Vitamin D Levels in Hip Fractures

Rationale and Guidelines for Rapid Substitution Therapy

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Introduction

- Assessment for and treatment of osteoporosis required after hip fracture
- Osteoporosis treatment requires adequate calcium and vitamin D levels
Aim of Study

- Determine vitamin D levels in patients with hip fracture
- Develop guidelines on how to safely and effectively substitute vitamin D levels with high dose oral vitamin D3 (cholecalciferol)
Functions vitamin D

- ↑ intestinal calcium absorption
- ↑ osteoclast activity
- ↑ renal calcium reabsorption
Calcium regulation

↑ PTH → ↑ Calcium

↓ Vitamin D → ↓ Calcium
Materials & Methods

- Consecutive hip fractures over 18 months
- Circulating 25-hydroxyvitamin D levels
- Substitution therapy with 50,000 IU oral cholecalciferol for 3 or 7 days
Definition vitamin D levels

- Sufficient: > 75 nmol/L
- Insufficient: 25 – 75 nmol/L
- Deficient: < 25 nmol/L
Results: vitamin D levels

381 patients (387 hip fractures)
95 men – 286 women
mean age = 83 years

27 sufficient
mean = 91 (SD 20) nmol/L
range = 75 – 171 nmol/L

354 insufficient / deficient
mean = 26 (SD 18) nmol/L
range = <10 - 74.4 nmol/L

22/27 on supplements

156 insufficient
204 deficient
Substitution: 50,000 IU – 3 days

- N = 14

<table>
<thead>
<tr>
<th>Test</th>
<th>Mean</th>
<th>SD</th>
<th>Range</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>30 nmol/L</td>
<td>30</td>
<td>16</td>
<td>&lt;10 – 56</td>
<td>&lt;0.0001</td>
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<tr>
<td>81 nmol/L</td>
<td>81</td>
<td>17</td>
<td>47 – 108</td>
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Only 2/3 above 75 nmol/L
Substitution: 50,000 IU – 7 days

- N = 54

31 nmol/L
- SD = 24
- range = < 10 – 113

131 nmol/L
- SD = 30
- range = 85 – 243

16 days
p < 0.0001

Fourfold increase
100% above threshold
Substitution: 50,000 IU – 7 days

**Calcium**
- **Initial Level:** 2.19 mmol/L (SD = 0.13, range = 1.94 – 2.50)
- **Final Level:** 2.33 mmol/L (SD = 0.17, range = 1.84 – 2.78)
- Change from 16 days: p < 0.0001

**Corrected Calcium**
- **Initial Level:** 2.47 mmol/L (SD = 0.09, range = 2.21 – 2.60)
- **Final Level:** 2.54 mmol/L (SD = 0.12, range = 2.18 – 2.81)
- Change from 16 days: p = 0.0002

No clinical or biochemical side effects
Costs

- Vitamin D analysis: 7.5 €
- 50,000 IU vitamin D
  - 100 tablets: 29 €
  - 7 days: 2 €
Algorithm

CC < 2.6
- 50,000 IU – 7 days
- Adcal D3 – 2x/d – for life
- Monitor calcium at 1/12

CC 2.6 – 2.8
- PTH levels normal and EGFR > 30

CC > 2.8
- PTH raised and/or EGFR < 30
- Treat slowly: 50,000 IU 1x/week
- Monitor calcium and renal function
- Consider stopping Adcal D3
- Stop treatment if CC > 2.8

Specialist referral
Conclusion

- All patients with hip fracture have insufficient or deficient vitamin D levels

- 50,000 IU oral cholecalciferol for 7 days
  - Rapid → Achieved during admission
  - Cheap → 2 € - No vitamin D analysis
  - Consistent → 100% patients
  - Safe? → No side effects