Peripheral nerve repair with fat precursor cells led to wider nerves and less muscle atrophy

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To determine if guided fat (adipose) precursor cells (APCs) could improve nerve regeneration and functional recovery, researchers at the University of Pittsburgh (USA) used biodegradable nerve guides to transplant APCs into the injured peripheral nerves of laboratory rats.

"Adipose tissues, shown to be multipotent, have also been shown to be an abundant source of post-natal precursor cells that are relatively easy to isolate from fat tissue and in sufficient amounts to be injected immediately post-isolation," said Dr. Kacey Marra, lead author of a study published in the current issue of the journal *Cell Transplantation* (18:2).

Adipose precursor cells, said Marra and co-authors, have demonstrated an ability to differentiate in vitro into cartilage (chondrogenic), bone (osteogenic), fat (adipogenic) and muscle (myogenic) cell types.

Control groups for this study included those with no treatment, those receiving an autograft but no nerve guide tube, and those receiving an autograft and nerve guide tube but no APC transplant in the guide tube.

Researchers noted that the "gold standard" for nerve repair is the autograft to repair nerve gaps. Pre-clinical studies have shown that including Schwann cells within nerve conduits can enhance nerve regeneration. However, the incorporation of Schwann cells requires a

second surgery, renders a secondary nerve nonfunctional, and requires Schwann cells in high numbers that are clinically challenging to obtain.

According to the researchers, significant differences in the sciatic functional index (SFI) were observed three weeks post-injury in the autografted, APC-transplanted group using nerve guides over a control group in which nerve guides were left empty. Researchers also observed the formation of a more robust nerve accompanied by modestly decreased muscle atrophy in the APC-transplanted group. No differences were observed after 12 weeks, however.

"We found that full regeneration of the sciatic nerve occurred in the rats receiving the autograft, the guide, and the guide loaded with APCs. No regeneration was observed in any of the rats in which the defect was left untreated," said Marra.

Their results also showed that transplanted human-derived APCs survived for up to 12 weeks in the injured peripheral nerve and formed a more robust nerve with nerve cells more than double the size of those formed using the conduit alone.

"The versatility of adult precursor cells, such as those from adipose, for the treatment of a number of disorders is promising and this study demonstrates their potential benefit towards nerve repair," said section editor Dr. John Sladek, professor of pediatrics and neuroscience at the University of Colorado School of Medicine.

Source: Cell Transplantation Center of Excellence for Aging and Brain Repair

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