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Vitamin D supplementation in elderly nursing home residents

Suplementacja witaminy D u osób w wieku podeszłym leczonych w zakładzie opiekuńczo-leczniczym

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Słowa kluczowe
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S u m m a r y

Introduction. Low serum concentration of vitamin D active metabolites is observed first and foremost in elderly people.

Aim. The aim of the present study was to evaluate 25-hydroxycholecalciferol [25(OH)D] serum level concentration, before and after three months vitamin D supplementation.

Material and methods. The study group consisted of 26 women and 11 men aged 75 to 98 years (mean age 84.5 years) – nursing home residents. Study has been performed from July 2015. 25-hydroksyvitamin D and calcium serum concentrations have been measured at the beginning of the study, than after three months supplementation (vitamin D from 2000 to 4000 IU and calcium from 800 to 1200 mg), depending on primary 25(OH)D serum level concentration. CLIA method and Liaison analyzer has been performed to measure 25(OH)D serum concentration.

Results. Initial mean 25(OH)D serum concentration was significantly lower – 10.1 ng/ml with standard deviation (SD ± 6.07); calcium serum level – 2.3 mmol/l (SD ± 0.10), after three months vitamin D supplementation average 25(OH)D serum concentration was 32.05 ng/ml (SD ± 6.61); calcium serum level 2.28 mmol/l (SD ± 0.11).

Conclusions. Among all the elderly subjects three months vitamin D supplementation has been sufficient to achieve suboptimal vitamin D status.

S t r e s z c z e n i e

Wstęp. Niskie stężenie aktywnych metabolitów witaminy D obserwuje się przede wszystkim w populacji osób starszych.

Cel pracy. Celem niniejszego badania była ocena poziomu stężenia 25-hydroksycholekalcyferolu [25(OH)D] w surowicy krwi przed suplementacją i po trzymiesięcznej suplementacji witaminy D.

Materiał i metody. Badana grupa składała się z 26 kobiet i 11 mężczyzn w wieku od 75 do 98 lat (średnia wieku 84,5 roku), przebywających w zakładzie opiekuńczo-leczniczym. Badanie rozpoczęto w lipcu 2015 roku. Stężenie 25(OH)D i wapnia w surowicy krwi zmierzono na początku badania oraz po upływie trzech miesięcy suplementacji witaminy D i wapnia [od 2000 do 4000 IU oraz wapnia od 800 do 1200 mg/dobę, w zależności od podstawowego stężenia 25(OH)D w surowicy krwi]. Oznaczenie 25(OH)D w surowicy krwi zostało wykonane metodą CLIA przy pomocy analizatora Liaison.

Wyniki. Początkowe średnie stężenie 25(OH)D w surowicy krwi wynosiło 10,1 ng/ml (SD ± 6,07), stężenie wapnia – 2,3 mmol/l (SD ± 0,10). Po trzech miesiącach suplementacji witaminy D średnie stężenie 25(OH)D w surowicy krwi wynosiło 32,05 ng/ml (SD ± 6,61), stężenie wapnia – 2,28 mmol/l (SD ± 0,11).

Wnioski. Trzymiesięczna suplementacja witaminy D pozwala na osiągnięcie suboptymalnego stężenia 25(OH)D w surowicy krwi u osób starszych.

Conflict of interest
Konflikt interesów
None
Brak konfliktu interesów

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INTRODUCTION

Vitamin D deficiency is common among elderly people, which causes muscle strength reduction and may also lead to increased number of falls and osteoporotic fractures. It can also influence secondary hyperparathyroidism development, which accelerates age related bone lose. Due to pleiotropic vitamin D effects it influences not only physical and mental health status but also the quality of life. Studies with vitamin D treatment suggest positive effects on falls, fractures, gait,

balance, muscle strength and other particularly among elderly and the oldest old (1, 2).

