Compression in concomitant arterial occlusive disease

Hugo Partsch

London, May 14, 2015

Concomitant PAOD is a frequent condition

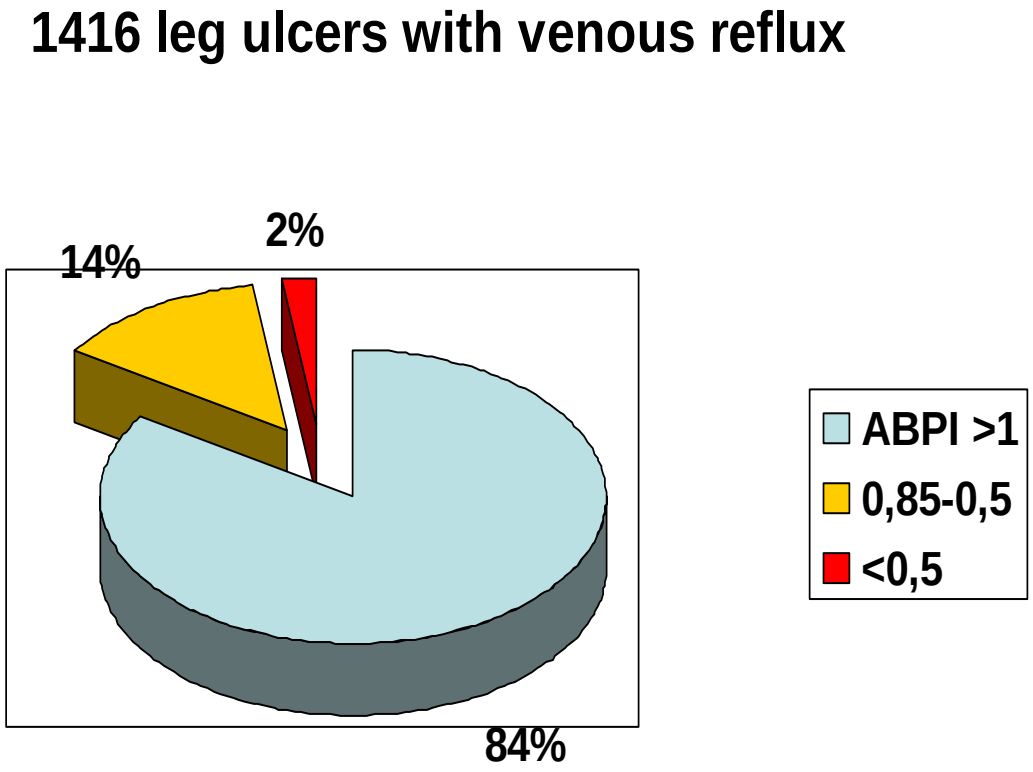
- Framingham Study:

- ABPI<0,9: ~10 % in adult population

  ~20% in age >70y

Price JF, et al. Frequency of a low ankle brachial index in the general population by age, sex and deprivation: cross-sectional survey of 28,980 men and women. Eur J Cardiovasc Prev Rehabil. 2008 Jun;15(3):370-5

