Lymphedema and Lymphatic Surgery: An Overview

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The Ohio State University
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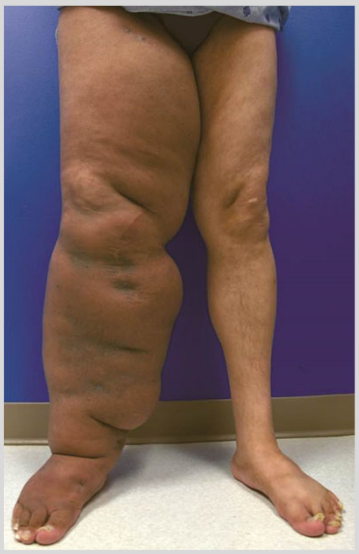
No Disclosures

What is lymphedema?

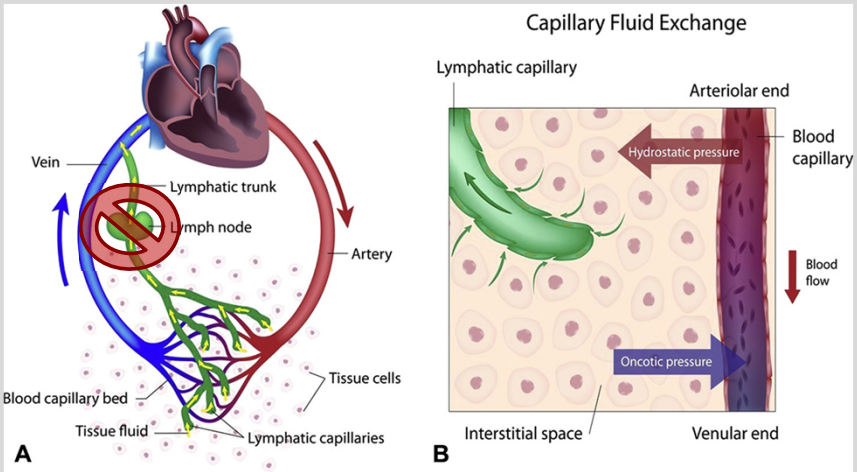
Lymphedema

- Physically, functionally & psychologically debilitating
  - Heavy, swelling
  - Deforming
  - Painful
  - Infection
- Life-long, chronic disability, financial cost



Background

- Lymphedema is a chronic, debilitating condition that affects about 250 million people worldwide.



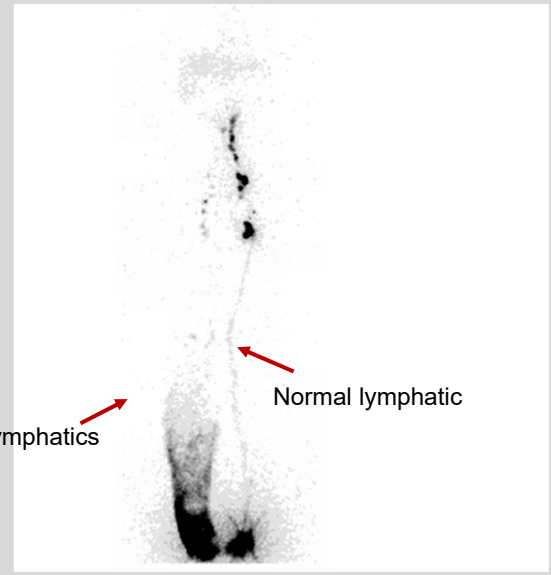
Lymphedema: Pathophysiology and clinical manifestations. Grada A, Phillips T. Journal of the American Academy of Dermatology. Volume 77, Issue 6, December 2017, Pages 1009-1020

Types of lymphedema

- Primary lymphedema
  - Born with no or abnormal lymphatic system
  - Frequently symptomatic during teenage years

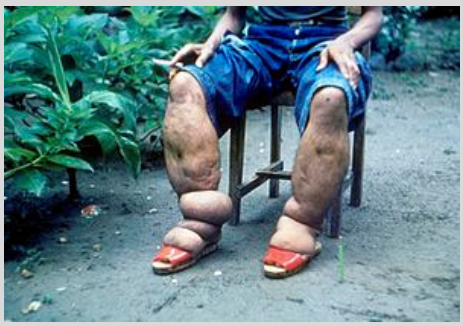
- Secondary lymphedema
  - The most common
  - Normal lymphatic system has been disrupted
    - Cancer treatment (lymph node removal, chemotherapy, radiation therapy, Trauma, Infection etc.

Primary lymphedema

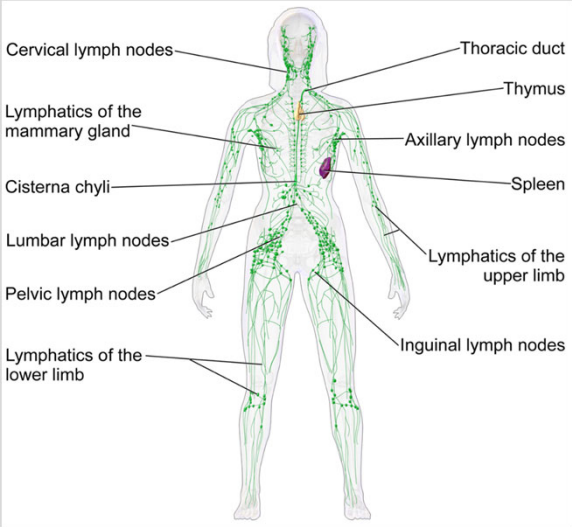


Secondary lymphedema

- The most common cause of lymphedema is lymphatic filiaris (LF) – roundworm, which affects 120 million people and is mostly limited to tropical countries.



