**Introduction**

- Brachial plexus birth injury (BPBI) is the most common nerve injury in children.
- 30-40% of injured children experience lifelong arm impairment with limited range of motion and joint dislocation.
- BPBI leads to gross changes in muscle and bone development during rapid postnatal growth.
- Muscular changes including contracture occur with BPBI, but the causes of these changes at the cellular level are not well understood.
- We hypothesize that underlying muscle composition changes, including increased fibrosis, contribute to limited arm functionality in patients with BPBI.

**Methods: Study Design**

**Age**
- **Day 0**: Sprague-Dawley rats
  - n = 6 (5 male, 1 female)
- **Day 5**: Postganglionic neurectomy
  - Nerves C5 and C6 excised
  - Unaffected-left, Affected-right
- **Week 8**: Sacrifice
  - Muscles of interest: 1) Biceps long head, 2) Biceps short head, 3) Lower subscapularis, 4) Upper subscapularis

**Methods: Histology**

- Muscles were snap frozen and stored at -80°C.
- Samples were cryosectioned to create three frozen sections (10 µm thickness) for each muscle.
- Sections were stained with Masson’s trichrome and imaged with an EVOS XL light microscope at 20X magnification.

**Methods: Image Processing**

**Imaged sections were analyzed using a custom protocol in ImageJ software**

**Collagen Detection**
- Excessive collagen, stained blue by Masson’s trichrome, indicates fibrosis.
- Color thresholding used to measure percent of image occupied by collagen.

**Muscle Tissue Detection**
- Healthy muscle fibers are stained red by Masson’s trichrome.
- Saturation thresholding used to measure percent of image occupied by tissue.

**Calculations and Statistics**
- The ratio of collagen to total tissue was calculated using the percentages of collagen and tissue in the image.
- Paired t-tests were used to compare collagen content in the affected and unaffected shoulders for each muscle (α = 0.05).

**Results: Representative Images**

**Results: Statistical Analysis**

Fibrosis was significantly increased in the affected biceps long, biceps short, and lower subscapularis muscles.

**Discussion**

- Neuromyectomy affects fibrosis in innervated muscles to different extents:
  - Biceps muscles demonstrated the greatest increase in collagen, suggesting development of fibrosis.
  - Subscapularis muscles demonstrated moderate or no increase in collagen.
- Our results confirm previous findings suggesting postganglionic neuromyectomy increases fibrosis in the developing shoulder.
- Understanding the impact of neuromyectomy on underlying muscle changes is the first step toward understanding the development and progression of limited arm function in patients with BPBI.
- Future work will compare collagen composition with preganglionic and postganglionic neuromyectomy.
- Additional metrics, muscle fiber size and geometry, will be analyzed and correlated with muscle and bone changes.

**References**


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