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Compression Therapy for the treatment of venous leg ulcers

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Indication/contraindications

indications

* Diagnosis of venous ulcer following assessment
* ABPI > O.8 for full compression
* Good pain management

Contraindications

* Arterial disease
* Untreated hypertension
* Wound infection
* Acute cellulitis
* Deep vein thrombosis
* Uncompensated heart failure
* Caution – diabetic patients/rheumatoid arthritis due to micro vascular disease
* Uncontrolled pain

A systematic review of compression treatment for venous leg ulcers

Fletcher, Cullum, and Sheldon (1997)

* Compression treatment increases the healing of ulcers compared with no compression
* High compression is more effective than low compression
* No clear differences in the effectiveness of different types of compression systems have been shown
* Intermittent pneumatic compression appears to be a useful adjunct to bandaging
* Rather than advocate one particular system, the increased use of any ***correctly*** applied high compression treatment should be promoted
* Type of compression used varies according to patient need

* Compression therapy in the form of bandaging or hosiery, is regarded as the first line of treatment when venous leg ulceration occurs in the absence of clinically important arterial disease

Fletcher, Cullum & Sheldon (1997)

* The current state of understanding is that optimum compression therapy is achieved with a sub-bandage pressure of 40mmHg at the ankle in order to reverse chronic venous hypertension .

Stemmer (2000)

Types of compression therapy

* Multi-layer graduated high compression systems (4 layer bandages) - elastic
* Short stretch bandages – non elastic
* Intermittent compression therapy
* Hosiery kits

Multi layer elastic bandage systems

The science of compression therapy
Laplace's law: theoretical pressures

$$P = \frac{T \times N \times 4620}{C \times W}$$

Sub Bandage Pressures

Sub bandage pressure P is dependent on:

* **N** = number of layers of bandage – more layers, the greater the pressure
* **T** = tension in the bandage – the greater the force applied, the greater the pressure
* **C** = limb circumference – the smaller the circumference, the greater the pressure
* **W** = width of bandage – the narrower the bandage, the greater the pressure
* **4620** = the accepted constant

* La Place's Law can be used to predict the level of pressure that will be exerted upon a limb by a given bandage
* The pressure generated by a bandage immediately following application is determined by tension in the fabric, number of layers applied and is inversely proportional to the circumference of the limb

Therefore:

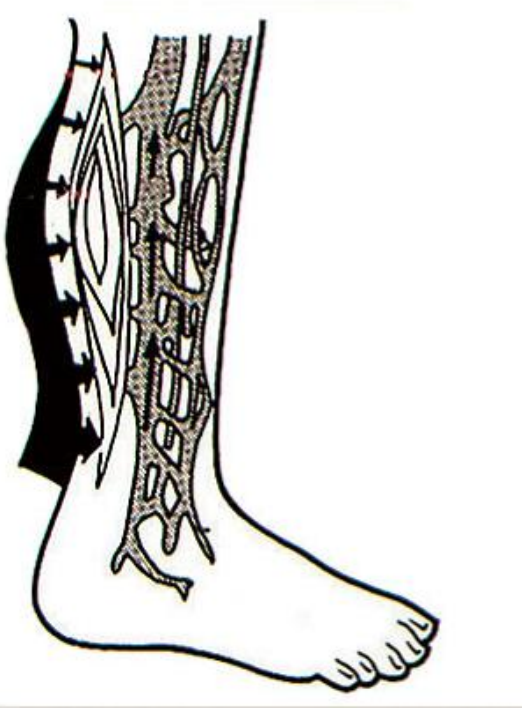
* Limb circumference affects the sub bandage pressure
* The thinner the leg, the more pressure will be exerted
* The more layers/overlaps are applied, the greater pressure
* This pressure is additive
* Requires skill in applying bandages to avoid excessively high pressures

LaPlace's law in practice

High pressures

Low pressures

* Multiple layer system has been recommended by International Leg Advisory Board as first line of treatment
* Provides consistent graduated compression to mobile/immobile patients – 40mmHg at ankle size 18-25cm



Multi layer compression therapy

* Introduced 15 years ago by Charing Cross Hospital
* Still popular today
* Healing rates achieved:
  * 34 -40% - 12 weeks
  * 46 -50% - 17 weeks
  * 57% - 24 weeks
  * 80% - 2 years

Thomson et al (1996)

Morrell et al (1998)

Ellison et al (2002)

However……..

