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Osteomalacia: recovery of bone density

A 78-year-old Caucasian woman presented to Tokoroa Hospital with long-term severe back pain, proximal limb myopathy, and walking difficulty—associated with biochemical features of osteomalacia and radionucleide bone scan pseudofractures.

In the preceding 25 years, she had sustained four separate fractures of bone after minor trauma, indicating preceding postmenopausal osteoporosis. Serum calcium at 76 years was 2.41 mmol/L, and phosphate was 1.37 mmol/L.

At 78 years of age, her pre-treatment biochemical results were: serum calcium (corrected) = 1.98 mmol/L (n = 2.15–2.57), phosphate = 0.93 mmol/L (n = 0.9–1.55), alkaline phosphatase (ALP) = 457 u/L (n = 40–120 u/L), parathyroid hormone (PTH) = 66 pmol/L (n=1.2–6.2), creatinine = 0.08 mmol/L, 25 hydroxy vitamin D = 5.5 nmol/L (n>50), 1,25 dihydroxy vitamin D = 55 pmol/L (n= 40–155).

Pre-treatment dual energy absorption (DXA) test for bone mineral density (BMD): at lumbar spine L2–L4, mean BMD = 0.4676 g/cm^2, T score = -3.69. Proximal radius/ulnar: BMD = 0.2627g/cm^2, T score = -7.20.

Treatment was commenced with oral calcium 1.0 g/day; oral vitamin D 2, 50,000 u/day for 7 days and thereafter 800 u/day; plus oral alendronate 70 mg/week (single dose). Therapy was maintained for 24 months.

Table 1. Effect of treatment on bone mineral density (BMD) at lumbar spine (L2–L4)

Time	BMD (g/cm^2)	% increase in BMD	ALP (u/L)
Pre-treatment	0.4676	0	457
Post-treatment			
2 months	0.5833	24.8	499
4 months	0.5909	26.4	143
5 months			94
10 months	0.6832	46.1	98
18 months	0.7437	59.1	94
24 months	0.7567	61.8	88

ALP=alkaline phosphatase.

Observations made throughout treatment:

- After 2 weeks: vitamin D stores were almost replete, 25 hydroxy vitamin D = 47.5 nmol/L (n >50), 1,25 dihydroxy vitamin D >160 pmol/L, PTH had fallen to 8.8 pmol/L, calcium was now normal = 2.31 mmol/L, and phosphate =1.23 mmol/L, ALP had risen to 540 u/L.
- After 4 weeks, vitamin D stores were fully replete : 25 hydroxy vitamin D =130 nmol/L, 1,25 dihydroxy vitamin D > 160 pmol/L. PTH was now suppressed at 1.6 pmol/L, ALP was now 499 u/L.
- At 4 weeks, back pain disappeared completely and walking improved.

- Over the next 23 months, 25 hydroxy vitamin D levels remained >67.5 pmol/L, and 1,25 dihydroxy vitamin D levels >160 pmol/L, calcium, phosphate, PTH remained normal. ALP slowly fell to normal over 5 months (to 94 u/L).
- Prospective DXA tests showed a progressive, incremental rise in lumbar spine BMD at 2, 4, 10, 18, and 24 months. By 24 months, there was an overall increase of BMD to 61.8%. (see Table 1)
- Much of this rise in BMD occurred in the post-vitamin D-replete phase with secondary hyperparathyroidism inhibited (ie, after 1 month) when vitamin D metabolites were constantly raised.
- There was only a small incremental increase in BMD at proximal (7.3%) and distal (5.8%) radius/ulnar over 24 months.
- The patient's body weight at the start of treatment was 53 kg with body mass index (BMI) = 21 kg/m 2; and after 24 months, weight was 68 kg, with BMI = 27 kg/m^2. Muscle mass, strength, balance, and walking ability improved gradually.
- No fractures occurred during the treatment period.

Vitamin D deficiency is common in elderly people in Australasia.[1] Lack of sunlight, poor vitamin D intake, and diminished ageing skin response to sunlight contribute.

Oral calcium and vitamin D2 is efficient in restoring vitamin D status,[2] occurring within 4 weeks here, accompanied by inhibition of secondary hyperparathyroidism.

Prolonged therapy thereafter continued to increase lumbar BMD. Alendronate, a potent inhibitor of calcium-resorbing osteoclasts, contributed to some rise in BMD (about 9.6% over 3 years) resulting from osteoporosis.[3]

When monitoring long-term bone recovery BMD measurements are superior to ALP, which underestimates the duration of the skeletal recovery process. ALP fell to normal by 5 months. At 4 months, lumbar spine BMD had increased to 26.4%; at 10 months, BMD was 46.1%; and at 24 months, BMD was 61.8%.

Back pain disappeared completely at 4 weeks when vitamin D status had returned to normal. ALP rose at 2 weeks (to 540u/L), and at 4 weeks (to 499 u/L), indicating that ALP is sensitive indicator for early bone response. Lumbar spine BMD had probably risen (as judged by an increase in BMD at 2 months of 24.8%).

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