of proximal lymph nodes, linear lymphatic ducts, and dermal backflow. Clinical severity of extremity lymphedema was determined using a 5-grade Lymphedema Grading System based on the circumferential difference between the lymphedematous limb and the healthy limb. Relationship between lymphedema severity and lymphoscintigraphy staging was determined using Spearman Correlation coefficient.

RESULTS: We present the largest series in the world of 285 patients with unilateral extremity lymphedema who underwent complex decongestive therapy and lymphedema microsurgery. Patients were divided as follows: 3.9% with normal drainage, 44.9% with partial obstruction, and 51.2% with total obstruction.

High inter-observer (average ICC: 0.93) and intra-observer reliability (ICC=0.75–0.91) of the Lymphoscintigraphy Staging system was found. The Lymphoscintigraphy Staging system showed substantial correlation with objective clinical findings such as circumferential difference (upper extremity $r=0.79$, lower extremity $r=0.75$), CT volumetric difference (upper extremity $r=0.62$, lower extremity $r=0.70$), and Lymphedema Grading System (ICC upper extremity=0.81, lower extremity= 0.77). Patients with total obstruction of the lymphatics should be treated with vascularized lymph node transfer, whereas those with partial obstruction can be managed with lymphovenous bypass.

CONCLUSION: The new Lymphoscintigraphy Staging system is a reliable and comprehensive tool for the assessment of lymphatic obstruction. For refractory extremity lymphedema, the Lymphoscintigraphy Staging system should be applied to guide appropriate treatment options.

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Reverse Axillary Mapping and Lymphaticovenous Bypass for Lymphedema Prevention in Breast Cancer: Optimizing Lymphatic Visualization and Restoration of Flow

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Lymphedema (LA) following breast cancer treatment is a critical and underappreciated problem with long-term health, functional, aesthetic and economic implications. Growing interest in LA prevention has motivated protective strategies. Our aim was to develop a novel intraoperative paradigm for breast cancer patients undergoing axillary lymphadenectomy(ALND) that protects against iatrogenic LA through enhanced lymphatic visualization during reverse axial mapping (ARM), and refinement in microsurgical decision making during lymphaticovenous bypass (LVB).

METHODS: All patients with planned ARM+LVB from October 2016-February 2018 were reviewed. Patient demographics and oncologic history were recorded. Operative details were noted including post-ALND lymphatic anatomy, availability of recipient veins with competent valves and technical microanastomotic details. Ability to achieve patency of lymphaticovenous bypass was documented by blue dye and ICG lymphangiography.

RESULTS: Thirty patients underwent ARM+LVB. 26 underwent modified radical mastectomy, 4 underwent lumpectomy with ALND, 15 underwent implant-based breast reconstruction. LVB operative time ranged from 40 – 150 min. 1–3 LVB were performed per patient. Bypass completion occurred in 29/30 patients and patency with ICG lymphangiography and blue dye was confirmed in
Two anastomoses were felt to be insufficient due to venous backflow into the lymphatic vessel. When size match was equivalent, end to end anastomoses were performed. If size mismatch between the chosen vein branch and lymphatic was present, or multiple cut lymphatics were in proximity and had sufficient mobility, an invagination technique was used to maximally restore anterograde lymphatic drainage. Short term follow-up has revealed no instances of transient or progressive lymphedema.

**CONCLUSION:** We have developed an intraoperative paradigm that accounts for post-ALND lymphatic and venous anatomy. By combining radioisotope free axillary reverse mapping under loupe magnification and lymphaticovenous bypass, we maximally preserve lymphatic continuity and reestablish physiologic upper extremity lymphatic drainage pathways.

**CT Volumetric Assessment Correlates Strongly with Circumferential Measurement in Patients with Lymphedema and Vascularized Lymph Node Transfers**

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**BACKGROUND:** Circumferential measurement of lymphedematous limbs at designated anatomic distances has been the primary mode for measuring lymphedematous extremities. However, this approach has been criticized for not being an accurate assessment of the volume of the affected limbs. CT imaging produces accurate, consistent, and hygienic measurements of volume and is a direct representation of the limb. Thus, CT imaging is an excellent standard for comparing other measurement methods. This study aims to compare circumferential measurements to volumetric studies using CT imaging and to assess their correlation.

**METHODS:** Patients with lymphedema who had vascularized lymph node transfers from January 2013 to May 2016 were assessed. CT and circumferential methods were compared using the same standardized position points and the same anatomical landmarks. Cost analysis of the two modalities was performed.

**RESULTS:** Seventy-six patients were evaluated. Their CT volume measurements significantly correlated with their respective circumferential measurement differentials and were found to have the same Pearson correlation coefficient of \( r = +0.7 \), which was statistically significant (\( p = 0.03 \)), indicating a strong positive correlation between the circumferential measurement differentials and the actual limb volume changes as determined by CT imaging. Circumferential measurement differentials are more cost effective than CT volume assessments and provide an accurate measurement of clinical improvement after treatment.

**CONCLUSION:** Standardized circumferential limb measurement differentials that are currently used are comparable to unbiased CT volumetric measurements and can be used as a reliable, reproducible, minimally invasive, low cost, and accurate method of measuring the lymphedematous limbs.

**Assessing the Successful Implementation of the Surgical Management and Reconstructive Training (SMART) Course in Nepal: Competency Test Data from Two Consecutive Years**

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**INTRODUCTION:** In low and middle-income countries (LMICs), lack of access to specialists hinders management of the severe soft-tissue injuries that accompany many fractures. Patients with such injuries then develop chronic osteomyelitis, resulting eventually in amputation. The SMART course addresses the scarcity of specialists in LMICs by teaching orthopaedic surgeons muscle...