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Editorial

Adipose Derived Stem Cell Therapy: Safety, Efficacy and Potential Therapeutic Role in Managing Knee Osteoarthritis?

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Introduction

Autologous stem cell therapy is an emerging therapeutic option for multiple local and systemic pathologies and is used to treat chronic musculoskeletal conditions including knee osteoarthritis (OA). Adipose derived stem cell therapy (ADSCT) has been advocated as preferable to other sites of stem cell harvesting due to increased chondrogenic potential in inflammatory environments [1] although currently this is not conclusive. There is increasing scientific evidence of both safety and efficacy with ADSCT in treating knee osteoarthritis and there are limited publications demonstrating symptom reduction, functional improvement, and emerging suggestions of potential cartilage regeneration. This editorial will outline the current scientific evidence for ADSCT in treating knee osteoarthritis.

Methods and Rationale

Literature searches of Pubmed, Ovid, and Medline were performed with search terms for adipose derived stem cells, stem cells, stem cell therapy, osteoarthritis, and knee osteoarthritis as well as combined searches of these terms. All available literature on ADSCT and knee osteoarthritis was reviewed and the results and conclusions analysed for this editorial.

Results

ADSCT has been researched through multiple centres worldwide with significant patient numbers and has evidence of safety with no serious side effects, systemic infections, or carcinogenesis with intra-articular dosing of between 2-100 million cells [2,3] as well as efficacy in reducing knee pain by greater than 50% in 91% of patients and greater than 75% in 63% of patients in one study [2], higher quality studies consistently show decreasing pain [4,5] but there are mixed results regarding improvement in functional knee scores in scientific publications and reviews [4,6,7]. It has been noted that obesity and high-grade of OA yield less predictable outcomes [2].

The mechanism of action of ADSCT in symptom reduction in knee OA and functional improvement on knee scoring systems is yet to be confirmed but has been postulated to be due to: direct effects on inflammation, immunomodulation, paracrine effects, or indeed potentially chondrogenesis [8,9,10]. Critically, it should be recognised that it is difficult to assess cartilage post-treatment as there are no universally agreed validated measures to ethically examine chondral volume within the knee joint.

The real crux of scientific and clinical controversy is whether ADSCT regenerates cartilage and limited evidence is emerging of potential cartilage regeneration on sequential magnetic resonance imaging (MRI) [7,11], or on direct visualisation at post-therapy arthroscopy [12] although both techniques of assessing cartilage are subjective.

Conclusion

Whilst ADSCT is an emerging therapy there is research evidence that it is safe, will significantly reduce knee pain in the majority of patients, and may improve functional knee scores, although patients who are obese, or have widespread high-grade knee OA likely have more unpredictable outcomes. There is only very limited subjective evidence of cartilage regeneration on MRI studies and post-treatment arthroscopy. As with many currently used medical therapies, there is a need for high quality randomised controlled clinical trials to better assess efficacy in the short-term and long-term. It should also be noted that there is no true consensus within the international medical community as to the: indications and contraindications for use, best donor site for accessing stem cells, rate and nature of side effects and complications, most effective rehabilitation protocols, and necessity of repeated dosing.

Implications

ADSCT appears to be safe with solid evidence of efficacy in reducing symptoms in knee osteoarthritis but has yet to be conclusively proven to regenerate cartilage *in vivo*.

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