scores for individuals with vertebral compression differed significantly form the group without compression with p-values in back p=0.017. Values in hip were also significant (p=0.012) but not in whole body determination (p=0.091) (Table 2). The same pattern was demonstrated for BMD values, which showed a significant difference (p=0.037) in the back with and without

Table 2. Mean T-scores with and without vertebral compression

	With compression			Without compression			p p age adjusted
	n	T-score	S.D.	n	T-score	S.D.	
Hip	34	–1.7	1.3	43	–1.0	0.9	p=0.012 p=0.014
Back	35	–1.9	1.5	44	–1.1	1.5	p=0.017 p=0.019
Whole body	34	–2.3	1.2	43	–1.9	1.1	p=0.091 ns p=0.136 ns

Table 3. Mean BMD with and without vertebral compression

	With compression			Without compression			p p age adjusted
	n	BMD	S.D.	n	BMD	S.D.	
Hip	34	0.77	0.15	42	0.85	0.11	p=0.014 p=0.012
Back	36	0.85	0.18	43	0.93	0.17	p=0.037 p=0.073 ns
Whole body	34	0.90	0.1	43	0.94	0.1	p=0.091 ns p=0.136 ns

vertebral fractures. There were also significant differences in the hip (p=0.014), but not in whole body DXA (p=0.093) (Table 3). After age adjustments the differences remained significant regarding T-score but not for BMD in back (table 2, 3).

Chi-square test for proportions of individuals with and without osteoporosis showed a significant difference for subjects with and without vertebral fractures in hip (p=0.007), back (p=0.031) but not for whole body (p=0.037). .

Mean values of body mass index (BMI) was 27.8 kg/m2 in the group without vertebral compressions and 26.3 kg/m2 in the fracture group with a difference of 1.5 (p=0.07). Mean values of the weight were 71.3 kg and 66.9 kg with a difference of 4.4 kg (p=0.08).

Mean age of patients with spinal fractures was 71 years and 68 years without fractures, however not significant. The differences in T-score and BMD were significant also after correction for age except for BMD in the spine.

Correlation between vertebral fractures and osteoporosis, adjusted for age and BMI, was significant in the hip (p=0.021), but not in the back (p=0.067) or in the whole body determinations (p=0.526).

Mean values of s-calcium for the 80 subjects were 2.43 mmol/l (range 2.22 –2.78). Actual reference area was 2.20–2.60 mmol/l, and one individual had a value of 2.78 that was normalised at control. At follow-up later it raised again, and she was after two years operated for a parathyroid adenoma.

Discussion

This investigation has showed that reason for height loss of three cm or more in women, in 45 per cent in our material, was undiagnosed vertebral compression. This was correlated to osteoporosis and a possibility to suspect this diagnose was their height loss.

Lower weight and BMI also seemed to correlate with a higher degree of spinal fractures, with values close to significance.

The differences of BMD and T-score between subjects with or without vertebral compression were significant but the numerical values were maybe not as large that these values could be used for safe diagnosing of vertebral compressions. Completion with X-ray were necessary for definite diagnose.

The recruitment of participators was not done randomly from a population but with advertisement that is becoming more usual in clinical research. All women except four, who wanted to take part, had however not been investigated earlier for their height shortening and had also no current history of back pain leading to medical examination, why the group was valuable to investigate. The prevalence of spinal fractures in our material was 45% which seems high compared to other studies where prevalence values from two to 39% have been demonstrated in men and women in different countries (1,8, 12–16). However, those studies were prevalence investigations in contrast to our trial comprising women with known height loss.

The differences in height between the groups were small and not significant. However, the group without vertebral compressions had spondylosis and other changes that explained their height loss. The compressions were also small, which indicate that they had occurred without symtoms. This means also that it is necessary to make further investigations in those subjects to obtain a right diagnose.

Should elderly women with height loss be screened for osteoporosis and spinal fractures? Height loss up to five cm could also be explained with decreased intervertebral discs, and in our limited material we could find this. As we could demonstrate a high prevalence of spinal fractures correlated to height loss larger investigations should be performed. Considering the high costs of osteoporotic fractures and inability with movement that will follow spinal and other fragility fractures, it must be important to identify these patients in the primary health care (17). This is of value as there is an association between vertebral fractures and increased mortality in patients with osteoporosis (18,19). In many treatment studies against osteoporosis, vertebral compression is used as primary endpoint showing that the risk of a new vertebral compression in the year following an incident vertebral fracture is about 20 per cent (7, 20). To screen all women in this age group is however not recommended because it is not possible to identify individuals who will develop a future fracture (21).

With limited resources for DXA measurements referral to spinal X-ray should be done in suspected cases.

We conclude, that among our group of women with height loss of more than three cm without earlier known osteoporotic disease or fracture, both spinal fractures (46%) and osteoporosis were common.

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