

# Self Management with Compression

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# Leg Swelling

- Obstruction of the veins or refluxing blood may cause increased pressure at the venous end of the capillary
- Flow through the capillary slows and the vessel dilates
- Eventually over-distention of the capillary causes endothelial cracks which attracts and activates white cells.
- The exposed collagen can trigger thrombosis
- White cells respond to the increased venous pressure, changing into adhesion molecules. These molecules attach to the endothelium and create an inflammatory response. The transfer of nutrients and waste products is impaired and eventually the capillaries are destroyed.

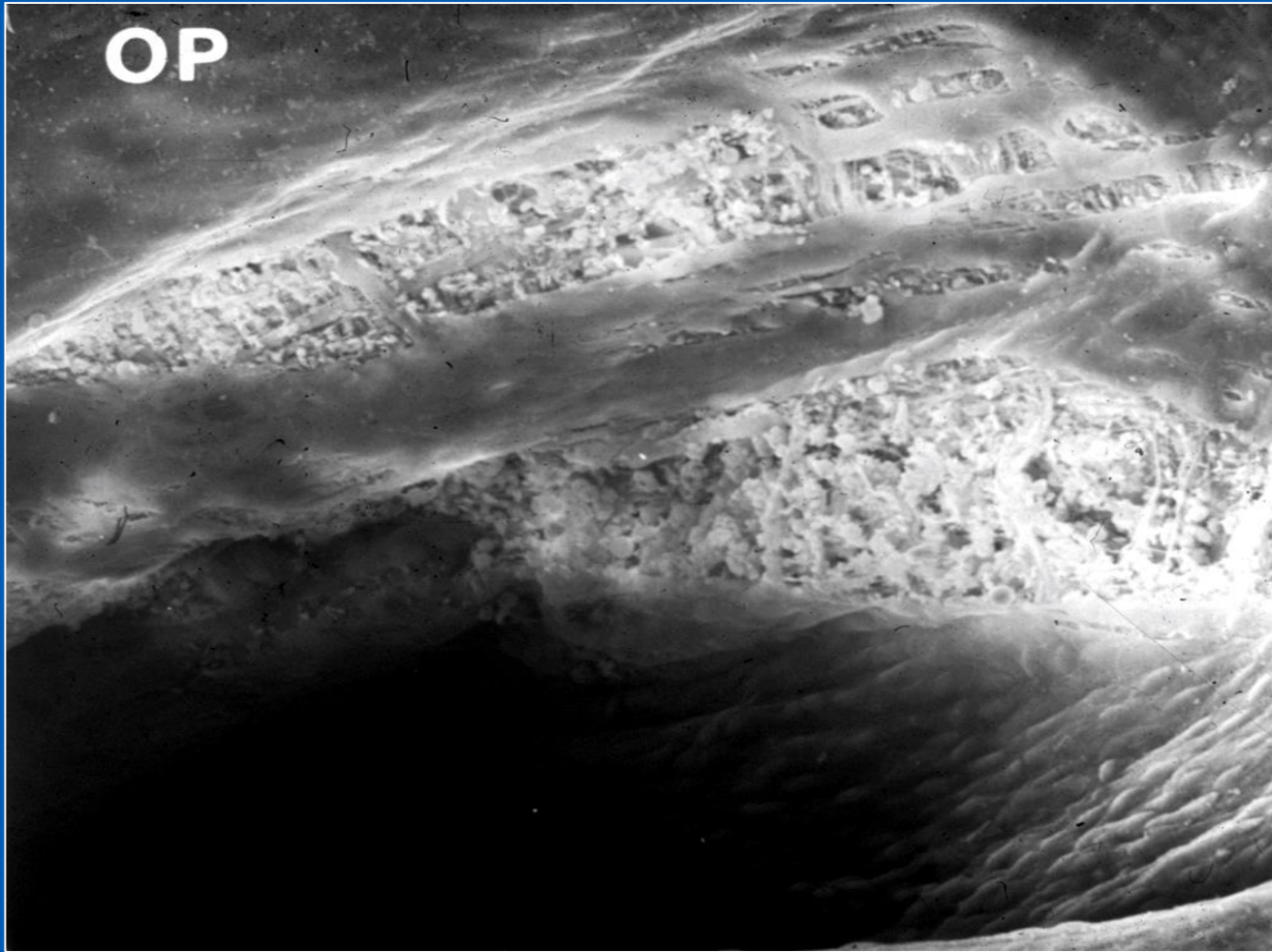


# Leg Swelling

- This process eventually results in total obstruction of the involved capillaries
- No longer is there exchange of nutrients and waste products through the capillary membrane so the areas normally supplied by the capillaries become ischemic
- Tissue necrosis may slowly occur resulting in mummification or skin ulceration
- Cellulitis and also thrombosis in the leg can occur



