

Integrative neuro-activation approach for the optimization of cell-based regenerative treatments

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Abstract:

Brain and spinal cord pathologies cause devastating functional disabilities and associated health complications. To date, most of them are irreversible and require long-term medical, nurse and rehabilitation treatments and home care of the patients. These chronic clinical conditions have a remarkable health, family and economic impact in our societies. During the last decades, cell-based regenerative treatments have emerged as a promise. Among them, several trials have already been carried out using stem cells and also olfactory ensheathing cells. However, studies using the same procedures not always have reported the same functional outcomes. These heterogeneous expectations for a same treatment seem related to individual differences between patients. First, not all pathologies lead to an equal neurological damage. Second, each injury occurs in a specific physiological context. Third, innate spontaneous neuronal plasticity and collateralization usually leads to misguided connections; this may cause aberrant function. The latter, does exclusively depend on the biochemistry, physiology and activity of each patient's uninjured tissue.

Cell transplantation after brain and spinal damage is aimed at both, restoring neurological activity of intact fibers and re-connecting interrupted ones. Therefore, for the optimization of these therapies, prior transplantation, intact fibers should be functionally activated and misfunctions re-educated. Then, collateralization and sprouting should be elicited to increase synaptic efficiency and also guided to gain function. This integrative neuro-activation approach depends on the neurological status and clinical situation of each individual and requires integrative and individualized procedure for diagnosis. Here we present this novel integrative diagnostic procedure and the functional outcome obtained in non-transplanted chronic patients with spinal cord injury after integrative neuro-activation. This is the necessary prelude for a better repair after stem cell and olfactory ensheathing cell and transplantation.

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