THE THERAPEUTIC POTENTIAL OF ADIPOSE TISSUE PERICYTES IN A DIABETIC RETINOPATHY

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Diabetes mellitus is an endocrine disorder that encompasses a large group of metabolic irregularities characterized by a high level of glucose in the bloodstream and impaired glycemic control (Cai X. et al, 2016). Diabetic retinopathy (DR) stands as the most frequently encountered microvascular complication of diabetes mellitus and remains the leading cause of vision loss in the working-age population worldwide (Yau JWY, 2012; Stitt AW, 2016). Research findings have demonstrated alterations in all major types of retinal cells during the development of DR, such as endothelial cells, neurons, microglia, astrocytes, and Müller cells (Lechner J, 2016). The main cause of retinopathy development is impaired blood circulation in the retina. The majority of modern treatment methods, such as laser photocoagulation, corticosteroids, vitreoretinal surgery, and anti-VEGF injections, are employed at advanced stages of the disease characterized by significant retinal damage (Das A, 2015). The potential for regenerative therapy in treating DR is currently under scrutiny by numerous researchers (Gaddam S, 2019, Bertelli PM, 2020). It is hypothesized that retinal function could be restored through regeneration of retinal blood flow, supported by cases of spontaneous reperfusion of ischemic retina and vision acuity restoration (Stitt AW, 2011). A promising approach in diabetic retinopathy treatment is various types of stem cells application. Mesenchymal stem cells (MSCs) are among the most actively studied cell types in cellular regenerative therapy and can be isolated from various sources like bone marrow, adipose tissue, peripheral and umbilical cord blood (Samsonraj RM, 2017). They are defined as multipotent precursor cells with spindle-shaped morphology, capable of trilineage mesenchymal differentiation (into adipocytes, osteoblasts, and chondroblasts), expressing specific surface cell markers, and displaying high proliferation capacity (Dominici MLBK, 2006). Six weeks after inducing diabetes in adult rats, intravenously administered endothelial-like MSCs were capable of restoring altered vascular functions (Motawea SM, 2020). It has been demonstrated that adipose stem cells, a type of mesenchymal stromal/stem cell derived from adipose tissue, under specific culture conditions, can acquire pericyte characteristics and express pericyte markers including α-smooth muscle actin (α-SMA), PDGFR, and NG2 (Mannino G, 2020). Pericytes are microcapillary cells that have similar to stem cells properties. Injection of human adipose stromal/stem cells into the vitreous of a murine model of oxygen-induced retinopathy facilitated vascular regrowth and were able to integrate into the retinal microvascular network, localizing similarly to pericytes (Hajmousa G, 2018). The optimal method of immunomodulatory and regenerative properties of pericytes need to be determined to increase the therapeutic potential of the cells.