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Intra-articular application of autologous, fat-derived orthobiologics in the treatment of knee osteoarthritis: a systematic review

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ADMINISTRATIVE INFORMATION

Support - n/a.

Review Stage at time of this submission - Completed but not published.

Conflicts of interest - The authors declare no conflict of interest. Liparthroplasty and Supercharged Liparthroplasty are Trademarks owned by Dr. Dominik Duscher.

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Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 25 January 2024 and was last updated on 25 January 2024.

INTRODUCTION

Review question / Objective This systematic review aims to screen the current literature for mid-term results (minimum follow-up period of 2 years) of intra-articularly applied, autologous fat-derived orthobiologics on pain levels and patient reported outcome measures in treating primary knee osteoarthritis. Studies combining fat-derived orthobiologics with arthroscopic bone marrow stimulation were excluded from this review, which focuses primarily on the effect of fat-derived orthobiologics alone.

Condition being studied Knee osteoarthritis of various stages, verified either on X-ray or magnetic resonance imaging.

METHODS

Search strategy To identify relevant studies, a systematic literature search is implemented until the date of 1st of November 2023. The search is conducted on the online databases of MEDLINE, Scopus, PubMed, and Cochrane Library. All studies in English and German language are included. The following search algorithm is applied:

“osteoarthritis” OR “arthritis”

AND

“adipose-derived stem cells” OR “fat grafting” OR “fat injection” OR “fat transfer” OR “fat transplantation” OR “mesenchymal stem cells” OR “mesenchymal stromal cells” OR “microfragmented adipose tissue” OR “stromal vascular fraction”

The term “knee” is not incorporated in the search algorithm to detect studies encompassing various types of knee OA (uni-, bi- or tricompartmental).

The following inclusion criteria are applied:

1. Patients with primary knee osteoarthritis;
2. Autologous, processed or non-processed, intra-articular fat tissue injection (adipose tissue-derived stromal/stem cells, cellular stromal vascular fraction, tissue stromal vascular fraction);
3. Mean or median follow-up period of more than 2 years with minimum one clinical parameter (visual analogue scale for pain or Patient reported outcome measure) available;
4. Minimal number of 10 patients.

Exclusion criteria for this review are as follows:

1. Patients with focal chondral defects;
2. Additional, arthroscopic bone marrow stimulation (microfracture or drilling);

First, duplicates are manually consolidated. Titles and abstracts of all references are screened by the first author. Studies not meeting the inclusion criteria are excluded. Following, full texts of the included references are obtained. The first and last author screen the full texts and re-assess the mentioned inclusion and exclusion criteria.

Participant or population Knee osteoarthritis of various stages, verified either on X-ray or magnetic resonance imaging.

Intervention intra-articularly applied, autologous fat-derived orthobiologics.

Comparator n/a.

Study designs to be included Randomized controlled trials (RCT), prospective or retrospective cohort studies, or case series.

Eligibility criteria Patients with primary knee osteoarthritis (studies investigating focal chondral defects are excluded); Autologous, processed or non-processed, intra-articular fat tissue injection including adipose tissue-derived stromal/stem cells, cellular stromal vascular fraction, tissue stromal vascular fraction; No additional, arthroscopic bone marrow stimulation (microfracture or drilling); mean or median follow-up period of more than 2 years with minimum one clinical parameter available; minimal number of 10 patients included in the study.

Information sources The search is conducted on the online databases of MEDLINE, Scopus, PubMed, and Cochrane Library.

Main outcome(s) Preoperative as well as postoperative visual analogue scale values for pain

and the most common functional scores are noted, if available.

Data management First, duplicates are manually consolidated. Titles and abstracts of all references are screened by the first author. Studies not meeting the inclusion criteria are excluded. Following, full texts of the included references are obtained. The first and last author screen the full texts and re-assess the inclusion and exclusion criteria.

Quality assessment / Risk of bias analysis The methodology of all included studies is assessed according to the recommendations of the Oxford Centre for Evidence-Based Medicine regarding the level of evidence. The quality of the studies is evaluated based on their respective study types. Randomized controlled trials are rated using the modified Jadad scale, which ranges from 0 to 8 points. Non-randomized studies are assessed using the Methodological Index for Nonrandomized Studies (MINORS) score. For non-comparative studies, this score ranges from 0 and 16 points. In case of comparative studies, this score incorporates an additional domain, resulting to a range between 0 and 24 points. The maximum score indicates the ideal assessment for each assessment.

Strategy of data synthesis Due to the methodological inhomogeneity of various fat-derived orthobiologics techniques, outcome parameters are summarized and tabulated primarily in a descriptive manner.

Subgroup analysis n/a.

Sensitivity analysis n/a.

Language restriction English, German.

Country(ies) involved Austria.

Keywords adipose tissue-derived stromal cells; cartilage regeneration; mesenchymal stem cells; orthobiologics; osteoarthritis; systematic review; stromal vascular fraction.

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