nanofat obtained by mechanical emulsification and filtration of decanted microfat, and stromal-vascular fraction isolated by collagenase type 2 digestion of fat. Overall number of surgical procedures was 523. Photography, elastosonography, magnetic resonance imaging and histology were used for results assessment.

RESULTS: Favorable outcome have been achieved in all cases. In the first group complete healing was observed in 98% (43 out of 44 patients). From one to three procedures was performed to get final result. Average healing time depended on size and depth of the wound and ranged from 8 to 14 weeks. Only in one case only VRAM flap was performed due to progressive osteoradionecrosis of the ribs. In the second group decreasing of LENT-SOMA grade was observed in all patients. Density of fibrotic tissues measured with elastosonography decreased from 220–650 kPa to 30–50 kPa. In the third group from 2 to 4 procedures were necessary to restore soft tissue flexibility. As far as density level becomes less than 60 kPa, additional 2–6 fat grafting sessions were performed to attain necessary volume and shape.

CONCLUSION: Late adverse effects of radiation therapy can be successfully prevented and treated with injection of products based on autologous lipoaspirate. This minimally invasive approach demonstrates extremely high efficiency rate and allows to avoid major surgery in most of the cases. As far as treatment of severe chronic radiation wounds may be associated with well-known issues it is seems to be reasonable to apply described techniques for patients with initial signs of late radiation-induced soft tissues damage in order to prevent necrotic complications. Proposed treatment algorithm, that takes into account LENT-SOMA stage, anatomical site and wound bed features, can be helpful for developing an effective management protocol for patients with soft tissue radiolesions.

Local Administration of FK506 with Impregnated Nerve Wraps Accelerates Peripheral Nerve Regeneration

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PURPOSE: Peripheral nerve injuries can be devastating, leading to permanent functional disabilities. Systemic FK506 administration has been shown to hasten recovery and improve functional outcomes after nerve injury repair. However, high systemic levels of FK506 can result in adverse side-effects. Localized administration of FK506 could provide the neuroregenerative benefits of FK506 while avoiding systemic, off-target side-effects. The purpose of this study is to investigate the utility of a novel FK506-impregnated nerve wrap in treating peripheral nerve injuries in a previously validated rat infraorbital nerve transection and repair model.

METHODS: Infraorbital nerve transection surgeries were performed on two groups (n=5 per group) of adult Lewis rats. In both groups, the infraorbital branch of the trigeminal nerve was transected. The transected nerve was then repaired primarily with 10-0 nylon suture with (treatment group) or without (no treatment group) the addition of a Poly(ester urethane) urea (PEUU) wrap impregnated with 20 mg of FK506. To evaluate neuroregeneration, trigeminal ganglion cell recordings, objective sensory testing, directional sensitivity, maximal response, and receptor compositions were analyzed from five rats in each group at four and six weeks postoperatively. Recordings from the trigeminal ganglion in naïve rats were taken for comparison. To assess local FK506 administration, blood and tissue samples (infraorbital nerve, muscle) were analyzed for FK506 concentration using liquid chromatography-mass spectrometry at four and six weeks postoperatively in the treatment group.

RESULTS: Data were analyzed using custom software written in Excel Visual Basic and the Excel add-on statistical package, Analyze-it (Analyze-it Software, LTD). Peri-stimulus time histograms (PSTHs) having 1 ms bins were constructed from spike times of individual single units. Responses to stimulus onsets (ON responses) were calculated during a 20 ms period beginning 1 ms after deflection onset; this epoch captures the initial, transient phase of the whisker evoked response. Rats within the treatment group (FK506 wraps) were found to have increased response magnitude at 4 weeks after implantation in the infraorbital
cut and repair model in comparison to no treatment group (p<.013, Fig. 1). FK506 blood levels at 4 and 6 weeks were nearly undetectable whereas concentration within the tissues of interest, the infraorbital nerve and muscle, was enriched and significantly higher than blood levels (p<0.01).

CONCLUSION: This study investigates the use of an FK506-impregnated PEUU nerve wrap to improve functional recovery following peripheral nerve injury. Sensory testing provides objective data on the effects of these wraps in the treatment of peripheral nerve injuries and the FK wraps appear to accelerate nerve recovery at 4 weeks, with minimal systemic drug exposure. The findings from this study may translate into novel treatment systems and protocols to treat nerve injuries.

Electrical Stimulation As a Conditioning Lesion for Promoting Peripheral Nerve Regeneration

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BACKGROUND: Peripheral nerve regeneration following injury is often incomplete with significant personal and socioeconomic costs. Although it has been well demonstrated that conditioning lesion (a nerve crush delivered prior to injury and repair) markedly accelerates nerve regrowth, it cannot be applied clinically because it is unethical to intentionally injure a healthy nerve. Recently, in a proof of principle study, we showed that conditioning electrical stimulation (CES) of the fibular nerve enhances upregulation of regeneration-associated-genes (RAGs) and axonal growth. However, whether similar beneficial effects can be generalized to other nerves and whether CES can improve functional recovery remain unknown. This knowledge is critical before applying CES for clinical use.

OBJECTIVES: To determine if CES upregulates RAGs, enhances nerve regeneration and improve sensory and motor function in a rat tibial nerve injury model.

METHODS: Sprague Dawley rats were divided based on the type of conditioning to the tibial nerve: i) CES, ii) conditioning crush lesion (CCL), iii) sham-CES controls, and iv) unconditioned controls. Expression of RAGs (GAP43, BDNF, pCREB, GFAP) were analyzed at 3-days post-conditioning (n=3). The length of regeneration was assessed at 7-days (n=6), and physiological and behavioral testing was performed at 7-weeks post-coaptation (n=10).

RESULTS: Similar patterns of RAG upregulation and axonal growth were found in animals conditioned with electrical stimulation and crush compared to controls. Sensory testing (von Frey filaments, intraepidermal nerve fiber density counts), gait analysis (toe spread evaluation, horizontal ladder testing) and gastrocnemius muscle reinnervation (muscle weight, neuromuscular junction analysis) were significantly improved in the CES animals compared to not only the controls, but also the crush-conditioned cohort. Nerve conduction studies shows significantly larger compound muscle action potential amplitude in CES compared to controls.

CONCLUSION: Our data supports that preoperative electrical stimulation delivers a conditioning-like effect in the tibial nerve, with upregulation of RAGs and enhanced axonal outgrowth. Interestingly, CES induced improvements in sensorimotor outcomes beyond those obtained with traditional methods of conditioning. As electrical stimulation has been shown to be safe and well-tolerated by patients, CES is likely a clinically feasible intervention that can potentially improve the sensorimotor recovery of patients with peripheral nerve injury.