

# Compression Therapy: The Unsung Hero in the Treatment Chronic of Venous Insufficiency

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midwest institute for  
interventional therapy

# Chronic Venous Insufficiency

- Affects up to 25% of U.S. Population
- Approximately 4% of those Partially Disabled
- 1% with Active or Healed Ulceration

# Venous Insufficiency

- High Venous Pressure Transmitted to the Skin Surface
  - Incompetent Perforating Veins
    - 70% of the Force of Muscular Contraction (100-300mmHg) Transmitted to the Superficial Venous System
- Stretching of Unsupported Veins, Venules and Epidermal Post-capillary Venules
  - Occurs during normal activity as well as with Therapeutic exercise.

# Compression Therapy: Indications

## Venous

Chronic venous insufficiency

Leg ulcer treatment

Deep venous thrombosis

Superficial thrombophlebitis

Addition to sclerotherapy/surgery for varicose veins

## Non-venous

Erysipelas

Vasculitis

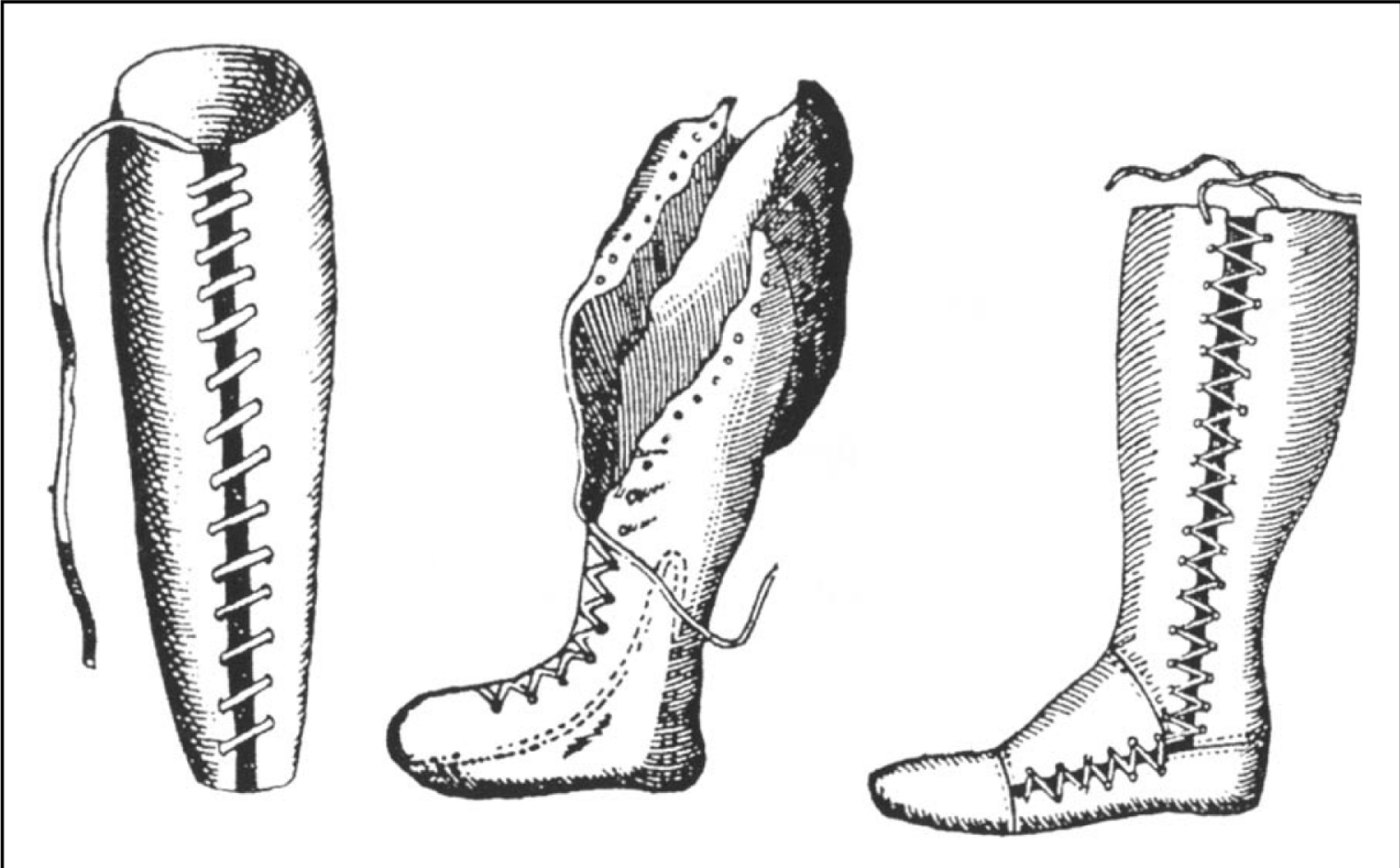
Oedema cruris; non-venous

Post-traumatic

Lymphoedema

# Compression Therapy

- Practiced for Many Centuries
  - Hippocrates
    - Bandages for Treatment of Leg Ulcers
- Richard Wiseman (1622-1676)
  - First to Treat leg Ulcers with Leather Lace Stockings
- William Brown (1848)
  - Manufactured First Elastic Stocking



