Evolution of bone mineral density after a 15 year intervention based on progressive force training

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Dear Editor,
Osteoporosis is the most common bone disorder in humans, affecting older people at a very high rate. It consists of an imbalance in bone formation-resorption which principally affects its strength and resistance, resulting in an increase in risk of fractures[1]. This situation is associated with high levels of morbidity and mortality[2]. One of the many causes which affect this relationship is the history of the mechanical load taken by the bone[3], and, according to the law proposed by Dr Wolff, the stress or mechanical load applied to the bone through the tendon and generated by the muscle. Pharmacological intervention for osteoporosis includes drugs of the biphosphonate family, the selective oestrogen receptor modulators, parathyroid hormone, the oestrogens and calcitonin[2]. In addition, the referent institutions and the specialists agree in including the practice of physical exercise among health-giving habits for people affected, or with possible affectation of bone mineralisation[2]. However, there is a need to evaluate longitudinal studies of physical exercise[3], given that bone improvements happen 4-6 months after the start of intervention, but only after a year will these changes become significant[3]. Similarly, Beck et al.[4] have found that, despite the abundant scientific evidence which relates resistance exercise with oestrogen stimulus, the changes in bone mineral density are usually modest. Therefore, it seems logical to think about the necessity of carrying out long term longitudinal studies to be able to observe changes resulting from the application of a resistance exercise programme.

Table 1. Percentage change in initial values and final values after the intervention. The percentage change has been calculated using the formula:

% change = [(post-pre)/pre]x100

	1995	2009	% change
Femoral neck	640 g/cm²	866 g/cm²	35.31%
L2-L4	729 g/cm²	994 g/cm²	36.35%

Thus we have evaluated an intervention using a progressive force training programme over 15 years in a 64 year old woman who was receiving standard antiresorptive drug treatment (alendronate). The trial started in 1995, after finding out the degree of osteoporosis suffered by the subject of the study by measuring her bone mineral density with dual energy X-ray absorptiometry (DXA), both in the femoral neck and in the lumbar region. The annual check was carried out in the same clinic using the same machine. The training programme consisted of a programme of progressive neuromuscular conditioning based on the performance of resistance exercises. Before starting the programme measurements were taken of maximum strength to enable the prescribing of exercise on the basis of the maximum voluntary load. Subsequently, 8 exercises were selected which involved all, the major muscle groups. The training programme was characterised by the performance of a series of warm-ups carried out with between 15 and 20 repetitions. After one minute of recuperation. 3 series were carried out, with 8-12 repetitions. This programme increase in frequency from one session a week during the first 6 years to two training sessions for the remaining 8 years. The other variable which experienced variation with the aim of contributing to the progression of the training was the load.

Our results (Table 1) show an annual progressive increase in bone mineral density of 2%. Assuming the potential limitations of carrying out the observation in a single case, in addition to receiving drug treatment, these data agree with those published my Suominen[5]. Their records determine that in people of advanced age the rhythm of annual progression of bone mineral density caused by the resistance exercise treatment may be between 1 and 3%[5]. The bibliographical search has found few studies whose period of intervention is similar to this case. However, our data are in line with earlier research which established the suitability of resistance exercise treatment as an efficacious measure, and as a tool synergistic with drug treatment for the treatment of osteoporosis. Finally, we note that over the period of treatment not a single fall or fracture was recorded.

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