

# Reconstructive Lymphedema Surgery

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# Disclosure

No conflicts of interest to report.

# Introduction

## Hospital of Divine Savior, Vienna, Austria



Established in 1935 by Nuns of Divine Savior in Vienna, Austria

# Introduction

## Hospital of Divine Savior, Vienna, Austria



Focus Lymphedema Surgery, Vascular Surgeries, General Surgery and Palliative Medicine,  
Teaching Hospital of the Medical University of Vienna, Austria

# History

## Surgical Therapies of Lymphedema

- **Resective** surgical therapy
- **Reconstructive** surgical therapy

# History

## Resection Surgical Therapies of Lymphedema

- **1912** : Charles Charles' Procedure
- **1912** : Kondoleon Resection Deep Fascia
- **1918** : Sistrunk Resection Deep Fascia, Tissue
- **1936** : Homan Delayed Resection, Skin Graft
- **1967** : Thompson Resection, Debulk, Skin Flap

# History

## Resection Surgical Therapies of Lymphedema

- 1912 : Charles                      Charles' Procedure
- **1912** : Kondoleon                Resection Deep Fascia
- **1918** : Sistrunk                    Resection Deep Fascia-Tissue
- **1936** : Homan                      Delayed Resection, Skin Graft
- **1967** : Thompson                 Resection, Debulk, Skin Flap

# History

## Surgical Therapies of Lymphedema

- Resective surgical therapy
- **Reconstructive** surgical therapy



# History

## Reconstructive Surgical Therapies of Lymphedema

- **1908** : Handley                      Silk Threads
- **1935** : Gillies                         Skin Flap
- **1956** : Kinmonth                    Omentum Flap
- **1966** : Goldsmith
- **1967** : De Los Santos
- **1987** : Kinmonth

# History

## Reconstructive Surgical Therapies of Lymphedema

- 1908 : Handley                      Silk Threads
- **1935** : Gillies                      Skin Flap
- **1956** : Kinmonth                      Omentum Flap
- **1966** : Goldsmith
- **1967** : De Los Santos
- **1987** : Kinmonth

# History

## Reconstructive Surgical Therapies of Lymphedema

- 1908 : Handley                      Silk Threads Methods
- 1935 : Gillies                        Skin Flap
- **1956** : Kinmonth                  Omentum Flap
- **1966** : Goldsmith
- **1967** : De Los Santos
- **1987** : Kinmonth

# History

## Reconstructive Microsurgical Therapies of Lymphedema

- **1960** : Jacobson                      Lymphovenous Anastomosis
- **1966** : Nielubowicz                  Lymphnode Vene Anastomosis
- **1969** : Yamada                        Lymphovenous Anastomosis
- **1977** : O´Brien                        Lymphovenous Anastomosis
- **1978** : Debny                          Lymphovenous Anastomosis

# History

## Reconstructive Microsurgical Therapies of Lymphedema

- 1960 : Jacobson                      Lymphovenous Anastomosis
- **1966** : Nielubowicz              Lymphnode Vene Anastomosis
- **1969** : Yamada                      Lymphovenous Anastomosis
- **1977** : O´Brien                      Lymphovenous Anastomosis
- **1978** : Debny                        Lymphovenous Anastomosis