# Compression Therapy

- Phases of Compression Therapy
  - Phase I
    - Reduction of edema and/or ulcer healing\*
      - Achieved by applying **non-elastic compression**
  - Phase II
    - Maintenance of compression
      - **Elastic Compression**

\*Investigation to determine if insufficiency can be corrected by surgery/endovenous repair

# Non-elastic Compression

- Application of a Fabric that is Incapable of Deformation or Stretching
  - Unna Boot
    - Zinc oxide impregnated Bandage
    - Two Minimum-stretch Bandages
  - CircAid Legging
  - Non-Stretch Bandages



# Non-elastic Compression

- Rigid Envelope Around Leg
  - Directs Force of Muscular Contraction Inward
  - No Elastic Recoil
- Clinically-relevant effect on deep venous hemodynamics
  - Minimizes outward flow of blood through incompetent perforating veins
  - Increases Calf Muscle Ejection Fraction
  - Improves Venous Filling Index
  - Prolongs Venous Reflux Time



# Non-Elastic Compression

- Low resting pressure
  - Compresses Superficial Tissues
    - Pressure is Low in Recumbent Position
    - Works primarily in upright position
- Ambulatory compression therapy
  - Walking enhances effect
  - Exerts pressure equal to the distending pressure generated by calf-muscle contraction
    - Counter force returns microcirculation to a more normal state
    - Better augmentation of venous emptying

# Non-Elastic Compression

- More Helpful in Serious Forms of Venous Disease
  - Correction of Venous Hypertension
    - Decreased Ankle Edema
    - Softening of Lipodermatosclerosis
    - Improve Venous Pumping, Microcirculation and Lymph Drainage
  - Prevents Fluid Accumulation in Skin and Subcutaneous Tissues
  - >> Venous Ulcer Healing/Recurrence Reduction

# Elastic Compression

- Application of fabric capable of recovering its' size and shape after deformation
- Elastic Compression
  - Compression Stockings
  - Bandages
  - External Intermittent Pneumatic Therapy



# Elastic Compression

- Exert counter force equal to pressure built into support stocking
- Primary effect on superficial venous system
- Graduated Compression Therapy (developed by Conrad Jobst) provides the best form of elastic support for lower extremity circulatory disorders

# Elastic Compression

- Prescribed after limb evaluation identifies presence of chronic venous insufficiency
- Once applied, stockings used
  - maintain edema-free state
  - Prevent skin changes
- Should not be used for reducing edema
  - Edema and limb size should be reduced prior to applying fitted stockings

**Rx** PHYSICIAN'S PRESCRIPTION **medi USA**

800.633.6334  
For more information about Medi Products and leg health visit our web site at [www.mediusa.com](http://www.mediusa.com)

**mediven** Graduated Medical Compression Stockings

Date: \_\_\_\_\_

Patient Name: \_\_\_\_\_

Diagnosis: \_\_\_\_\_ (Required for insurance reimbursement)

Physician Signature: \_\_\_\_\_ (Dispense as written)






Please indicate Type, Compression and Style.

**TYPE** (select one)  
 Ready-to-Wear Stocking  Custom Stocking

**RX COMPRESSION** (select one)  
 Class I; 20-30 mmHg  Class II; 30-40 mmHg  Class III; 40-50 mmHg

**THERAPEUTIC SUPPORT**  
 16-20mmHg

**STYLE** (select one style from chart below)  
 Include Butler Application Aid

						
<b>Calf</b>	<b>Thigh</b>	<b>Thigh w/waist attach</b>	<b>Panty Hose</b>	<b>Maternity Panty</b>	<b>Men's Leotard</b>	<b>Lymph Sleeve</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Left <input type="checkbox"/> Right	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Left <input type="checkbox"/> Right
						<input type="checkbox"/> Gauntlet

medi medical stockings are available in a range of colors.

