

# Does prophylaxis affect bone strength beyond physical activity?

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## Objectives:

Previous studies have demonstrated that children with severe hemophilia (HF) and prophylaxis have less joint damage related to bleeding than those without. With prophylaxis bleeding in severe HF is less likely to occur spontaneously, allowing the patients to participate in physical activities. Several studies have demonstrated that boys with HF are at risk of suboptimal peak bone mass and low bone mineral density. As the clinical significance of this is unclear, we sought to evaluate bone strength in children with HF and on prophylaxis or on-demand treatment.

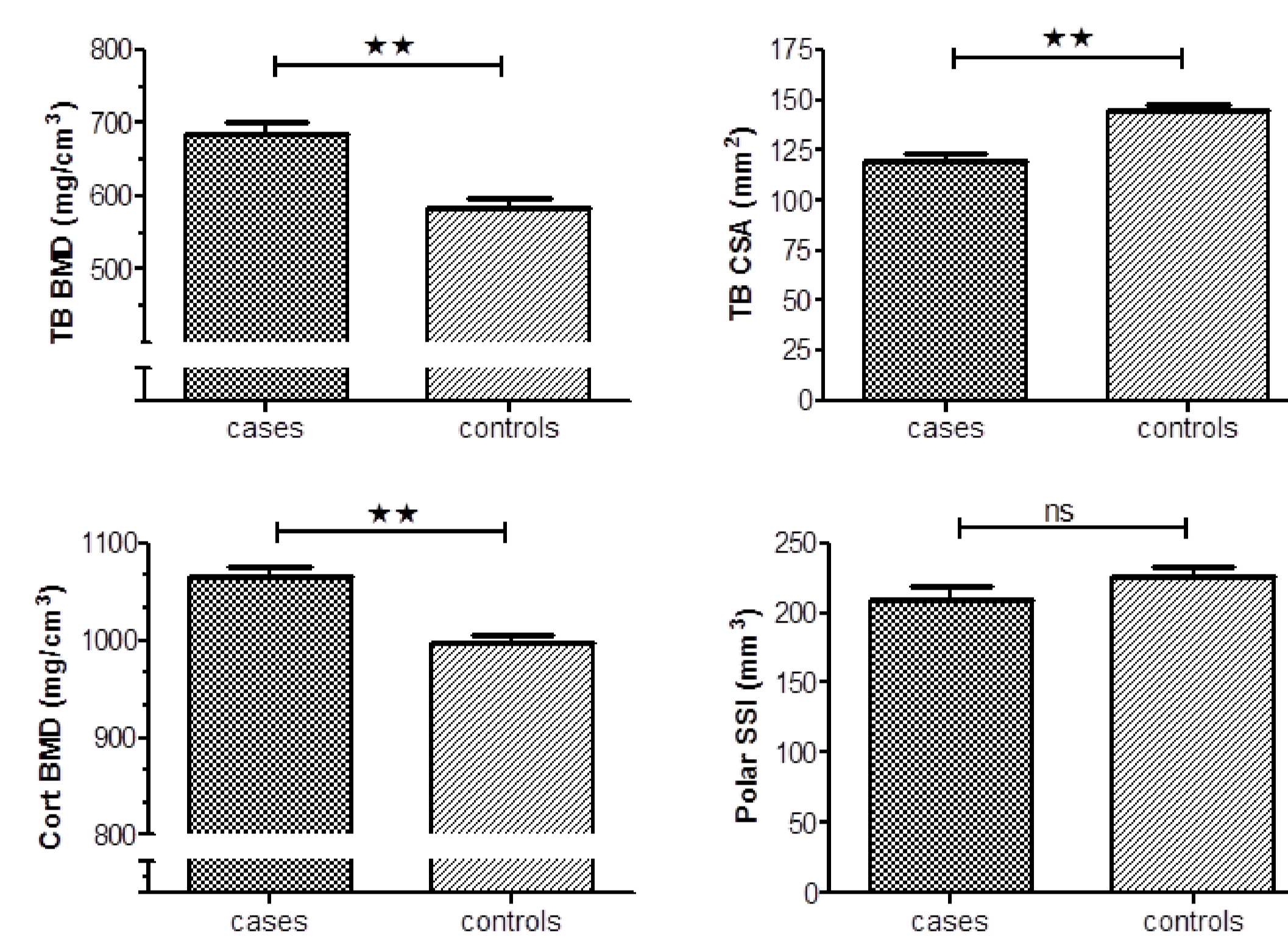
## Methods:

