13 - OSTEOPOROSIS AND PHYSICAL ACTIVITY IN ELDERLY

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ARTICLE

The shape and bone structure of the human skeleton are determined primarily by intrinsic hereditary, but the final determination, modifications and maintenance of bone are influenced by functional stimuli and metabolic side by which the skeleton is subjected during the entire life course (DI DIO, 2002; SOUZA, 1970; LITVOC & BRITO, 2004). This way, the bone structure and architecture experienced by the elderly show variations according to the influence of the following factors: gender, race, nutrition, metabolism, occupation, posture, hormonal conditions, biotype, general health and physical activity of ederly (DI DIO 2002; MARIEB & HOEHN, 2009; WILLIAMS et al., 1995; PETROIANU & PIMENTA, 1999).

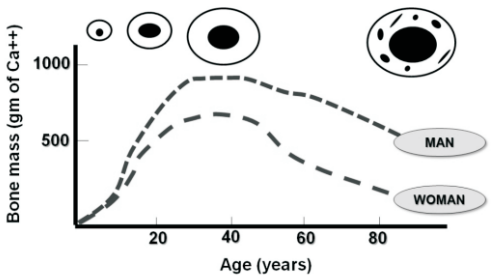
The most obvious and significant anatomical feature found in the skeletal system of the elderly compared to adults, is the substantial reduction of bone mass Called osteoporosis (or osteopenia, when there is no risk of fractures), degenerative bone condition that is characterized by increased bone resorption in relation to its deposition and is part of the normal aging process (MARIEB & HOEHN, 2009).

With advancing age the osteocytes and osteblasts become less and its activity is decreased, leading, ultimately to reducing the amount of calcium salts and collagen in the extracellular matrix, and an increase in the size of the osteons central channels. That way, the sustenance compact bone becomes less dense and spongy bone substance has reduced the amount of lamellar bone and enlargement of intertrabecular (PETROIANU & PIMENTA, 1999; GUYTON & HALL, 2004).

Bone mass becomes so reduced that the bones of the elderly become thin, porous, light and fragile compared to adults, leaving ederly likely to develop bone pain, fractures in daily activities, kyphosis and height loss caused by morphological changes of the vertebrae. Since the femurs, the hip bones, vertebrae and forearm bones were most affected because they are more subjected to mechanical forces of tension and compression (MARIEB & HOEHN, 2009; TORTORA & GRABOWSKI, 2006).

In the elderly the many common causes that contribute to the degeneration of bone mass (graphic 1) are: a) the decrease of hormone and growth factors after 45 years, in addition to the protein anabolic functions become impaired to form the bone matrix; b) ecreased absorptive capacity of vitamins, electrolytes and amino acids necessary for the formation of extracellular matrix and activity of osteoblasts; c) decreased secretion of the hormone estrogen after menopause, making women more affected and vulnerable, because it is necessary to stimulate osteoblastic activity and decrease osteoclastic activity; d) inadequate diet, excessive dieting for carbonated beverages (soft drinks) and low in calcium and fluoride to promote bone demineralization, and e) short people and lifestyle, once the regular physical activity is often reduced in the elderly, and the physical stress of compression (walking, running, jumping and weight bearing) is a necessary stimulus to the formation and increased bone matrix deposition (MARIEB & HOEHN, 2009; GUYTON & HALL, 2004; TORTORA & GRABOWSKI, 2006; ALOIA, 1989; ALOIA at al.,1978; STEINBERG, 1989).

Graphic 1: Bone mass versus age



In addition to osteoporosis is characteristic in the bones of the elderly the formation of ossification subchondral bone lip the margins of the articular surfaces within the tendons and ligaments(WILLIAMS et al., 1995). Specific modifications of the bony structures are also typically identified and described below.

In the skull, bones atrophy (mainly parietal) and begin to melt, by synostosis of sutures, from within 40 years of age. Diploic channels independent of each bone start to communicate and form a network that spans the sutural space. So, the skull becomes a sphere with continuous bone elasticity and resistance to fractures. The mandibular angle is increased, the bulge protruding chin and the alveolar processes of maxilla and mandible are reduced due to wear and lacking teeth (PETROIANU & PIMENTA, 1999; MADEIRA, 2004).