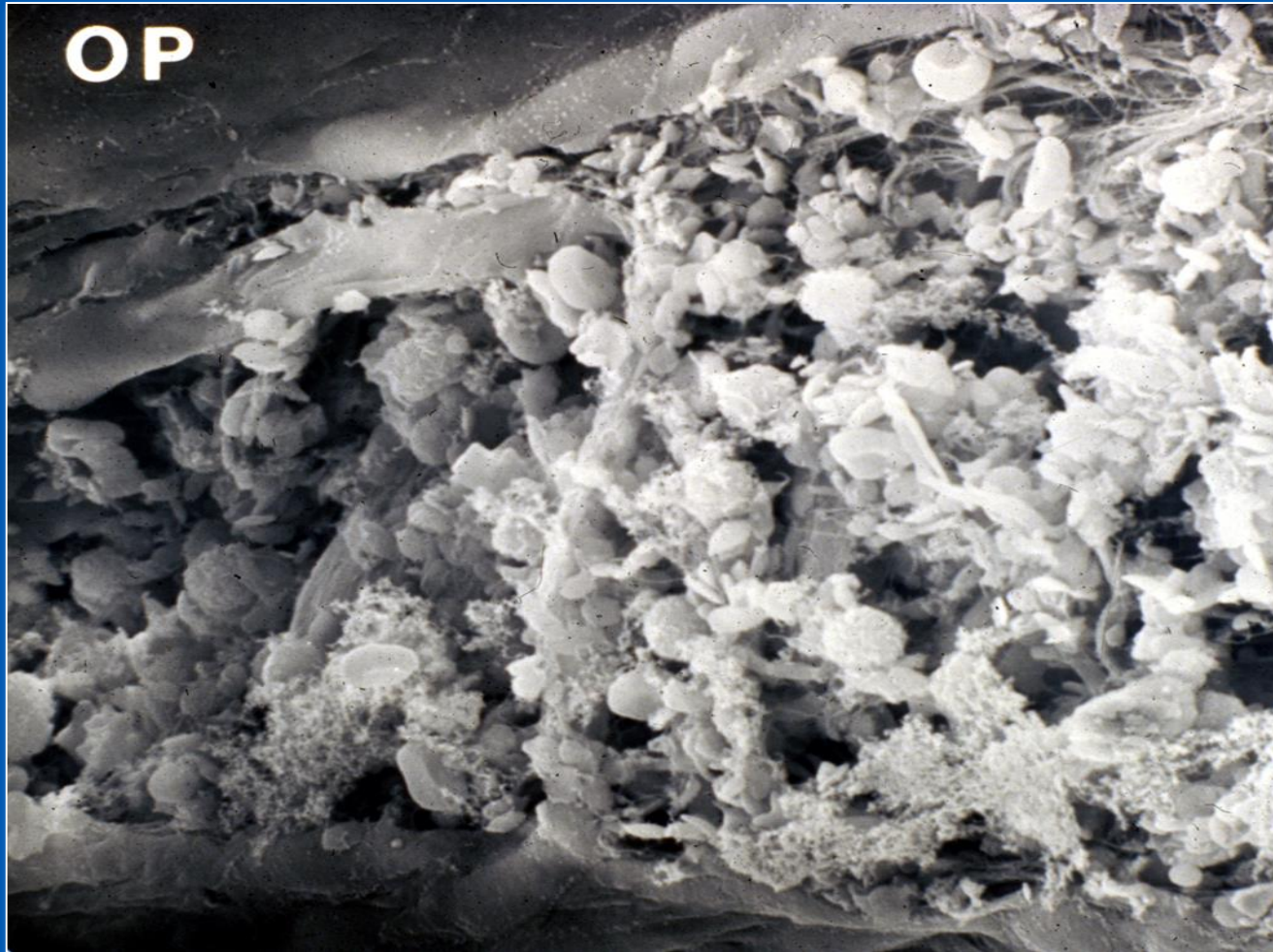
# Endothelial Damage From Venodilatation



Comerota, AC in Rutherford's Textbook of Vascular Surgery, Fourth Edition (WB Saunders Co., Phila. 1995) Figure 134-4(B), page 1793.



