Is Weekly Supplementation of Vitamin D Favorable for Treatment of Osteoporosis in Postmenopausal Women?

Mehmet Şükrü BUDAK1, Sedat AKGÖL2, Şahin ÖNEN2, Selami ERDEM3, Serkan KAHYAOĞLU4
Mine KANAT PEKTAŞ5
Şırnak, Turkey

OBJECTIVE: The present study aims to determine whether once weekly supplementation of vitamin D and alendronate is efficient and safe for treatment of postmenopausal osteoporosis.

STUDY DESIGN: Group I (42 women with postmenopausal osteoporosis) received daily supplementation of calcium (1000 mg) and vitamin D (880 IU) while group II (42 women with postmenopausal osteoporosis) had weekly supplementation of vitamin D (2800 IU) along with weekly treatment of alendronate (70 mg).

RESULTS: Group I had significantly lower lumbar spine T-scores before and after treatment. Post-treatment lumbar spine T-scores and femur neck T-scores were significantly higher with respect to pre-treatment scores in both study groups. The alterations in lumbar spine and femur neck T-scores were statistically similar in both group I and group II.

CONCLUSION: Once weekly administration of vitamin D and alendronate is an effective and safe option of treatment for women who cannot take calcium supplements for postmenopausal osteoporosis.

Key Words: Calcium, Osteoporosis, Postmenopausal, Vitamin D

Material and Method

The present study was approved by the Institutional...
This study was designed as a randomized study which aims to determine whether once weekly supplementation of vitamin D and alendronate is efficient and safe for the prevention of postmenopausal osteoporosis and whether it can be used to replace daily supplementation of calcium and vitamin D along with once weekly administration of alendronate. Due to ethical considerations, neither a control group nor a placebo group was constituted.

Subjects
A total of 84 Turkish women (age range: 45-75 years) who were diagnosed with postmenopausal osteoporosis were included in the present study. Written informed consent was obtained from each participant.

Women were excluded if their spine bone mineral density was more than two standard deviations or below the normal peak bone mineral density or if they had a history of nontraumatic spine or hip fracture. Women with disorders of bone mineral metabolism were also excluded, as well as those with recent (within one year of study entry) major gastrointestinal disease such as peptic ulcer, esophageal disease, and malabsorption. Other exclusion criteria were previous treatment with bisphosphonates or fluoride (>1 mg/day) or treatment within 12 months of enrolment with estrogen, progestin, calcitonin, glucocorticoids, anticonvulsant agents, phosphate-binding antacids, or excessive vitamin A or vitamin B.

The women who regularly used (>four times per week) any treatment that might cause gastrointestinal irritation (such as aspirin), women who smoked more than 20 cigarettes per day, or drank three or more alcoholic beverages per day were also excluded.

Treatment
The participants were randomly assigned into two groups. Group I (n=42) received daily supplementation of calcium (1000 mg) and vitamin D (880 IU) while the second group (Group II, n=42) had weekly supplementation of vitamin D (2800 IU) along with once weekly treatment of alendronate (70 mg).

Results
The present study reviews 84 Turkish women who were diagnosed with postmenopausal osteoporosis. The mean age of these women was computed to be 54.95±7.44 (range: 45-75 years). The first group of participants (Group I, n=42) received daily supplementation of calcium (1000 mg) and vitamin D (880 IU) while the second group (Group II, n=42) had weekly supplementation of vitamin D (2800 IU) along with once weekly treatment of alendronate (70 mg).

Table 1 compares the demographic features of women who were randomly assigned into group I and group II. Accordingly, both study groups were statistically similar in aspect of age, duration of menopause, parity and body mass index.

Table 2 demonstrates the lumbar spine T-scores of the women who were recruited into group I and group II. When compared with group II, group I had significantly lower lumbar spine T-scores before and after treatment. Post-treatment lumbar spine T-scores were significantly higher with respect to pre-treatment scores in both study groups. The alteration in lumbar spine T-score was statistically similar in both group I and group II.

Table 3 shows the femur neck T-scores of the women who were randomly allocated into group I and group II. Group I and group II were statistically similar in aspect of pre-treatment and post-treatment femur neck T-scores. Post-treatment
femoral neck T-scores were significantly higher with respect to pre-treatment scores in both study groups. The alteration in femoral neck T-score was statistically similar in both group I and group II.

Neither of the participants gave up the prescribed treatment and no side effects occurred. Hypercalcemia or hypercalciuria was noticed in neither of the recruited women.

