

Title: Electrical Stimulation Facilitates Rat Facial Nerve Recovery

Problems addressed: Facial nerve paralysis

Methods and measures:

Objectives:

1. To induce a crush injury to the facial nerve in the rat model
2. To implant an electrical stimulator proximal to the injury site
3. To study the effect of electrical stimulation on functional recovery of the facial nerve

Study Design: Experimental, animal model.

The right facial nerve of 17 rats was crushed at the stylomastoid foramen, causing complete right-sided facial paralysis. An electrical stimulator was implanted proximal to the crush site. Nine rats underwent electrical stimulation and eight underwent sham stimulation (30 minutes daily) until each nerve recovered completely. Facial nerve function was estimated by vibrissae orientation, movement and eye-blink. The “semi-eyeblink” indicated early facial nerve recovery. Daily facial function assessments were made, using the un-injured left side for comparison. Each parameter was graded on a scale of 1(no function) to 3 (full recovery). Complete facial nerve recovery was achieved when facial function on crushed side equaled that of un-injured side. Unpaired t-test was used for statistical analysis.

Results:

The semi-eyeblink returned significantly earlier ($(3.71 \pm 0.97$ vs. 9.57 ± 1.86 days) in stimulated rats ($p=0.0123$). Stimulated rats also recovered vibrissae orientation, vibrissae movement and complete movement earlier, than the non-stimulated rats.

Conclusions:

Electrical stimulation initiates earlier nerve regeneration and shortens the initial period of facial nerve recovery in rats. This model is reliable for electrical stimulation and assessment of facial nerve recovery. There is a trend towards shorter and less variable period to complete recovery in stimulated rats.

Clinical significance of study:

Our study has potential for early translational application in humans with intact facila paralysis that have an intact facial nerve. These situations include Bell's paralysis, traumatic facial nerve paralysis, and after surgery such as parotidectomy and acoustic neuroma resection.

Grants: