Assessment of Osteoporosis by Quantitative Ultrasound vs. Dual Energy X-Ray Absorptiometry in Children with Chronic Rheumatoid Diseases

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Objective
Osteopenia and osteoporosis are common complications in children with chronic rheumatic disorders (CRD), which justify regular monitoring of such patients. The aim of this study was to evaluate bone ultrasound densitometric parameters using quantitative ultrasound bone sonometer (QUBS) as a screening tool for the diagnosis of osteoporosis, and to compare the results with the conventional dual-energy x-ray absorptiometry (DXA).

Patients / Methods
Forty children with CRD followed at the Pediatric Rheumatology Clinic were evaluated by QUBS of radius and tibia and by DXA of spine on the same day. Thirty-two had Juvenile Chronic Arthritis (JCA), 6 had Systemic Lupus Erythematosus (SLE), and 2 had dermatomyositis. All children had anthropometric evaluation, pubertal staging and assessment of their disease activity. Quantitative measurements of the velocity of ultrasound waves, expressed as speed of sound (SOS) in m/sec, were performed at two skeletal sites: distal third of radius and mid-shaft tibia, while lumbar bone mineral density (BMD) was estimated by DXA. The results of the QUBS studies were compared to a healthy and gender matched control group age, and expressed in z-scores (age and sex correction). The results of the DXA studies were compared to reference data in Israeli children.

Results
The study group included 27 girls and 13 boys with a mean age of 9.9±4.3 years (range 4-18 years) and mean disease duration of 4.8±3.5 years (range 0.5 - 15 years). Five children had a history of past fractures. Twenty-five were past or current corticosteroid users and 16 were treated with methotrexate. Compared to controls, CRD patients displayed significantly lower values by QUBS and DXA alike. Lumbar scores <-1SD and SOS measurement <1SD were found in 45% and 38% of the patients, respectively. A positive
significant correlation was found between the two methods. Reduced DXA scores and QUBS values correlated with age at onset of illness and with corticosteroids treatment, but DXA alone correlated negatively also with disease duration and MTX therapy. Patients with polyarticular course of JCA suffered significantly more from osteopenia of lumbar spine than patients with pauciarticular disease (p< 0.03), whereas SOS values did not differ between subtypes of JCA. DXA but not QUBS correlated significantly with patient’s height.

**Conclusions**

QUBS evaluation of radius and tibia yields results similar to those of conventional DXA and may therefore be used for screening patients for osteoporosis. Because ultrasound is non-invasive, safely repeated, and does not expose patients to radiation, QUBS is a promising means of evaluating and following BMD and bone quality in children at-risk.

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