Letter to editor

Exercise training and muscle-cartilage cross-talk: A potential therapeutic target for osteoarthritis

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Dear Editor-in-Chief

Osteoarthritis (OA) is a progressive disease and up to now, no effective cure has been found for these diseases. OA was characterized by destruction of articular cartilage (extracellular matrix). As we age, chondrocytes show less response to growth factors, also, there is an increase abnormal accumulation of advanced glycation products (AGEs), mitochondrial dysfunction, and oxidative stress. As a result, cartilage homeostasis is impaired and ECM becomes more vulnerable to injury, leading to the onset of OA (Abramoff & Caldera, 2020). Chondrocytes are the only cell type present in articular cartilage that are solely responsible for circulating and maintaining the matrix. Exercise training with increased mechanical stress can affect the extracellular matrix in the joints. However, exercise apart from mechanical stress can also indirectly affect cartilage metabolism by increasing muscle contraction and the expansion of some myokines, which is a potential therapeutic target for osteoarthritis.

A variety of growth factors and cytokines are actively secreted by muscle tissue. Thus, muscle can act as an endocrine and paracrine organ. Secretoms are secreted not only through muscle tissue but also from other tissues and affect other organs of the body. Adipokines include adiponectin, leptin, resistin, chemerin, IL-6, and TNF-α playing an important role not only during inflammation but also in the metabolic regulation of joint cells including cartilage, osteoblasts, osteoclasts, and mesenchymal stem cells (Xie & Chen, 2019). Muscle tissue also affects cartilage metabolism with its myokines.

FNDC5 is an important exercise myokine for slowing down age-related diseases, such as sarcopenia, osteoporosis, obesity, and neurodegeneration. Loss of FDNC5 has been shown to be associated with chondrocyte aging in the development of OA in humans and mice. Myokine maintains chondrocyte activity by preserving the metabolism and biology of the mitochondrial TCA cycle to protect against inflammation-induced aging. Myokine maintains chondrocyte survival and ECM synthesis by suppressing the cartilaginous inhibitory factor Wnt3a to control autophagy programs and apoptosis (Chen et al., 2020). Recently, it has been discovered that Sox9 was expressed in MTJ, tendon, and bone progenitor cells at E13 and in bone at E16. The expression of Sox9 in muscle precursor cells is also being studied. It is hypothesized that an increase in this factor of muscle tissue after exercise can also affect cartilage metabolism because it is stated that decreased Sox9 expression in connective tissues, tendons and bones is associated with cartilage hypoplasia (Nagakura et al., 2020). These hypotheses elucidated that the role of Sox9 secreted by muscle tissue can also play an important role in the development and healing of joint and cartilage, requiring animal and human studies.

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