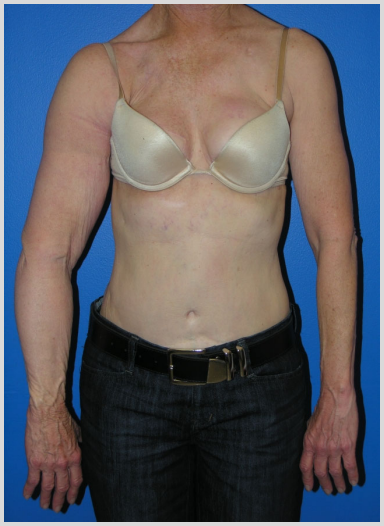
Secondary lymphedema – cancer related



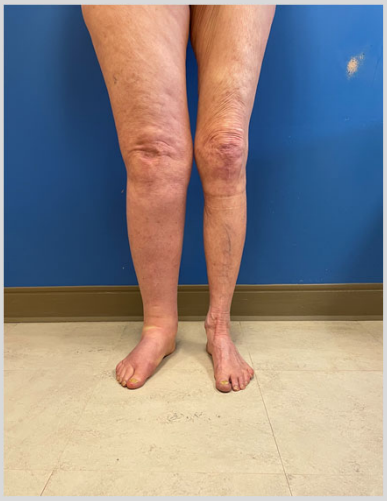
- 40-70% (breast/melanoma) will develop lymphedema after lymph node dissection

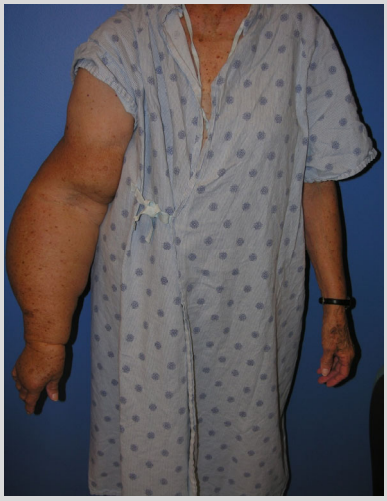
Lymphedema

- United States
  - Highest number in breast cancer patients
  - ALND & XRT
    - ~10%-40%
  - SLND
    - ~5-10%
  - ~ 1:4-5 patients treated for breast cancer will develop arm lymphedema



Patients with secondary lymphedema





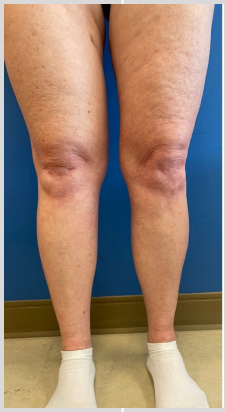
Cost of lymphedema

- Lymphedema increases treatment costs by ~$10,000 per year per patient
  - Functional impairment
  - Susceptible to infection
  - Negative psychosocial impact
- Managing “lymphedema is worse than having cancer” due to “perpetual discomfort”

How to stage lymphedema?

The International Society of Lymphology Staging

Stage 0 – subclinical - patients' self-reported symptoms are accurate indicators of early lymphedema. May be detected with bioimpedance and perometry.
Stage 1 – Pitting edema that subsides with elevation of the affected part
Stage 2 – Pitting edema that may improve, but does not resolve, with elevation. In later stages fibrosis develops.
Stage 3 – The tissue in this stage becomes harder (more fibrotic) and pitting is absent. Swelling may lead to extreme volume excess. Skin changes may be present such as thickening, hyper-pigmentation, increased (deepened) skin folds, fat deposits and warty overgrowths. Elephantiasis



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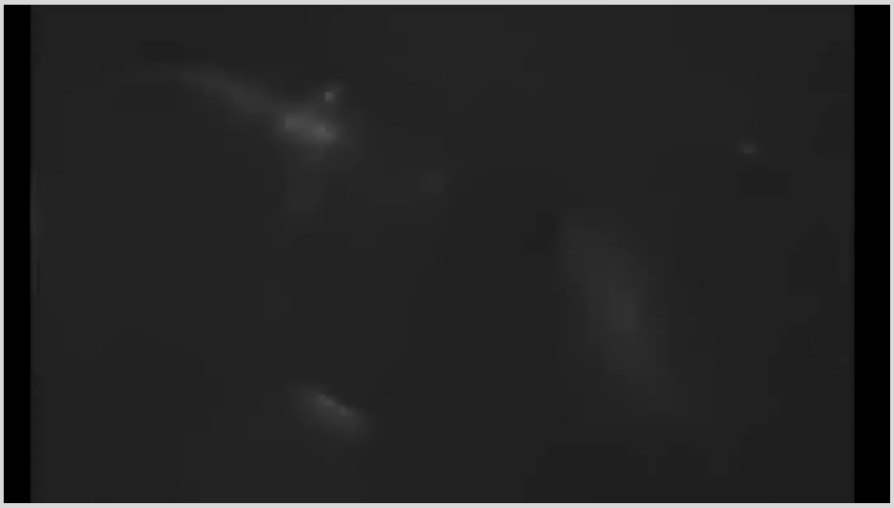
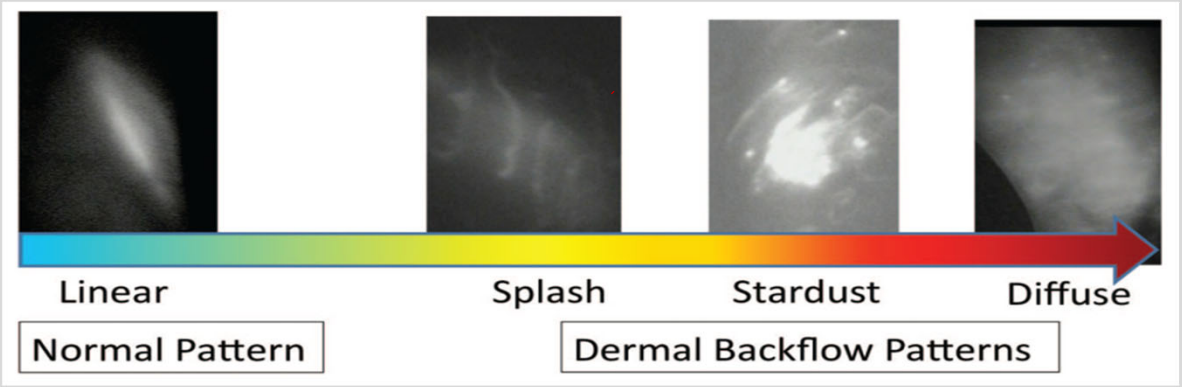
Video - ICG (Indocyanine Green) Lymphography



