

Effects of electrical stimulation and testosterone on functional recovery following a recurrent laryngeal nerve injury

Piotr T. Tekiela, Gina N. Monaco, Eileen M. Foecking, Keith N. Fargo

Nerve damage is a significant contributor to serious sensory and motor disability. Although peripheral nerves are known for their regenerative capacity, recovery from peripheral nerve injury is often unpredictable and may be quite prolonged. It is therefore important to gain a better understanding of the recovery process and the kinds of treatments that can enhance it. In the present experiment, we used a nerve crush injury in rats to study the effectiveness of testosterone and electrical stimulation in promoting recovery. All animals received a unilateral crush injury of the recurrent laryngeal nerve, which controls movement of the vocal folds. Animals were then treated with either testosterone, electrical stimulation, or a combination of both. A group of untreated animals served as controls. Animals were allowed to survive between 1 to 6 weeks. Just prior to sacrifice, an endoscopic camera was used to record vocal fold movements. All recordings were viewed by a blind observer, and vocal fold mobility scores were assigned by comparing movement between the injured and uninjured sides. Untreated animals reached complete functional recovery in approximately 6 weeks. Treatment significantly reduced recovery time, with treated animals reaching complete functional recovery within 4 weeks. In addition, untreated animals did not display appreciable recovery until 2 weeks after injury, but treated animals showed significant recovery of vocal fold function by 1 week post-injury. Both in terms of recovery time and initial delay, all treatments were significantly better than control, and were approximately equal to one another in efficacy. Thus, both testosterone and electrical stimulation (and combined treatment) led to more rapid recovery from peripheral nerve injury. Future studies should focus on determining the biological mechanisms underlying the ability of these treatments to enhance recovery from nerve injury.