

Autologous Adipose-Derived Mesenchymal Stem Cells Combined with Shockwave Therapy Synergistically Ameliorates the Osteoarthritic Pathological Factors in Rat Knee Joint

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Introduction

Adipose-derived mesenchymal stem cells (ADSCs) and shockwave (SW) therapy have been shown to exert a chondroprotective effect for osteoarthritis (OA). The results of this study demonstrated that autologous ADSCs had dose-dependent and synergistic effects with SW therapy (0.25 mJ/mm² with 800 impulses) in OA rat knee joint.

Material & Method

Autologous, high-dose 2×10^6 ADSCs (ADSC2 group) combined with SW therapy significantly increased the bone volume, trabecular thickness, and trabecular number among in the treatment groups. ADSC2 combined with SW therapy significantly reduced the synovitis score and OARSI score in comparison with other treatments.

Results

In the analysis of inflammation-induced extracellular matrix factors of the articular cartilage in OA, the results displayed that ADSC2 combined with SW therapy had a greater than other treatments in terms of reducing tumor necrosis factor-inducible gene (TSG)-6 and proteoglycan (PRG)-4, in addition to increasing tissue inhibitor matrix metalloproteinase (TIMP)-1 and type II collagen. Furthermore, ADSC2 combined with SW therapy significantly reduced the expression of inflammation-induced bone morphogenetic protein (BMP)-2 and BMP-6.

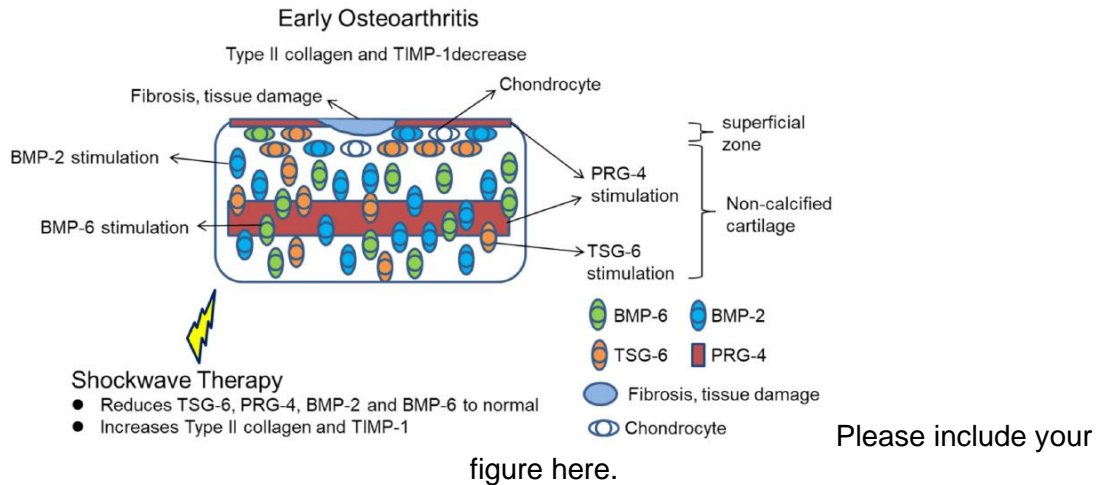


Figure 1 Schematic representation of shockwave therapy modulates the expression of TSG-6, PRG-4, BMP-2, BMP-6, Type II collagen, and TIMP-1 in early OA..

Discussion

High-dose autologous ADSCs combined with SW therapy significantly improved the destruction of the articular cartilage and subchondral bone and reduced synovitis. Our data showed that the expression of inflammation-induced TSG-6, PRG-4, BMP-2, and BMP-6 were reduced, while those of matrix metalloproteinases regulator, TIMP-1, and type II collagen were enhanced by ADSC2 + SW treatment for knee OA in rats. The results of the study demonstrated regulation of anabolic factors and inflammation induced growth factors by ADSCs and SW therapy individually, or ADSCs combined with SW therapy, in the articular cartilage of OA rat knees.

Technology: Focused shockwave was used in this study.

Device and Manufacturer: DUOLITH SD1 (STORZ MEDICAL AG, Swiss).

COI: No conflict of interest.