

Bone Quality assessment measured by qualitative ultrasonometry (QUS) measurement in children and adolescents with cerebral palsy

Research worker: *Dr Bidisha Lahoti, Consultant Paediatrician*
Dr Andreas Meyer-Heim, Consultant Paediatrician
Dr Yasmin Khan, Consultant Paediatrician, CHCS
Dr Charlie Fairhurst, Consultant in Neuropaediatrics, CHCS

Background

We looked at the use of Qualitative Ultrasonometry (QUS) to assess bone health in children with quadriplegic cerebral palsy (CP). QUS measures Speed of Sound (SOS) through the bone which is dependent on the bone quality. There were no values for children with quadriplegic CP.

Objective

The purpose of this study was to provide reference values of bone quality in children and adolescents with CP measured by tibial and radial quantitative QUS and relate these values to profile of risk factors within this population.

Methods

Study design: This was a cross sectional study with two group comparison using the study group and matched control group. We measured right tibial and radial SOS using QUS.

Study population: Children with CP attending Chailey Heritage School, age 4-19 years. The children were non ambulatory, GMFCS level of IV-V. Bone Ultrasound examination was performed in 61 of the 63 children who consented for the study.

Control group: The ultrasound device (Sunlight OMNISENCE) compares each study measured with the SOS of age and gender matched control group, consisting of 500 Israeli (Caucasian) children and calculates the z-score for each reading. We obtained data on the child's growth, mobility, weight bearing, medications, past history of fractures and reports of x-rays and DXA scans.

Results

Ultrasound scanning was done in 61 children, values were obtained in 60.

The 34 boys were in age range 4.05 to 18.05 years, median=12.56 years.

The 26 girls were in age range 4.39 to 19.36 years, median=11.97.

SOS showed increase with age in both senses.

Of the 34 boys, 8 had z-scores of <-2.5, 9 of <-1.5 to -2.4 and 9 of <-1.0 to -1.4.
Of the 26 girls, 4 had z-scores of <-2.5, 9 of <-1.5 to -2.4 and 8 of <-1.0 to -1.4.

The z-scores were lower in the radius and with increasing age.?

USS findings did not consistently correlate with radiological findings of osteopenia, with history of fracture. DXA results were too few to compare.

Conclusions

This is the first study of its kind in children and young people with CP.

We found the bone quality as measured by QUS to be poorer when compared to healthy typical children. The z-scores trends were generally lower with increasing age and skeletal growth, this observation was seen more definitely in the radial bone and in girls. This may reflect minimal hand function in the study group along with progressive decrease in ambulation associated with age.

We need further studies to compare USS with DXA scan results with bone biopsies possibly being used as standard, before this tool can be reliably used for assessment of bone health in children with quadriplegic cerebral palsy.

Bidisha Lahoti
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