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**PURPOSE:** Gustilo type IIIC open tibia fractures are characterized by an ischemic limb requiring immediate arterial repair. Despite recent advances in microvascular reconstruction, these patients are at high risk of complications and the decision between primary amputation and limb salvage can be challenging for plastic surgeons. The purpose of this study is to evaluate our experience with Gustilo type IIIC patients who have underwent reconstruction with a free tissue transfer.

**METHODS:** We retrospectively reviewed an institutional database of all patients who underwent free tissue transfers. Patients with Gustilo type III open tibia fractures that underwent reconstruction with free flap coverage were included in this study. The following information was collected: patient demographics and comorbidities, operative details including flap type and anastomosis details, extent of arterial injury as determined by preoperative angiography and/or intraoperative findings, perioperative complications, and flap outcome (e.g., partial or total failure, take-backs, and salvage rates). To elucidate the difference in outcomes based on the extent arterial injury, we specifically compared the outcomes of Gustilo type IIIC patients and Gustilo type IIIB patients with 1 patent vessel.

**RESULTS:** Thirty-two patients with Gustilo type IIIC injuries underwent reconstruction with free tissue transfers. The average patient age was 32.6 ± 18 years old, with the majority being male (28, 87.5%). The mechanism of injury was traumatic in all patients. More than one-third of patients received flap coverage within one week of injury. The majority of cases were reconstructed with myocutaneous flaps (24, 75%). The two most commonly used muscle flaps were latissimus dorsi (13, 40.6%) and rectus abdominis (9, 28.1%). The remaining two patients were reconstructed with tensor fascia lata and gracilis muscle flaps. Twenty-five percent of patients were reconstructed with fasciocutaneous flaps with the most common being the parascapular flap (4, 12.5%).

The rate of major perioperative complications in the Gustilo type IIIC patients and Gustilo type IIIB patients with one patent vessel was 31.3% and 38.5%, respectively (p= 0.527). Three patients (9.4%) and 5 (15.6%) patients suffered partial and total flap loss, respectively in the Gustilo type IIIC cohort. This was not significantly different than the rates of partial and total flap loss (p=0.209 and p=0.596) in the Gustilo IIIB patients with one patent vessel, which were 12.8% and 20.5%, respectively. In the Gustilo type IIIC group, seven (21.9%) patients were taken back to the operating room and the salvage rate was 28.6% (2/7). The take-back rate in the Gustilo type IIIB group with one patent vessel was 25.6% and salvage rate was 20%. The take-back (p= 0.711) and salvage rates (p= 0.682) between these two groups were not statistically significant.

**CONCLUSION:** The perioperative complications and flap outcome rates for patients with ischemic limb injuries who underwent free tissue transfer is comparable to those of patients with continuous flow via one patent vessel. Patients who have suffered Gustilo type IIIC open tibia fractures should be considered candidates for limb salvage.

**A New Lymphoscintigraphy Staging for Unilateral Extremity Lymphedema: Validation and Correlation between Nuclear Images and Clinical Findings**

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**BACKGROUND:** Approximately 200 million people worldwide suffer from lymphedema.1 Appropriate diagnosis and staging are fundamental for the management of patients with extremity lymphedema.2,3 Lymphoscintigraphy has long been considered the imaging modality of choice for the diagnosis of lymphatic disorders.4,5 The purpose of this study was to validate the new Lymphoscintigraphy Staging system for unilateral extremity lymphedema based on a precision medicine concept and to investigate the correlation between the lymphoscintigraphy findings and objective clinical findings.

**METHODS:** A review of a prospective database was performed for patients with suspected lymphedema who had undergone lymphoscintigraphy for diagnosis and assessment of lymphedema. Patients with unilateral extremity lymphedema were included. Lymphoscintigraphy images were divided into three types: normal drainage, partial obstruction, and total obstruction based on the visualization
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 axillary 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...