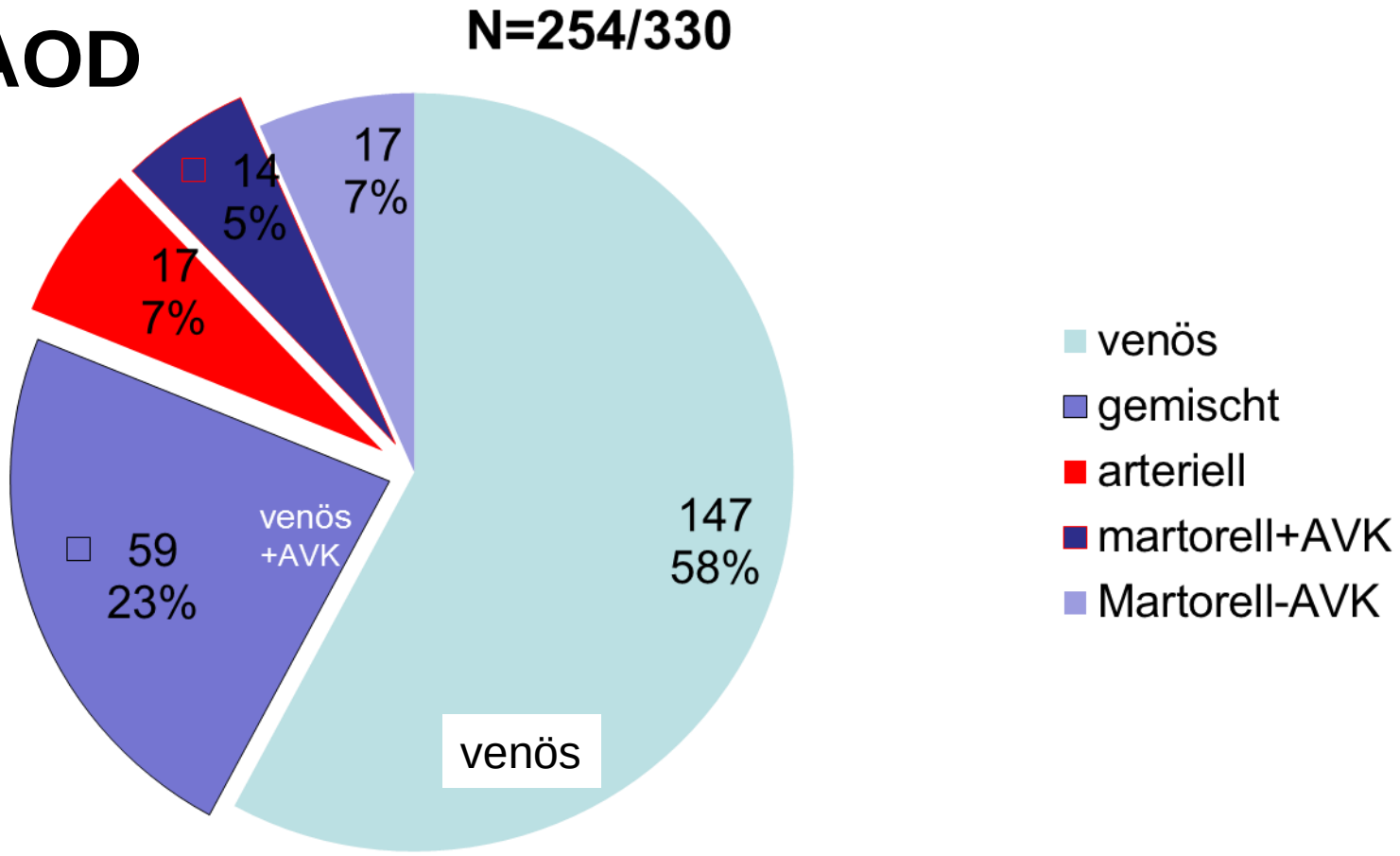
16% of venous ulcers are „mixed“



Humphreys ML et al. Br J Surg. 2007 Sep;94(9):1104-7

„Vascular Ulcers“

27% PAOD in 330 ulcers



Hafner J et al. Arch Dermatol. 2010;146(9):961-968

COMPRESSION

- First choice when extremity is swollen, painful, inflamed, open

- Contraindiated in every case of arterial occlusive disease (20-30%) ?

Patient in horizontal position

Cuff over the ankle area: Ankle pressure AP

ABPI= Systolic ankle pressure : arm pressure	
>1,3	Mediasclerosis
>1,0-1,3	No PAOD
0,81-1,00	Mild PAOD ?
0,51-0,8	Moderate PAOD
<0,5	Critical ischaemia

