EDEMA
CONFUSION

Physical Therapy and Lymphedema
An Art and A Science

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OBJECTIVES:

1. Recognize different types of edema
2. Recognize how our fluid transport systems are interwoven
3. Recognize treatment opportunities
Organized Approach to Wound Care

1. Is there adequate perfusion and/or oxygenation?
2. Is non-viable tissue present?
3. Are signs/symptoms of infection and/or inflammation present?
4. Is offloading or pressure relief appropriate?
5. Is edema controlled?
6. Is tissue growth optimized?
7. Is the wound microenvironment conducive to healing?
8. Is pain controlled?
9. Are host factors optimized?
VASCULAR MECHANICS

VENOUS SYSTEM

- DEEP VEINS
- SUPERFICIAL VEINS
- COMMUNICATING VEINS (PERFORATORS)
- VALVES
- CALF PUMP

CHRONIC VENOUS ULCERS (CVI)

Venous Ulcer account for 60-90\% of leg ulcers

More common in women: 3X

Difficult to heal: 50\% > 9 months/20\% > 2 years

High rate of reoccurrence: 60\%  WHY???

76\% Diagnosed by presentation alone
What Effects the Pressure??

Directly proportional to persons Height: Distance from head to feet

OBESITY: Linear relationship girth and vascular pressure

- Resting Pressure/supine: ~8 mmHG
- Standing: + 100 mmHG
- Ambulation: ~25-100 mmHg

Hegarty M.; Am Overview of Compression Therapy. Today’s Wound Clinic vol 4 issue 10-Oct 2010
Partsch H. Annuals Vascular Disease 2012
VENOUS PRESSURE: Anatomic Failure

**Ambulatory Venous Hypertension:**
The elevated pressure in the leg vein during walking

Even with intact vessels:
25 mmHg calf pump - 8 mmhg rest = 17 mmHg

1. Venous Wall Physical Properties: Reduced Strength
2. Venous Valves
   Degenerative damage DVT
3. Calf Pump (....exercise....😊)

90% of venous return is through these 3

Partsch, H; compression therapy of venous ulcers; Hemodynamic effects depend on interface pressure and stiffness; EWMA Journal 2006, vol 6 NO2.

Fletcher, Moffatt, Partsch, Vowden, Vowden: Principles of Compression in venous disease, a practitioner's guide to treatment and prevention of venous leg ulcers; Wounds International: 2013
LYMPHEDEMA

An abnormal collection of excessive tissue proteins, edema, chronic inflammation and fibrosis in the interstitial space. The International Society of Lymphology

CHRONIC PROBLEM

NO CURE

TREATMENT: CDT PROGRAM
- Manual Lymphatic Drainage
- Compression Therapy
- Skin Care
- Exercise
ANATOMY

- PRECOLLECTORS
- COLLECTORS
- LYMPHATIC CAPILLARIES
- NODES
- THORACIC DUCT
Lymph Capillaries in the Tissue Spaces

- Tissue cells
- Lymph capillary
- Tissue spaces
- Arteriole
- Venule
- Tissue fluid
- Lymphatic vessel
MECHANICAL INSUFFICIENCY

Low Output Failure

LYMPHATIC SYSTEM IS DAMAGED AND HAS REDUCED TRANSPORT CAPACITY

Structural/Functional Abnormalities
DYNAMIC INSUFFICIENCY

High Output Failure: OVERLOAD

FLUID LOAD EXCEEDS LYMPHATIC TRANSPORT CAPACITY

- Infection
- CVI
- Trauma
- Cardiac Insufficiency, etc
Dr. Wade Farrow:
“WITHOUT FUNCTIONAL LYMPHATICS, WE WOULD DIE IN ABOUT 24 HOURS.”

Carlson and Foldi:
Lymphatic Failure= infection, inflammation and carcinogenesis


“PHLEBOLYMPHEDEMA”

WHAT?????

Mixed-etiology swelling....... 

CVI+ lymphatic insufficiency 
= Phlebolymphedema
DEFINITION:
Phlebolymphedema:

is due to insufficiency of the venous or/and lymphatic system, in combination with possible systemic contributors, leading to accumulation of interstitial protein-rich fluid in the interstitial space.
What we get.....

- Hyperemia: Venous Hypertension
- Increased interstitial fluid
- Increased sub fascial edema
- Increased compartment pressure
- OVERWHELMED LYMPHATIC SYSTEM
- PROINFLAMMATORY STATE
STARLINGS LAW

1) Capillaries are semi-porous membranes → Fluid moves in and out
2) Increasing capillary hydrostatic pressure, moves fluid into the interstitium
3) Lower capillary hydrostatic pressure + higher capillary oncotic pressure of proteins = pulls fluid back into the venous system.

