TITLE: Autologous Mesenchymal Stem Cell Therapy for Orthopedic Patients: Clinical Effectiveness

DATE: 10 November 2015

RESEARCH QUESTION

What is the clinical effectiveness of autologous mesenchymal stem cell therapy for adult orthopedic patients?

KEY FINDINGS

One systematic review, two randomized controlled trials, and four non-randomized studies were identified regarding the clinical effectiveness of autologous mesenchymal stem cell therapy for adult orthopedic patients.

METHODS

A limited literature search was conducted on key resources including PubMed, The Cochrane Library, University of York Centre for Reviews and Dissemination (CRD) databases, Canadian and major international health technology agencies, as well as a focused Internet search. Methodological filters were applied to limit retrieval to health technology assessments, systematic reviews, meta-analyses, randomized controlled trials, and non-randomized studies. Where possible, retrieval was limited to the human population. The search was also limited to English language documents published between January 1, 2010 and October 28, 2015. Internet links were provided, where available.

The summary of findings was prepared from the abstracts of the relevant information. Please note that data contained in abstracts may not always be an accurate reflection of the data contained within the full article.

SELECTION CRITERIA

One reviewer screened citations and selected studies based on the inclusion criteria presented in Table 1.
Table 1: Selection Criteria

<table>
<thead>
<tr>
<th>Population</th>
<th>Adult orthopedic patients</th>
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<tbody>
<tr>
<td>Intervention</td>
<td>Autologous mesenchymal stem cell therapy including, but not limited to: adipose derived stem/stromal cells (ADSC) and bone marrow aspirate concentrate (BMAC) alone or in combination</td>
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<tr>
<td>Comparator</td>
<td>Relevant comparator (e.g., bone graft, pain management, surgery)</td>
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<tr>
<td>Outcomes</td>
<td>Clinical effectiveness (e.g., pain reduction, functional measures, improved range of motion, quality of life); Safety (e.g., tolerability of aspiration procedure)</td>
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<tr>
<td>Study Designs</td>
<td>Health technology assessments, systematic reviews, meta-analyses, randomized controlled trials, non-randomized studies</td>
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RESULTS

Rapid Response reports are organized so that the higher quality evidence is presented first. Therefore, health technology assessment reports, systematic reviews, and meta-analyses are presented first. These are followed by randomized controlled trials, and non-randomized studies.

One systematic review, two randomized controlled trials, and four non-randomized studies were identified regarding the clinical effectiveness of autologous mesenchymal stem cell therapy for adult orthopedic patients. No relevant health technology assessments were identified.

Additional references of potential interest are provided in the appendix.

OVERALL SUMMARY OF FINDINGS

One systematic review examined the adverse events related to intra-articular treatment of osteoarthritis and cartilage repair with autologous bone marrow-derived mesenchymal stem cells (MSCs). Four serious adverse events and 22 possibly related adverse events were reported in 844 procedures. The most reported adverse events were an increase in pain and swelling and dehydration following the bone marrow aspiration procedure.

One randomized controlled trial (RCT) compared the outcomes of matrix-induced autologous mesenchymal stem cell implantation versus matrix-induced autologous chondrocyte implantation in the treatment of chondral defects of the knee. A significant improvement was observed in both groups at 24 months following the procedure. The group that received matrix-induced autologous mesenchymal stem cell implantation had significantly better functional, pain, and quality of life outcomes at follow-up.

One RCT examined the use of intra-articular cultured autologous bone marrow-derived MSC injections plus microfracture and medial opening-wedge high tibial osteotomy compared with a control group. Following the procedure, symptom and functional scale scores were significantly better in the treatment group.

One non-randomized study compared the outcome of matrix-induced autologous chondrocyte implantation and bone marrow aspirate concentrate-derived multipotent stem cell implantation in patellofemoral chondral lesions. Symptom and functional scale scores were significantly improved in both groups, but there was not a significant difference in outcomes between groups. No adverse reactions or infections were identified. In another study, patients with osteoarthritis of the knee underwent surgical debridement and infrapatellar fat pad-derived mesenchymal
stem cell injection and were compared with a control group.\textsuperscript{5} Symptom and functional scale scores were significantly improved in the treatment group; however, clinical outcomes were not significantly different between groups. No major adverse events were reported.

One non-randomized study\textsuperscript{6} compared a novel minimally invasive approach to cartilage repair with MSCs with an open surgical technique. Significant improvement in scale scores was reported in both groups following the procedures. No adverse events were reported in either group. One non-randomized study\textsuperscript{7} evaluated first-generation autologous chondrocyte implantation versus autologous bone marrow-derived MSCs for cartilage repair. Symptom and functional scale scores were significantly improved in both groups and clinical outcomes were not significantly different between groups.
REFERENCES SUMMARIZED

Health Technology Assessments
No literature identified.

Systematic Reviews and Meta-analyses


Randomized Controlled Trials


Non-Randomized Studies


APPENDIX – FURTHER INFORMATION:

Systematic Reviews and Meta-Analyses – Origin of Stem Cells Not Specified in Abstract


Non-Randomized Studies


**Comparative Studies – Origin of Stem Cells Not Specified in Abstract**


**Review Articles**