* Healing rates achieved by specialist leg ulcer clinics
* Rule of 6:-
* Ulcer > 6^2 cm
* Present for > 6months
* Will not achieve healing within 6 months
* Increasing number of mixed aetiology ulcers


Dressing


Layer #2


Layer #3


Layer #1


Layer #4

How compression works

* Accelerates venous flow
* Central haemodynamic effects
* Reduces venous reflux by realignment of valves
* Improves venous pump action
* Reduces oedema
* Promotes healing of ulceration

Multi layer compression

Advantages

* Proven to heal venous leg ulceration
* Provides constant high working pressures
* Can be tailored to patient need ie mixed aetiology ulcers
* Sustained compression for up to 1 week (depending on exudate)

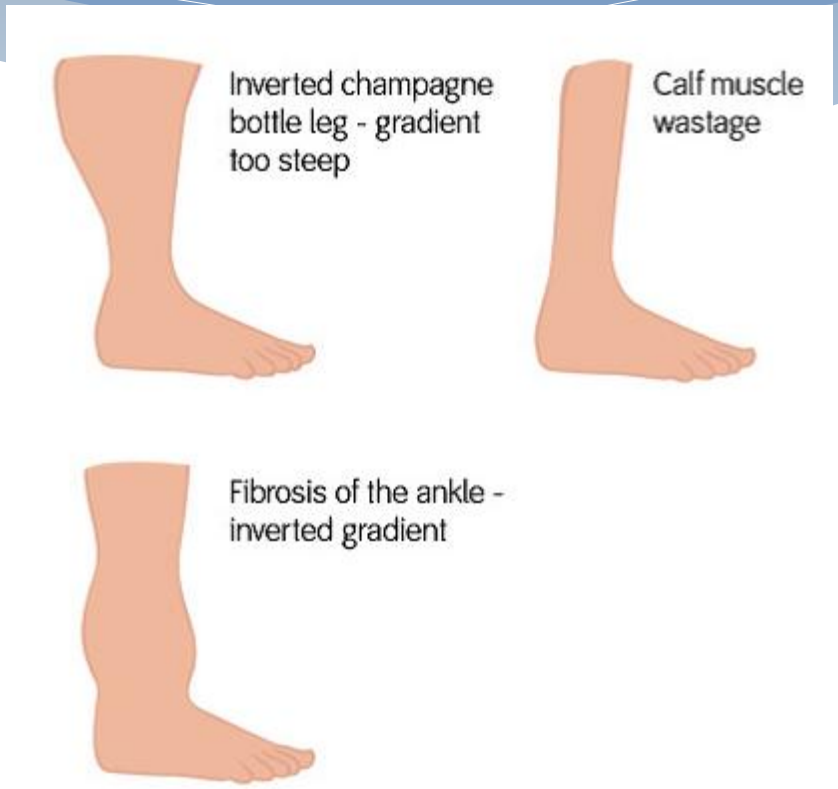
Disadvantages

* Requires skilled application
* Poor application can have devastating consequences
* Can be painful initially
* Poor patient concordance – warm, difficult to get footwear
* Constant pressures
* Expensive

