Effect of calcium and cholecalciferol supplement on bone mass accrual among perinatally HIV-infected adolescents with osteopenia

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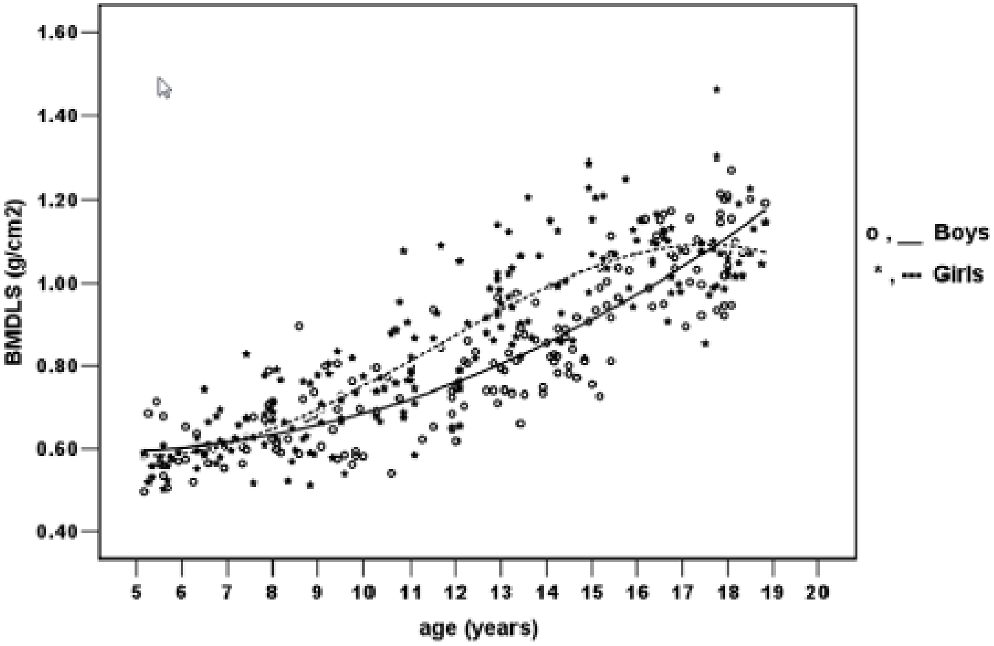
Background

- Prevalence of low bone mineral density(BMD) among HIV-infected adolescents[1]:range 4-32%
- **Factors associated with low BMD**
  - Nutrition factors[2]
    - Only 17% had calcium intake > 1000 mg/day
    - Only 25% had 25-OH vitamin D > 30 ng/ml
  - HIV infection esp. advanced stage
  - Antiretroviral drugs e.g. TDF, PIs

[1]Puthanakit T, Siberry GK 2013, JIAS;16:18575
2 Chokephaibulkit K. Ped Infect Dis J 2013;32:1237-9.

Bone mineral density in adolescents

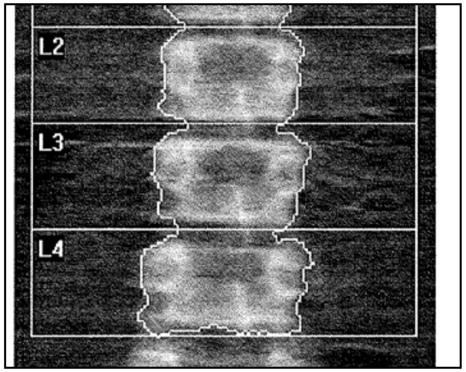
- BMD = $\frac{\text{Bone mineral content}}{\text{area}}$ (g/cm2)
- BMD is increased by age
- BMD z-score is a comparison with age, gender, ethnicity



N=174
N=193

Study Objective

To describe changes in bone mineral density (BMD) among perinatally HIV-infected adolescents with osteopenia (< -2 Z-score) before and after calcium + cholecalciferol supplement