# History

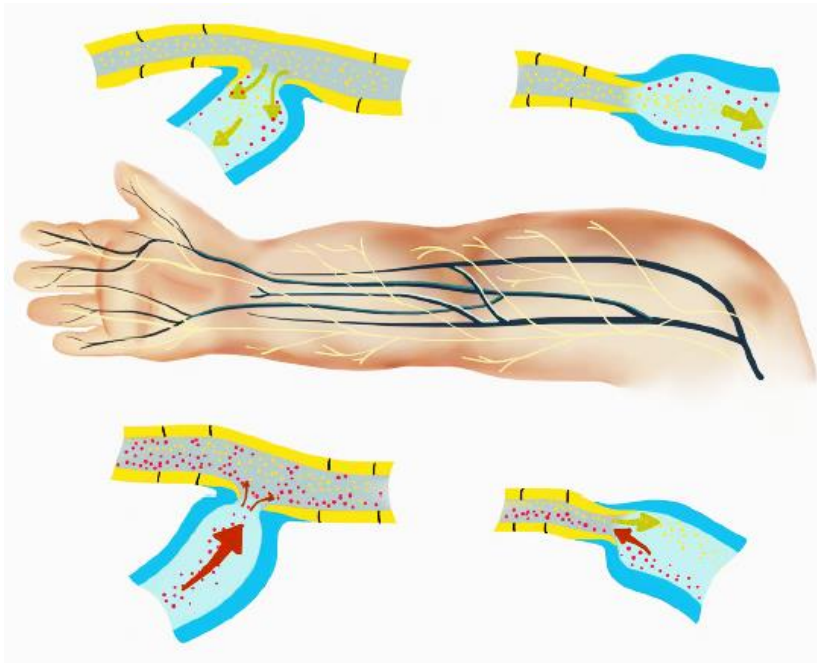
## Reconstructive Microsurgical Therapies of Lymphedema

- 1960 : Jacobson                      Lymphovenous Anastomosis
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- **1969** : Yamada                    Lymphovenous Anastomosis
- **1977** : O´Brien                   Lymphovenous Anastomosis
- **1978** : Debny                      Lymphovenous Anastomosis

# Present

## Reconstructive **Super-Microsurgical** Therapies of Lymphedema

- **2000** : Koshima



Subdermal lymphatics to  
subdermal venules

**Super-Microsurgery**  
 $\text{Ø} < 0.8 \text{ mm}$

Rationale  
Venous pressure is low in  
subdermal venules

*Koshima I, Inagawa K, Urushibara K, Moriguchi T. Supermicrosurgical lymphaticovenular anastomosis for the treatment of lymphedema in the upper extremities. J Reconstr Microsurg. Aug 2000;16(6):437-442.*

