

Ultrasonography Technology for the Assessment of Bone Health in Children

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Background

Bone development during childhood and adolescence is a key determinate of adult skeletal health. Key measured parameters to determine proper growth, in addition to height, weight, and stage of maturity, are bone strength and skeletal maturity.

Bone Strength

More than 85% of peak skeletal mass is acquired by the age of 18 years, making bone growth during childhood and adolescence a critical process. Reduced bone mass is associated with increased fracture risk in adults as well as in children. The ability to measure, assess, and monitor bone strength development in pre-term babies through adults will be demonstrated using Sunlight Omnisense® 7000P. Speed of Sound (SOS) has evolved as a surrogate measure of bone fragility that reflects structural properties of bone. Omnisense 7000P has the advantage of being mobile and easy to use for any age patient, and under field conditions. As SOS offers further information on bone quality, in addition to bone matrix microstructure and architecture, it has been shown in different studies that it is important when assessing fracture risk, even in children.

Skeletal Age

At least 5% of children and adolescents are categorized as having short stature or growth abnormalities. Skeletal development of children is regularly assessed using hand and wrist radiographs and standard atlases. A novel automated ultrasound-based methodology for assessing bone age, Sunlight BonAge, will be introduced, demonstrating a new, easy-to-use method to assess bone age.

Different studies, which were performed in Israel and China, resulted in a high correlation between the US and GP assessments. R² values of 0.89 and 0.90 for boys and girls respectively were found between the standard method of a hand X-ray interpreted with the GP Atlas and the new technique. Accuracy of 0.90 (± 0.70) years for boys and 0.86 (± 0.65) years for girls was obtained for the ultrasound measurements. Inter-physician accuracy was 0.65 (± 0.67) and 0.54 (± 0.72) years for boys and girls respectively. Inter-operator precision for the ultrasound bone age

device was 0.34 years for boys and 0.25 years for girls. Ultrasound measurements using Sunlight BonAge are highly reproducible and highly correlated with conventional bone age results.

The combination of both applications offers the physician a complete pediatric evaluation tool.

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