P49. MEASUREMENT OF BROADBAND ULTRASOUND ATTENUATION ON FINGER PHALANGES FOR AN IMPROVED ASSESSMENT OF RHEUMATOID ARTHRITIS

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QUS of finger phalanges is sensitive to phalangeal periarticular bone loss in rheumatoid arthritis (RA). Broadband Ultrasound Attenuation (BUA) is used in calcaneal measurements for the assessment of trabecular bone properties. We tested if BUA of trabecular as well as cortical bone of finger phalanges can be used for the characterization of erosions caused by RA.

Metaphyses of the proximal phalanges of 29 female patients and 30 healthy women were measured using the DBMSonic 1200 (IGEA) according to standard manufacturers recommendations. Additionally QUS was performed directly at the PIP joint in dorso-volar direction. Standard parameter AD-SoS and a new parameter BUA were calculated for both sites and were compared with the presence of erosions as evaluated from hand x-rays of the patients. Results were expressed as Z-scores.

Both parameters decreased with the severity of RA at the joint, but only AD-SoS decreased at the metaphysis while BUA increased.

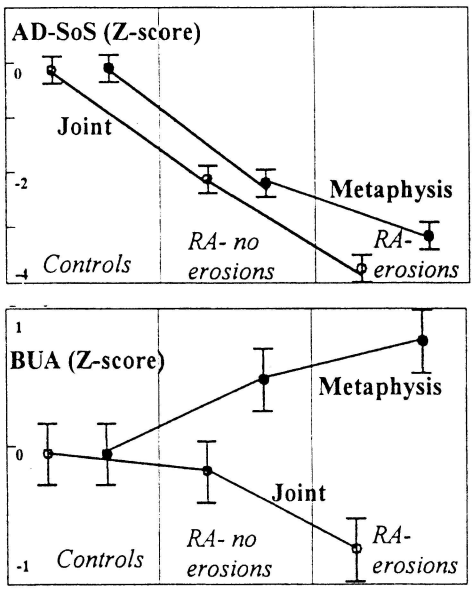

Fig. QUS Z-scores for controls, patients without and with erosions

Similar to calcaneus measurements, AD-SoS and BUA decrease with increased impairment of cancellous bone at the joint. The increase of BUA at the metaphysis may indicate a higher porosity in impaired cortical bone. The new parameter BUA and measurements directly at the trabecular joint appear to provide clinically relevant additional information complementing the standard measurement.

P50. CAN WE USE ULTRASOUND OF THE HEEL TO PREDICT LOW BONE MASS IN THE HIP OR THE LUMBAR SPINE?

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Quantitative ultrasound (QUS) is a non-invasive, portable and inexpensive technique for measuring fragility of bone. However, the limitations of QUS in diagnosing individuals with osteoporosis are usually less emphasized. It was our aim to descriebe the utility of QUS in predicting low bone mass of the hip and the spine, i.e. T-scores at −1.0 and −2.5 as proposed by WHO in defining osteopenia and osteoporosis.

Methods: We included 165 randomly selected women aged 45-58 years from a cohorte of late perimenopausal or postmenopausal women. We compared the results of dual energy X-ray absorptiometry (DXA) of the hip and the lumbar spine employing the Hologic QDR-2000 with the results of QUS of the right calcaneus employing the Lunar Achilles. A calculation of "Stiffness" based on measured SOS and BUA values was compared with DXA values of the hip and the spine using af 2×2 table calculating the sensitivity and specificity with reference to DXA as the gold standard.

Results: The predictive values of Stiffness to exclude low bone mass is excellent for both the hip (88%) and the spine (90%). However, there is a poor predictive power to diagnose osteopenia and osteoporosis of the hip (27–32%) or the spine (21–34%). The calculated predictive values are highly dependent on the prevalence of low bone mass.

Conclusion: QUS can possibly be used for screening purposes in low-prevalence settings, but can not replace DXA in confimatory testing for osteoporosis or osteopenia.

P51. A STRATIFIED MODEL FOR ULTRASONIC WAVES IN BONE

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For Quantitative Ultrasound to be confidently used in the clinical assessment of bone condition, a fundamental understanding of how ultrasound travels in cancellous bone is important. Previous authors used Biot's theory to predict ultrasonic wave properties, but with limited success. Ultrasonic attenuation and speed of sound are strongly dependent on the direction of propagation relative to the trabecular alignment, but Biot does not predict this anisotropy. The authors have therefore proposed an alternative approach [1], which applies Schoenberg's theory to a stratified model of the trabecular architecture. Schoenberg predicts two distinct longitudinal waves in porous bone, whose speeds vary with angle (fig). Preliminary data from bovine femur appear to support the theory, and it is therefore conceivable that structural proprieties of bone may be derived directly. This paper explains how the theory may be of value to the diagnosis of osteoporosis.

1. Hughes ER, Leighton TG, Petley GW, White PR, *Ultrasound Med Biol*, 25(5):811–21 (1999).