# Lymphovenous Anastomosis (LVA)

## ICG Staging of Lymphedema



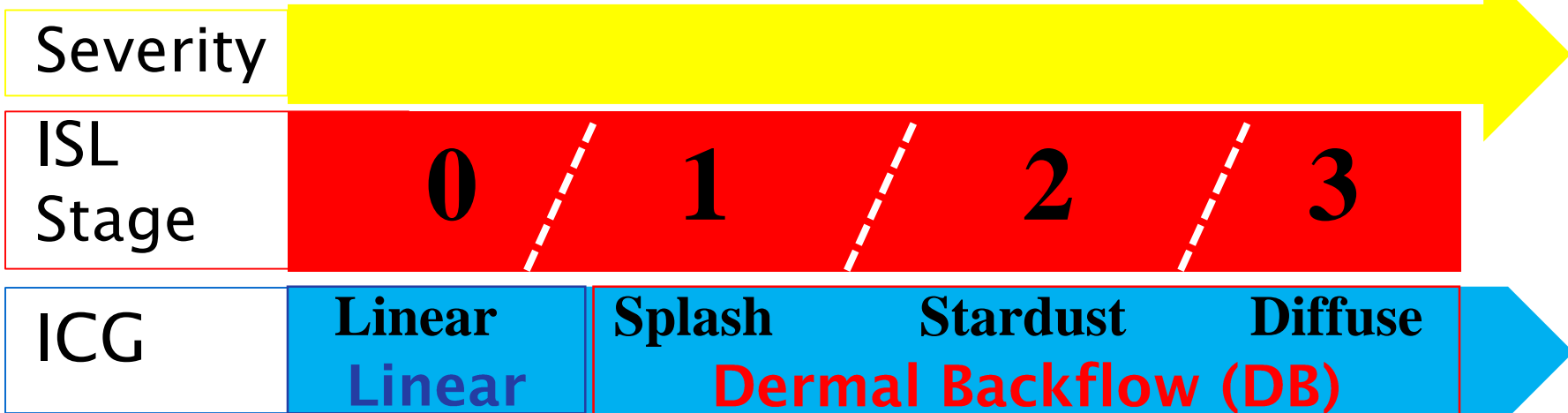
**Linear**  
**Linear**



**Splash Stardust Diffuse**  
**Dermal Backflow (DB)**

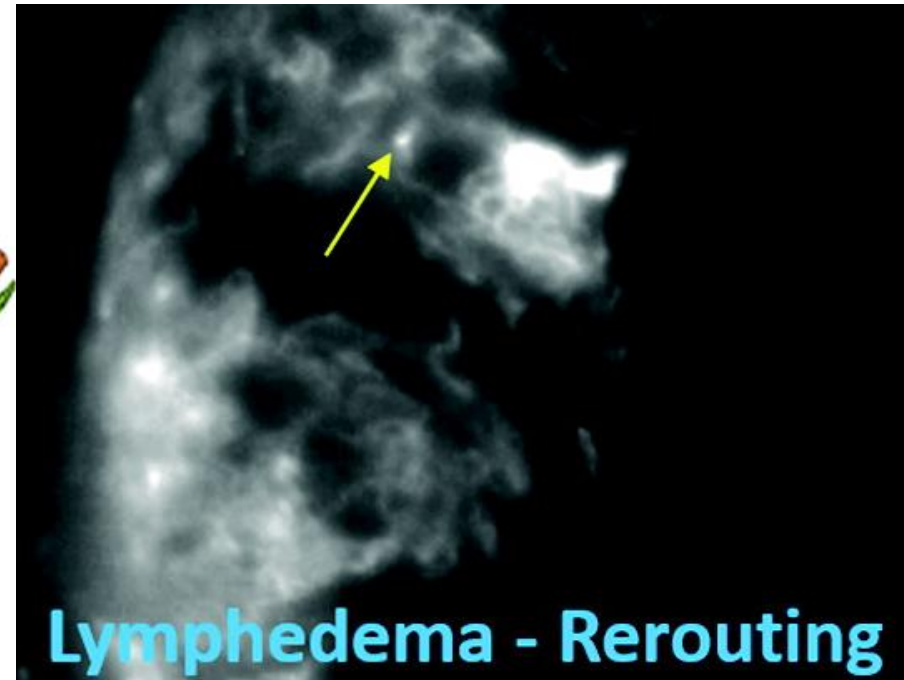
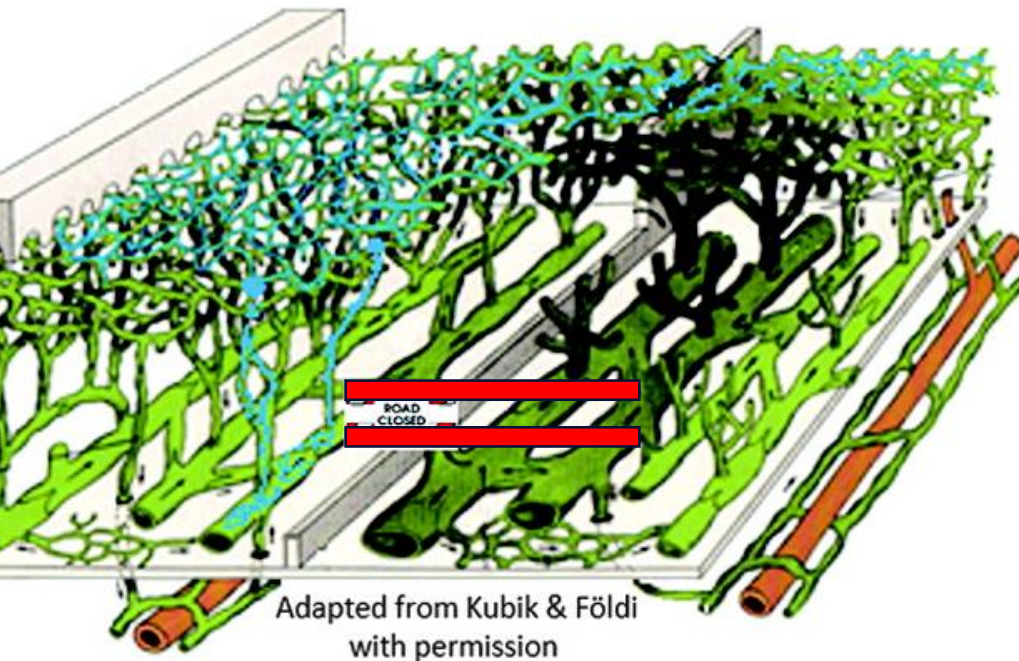
Yamamoto T, Narushima M, ... , Koshima I, Munding GS. Characteristic indocyanine green lymphography: the generation of a novel lymphedema severity staging system using dermal backflow patterns. *PRS*. May 2011;127(5):1979-1986.