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# Velcro Compression



Most people are unaware that giraffes have venous pressures of more than 250 mmHg at their ankles. That is three times more than humans. However, giraffes do not suffer from lymphedema or venous disorders. Physiologists have discovered the answer is in the skin. Giraffe skin is inelastic, so it does not stretch. As their leg muscles contract the veins in the legs are squeezed forcing the blood toward the heart. Thus, giraffes are not susceptible to problems like lymphedema and venous disease, even though they may be on their feet 24 hours a day.

[www.CircAid.com](http://www.CircAid.com)

# Velcro Compression

- Consists of a series of velcro straps that encircle the extremity
- Donning and doffing are extremely fast and efficient
  - Advantages include being able to tighten the device if loosening occurs due to edema reduction, or loosening the device if pain, tenderness, numbness, or other compression-related symptoms occur
- Usually worn over a light stocking or hybrid liner, with only foot compression, to facilitate application of the stocking



# Velcro Compression

- Devices utilize short-stretch material
  - Features a low resting pressure providing comfort at rest
  - Achieves a high working pressure with exercise
    - » As the muscles contract blood is forced out of the leg since the bandage does not “give way”
    - » This results in decreased residual venous volume and edema producing a decrease in leg circumference
    - » Static stiffness index of greater than 10 which is ideal for treating edema

XXXX

# Graduated compression surgical stocking

No change in pressure on leg resulting in  
little to no increase in venous outflow

20 mmHg

10 mmHg

LAY

STAND

EXERCISE

RECOVERY

sec/div: 10s (examination time 90 s)

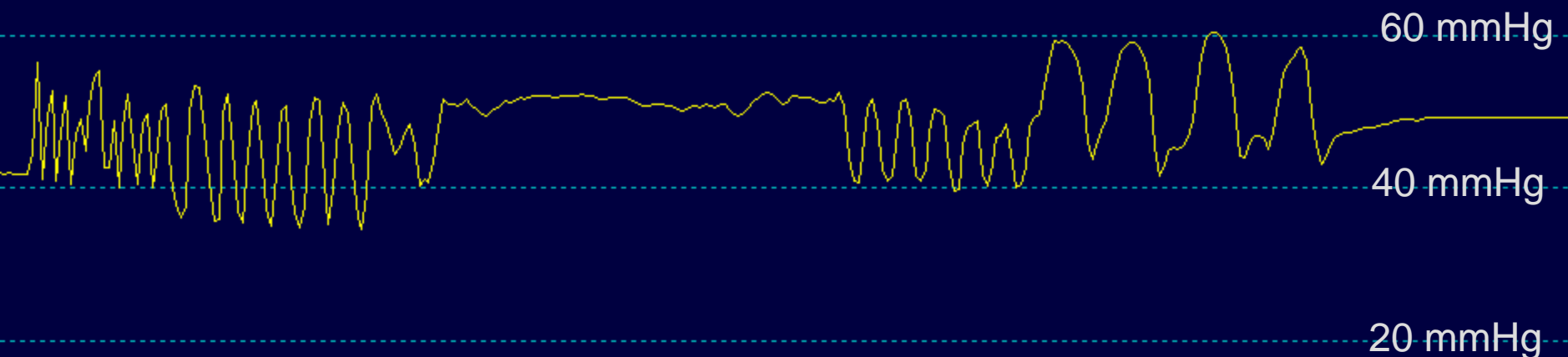
pressure (mmHg):

cursor 1: -

cursor 2: -

difference: -

## Velcro Appliance System



Note the marked difference between resting and ambulatory pressure. Dramatic edema reduction will result. This device is designed to be used as a wound compression dressing, can be changed daily, and shortens healing time.

