



# USE OF STEM CELLS IN THE TREATMENT OF OSTEOARTHRITIS

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The use of mesenchymal cells (MSCs), due to their multi-lineage differentiation, represents an emerging treatment for osteoarthritis. MSCs are able to differentiate into different cellular lines, such as osteoblasts, chondrocytes and adipocytes, and are characterized by high plasticity, limited reproductive capacity and an immunosuppressive and anti-inflammatory properties. They also release growth factors, cytokines, bioactive lipids and micro-vesicles which have several beneficial effects including an angiopoietic and anti-apoptotic action. Some studies have demonstrated the presence of MSCs in many different tissues, including adipose and muscle, dermis, periosteum, synovial membrane, synovial fluid and articular cartilage. With the aim of identify new strategies for the use of MSCs, the concept of “minimally manipulated cells” was developed, where mesenchymal cells are not expanded, but only manipulated in the operating room. Two therapeutic possibilities have emerged: bone marrow concentrates (BMAC) and adipose-derived Stromal Vascular Fraction (SVF), which we will now discuss.

## Methods:

LIPO-STEM DUO™ is an innovative closed-circuit disposable device for collecting, microfragmenting and purifying a lipoaspirate intended for autologous implantation without the use of enzymes or centrifuge. Thanks to a sophisticated filtering and washing system, LIPO-STEM DUO™ preserves the entire architecture of the vascular-stromal niches of the lipoaspirate, increasing the bioavailability and the ability of cells to respond to regenerative stimuli. The processing of the adipose tissue takes place inside the device, through minimal manipulation in a single surgical stage.

## Case report:

The clinical case examined is that of a patient, a nurse, 52 years old, BMI: 37, on a balanced diet.

Remote pathological history: ex-smoker, arterial hypertension, previous left arthroscopic surgery after a road accident at the age of 18;

Proximate pathological history: left knee pain that started 10 years ago; right knee pain that arose in February 2022 exacerbated by intense physical activity, with the appearance of swelling. NRS 10/10. After cycles of infiltrations with steroid drugs, subsequent pulsed RDF and PENS both in the right and left knee. She had been starting ibuprofen therapy on a daily basis since November. Pain regressed to resolve on right, persisted on left, with NRS 10/10.

Infiltration of mesenchymal cells according to another technique was performed on the left knee in December 2022. At one-month follow-up: ODI 40, QoL 50, EQ5D (2,2,2,3,2), NRS 8-9/10; ineffective result due to inadequate amount of tissue.

Due to the persistence of the high-intensity pain symptoms, a new infiltration of mesenchymal cells was performed according to the LIPO-STEM DUO™ technique on the left knee, in February 2023. A total of 8 ml of autologous tissue was injected.

At the various serial checks, on a monthly basis he reported progressive and gradual improvement of the pain symptoms for which he proceeded to a gradual and autonomous decalage of the analgesic therapy previously taken daily up to a maximum of 1 capsule/week on excessive physical effort; therapy which was definitively suspended in April 2023. At the four-month follow-up, ODI 14, EQ5D (2,1,2,2,1), QoL 85%, NRS 2/10, which reaches 4/10 in acute cases at night.

## Discussion:

The implantation of mesenchymal cells using the LIPO-STEM DUO™ method is a minimally invasive procedure; it is indicated in arthrosis with minimal wear, in patients refractory to other conservative treatments, in early arthrosis of young subjects; significantly delaying the need to resort to a prosthetic intervention or avoid it altogether, with possible repetitions of the same infiltrative procedure.

The treatment has no particular contraindications and we can say that it is suitable for multiple clinical pictures, including patients with heart disease or kidney disease, for whom prosthesis implantation is not indicated. On the other hand, treatment is not recommended in cases of advanced arthritic pathology and when the patient's functional requests are high (for example for sportsmen who want to go back to their activities), because it may not be able to meet the patient's expectations. The patient must wait for the benefits to arrive in the medium term, in the first three months following the infiltration; the maximum result will be obtained within 6 post-operative months, and the benefit can last for several years.

## Conclusion:

The case described here shows that the implantation of mesenchymal cells according to the LIPO-STEM DUO™ technique represents an effective, safe, long-lasting and minimally invasive conservative treatment; a way to improve the patient's quality of life. Although it does not allow the reconstruction of worn cartilage, it is useful for preserving residual cartilage, especially if included in a protocol that includes regular physical activity and a healthy diet.

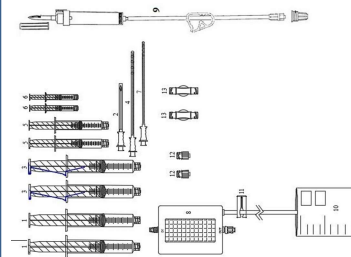


Figure 1: usage kit



Figure 2: SVF sampling

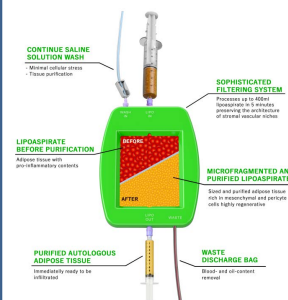


Figure 3: Filtering



Figure 4: implant of autologous adipose tissue

## Bibliography :

1. Poole AR (2003) What type of cartilage repair are we attempting to attain? *J Bone Jt Surg, Am* 85-A(Suppl):40-44
2. Richards MM, Maxwell JS, Weng L et al (2016) Intra-articular treatment of knee osteoarthritis: from anti-inflammatories to pro-ducts of regenerative medicine. *Phys Sportsmed* 44(2):101-108
3. Zuk PA, Zhu M, et al. Multilineage cells from human adipose tissue: implications for cell-based therapies. *Tissue Eng*. 2001;7(2):211-228. DOI:10.1089/107632701300062859
4. Yoshimura K, Shigueru T.: Characterization of freshly isolated and cultured cells derived from the fatty and fluid portions of liposuction aspirates. *J Cell Physiol*. 2006 Jul;208(1):64-76. DOI: 10.1002/jcp.20636.
5. De Francesco F, Ricci G, et al.: Human Adipose Stem Cells: From Bench to Bedside. *Tissue Eng Part B Rev*. 2015 Dec;21(6):572-84. DOI: 10.1089/ten.TEB.2014.0608
6. <https://pubmed.ncbi.nlm.nih.gov/30835956/>