114 Takisha Morancy Advisor(s): Dr. Richard Kollmar Ph.D.

Symmetric Stimulation of the Distal Branch of a Transected Facial Nerve

Our goal is to demonstrate, using a rat model, that it is possible to stimulate a facial nerve that has sustained injury without repair to produce movement that is spatially and temporally symmetric to a movement on the contralateral uninjured side.
Methods: The facial nerves were exposed bilaterally and the rat received kainic acid (5mg/kg) to induce seizure activity. One nerve was transected to elicit facial nerve damage. The filtered intact nerve signal was passed through a custom window discriminator that generated a trigger pulse for each action potential that fell within the specified amplitude window set on the discriminator. Trigger pulses drove constant current stimuli from the digital pulse generator. Nerve stimulation was performed using a digital pulse generator with stimulus isolation from ground (A-M Systems 2100). Vibrissae (whisker) tracking was achieved through videobased quantitative analysis.
Results: Episodes of kainic-acid-induced whisking activity with regular amplitude and ~10-12 Hz frequency were visible on the intact side, as was more irregular whisking on the bisected side resulting from our electrical stimulation of the distal nerve segment triggered by nerve activity recorded on the intact side. Video-based quantitative analysis demonstrated synchronized whisker movement on the damaged nerve with nerve stimulation.
Conclusion: We demonstrated successful symmetric stimulation of the transected facial nerve driven by monitoring of the healthy facial nerve, thus demonstrating that stimulation recording methods work. Trigger pulses using constant current stimuli from the digital pulse generator produced whisker movement on the damaged side. However, these experiments were performed on a freshly transected facial nerve wherein the axons have not undergone Wallerian degeneration or undergone a period of recovery and regrowth. Future studies will extend this system to the stimulation of facial nerves after repair from injury and regeneration.