Subcortical synaptophysin asymmetry after M1 lesion and autologous neural cell ecosystem (ANCE) therapy in primate: a preliminary study

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Throughout the previous decades in the domain of neurosciences, the neural stem cells graft and progenitor cell transplantation experimental approaches for neural repair have shown a new promising step against brain damages such as stroke. The autologous neural cell ecosystem (ANCE) transplantation strategy was applied in a non-human primate (NHP) model of cortical stroke of the primary motor cortex (M1), hand area. The animals subjected to the ANCE therapy showed significant behavioral improvement as compared to control group. However, the underlying morphological changes due to the transplantation remains poorly understood. In order to assess the subcortical impact of the ANCE therapy, we used a molecular marker commonly involved in the synaptogenesis and plasticity, namely the synaptophysin (SYP) vesicle-associated membrane protein. This allowed the quantification of the synaptic trafficking changes through the internal capsule (IC) where the main descending axons coming from the hand area of M1 reside.

Three groups of macaque monkeys were used in this study: (1) the cell group composed of 2 animals subjected to the M1 lesion and ANCE therapy; (2) the lesion group composed of 1 animal subjected only to the M1 lesion and (3) the control group included 1 animal without the lesion nor the ANCE treatment.

In the cell group animals, the results showed a qualitative increase of the SYP vesicles density in the ipsilesional hemisphere into the caudal IC. Interestingly, the lesion group showed an increase of the contralesional SYP density. However, the quantification showed discrepancies among animals. This might be explained by poor tissue quality and a low signal-to-noise ratio of the automated quantification analysis.

In conclusion, the increase in SYP-density vesicles could indicate that the caudal IC undergoes a differential plastic reorganization depending on the ANCE or M1 lesion alone. However, this has to be confirmed in a larger cohort of animals and with an unbiased densitometry analysis.

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