Stem Cells Therapy for Neuromuscular Disorders: What Have we Learned?

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Neuromuscular disorders include many genetic conditions which affects 1 in 1000 individuals worldwide. They are characterized by progressive muscular wasting and weakness, which can start in infancy with a rapid progression or later in life with a slower course. The possibility to treat these disorders with stem cell has been of great interest and the subject of innumerable investigation. Several clinical trials with autologous mesenchymal stem cells (MSCs), mostly from bone marrow, are currently underway. However, for genetic disorders the use of patients’ own stem cells is unlikely to bring any benefit. Therefore, the questions to be addressed are: How safe is the procedure of cell therapy using non-autologous MSCs cells? What is the clinical effect of MSCs therapy for affected patients? What is the best source of MSCs for treating neuromuscular disorders? Should the injections be repeated? Is immunosuppression necessary? In order to address these questions our group has focused on pre-clinical studies with human MSCs obtained from different sources which were injected in various non-immunosuppressed animal models for neuromuscular disorders. Comparison of MSCs and pericytes obtained from different tissues of a single donor showed that the best clinical effect was observed with human adipose derived pericytes. The double knockout mdx/utr- mice, the murine model for Duchenne muscular dystrophy, treated with pericytes lived 25% longer than untreated controls. Furthermore, we confirmed the safety of this procedure in three golden retriever muscular dystrophy dogs injected repeatedly with human MSCs. Two of these dogs have been followed for more than 6 years and showed no adverse reaction or tumor formation after repeated human MSCs injections, the longer follow-up study reported to date. Our data support the current hypothesis according to which the benefit effect of MSCs cells is probably based on their immunomodulatory and anti inflammatory properties.