RESULTS: The vascular volume in the VEGF and PDGF-treated group (164 mm³) was significantly higher compared to the control group (88 mm³, p=0.003) and the untreated contralateral sides (36 mm³, p=0.016). The inner cortex showed significantly more bone remodeling in the VEGF and PDGF treated group compared to the control group (Bone Formation Rate: 557 μm³/μm³/jaar versus 403 μm³/μm³/jaar, p=0.013). Compared to the untreated contralateral side the VEGF-group showed no significant difference (Bone Formation Rate: 557 μm³/μm³/jaar versus 80 μm³/μm³/jaar, p=0.109). The Sanderson’s rapid bone stains showed significant higher numbers for osteoblasts in the inner cortex (224) compared to the control group (119, p=0.007), osteoid surface (45mm² versus 26mm², p=0.015) and eroded surface (11mm² versus 5mm², p=0.015), but not for osteoclast number (7 versus 7, p=0.800).

CONCLUSION: Revascularization of cryopreserved segmental tibia through placement of an AV-bundle intramedullary and adding growth factors VEGF and PDGF results in increased neoangiogenesis and bone formation compared to the use of the AV-bundle alone in a Yucatan minipig model.

Primary Lymphedema of the Upper Extremity: Clinical and Lymphoscintigraphic Features in 22 Patients

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BACKGROUND: Primary idiopathic lymphedema is an uncommon condition that typically affects the lower extremity. Patients have a malformed lymphatic system that causes subcutaneous fluid and adipose deposition. Rarely, the disease also has been described in the upper extremity. The purpose of this study was to investigate a cohort of patients with primary arm lymphedema in order to better understand the disease.

METHODS: Patients evaluated in our Lymphedema Program between 2008 and 2017 were reviewed for individuals with upper extremity primary lymphedema. Sex, age of onset, morbidity, associated features, and management were identified. Transit of radiolabeled tracer and dermal backflow on lymphoscintigraphy were recorded.

RESULTS: Twenty-two patients out of 233 with primary lymphedema had upper extremity disease (9.4%). Eleven subjects were male. Age of onset was infancy (n=14), adolescence (n=5), or adulthood (n=3). The disease affected the left arm (n=11), right arm (n=8), or both upper extremities (n=3). Lymphoscintigraphy in 14 patients exhibited delayed transit of tracer and 2 illustrated dermal backflow. One-half of individuals also had primary lower extremity lymphedema (5 unilateral, 6 bilateral). None of the patients in the cohort exhibited a family history of lymphedema. Two individuals had Turner syndrome. Morbidity included: infection (n=5), systemic lymphatic anomalies (n=5), and lymphangiosarcoma (n=1).

CONCLUSION: The upper extremity is a rare location for primary lymphedema and patients often also have lymphedema of the legs. Compared to the lower extremity, primary disease of the arm is more likely to be associated with systemic lymphatic dysfunction and have a lower risk of familial transmission.

Vascularized Lymph Node Transfer to the Ankle Improves Outcomes in Lower Limb Lymphedema Treatment Compared to Inset at the Knee

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INTRODUCTION: Lower limb lymphedema is a debilitating condition conferring lifelong morbidity to patients. The mechanism of action of vascularized lymph node transfer is a principally by the pumping mechanism, which itself is dependent on the catchment of lymph under the effect of gravity.

This study evaluated whether distal placement of vascularized lymphatic flaps for lower limb lymphedema, at the
ankle, maximising the lymphatic pump mechanism, was superior to placement at the knee.

**MATERIALS AND METHODS:** 43 patients were enrolled in the study with lymphedema Cheng’s grade 2–4. Vascularized submental lymph node flaps were implanted at the knee or ankle respectively. Patients were analysed for grade of lymphedema, numbers of episodes of cellulitis and measurements of limb circumference.

**RESULTS:** The proximal leg was used in 12 cases and the distal leg in 31 cases. There was no difference in patient demographics between the two groups. At three months the circumferential reduction rate was improved at the below knee and above ankle level in the distal placement group (p=0.01 and p=0.01), but improved in the proximal leg in the proximal placement group (p=0.01). At one year postoperatively there was equal improvement in the above knee region (p=0.04) but there was significantly higher improvement in the distally placed group in the below knee, above ankle, and overall measurements (p=0.01, p=0.01, p=0.01 respectively). Lymphedema grade was improved in both groups but significantly more in the distally placed group. Episodes of cellulitis were reduced globally.

**CONCLUSION:** Distal placement of vascularized lymph node transfer gives a long term overall improvement in treatment of lower limb lymphedema. The dependant position increases the pump / catchment effect.

**Lymphedema Microsurgery Improved the Outcomes of Congenital Limb Lymphedema**

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**INTRODUCTION:** Congenital lymphedema is a rare disease (1 in 100,000 individuals) that causes discomfort, functional impairment, recurrent infections, and psychosocial maladjustment. Complex decongestive physiotherapy provides certain benefit. Physiological lymphedema microsurgeries include lymphovenous anastomosis (LVA) for patients with short symptom duration and partial lymphatic obstruction and vascularized lymph node transfer (VLNT) for patients with prolonged symptoms and total lymphatic obstruction. This study investigates the outcome of microsurgical procedures for congenital lymphedema.

**METHODS:** Nine pediatric patients (7 females, 77.8%), with a mean age of 9.2±5.9 years (ranged, 2-18 years), underwent surgical intervention for congenital lymphedema between 2013 and 2017. Preoperative assessments included measurements of limb circumference (to measure treatment effectiveness), Tc-99 lymphoscintigraphy (to assess lymphedema severity), sonography (to rule out proximal venous insufficiency and assess donor site lymph node quantity), Magnetic resonance (MR) lymphography (to rule out vascular lesions), MR angiography (to ascertain donor site vessel course and lymph nodes), and any other physical conditions (e.g., cellulitis). After surgical treatment, they received regular follow-up assessments including episodes of cellulitis, limb circumference measurement and ultrasound Doppler for the patency of pedicle and number of transferred lymph nodes. The Wilcoxon signed-rank and Spearman’s rank correlation tests were performed for statistical analyses.

**RESULTS:** A total of 13 lymphedematous limbs (11 lower limbs and 2 upper limbs) underwent surgical treatment (10 submental VLNT, 2 LVA, 1 omental VLNT). Cheng’s Lymphedema Grading ranged from 0 to 4 (2.6±1.6). The VLNT flap success rate was 100%, and the two LVA were patent. At a follow-up of 32.2±15.2 months, mean body weight was increased 6.9±3.7 kg, from 38.7±21.7 kg (range 12 to 71 kg) preoperatively to 42.8±17.3 kg (range 18 to 71 kg). The limb circumference was reduced by 0.9±4.0 cm for AK/AE (range: -3.5 to 8.5 cm, p=0.5), 1.2±4.8 cm for BK/BE (range: -3.5 to 9.5 cm, p=0.7) and 4.9±6.5 cm for AA (ranged -1.5 to 16.5, p<0.05) without wearing compression garments. Among 9 limbs with cellulitis preoperatively, the frequency of cellulitis decreased from 2.3±2.1 times/year preoperatively to 0.5±0.5 times/year postoperatively (p<0.05), and showed moderate positive correlation to preoperative Cheng’s Lymphedema Grading (p=0.503, p=0.2).

**CONCLUSION:** Pediatric patients with congenital limb lymphedema may have reduced limb circumference and decreased episodes of cellulitis without wearing compression garments from the approaches of LVA and VLNT.