ORIGINAL ARTICLE

CORRELATION BETWEEN CALCANEAL BONE ULTRASOUND MEASUREMENTS AND DENSITOMETRY AMONG POSTMENOPAUSAL WOMEN WITH FRACTURES CAUSED BY BONE FRAGILITY

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ABSTRACT

Objective: To assess the correlation between ultrasound (US) measurement on the calcaneus and bone densitometry (DEXA), among postmenopausal women who already presented fragility fractures. Methods: 35 postmenopausal women over 40 years of age, with the ability to walk and presenting osteoporotic fractures of the wrist or spine, without previous treatment for osteoporosis, were analyzed in a retrospective cohort. Of these, 16 were under 60 and 19 were over 60. The broadband ultrasound attenuation (BUA) and speed of sound (SOS) were compared using DEXA (L1-L4, total femur, femoral neck and wrist). Two different values of BUA were used as cutoff points for osteoporosis: BUA < 60 dB/MHz and BUA < 64 dB/MHz ($P < 0.05$); and SOS < 1600 m/s. The confidence interval was 95%. The DEXA and US data were plotted on dispersion graphs and, through linear regression, it was possible to establish correlations. Following this, the sample was stratified according to age (up to 60 years and 60 years and over). Thus, the values were again compared and correlated. Results: The best correlation obtained between DEXA and US was between the T-score of the wrist and BUA < 64 dB/MHz, with 92% sensitivity and 95% specificity. Better sensitivity at all DEXA sites was obtained when US was performed on patients over 60 years of age. The SOS compatible with osteoporosis was < 1592.5 m/s (89% sensitivity and 85% specificity). Conclusion: US on the calcaneus can be used for screening the risk of osteoporosis fractures, using a cutoff of BUA < 64 dB/MHz, especially among patients over 60 years of age.

Keywords - Calcaneus; Ultrasound; Bone Density; Postmenopausal Osteoporosis/prevention and control

INTRODUCTION

Osteoporosis is a systemic disease which is characterized by low bone mass and a deterioration in the bone microarchitecture, leading to a decrease in its biomechanical resistance, which, in turn, creates a relatively higher (2-4 times) risk of fractures[(1)].

It presents important prevalence in the worldwide population, affecting 30 out of 100 post-menopausal women. Another important factor is that the population is ageing due to a longer life expectancy, which also increases the number of fractures caused by osteoporosis. In 2000, Brazil had more than 14,000,000 people aged over 60 years[(2)].

Despite the medical treatments available to treat patients with osteoporosis and reduce the risk of fractures, many patients are asymptomatic, not diagnosed

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or undertreated[3-6]. Ideally, to avoid fractures, osteoporosis should be diagnosed early, which is currently done by bone density scan (DEXA). Bone ultrasound has been performed as a method of screening the population, to evaluate the risk of fracture[7]; however, there is still controversy on the usefulness of this method, as there are few studies that demonstrate the ideal values for correlation of BUA and SOS with DEXA[8].

Prospective studies have shown that ultrasound of the calcaneus can predict a risk of bone fracture, as well as DEXA[9,10]. The method also presents several advantages: it is cheaper, portable, and does not involve ionizing radiation[11].

The objective of this work is to evaluate the correlation between ultrasound of the calcaneus and DEXA in post-menopausal women, in the city of Goiânia, Goiás, who already presented a fracture due to osteoporosis.

METHOD

A retrospective cohort study was carried out involving 35 women with osteoporotic fractures of the wrist or vertebral spine, who were able to walk, aged over 40 years, post-menopausal, attending the Orthopedics and Fracture Clinic, and without prior treatment for osteoporosis. Of these patients, 15 presented fracture of the vertebral column and 20, fracture of the wrist. All were submitted to non-surgical treatment. Of these women, 16 were aged below 60 years, and 19 were 60 or over (from 44 to 87, with a mean age of 61.6 years).

