Angiogenic Potential of Mesenchymal Stem Cells From Bone Marrow and Amniotic Membrane To Optimize Pancreatic Islets Transplantation

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Introduction: Islet transplantation emerged as an ideal treatment for diabetes type I. β cell death and loss of vascularization, however, remains a significant obstacle in successful islet transplantation. Mesenchymal Stem Cells (MSCs) appear as an interesting option to be used in transplantation due their trophic effect on vascularization and as an immunomodulatory agent.
Objectives: Address the angiogenic potential of MSC conditioned medium (CM) from bone marrow (MSC-BM) and amniotic membrane (MSC-AM) to improve viability of endothelial cells and revascularization of pancreatic islets.
Materials and Methods: Isolated MSC-AM and MSC-BM were cultured and fully characterized by flow cytometry and real time PCR. Cells were expanded and submitted to hypoxia and normoxia. Production of conditioned medium (CM) from MSC-AM and MSC-BM was standardized with total protein and alkaline phosphatase assay. Endothelial cells from umbilical vein (HUVECs) were isolated and cultured. The effect of conditioned medium on endothelial cell angiogenic capacity, migration, viability and apoptosis was investigated.
Results and conclusions: FACS analysis of MSC-AM and MSC-BM show similar expression of the typical MSC markers CD29, CD73, CD90 and CD105, and any expression of endothelial cell markers (CD14 and CD34) and HLA-DR$^-$. MSC-BM showed a better angiogenic potential compared to MSC-AM. In a wound healing assay, HUVECs showed increased migratory capacity in the presence of hypoxic MSC-BM CM. In contrast, apoptotic endothelial cells were identified in the presence of hypoxic CM from MSC-BM and MSC-AM. Thus, use of adequate CM represents a viable alternative to the maintenance of endothelial cells integrity and a good alternative to improve pancreatic islet transplantation.

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