# Lymphovenous Anastomosis (LVA)

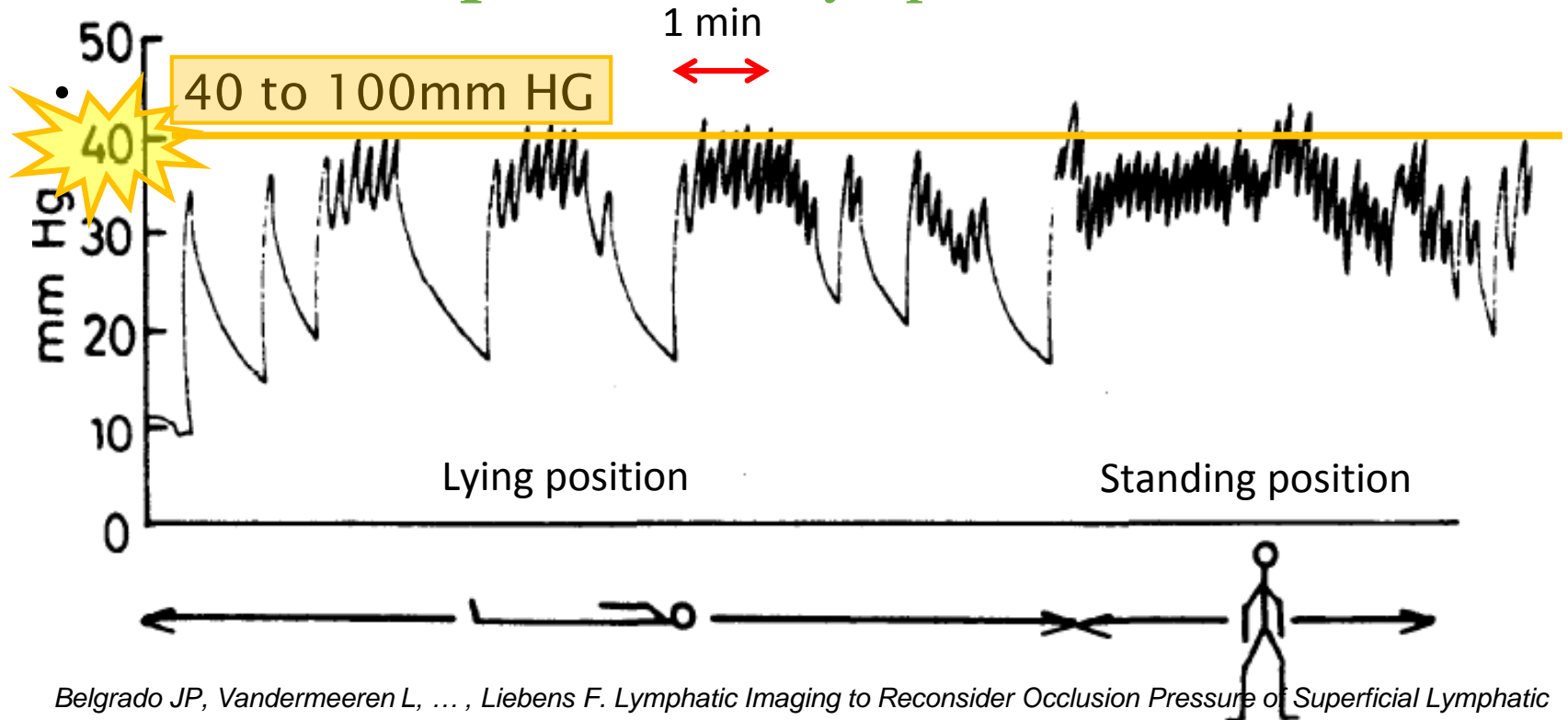
## Dermal Backflow of lymphatic vessels



Belgrado JP, Vandermeeren L, ... , Liebens F. Lymphatic Imaging to Reconsider Occlusion Pressure of Superficial Lymphatic Collectors in Upper Extremities of Healthy Volunteers. *Lymphatic research and biology*. Jun 2016;14(2):70-77.

