



Figure 1. a) The organ-on-a-chip experimental setup where endothelial cells are in-line with the flow and adipocytes are in-set and shielded from shear stress, b) Day 7 Live (Calcein) Dead (Ethidium) image of adipocytes, c) Day 7 immunofluorescent image of adipocytes (BODIPY =green), DAPI =blue), phalloidin =red), d) Day 7 Live Dead image of HUVECs. Scale bar =100 μm .

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

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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 epididymal fat removed in a second time, then the autologous SVF is purified (>90% of viability), before 1 million of cells are reinjected into the peri-medullary 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 7T 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 neuronotrophic and neuritogenic), 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.