Trent Gause

PG4

RRD Abstract

Title: Long-Gap Peripheral Nerve Repair Through Sustained Release of a Neurotrophic Factor in Non-human Primates

Abstract:

Log-gap peripheral nerve injuries are often challenging to repair. For nerve gaps > 3m, autografting remains the standard of care; however, autograft may result in neuroma formation, loss of sensation at the donor time, and increased operative time. This study assesses the outcomes of long gap nerve repair with a synthetic nerve conduit comprised of polycaprolactone (PCL) with double-walled polymeric microspheres eluting glial cell line-derived neurotrophic factor (GDNF) in a rhesus macaque model compared with PCL with empty microspheres and a median nerve allografts. Nerve conduction velocity (NCV) was determined at baseline and at one-year. The NCV of the PCL/GDNF was statistically increased (3.41$\pm$ 15.32 m/s) compared to autograft (25.45 $\pm$ 3.96 m/s) and PCL/Empty (12.60 $\pm$ 3.89 m/s) groups. Function fine motor skill assessment showed no significant difference between the autograft (77.49% $\pm$ 19.28%) and the PCL/GDNF group (75.64% $\pm$ 10.28%), but both groups outperformed the PCL/empty (44.95% $\pm$26.94%). Histologic data included Schwann cell presence, myelination of axons, nerve fiber density and g-ratio. The PCL/GDNF group had a greater density of Schwann cells (11.60 $\pm$ 33.01 μm^2) distal to the injury than the autograft (4.62 $\pm$ 4.62 μm^2) and the PCL/Empty (4.52 $\pm$ 5.16 μm^2). The study demonstrated the efficacy of a biodegradable, synthetic nerve conduit with sustained GDNF release in long-gap peripheral nerve repair in a non-human primate model.