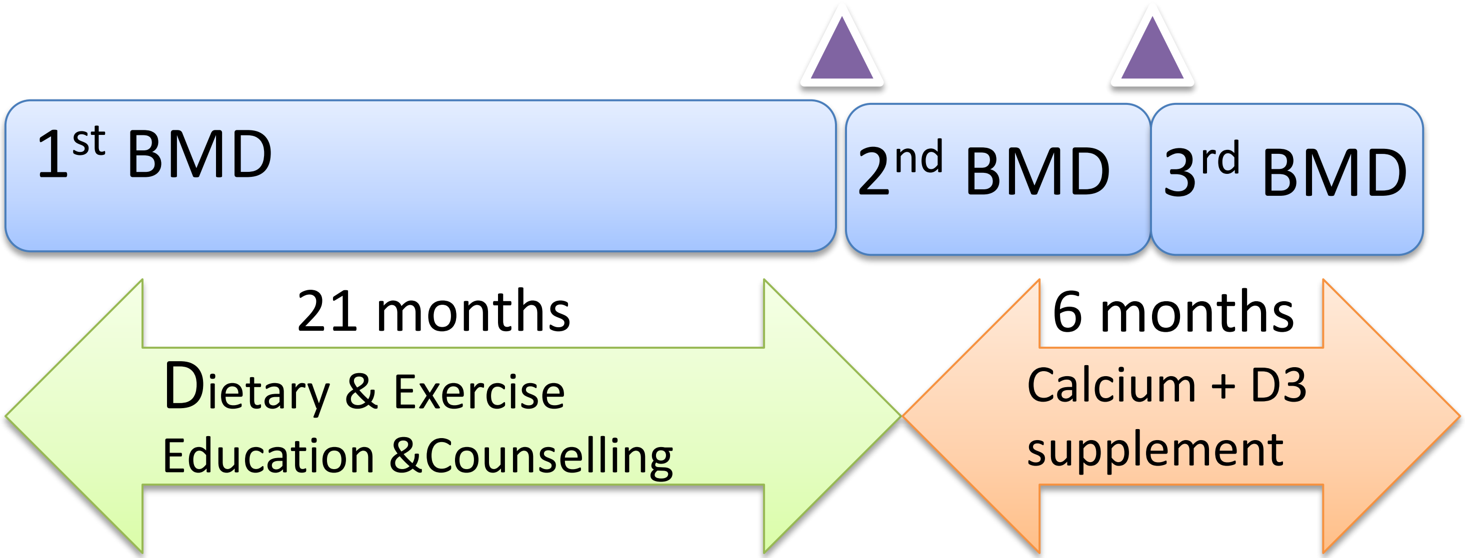
Dual-energy X-ray absorptiometry (DXA)
At Lumber spine (L2-L4)

Study design

Population*: Perinatally HIV-infected aged 12-20 yrs

L2-L4 BMD < -2 Z-score

Intervention: 1.2 g of calcium + Vit D3 400 IU/d * 6 mos



[1]Puthanakit T JAIDS 2012;61:477-83. [2]Chokephaibulkit K. Pediatr Infect Dis J 2013;32:1237-9.

Study procedure

- Without vitamin D deficiency
  - Calcium 600 mg+ D3 200 IU (Oskept) 1 tab bid

- With vitamin D deficiency (< 20 ng/mL)
  - Vitamin D2 60,000 IU/week * 8 week then every 4 weeks <u>PLUS</u> Oskept 1 tab twice daily until 25-OHD > 30 mg/mL
- Parameters of interest
  - L2-L4 BMD by DEXA scan: BMD, BMD z-score
  - Vitamin D, Calcium, Parathyroid hormone (PTH)

Statistical Methods

- BMD z-score was calculated using age and sex-matched Thai adolescent norms (Lunar prodigy)[1]
- Comparison of changes in BMD and BMDz-score pre and post supplementation using signed-rank test

[1]**Nakavachara P.** PLoS One. 2014;21;9(5):e97218.

Result: Baseline characteristics

	Total (N=24)	Persistent (N=13)	New (N=11)
Age (years)	14.1 (13.0-14.9)	13.8 (12.9-15.1)	14.5 (13.3-14.8)
Male (%)	15 (63%)	6 (46%)	9 (82%)
CD4 cell (cell/mm3)	706 (540-789)	738 (614-807)	610 (472-769)
% HIV RNA < 50 c/ml	21 (88%)	11 (85%)	10 (91%)
Tanner stage			
1-2	15 (63%)	9 (69%)	6 (55%)
3-5	9 (37%)	4 (31%)	5 (45%)

Result: Pre and post supplement

Data of 24 adolescents	Pre-supplement	Post-Supplement	P-value
BMD (g/cm2)	0.76 (0.70-0.86)	0.82 (0.78-0.92)	<0.001
BMD z-score	-2.59 (-3.02 to -2.35)	-1.70 (-2.76 to -1.10)	<0.001
BMD > -2z-score	0(0%)	14(58%)	-
25-OH vitamin D	31.2 (23.6-37.3)	28.7 (24.2-35.8)	0.573
Calcium	9.3 (9.0-9.5)	9.5 (9.2-9.9)	0.036
PTH level	58.2 (35.7-84.0)	42.8 (33.3-51.7)	0.055