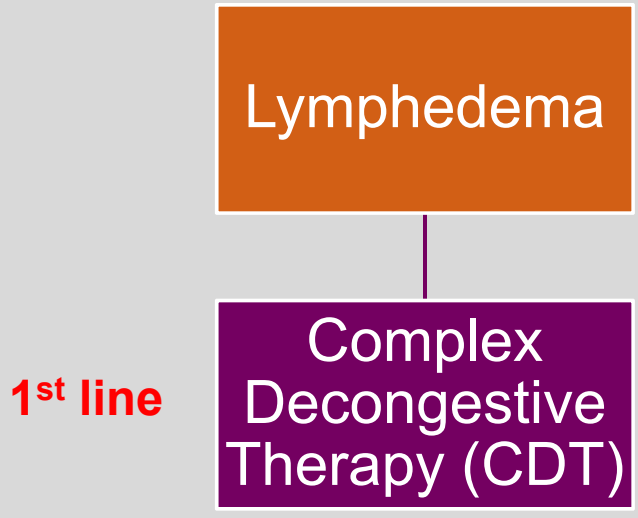
Staging According to Dermal Backflow Patterns



Early Diagnosis and Risk Factors for Lymphedema following Lymph Node Dissection for Gynecologic Cancer. Akita, Mitsukawa, Rikihisa, Kubota, Omori, Mitsuhashi, Tate, Shozu, Satoh. PRS Feb 2013

How to treat lymphedema?

Treatment Options



Complex decongestive therapy

Lymphcare.com

TREATMENT OPTIONS FOR PATIENTS WHO DO NOT IMPROVE WITH CDT

Surgical lymphedema treatment is considered, if:

The patient and the lymphedema therapist are dissatisfied with the result achieved with CDT alone after at least 3 months of compliant therapy during which the patient has plateaued or worsened

Surgical Treatment Options

Lymphedema

ISL Stage 0

Stage 0

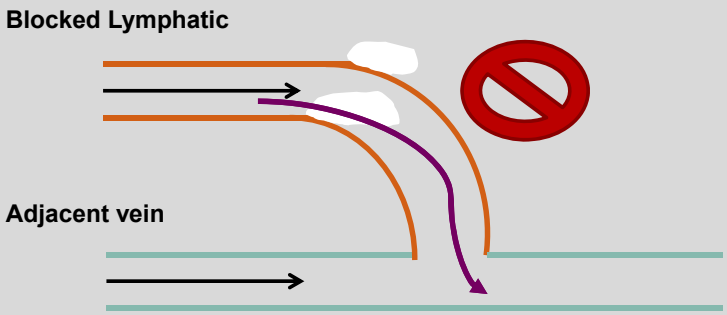
- Pre-clinical
  - Certified lymphedema therapist referral for teaching and possibly compression for high risk activity
  - Consider ICG lymphogram for staging and LVB if Stardust or diffuse pattern
  - Close surveillance for signs of progressive lymphedema
  - Consider annual ICG lymphograms for surveillance

ISL Stage 1

Stage 1

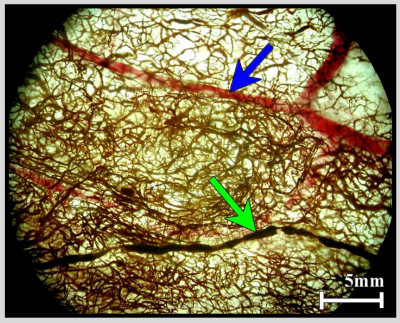
- Early lymphedema – reversible with elevation
  - Candidate for LVB on ICG lymphogram
    - Lymphovenous bypass (LVB)

Lymphovenous Bypass



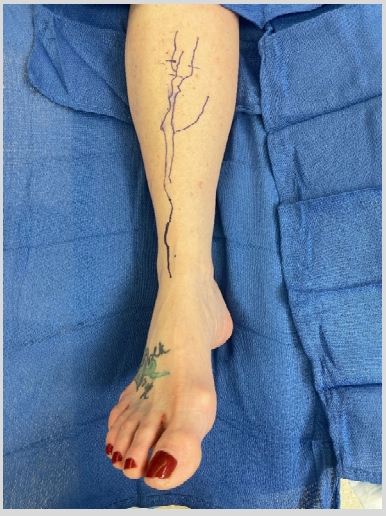
Isao Koshima, Kiichi Inagawa,
Katsuyuki Urushibara,
and Takahiko Moriguchi

SUPERMICROSURGICAL LYMPHATICOVENULAR ANASTOMOSIS FOR THE TREATMENT OF LYMPHEDEMA IN THE UPPER EXTREMITIES



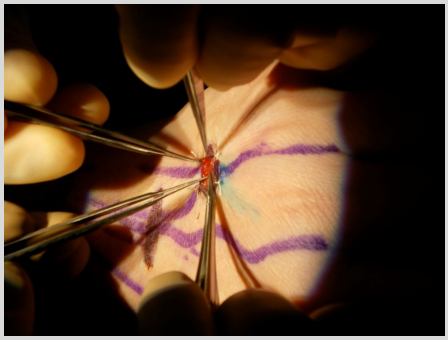
- Subdermal lymphatics to subdermal venules
- "super-microsurgery"
  - < 0.8 mm

Lymphatic mapping



- Lymphatic mapping with ICG angiography
- Identify areas of dermal reflux and available lymphatic channels
- **"Roadmap for LVB"**

