Peripheral nerve reconstruction

Peripheral nerve reconstruction is a difficult problem to solve. Acellular nerve allografts (ANAs) have been widely tested and are a promising alternative to the autologous gold standard. However, current reconstructive methods still yield unpredictable and unsuccessful results. Consequently, numerous studies have been carried out studying alternatives to plain ANAs, but it is not clear if nerve regeneration potential exists between current biological, chemical, and physical enrichment modes.

To systematically review the effects of cell-enhanced ANAs on regeneration of peripheral nerve injuries.

PubMed, ScienceDirect, Medline, and Scopus databases were searched for related articles published from 2007 to 2017. Inclusion criteria of selected articles consisted of (1) articles written in English; (2) the topic being cell-enhanced ANAs in peripheral nerve regeneration; (3) an in vivo study design; and (4) postgrafting neuroregenerative assessment of results. Exclusion criteria included all articles that (1) discussed central nervous system ANAs; (2) consisted of xenografts as the main topic; and (3) consisted of case series, case reports or reviews.

Forty papers were selected, and categorization included the animal model; the enhancing cell types; the decellularization method; and the neuroregenerative test performed. The effects of using diverse cellular enhancements combined with ANAs are discussed and also compared with the other treatments such as autologous nerve graft, and plain ANAs.

ANAs cellular enhancement demonstrated positive effects on the recovery of nerve function. Future research should include clinical translation, in order to increase the level of evidence available on peripheral nerve reconstruction [1)].

A literature search of the MEDLINE and Embase databases was performed from inception to April 2012, searching for animal experiments on peripheral nerve reconstruction models in which a nerve conduit was used with and without the support of 3 different types of stem cells. Stem cells were analyzed according to their origin: bone marrow, adipose tissue, and other origins. Included studies had consistent outcome measurements: walking track analysis, muscle mass ratio, and electrophysiology.

Forty-four studies were included in the final analysis. Forest plots of the 3 outcome measurements (walking track analysis, muscle mass ratio, and electrophysiology) showed positive effects of stem cells on the regeneration of peripheral nerves at different time points. Almost all comparisons showed significant differences for all 3 stem cells groups compared with a control group in which stem cells were not used.

The present report systematically analyzed the different studies that used stem cells as a luminal additive when bridging a large peripheral nerve defect. All 3 different stem cell groups showed a beneficial effect when used in the reconstruction compared with control groups in which stem cells were not used [2)].

1)
Pedrini FA, Boriani F, Bolognesi F, Fazio N, Marchetti C, Baldini N. Cell-Enhanced Acellular Nerve Allografts for Peripheral Nerve Reconstruction: A Systematic Review and a Meta-Analysis of the

Literature. Neurosurgery. 2019 Nov 1;85(5):575-604. doi: 10.1093/neuros/nyy374. PubMed PMID: 30247648.
2)

Hundepool CA, Nijhuis TH, Mohseny B, Selles RW, Hovius SE. The effect of stem cells in bridging peripheral nerve defects: a meta-analysis. J Neurosurg. 2014 Jul;121(1):195-209. doi: 10.3171/2014.4.JNS131260. Epub 2014 May 9. PubMed PMID: 24816327.