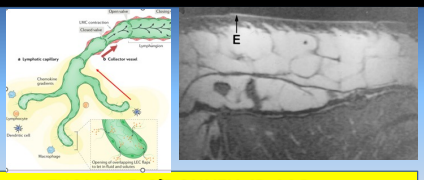
Overview Of Lymphatic Anatomy & Physiology



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DISCLOSURES

NONE CURRENTLY

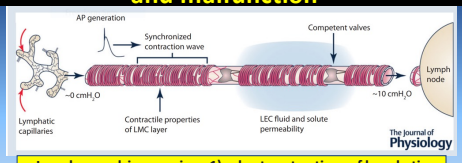
FORMERLY CONSULTANT TO TACTILE MEDICAL
(Ended 5/31/2023)

PATHOGENESIS OF LYMPHEDEMA*

- *Recent research in Lymphedema → fundamentally an immunologic process that ultimately results in:*
- Inflammation
- Impaired lymphangiogenesis
- Dysfunctional lymphatic pumping
- Fibroadipose deposition

*Dayan JH, et al. Lymphedema: Pathogenesis and Novel Therapies. Annu Rev Med. 2018 ;69 :263-276.

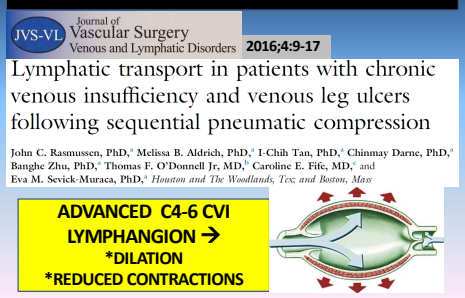
Lymphatic pumping: mechanics, mechanisms and malfunction*



Lymph propulsion requires: 1) robust contractions of lymphatic muscle cells, 2) contraction waves that are synchronized over the length of a lymphangion and 3) properly functioning intraluminal valves.

*Scallan JP, et al. J Physiol 2016;594.20:5749–5768

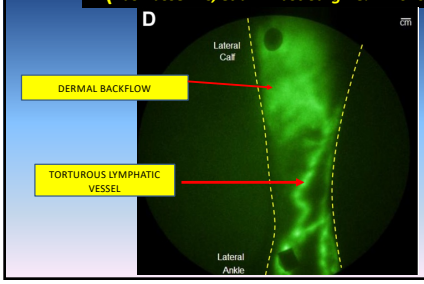
WHAT HAPPENS IN ADVANCED CVI?



ADVANCED C4-6 CVI
LYMPHANGION →
*DILATION
*REDUCED CONTRACTIONS

LYMPHATIC DYSFUNCTION WITH VLU

(*Rasmussen JC, et al. J Vasc Surg V&LD 2016;4: 9 1-17)*



NIRFLI →
LYMPH DYNAMICS

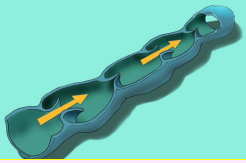
LYMPHATIC FLOW VELOCITY

CONTRACTION FREQUENCY

CONTRACTIONS OF THE LYMPHANGION (Function)

- NORMAL SUBJECTS →0.46 +/- 0.3 lymphatic contractions/min *(Rasmussen J et al. Trans Onc 2010;3: 362-72)*
- PHLEBOLYMPHEDEMA →*Diminished contractile events* too infrequent to be quantified → DECREASED PUMPING

Besides obstruction or diminished # of lymphatic vessels
DECREASED PUMPING MAY BE THE UNDERLYING PATHOPHYSIOLOGY

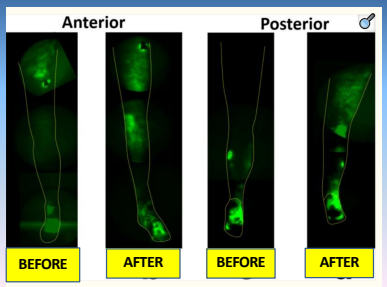


EFFECT OF MLD ON LYMPH VELOCITY & CONTRACTILE EVENTS*

- Lymph Velocity Improved +23%
- The average interval between lymphatic propulsion events decreased –9%
- NRFLI Quantified improved lymphatic contractile function following MLD

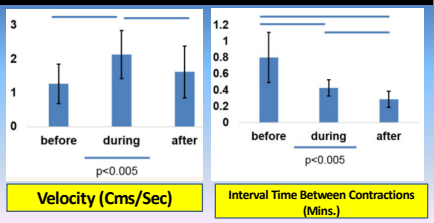
*Tan IC, et al. Arch Phys Med Rehabil. 2011; 92: 756–764.

THE EFFECT OF PNEUMATIC COMPRESSION



THE EFFECT OF APCD IN C4 CVI ON LYMPHANGION FUNCTION

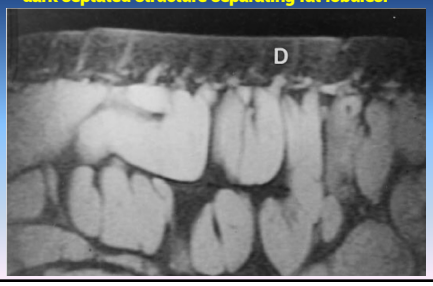
(Aldrich MB, et al. J Innov Opt Health Sci. 2017 Mar;10(2)



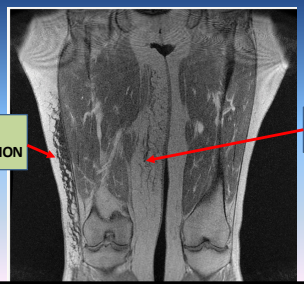
Velocity (Cms/Sec)

Interval Time Between Contractions (Mins.)

Dermis (D) corresponds to the hypointense layer located under the epidermis. The hypodermis appears hyperintense and contains a dark septated structure separating fat lobules.



40 yo Man S/P Treatment Of Melanoma



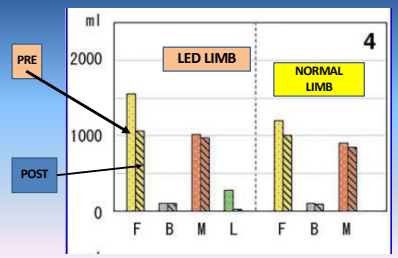
Mechanisms for Lymphedema to increase fat deposition

- Slowed lymph flow
- Diminished lymphatic drainage- *prevents fat tissue from converting stored fat into energy.*
- Fat lobules compressing lymphatic capillaries- ***disrupts the transport of fluid and lipids → further fat accumulation***
- Chronic inflammation

IMPLICATIONS FOR TREATMENT

- Greater Volume of Limb due to Fat Deposition, not just fluid
- Less Amenable to MLD or Pneumatic Compression Decreasing Limb Girth
- Requires "Debulking" by Liposuction & Continued PCD Rx

CHANGES IN TISSUE COMPOSITION AFTER LIPOSUCTION IN LYMPHEDEMA



Sen Y, et al.
LYMPHATIC RESEARCH AND BIOLOGY 2017
Volume 00, 00, 2017

Lymphangion contractions and Fat deposition play a major role in affecting therapy in Lymphedema