The chest of the elderly has increased in diameter, loss of elasticity, mobility and height, for the ribs and costal cartilage becomes less flexible and the joints suffer thoracic ankylosis (ossification). In addition, aging and overuse of the spine to promote bone loss of vertebrae, making them thinner, fragile and prone to develop bone spurs, which makes the spine curve and compressed (PETROIANU & PIMENTA, 1999; FREITAS, 2002).

The scapula and other bones plans may also have small holes visible on radiographs. The long bones of the upper and lower limbs, although more brittle due to decreased bone mass, not present changes in length, which is why the members appear longer in comparison with the rest of the body (PETROIANU & PIMENTA, 1999; FREITAS, 2002).

Knowing that aging and physical inactivity, promote physical impairments affecting the quality of life and independence to perform activities of daily living, there is a need to develop preventive measures and treatments to reduce the impairments associated with osteoporosis. This way it has been observed that resistance and aerobic exercise (promoting impact) improve

quality of life and delay age-related physiological changes, mitigating the decline in muscle strength and bone mass, and consequently promote greater independence to perform activities of daily living for the elderly (MISKO & CRESS, 2002).

Bone tissue, despite its resistance to compression, is highly adaptable and plastic, very sensitive to disuse, weightlessness, immobilization, high load levels and vigorous physical activity. Being able to adapt to changes in response to the forces that are being submitted to. According to Wolf's Law, every change in function is followed by certain changes in internal architecture and external conformation of the bone, while the structure of bone tissue related to its functional activity (HAMILL & KNUTZEN, 1999; JUNQUEIRA & CARNEIRO, 1999). Therefore, the effects of exercise training or improvement in bone density can be elucidated by the Law of Wolf, as its formation and remodeling occur in response to mechanical forces to which it is submitted (SIMÃO, 2004; NUNES, 2001; BALSAMO & SIMÃO, 2005).

Through the mechanical stimulus imposed by physical activity, or in case of bone injury, bone formation will exceed resorption. This way it was observed that weight lifters, dancers, runners and tennis players have developed greater thickness in the insertion of the more active muscles, and bones become more dense in places where the stresses were higher, such as vertebrae and femoral necks (HAMILL & KNUTZEN, 1999; COLLETTI et al., 1989; DALIN & OLSSON, 1974; ZETTERBERG et al., 1990). And that post-menopausal women, physically active for an hour three times a week during one year, increased their bone density, while the inactive decreased their density in the same period (ALOIA et al.,1978).

The process of increasing bone density through exercise, especially of resistance occurs by the periodic increase of compression load that are larger than usual applied to bone (GRAVES & FRANKLIN, 2001). Through the tension imposed by the forces of compression, the osteoblasts begin the formation of bone tissue by depositing collagen fibers in bone matrix. This initial process occurs through the practice of regular physical activity for 8 to 12 weeks, with the mechanical loads considered the minimum core voltage. As a result, the minimum stimulus for increasing bone mineral density with the appropriate loading condition for osteoporosis is 4 to 6 months (GRAVES & FRANKLIN, 2001).

Through the physical practice it appears that trabecular bone adapts according to the directions of the loads imposed, demonstrating that the changes that occur in bone, produce changes both in its internal structure and in its external structure and function, making this restructuring strongest bone in the direction of greater demand. It is noteworthy also that the greater the pressure the greater the deposition of calcium and the organization of similar structure to carry loads (NUNES, 2001). And that physical stimulation that do not undergo the bone compression, contribute little to the increase in bone mass, since swimmers have bone similar to or lower than sedentary individuals(LIU et al., 2003). So there is a minimum effective stimulus that promotes bone formation, but if in excess should be remembered that there may be injuries to the weakened bone structures.

FINAL CONSIDERATIONS

In this literature review can be seen that physical exercise contributes to health promotion in the elderly. For the compressive forces to which the bones are subjected during regular physical practice, have positive results in maintaining bone mass. Considering the above studies, exercise during aging, since regular and oriented, is a key component in preventing osteoporosis. And, can assist in greater independence for the elderly to perform activities of daily living, enabling a more dignified old age, healthy and better quality of life.