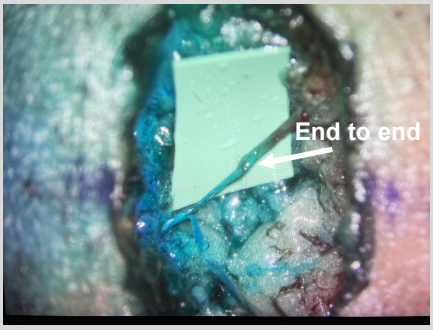
Lymphovenous bypass

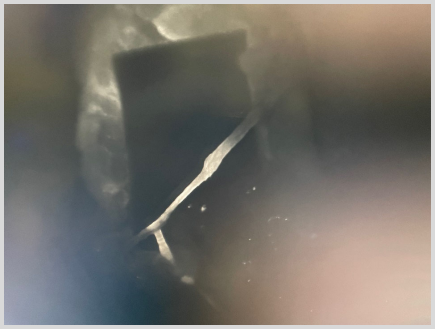


- Supermicrosurgery
- Specialized microscope

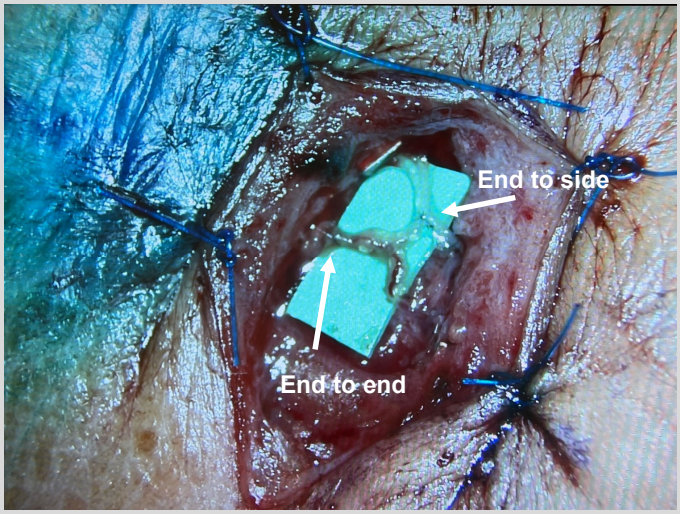
- Incision length: 2-3 cm
- 11-0 or 12-0 nylon, 50μ needle

Types of lymphovenous bypass





Types of lymphovenous bypass



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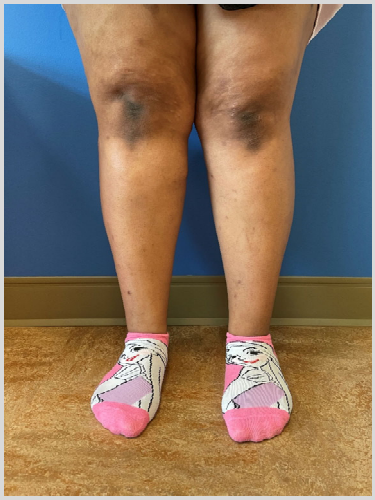
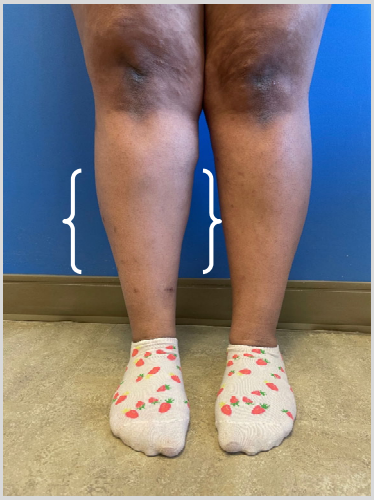
MDACC Stage 1 Pre/Post Op





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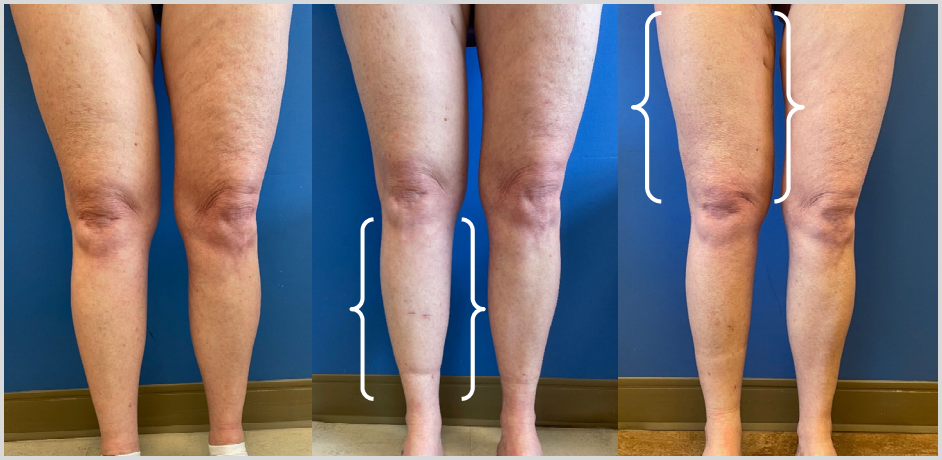
MDACC Stage 2 Pre/Post Op



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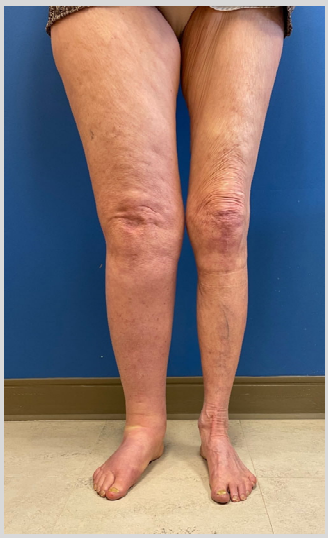
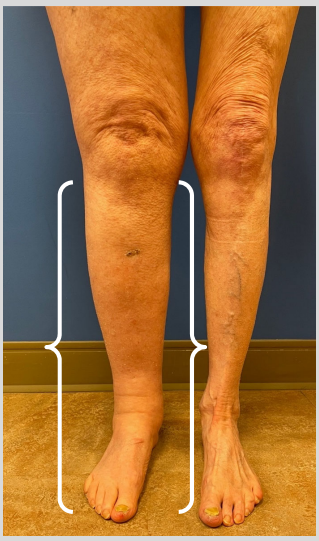
MDACC Stage 3 Pre/Post Op





