

Mesenchymal Stem Cells (MSCs) and Mesenchymal stem cell-derived Exosomes for Myocardial Infarction therapeutics

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Background:

Cardiovascular diseases are the leading cause of mortality and morbidity globally, representing about a third of all deaths annually. Most of these cases are myocardial infarctions, better known as heart attacks. In a global report, there were 10.6 million heart attacks in 2018 alone (James et al, 2018). Heart attacks occur when there is a decline in blood flow to the heart which causes damage to the heart muscles (necrosis and apoptosis). Major strides in several biomedical fields especially stem cell biology have attracted attention towards the research and development of cardiac regeneration after heart attacks.

MSCs:

Preclinical and clinical studies of MSCs in general suggest that MSC are capable of differentiating into cardiac muscle cells (Xu et al, 2004) or endothelial cells (Silva, et al, 2005) and vascular smooth muscle cells (Gu et al, 2018). However, the beneficial effects of transplanted MSC into patients have proven to be only modest and inconsistent. The MSCs problem seems to be low engulfment rates and low survival rates in the recipient hearts. This is thought to be from being in a non-ideal, post MI environment. However, recent studies have demonstrated that the therapeutic activity of MSC is mainly exerted in a paracrine manner, rather than via a direct stem cell trans-differentiation; that paracrine effect is facilitated by secreted exosomes.

Exosomes:

Mesenchymal cell derived exosome (MSC-Exo) cargo contains a variety of entities including cytokines (Il-6, and Il-10), growth factors (TGF-beta and HGF), signaling lipids, mRNAs (IGF-1R), and regulatory miRNAs (miR-21, and miR-133b) (Tan et al, 2020). MSC-Exo may help a patient heal themselves by increasing angiogenesis and decreasing apoptosis, which is programmed cell death and modulating the immune response after a heart attack (Teng, et al, 2015). Here at Cedar Stem Cell Institute we offer both intravenous treatments of umbilical cord blood stem cells, as well as pure MSC derived exosomes or a combination of both, to help our patients with cardiac rehabilitation after a heart attack. Contact our institute for more information.

References:

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