# Elastic Compression

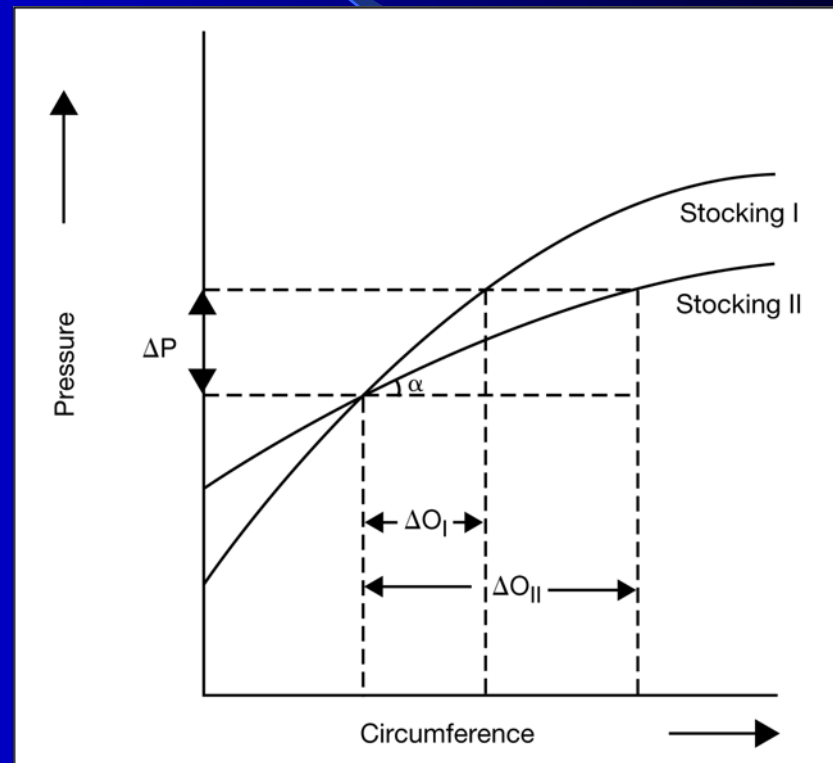
- Mechanism of Action
  - Incompletely Understood
  - Result of Pressure Exerted on Leg
    - Diversion of Blood From Superficial to Deep System
    - Prevention of High-Amplitude Pressure Swings in Superficial Veins during Muscular Systole
    - Enhancement of Emptying of the Deep Venous System

# Elastic Compression

- Made of natural or synthetic yarns
  - Elasticity of yarn is the ability of material to regain shape after stretching
  - Elasticity Coefficient
    - Pressure exerted is related to its extension
      - Relationship between pressure exerted by circumference of stocking and circumference of leg
      - If circumference of leg increases (edema, walking) so does the pressure by a certain amount

# Elastic Compression

- Elasticity Coefficient
  - Stiffness or slope value
    - Increase in pressure when circumference increases by 1cm



# Elastic Compression

- Higher the stiffness/slope the more capable of preventing edema
  - More difficult to put on the stocking
  - Can be overcome by wearing multiple layers as compressive effect is additive

# Elastic Compression

Class	Pressure (mmHg)	Indication
I	20-30	Pain, Swelling, Telangiectasias, Reticulars
II	30-40	Varicose Veins, CVI, Post-ulcer, Sclerotherapy
III	40-50	CVI, Post-ulcer, Lymphedema
IV	50-60	CVI, Post-Ulcer, Lymphedema

# Elastic Compression

- Severe Chronic Insufficiency
  - Requires Graduated compression stocking with ankle pressure of  $>30\text{mmHg}$
  - No clinical evidence of value of stocking stretched above the knee
    - Exception being presence of thigh edema secondary to central venous occlusive disease

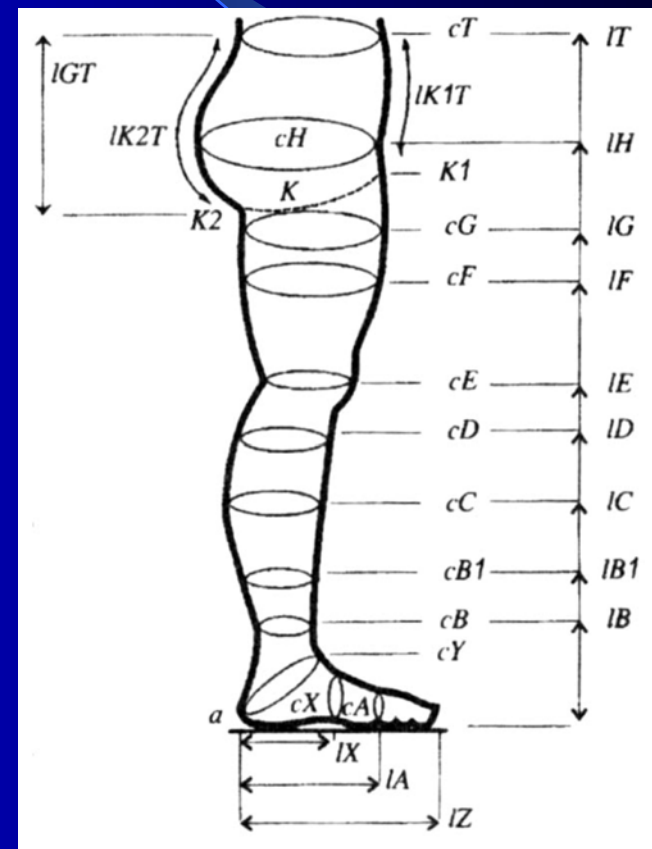
# Elastic Compression

- Measuring compression device
  - Measure when edema free
  - Measure at standard measuring points
    - Supine position