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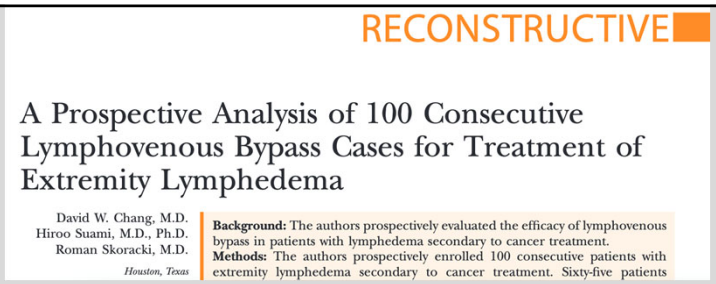


RECONSTRUCTIVE

A Prospective Analysis of 100 Consecutive Lymphovenous Bypass Cases for Treatment of Extremity Lymphedema

David W. Chang, M.D.
Hiroo Suami, M.D., Ph.D.
Roman Skoracki, M.D.
Houston, Texas

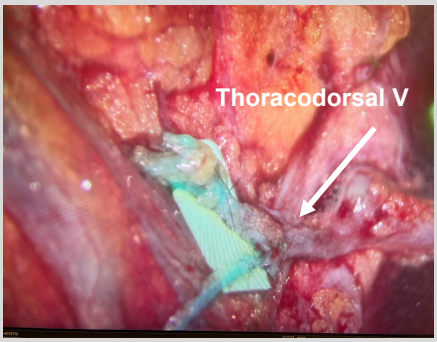
Background: The authors prospectively evaluated the efficacy of lymphovenous bypass in patients with lymphedema secondary to cancer treatment.
Methods: The authors prospectively enrolled 100 consecutive patients with extremity lymphedema secondary to cancer treatment. Sixty-five patients

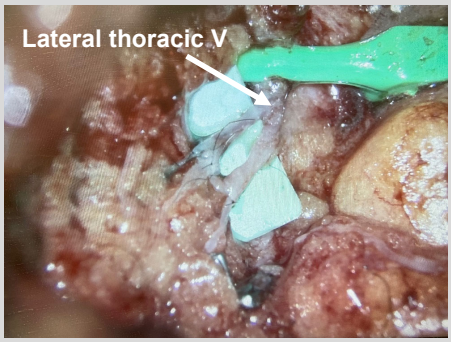
- 96 % symptomatic improvement
- 74 % with quantitative improvement
  - Upper Extremity mean volume differential reduction was 42 % at 12 months
    - Stage 1 & 2 – 61%
    - Stage 3 & 4 - 17%

Prophylactic lymphovenous bypass

- For patients who will have complete lymph node basin resection in high-risk patient (anticipated or delivered radiation therapy and chemotherapy)
- **Prophylactic LVB or Immediate Lymphatic Reconstruction is offered**

Prophylactic LVB





LYMPHATIC MICROSURGICAL PREVENTING HEALING APPROACH (LYMPHA) FOR PRIMARY SURGICAL PREVENTION OF BREAST CANCER-RELATED LYMPHEDEMA: OVER 4 YEARS FOLLOW-UP

FRANCESCO BOCCARDO M.D., Ph.D.,[1]* FEDERICO CASABONA M.D.,[2] FRANCO DeCIAN M.D.,[3] DANIELE FRIEDMAN M.D.,[4] FEDERICA MURELLI M.D.,[4] MARIA PUGLISI M.D.,[4] CORRADO C. CAMPISI M.D.,[5] LIDIA MOLINARI M.D.,[1] STEFANO SPINACI M.D.,[1] SARA DESSALVI M.D.,[1] and CORRADINO CAMPISI M.D., Ph.D., F.A.C.S.[1]

- 74 patients
  - 47% had radiation
  - 96% of patients with no signs of lymphedema
  - 4% of patients developed lymphedema 8-12 months after surgery

Ann Surg Oncol (2016) 23:3558–3563
DOI 10.1245/s10434-016-5282-4

Annals of SURGICAL ONCOLOGY
OFFICIAL JOURNAL OF THE SOCIETY OF SURGICAL ONCOLOGY

CrossMark

ORIGINAL ARTICLE – MELANOMAS

LYMPHA Technique to Prevent Secondary Lower Limb Lymphedema

Francesco Boccardo, MD, PhD[1], Mario Valenzano, MD[2], Sergio Costantini, MD[2], Federico Casabona, MD[2], Matteo Morotti, MD[2], Paolo Sala, MD[2], Franco De Cian, MD[3], Lidia Molinari, MD[1], Stefano Spinaci, MD[1], Sara Dessalvi, MD[1], Corrado Cesare Campisi, MD[1], Giuseppe Villa, MD[4], and Corradino Campisi, MD, FACS[1]

- 11 vulvar cancer and 16 melanoma of the trunk - inguinofemoral lymphadenectomy
  - No lymphocele or infectious complications
  - Transient edema in one melanoma patient
  - Lymphedema in one patient (9 %) with vulvar cancer.

ISL Stage 2

Stage 2

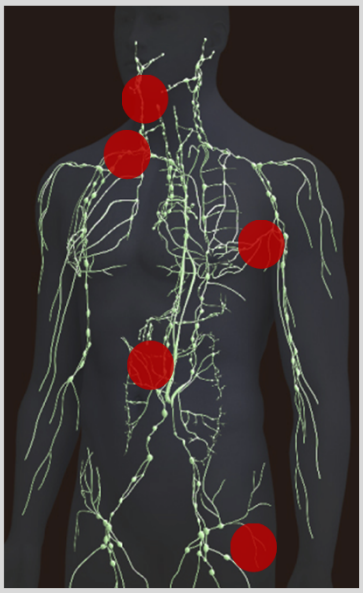
- Lymphedema that does not resolve with elevation alone

Pitting Edema

Non-Pitting Edema

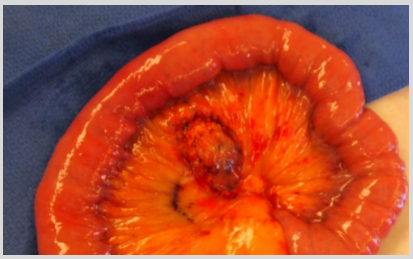
Types of Vascularized Lymph Node Transfer