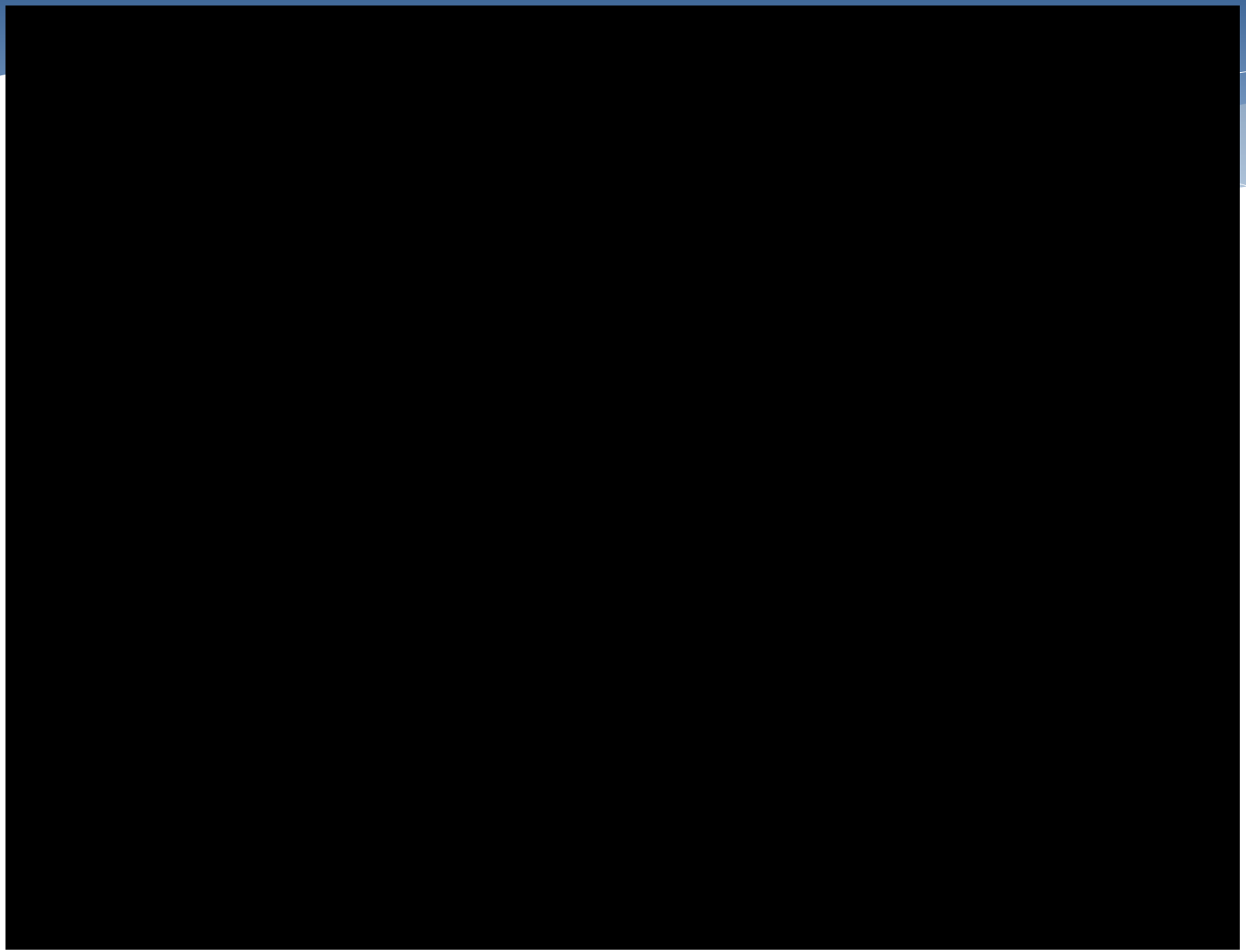
Pressure damage through poor application technique

Assessing the shape of the leg

* Many legs do not have a natural gradient as a result muscle wastage, fibrosis and oedema
* These legs can be re-shaped using absorbent padding to approximate a natural gradient before applying compression bandage