# Lymphovenous Anastomosis (LVA)

## Intraluminal pressure of lymphatic vessels

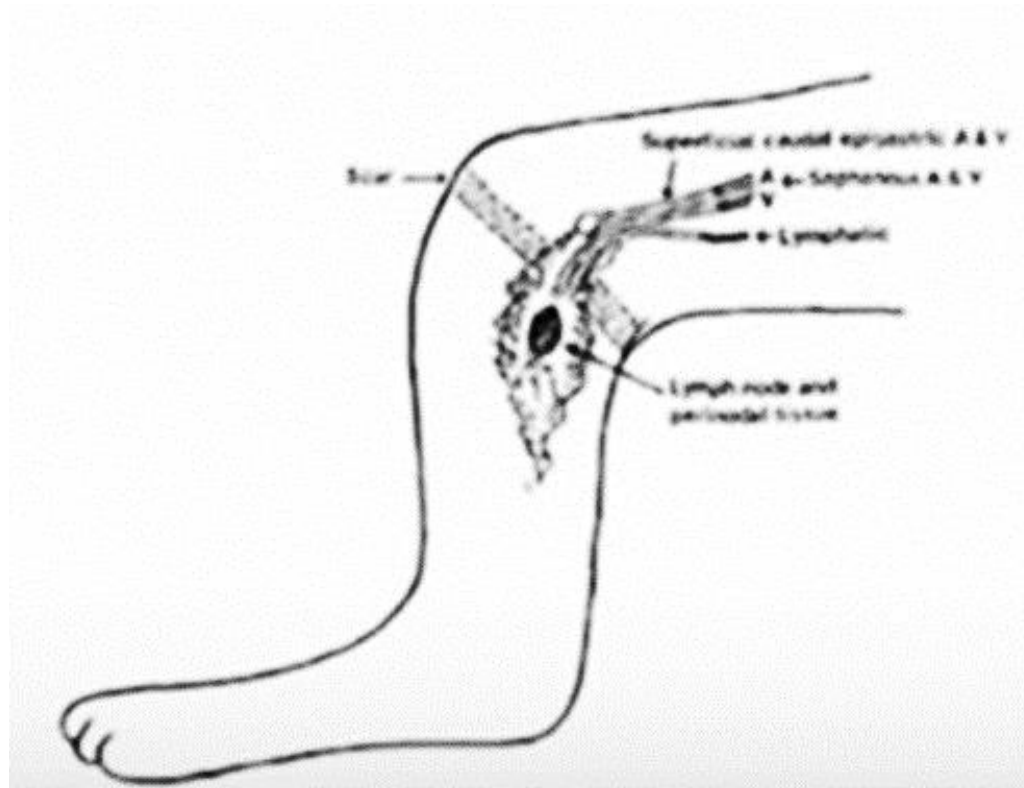


Belgrado JP, Vandermeeren L, ... , Liebens F. Lymphatic Imaging to Reconsider Occlusion Pressure of Superficial Lymphatic Collectors in Upper Extremities of Healthy Volunteers. *Lymphatic research and biology*. Jun 2016;14(2):70-77.

Olszewski WL, Engeset A. Intrinsic contractility of prenodal lymph vessels and lymph flow in human leg. *The American journal of physiology*. Dec 1980;239(6):H775-783.

# Vascularized Lymphnode Transfer (VLNT)

## 1990 Lymphnode-Flaps as Therapies of Lymphedema



Chen HC, O'Brien BM, Rogers IW, Pribaz JJ, Eaton CJ. Lymph node transfer for the treatment of obstructive lymphoedema in the canine model. *British journal of plastic surgery*. 1990;43(5):578-586.