Result: Change pre vs post supplement

Data of 13 adolescents	Change Pre-Supplement	Change Post-supplement	P-value
Interval (month)	20.9 (20.5-21.6)	6.0 (5.8-6.7)	N/A
BMD gain (g/cm^2)	0.063 (0.047-0.096)	0.057 (0.040-0.066)	0.133
BMD z-score change	-0.50 (-1.00 to 0.06)	0.65 (0.13 to 1.20)	0.028
25-OH vitamin D change	5.51 (2.02 to 11.95)	0.10 (-4.80 to 3.31)	0.075
Calcium change	-0.5 (-0.7 to -0.1)	0.45 (-0.2 to 0.9)	0.047
PTH level change	11.57 (-11.87 to 22.87)	-3.33 (-42.45 to 0.36)	0.314

Discussions (I)

- Improvement of bone mass accrual after 6 months of calcium and vit D supplement in pt. with low BMD
- [1]No improvement after 2 yrs of supplement among 30 HIV-infected children with baseline BMD 50th percentile
- [2]Improvement of BMD after 1 yr of supplement in 24 adult on TDF-based ART with baseline vit D or calcium deficiency

  (BMD change +2.4%, Low baseline BMD group +3.4%)
- [3]Improvement of BMD among 10-12 yrs old girls in Beijing Vitamin D-fortified milk supplement for 2 yrs versus control (change in BMD 8.9% versus 3.9%)

[1]Arpardi SM. Am J Clin Nutr 2012; 95: 678-85 [2]Bech A. HIV Clin Trials 2012;13:350-6.
[3]Du X. Br J Nutr 2004;92:159-68

Discussions (II)

Strength

- Longitudinal cohort comparing PRE-POST supplement
- Selected patient with low baseline BMD

Limitations

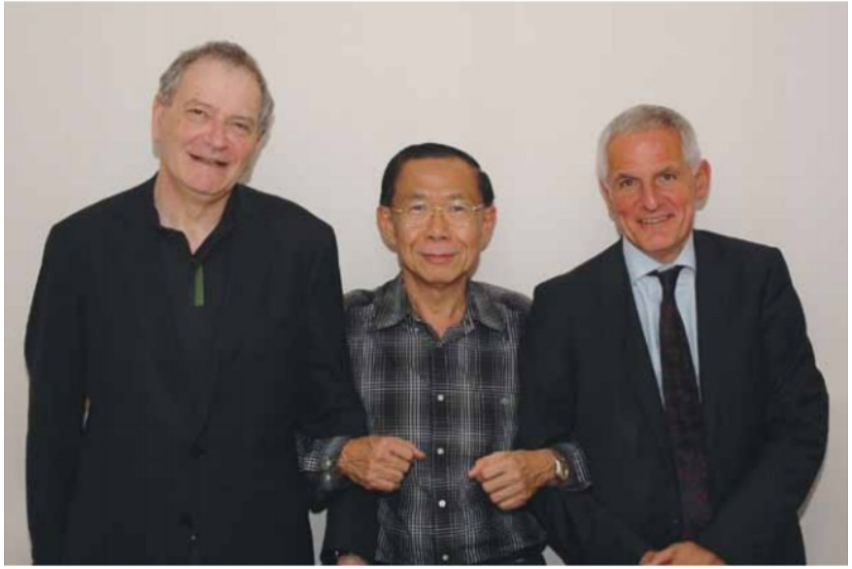
- Pilot study (N=24)
- Short term supplement for 6 months
- Whether the effect last after stop supplement

[1]Arpardi SM. Am J Clin Nutr 2012; 95: 678-85
[2]Bech A. HIV Clin Trials 2012;13:350-6.
[3]Du X. Br J Nutr 2004;92:159-68

Conclusions

- Improvement of bone mass accrual after 6 months of calcium and vitamin D supplement in HIV-infected adolescents who had low BMD.
  - In context of inadequate nutrition intake of calcium and vitamin D.
- Additional research is needed e.g.
  - Randomized placebo controlled trial
  - Duration of supplement
  - Long term effect after stop supplement

Acknowledgements



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