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ABSTRACT

During the development of the individual's body, the body goes through personal, dynamic and progressive transformations. In the normal aging process, called senescence, are found morphological, functional, biochemical and psychological changes common to elderly individuals. Being the most common change in bone tissue is the loss of its mineral density, osteoporosis. Knowing that physical activity often helps minimize the physiological changes caused by aging, this study aimed, through a literature review, identifying the main bouts of the bone structure of the elderly and physical activity can help reduce or prevent these bone changes developed age. It was observed, therefore, that in specialized literature, regular exercises minimize and prevent loss of bone mineral density by means of compressive forces in which the bone is subjected during physical activity.

KEYWORDS: osteoporosis, bone, physical activity, elderly, senescence.

RÉSUMÉ

Au cours du développement du corps de l'individu, votre corps passe par une transformation personnelle, dynamique et progressive. Dans le processus normal de vieillissement, appelé sénescence, on trouve morphologiques, fonctionnelles, biochimiques et psychologiques communes aux personnes âgées. Depuis le changement le plus commun dans le tissu osseux est la perte de sa densité minérale, de l'ostéoporose. Sachant que l'activité physique aide souvent de minimiser les changements physiologiques causés par le vieillissement, cette étude vise, à travers une revue de la littérature, en identifiant les épisodes principaux de la structure osseuse de l'activité des personnes âgées et physique peut aider à diminuer ou éviter ces modifications de l'os au point âge. Il est, par conséquent, que dans la littérature, de l'exercice régulièrement, réduire et prévenir la perte de densité minérale osseuse au moyen de forces de compression dans laquelle l'os est soumis pendant l'activité physique.

Mots-clés: activité physique, les personnes âgées, l'ostéoporose, la sénescence osseuse.

RESUMEN

Durante el desarrollo del cuerpo del individuo, su cuerpo pasa por una transformación personal, dinámico y progresista. En el proceso normal de envejecimiento, llamado senescencia, se encuentran morfológicos, bioquímicos funcionales y psicológicas comunes a las personas de edad avanzada. Dado que el cambio más común en el tejido óseo es la pérdida de su densidad mineral, la osteoporosis. Sabiendo que la actividad física con frecuencia ayuda a minimizar los cambios fisiológicos causados por el envejecimiento, este estudio tuvo como objetivo, a través de una revisión de la literatura, la identificación de los combates principales de la estructura ósea de la actividad física y personas mayores pueden ayudar a reducir o prevenir estas alteraciones óseas desarrollados edad. Hay, por tanto, que en la literatura, hacer ejercicio regularmente, minimizar y evitar la pérdida de densidad mineral ósea por medio de fuerzas de compresión en los que es sometido el hueso durante la actividad física.

PALABRAS CLAVE: actividad física, la osteoporosis ancianos, la senescencia hueso.

OSTEOPOROSE E ATIVIDADE FÍSICA NO IDOSO

RESUMO

Durante o desenvolvimento do corpo do indivíduo, seu organismo passa por um processo pessoal, dinâmico e progressivo de transformações. No envelhecimento normal, denominado de senecência, são verificadas modificações morfológicas, funcionais, bioquímicas e psicológicas comuns para indivíduos idosos. Sendo que a modificação mais habitual no tecido ósseo é a perda de sua densidade mineral, a osteoporose. Sabendo que a atividade física normalmente contribui minimizando as alterações fisiológicas causadas pelo envelhecimento, o presente trabalho buscou, através de revisão de literatura, identificar os principais acometimentos da estrutura óssea do idoso e se a atividade física pode contribuir para minimizar ou prevenir essas alterações ósseas desenvolvidas na idade. Observou-se, portanto, que na literatura especializada, os exercícios físicos regulares, minimizam e previnem a perda da densidade mineral óssea, através de forças de compressão no qual o osso é submetido durante as atividades físicas.

PALAVRAS-CHAVE: Atividade física, idoso, osteoporose, osso, senecênci