Problem-solving……

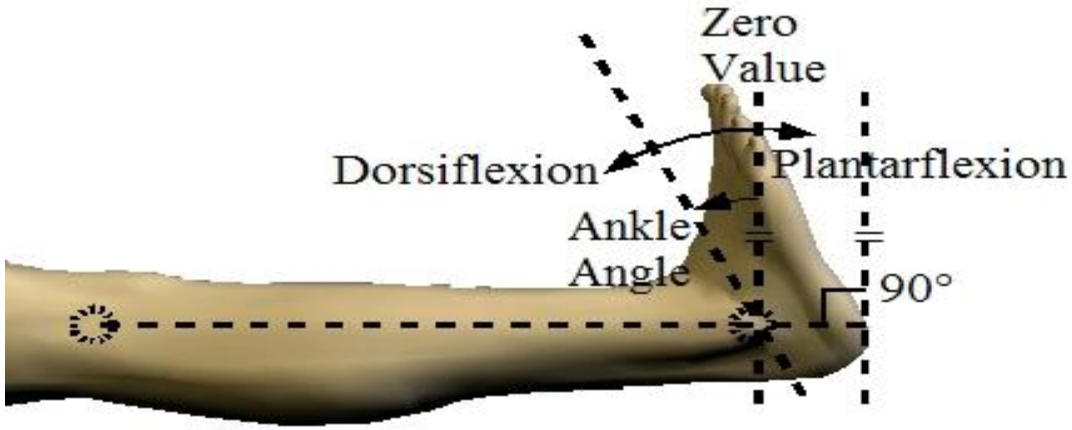


Inelastic bandages – short stretch

Mode of action

* Limited extensibility of bandage creates semi-rigid tube
* As calf muscle contracts, blood rebounds against tube and pressure causes blood in deep veins to progress towards the heart
* Firm tube discourages backflow of blood, reducing high pressures in ankle and oedema

Mode of action



Short stretch bandages

Advantages

* Safe to apply – even inexperienced practitioners
* Better patient concordance – footwear
* High pressures only on mobilisation – mixed aetiology
* Cost=effective – some can be re-washed
* Used for lymphoedema also

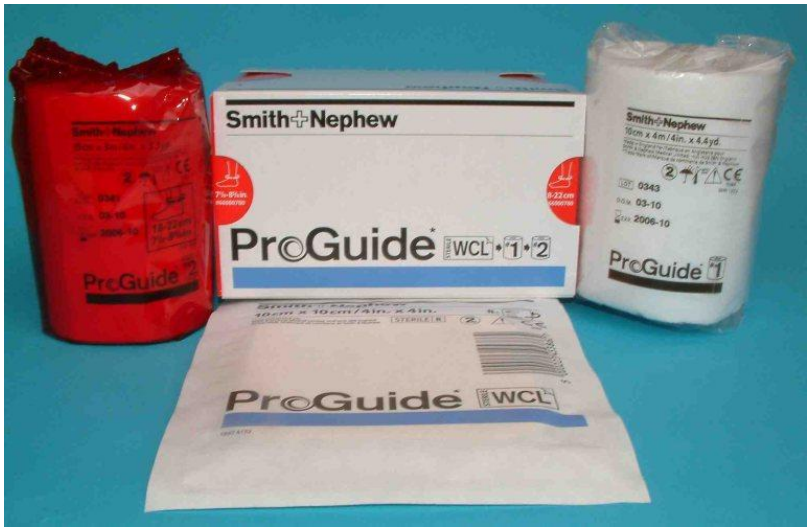
Disadvantages

* Rapid reduction of oedema – will slip
* May need more frequent applications
* Assessment of patient's mobility

Alternative Systems
2 piece compression hosiery kits

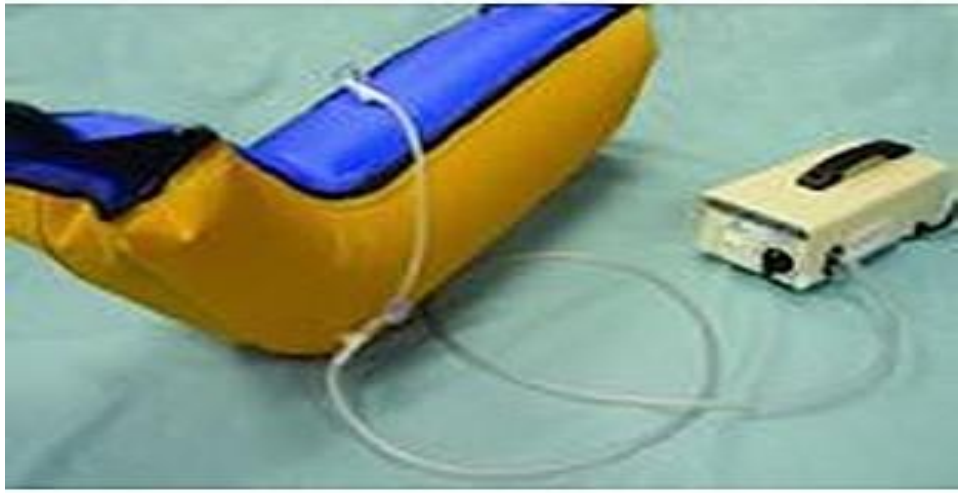
* Gives 40mmHg at the ankle
* Self-care for patients
* No specialist training required
* Ulcers with low exudate levels only
* Made to measure options available
* Suitable for therapy and prophylaxis

