**A Clinical Trial to Assess the Safety of a Novel Scaffold Biomaterial**

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**Introduction**

Autologous nerve grafts are the only reconstructive options for major traumatic nerve injuries with tissue destruction. This type of graft has limitations including donor site morbidities and limited availability. Synthetic nerve conduits are alternative to nerve autografts. The current approach for introduction of nerve scaffolds typically involves preclinical testing of novel materials in vitro and then testing in small animal, usually rodent, nerve injuries. The next step in pre-clinical testing has been to use candidate scaffolds in a larger animal model, which is very expensive and takes 2 - 3 years to complete. We propose a new balanced risk/benefit parallel process in developing and translating into practice novel materials for nerve repair, using a carefully defined clinical model.

**Materials and Methods**

Patients with suspected peripheral neuropathy who undergo whole sural nerve biopsy will be evaluated. Those meeting inclusion criteria will be recruited into the study. Thirty patients will be randomly assigned to one of two groups: 15 patients will undergo sural nerve biopsy and repair of the nerve defect with a 6 cm polycaprolactone fumarate (PCLF) nerve tube (study group); 15 patients will undergo sural nerve biopsy without nerve tube reconstruction (control group). Patients in both groups will undergo the same pre and postoperative evaluations. Baseline assessment will include clinical evaluation (static and dynamic 2-point discrimination, visual analogue scale of pain), nerve conduction study (sural nerve sensory nerve action potential, SNAP), quantitative sensory testing (vibration detection threshold, touch-pressure, thermal discrimination) and autonomic sweat testing. Post-operatively possible implant reaction/toxicity will be monitored. These include local swelling and redness, itching and pain, visible and palpable nodules, or erosions and pustules and systemic symptoms of fever and fatigue. Complete blood count and erythrocyte sedimentation rate will be obtained. Development of severe swelling or pustules or evidence of tube extrusion or wound dehiscence will fulfill criteria for implant removal and definition as a failure. At 3 months and 1 year after the surgery, all the baseline evaluations will be repeated.

**Results**

This is a phase 1 study to determine the safety of PCLF scaffolds for repair of 6 cm nerve gaps. If completed, the study is powered to detect a significant difference (p<.05) if 4/15 implant patients versus 0/15 controls or 6/15 implant patients versus 1/15 controls meet criteria for implant failure using chi-square contingency table analysis. All efficacy measures are secondary evaluations. In the control group, it is predicted that no patients will have a sural SNAP at any time. If the graft promotes regeneration and the SNAP returns, this will be considered as a positive result.

**Discussion and Conclusions**

The trial will have 2 important outcomes: 1) a nerve scaffold for use in reconstruction of large nerve defects; 2) an accelerated pathway for introducing new scaffold materials or devices into clinical use by cutting out the need for an intermediate large animal study that requires several years to complete.

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**Disclosures**

The proprietary material polycaprolactone fumarate (PCLF) in this work is patented by Michael Yaszemski.