Modified adult stem cells may be helpful in spinal cord injury

February 24 2010

Researchers at UTHealth have demonstrated in rats that transplanting genetically modified adult stem cells into an injured spinal cord can help restore the electrical pathways associated with movement. The results are published in the Feb. 24 issue of the *Journal of Neuroscience*.

In spinal cord injury, demyelination, or the destruction of the myelin sheath in the central nervous system, occurs. The myelin sheath, produced by cells called oligodendrocytes, wraps around the axons of nerves and helps speed activity and insulate electrical conduction. Without it, the nerves cannot send messages to make muscles move.

The research team, led by Qilin Cao, M.D., principal investigator and associate professor of neurosurgery at UTHealth (The University of Texas Health Science Center at Houston), discovered that transplanted adult stem cells (oligodendrocyte precursor cells or OPC) from the spinal cord could become oligodendrocytes. The new cells helped restore electrical pathways of the spinal cord and therefore, function, in a process called remyelination.

Cao said two important discoveries were isolating precursor cells from the adult spinal cord and, prior to transplanting them into the spinal cord, genetically modifying them to express ciliary neurotrophic factor (CNTF), a protein that encourages nerve growth. In preliminary experiments, also published in this paper, CNTF was shown to facilitate survival and differentiation of OPCs in cell culture.

"Most importantly, the evidence of remyelination was shown to exactly coincide with the anatomical localization of these motor pathways in spinal cord white matter," Cao said. "These latter data provide confidence that the mechanism by which the grafted OPCs are enhancing functional recovery is through remyelination."

Previous studies by the team and other researchers have shown that grafted OPCs survive after grafting into an injured spinal cord and increase movement recovery, but the mechanical connection to remyelination had only been theorized. In this research, results showed that there was significantly enhanced behavioral recovery, return of electrophysiological conduction and ultra-structural evidence of remyelination.

The clinical significance is two-fold, Cao said: "First it confirms what has been suggested by these and other authors that stem cell grafting in attempts to remyelinate an injured spinal cord is a viable therapeutic strategy. Secondly, it strongly cautions that optimal recovery using such an approach will require more than simply grafting nad′ve precursor cells ."

Provided by University of Texas Health Science Center at Houston