2 layer elastic compression systems



Compression for mixed aetiology ulceration

Intermittent Pneumatic Compression (IPC)



* Boot comprising of air-filled chambers attached to an electric pump – pressures 40-90mmHg
* Sequential inflation 7 deflation mimics effect of calf muscle pump
* Improves oxygenation, accelerates venous return and reduces oedema
* Useful for patients with poor mobility or arterial insufficiency
* Useful for intolerance of bandages/hosiery
* 2 hours twice daily
* Can be used with compression bandages

Disadvantages

* Costly - £2000-£3000 each
* Noisy
* Inconvenience
* Technically complex for older people
* Requires perseverance
* Further research required as to optimum usage

Post-healing Care

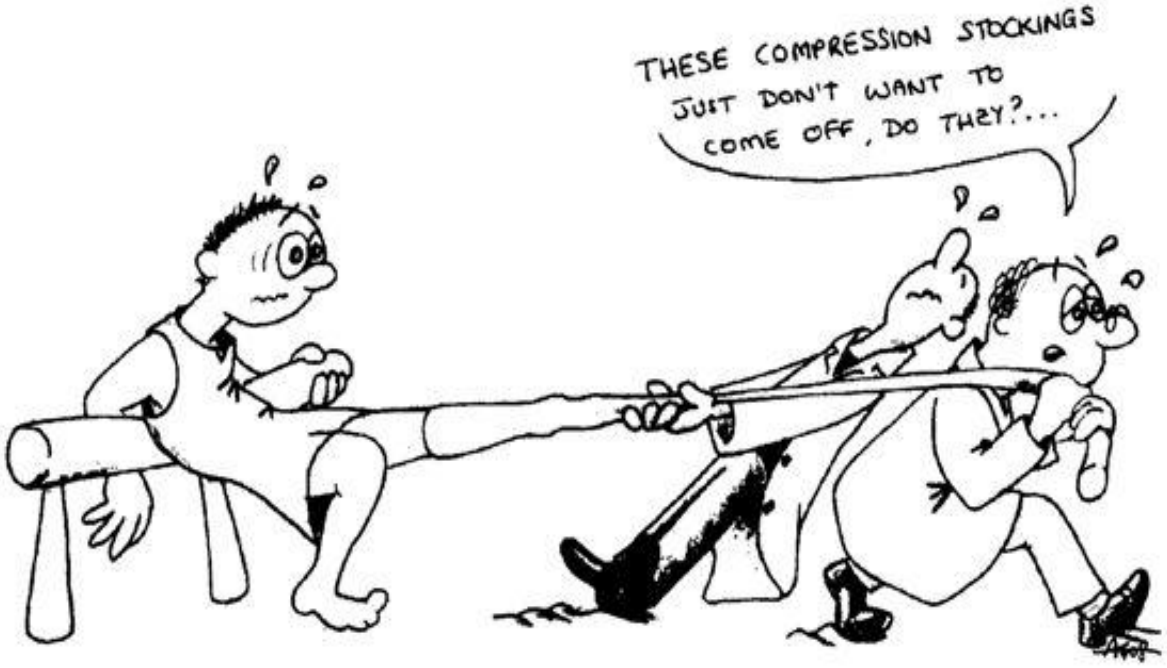
* Requirement for life-long compression –in absence of surgery - not curative
* Class 2 (18-24mmHg) compression stockings fitted 2 weeks post healing
* Reassessment every 3 months
* Doppler assessment every 6 months
* ***"A leg ulcer patient is a patient for life"***

Problems

* High recurrence rates – 70% in 1 year

  30% in year

- Poor concordance due to
- Poor education
- Poor understanding of aetiology/health needs
- Inability to apply hosiery
- Lack of follow up


THESE COMPRESSION STOCKINGS JUST DON'T WANT TO COME OFF, DO THEY?...

Further reading

* A World Union of Wound Healing Societies' Initiative Principles of Best Practice – ***Compression in venous leg ulcers*** – a consensus document (2008)
* EWMA- ***Understanding Compression Therapy*** – Position document (2003)
* Available to download on the internet.

Thank you – any questions?