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A Meta-Analysis and Systematic Review on the Use of Adipose-Derived Mesenchymal Stem Cells for Knee Osteoarthritis Management

Background Knee osteoarthritis (KOA) is one of the most common forms of joint degeneration, frequently resulting in persistent pain, reduced mobility, and impaired quality of life. The disease is characterized by the progressive breakdown of articular cartilage, synovial inflammation, and subchondral bone changes. Conventional management options such as analgesics, nonsteroidal anti-inflammatory drugs (NSAIDs), corticosteroid injections, and surgical procedures are primarily aimed at alleviating symptoms rather than reversing or halting disease progression. In recent years, interest has grown in regenerative strategies, particularly the use of human adipose-derived mesenchymal stem cells (hAD-MSCs), due to their ability to modulate inflammation, promote tissue repair, and potentially regenerate damaged cartilage. These stem cells are favored for their ease of harvest, high yield, and ability to differentiate into chondrocytes. Despite their promising biological properties, the clinical benefit of intra-articular hAD-MSC therapy in KOA remains a subject of ongoing investigation, with varying outcomes reported across studies. Aim This systematic review and meta-analysis aims to assess the therapeutic efficacy of intra-articular hAD-MSC injections in individuals with knee osteoarthritis by analyzing data from randomized controlled trials. Methods An extensive search of the literature was performed in alignment with the PRISMA framework, using four major databases: PubMed, Scopus, Web of Science, and the Cochrane Library. Studies considered for inclusion were randomized controlled trials (RCTs) examining the effects of intra-articular human adipose-derived mesenchymal stem cell (hAD-MSC) therapy in individuals diagnosed with knee osteoarthritis (KOA). Risk of bias in the selected trials was evaluated using the Cochrane Risk of Bias 2 (ROB2) tool. Statistical pooling of data was conducted using a random-effects model via Review Manager (RevMan) version 5.3. Results A total of 11 RCTs, encompassing 510 patients, met the eligibility criteria for inclusion in the meta-analysis. Treatment with hAD-MSCs led to statistically significant improvements in WOMAC scores (mean difference [MD]= – 25.32, 95% confidence interval [CI] – 31.30 to – 19.34; p

Biography

Ahmed Abdelhadi is a dedicated healthcare professional committed to advancing clinical practice, patient care, and continuous professional development. He has been actively involved in medical work and collaborative clinical environments, contributing to improving patient outcomes and supporting multidisciplinary teams. With a strong interest in expanding his expertise, Ahmed engages in ongoing learning, skill refinement, and participation in academic or training activities relevant to his field.

Driven by professionalism and a commitment to excellence, he continues to develop his career through practical experience, research engagement, and contributions to medical education and teamwork. Ahmed remains dedicated to delivering high-quality care and enhancing his knowledge within the medical community.