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Physical Activity and Risk of Fracture

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Introduction

The association between mechanical stress and bone mass was first recorded by Galileo in 1683 who noted the relationship between body weight and bone size; but it was not until 1892 that Julius Wolff, a German anatomist realised that changes in the mechanical stresses applied to a bone influenced bone strength.

Fracture represents a major health concern, leading to substantial disability, morbidity, and a loss of quality of life. Increased age, smoking, cortisone intake, and Body Mass Index (BMI) are important risk factor relating to osteoporosis and fractures. A regular and appropriate amount of physical activity is advocated as an efficient means of preventing osteoporosis and subsequent probabilities of fracture. Physical exercise is an accessible form of prevention and treatment of the loss of bone mass, has no side effects, its cost is low, and also provides additional benefits in this field on postural stability and the prevention of falls [1].

It is generally accepted that reduced levels of physical activity are implicated in the global increase in osteoporotic fracture and some meta-analysis showed that physical exercise in postmenopausal women increased lumbar BMD in a meaningful way, Most of the cross-sectional studies have found BMD higher in athletes or active individuals, compared to inactive controls,even though the results of clinical trials are less clear [2]. In another meta-analysis, which reviewed both ECA and other kind of studies in older adults, they found that the overall effect of exercise was stop or prevent bone loss by 0.9% per year, which is to be the average loss rate [3]. The most convincing evidence for a casual relationship between activity and BMD come from intervention studies .

Several prospective cohort studies have verified that physical activity may contribute to the prevention of fracture through various means [4]. However, the results of these studies are inconsistent [5].

A recent study t have examined the association between physical activity and fracture risks The authors performed a meta-analysis to evaluate this association with the following objectives: (1) to assess the association between physical activity and fracture; and (2) to evaluate the association between physical activity and subtypes of fracture [6].

They searched MEDLINE (1966 to February 1, 2013), EMBASE (1980 to February 1, 2013), and OVID (1950 to February 1, 2013) for prospective cohort studies with no restrictions. There were 22 cohort studies with 1,235,768 participants and 14,843 fractures, including 8874 hip, 690 wrist, and 927 vertebral fractures. The pooled relative risk (RR) of total fractures for the highest versus lowest category of physical activity was 0.71 (95% Confidence Interval [CI], 0.63-0.80).

The analysis of fracture subtypes showed a statistically significant inverse relationship between a higher category of physical activity and risk of hip and wrist fracture. The risk of hip or wrist fracture was 39% and 28% lower, respectively, among individuals with the highest category of physical activity than among those with the lowest category (95% CI, 0.54-0.69 and 0.49-0.96, respectively). The association between physical activity and vertebral fracture risk was not statistically related (RR, 0.87; 95% CI, 0.72-1.03). There was no evidence of publication bias. There was a statistically significant inverse association between physical activity and total fracture risk, especially for hip and wrist fractures. Additional subject-level meta-analyses are required for a more reliable assessment of subgroups and types of physical activity.

This meta-analysis of 22 prospective cohort studies supports the view that being more physically active is associated with a lower risk of fracture. These findings suggest that individuals who were more physically active had a 29% lower risk of all types of fracture compared with those performing no physical activity. An analysis stratified by subtypes of fractures suggests that performing a greater amount of physical activity is associated with 39% and 28% lower risk of hip and wrist fracture, respectively. However, they did not observe statistical relevance between physical activity and vertebral fracture risk.

A prevailing theory of skeletal mechanisms proposes that bone tissue responds to local mechanical stimuli by deforming, which can be transformed into biologically active signals during the process of mechanotransduction [7]. Studies in postmenopausal women have the limitations of the capacity of the skeleton to adapt to the mechanical stress of the exercise, due to the altered hormonal status and sometimes inadequate nutrient intake.

In effect the exercise osteogenic may be implicated local mechanisms such as the release of prostaglandin E2, changes in cell membranes and reparative processes that compensate and exceed the microdanos produced by the exercise in skeletal tissue. In addition, physical activity can add General hormonal effects. An endocrine response to the effort is the increase in secretion of the Growth Hormone (GH), influenced by the intensity, duration, the work produced and the amount of muscle mass involved. However, this beneficial effect occurs you should work above the anaerobic threshold.

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