A Rodent Model of Partial Muscle Re-innervation

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Introduction

- suboptimal motor recovery following nerve repair is not uncommon
- partial reinnervation is a particularly challenging scenario
  - options include revision surgery, “supercharging”, pharmaceutical augmentation
- difficult to study since no good animal model exists
  - rodents have superior neural healing potential
  - purposefully compromising nerve repair mimics poor recovery
    - but not reproducible

- Need a reproducible and predictable animal model of partial re-innervation

Materials/Methods

(12 female Sprague-Dawley rats)
Manipulation:
- Sciatic nerve (and branches) exposed
  - 15mm above knee, Tibial nerve partially transected (leaving 1/3rd closest to Peroneal nerve intact
  - intact 1/3rd subjected to 5 second crush

Testing:
- 2 mos post manipulation
- Sciatic nerve exposed
- Gastrocnemius, Soleus, Flexor Digitorum Longus
Muscles and tendons isolated
- Optimal length maintained (Blix curve)
- Supramaximal stimulations (5v, 2ms)
- contraction force and muscle weights recorded

Results

Discussion

- Model designed to be technically easy, reproducible, economical
  - three muscles tested (not clear which would be consistently weakened)
  - need 80% decrease in axons (b/c compensatory sprouting results in enlarged motor units) (Tam et al. 2001)
  - delay in testing to ensure that compensatory sprouting would have occurred

- Gastrocnemius muscle is consistently weakened following the described tibial nerve manipulation and can be the target of future study
- Muscle weight is not consistently altered