

ROLE OF CALCIUM SUPPLEMENT AND EXERCISE IN MANAGEMENT OF WOMEN HAVING OSTEOPENIA AND OSTEOPOROSIS

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ABSTRACT

Objective: To measure the effects of calcium supplements and exercise on bone mineral density in women between 35-70 years.

Design: Quasi experimental study.

Place and Duration of Study: The study was conducted in the department of gynecology Combined Military Hospital Abbotabad, from July 2004 to June 2006.

Patients and Methods: Based upon bone mineral densities T score 39 patients were assigned to group A (osteopenic) and 20 patients to group B (osteoprotic). Both groups were subdivided into I and II groups. The cases in group-IA and group-IIA were given calcium Ossonate 800 mg in two divided doses. Whereas, the cases in group-IB and group-IIB were advised to take dietary calcium in the form of two glasses milk (300 mg calcium/glass) and one hour brisk walk daily.

Results: Better improvement in bone mass density was noted in group I-B patients as compared to other groups.

Conclusion: In osteopenia a combination of dietary supplementation and brisk walk is beneficial in maintaining or improving bone mineral density. In osteoporosis, the more severe form of the disease, simple calcium supplements or dietary calcium supplementation with exercise are not helpful.

Keywords: Osteopenia, osteoporosis, bone mineral density, calcium, exercise

INTRODUCTION

Bone mineral density (BMD) has been known to decline in middle-aged and elderly individuals, but when this decline begins and the rate at which it occurs remain unclear [1]. The risk factors include increasing age, female sex, post menopausal period inactivity, dietary deficiency of calcium and vitamin D, high dietary sodium, high caffeine intake, tobacco and alcohol use, hyperthyroidism, hyperparathyroidism, renal failure and prolonged intake of drugs like steroids and anti-epileptics. Loss of BMD is characterized by low bone mass and structural deterioration

of bone tissue, leading to bone fragility and an increased susceptibility to fractures [2]. In elderly postmenopausal women hip and spine fractures are associated with particularly high morbidity and mortality [3].

BMD is measured by using different techniques including single x-ray absorptiometry, quantitative CT scan, simple photon absorptiometry and dual-energy x-ray absorptiometry. These techniques require specialized equipment and technical expertise and are not readily available. Ultrasound uses sound waves to determine BMD, usually on heel. It is readily available, painless, does not use potentially harmful radiation and can be easily used in an office setting [4]. In 1994 The World Health Organization (WHO) proposed a clinical definition of osteoporosis based on measurements of BMD. According to the

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WHO definition, a patient is osteoporotic based on a BMD measurement that is 2.5 standard deviations (SDs) below typical peak bone mass of young healthy white women. This measurement of standard deviation from peak mass is called the T score [2,5]. Regarding the interpretation of bone densitometric findings, a T-score of more than 1 standard deviation (SD) but less than 2.5 SDs below the mean peak value confirms osteopenia and a level more than 2.5 SDs below the mean peak value is diagnostic of osteoporosis [2,6].

Because osteoporosis is irreversible, the most effective approach to reduce morbidity and mortality from this disease is to maximize peak bone mass and minimize bone loss. Available evidence indicates that postmenopausal women should consume 1000-1500 mg of calcium and 400 to 800 IU of vitamin D per day to minimize bone loss [3]. Walking is also effective in slowing the rate of bone loss from the legs [3].

The present work is an effort to measure the effects of calcium supplements and exercise on bone mineral density.

PATIENTS AND METHODS

Women between 35 to 70 years of age, reporting to Gynecology and Obstetrics outpatient department of Combined Military Hospital (CMH) Abbottabad, from July 2004 to June 2005 were enrolled in the study after an informed consent.

Pregnant ladies, patients on corticosteroids and on hormone replacement therapy and those not willing to participate in the study were excluded. All queries were translated in the language best understood by the participant.

Heel bone mineral density was measured by DXA (Hologic QDR-4500; Bedford, MA, USA) and bone mineral density (BMD) T - score was estimated. Based on T - score the patients were divided into "Group I" and "Group II". All cases with a score range from -1.0 to - 2.5 were diagnosed to have osteopenia and were placed in group-I. The

cases with a score below -2.5 were diagnosed to have osteoporosis and were placed in group-II.

Both groups were subdivided into A and B on the basis of method of calcium intake, which was decided on the will of the participants. The cases in group-IA and group-IIA were given calcium Ossionate 800 mg in two divided doses. Whereas, the cases in group-IB and group-IIB were advised to take dietary calcium in the form of two glasses milk (300 mg calcium/glass) and one hour brisk walk daily.

A proforma was designed which included personal particulars, brief history, initial examination and BMD of heel in terms of T - score at first visit, second visit after 03 months and third visit after 06 months.

Analyses of data were carried out with the help of computer software of Statistical Package for Social Sciences (SPSS V- 12). P-value < 0.05 was Paired t - test was applied considered as significant. Descriptive statistics were used to describe the data.

RESULTS

Out of 500 total women screened for bone mineral density, 149 (29.8%) showed evidence of decreased BMD. Out of these 107 (71.8%) cases were diagnosed suffering from osteopenia, whereas 42 (28.2%) cases had osteoporosis. The mean age of osteopenia cases was 45 years with a range from 35 to 50 years. The mean age of osteoporosis cases was 66.7 years with a range from 35 to 70 years. The only one lady with the age of 36 years had severe osteoporosis, who was on tablet warfarin for treatment of deep vein thrombosis (DVT). Only 3 (2.8%) cases in osteopenic group had history of fracture in previous 2 years, whereas 10 (23.8%) cases with osteoporosis had history of fractures in previous 2 years.

