motor-sensory feedback loop between human and machine. The Regenerative Peripheral Nerve Interface (RPNI) and Composite-RPNI (C-RPNI) are biologic nerve interfaces designed for stable integration of a prosthetic device with transected peripheral nerves in a residual limb. The former employs a free muscle graft as a neural signal transducer, while the latter incorporates a skin graft combined with the muscle graft to simultaneously transduce efferent nerve signals via muscle, and afferent sensory cues back to the brain. Both RPNIs and C-RPNIs may benefit from electrode arrays able to simultaneously record multiple motor units in order to enhance the degrees of freedom for prosthetic control. In addition, electrode arrays placed on the dermal component of the C-RPNI may be able to individually stimulate dermal sensory organelles, thereby providing a range of sensory modalities to the user. The present work utilized ultrafine carbon fiber electrode arrays to stimulate and record single unit motor and sensory information from skin, muscle and nerve.

**Methods:** 12 rats were randomly assigned to either an RPNI (n=6) or C-RPNI (n=6) surgical group. After a three month convalescent period, animals were anesthetized and Carbon Fiber Micro-electrode Arrays (CFMA) of eighteen 500 μm long electrodes were implanted into the peroneal nerve and muscle graft of the RPNI group, as well as the skin graft for the C-RPNI cohort, for acute single fiber stimulation and recordings. Both RPNIs and CRPNIs were electrophysiologically evaluated ex-vivo by electrically stimulating single carbon fibers with biphasic pulse trains of up to 3 mA within: 1) nerve, 2) muscle, and for the latter, 3) skin, while simultaneously recording signals from: a) muscle, b) nerve, and in the case of CRPNIs c) nerve and skin, or muscle and skin, respectively.

**Results:** Single CFMA electrode stimulation of nerve generated signals in the muscle grafts of RPNIs and CRPNIs of 5.1±1.7 mV amplitude. Alternating EMG signals were noted as the stimulating electrode was varied. Muscle graft stimulation in RPNIs and CRPNIs yielded compound neural signals of 28±10 μVPeak-Peak. Selective skin graft stimulation in CRPNI constructs generated alternating compound neural signals of 65±22 μVPeak-Peak, some of which displayed a shift in conduction velocity.

**Conclusion:** CFMAs incorporated into RPNI and CRPNI constructs are capable of recording from subsets of reinnervated myocytes, and selectively stimulating different skin regions of CRPNI dermal grafts. Results from this study have potential broad implications for the realization of an intuitive, selective, and novel prosthetic interface.

194

**Gpr126 Contributes To The Terminal Schwann Cell Injury Response At The Neuromuscular Junction**

**Albina Jablonka-Shariff, PhD1, Johnny Chuieng-Yi Lu, MD, MS1, Katherine Campbell, BA1, Kelly R. Monk, PhD2, Alison K. Snyder-Warwick, MD1**

1Washington University School of Medicine, St. Louis, MO, USA, 2Vollum Institute, Oregon Health and Science University, Portland, OR, USA.

**Purpose:** Gpr126 is an adhesion G protein-coupled receptor essential for Schwann cell (SC) myelination with important contributions to repair after nerve crush injury. Despite critical functions in myelinating SCs, the role of Gpr126 within non-myelinating terminal Schwann cells (tSCs) at the neuromuscular junction (NMJ), is not known. tSCs have important functions in synaptic maintenance and reinnervation, and after injury tSCs extend cytoplasmic processes to guide regenerating axons to the denervated NMJ. In this study, we evaluate the contributions of Gpr126 to tSCs after nerve injury.

**Methods:** A SC-specific conditional Gpr126 knockout model, DhhCre;Gpr126fl/fl mice, hereafter called cGpr126 mice, underwent spinal accessory nerve transection and primary repair. NMJ structures, NMJ reinnervation, and immune mediators were assessed in the sternomastoid (SM) muscles from both the injured and sham uninjured sides at 1, 3, or 6 weeks following nerve transection and repair with immunostaining and qRT-PCR.

**Results:** Gpr126 is expressed in tSCs. cGpr126 mice display delayed NMJ reinnervation, altered tSC morphology with decreased S100β expression and reduced tSC cytoplasmic process extensions. The immune response promoting reinnervation at the NMJ following nerve injury is also altered with decreased macrophage infiltration, Tnfα, and anomalous cytokine expression compared to NMJs of control mice. In addition, Vegfa expression is decreased in muscle, suggesting that cGpr126 non-cell autonomously modulates angiogenesis after nerve injury.

