Adipose-derived stem cell

An adipose-derived stem cell (ADSC) is defined as a mesenchymal cell within adipose tissue with multipotent differentiation and self-renewal capacity.

see Allogeneic adipose tissue-derived mesenchymal stem cells

The potential to differentiate into different cell lines, added to the easy and cost-effective method of extraction, makes adipose-derived stem cells (ADSCs) an object of interest in lymphedema treatment.

It is crucial and clinically relevant to clarify the homing efficiency and retention of stem cells in different implanting strategies of cell therapy for various injuries. However, the need for a tool for investigating the mechanisms is still unmet. Tang et al. introduced multi-modal BaGdF5:Yb, Tm nanoparticles as a nanoprobe to label adipose-derived stem cells (ADSCs) and detect the homing behavior with micro-computed tomography (micro-CT) imaging technique. The migration of cells injected locally or intravenously, with or without a chemokine, CXCL12, was compared. Higher homing efficiency of ADSCs was observed in both intravenously injected groups, in contrast to the low efficiency of cell retention in local implantation. Meanwhile, CXCL 12 promoted the homing of ADSCs, especially in the intravenous route. Nonetheless, the administration of CXCL 12 showed its therapeutic efficacy, whereas intravenous injection of ADSCs almost did not. The work provided a tool for in vivo imaging of the behavior of implanted cells in preclinical studies of cell therapy, and more importantly, implied that the parameters for implanting stem cells in clinical operation should be carefully considered [1)].

Forte et al. conducted a comprehensive systematic review of the use of ADSCs in lymphatic tissue engineering and regeneration. On July 23, 2019, using PubMed/MEDLINE, Cochrane Clinical Answers, Cochrane Central Register of Controlled Trials, and Embase databases, we conducted a systematic review of published literature on the use of ADSCs in lymphatic tissue engineering and regeneration. There were no language or time frame limitations, and the following search strategy was applied: (Adipose stem cell) OR Adipose-derived stem cell) AND (Lymphedema) OR Breast Cancer Lymphedema). Only original research manuscripts were included. Fourteen studies fulfilled the inclusion criteria. Eleven studies were experimental (in vitro or in vivo in animals), and only three were clinical. Publications on the topic demonstrated that ADSCs promote lymphangiogenesis, and its effect could be enhanced by modulation of vascular endothelial growth factor-C, interleukin-7, prospero homeobox protein 1, and transforming growth factor-β1. Pilot clinical studies included 11 patients with breast cancer-related lymphedema, and no significant side effects were present at 12-month follow-up. Literature on the use of ADSCs in lymphatic tissue engineering and regeneration demonstrated promising data. Clinical evidence is still in its infancy, but the scientific community agrees that ADSCs can be useful in regenerative lymphangiogenesis. Data collected in this review indicate that unprecedented advances in lymphedema treatment can be anticipated in the upcoming years [2)].

1)

Tang N, Wang X, Zhu J, Sun K, Li S, Tao K. Labelling stem cells with a nanoprobe for evaluating the homing behaviour in facial nerve injury repair. Biomater Sci. 2022 Jan 6. doi: 10.1039/d1bm01823j. Epub ahead of print. PMID: 34989358.

2)

Forte AJ, Boczar D, Sarabia-Estrada R, Huayllani MT, Avila FR, Torres RA, Guliyeva G, Aung T, Quiñones-Hinojosa A. Use of adipose-derived stem cells in lymphatic tissue engineering and regeneration. Arch Plast Surg. 2021 Sep;48(5):559-567. doi: 10.5999/aps.2021.00339. Epub 2021 Sep 15. PMID: 34583446.