Evaluation of bone geometry, quality and bone markers in children with type 1 diabetes
Silvia Longhi, Roberto Franceschi, Vittoria Cauvin, Davide Gatti, Caterina Fraccarollo, Giuseppe Gallo, Fiorenzo Lupi, Petra Reinstadler, Giorgio Radetti

Department of Paediatrics, General Hospital Bolzano (SL, FL, PR, GR), Department of Paediatrics, Santa Chiara Hospital Trento (RF, VC, GG). University of Verona, Rheumatology Unit (DG, CF)

Disclosure Statement: The authors have nothing to disclose

Introduction
Several studies have examined the relationship between type 1 diabetes and bone, however, with contradictory data on BMD, bone remodelling markers and bone quality. Nevertheless an increased prevalence of osteopenia was observed among patients with duration of disease of > 6 years.

Objectives
The aim of the study was to investigate the potential negative impact of type 1 diabetes on bone status in a group of children with type 1 diabetes, by evaluating bone geometry, quality and bone markers.

Patients and Methods
82 children (47 m, 35 f), mean age 10.7±3.0 years, height SDS 0.05±0.94, BMI SDS -0.49±0.87 with a mean duration of type 1 diabetes of 4.4±2.9 years were studied. Bone geometry was evaluated on digitalized X-rays at the level of the 2nd metacarpal bone. The following parameters were investigated: outer diameter (D), inner diameter (d), cortical area (CA) and medullary area (MA), meanwhile bone quality was evaluated by ultrasound and expressed as amplitude dependent speed of sound (Ad-Sos) and bone transmission time (BTT). Data were converted to SDS and evaluated according to bone age. Bone markers (P1NP, CTX and BAP), sclerostin, Dkk-1, PTH and 25OHD were also assessed. Differences in bone geometry and quality were evaluated against zero, while the biochemical values of the patients were compared with a control group of 40 subjects of normal weight and height, which did not suffer of any chronic diseases.

Results
D (-0.99±1.03), d (-0.42±0.92), CA (-0.87±0.82) and MA (-0.46±0.82) were all significantly smaller than in controls (P<0.01) while MI (0.05±1.12), Ad-Sos (0.40±1.22) and BTT (0.05±0.92) were not significantly reduced. The bone markers were similar in children with type 1 diabetes and controls. When the patients were subdivided according to the HbA1c value <7.5% (n=35) and > 7.5% (n=47) no differences where found except for a BAP (106.43±35.12µg/L vs 84.99±39.84µg/L; p<0.01) which is a marker of bone formation.

Conclusions
Type 1 diabetic children show a bone of reduced size but with conserved proportion and quality. Bone turnover seems to be increased in patients with a suboptimal metabolic control.