

Biology and therapy of adult human brain stem cells

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Characterizing the properties of adult human brain stem cells may ultimately contribute to development of effective medicines for brain tissue repair and regeneration. Neural stem cells are present not only in the developing nervous systems, but also in the adult human central nervous system. Open head injury often causes damage to brain tissue. If neural tissue is out of the brain, it is generally discarded. We investigated whether such tissue could be used as a source for isolation of neural stem cells and the cultured neural stem cells could be implanted autologously into patients for treatment of neurological deficits caused by trauma. We isolated and propagated adult neural stem cells from the exposed brain tissue of the patients with open brain trauma, and then implanted autologous neural stem cells into the traumatic regions with MRI-guided stereotactic device for the patients. Within 2-years follow-ups, the patients were investigated by fMRI, FDG-PET and SEP for functional recovery. Contrast to the case control group, implantation of neural stem cells was associated with a significant improvement in patient's neurological function investigated by DRS. The improved brain function was accompanied by partial recovery of activity in damaged areas as assessed by fMRI and SEP, and by significant increases in neural viability within injured territories as assessed by FDG-PET. Investigations of stem cell therapy have required non-invasive analysis of the fate and migration of implanted neural stem cells. Here, we report a pilot clinical study to demonstrate that stem cell engraftment and migration after brain implantation can be detected using an MRI scanner (Zhu J, Zhou L, Ge F, Wu X. Tracking neural stem cells in brain trauma patients. *New Engl J Med* 2006, 355 (22) 2736-2738). It is highly important that we should combine biology of human adult brain stem cells with clinical brain regenerative medicine.

Keywords: adult brain stem cells, stem cell therapy, tracking stem cells

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laboratory, and used these to repair the damaged brains of head-injury victims. His academic efforts have been acknowledged and rewarded both on national and international level, having received the Young Neurosurgeon Award of the World Federation of Neurosurgical Societies (WFNS) and named among the Cheung Kong Professorship of National Education Ministry. Dr Zhu serves on the executive committee as the current treasurer for Asia-Australasian Society of Neurological Surgery (AANS) and the vice president for Chinese Society of Neuro-Oncology (CSNO) and as editorial board member of international magazines *Regenerative Medicine* and *Reviews on Clinical Trials*.