25-Hydroxy Vitamin D levels in patients with chronic diseases on corticosteroid treatment

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Background

Corticosteroids are medicines that are widely used for treatment of many chronic diseases. They are very effective anti-inflammatory drugs by suppressing the immune system, and are also used as a replacement therapy in conditions with low levels of endogenous cortisol. It is well known that the steroids treatment causes osteoporosis and growth retardation with the effects on bone metabolism such as reduced absorption of calcium in the intestine; increased calcium urinary excretion; increased bone resorption and reduced bone density. Steroids decrease the level of growth hormone (GH) and insulin-like growth factor 1 (IGF-1), cause a reduce lifespan and promote the apoptosis of osteoblasts and osteoclasts, and also decrease the recruitment of osteoblasts and osteoclasts from progenitor cells. Corticosteroid treatment increases the activity of the 24-hydroxylase (CYP24A1) and thereby reduce the level of 25-Hydroxy Vitamin D (25-OH-D). CYP24A1 converts the active form of vitamin D - $1,25(OH)_2D$ (calcitriol) in the inactive metabolite $1,24,25(OH)_3$ D. Patients on a long term treatment with oral glucocorticoids have significantly lower levels of 25-OH-D, decreased mineral bone density and osteoporosis. The confirmation of vitamin D deficiency is by measurement of serum levels of 25-OH-D (cacidiol), which is the main circulating form of vitamin D. Its half-life is several weeks, while the calcitriol is only a few hours. Measuring the level of serum 25-OH-D is very important to determine vitamin D status in this group of patients.

Vitamin D status	Serum 25-OH-D level (nmol/L)
Deficient	< 25
Insufficient	25-50
Adequate Healthy	50-75
Optimal (Healthy)	>75

Methods

We present five children with chronic diseases on a long term treatment with corticosteroids – three with progressive muscular dystrophy (PMD) and two children with chronic juvenile arthritis (JA). Two of the children with progressive muscular dystrophy aged 10-11 years were diagnosed early in life at the age of 2 years, one was diagnosed at the age of 7 years. Since then they are on continuous steroids treatment. One of these patients has been diagnosed with adrenal insufficiency at the age of two months. The patients with chronic juvenile arthritis are now adolescents but have been diagnosed at the age of 3 and 4 years.

№	NAME, AGE, DIAGNOSIS	HIGH (cm) SDSh	25-OH-D (nmol/l) Before treatment/ After treatment	PTH (pg/ml) Before treatment/ After treatment	ALP U/l Before treatment/ After treatment	Ca (mmol/l) Before treatment/ After treatment	Ca 2+ (mmol/l) Before treatment/ After treatment	REN Before treatment/ After treatment
1	A.B.P., 10 y, PMD	118 / -3,38	45,7 / 78,7	15,1 / 16,7	65 / 43	2,45 / 2,3	1,33 / 1,26	0,05 / 0,3
2	D.M.M., 15 y, PMD	127 / -5,47	37,8 / 73,4	16,2 / 22,1	49 / 120	2,4 / 2,5	1,32 / 1,29	0,3 / 0,6
3	I.A.I, 17 y, JA	154 / -3,04	15,8 / 49,8	13,4 / 15,8	97 / 111	2,55 / 2,5	1,25 / 1,29	0,5 /0,6
4	P.-N.D.R, 17 y, JA	142 / -4,93	4,49 / 67,4	11,5 / 13,2	106 / 132	2,49 / 2,45	1,27 / 1,28	1,0 / 0,5
5	Y.S.F, 12 y, PMD Adrenal hypoplasia	131 / -2,0	25,6 / 52,8	13,6 / 15,1	90 / 106	2,2 / 2,45	1,2 / 1,33	0,4 / 1,8

Results

25-OH-D level was checked at the time of first admission to the hospital and was low. The patients were started then on treatment with vitamin D3 (cholecalciferol) under endocrine follow up and the control studies did show normal levels. Parathyroid hormone (PTH), alkaline phosphatase (ALP), serum calcium and urine calcium/creatinine ratio (REN) were all normal.
All patients have growth failure with SDS_h (-2,0) ÷ (-5,47)
The patients with progressive muscular dystrophy have osteoporosis.
The tests after treatment showed normal level or mild insufficiency of 25-OH-D and normal parathyroid hormone, alkaline phosphatase, calcium in the serum and calcium/creatinine ratio in the urine. The child with progressive muscular dystrophy and adrenal insufficiency had increased urine calcium/creatinine ratio 1.5-1.8 (<0.56) and the renal ultrasound did show bilateral nephrocalcinosis

Conclusions

Vitamin D is very important for calcium homeostasis and for optimal bone metabolism and health. Testing of serum 25-OH-D is most useful in patients who are at risk of vitamin D deficiency and also useful for purposes of planning or monitoring vitamin D therapy. Children treated for a long period with oral corticosteroids often have low levels of 25-OH-D. In these patients it is necessary to check 25-OH-D levels regularly and treat the impaired vitamine D status with oral vitamin D supplementation

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Bone

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