# Vascularized Lymphnode Transfer (VLNT)

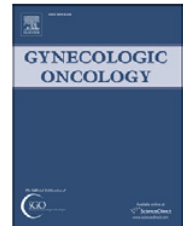
## Lymphnode-Flaps as Therapies for Lymphedema



Contents lists available at [SciVerse ScienceDirect](http://SciVerse ScienceDirect)

Gynecologic Oncology

journal homepage: [www.elsevier.com/locate/ygyno](http://www.elsevier.com/locate/ygyno)



A novel approach to the treatment of lower extremity lymphedema by transferring a vascularized submental lymph node flap to the ankle<sup>☆</sup>

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Bien Keem Tan<sup>d</sup>, Chyi-Long Lee<sup>e</sup>

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<sup>e</sup> Division of Gynecologic Endoscopy, Department of Obstetrics and Gynecology, Chang Gung Memorial Hospital, College of Medicine, Chang Gung University, Taoyuan, Taiwan

Cheng MH, Huang JJ, Nguyen DH, Saint-Cyr M, Zenn MR, Tan BK, Lee CL. A novel approach to the treatment of lower extremity lymphedema by transferring a vascularized submental lymph node flap to the ankle. *Gynecologic oncology*. Jul 2012;126(1):93–98. <http://www.ncbi.nlm.nih.gov/pubmed/22516659>

# Vascularized Lymphnode Transfer (VLNT)

## Vascularized **Submental** Lymphnode Transfer (VLNT)



### Surgical Anatomy of the Vascularized **Submental Lymph Node Flap**: Anatomic Study of Correlation of Submental Artery Perforators and Quantity of Submental Lymph Node

**CHIEH-HAN J. TZOU, MD,<sup>1\*</sup> STEFAN MENG, MD,<sup>2</sup> TINHOFER INES, MD,<sup>1</sup> LUKAS REISSIG, MD,<sup>2</sup> URSULA PICHLER, MD,<sup>1</sup> JOHANNES STEINBACHER, MD,<sup>1</sup> IGOR PONA, MD,<sup>1</sup> JULIA ROKA-PALKOVITS, MD,<sup>1</sup> THOMAS RATH, MD,<sup>1</sup> WOLFGANG J. WENINGER, MD,<sup>2</sup> AND MING-HUEI CHENG, MD<sup>3</sup>**

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Tzou CH, Meng S, et al.. Surgical anatomy of the vascularized submental lymph node flap: Anatomic study of correlation of submental artery perforators and quantity of submental lymph node. *Journal of surgical oncology*. Jun 23 2016.

# Vascularized Lymphnode Transfer (VLNT)

## Vascularized **Supraclavicular** Lymphnode Transfer (VLNT)



### The Surgical Anatomy of the **Supraclavicular Lymph Node Flap**: A Basis for the Free Vascularized Lymph Node Transfer

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LUKAS F. REISSIG, MD,<sup>2</sup> EVA PLACHETA, MD,<sup>1</sup> JULIA ROKA-PALKOVITS, MD,<sup>1</sup> THOMAS RATH, MD,<sup>1</sup>  
MING-HUEI CHENG, MD,<sup>4</sup> WOLFGANG J. WENINGER, MD,<sup>2</sup> AND **CHIEH-HAN J. TZOU, MD<sup>1\*</sup>**

<sup>1</sup>Division of Plastic and Reconstructive Surgery, Department of Surgery, Medical University of Vienna, Vienna, Austria

<sup>2</sup>Department of Systematic Anatomy, Institute of Anatomy, Center for Anatomy and Cell Biology, Medical University of Vienna, Austria

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<sup>4</sup>Division of Reconstructive Microsurgery, Department of Plastic and Reconstructive Surgery, Center for Tissue Engineering, Chang Gung Memorial Hospital, College of Medicine, Chang Gung University, Taoyuan, Taiwan

**Background:** Vascularized lymph node transfer is an effective surgical method in reducing lymphedema. This study provides the first detailed

Steinbacher J, Tinhofer IE, Meng S,... , Tzou CH. The surgical anatomy of the supraclavicular lymph node flap: A basis for the free vascularized lymph node transfer. Journal of surgical oncology. Jun 28 2016.