The consequences of vitamin D deficiency can be severe in the elderly and age related decrease in vitamin D serum level constitutes an important medical treatment issue. The recommendations for vitamin D supplementation in elderly since 2014 suggest need of high doses in the oldest olds. However, the clinical experience shows that health care professionals rarely have the opportunity to evaluate vitamin D serum level concentration during vitamin D treatment. Moreover, the present study seeks to address this need by comparing initial serum 25(OH)D level and 25(OH)D level after cholecalciferol supplementation.

AIM

The main aim of the present study was to evaluate 25-hydroxyvitamin D [25(OH)D] serum level and calcium, magnesium and inorganic phosphorus serum level among elderly subjects. The further goal of the study was to evaluate 25(OH)D and calcium serum level after three months of cholecalciferol supplementation and also to compare results.

MATERIAL AND METHODS

The study group consisted of 26 women and 11 men aged 75 to 98 years (mean age 84.5 years). All the subjects were nursing home residents, they had the same diet and conditions as well as sun exposure. Endocrinopathy or chronic digestive system illnesses with malabsorption, advanced heart failure (NYHA IV class), respiratory failure, liver or kidney failure were not found in study group. The routine laboratory measures were in the normal range.

Methods applied in the study included: medical history and physical examination with special focus on symptoms and signs of vitamin D deficiency, and also laboratory tests: blood hemoglobin, albumin, protein and creatinine serum levels. In order to achieve the main goal of the study 25-hydroxycholecalciferol [25(OH)D], calcium, magnesium, inorganic phosphorus serum levels were also performed.

Study has been performed from July 2015. The initial 25(OH)D, calcium, magnesium and phosphorus serum concentrations have been measured at the beginning of the study, then after three months supplementation. All the subjects have been following three months oral cholecalciferol supplementation. Participants with initial 25(OH)D serum concentration lower than 10 ng/ml received 4000 IU cholecalciferol and 1200 mg calcium and subjects with initial 25(OH)D serum concentration higher than 10 ng/ml – 2000 IU and 800 mg calcium.

This is the preliminary study consisting part of research of vitamin D supplementation and vitamin D pleiotropic mechanism with long-term evaluation of calcium-phosphate metabolism after vitamin D supplementation.

CLIA method and Liaison analyzer has been performed to measure 25(OH)D serum concentration.

Data were analyzed with Pearson correlation test, application R 3.3.1 [R Core Team (2016)]. R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria.

RESULTS

Initial mean 25-hydroksyvitamin D [25(OH)D] serum concentration was 10.1 ng/ml, standard deviation ± 6.07 and calcium serum level 2.3 mmol/l, standard deviation ± 0.10. Low 25(OH)D serum concentration – below 10 ng/ml – was observed in 46% subjects. Mean magnesium serum concentration was 0.81 mmol/l, standard deviation ± 0.1, mean inorganic phosphorus serum concentration – 1.12 mmol/l, standard deviation ± 0.15. After three months vitamin D supplementation mean 25(OH)D serum level was significantly higher – 32.05 ng/ml (standard deviation ± 6.61), $p < 0.001$; calcium serum level 2.28 mmol/l, standard deviation ± 0.11, $p = 0.28$. In all the subjects gain of 25-hydroksyvitamin D serum concentration was observed. It was also found out that there existed vitamin D gain regardless the age, initial concentration and body mass. Negative correlations, in turn, were observed between initial 25(OH)D serum level and value of vitamin D increase after three months of cholecalciferol supplementation (correlation ratio -0.63, $p < 0.001$). Vitamin D concentrations – initial and after three months cholecalciferol supplementation are presented on the figure 1.