**Discussion**

Alendronates have been commonly used for the prophylaxis and treatment of female or male osteoporosis as well as prevention and treatment of corticosteroid-associated osteoporosis together with supplements of calcium and vitamin D. For instance, Cecilia et al. adopted the triple regimen of alendronate (70 mg, once weekly), calcium (500 mg/day) and vitamin D (400 IU/day) for postmenopausal osteoporosis in 239 women. Thus, femoral neck T-score increased by 2.6%.\(^{11}\)

It has been previously reported that weekly administration of alendronate for one year caused an increase of 5% in lumbar spine T-score and 2.4% in femur neck T-score.\(^{12-17}\) A meta-analysis of 9360 women with postmenopausal osteoporosis indicated that administration of 5 mg alendronate for two years increased lumbar spine T-score by %5.8 and femur neck T-score by %3.4. On the other hand, administration of 10-40 mg alendronate for two years increased lumbar spine T-score by 7.5% and femur neck T-score by 4.3%.\(^{18}\) Alendronate Once-Weekly Study Group observed statistically similar alterations in both lumbar spine and femur neck T-scores of the postmenopausal women who were treated with either 10 mg alendronate once daily or 70 mg alendronate once weekly.\(^{13}\) Later, the same study group noticed statistically similar alterations in both lumbar spine and femur neck T-scores of the postmenopausal women who received either 70 mg alendronate once weekly or 35 mg alendronate twice weekly.\(^{19}\)

In order to evaluate the safety and tolerability of an additional 2800 IU vitamin D3 single tablet supplement, Binkey et al. conducted a randomized, 15-week-long, double-blind

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**Table 1: Demographic Features of Women with Postmenopausal Osteoporosis**

<table>
<thead>
<tr>
<th></th>
<th>Group I (n=42) Mean±SD (Median)</th>
<th>Group II (n=42) Mean±SD (Median)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>55.28±7.93 (52)</td>
<td>54.50±6.84 (52)</td>
<td>0.656</td>
</tr>
<tr>
<td>Menopause (years)</td>
<td>9.21±7.31 (6)</td>
<td>8.00±5.03 (7)</td>
<td>0.771</td>
</tr>
<tr>
<td>Parity</td>
<td>3.26±1.70 (3)</td>
<td>3.22±1.62 (3)</td>
<td>0.896</td>
</tr>
<tr>
<td>Body mass index (kg/m²)</td>
<td>27.04±4.53</td>
<td>27.29±3.63</td>
<td>0.795</td>
</tr>
</tbody>
</table>

* Student t test ** Mann Whitney U test

**Table 2: Lumbar Spine T Scores of Women with Postmenopausal Osteoporosis**

<table>
<thead>
<tr>
<th>Lumbar Spine T Scores</th>
<th>Group I (n=42) Mean±SD (Median)</th>
<th>Group II (n=42) Mean±SD (Median)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-treatment+</td>
<td>0.72±0.05</td>
<td>0.75±0.06</td>
<td>0.018*</td>
</tr>
<tr>
<td>Post-treatment+</td>
<td>0.75±0.06</td>
<td>0.80±0.08</td>
<td>0.012*</td>
</tr>
<tr>
<td>Alteration ++p</td>
<td>0.001**</td>
<td>0.001**</td>
<td></td>
</tr>
<tr>
<td>Alteration (%) ++++</td>
<td>4.95±6.28 (4.39)</td>
<td>6.00±6.99 (4.84)</td>
<td>0.520</td>
</tr>
</tbody>
</table>

* Student t test ++ Paired sample t test +++ Mann Whitney U test

**Table 3: Femur Neck T Scores of Women with Postmenopausal Osteoporosis**

<table>
<thead>
<tr>
<th>Femur Neck T Score</th>
<th>Group I (n=42) Mean±SD (Median)</th>
<th>Group II (n=42) Mean±SD (Median)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-treatment</td>
<td>0.66±0.11</td>
<td>0.69±0.09</td>
<td>0.208</td>
</tr>
<tr>
<td>Post-treatment</td>
<td>0.68±0.11</td>
<td>0.71±0.08</td>
<td>0.180</td>
</tr>
<tr>
<td>Alteration ++p</td>
<td>0.003**</td>
<td>0.024*</td>
<td></td>
</tr>
<tr>
<td>Alteration (%) ++++</td>
<td>3.23±6.08 (2.39)</td>
<td>3.36±10.56 (3.92)</td>
<td>0.570</td>
</tr>
</tbody>
</table>

* Student t test ++ Paired sample t test +++ Mann Whitney U test

** p<0.01
study on a cohort of men and postmenopausal women. They reported that supplementation of vitamin D3 (2800 IU) alongside with once weekly administration of alendronate (70 mg) and cholecalciferol (2800 IU) for 24 weeks was favorable and caused no serious side effects related with hypercalcemia and hypercalciuria. Therefore, the authors concluded that this triple combination was sufficient to meet the minimal requirement of vitamin D and, thus, could be used to treat postmenopausal osteoporosis effectively and safely.16

