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RECONSTRUCTIVE SESSION 1

A Prospective Randomized Controlled Trial of Autologous Fat Grafting for Pedal Fat Pad Atrophy

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INTRODUCTION: Pedal fat pad atrophy is associated with pain, decreased tissue thickness, and elevated foot pressures. To date, no objective studies have investigated the utility of injecting fat into the forefoot to treat this costly and debilitating form of lipoatrophy. We hypothesize that pedal fat grafting can reduce pain, improve function, increase tissue thickness, and decrease pedal pressures.

MATERIALS AND METHODS: A randomized, controlled trial was performed, assessing tissue thickness, pain, and foot pressures after fat grafting to the forefoot. Patients were randomized to receive either fat grafting or conservative management. Ultrasound-assessed tissue thickness, pedobarograph-assessed foot pressures, and the Manchester Foot Pain and Disability Index (MFPDI) were obtained at baseline, 6mo, and 12mo visits. 18 patients (4 Male, 14 Female) comprised the treatment group, and 12 patients (4 Male, 8 Female) comprised the control group.

RESULTS: Average age was 60±8.7 years for the treatment group and 65.3±8.5 for the control. Mean BMI was 26.8±4.7 and 25.6±6.1 in treatment and control groups respectively. 11 patients received bilateral injections with a mean volume of 4.8±0.8mL and 4.7±0.7mL in the right and left feet respectively. Mean follow-up time was 8.7±6.2 months for the treatment group and 13.8±4.2 months for controls (p=0.001). At 1 year, grafted subjects demonstrated improvements in foot function (p=0.022), pain (p=0.022), and work/leisure activities (p=0.021) with a significant increase in tissue thickness over the metatarsal heads (p<0.04) at 6mo but not at 12mo. However, controls experienced significant decreases in average metatarsal tissue thickness over the first 6mo (p<0.05), and in the thickness over the 3rd metatarsal at 12mo (p=0.036), with most of the worsening occurring between the 6mo and 12mo time point (p=0.023). Foot pressures did not decrease after grafting. However, controls experienced increasing left foot pressure (P=0.011). When comparing the groups at 1 year, controls had significantly greater foot pressures and forces than patients receiving fat grafting (p<0.05).

CONCLUSION: Despite decreasing tissue thickness over time, fat grafting for forefoot fat pad atrophy significantly improves pain and disability outcomes and prevents worsening foot forces and pressures. Pedal fat grafting is a safe, minimally invasive approach to treat fat pad atrophy with minimal downtime. Future analysis will reveal whether fat grafting has lasting efficacy.

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Subcutaneous Injection of SVF in Combination with HBOT Improves Viability of Unfavorably Designed Cutaneous Flaps

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INTRODUCTION: Soft tissue reconstruction is inherently complicated by ischemia and reperfusion injury. Efforts to minimize these deleterious effects include meticulous surgical design, minimizing the ischemic period and optimizing
vascularity. Adjunctive measures have included free microvascular transfer, supercharging, caspase inhibitors and free oxygen radical scavengers. In this study, we explored the potential complementary effects of HBOT and stem cell delivery on cutaneous flap survival.

MATERIALS AND METHODS: The potential healing benefits of HBOT preconditioning and stromal vascular fraction (SVF) delivery on flap survival were examined in a guinea pig model. Animal subjects were randomly assigned to one of four study groups: SVF/saline injections followed by HBOT, SVF/saline injections only, HBOT only, or neither HBOT nor injections. In order to enhance clinical relevance, an additional group of animals underwent HBOT prior to SVF/saline injections. Thereafter, an unfavorably designed cutaneous flap was elevated and clinically assessed via study-blinded observer, as well as by quantification of TUNEL-positive cells.

RESULTS: Distal necrosis of the tissue flap was most often observed in the no intervention group (72.8% of the flap, p < 0.001), similar to tissue flaps treated with HBO only (62.9%, p = 0.036) and SVF injections (46.7%, p = 0.013). The most significant difference occurred in the combination HBO and SVF delivery group, where distal necrosis was only visible in 24.6% of the flap (p < 0.05). Most notably, SVF delivery immediately prior to flap elevation further minimized distal necrosis of the flap to 18 percent. These findings were mirrored by the TUNEL assay, indicating the highest percentage of cell death in the no intervention and HBO only groups (p < 0.05).

CONCLUSION: Findings not only indicate that combining HBO treatment and SVF improves flap viability, they also suggest that it may be more appropriate to deliver SVF at the time of tissue elevation, providing a more clinically relevant way to treat these patients.

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