Abstract Information

First Name :	Afsaneh
Last Name :	Gaillard
Email :	afsaneh.gaillard@univ-poitiers.fr
Address :	13 Bis rue du bas des sables
Participation :	symposium
Title of the Symposium :	Emerging regenerative medicine for CNS repair
Category :	Academic/Researcher
Thematic Area :	Neurodegeneration, Neuroplasticity, and Repair
Title :	Combination of biomaterial and stem cell-based strategies to improve cortical repair
Co-Authors :	Annousha Devi Govindan, Oriane Rabesandratana, Anaïs Lainé, Antoine Retho, Marie-Laure Bonnet, Sébastien Brot, Afsaneh Gaillard, Laboratory of Experimental and Clinical Neurosciences INSERM1084, FRANCE

Abstract :

Traumatic brain injury (TBI) is among the leading cause of death and disability with limited treatment options available. Given the limited capacity of the adult brain for self-repair, cell transplantation is a potential strategy to repair the degenerated brain pathways following TBI. One clinically relevant cortical tissue in the context of cortical lesion is the motor cortex, however, there is no reliable protocol to generate cortical neurons of motor identity.

Recently, we have generated a 3D motor cortical neurospheres (mCO) from human induced pluripotent stem cells (hiPSC) using a well-established protocol in our laboratory. These mCO grafted into injured motor cortex of adult Rag2??? mice, develop axonal projections to appropriate cortical and subcortical host targets. However, a major limiting factor after transplantation is cell death of grafted neurons. To enhance graft survival and functional recovery post TBI, mCO were embedded with hyaluronic acid (HA)-based hydrogel at day 18 of differentiation in vitro.

In the present study, we investigated the impact of HA-hydrogel on cell survival and maturation of hiPSC derived motor cortical neurons in vitro and in vivo after transplantation. We first analyzed in vitro the cellular composition of generated cortical neurons in combination with or without HA-Hydrogel at day 46. In vitro, we found that the HA-hydrogel romotes the survival and the maturation cortical neurons derived hiPSC. Next, we grafted mCO treated +/- HA-Hydrogel into injured motor cortex of adult Rag2??? mice. Interestingly, we found that 2 months after transplantation, the combination of HA-Hydrogel with mCO improves dramatically

the connectivity of the grafted neurons in term of density and the extent of repair.

These results reported a beneficial effect of HA-hydrogel on hiPSC-derived mCO in vitro and in vivo after transplantation. Further studies are underway to assess long-term connectivity and functionality of the grafted neurons.