HIGH CORRELATION BETWEEN A NEW ULTRASOUND-BASED METHODOLOGY FOR SPINAL DENSITOMETRY AND DUAL X-RAY ABSORPTIOMETRY.

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OBJECTIVES: To carry out a preliminary clinical validation of a novel ultrasound (US)-based diagnostic paradigm to perform spinal densitometry without employing X-rays.

MATERIALS and METHODS: A total of 260 female patients were enrolled according to the following criteria: 45-80 years of age, BMI (body mass index) $\leq$ 40 kg/m^2, no severe deambulation impairments, medical prescription for a spinal dual x-ray absorptiometry (DXA), signed informed consent. All the enrolled patients underwent two examinations: a conventional spinal DXA (Hologic Discovery) and an US scan of lumbar spine. US data were analyzed by a novel algorithm that processed both echographic images and "raw" radiofrequency signals and calculated the same diagnostic parameters provided by DXA (bone mineral density (BMD), T-score, Z-score). Diagnostic accuracy of obtained results was evaluated through a direct comparison with DXA output as a function of patient age and BMI.

RESULTS: For 90.0% of the patients US diagnosis (osteoporotic, osteopenic, healthy) was the same of the corresponding DXA one. Specifically, diagnostic accuracy was 91.7% for patients with BMI in the range 25-40 kg/m^2 (n = 108) and 88.8% for those with BMI<25 kg/m^2 (n = 152), with maximum (94.7%) and minimum (78.8%) accuracy in the age range 65-70 yr and 45-50 yr, respectively. All the obtained values of Pearson correlation coefficient (r) between diagnostic parameters (BMD, T-score, Z-score) provided by DXA and US for patients in the same age and BMI ranges were within the interval 0.72-0.92 (p<0.001) and their trends against age and BMI qualitatively reflected the observed diagnostic accuracy profile.

CONCLUSIONS: The proposed approach represents the first methodology for US evaluation of BMD directly on the spine showing a very good agreement with DXA diagnoses. This new technique could represent a breakthrough approach for early diagnosis and therapeutic outcome monitoring.