# Elastic Compression

- Length of stocking
  - AG
    - Sclerocompressive therapy
    - DVT
    - Lymphedema
  - AD
    - Chronic venous insufficiency



# Elastic compression

- If measurements due not match standard size can be made to order
- Stocking must be watched to make sure it properly fits
  - If patient complains often needs tighter stocking as opposed to low compression grade
- Compression pad may be necessary to exert additional pressure to compensate for leg circumference variations

# Compression Therapy

- Laplace's Law

$$T = P \times R$$

T = Tension (elastic material in bandages)

P = Pressure

R = Diameter

>> Where leg has smallest circumference (ankle), pressure is highest



# Elastic Compression

- Due to ankle cross-sectional configuration Elastic stockings do not provide adequate compression to medial aspect of ankle
  - Study demonstrated pressure 74% below designated pressure

# Elastic Compression

- Contraindications
  - Arterial Insufficiency
    - ABI <60%
    - Absolute ankle arterial pressure <65mmHg
  - Elastic compression is active under all circumstances
    - Must be removed at night/recumbent position to avoid problems with arterial influx to extremity

# Elastic Compression

- Cutaneous pressure reduces total blood flow
  - Amount of reduction proportional to pressure exerted
    - 10mmHg caused a 10% decline
    - 30mmHg caused a 25% drop
    - 60mmHg a 84% drop
  - Significant change in pressure due to increase in limb girth
    - Increase of 5cm could double the amount of pressure
    - DVT, CHF
  - Factors causing drop in local blood flow and potential for higher than expected pressure can impair local blood flow and lead to ischemia and ulceration

# Elastic Compression

- Ischemic Complications
  - Produce higher intramuscular pressure (soleus and tib anterior) than non-elastic compression
  - Prolonged wearing of stockings in recumbent position may impede microcirculation and impair tissue viability

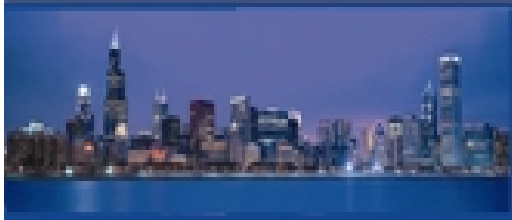
# Elastic Compression

- If patient is likely to experience recurrent leg swelling measurement should be performed over several days
  - Particularly in patients with diabetes or PVD
- If patient develops pain or tightness, stockings should be removed and patient remeasured

Feature	CircAid Support	Unna Boot	Elastic Stocking (ready-made)	Elastic Stocking (custom-made)	Elastic Bandage
Easy on/off	+	-	+/-	+/-	+/-
Unyielding	+	+	-	-	-
Compression Level Maintained	+	-	-	-	+
Compression Level Adjustable	+	-	-	-	+
Graduated Counterpressure	+	+	+	+	+
Comfort level	+	-	+/-	+/-	+/-
Overnight Removal	+	-	+	+	+
Nonallergenic	+	-	+	+	+
Effective Life	18mo	1-2wk	3-6mo	3-6mo	2mo
Long-term cost	\$	\$\$	\$\$	\$\$	\$\$

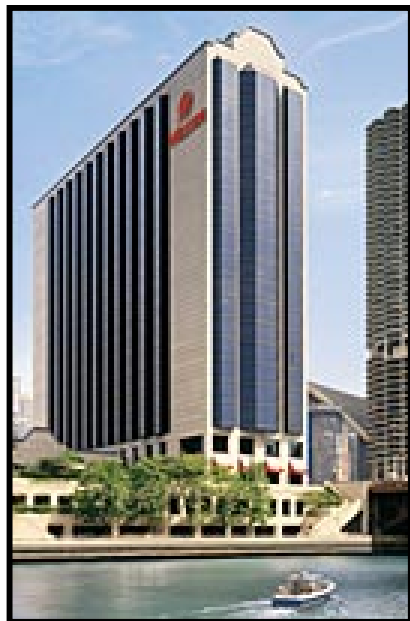
# Summary

- Compression therapy is the cornerstone of Treatment of phlebological disease
- Supportive therapy
  - Surgical treatment
  - Sclerocompressive therapy
  - Endovenous ablation
- Maintenance therapy
  - Venous ulcer
  - Lymphedema



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