- Groin
- Axilla
- Supraclavicular
- Submental
- Omental
- Jejunal mesenteric



Jejunal Mesenteric Lymph Node Transfer

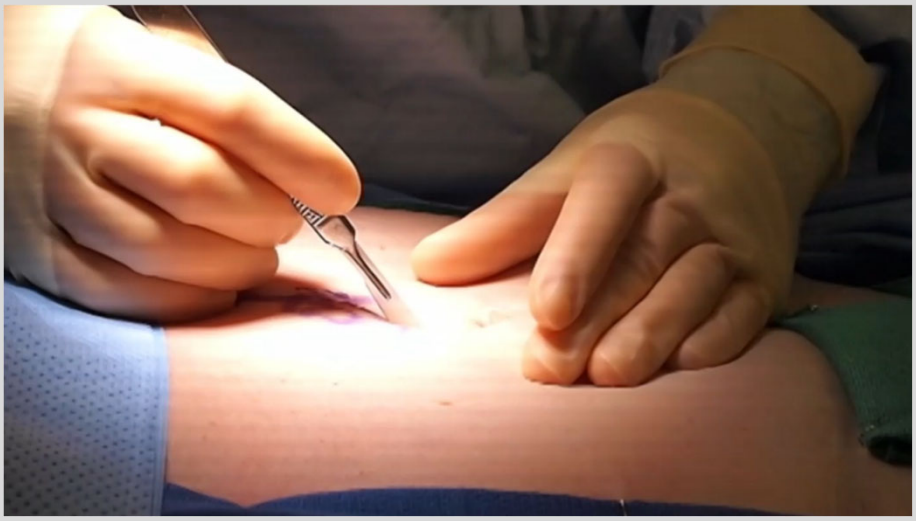
- Advantages
  - Multiple flaps of 3-5 nodes can be harvested
  - Small size (4x3x2cm) ideal for distal placement of nodes
  - Avoid iatrogenic donor site lymphedema
- Disadvantages
  - No skin island
  - Require laparotomy



Pre-operative Considerations

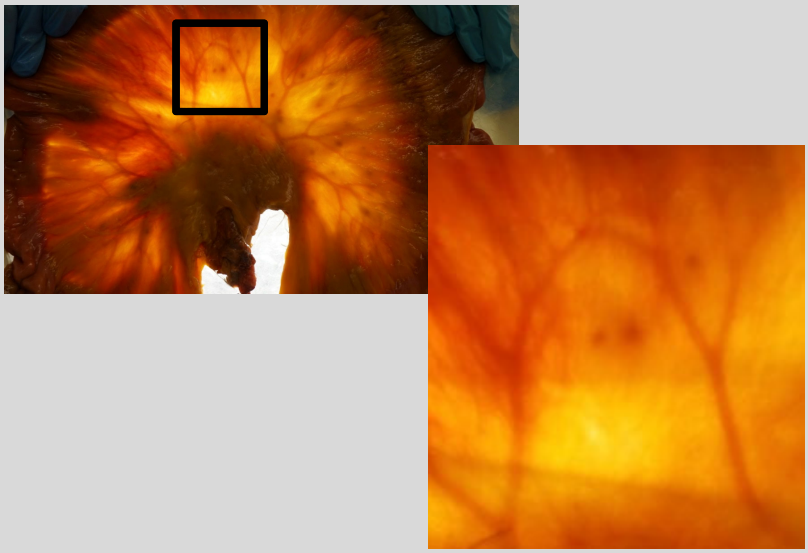
- Relative contraindications
  - History of multiple previous open laparotomies
  - Intra-abdominal radiation
  - Ventral hernia repair
- Absolute contraindication
  - Multiple hernia repairs
  - Previous adhesive bowel obstruction

Video - Surgical Approach



*Courtesy of Dr. Roman Skoracki

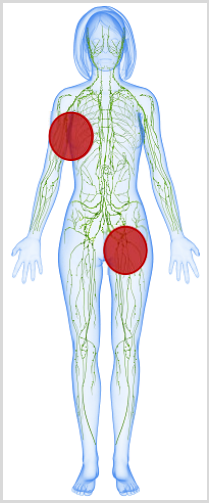
Peripheral Mesenteric Node VLNT



Distal vs. Proximal VLNT Placement

Proximal

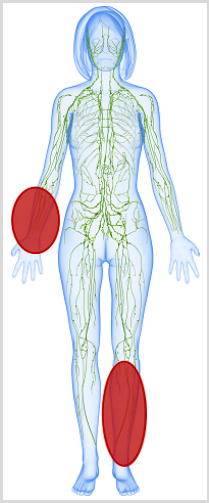
- Release of scar with placement of healthy well vascularized tissue
  - Release of potential venous compression from scar with soft tissue fill



