Evidence-based Rheumatology

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Calcaneal quantitative ultrasound as a reliable tool in assessing osteoporosis and its risk factors in a large cohort of the Italian population

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Title: The effect of age, weight, and lifestyle factors on calcaneal quantitative ultrasound: the ESOPO study
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Aim. Low bone mass is apparently the strongest predictor of osteoporotic fractures, known to be important causes of morbidity and mortality in elderly people. Quantitative ultrasound (QUS) techniques have been shown to be as reliable as dual-energy X-ray absorptiometry (DXA) in evaluating bone mineral density (BMD) and in predicting fracture risk.

QUS, a less expensive and more widely available technique than DEXA, could make the evaluation of the risk of osteoporosis more feasible for many clinics. Since little is known about the reliability of QUS in measuring the risk factors predictive of DXA-BMD, a cross-sectional study was undertaken in Italy to assess the correlation between BMD measured by QUS and factors predicting fracture risk in a large cohort of women and men.

Methods. 1,532 general practitioners selected from their registries 14,327 women (40-80 years of age) and 8,742 men (60-80 years of age) and referred them to one of the 83 osteoporosis centers located throughout Italy. A total of 11,011 women (77%) and 4,981 men (57%) men agreed to participate.

All participants were questioned on epidemiological features, lifestyle habits (bed confinement for > 2 months, outdoor physical activity, dairy calcium intake, smoking habits, and alcohol, coffee and tea intake), medical history (taking of drugs that might interfere with bone metabolism, corticosteroid therapy > 3 months, general health) and the gynaecologic history for women (age at menarque and menopause, number of pregnancies, eventual ovariectomy or hysterectomy and hormone replacement therapy).

After a physical examination, "bone stiffness" (henceforth referred to as "stiffness") derived from the values of broadband ultrasound attenuation (BUA) and speed of sounds (SoS) was measured by a heel QUS device (Achilles Apparatus, Lunar, Madison, USA). The most widely recognized determinants of bone mass were modelled (as either categorical or continuous variables) with stiffness by multiple regression analysis or ANOVA.

Results. A total of 6,811 post-menopausal women (40-80 years of age) and 4,981 men (60-80 years of age) representative of the general population of all regions of Italy were studied. Over every age range, stiffness was significantly higher in men than in women. Adjusted for age, weight, and height the mean stiffness values in men (92.2±0.2 SE) was 14.4% higher than in women (79.9±0.2).

Stiffness was strongly correlated to age and weight. After adjusting for these variables, the women who had taken hormone replacement therapy for more than a year had significantly higher stiffness values. The difference versus non-users remained significant for up to 20 YSM (years since menopause). This effect was so marked that these women (n = 693) were excluded from further analysis.

By multivariate analysis, stiffness was then found to be significantly related to recalled body weight at 25 years of age, actual and past number of cigarettes smoked per day, and dairy calcium intake. Stiffness was also associated with a number of categorial factors adjusted for age, weight, and YSM: prior ovariectomy, history of more than 2 months of bed confinement, outdoor physical activity, smoking, chronic use of any drug, and past corticosteroid use. All of these categorial and continuous variables were predictors of stiffness equally in men and women.

Conclusions. QUS bone measurement is a reliable tool for assessing BMD and is also useful in screening for the risk of osteoporosis. The risk factors usually associated with BMD as measured by DXA are also associated with calcaneal bone stiffness as measured by QUS, and most of the risk factors for osteoporosis usually observed in women are equally applicable to men. Moreover, QUS can identify postmenopausal women and their past use of hormone replacement therapy.

Comment

The Authors describe an analysis carried out in a large population of Italian men and women randomly selected by general practitioners. The conclusions of the authors are of interest, primarily due to the impressive size of the sample, although it is difficult to judge the relevance of the results to actual clinical applications.

One of the limits of this study is the lack of clarity as to what is meant by the parameter of "stiffness". The measurement of BMD in a subgroup of the entire population could certainly have been useful for a comparison analysis between "stiffness" and BMD. This could have been included in the original study design, as many of the participating centers are recognized osteoporosis clinics which are certainly equipped with a DXA machine.

The authors' conclude that the risk factors shown to correlate with "stiffness" could be used to select those individuals, either men or women, for whom a QUS measurement could be recommended. Some doubts may be raised regarding this recommendation, as the population selected for a QUS measurement would be quite large. This disadvantage, together with the lack of a clear definition of the term "stiffness", would make it difficult to apply US in clinical practice.

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