Abstract: We developed a novel protocol for generation and selective amplification of neural progenitor cells regionally specified to the rostral brain but not the spinal cord from mouse embryonic stem cells (ESCs). The neural progenitors could differentiate in vitro and in vivo into many cholinergic and a few GABAergic neurons but rarely into astrocytes. The transplanted neurospheres could survive in the hippocampus (CA3) of animals with mild traumatic brain injury (TBI). Twelve weeks after transplantation (a week after the behavioral test), we found significant cholinergic differentiation recognized as ChAT immunoreactivity in the eGFP+ transplanted cells. Moreover, the grafts contained a few GAD67+cells. However, we barely found GFAP+ astrocytes within the grafts. Furthermore, presynaptic formations of graft-derived neurons were recognized by immunohistochemistry of near the grafts around CA3. However, these findings were not observed in severe TBI group. So, we examined NGF, BDNF, and FGF-2 mRNA by RT-PCR in 12 mice including normal, mild TBI and severe TBI group. Increases in the neurotrophic factors’ mRNA were evident in the hippocampus on the ipsilateral side in the mild TBI group. Statistical analysis revealed significant differences between the mild and severe TBI groups. The data also revealed significant differences between the mild TBI and normal groups. The transplanted neurospheres could survive in the mild TBI animals, but not in the severe TBI group. J. Med. Invest. 53: 42-51, February, 2006

Keywords: embryonic stem cell, neural stem cell, transplantation, cholinergic, traumatic brain injury
Animals

Discussion

ESC culture

Differentiation of ESCs and selective amplification and differentiation of neural progenitor cells


cells and differentiation of neural progenitor cells

Animals

Differentiation of ESCs and selective amplification

Animals

Differentiation of ESCs and selective amplification and differentiation of neural progenitor cells
Brain Injury and Cell Transplantation

Behavioral Assessment

Histology and Immunohistochemistry
Reverse Transcription-Polymerase Chain Reaction (RT-PCR) Analysis

There were no significant differences in the expression levels of the target gene after reverse transcription and amplification by RT-PCR in 

Statistics

Using a two-tailed t-test, we analyzed the differences in the expression levels of the target gene between the control and experimental groups. The results showed that the expression levels were significantly different (p < 0.05) in the two groups. The comparisons were made using the Student's t-test.
Derivation and selective amplification of neural progenitor cells from embryonic stem cells

Neurospheres survival and differentiation mainly into cholinergic neurons after transplantation into the cortex

Neural transplantation in injured brain

T. Shindo, et al.
mRNA Expression of neurotrophins

The Journal of Medical Investigation Vol. 53 February 2006
Eight-arm radial maze testing

It is often used to assess the performance of animals in a radial maze. The animals are required to find the correct arm to a goal box. The number of errors or escape times are used as a measure of performance. The results of this test can be used to assess the effectiveness of different treatments or interventions. In the example shown, the performance of different groups of animals is compared.

The chart shows the number of errors made by different groups of animals. The groups are labeled as Normal, Sham, mild TBI w/o NPC, mild TBI w/o NPC + NPC, and mild TBI severe TBI. The number of errors is plotted on the y-axis, and the groups are plotted on the x-axis. The chart shows that the groups mild TBI w/o NPC + NPC and mild TBI severe TBI have the highest number of errors, while the Normal and Sham groups have the lowest number of errors.
A 3D model of the patient's heart is created using magnetic resonance imaging (MRI) and then used to simulate the magnetic field distribution and its effects on the patient. The model is then used to analyze the spatial distribution of the magnetic field and its effects on the patient's heart. The results of the simulation are then used to optimize the placement of the implantable device to minimize the exposure of the patient's heart to the magnetic field.

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in vivo study of the effects of isoflurane on the cardiovascular system in dogs...