Neuroprotective Effects of Adipose-derived Stromal Vascular Fraction on Acute Spinal Cord Injuries in Rats

Presenter: Céline Erllan (France)
Affiliation: La Timone Hospital, Assistance Publique - Hôpitaux de Marseille
Authors: Céline Erllan, Mostafa Serhani, Maxime Bonnet, Sara Belluco, Jean-Michel Brezun, Tanguy Marqueste, Nicolas Senart, Patrick Decherchi

INTRODUCTION: Spinal cord injuries (SCI) lead to functional alteration with important consequences such as motor and sensory disorders. The repair strategies developed to date remain ineffective. The adipose tissue-derived stromal vascular fraction (SVF) is composed of a cocktail of mesenchymal and hematopoietic stem cells with trophic, pro-angiogenic and immunomodulatory effects. Numerous therapeutic benefits were shown for tissue reconstitution, peripheral neuropathy and for the improvement of neurodegenerative diseases.

METHODS: Our strategy is based on an autologous injection of the SVF within 4 hours after SCI. To check our hypothesis, we conducted a pre-clinical study in adult male rats. Contusions performed at thoracic level T10 using an impactor; all the animals were paraplegic. The epidymal fat removed in a second time, then the autologous SVF is purified (>90% of viability), before 1 million of cells are re-injected into the peri-mediullary space in front of the lesion.

RESULTS: Autologous SVF implantation promotes 1) locomotor recovery (BBB test, Ladder rung walking test), 2) h-reflex normalization, 3) and ventilatory frequency adjustment to an isometric exercise. 4) In vivo T2 MRI, shows a significant regeneration and vascularization in the periphery of the spinal contusion. 5) These results were also confirmed by immunohistology analysis (neurofilament labeling, signs of neurontrophic and neurogenic), that also revealed axonal regeneration within the SCI at 3 months.

CONCLUSION: However, our results are not complete, some biochemical analyses are still being processed, these encouraging results demonstrate significative recovery at 3 months post-autologous SVF implantation that could be improved by treadmill exercise.