**Conclusion:** Gpr126 is required for tSC process elongation for successful NMJ reinnervation in the muscle. We also show that Gpr126 deficiency in SCs delays the immune response in
muscle, necessary for reinnervation, after nerve injury. Gpr126 signaling, therefore, is integral not only to myelinating SCs, but also to non-myelinating tSC function at the NMJ. The integral function of Gpr126 in tSCs at the NMJ provides the framework for new therapeutic targets for neuromuscular disease.

**195**

**Efficacy Of Amniotic Membrane Nerve Wraps In A Rat Sciatic Nerve Reverse Autograft Model**

Erin M. Wolfe, BS, Sydney A. Mathis, BS, Natalia de la Oliva Munoz, PhD, Daisy I. Gonzalez, BS, Steven A. Ovadia, MD, Prakash J. Mathew, MD, Damien D. Pearse, PhD, Martin Oudega, PhD, Zubin J. Panthaki

University of Miami Miller School of Medicine, Miami, FL, USA.

**Purpose:** Nerve wraps provide a protective encasement around peripheral nerves following neurorrhaphy. Various types of nerve wraps are available for use in clinical practice. Human amniotic membrane (hAM) is an easily obtainable FDA-approved biomaterial with no donor site morbidity and minimal inflammatory response. hAM nerve wraps provide a neurotrophic effect, containing human mesenchymal stem cells (hMSC) and human amniotic epithelial cells (hAEC) which have multilineage differentiation potential and can synthesize and secrete neurotrophic factors, differentiate into neural phenotypes and enhance Schwann cell proliferation. The purpose of this study was to evaluate the efficacy of hAM nerve wraps in a rat sciatic nerve reverse autograft model.

**Methods:** Lewis rats underwent sciatic nerve injury and repair in which a 10-mm gap was bridged with a reverse autograft combined with either no nerve wrap (control) or hAM nerve wrap. Functional evaluation including the Sciatic Functional Index (SFI) and CatWalk gait analysis was performed at baseline, 4, 8 and 12 weeks. Electrophysiological studies were conducted at 8, 10 and 12 weeks. Gastrocnemius muscle weight ratios and nerve adhesions were evaluated at 12 weeks. Axonal regeneration, perineural fibrosis and muscle atrophy were investigated via histological evaluation and retrograde labeling at 12 weeks.

**Results:** Immunohistochemical analysis demonstrated that hAM-treated animals had significantly higher numbers of axons compared to controls. hAM-treated nerves had significantly less perineural fibrosis and nerve adhesions compared to controls. Analysis of SFI demonstrated significant improvements in the hAM-treated group compared to control groups, and CatWalk analysis demonstrated that hAM treated animals had a higher average mean stand time on the injured limb as well as an improved mean swing time at 8 and 12 weeks; however, these differences were not significant. The ratio of experimental to control gastrocnemius weights was significantly greater in hAM compared to control groups. The normalized CMAP of hAM animals was significantly improved compared to controls at 10 weeks. Retrograde labeling demonstrated that significantly greater numbers of motoneurons were regenerating axons in the hAM group compared to controls.

**Conclusion:** Functional, electrophysiological and histological evaluation demonstrated that hAM nerve wraps improved outcomes compared to controls. Anti-inflammatory and pro-regenerative effects of hAM may result in reduced scarring and improved axonal regeneration and functional recovery, make it a promising biomaterial for clinical applications in peripheral nerve repair.

**196**

**Robotic Assisted Vaginoplasty: A Multi-Disciplinary Technique For Gender Affirmation**

Haripriya Ayyala, MD, Taylor Carlsen, MS, Nitin Patel, MD, Jonathan Keith, MD

Rutgers, Newark, NJ, USA.

**Purpose:** Gender affirmation “bottom” surgery is a critical component in treating gender dysphoria. However, male to female vaginoplasty is associated with many complications including wound dehiscence, stricture development, infection and rectal injury. The authors describe a multidisciplinary robotic-assisted technique to alleviate these complications.

**Methods:** All patients who underwent robot-assisted vaginoplasty by a single reconstructive urologist (N.P.) and plastic surgeon (J.K.) were included. A star-shaped perineal flap was raised from the base of the scrotum extending to the base of the penis to construct the inferior neovaginal introitus. The neoclitoris was constructed from the dorsal glans penis by utilizing an inverted-W incision and raised on a neurovascular pedicle superficial to the investing fascia of the corpora. The penile skin was then degloved. Urethroplasty was performed