
Neuroprotective effects of mesenchymal stem cell transplantation in animal model of cerebellar degeneration.

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Source

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Abstract

BACKGROUND:

The cerebellum has been considered a key structure for the processes involved in sensorimotor integration ultimately leading to motor planning and execution of coordinated movement. Thus, motor deficits and behavioral changes can be associated with cerebellar degeneration.

METHODS:

Here, the chemical neurotoxin pyridine-2,3-dicarboxylic acid (quinolinic acid, QA) used to create partially cerebellar degeneration in adult Wistar rats suitable for use in stem cell transplantation studies. Stereotaxically administration of QA (0.2 mmol) in the right cerebellar hemisphere (folia VI) caused noticeable motor disturbance in all treated animals. Forty-eight hours after causing lesion, rat bone marrow-derived mesenchymal stem cells (MSCs) were transplanted into damaged cerebellar hemisphere. We investigated the role of MSC transplantation in forms of motor and non-motor learning that involves the cerebellum and its neuroprotective effects in Purkinje cells loss.

RESULTS:

CM-Dil labeling showed that the transplanted MSCs survived and migrated in the cerebellum 6 weeks after transplantation. The MSC-transplanted group showed markedly improved functional performance on the rotating rod test (P<0.0001) and beam walking test (P<0.0001) during 6 weeks compared with the controls. For non-motor learning, we used passive avoidance learning test in 3 weeks after transplantation. The results showed that MSC transplantation prevented the development of memory deficit caused by cerebellar degeneration (P<0.001). Stereological analysis in 6 weeks after transplantation showed that QA significantly decreases Purkinje cells in vehicle-treated rats and MSC transplantation is neuroprotective and decreases Purkinje cell loss in MSC-treated rats (P<0.0001).

CONCLUSION:

The results indicate that transplantation of MSCs can significantly reduce the behavioral and neuroanatomical abnormalities of these animals during 6 weeks after engraftment. According to results of this assay, cell therapy by means of bone marrow-derived adult stem cells promises for treatment of cerebellar diseases.

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