g

sec/div: 10s (examination time 90 s)

pressure (mmHg):



cursor 1: -

cursor 2: -

difference: -

ate: 05.11.2011

# Velcro Compression Devices



# Indications

- Patient having difficulty donning or doffing devices due to some or all of the following problems
  - » Age
  - » Weakness
  - » Arthritis in hands, shoulders etc.
  - » Obesity or advanced pregnancy
  - » Restricted mobility
  - » Lymphedema
  - » Edema uncontrolled with conventional stockings
  - » Leg wounds where treatment with compression bandages not tolerated or feasible



# Indications II

- Patients having joint replacement who have preoperative swelling or venous insufficiency
- Patients with more severe leg swelling uncontrolled with conventional support stockings
- Patients with advanced degrees of swelling including lymphedema or the venous stasis syndrome due to obesity
- Patient after leg surgery where stockings cannot be properly donned or doffed

# Stocking Failure



F1=Batt

F4=Start

F5=Save

F6=>Tra

F9=Pri

F10=Sc

ENTER=S

Home=M

\*=Calcul

SPACE=S

ESC=E

**Elastic stocking 20-30mm Hg**

60 mmHg

40 mmHg

20 mmHg

Pressure on leg decreases with activity resulting  
in little to no increase in venous outflow

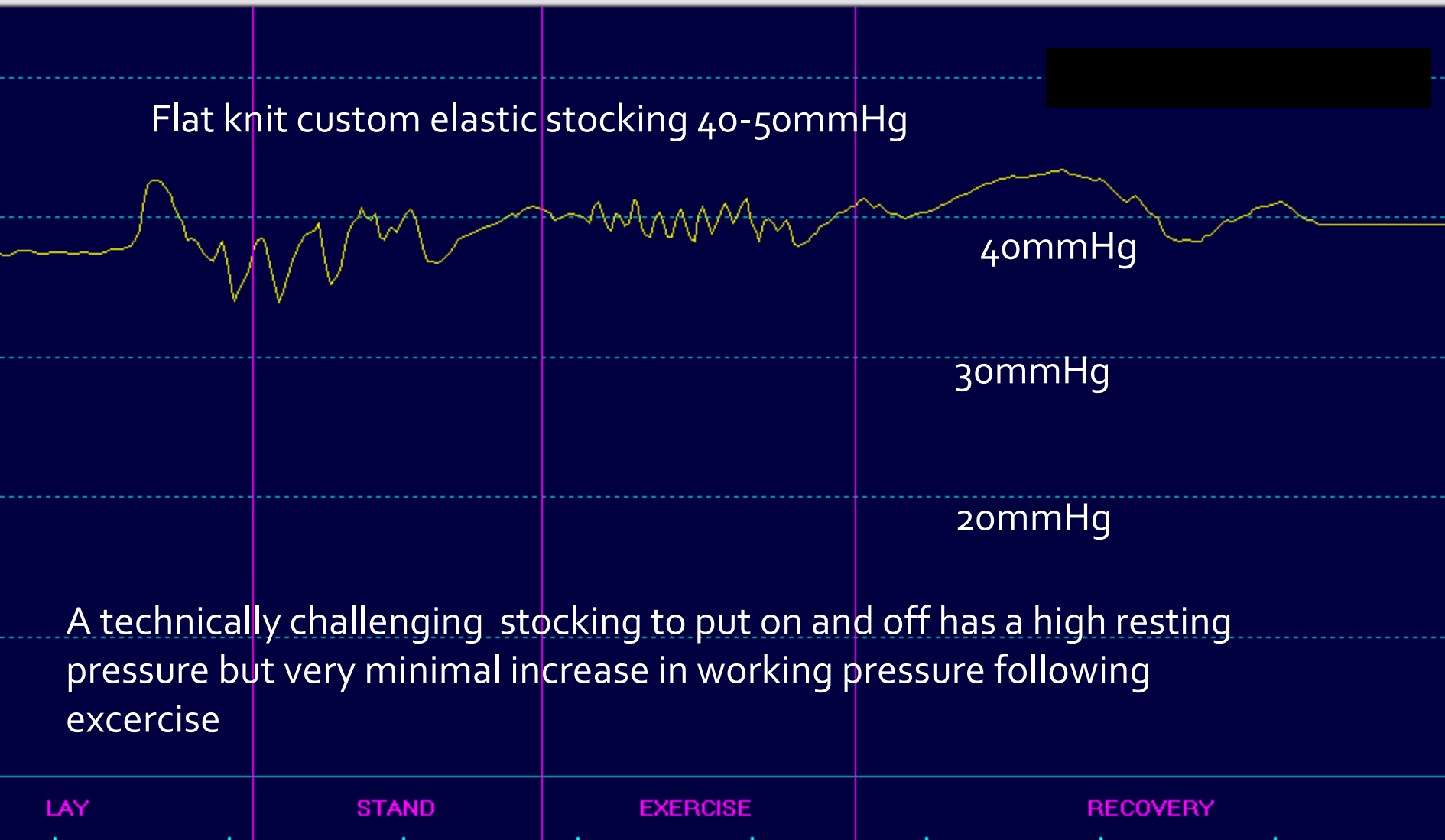
sec/div: **10s (examination time 90 s)**