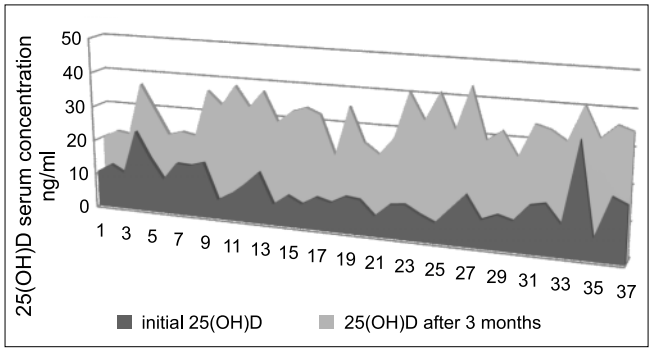

Fig. 1. Vitamin D concentrations – initial 25(OH)D concentration and after three months cholecalciferol supplementation – 25(OH)D after 3 months

DISCUSSION

The high prevalence of vitamin D deficiency among elderly participants have been observed in other studies (3, 4). In the present study we have confirmed severe deficiency in participants living in the nursing home. The research shows that the vitamin D deficiency have been found in all the subjects. However, correlation with age or years of residence hasn't been observed. Moreover there are plenty other factors influencing the lack of vitamin D supplementation among elderly (5). The current recommendations suggest the need of high dose vitamin D especially in the oldest olds but in the present study only one participant had received vitamin D oral doses, without achieving the

goal of optimal 25(OH)D serum concentration. Our findings suggest that frequently elderly patients are not informed by health care professionals about the necessity of vitamin D supplementation (6). Biancuzzo et al. has pointed out that 80% of women haven't been getting enough calcium and vitamin D treatment (7). Findings of the present study have also shown that mean 25-hydroksyvitamin D increase per week is 1.8 ng/ml so these data suggest that only long term supplementation could result in optimal 25(OH)D serum level.

It should be noted that despite of having vitamin D deficiency, the concentration of calcium, magnesium and inorganic phosphorus is likely to be stable, which could suggest long-term period of vitamin D deficiency. After three months of calcium supplementation its serum concentration seems to be slightly lower than the initial value. It is also probable that calcium intake had escalated bone calcium deposition, therefore it seems that our observations support the findings of other studies (8).

The present study require further research to confirm our findings and to evaluate all aspects of calcium-phosphate metabolism as well as the optimal period of vitamin D and calcium supplementation.

CONCLUSIONS

Insufficient 25-hydroksyvitamin D serum levels were common among elderly, since calcium, magnesium, inorganic phosphorus deficiency have not been observed.

Three months supplementation of cholecalciferol is sufficient to achieve suboptimal vitamin D status in elderly.

BIBLIOGRAPHY

1. Bogaerts A, Delecluse Ch, Boonen S et al.: Changes in balance, functional performance and fall risk following whole body vibration training and vitamin D supplementation in institutionalized elderly women. A 6 month randomized controlled trial. Gate & Posture 2011; 33: 466-472.
2. Bacon CJ, Gamble GD, Horne AM et al.: High-dose oral vitamin D_3 supplementation in the elderly. Osteoporos Int 2009; 20: 1407-1415.
3. Souberbielle JC: Epidemiology of vitamin D deficiency. Geriatr Psychol Neuropsychiatr Vieil 2016; 14(1): 7-15.
4. Bischoff-Ferrari HA, Dawson-Hughes B, Staehelin HB et al.: Fall prevention with supplemental and active forms of vitamin D: a meta-analysis of randomised controlled trials. BMJ 2009; 339: b3692.
5. Golan-Cohen A, Merzon E, Alhin O et al.: Blood levels of vitamin D and health-functional status in asymptomatic individuals: a cross sectional study. J Eval Clin Pract 2016. DOI: 10.1111/jep.12568. Epub ahead of print.
6. Zittermann A, Iodice S, Pilz S et al.: Vitamin D deficiency and mortality risk in the general population: a meta-analysis of prospective cohort studies. Am J Clin Nutr 2012; 95: 91-100.
7. Biancuzzo RM, Clarke N, Reitz RE et al.: Serum Concentrations of 1,25-Dihydroxyvitamin D_2 and 1,25-Dihydroxyvitamin D_3 in Response to Vitamin D_2 and Vitamin D_3 Supplementation. J Clin Endocrinol Metab 2013; 98(3): 973-979.
8. Flynn A: The role of dietary calcium in bone health. Proc Nutr Soc 2003; 62(4): 851-858.

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