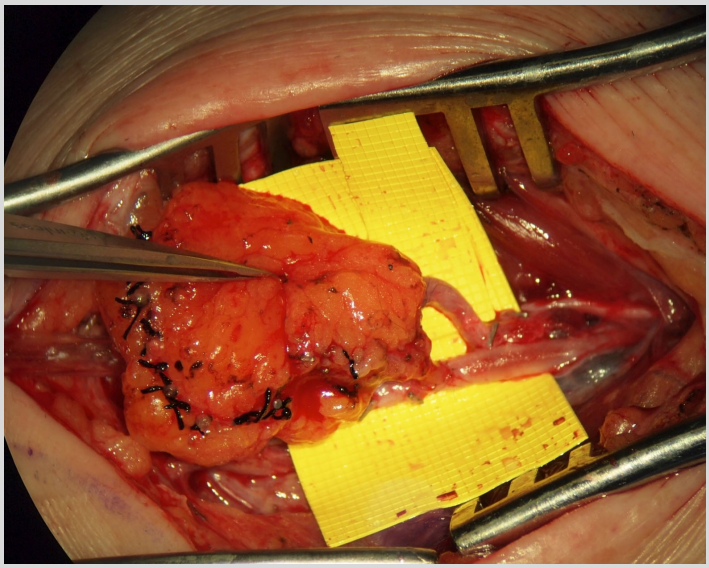
Distal vs. Proximal VLNT Placement

Distal

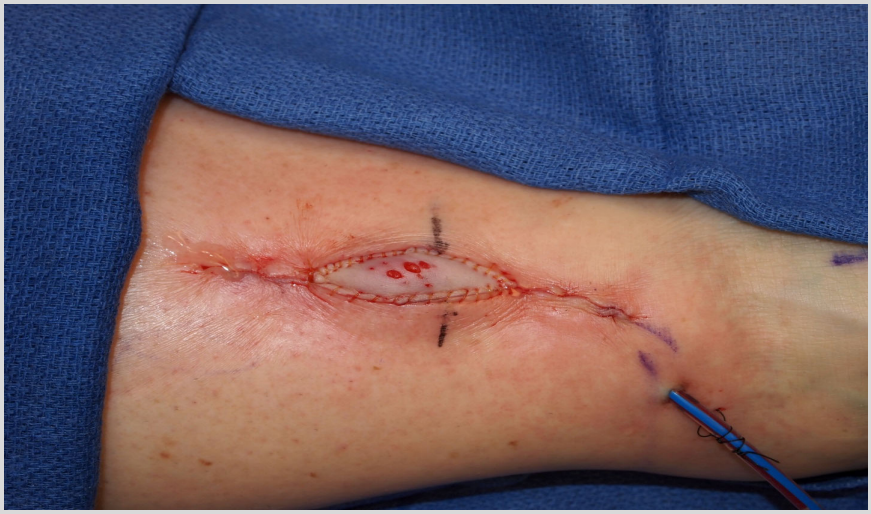
- Site of greatest fluid accumulation / most dependent
- Greatest volume reduction, especially early



Flap Revascularized

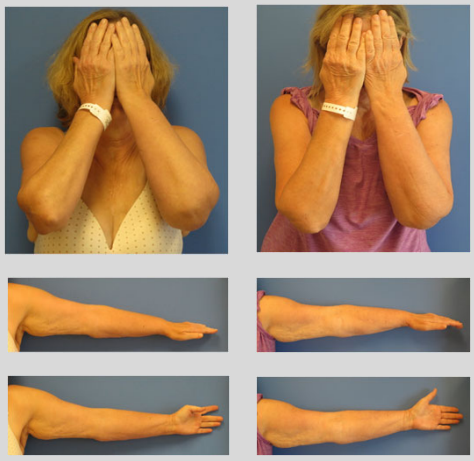


Flap Inset and Skin Graft



Mesenteric VLNT Outcome

Pre-op	
Middle finger left	6.4
Palmer crease left	19.6
Wrist left	19.6
Forearm left	27.6
Elbow left	28
Mid-upper arm left	32.8
Axilla left	36.6



8 months	
Middle finger left	6.4
Palmer crease left	19
Wrist left	17.4
Forearm left	26
Elbow left	27
Mid-upper arm left	30
Axilla left	35

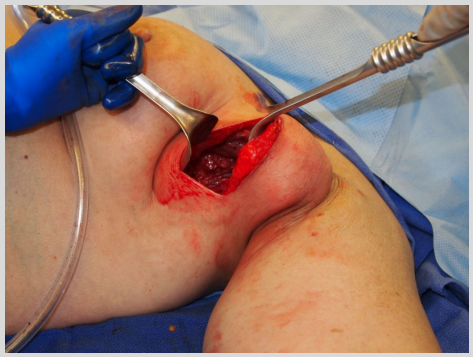
Patient describes extremity as much softer and wears compression only occasionally

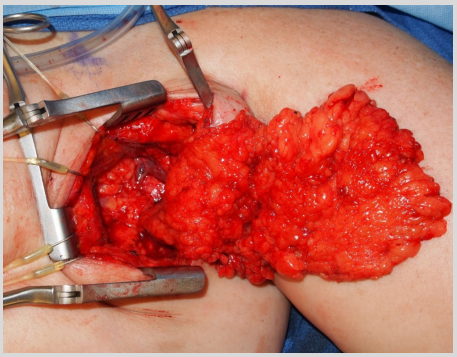
Postoperative Considerations

- Admitted for free flap monitoring
- Diet is advanced from clears as tolerated

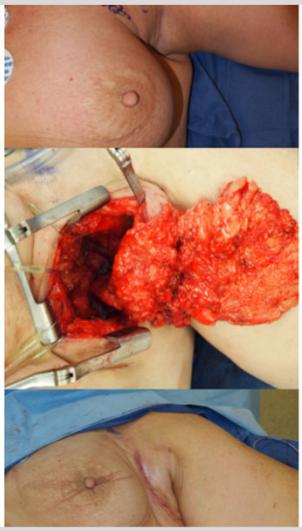
- Axilla
  - Arm abducted with an abduction pillow x 1 week
- Groin
  - Avoid hip flexion >45 degrees x 1 month
- Distal leg
  - Dangle protocol