# Vascularized Lymphnode Transfer (VLNT)

## Vascularized **Lateral Thoracic** Lymphnode Transfer (VLNT)



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**RESEARCH ARTICLE**

WILEY 

## The surgical anatomy of the vascularized lateral thoracic artery lymph node flap—A cadaver study

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Johannes Steinbacher MD<sup>1</sup> | Julia Roka-Palkovits MD<sup>3</sup> | Eva Györi MD, PhD<sup>3</sup> |  
Lukas F. Reissig MD<sup>1</sup> | Ming-Huei Cheng MD, MBA, FACS, PhD<sup>4</sup> |  
Wolfgang J. Weninger MD, PhD<sup>1</sup> | **Chieh-Han J. Tzou MD**

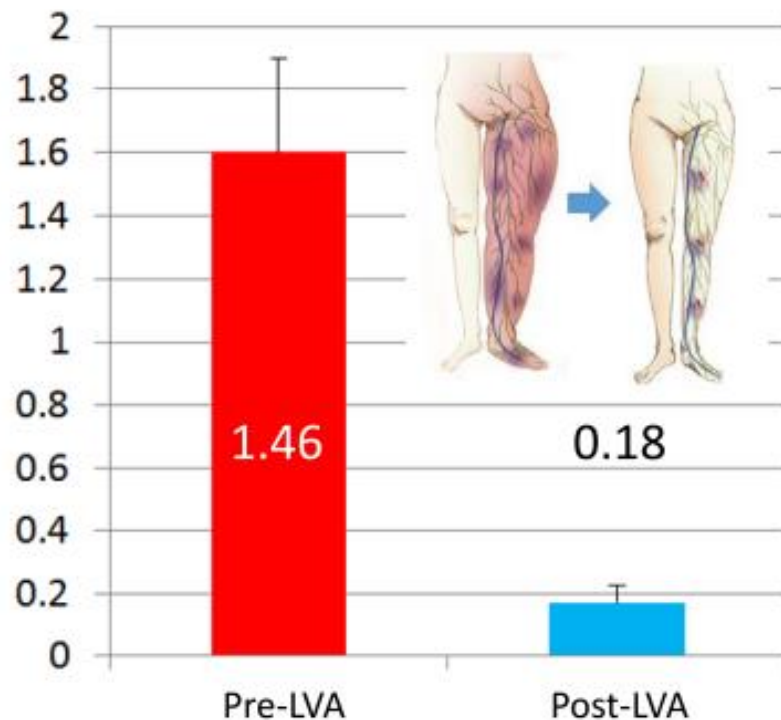
*Tinhofer IE, Meng S, Steinbacher J, Roka-Palkovits J, ..., Cheng MH, Weninger WJ, Tzou CH. The surgical anatomy of the vascularized lateral thoracic artery lymph node. Journal of surgical oncology. Dec 2017;116(8):1062–1068.*



# Lymphovenous Anastomosis (LVA)

## Cellulitis in lymphedema patients

Frequency of Cellulitis



Patients  
n=95 (M 6, F 89)

|             |    |
|-------------|----|
| Primary     | 7  |
| Secondary   | 88 |
| Upper limb; | 11 |
| Lower limb; | 84 |
| Rd (+)      | 29 |
| Rd (-)      | 59 |

Mihara M, Hara H, Furniss D, ... Ohtsu H, Gennaro P, Gabriele G, Murai N. Lymphaticovenular anastomosis to prevent cellulitis associated with lymphoedema. *The British J Surgery*. Oct 2014;101(11):1391-1396.