CONSENSUS RECOMMENDATIONS

SIMPLIFYING VENOUS LEG ULCER MANAGEMENT

Recommendations from an expert working group

Wounds INTERNATIONAL

2015

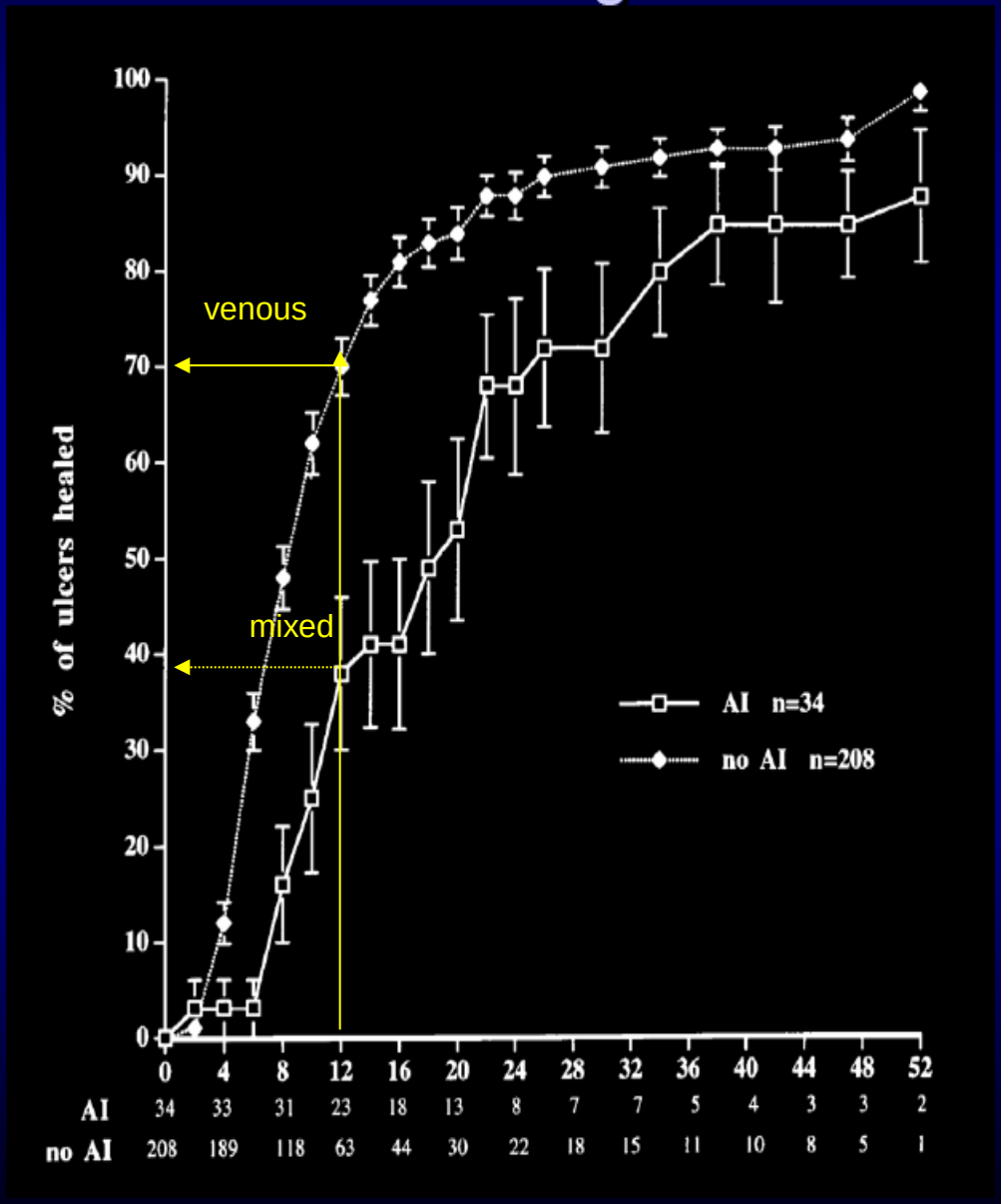
What to do if ABPI is abnormal?

ABPI <0,8 or >1,3	
ABPI > 1,3	Refer to specialist for further investiagtions and care
ABPI 0,5-<0,8	Refer to specialist MODIFIED COMPRESSION using a stiff system may be applied with frequent reassessment and monitoring for ischemia and pressure damage
ABPI < 0,5	Refer to vacular surgeon for possible revascularisation Consider IPC

PAOD –NO containdication

ABPI 0,5-<0,8	**MODIFIED COMPRESSION using a stiff system may be applied with frequent reassessment and monitoring for ischemia and pressure damage**

Venous Ulceration and Healing



Marston W et al
J Vasc Surg 1999; 30: 491

Reproduced with permission from Anthony J.Comerota, MD, FACS

25 patients with mixed ulcers

(ABPI 0.42-0.8)

Mosti G. Iabichella M, Partsch H: J Vasc Surg. 2011

- 1. Flat Laser Doppler under the bandage
- 2. Standard Laser Doppler on first toe (plantar)
- 3. TcPO2 dorsum of the foot
- 4. Toe pressure

- without bandage
- Inelastic bandages
  - 20-30 31-40 41-50 mm Hg (measured by Picopress)


25 patients with mixed ulcers (ABPI 0,6-0,8)
ergoline
Microlab
Pull plunger out
PicoPress
Inelastic bandages -40 mmHg
INCREASE of LDF
NO distal
flow reduction
Mosti G et al. **J Vasc Surg**. 2012 Jan;55(1):122-8

Inelastic compression in mixed ulceration (n=25)

- ABPI 0,5-0,8, ankle pressure > 60 mmHg:
- Inelastic bandages with pressures <40mmHg
  - **Increase arterial perfusion**
  - **increase venous pump (Ejection fraction)**

Mosti G et al. J Vasc Surg. 2012 Jan;55(1):122-8.

