compared to isolates classified as *Probable Contaminants*, indicating distinct differences in those strains causing clinically relevant orthopedic shoulder arthroplasty infections.

Further reading

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Paper #34 ANALYSIS OF HUMAN MUSCLES OF THE SHOULDER AND UPPER EXTREMITY A TEMPORAL PROFILE OF HUMAN MOTOR ENDPLATE DEGRADATION

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Hypothesis: The suprascapular nerve is prone to traumatic injury during falls on an out-stretched hand, as well as secondary to blunt trauma to the top of the shoulder, due to its relatively fixed position under the ligaments and rotator cuff as well as high position on the brachial plexus. The supraspinatus muscle is innervated by the suprascapular nerve and routinely undergoes fatty degeneration and fibrosis with rotator cuff pathology in a manner that grossly seems analgous to a nerve injury. Although the supraspinatus is also the most studied muscle of rotator cuff, the pathophysiology of motor endplate degeneration specific to humans is not well understood. Patients with traumatic peripheral nerve injuries provide a unique opportunity to capture this invaluable data about human muscle degeneration.We hypothesized that the time course of human motor endplate degeneration after traumatic nerve injury is temporally correlated with the duration of denervation after traumatic nerve injury. We tested this hypothesis by rigorously analyzing denervated human muscle tissue to build a temporal profile of neuromuscular junction (NMJ) degeneration after a distinct, identifiable injury so as to better understand end stage human muscle degeneration.

Methods: IRB approval was obtained so as to permit biopsies from denervated muscles in patients with injuries ranging from complete pre-ganglionic C5-T1 brachial plexus injuries to less severe, but distinct, traumatic nerve injuries. Specimens were processed for immunohistochemistry and visualized with two-photon excitation and confocal microscopy. Human muscle samples from multiple timepoints after injury were analyzed along with control specimens from innervated muscles so as to create a temporal sequence of events for human motor endplate degradation following traumatic nerve injury.

Results: Denervated muscle samples show distinct differences from innervated muscles, including fragmentation and dispersion of acetylcholine receptors (Fig. 1). There is also a noted decrease in NMJ volume as seen in 3D reconstruction, and a trend towards plaque endplate morphology. Moreover, comparison of denervated muscles shows signs of temporal degeneration. NMJs from early denervated muscles still show well preserved circular morphology with definite acetylcholine receptors arranged in distinct folding patterns. By one year status post traumatic brachial injury, NMJs begin to present with greater fragmentation (Fig. 2). Moreover, synaptic gutters start to fade, and asymmetry in acetylcholine receptor distribution is noted. Interestingly, even after one year of denervation, NMJs were able to retain their overall circular shape.

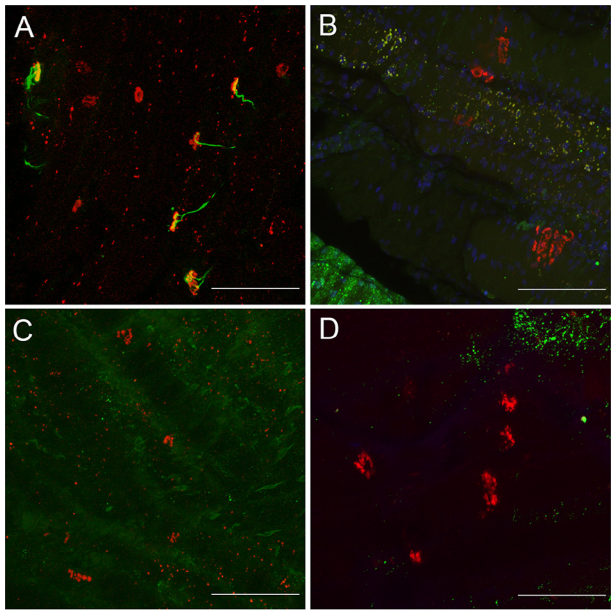

Figure 1 Confocal images of human NMJs. (A) innervated deltoid. (B) 5 month denervated first dorsal interossei. (C) 4 month denervated biceps. (D) 1 year denervated biceps. BTX = α-bungarotoxin. NF/syn = neurofilament and synaptophysin. Scale bars = 50 μm (20×).

Summary: This study details the novel and critically important data about the sequence of events involved in human motor endplate degradation after a clearly defined traumatic injury. Surprisingly, human NMJs persist and retain their structures even after the 6-month window of opportunity for meaningful functional recovery has elapsed. These findings may indicate a limited utility of animal models for traumatic peripheral nerve injuries and point to better understanding the morphometric changes in human muscle after injury.

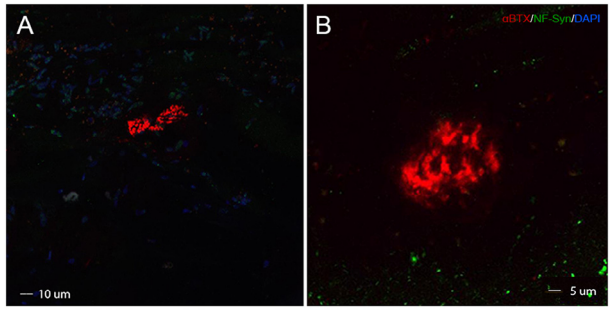

Figure 2 Staining of NMJs from biceps muscle one year after traumatic brachial plexus injury. (A) NMJ at low magnigication. (B) NMJ at higher magnification. Red for alpha-bungarotoxin, blue for DAPI, green for neurofilament and synaptophysin.