

AN INNOVATIVE ULTRASOUND-BASED METHOD FOR THE ESTIMATION OF OSTEOPOROTIC FRACTURE RISK

Francesco Conversano¹, Paola Pisani¹, Antonio Greco¹, Giulia Soloperto¹, Maurizio Muratore², Sergio Casciaro¹.

¹Institute of Clinical Physiology, National Research Council, Lecce, Italy; ²O.U. of Rheumatology, "Galateo" Hospital, San Cesario di Lecce, ASL-LE, Lecce, Italy.

Background: Osteoporosis affects about 200 million people in the world and is responsible for 8.9 million fractures each year worldwide. Hip fractures are a major public health burden, from both social and economic point of view, since they represent one of the most important causes of morbidity, disability, decreased quality of life and mortality for the elderly population. It has been demonstrated that BMD measurements on lumbar spine or proximal femur, currently performed essentially by dual-energy X-ray absorptiometry (DXA) examinations, are the most reliable to predict the global fracture risk. However, DXA examinations exploit X-rays, which imply the well-known safety- and cost-related issues, and, therefore, they are not employable for population mass screenings.

Objectives: Aim of this work is to evaluate the performance of a new method to estimate the general osteoporotic fracture risk from an ultrasound spinal scan.

Methods: 70 female patients [50-70 years; BMI (body mass index) ≤ 30 kg/m²] were enrolled, 34 with a recent non-vertebral osteoporotic fracture and 36 controls without fracture history. All the patients underwent two examinations: a conventional spinal DXA (Hologic Discovery) and an abdominal ultrasound scan of lumbar spine. Ultrasound data were analyzed by an innovative algorithm that processed both echographic images and "raw" radiofrequency signals providing as final output a new parameter named Fragility Score (F.S.), which provides an estimate of skeletal fragility and, therefore, of fracture risk. Accuracy of F.S. in the identification of subjects prone to fractures was assessed by calculating area under the receiver operating curve (AUC) and using unpaired two-sided Student *t*-test. Discrimination power of F.S. was also compared with that of DXA-measured BMD.

Results: Both F.S. and BMD discriminated significantly between fractured and non-fractured women: F.S. values found in patients with fragility fractures (52.2 ± 17.3) were significantly higher than the corresponding values found in non-fractured women (42.3 ± 10.6 , $p < 0.01$) and BMD values of the fractured group (0.835 ± 0.137 g/cm²) were significantly lower than the corresponding values found in the control group (0.949 ± 0.143 g/cm², $p < 0.01$). The comparison between the AUC values indicated that BMD (AUC=0.71) performed only slightly better than F.S. (AUC=0.68).

Conclusions: The proposed method demonstrated a good discrimination power between fractured and non-fractured patients, indicating that this innovative non-ionizing device could become extremely useful for the early identification of patients at high risk of osteoporotic fracture.

Acknowledgements: This work was partially funded by FESR P.O. Apulia Region 2007-2013 – Action 1.2.4, grant n. 3Q5AX31.