Comparative Analysis of Vitamin D level in Elderly Patients with or without Osteoporotic Spinal Compression Fracture

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Introduction

Osteoporosis

- Characteristics
  - Low bone mass
  - Structural deterioration of bone

- Predisposing factor
  - Deficiency of estrogen, vitamin D
  - Overproduction of PTH
  - Poor and absorption of calcium
Introduction

Osteoporosis

Elderly population

Osteoporosis

Osteoporotic fracture
Introduction

Osteoporotic fracture

• Significantly associated with decreased quality of life, shorter life expectancy, and increased health care costs

➔ It is crucial to prevent osteoporosis and fractures

Vitamin D

• Low calcium intake and poor vitamin D status are key determinants of osteoporosis and fracture risk

• Calcium and vitamin D supplementation is an essential component of management strategies for the prevention and treatment of osteoporosis and osteoporotic fracture

Devine J et al, Osteoporosis Int, 2012
Lips P et al, Clin Endocrinol(Oxf), 2010
• Studies that analysis correlation vitamin D between osteoporotic vertebral fracture are rare.

✓ **Comparison** serum vitamin D levels in elderly patients with or without osteoporotic spinal compression fractures

✓ **Correlation** between serum vitamin D level and age, bone mineral density bone turnover markers, the number of fractured vertebral bodies in Fx. group
## Materials & Methods


- **Patients**
  - Age $\geq 60$ years
  - Evaluated vitamin D and bone turnover markers
  - Separated by presence of spinal compression fracture

### Inclusion criteria

- BMD $\leq -2.5$ (T-score)

### Exclusion criteria

- High energy trauma
- Osteoporotic medication Hx.
- Underlying Dz. that affects bone metabolism
- Hx. of osteoporotic fracture
- Hx. of spine operation

### Retrospective review
Materials & Methods

➢ Comparative analysis

OSCF group VS. Control group

✓ Serum Vitamin D level (Serum 25(OH) vitamin D3)
  - according to age, sex, season and living environment
✓ BMD (T-score)
✓ Bone turnover markers (Osteocalcin and C-telopeptide)
Correlative analysis

Serum Vitamin D with

- Age
- BMD
- Bone turnover markers
- Number of fractured vertebral bodies in fracture group
Materials & Methods

- 78 patients with OSCF (fracture group)
- 84 age-matched patients without OSCF (control group)

Demographic information & clinical data

<table>
<thead>
<tr>
<th>Sex</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>20</td>
</tr>
<tr>
<td>Female</td>
<td>142</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Mean age</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>OSCF group (n = 95)</td>
<td>72.07 ± 5.28</td>
</tr>
<tr>
<td>Control group (n = 118)</td>
<td>70.09 ± 7.84</td>
</tr>
</tbody>
</table>

p = 0.063

No significant difference on age
Serum 25(OH) Vitamin D3: **Normal range: >30ng/ml**

Dawson-Hughes B et al, Osteoporos Int, 2005

Comparison of Serum Vit D (ng/ml)

<table>
<thead>
<tr>
<th>OSCF</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>62</td>
<td>46</td>
</tr>
<tr>
<td>16</td>
<td>38</td>
</tr>
</tbody>
</table>

79% Insufficiency

55% Normal

**Significant difference (p < 0.0001)**
Results

Comparison of BMD (T-score)

- OSCF: -3.77
- Control: -3.05

Significant difference (p < 0.0001)

Comparison of Bone Turnover Markers

- Osteocalcin:
  - OSCF: 17.95
  - Control: 0.75
- C-telopeptide:
  - OSCF: 20.27
  - Control: 0.57

Significant difference on C-telopeptide (p = 0.003)
**Results**

Comparison of Serum 25(OH)D3 (ng/ml) **according to Season**

- **Spring**
  - OSCF group: 14.50
  - Control group: 35.44

- **Summer**
  - OSCF group: 22.73
  - Control group: 33.62

- **Autumn**
  - OSCF group: 26.78
  - Control group: 52.35
  - Significant difference on spring and autumn \( (p < 0.0001) \)

- **Winter**
  - OSCF group: 19.80
  - Control group: 24.98
  - Low: 23.15

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*OSCF group  Control group*

*High: 37.22  Low: 23.15*
Comparison of Serum 25(OH)D3 (ng/ml) according to SEX

Results

No significant difference
Comparison of Serum 25(OH)D3 (ng/ml) according to Age

Results

Significant difference 60s (p < 0.0001)

<table>
<thead>
<tr>
<th>Years</th>
<th>OSCF group</th>
<th>Control group</th>
</tr>
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<tbody>
<tr>
<td>60-69</td>
<td>17.58</td>
<td>41.89</td>
</tr>
<tr>
<td>70-79</td>
<td>24.63</td>
<td>30.33</td>
</tr>
<tr>
<td>80-89</td>
<td>20.75</td>
<td>38.70</td>
</tr>
</tbody>
</table>
Comparison of Serum 25(OH)D3 (ng/ml) according to Living environment

Results

No significant difference

OSCF group

Control group
## Results

**Correlation with Serum 25(OH)D3 (ng/ml) and variables**

<table>
<thead>
<tr>
<th></th>
<th>Age</th>
<th>Osteocalcin</th>
<th>C-telopeptide</th>
<th>BMD total</th>
<th>L-spine</th>
<th>Lt. hip</th>
<th>Rt. hip</th>
<th>No. of fractured vertebral bodies</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>r</strong></td>
<td>-0.183</td>
<td>-0.008</td>
<td>-0.195</td>
<td>0.251</td>
<td>0.224</td>
<td>0.320</td>
<td>0.154</td>
<td>-0.217</td>
</tr>
<tr>
<td><strong>p-value</strong></td>
<td>0.020</td>
<td>0.915</td>
<td>0.013</td>
<td>0.001</td>
<td>0.005</td>
<td>&lt;0.0001</td>
<td>0.054</td>
<td>0.048</td>
</tr>
</tbody>
</table>

*Significant difference on Age, BMD and No. of fractured vertebra*
Vitamin D deficiency in adults can precipitate or exacerbate osteopenia and osteoporosis, cause osteomalacia and muscle weakness, and increase the risk of fracture.

A meta-analysis revealed that increased vitamin D intake reduced the risk of falls.

Holick MF, NEJM, 2007
Daily intake of at least 700 to 800 IU of vitamin D is shown to prevent hip fractures and nonvertebral fractures in elderly persons.

Post-menopausal Korean women with a distal radius fracture were found to have significantly lower serum vitamin D levels than the control group.

Bischoff-Ferrari HA et al, JAMA, 2005

HS Gong et al, Injury, 2012
In this study

- Vitamin D level was insufficient in most patients with OSCF.

- Patients with OSCF were found to have significantly lower vitamin D levels than patients without fracture.

- Vitamin D level is correlated with age and BMD.
Conclusions

✓ Vitamin D level was insufficient in most patients with OSCF.

  Patients with OSCF were found to have significantly lower vitamin D levels than patients without fracture.

✓ So, the optimal range of serum vitamin D level in elderly patients with osteoporosis is considered as a factor for prevention of OSCF.

✓ Further studies are necessary to determine whether vitamin D supplementation can be helpful in preventing OSCF in patients with osteoporosis.
Thank you for your attention!