

P0468

Enhancement of Re-closure Capacity by the Intra-amniotic Injection of Human Embryonic Stem Cells in Surgically Induced Spinal Open Neural Tube Defects in Chick Embryos

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To evaluate the potential of the stem cell therapy as a method for prenatal management of spinal open neural tube defect (ONTD), the influence of embryonic stem cells injected into the amniotic cavity on the re-closure capacity of spinal ONTD was investigated. Spinal neural tube was incised open for a length of 6 somites using chick embryos of Hamburger and Hamilton stage 18 or 19. Embryos were divided into three groups: control group (no injection), vehicle group (injection of glucose in PBS), human embryonic stem (hES) cell group (injection of 20,000 hES cells with green fluorescence protein (GFP) in vehicle). On 3, 5, and 7 days after neural tube incision and immediate intra-amniotic injection, ONTDs were significantly more re-closed in the hES cell group than in the control and vehicle groups. On light and fluorescence microscopic examinations, hES cells were not found in the re-closed area but were present at the area on the process of re-closure, covering ONTDs. In conclusion, intra-amniotic injection of hES cells enhances re-closure capacity of surgically induced ONTDs in chick embryos. The hES cells do not incorporate themselves into the neural tube but do help re-closure.

Key words: *Human embryonic stem cell, Chick embryo, Re-closure, Open neural tube defect*