Opinion

Stem Cell INVESTIGATION

# Mesenchymal stem cells as a valuable agent in osteoarthritis treatment

**Mohsen Sheykhhasan[1,2], Hamed Manoochehri[1], Mona Pourjafar[1], Nashmin Fayazi[1]**

[1]Research Center for Molecular Medicine, Hamadan University of Medical Sciences, Hamadan, Iran; [2]Department of Mesenchymal Stem Cell, the Academic Center for Education, Culture and Research, Qom Branch, Qom, Iran

*Correspondence to:* Mohsen Sheykhhasan. Research Center for Molecular Medicine, Hamadan University of Medical Sciences, Hamadan, Iran. Email: mohsen.sh2009@gmail.com.

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Osteoarthritis (OA), a common disease that originates from cartilage damage, affects approximately 250 million people around the world (1). The disease is more common in older people. Among younger and middle-aged people, injuries are the most common causative agents for OA (2). The application of conventional treatment methods, such as pain medication and physical therapy techniques, could temporarily alleviate pain, but these methods do not have the ability to recover the primary function of the cartilage (3). Additionally, many difficulties are encountered in autologous chondrocyte implantation for cartilage regeneration, such as donor site damage and cell limited life span after transplantation (4,5). These problems make new therapeutic methods, such as regenerative medicine, to repair the damaged cartilage tissue an exciting prospect (6).

Mesenchymal stem cells (MSCs), as a suitable cell source, are considered as novel therapeutic agents for cartilage and bone diseases and injuries because of their special ability to differentiate into a variety of cell types and their potent capability to self-renewal and repair, as well as their high healing ability and their growth factor secretory capacity (6). MSCs have been identified in many tissues, including bone marrow, adipose tissue, and synovial tissue (6). In addition, because lack of human leucocyte antigen (HLA) class II expression, mesenchymal stem cells are also able to retain immunomodulatory activity *in vivo* (7). As a result, both autologous and allogeneic MSCs could act as hope agents in OA treatment because of their immunomodulatory properties.

Preclinical studies have confirmed the success of treatment using MSCs on animal models with OA (8,9). According to a review article presented by Xing *et al.*, of 23 studies performed on animals using MSCs through 2017, 21 showed promising results (10). Additionally, an MSC-based therapy has been assessed as a viable alternative for treating cartilage-bone disease, particularly OA (11). MSCs have even been used in many clinical trials in different phases for curing cartilage defects in patients with OA; one review study found that MSC-based therapy has been used to treat OA in 18 clinical trials (12).

Apart from MSCs, exosomes from MSCs have a beneficial role in OA treatment too.

Exosomes released by MSCs, not only have a promoted cartilage defect regeneration activity via shuttle bioactive RNAs and growth factors associated with different cellular and biological process, i.e., cell proliferation, differentiation, and tissue reconstruction between cells, but are also related to accelerate subchondral bone restoration, which has been demonstrated as an innovative target for OA drug delivery strategy (13-15).

Taken together, the preclinical and clinical studies' results strongly suggest that MSCs and exosomes from MSCs may play a curative role in OA, which brings increased interest in their potential for therapeutic application.

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## Footnote

*Conflicts of Interest:* The authors have no conflicts of interest to declare.

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