Omental VLNT



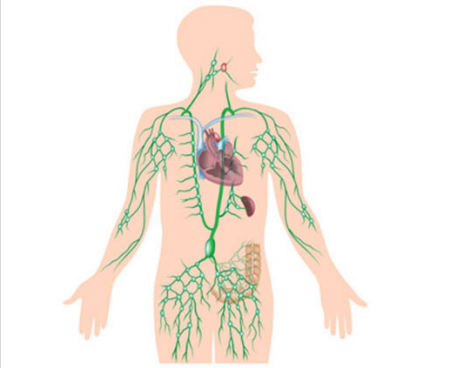


Simultaneous double level VLNT

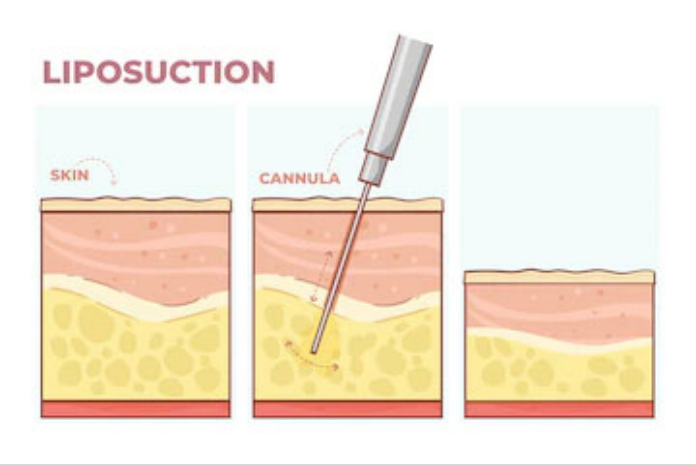


Patients with non-pitting edema

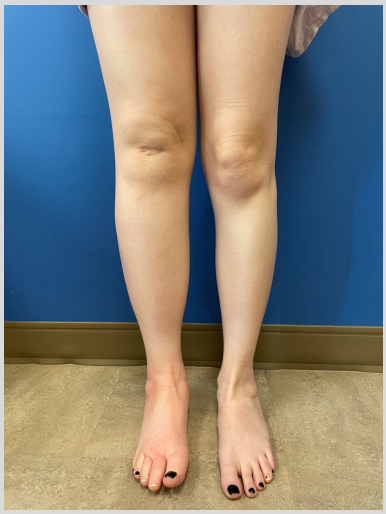
- Most likely secondary to soft tissue hypertrophy
- Are candidates for non-physiological surgery
  - Liposuction
  - Debulking

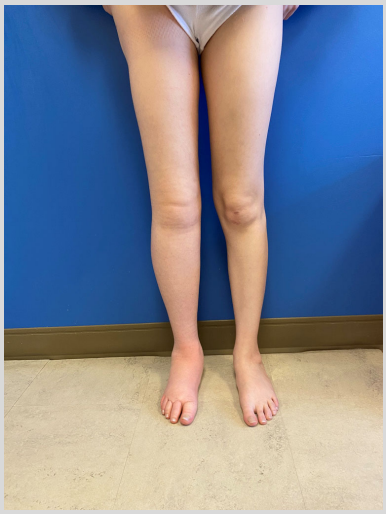


Liposuction



Pre and Post-operative Liposuction





REVIEW ARTICLE

Lymphedema

A Comprehensive Review

Anne G. Warren, BA, Håkan Brorson, MD, PhD,‡ Loren J. Borud, MD,† and Sumner A. Slavin, MD†*

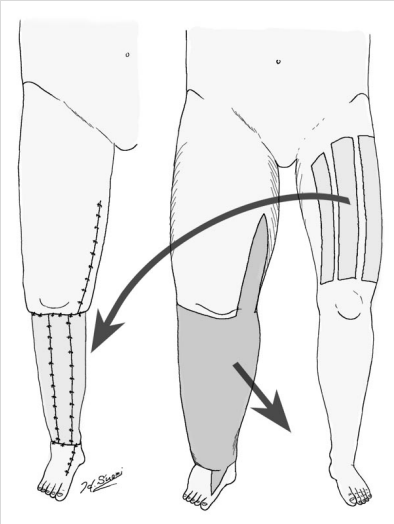
106% mean edema volume reduction at 10 years

Issues:

- Permanent need for garments (discontinuation of garment = recurrence)
- multiple incisions 15-20
- New compression stocking every 3 months

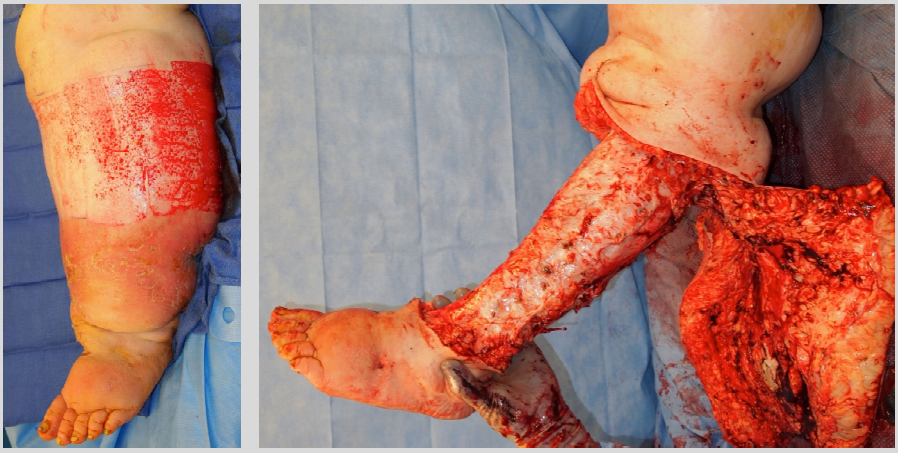
ISL Stage 3

Charles Procedure

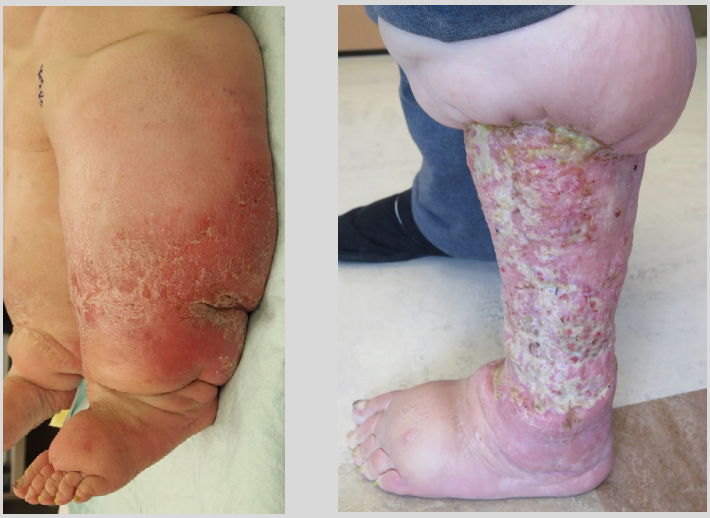


- Circumferential excision of skin, subcutaneous tissue and deep fascia
- Coverage with split or full thickness skin grafts

Intraoperative photographs



Pre and Post-op Charles Procedure



Conclusion

- Lymphedema treatment can be personalized based on the severity and stages of patient's lymphedema
- It is critical to recognize, and initiate indicated treatments early to maximize patient's outcomes