The study group comprised 29 children with HF (mean age 12.2 years) and 46 age-matched controls. One fourth (7/29) had mild or moderate HF and on-demand treatment while three quarters had severe or moderate HF (22/29) and prophylaxis. Their bone strength was assessed by peripheral quantitative computed tomography (pQCT) at the radius. Physical activity was evaluated by a questionnaire.

## Table

## Fig

	PATIENTS (n=26)	CONTROLS (n=42)	P
TB CSA (mm <sup>2</sup> )	120 ± 6	145 ± 5	0.002
TB BMD (mg/cm <sup>3</sup> )	687 ± 19	579 ± 15	≤0.001
TB BMC (g/cm)	0.823 ± 0.05	0.841 ± 0.04	0.763
Cort CSA (mm <sup>2</sup> )	63 ± 4	58 ± 3	0.434
Cort BMD (mg/cm <sup>3</sup> )	1068 ± 12	993 ± 10	≤0.001
Cort BMD Z-score	0.94 ± 0.25	-0.96 ± 0.20	≤0.001
Polar SSI (mm <sup>3</sup> )	211 ± 18	222 ± 15	0.641
Polar SSI Z-score	-0.26 ± 0.24	-0.14 ± 0.19	0.713



## Results:

- Anthropometric characteristics of the patients and controls were similar
- No significant differences in physical activity or number of joint bleeds between patients with on-demand treatment and prophylaxis
- No differences in physical activity between patients and controls, but the intensity of physical activity was significantly lower in patients (p=0.03)

### The distal radius:

- boys with HF had lower TB BMD Z-scores compared with the controls (p≤0.001) and a tendency to lower subcortical BMD (p=0.125)

### The proximal radius:

- TB CSA was significantly smaller in patients with HF (p=0.002)
- The smaller CSA seemed to be compensated by higher BMD; the bone strength parameter SSI was normal
- SSI Z-score was significantly lower in patients with on-demand treatment than with patients on prophylaxis (p=0.005)
- Patients on prophylaxis had similar bone strength as healthy children
- Patients with on-demand treatment had inferior bone strength compared to healthy children (p=0.013).

## ABBREVIATIONS

**BMC** bone mineral content (bone mass measured as grams per centimeter slice thickness)

**BMD** bone mineral density (mass of mineral per cubic centimeter of the bone, mg/cm<sup>3</sup>)

**Cort** cortical (compact bone type)

**CSA** cross-sectional area (surface area under cross sectional pQCT slice)

**pQCT** peripheral quantitative computed tomography (a method to measure volumetric BMD and bone geometry in the peripheral skeleton)

**polar SSI** polar Strength-Strain Index (combines both bone geometry and material properties; an indicator of bone strength)

**TB** total bone (includes cortical, subcortical and trabecular bone)

## Conclusions:

- 1) Boys with HF have smaller bone size at proximal radius as compared to healthy children; the healthy controls had 21 % higher total bone cross-sectional area than the patients.
- 2) To compensate for the size difference the patients had denser cortices.
- 3) These characteristics may make patients with HF more prone to fractures later in life.
- 4) Unlike boys with mild to moderate HF and on-demand treatment, boys with severe HF and prophylaxis have normal bone strength at the radius when compared with healthy controls. Prophylactic treatment seems to have a beneficial effect on bone health beyond the effect on physical activity.

## References:

Ranta et al, *Peripheral quantitative computed tomography (pQCT) reveals alterations in the three-dimensional bone structure in children with haemophilia. Haemophilia, epub ahead of print*