BUA and SOS were correlated in dispersion graphs, with the DEXA sites (L1-L4, total femur, neck of the femur, right wrist and left wrist), both in the general population and in stratified population (aged under 60 and 60 or over). The equation was then calculated for linear regression and the strength of correlation between the variables through Pearson's correlation.

To predict the risk of osteoporotic fracture, BUA < 60dB/MHz was initially adopted, and then BUA < 64dB/MHz[8].

As for SOS, the value that predicts the risk factor was calculated by the linear regression equation.

A confidence interval of 95% was adopted, with $p < 0.05$ considered significant.

Ultrasound was carried out with the SONOST-2000 device and DEXA with a Lunar device. The research was carried out in the COF – Orthopedics and Fracture Clinic of Goiânia, Goiás, and authorized by the ethics committee of the COF.

RESULTS

The results are shown in Figures 1, 2, 3 and 4 and in Tables 1, 2 and 3 below.

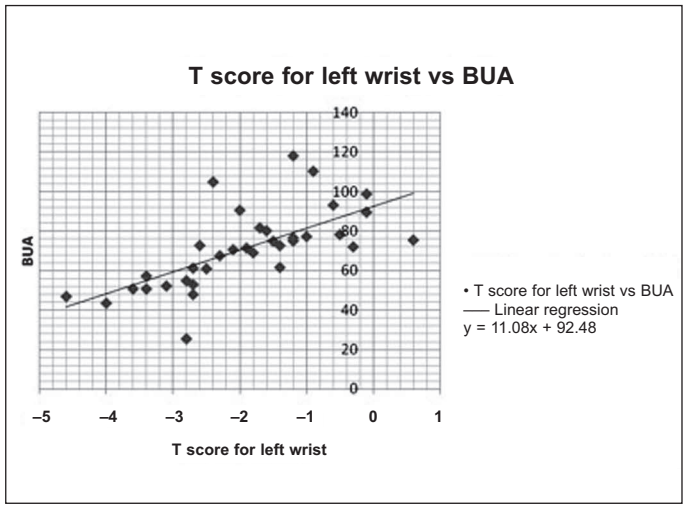

Figure 1 – Association between BUA and T score of the wrist for all the patients in the sample. Adopting a value for BUA < 60dB/MHz, sensitivity of 77%, specificity of 100% and positive predictive value of 100% were obtained. When BUA < 64dB/MHz was adopted, the sensitivity obtained was 92%, with specificity of 95% and a positive predictive value of 92%.

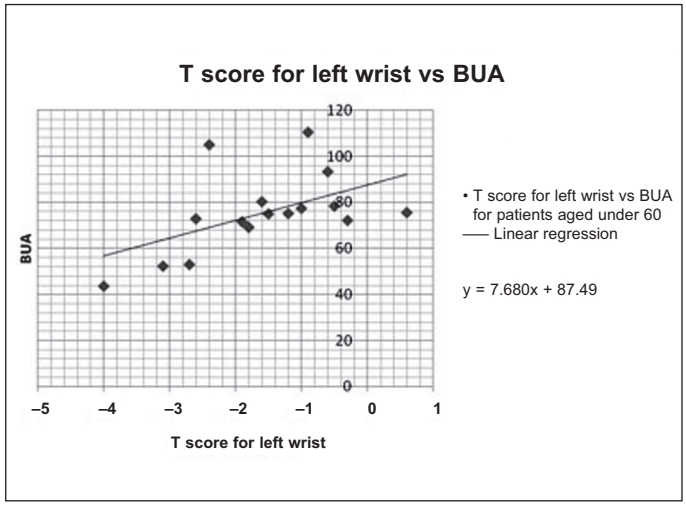

Figure 2 – Association between BUA and T score of the wrist by DEXA in patients aged under 60. Using a value for BUA < 60dB/MHz, sensitivity of 75%, specificity of 100% and positive predictive value of 100% were obtained. Using BUA < 64dB/MHz, no alterations in sensitivity, specificity and positive predictive value were obtained, compared with the values above.