Maybe NOT?
ENDOTHELIAL GLYCOCALYX LAYER

Controls movement of proteins and fluid across the blood capillary wall.

There is **NO** reabsorption of fluid, back into the venous side of blood capillaries.

**REABSORPTION OCCURS ONLY THROUGH THE LYMPHATIC CAPILLARIES**

Photo used with permission.
The EGL: regulates fluid/protein movement

1. Through the capillary wall to tissue
2. Prevents movement back into venous side of capillaries: even in presence of higher pressures.

All fluid/protein existing the blood capillaries into the interstitium MUST be removed by the lymphatics.

THEREFORE:

“Arguably, it may be better to consider the presence of chronic oedema as synonymous with the presence of lymphoedema, in as much all oedema represents relative lymph drainage failure.” Mortimer and Rockson (2014)
Consider lymphatic function

Recognize lymphedema comes in various forms

Use Stemmers sign at various physical locations

Consider CDT/MLD program: PT/OT
- compression
- exercise
- manual lymphatic mobilization
- skin care
WHAT DOES ALL THIS LOOK LIKE??
LYMPHEDEMA RUBRA
-CELLULITIS?

Lipodermatosclerotic changes (sand paper)
FUNCTIONAL CONSIDERATIONS

Lymph node locations: joints

Joint Movement

Mobility

Endurance: (Heart rate/Breathing)

Accountability
WHAT MUST WE DO ABOUT IT?

COUNTERACT GRAVITY: ELEVATION

EXERCISE

COMPRESSION THERAPY

MANUAL LYMH DRAINAGE

SKIN CARE

SELF MANAGEMENT

PHYSICAL THERAPY
EXERCISE!!

- CALF RAISES
- CALF STRETCHES
- MARCHES
- DAILY WALKING
- UP AND DOWN STAIRS
- SWIMMING

- 75% adherence
- 24% improved healing rates

PURPOSE OF COMPRESSION

1. Counteract the force of gravity and promote the normal flow of venous blood up the leg

2. Acts on the venous and lymphatic systems to improve venous and lymph return and reduce edema

3. Causes narrowing of the superficial veins

Elevated MMP-1 in Venous Ulcers

TYPES

■ COMPRESSION WRAPS

■ COMPRESSION HOSIERY

■ INTERMITTENT PNEUMATIC COMPRESSION (IPC)

■ MIXED TEXTILES
HOW DO WE DEFINE THIS IN PRACTICE??????
Types of Compression

- ELASTIC
- INELASTIC
- STATIC
- DYNAMIC
- WRAPS
- HOSE
- LONG STRETCH, SHORT STRETCH
- NON-STRETCH

HELP!!!!!

PARTNER WITH A LYMPHATIC THERAPIST
WHAT IS ADEQUATE COMPRESSION

- Overcomes intravenous pressure
- Exerts a sub-bandage resting pressure that is well tolerated in a resting position
- Provides a pressure increase when the patient rises to a standing position: (50-70mmHG)
- Provides external compression improving venous reflux during walking

Fletcher, Moffatt, Partsch, Vowden, Vowden: Principles of Compression in venous disease, a practitioner's guide to treatment and prevention of venous leg ulcers; Wounds International: 2013

Partsch, H; compression therapy of venous ulcers; Hemodynamic effects depend on interface pressure and stiffness; EWMA Journal 2006, vol 6 NO2.
La Place's Law:

A formula that defines the pressures exerted on curved surfaces

\[ \text{Pressure} = \frac{T \times N}{C \times W} \]

N = number of layers applied
T = bandage tension
C = limb circumference
W = Bandage Width

Non-Stretch

ZINC PASTE BANDAGES
Short Stretch

- Bandages that stretch to less than 100% of their original length: minimal extensibility

- High Working Pressure/Low Resting Pressure
Long Stretch

- Expands over 100% of its original length
- Low Working Pressure/High Resting Pressure
- Contains Elastomeric Fibers: fibers that are able to stretch and return to almost their original size.

Combining Textiles
ULCER X 7 YEARS
3 YEARS ACTIVE TREATMENT
3 X PER WEEK
NO FINAL CLOSURE
STARTED PHYSICAL THERAPY
- EXERCISE
-NODE MASSAGE
-INELASTIC MULTILAYER COMPRESSION
TAKE HOME PEARLS

- THINK ABOUT THE WHOLE PATIENT.....
- REMEMBER OTHER SPECIALITIES THAT MAY BE ABLE TO HELP
- EDEMA IS NOT DIAGNOSIS SPECIFIC: ALWAYS, NEVER...ETC
- EXERCISE/MOBILITY
- LYMPHATIC CARE/EDUCATION
- COMPRESSION TOOLS/TRICKS
BIBLIOGRAPHY