

Neural crest derived niche of human dental pulp stem cells promotes peripheral nerve regeneration and remyelination in animal model of critical sized sciatic nerve injury

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Peripheral nerve injuries are a commonly encountered clinical problem and often result in long-term functional defects. The use of stem cells, easily accessible, capable of rapid expansion in culture as well as fully integrate into the host tissue and capable to differentiate in myelinating cells of the peripheral nervous system, represent an attractive therapeutic approach for the treatment of nerve injuries. Farther, stem cells sources sharing the same embryological origin of Schwann cells, might be considered a suitable tool. The aim of this study was to demonstrate the ability of a neuroectodermal sub-population of STRO-1⁺/c-Kit⁺/CD34⁺ hDPSCs (1, 2), most of which being positive for neural crest (P75^{NTR}) and neural progenitor cells (nestin) markers, to differentiate into Schwann cells-like cells *in vitro* and to promote axonal regeneration *in vivo*. As a matter of fact, following culture in appropriate induction medium, STRO-1⁺/c-Kit⁺/CD34⁺ hDPSCs were able to commit towards Schwann cells expressing P75^{NTR}, GFAP and S100b. After transplantation in animal model of sciatic nerve defect, hDPSCs promoted axonal regeneration from proximal to distal stumps, providing guidance to newly formed myelinated nerve fibers, which led to functional recovery as measured by sustained gait improvement. Particularly, transplanted hDPSCs engrafted into critical sized sciatic nerve defect, as revealed by the positive staining against human nuclei, showed the expression of typical Schwann cells markers, S100b and GFAP. In conclusion this study demonstrates that STRO-1⁺/c-Kit⁺/CD34⁺ hDPSCs, associated to neural crest derivation, represent a promising source of stem cells for the treatment of demyelinating disorders and might provide a valid alternative tool for future clinical applications to achieve functional recovery after injury or peripheral neuropathies besides minimizing ethical issues.

References

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Keywords

hDPSCs; Neural crest; sciatic nerve.