# Therapy Plan of Lymphedema Patients

## Algorithm for Reconstructive Lymphedema Surgery

**Lymphoscintigraphy** to confirm diagnosis of lymphedema

**CDT** Complete Decongestive Therapy pre- and post-operative

**Reconstruction** before **Resection**

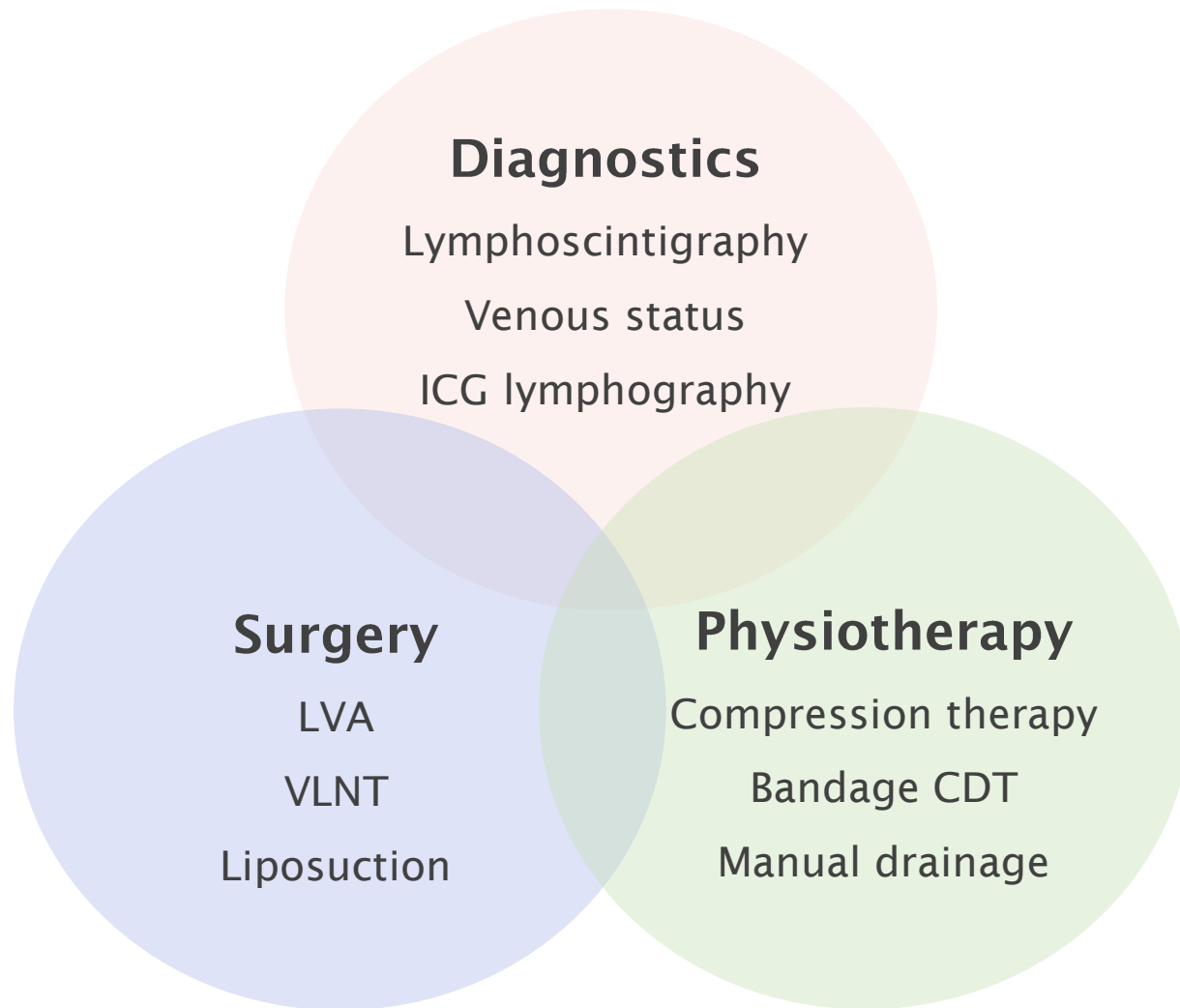
|                               |  |
|-------------------------------|--|
| <b>ISL 0</b> transient        | <b>CDT</b> (Complete Decongestive Therapy) |
| <b>ISL I</b> reversible, mild | <b>CDT, LVA</b>                            |
| <b>ISL II</b> moderate        | <b>CDT, LVA, [Liposuction]</b>             |
| <b>ISL III</b> severe         | <b>CDT, LVA, VLNT, [Liposuction]</b>       |

# Therapy Plan of Lymphedema Patients

*“... cooperation is the key to success ...”*

*Ming-Huwei Cheng M.D.  
Distinguished Chair Professor and Director  
Department of Plastic Surgery  
Chang Gung Memorial Hospital  
Chang Gung Medical College & University  
Taipei, Taiwan*

# Therapy Plan of Lymphedema Patients



# The Team



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