Only 59 out of 149 cases with decreased BMD consented for further participation. Thirty nine cases with osteopenia were placed in Group-I, whereas 20 osteoporotic cases were placed in group II. Thirty nine cases of

group-I were divided in to group-IA having 18 cases and group-IB having 21 cases. Out of 20 patients of group-II, 12 were placed in group-IIA and 8 in group-IIB.

BMD-T score was improved in 5 (27.8%) cases of group-IA, 12 (57.1%) cases of group-IB, 4 (33.3%) cases of group II-A and none of group II-B. Whereas BMD-T score remained static in 8 (44.4%) cases of group I-A, 8 (38.1%) cases of group I-B, 7 (58.3%) cases of group II-A and 4 (50%) cases of group II-B (table-1).

The mean BMD (Std. Deviation) for group 1-A was -1.5667(0.26122), -1.5611(0.25469), and -1.5611(0.27038), for group 1-B was -1.5714 (0.27954), -1.5429 (0.25411), and -1.4905 (0.27511), for group II-A was -2.9833 (0.38573), -2.9417 (0.40330), and -2.9500 (0.39428) and for group II-B was -2.7667 (0.2000), -2.7667 (0.2000), and -2.7750 (0.19821) at baseline, 3 months and 6 months respectively. The results of group 1B should improvement as compared to remaining three groups (table-2). No fractures were reported in any group during the study period.

DISCUSSION

Peak bone mass is achieved by the age of 30 years and it starts declining after the age 35 years. Post-menopausal osteoporosis becomes evident after 50-55 years of age [1]. In present study the patient having osteopenia were in the age range of 35-50 years and patients having osteoporosis were between 50-70 years of age except one patient having osteoporosis at the age of 36 years (on warfarin for DVT).

Use of calcium supplements alone in patients of osteopenia showed that deterioration of bone mineral density was arrested in 44.4% of patients, and 27.8% patients showed an improvement in BMD. However 27.8% patients showed a fall in BMD. Exercise and dietary calcium in osteopenic patients showed improvement in 57.1% of patients, while arrest of further deterioration in 38.1% and fall of BMD in 4.8% patients. The results showed improvement in patients taking dietary calcium supplements and exercise (table-2). Thus it is observed that exercise along with good dietary calcium helps in improving

Table-1: Different features of osteopenia and osteoporosis groups.

Groups Sub-groups	Group I - Osteopenia (n=39)		Group II- Osteoporosis (n=20)	
	I-A (n=18)	I-B (n=21)	II-A (n=12)	II-B (n=8)
Therapeutic intervention	Calcium supplements (calcium Ossonate 800mg/day)	Dietary calcium (two glasses of milk - 300 mg of calcium/glass) + walk	Calcium supplements (calcium Ossonate 800mg/day)	Dietary calcium (two glasses of milk - 300 mg of calcium/glass) + walk
Improved T-score	5 (27.8%)	12 (57.1%)	4 (33.3%)	0 (0%)
Static T-score	8 (44.4%)	8 (38.1 %)	7 (58.3%)	4 (50%)
Worsening of T-score	5 (27.8%)	1 (4.8%)	1 (8.3%)	4 (50%)
Development of fractures	Nil	Nil	Nil	Nil

Table-2: Mean (Std Deviation) BMD-T Score of the cases recorded during the study.

Groups	BMD Score			P-value
	0 Month	3 Month	6 Month	
I-A (n=18)	-1.5667 (0.26122)	-1.5611 (0.25469)	-1.5611 (0.27038)	p>0.05
I-B (n=21)	-1.5714 (0.27954)	-1.5429 (0.25411)	-1.4905 (0.27511)	P>0.05
II-A (n=12)	-2.9833 (0.38573)	-2.9417 (0.40330)	-2.9500 (0.39428)	p>0.05
II-B (n=9)	-2.7667 (0.2000)	-2.7667 (0.2000)	-2.7750 (0.19821)	p>0.05

BMD. This finding is similar to the study of Rutherford [7].

Patients having osteoporosis taking dietary calcium alone showed improvement in BMD in 33.3% of patients. BMD remained static in 58.3% while a fall in BMD was seen in 8.3% of the patients. Patients with osteoporosis on exercise and dietary calcium showed static BMD in 50% and a fall in BMD was seen in 50% of patients. None of the patients in this group showed an improvement of BMD. This is in contradiction to the findings of Laurie Barclay who observed that calcium supplements in combination with exercise can substantially improve BMD [8]. The possible reason for this could be that the patients in this group opted for dietary calcium in form of milk thus their intake of calcium was unpredictable and unreliable. None of the results in our osteoporosis group were statistically significant (table-2).

CONCLUSION

Loss of BMD is present in about one fourth of patients of age group 35-70 years of age presenting in gynecology outpatient for problems unrelated to bone. Osteopenia (occurring in age group 35-50) is more common as compared to osteoporosis (occurring in age group 50-70 years). A combination of dietary supplementation and brisk walk is beneficial in maintaining or improving BMD in osteopenic group. Calcium supplementation with or without exercise are not sufficient to help osteoporosis.

We recommend a multicentric study with large numbers of patients to be conducted for more statistically significant results.

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