Transplanting mesenchymal stromal cells derived from amniotic membranes can benefit eye diseases

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A team of researchers in South Korea has successfully transplanted mesenchymal stromal cells (MSCs) derived from human amniotic membranes of the placenta (AMSCs) into laboratory mice modeled with oxygen-induced retinopathy (a murine model used to mimic eye disease). The treatment aimed at suppressing abnormal angiogenesis (blood vessel growth) which is recognized as the cause of many eye diseases, such as diabetic retinopathy and age-related macular degeneration. The researchers reported that the AMSCs successfully migrated to the retinas of the test animals and, because of the growth factors secreted by the cells, were able to suppress retinal neovascularization.

Their study will be published in a future issue of *Cell Transplantation* and is currently freely available on-line as an unedited early e-pub at: http://ingentaconnect.com/content/cog/ct/pre-prints/content-CT-1190_Kim_et_al

The benefit of using MSCs in stem cell therapy is their ability to self-renew and differentiate into a variety of specialized cell types, such as osteoblasts (cells that contribute to bone formation), chondrocytes (cartilage cells), adipocytes (fat cells), myocardiocytes (heart muscle cells), and neuron-like cells (nervous system cells).

In addition, it has been shown that MSCs have the ability to modulate the immune response and reduce local inflammation. They can be isolated from a variety of sources, such as adipose (fat) tissues, tendons, peripheral blood, umbilical cord blood, human placenta, and bone marrow. MSCs have been successfully transplanted in a number of disease models for which they have been shown to offer therapeutic benefits. MSCs isolated from human placenta, however, may be richer in growth factors than those derived from other sources because of their essential role in fetal development, said the researchers.

According to the researchers, AMSCs secrete higher levels of certain growth factors (such as transforming growth factor beta (TGF-β) and cytokines) than MSCs derived from other sources, such as fat or bone. The beneficial growth factors secreted by the placenta-derived stem cells included vascular endothelial growth factor (VEGF) and pigment epithelium-derived factor (PEDF), the latter, a well-known natural inhibitor of angiogenesis.

They also cited the abundance of placental tissues over other sources, and the greater ease of MSC isolation from these growth factor-rich tissues as another benefit for their therapeutic use.

"Placenta-derived MSCs have powerful immunomodulatory functions," said study co-author Dr. Jisook Moon, Department of Applied Bioscience and Department of Engineering, CHA University, Gangnam-gu, Seoul, Korea. "In our study the AMSCs were administered via intraperitoneal injection. Detection of the transplanted cells in the retina illustrated their ability to migrate from the site of injection to the injured tissue. The blood brain barrier (BBB) restricts the permeation of molecules and cells through the circulatory system into the central nervous system (CNS). Confirming that AMSCs were able to traverse the BBB was crucial in elucidating whether or not these cells are viable candidates for treatment of retinopathy.

The researchers concluded that although further studies are needed to confirm the effect of AMSCs on neovascular diseases, the data collected in their study provided insights into the mechanisms by which these cells exert their therapeutic effects.

"As the researchers astutely pointed out, the use of a tissue that would normally be discarded as biomedical waste circumvents the need for using invasive procedures to obtain stem cells for therapeutic purposes," said Dr. Cesar Borlongan, President Elect of the International Placenta Stem Cell Society. "Though it is not clear how effective AMSC transplantation would be for treating diseases of the eye in humans, this study may be regarded as a stepping stone for improving the feasibility of stem cell therapy in clinical practice."

Source:
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