

## Gradual deterioration of vitamin D status and bone mass density in children and adolescents with Fontan circulation

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**Introduction:** Patients with a Fontan circulation are at risk of malnutrition and growth deficit. Our group has shown high prevalence of vitamin D deficiency and low bone mass density in adolescents with Fontan circulation. The aim was to investigate vitamin D status and bone mass density in children with Fontan circulation at different ages.

**Methods:** Patients were recruited from our national Fontan clinic and divided in two cohorts aged 5 to 9 years and 10 to 15 years respectively. We prospectively measured serum levels of 25-OH-vitamin D and total body bone mass density by narrow fan-beam dual energy x-ray absorptiometry (DXA) scan. The DXA results were compared to age and gender matched reference data and expressed as Z-scores. Vitamin D and DXA results of the two cohorts were compared to the previous cohort of 17 patients aged 16 to 18 years. Current recommendations for patients with chronic illness suggest an optimal serum level of 75–125 nmol/L.

**Results:** We included 15 patients aged 5 to 9 years and 19 patients aged 10 to 15 years. Vitamin D levels in the two cohorts were  $77.5 \pm 31.0$  nmol/L (mean  $\pm$  SD) and  $61.6 \pm 30.2$  nmol/L respectively, while the level in the adolescent cohort was  $34.6 \pm 18.3$  nmol/L. The DXA scans for the two youngest cohorts showed z-scores of  $0.7 \pm 0.9$  and  $-0.7 \pm 1.4$ , while the oldest cohort had a z-score of  $-0.8 \pm 1.1$ . Statistically significant differences are shown in figure 1.

**Conclusion:** Both vitamin D status and bone mass density show age-related differences in Fontan patients and a significant decrease through childhood and adolescence. Whether this is due to life style factors (i.e. sun exposure, dietary intake of vitamin D and physical activity) or due to a pathophysiological effect of the Fontan circulation is unknown. Future studies should investigate the pathogenesis of both vitamin D deficiency and impaired bone mass density, as well as determine the risk of bone related complications.

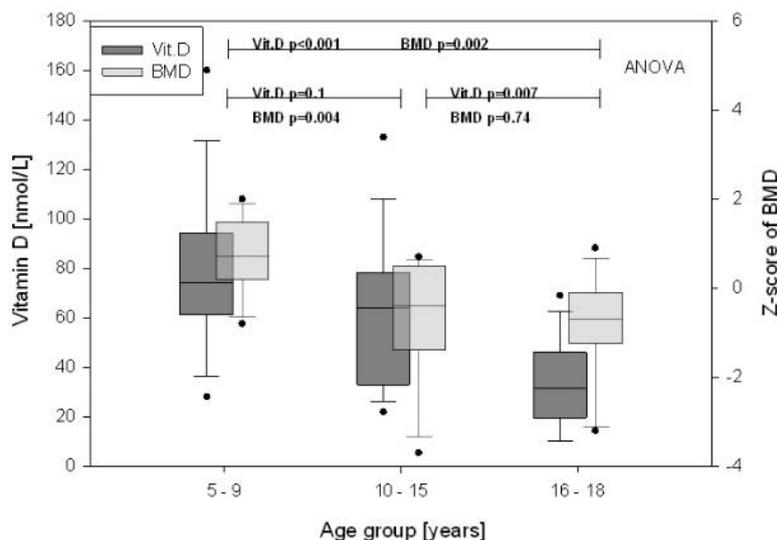


Figure 1. Vitamin D serum level and bone mass density by age group