

## ACELLULAR NERVE GRAFTS FOR NERVE GAP REPAIR

Haase, SC, Cederna, PS, Dennis, RG and Kuzon, WM

University of Michigan Medical School and College of Engineering,  
Ann Arbor, MI

Sponsor: Paul S. Cederna, MD

**Introduction:** Options for reconstruction of nerve gaps are currently limited. Donor site morbidity limits the availability of autografts, and allografts necessitate the use of immunosuppressive therapy. We hypothesize that acellular nerve grafts can support nerve regeneration across a small nerve gap in the rat hind limb model.

**Methods:** Peroneal nerves were harvested from six adult male rats and acellularized using a technique developed in our lab. In twenty-one adult isogenetic rats, nerve gaps of 2- or 4-cm were created in the left peroneal nerve. This gap was repaired with either the native nerve (Auto groups) or an identical length of acellular graft (Acell groups). The animals were evaluated with walking tracks preoperatively and at three-week intervals postoperatively. The intermediate toe spread (ITS) was measured for both hind limbs at each interval. Fifteen weeks postoperatively, maximum force ( $F_0$ ) of the left extensor digitorum longus (EDL) muscle was measured, and specific force ( $sF_0$ ) was calculated.

**Results:** Mean data for each group are shown below (left limb only).

	N	EDL Mass (mg)	15w ITS (mm)	$F_0$ (mN)	$sF_0$ (mN/mm <sup>2</sup> )
Auto 2-cm	5	114 ± 11	12.7 ± 1.2	1790 ± 315	188 ± 34
Auto 4-cm	5	112 ± 6	12.4 ± 1.1	1980 ± 695	216 ± 80
Acell 2-cm	4	73 ± 23*	10.1 ± 2.8	726 ± 608*	106 ± 65
Acell -4cm	5	33 ± 3 <sup>†</sup>	8.3 ± 1.5 <sup>†</sup>	6 ± 6 <sup>†</sup>	2 ± 2 <sup>†</sup>

\* $p < 0.005$  vs Auto 2-cm; <sup>†</sup> $p < 0.005$  vs Auto 4-cm; two-way ANOVA

Significant differences ( $p < 0.005$ ) were observed for EDL mass and  $F_0$  between Auto and Acell rats at each gap length. Both 15-week ITS and  $sF_0$  were significant only at a 4-cm gap length. Although cellularity was the most influential variable, interaction between cellularity and gap length did occur with significance in measurements of muscle mass and  $sF_0$ . Differences in ITS at fifteen weeks parallels the trend in  $sF_0$ .

**Conclusion:** The data support our hypothesis that acellular nerve grafts, prepared by our technique, can support nerve regeneration across short nerve gaps in the rat hind limb model.