Strategies to Improve Homing of Stem Cells to achieve better Efficacy in Stem Cell Therapy

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Abstract:

Stem/progenitor cell based therapeutic approach in our daily routine clinical practice, has been elusive dream in medical sciences and improvement of stem cell homing as one of major challenges in cell therapy programs, has been considered a promising milestone. It has been proved that stem/progenitor cells exhibit a homing response to injured tissues/organs, mediated by interactions of chemokine receptors expressed on the cells and chemokines secreted by the injured tissue. For improvement of directed homing of the cells, many techniques have been developed either to engineer stem/progenitor cells with higher amount of chemokine receptors (stem cell-based strategies) or to modulate the target tissues to release higher level of the corresponding chemokines (target tissue-based strategies).

Treatment with chemical compounds, preconditioning of the cells with hypoxia, cytokine and growth factor priming of the cells, genetic modifications, coating of cell surface with antibodies, glycoengineering, coating of stem cells with homing ligands by streptavidin linkers are some of strategies to increase the ability of stem cells to respond to the migratory stimuli. On the other side to modulate target sites to be more attractive for stem cells, some strategies like direct injection of chemokines, direct transfection of the target tissue with chemokine encoding genes, injection of ectopic chemokine expressing cells, application of scaffolds, electrical fields and low level laser have been introduced. These extensive investigations have provided significant potentials to enhance targeted stem/progenitor cells homing. Meanwhile there are still some limitations to apply these findings in clinics. To overcome these limitations, further studies should be aimed, unveiling the molecular and cellular mechanisms underlying endogenous cell trafficking during physiological and pathological events like embryogenesis, inflammation, wound healing, or cancer metastasis.

Keywords: Cell therapy, Homing, Stem cells.

Oral Presentation

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