Similarly, Recker et al. designed a 15-week-long, randomized, double-blind, multi-center, active-controlled study over 35 men and 682 postmenopausal women who avoided sunlight and vitamin D supplementation. Consequently, it was demonstrated that once weekly tablet containing alendronate and cholecalciferol provided equivalent antiresorptive efficacy, reduced the risk of low serum 25OHD, improved vitamin D status over 15 weeks, and was not associated with hypercalcemia, hyperparathyroidism, or other adverse findings, versus alendronate alone in osteoporosis patients who avoided sunlight and vitamin D supplements.17

Osteoporosis Research Advisory Group conducted an extensive meta-analysis which included 15 clinical studies that reviewed 1806 women with postmenopausal osteoporosis. This meta-analysis found out that solitary supplementation of calcium only mildly improved the bone mineral density in postmenopausal women.3,20 On the other hand, calcium supplementation is contraindicated in case of hypersensitivity, hypercalcemia, hypophosphatemia, nephrolithiasis, hypercalciuria, renal impairment and hyperparathyroidism as well as gastrointestinal bleeding and obstruction.1

The present study aims to determine whether once weekly supplementation of vitamin D along with alendronate is efficient and safe for the prevention of postmenopausal osteoporosis and whether it can be used to replace daily supplementation of calcium and vitamin D along with once weekly administration of alendronate. Therefore, 84 women with postmenopausal osteoporosis were randomly assigned into two groups that were statistically similar in aspect of age, body mass index, parity and duration of menopause. The recruited subjects were randomly assigned into two study groups that were matched for age, body mass index and duration of menopause. Secondly, the basal lumbar spine T-scores of women in group I were significantly lower than those of women in group II. That’s why; the alteration in bone mineral density of lumbar vertebrae after one-year-long treatment could be biased. Further research is warranted for better understanding of once weekly replacement of vitamin D.

The findings of the present study indicate that the improvement in bone mineral density of lumbar spine and femoral neck was statistically similar in women who received daily supplementation of calcium and vitamin D and once weekly supplementation of vitamin D along with once weekly alendronate treatment. Moreover, no side effects related with hypercalcemia or hypercalciuria occurred. Therefore, it can be suggested that once weekly administration of vitamin D and alendronate is an effective and safe option of treatment for women who are diagnosed with postmenopausal osteoporosis and who cannot take calcium supplements.

To the best of our knowledge, the present study is the first to specify the efficiency of weekly vitamin D treatment in the prevention of postmenopausal osteoporosis. This study reviews a homogeneous study cohort that included only women with postmenopausal osteoporosis. The recruited subjects were randomly assigned into two study groups that were matched for age, body mass index and duration of menopause. However, the present study has some limitations. First of all, the study cohort is relatively small when compared with the previously published studies. Secondly, the basal lumbar spine T-scores of women in group I were significantly lower than those of women in group II. That’s why; the alteration in bone mineral density of lumbar vertebrae after one-year-long treatment could be biased. Further research is warranted for better understanding of once weekly replacement of vitamin D.

**Haftada Bir Uygulanan Vitamin D Desteği Postmenopozal Osteoporoz Tedavisinde Yeterli mi?**

**AMAÇ:** Sunulan çalışma, haftada bir uygulanan vitamin D ve alendronat tedavisinin postmenopozal osteoporoz tedavisinde etkin ve güvenilir olup olmadığını belirlemeyi amaçlamaktadır.

**GEREÇ VE YöNTEM:** Bu çalışmada, postmenopozal osteoporozu olan 42 kadına haftada bir alendronat (70 mg) ile birlikte günlük kalsiyum (1000 mg) ve vitamin D (880 IU) uygulanırken postmenopozal osteoporozu olan 42 kadına haftada bir alendronat (70 mg) ve vitamin D (2800 IU) verilmektedir.

**BULGULAR:** Grup II olgularla karşılaştırıldığında, grup I olgularla tedavi öncesi ve sonrası lumbar T skorları anlamlı olarak düştü. Her iki çalışmada birlikte, tedavi öncesi skorlarla kıyaslannıldığında, tedavi sonrası lumbar ve femur boynu T skorları anlamlı olarak yüksek bulundu. Grup I ve grup II, lumbar ve femur boynu T skorlarında meydana gelen değişiklikler bakımından istatistiksel olarak benzerdi.
SONUÇ: Haftada bir uygulanan alendronat ve vitamin D desteği, postmenopozal osteoporoz tanısı konulan ve kalsiyum desteği alamayan kadınlarda etkin ve güvenilir bir tedavi seçeneğidir.

Anahtar Kelimeler: Kalsiyum, Osteoporoz, Postmenopoz, Vitamin D

References