Free Functioning Muscle Transplantation for Lower Leg Neuropathy
Nai-Jen Chang, MD; David Chwei-Chin Chuang
Institution where the work was prepared: Chang-Gung Memorial Hospital, Taoyuan, Taiwan

Free Functioning Muscle Transplantation for Lower Leg Neuropathy

Author: Nai-Jen Chang, David Chwei-Chin Chuang
Institution: Division of Reconstructive Microsurgery, Department of Plastic and Reconstructive Surgery, Chang Gung Memorial Hospital, Chang Gung Medical College and Chang Gung University, Taoyuan, Taiwan

Background: The incidence of lower extremity nerves injuries is relatively rare and the results are usually poorer compare with upper extremities. Free functioning muscle transplantation (FFMT) is a choice of reconstruction for the sequelae of chronic neuropathy or the poor result of nerve reconstruction. However, there were limited cases reported in the literature review. Here we share our 20 years clinical experience using FFMT to reconstruct the lower leg neuropathy.

Material and method: Between 1989 and 2010, 11 cases suffered from sciatic nerve neuropathy with devastating clinical recovery of ankle dorsiflexion included in our studies. There were 6 male and 5 female, with the average of 27.7 (13-49) years old. The etiology of injury including traffic accident (n=6), penetrating injury (n=2), explosive injury (n=1), falling from height (n=1), and crushing injury (n=1). 8 cases received FFMT after primary injury with an average of 16.6 (2-31) month post primary injury, another 3 cases received FFMT after poor result of serial nerve surgeries. The donor site of free functioning muscle including rectus femoris muscle (n=7), gracilis (n=3), and lattismus dorsi (n=1). Concomitant operation were performed simultaneously such as calcaneous tendon lengthening (n=4), tibialis posterior tendon transfer to 3rd or 4th metatarsus (n=3), direct neurotization (n=1) and nerve graft (n=1) for outcome improvement. All the patients received regular rehabilitation post-operatively; all the patients follow up at least 1 year. Results: Between the 11 cases, only one rectus femoris (RF) muscle failed due to anterior tibial artery (ATA) occlusion which we then shifted to gracilis muscle. The survive rate of muscle flap was 90.9%. 7/11 patients achieved at least M3 post-op. Only one patient received tendon transfer because of poor result from the
transferred functioning muscle. Conclusion: FFMT is an efficient way to regain the dorsiflexion of ankle for the patient with sciatic nerve or peroneal nerve palsy. Concomitant operation such as calcaneous tendon lengthening, tibialis posterior tendon transfer to metatarsus, or any kind of nerve surgeries can be done simultaneously for outcome improvement.
Introduction: Patients in their later years of life suffering from facial palsy are often denied the option of dynamic facial reanimation on the basis of their age alone and are often offered inferior reconstructive static techniques. Several studies strongly indicate that a two stage reanimation with cross facial nerve grafting in the older population reveal inferior results explained by poor reinnervation. We present a series of 5 patients over the age of 60 who were successfully reanimated for their facial palsy with a partial gracilis muscle innervated by the nerve to masseter as measured by smile excursion, improved symmetry in repose and animation, and satisfaction from surgery.

Methods: A retrospective review was completed of 5 patients over the age of sixty who had undergone dynamic facial reanimation in a one-stage procedure with a partial gracilis muscle innervated by the masseter nerve. Demographics include age, sex, etiology, time interval from palsy to surgery, and time interval from surgery to motion. Additionally each patient was analyzed pre and post operatively for changes in philtral deviation, and smile angle with the FaceGram software.

Results: Average age of the study population was 64.4 years (Range 60-71). All patients were female. Mean follow up was 23.4 months (Range 11-44 months). Time interval from palsy to surgery was 14.1 years (Range 1.5 – 27 years), average time interval from surgery to motion was 4 months. Based on measurements with the FACE program average change in degree of the modiolus on the paralyzed side from the horizontal were 3.6 degrees in repose and 8.8 degrees in animation, and average change in philtral deviation on the paralyzed side was 2.96 mm in repose and 6.88 mm in animation. A satisfaction questionnaire revealed that all patients would have repeated the surgery.

Conclusion: Old age alone should not be exclusion for dynamic reanimation in the patient with facial palsy. If the patient can medically undergo a free tissue transfer for dynamic animation of the face, a one-stage technique with a partial gracilis muscle to the masseter nerve yields excellent excursion and improved facial symmetry.
Introduction:

Military personnel often suffer extensive peripheral nerve damage to the upper extremities due to combat-related injuries. These traumatic injuries often require very complex reconstructions. While the gold standard in peripheral nerve repair remains the autograft, utilizing processed nerve allograft provides an alternative option when there is limited availability of autologous nerve tissue or when complications of a secondary surgical procedure must be avoided. Here we report outcomes of nerve reconstructions after military combat and civilian “combat-like” injuries from a multicenter registry designed to capture data on the use of processed nerve allografts (Avance® Nerve Graft, AxoGen, Inc.).

Methods:

The registry, inclusive of 18 centers with 36 surgeons, was designed to continuously monitor peripheral nerve injury, repair, safety and outcomes data using standardized case report forms entered into a centralized database. From this database, injuries from military institutions and analogous civilian injuries were identified and analyzed. Centers followed their own standard of care for treatment and follow-up. Outcome measures were reviewed and reported. Meaningful recovery was defined by the MRCC scale at S3-S4 for sensory and M3-M5 for motor.

Results:

There were 45 subjects with 50 nerve repairs identified in the database. Sufficient follow-up data was reported for 17 nerve repairs (8 sensory, 6 mixed, and 3 motor) in 16 subjects (15 males and 1 female). There were seven gunshot wounds, five blasts, four crushes, and one blunt trauma.
Concomitant repairs included vascular, tendon, muscle, and bony reconstructions. The average ± standard deviation (minimum, maximum) age for these subjects was 36 ± 14 (18, 55) years. The average gap length was 26 ± 15 (8, 50) mm and the median time waited until repair was 11 days. Quantitative outcomes data was reported on 15 of the 17 repairs. Meaningful recovery was reported in 73% of these complex repairs. There were no reported graft related adverse events.

**Conclusion:**

In this study, processed nerve allografts performed well for this application. Due to their complex nature, outcomes were slightly lower than those seen in the overall RANGER registry, with 73% vs. the 87% reporting meaningful recovery. These outcomes compared favorably to combat related nerve reconstructions reported in the literature for nerve autograft. This registry is currently in open enrollment; additional data provided by participating military institutions will allow for the continued analysis of processed nerve allografts for the reconstruction of peripheral nerve defects after combat related injuries.