Human mesenchymal stem cells as novel neuropathic pain tool

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Background: Neuropathic pain is a very complex disease, involving several molecular pathways. Current available drugs have a generalized nature and act only on the temporal pain symptoms rather than being targeted towards the several mechanisms underlying the generation and propagation of pain. Nowadays, pain research is directing towards new molecular and cellular methods, such as stem cell therapy. Aim of this study was to verify whether human mesenchymal stem cell (hMSC) transplantation could be an useful cell-based therapy for neuropathic pain treatment.

Material and Methods: We used spared nerve injury (SNI) mouse model of neuropathic pain to assess the possible use of hMSCs as anti-neuropathic tool. Bio-molecular, immunocytochemical and immunohistochemical analysis were carried out in order to verify stem cell-mediated changes in molecular mechanisms underlying pain development and maintenance.

Key Results: Human MSCs were transplanted in the mouse lateral cerebral ventricle. Stem cells injection was performed 4 days after sciatic nerve surgery. Neuropathic mice were monitored 7, 10, 14, 17, and 21 days after surgery. Human MSCs were able to reduce pain like behaviours, once transplanted in cerebral ventricle. Anti-nociceptive effect was detectable from day 10 after surgery (6 days post cell injection). Transplanted MSCs reduced the mRNA levels of the pro-inflammatory interleukin IL-1ß mouse gene, astrocytic, microglial cell activation and premature senescence-associated neuronal suffering. Indeed, hMSCs were able to decrease the ß-galactosidase over-activation positive profiles in the cortex of SNI/hMSC-treated mice compared to SNI/vehicle mice.

Conclusions: Despite over fifty years of research there are no valid treatments over time and neuropathic pain can be classified as an incurable disease without treatment. Mesenchymal stem cell therapy represents the new promising potential treatment for neuropathic pain relief.