pressure (mmHg):

cursor 1: -

cursor 2: -

difference: -



g

sec/div: 10s (examination time 90 s)

pressure (mmHg):

cursor 1: -

cursor 2: -

difference: -

ate: 4/23/2012

# Clinical Experience II

- Patients with a large abdominal girth have increased leg venous pressure due to the increased intra-abdominal pressure which may exceed 50mmHg in some patients
- The standard 30-40mm Hg stockings are unable to reduce swelling, pain, and discomfort
  - Extremely difficult to apply and remove
  - Increase leg discomfort due to their elastic properties
  - Poor patient compliance results increasing leg swelling, venous stasis, and increased skin fragility



# Venous Stasis Syndrome



# ***Venous Insufficiency Induced Lymphedema***





# ***Venous Insufficiency-induced Lymphedema After Treatment With Velcro Devices And Lace Shoes***



# Mixed Arterial & Venous Insufficiency

- Patients with reduced ankle pressures and swollen legs
  - Velcro devices are ideal providing low resting pressure and high working (walking) pressure
  - Easily adjusted to tighten or loosen depending on patient tolerance (pain, numbness, tingling, etc)
  - Can be used for most of these patients as long as the resting pressure is less than the systolic pressure at the ankle
- Arterial inflow may increase as blood is pumped out of the leg temporarily improving leg perfusion

# Adjunctive Measures

- Foot Compression
  - » specially designed velcro foot piece used when significant foot swelling is present
  - » Hybrid stockings \*
    - features 20mm Hg foot compression but negligible leg compression
    - This facilitates donning and doffing of the stocking
  - » Stockinette under liner may be used for when skin lesions are present
  - » Light stocking can supplement the effects of leg compression
  - » Ankle sleeve may be necessary to control ankle swelling in some patients
  - Lace or Velcro strap shoes limit foot swelling

\*Farrow, USA



## Velcro Appliance Over Farrow Hybrid liner\*



## Ankle Sleeve Used To Control Swelling



\*The Farrow hybrid liner is a stocking with 20mmHg foot compression and negligible leg compression to aid donning and doffing. It serves as a liner under the velcro appliance to protect the skin and along with lace shoes helps prevent foot swelling.

# Clinical Experience II

- Patients who reach their eight or ninth decade frequently suffer from leg edema especially if they are also overweight
  - These individuals frequently are seen in the wound clinic with skin lacerations or stasis ulcers and once they are healed long-term management with velcro devices has reduced recidivism
  - Relying on these patients to use stockings to control swelling long-term has a high failure rate
  - The use of velcro devices in our experience is well tolerated and provides ongoing edema reduction

# Patient is 95 years old: Six months using Surgical hose (TED)

Velcro devices prescribed after 1 wk compression bandages





# CirCaid Cure

- These devices are particularly useful in patients with healing venous stasis leg ulcers instead of using compression bandages
- They can be removed for wound cleansing and reapplied to exact leg pressures without special expertise
- They can be fitted in the office without the need for sending the patients to be measured at an outside facility
- In some cases they may have economic advantages

# Leg Lesions Suitable For Velcro Instead of Bandages





# CircAid Cure



# Conclusions

- *Velcro appliances should be considered in patients who fail standard support stockings*
  - *Non compliance due to donning/doffing issues*
  - *Failure to control swelling*
  - *Morbidly obese patients*
  - *Patients with arthritis or reduced flexibility*
  - *Most patients over 75-80 years of age*
  - *Patients with mixed arterial and venous insufficiency*
  - *Alternative to compression bandages for selected leg wounds*



THE END