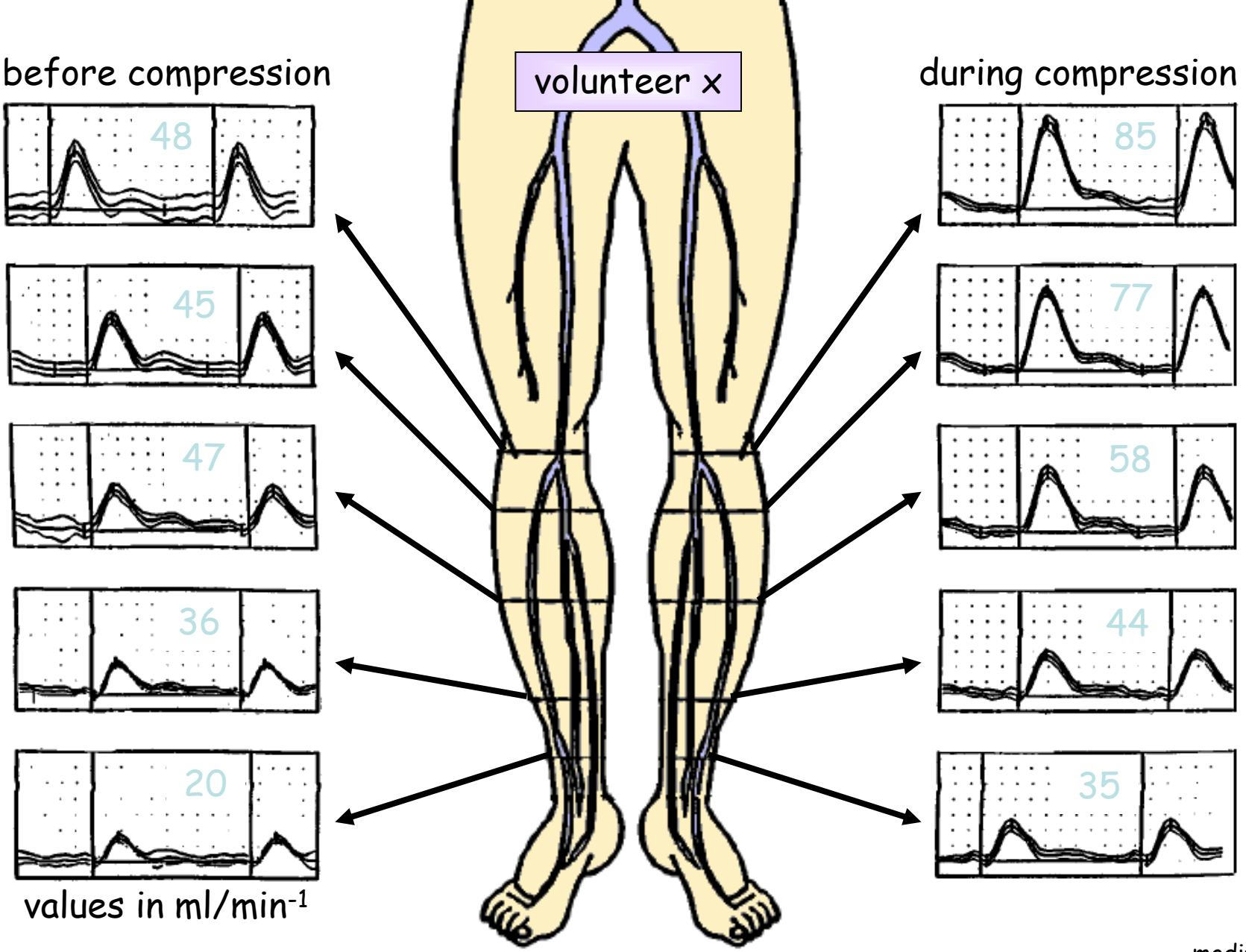
„MODIFIED compression“ if ABPI 0,5-0,8

- Inelastic material not exceeding 40 mmHg
- Paddding of sharp curvatures (bones and tendons)
- Frequent bandage change (initially daily)
- Check for pressure marks on the skin
- Walking exercises
- Combine with IPC

Inrease of blood flow under light compression

Shown :

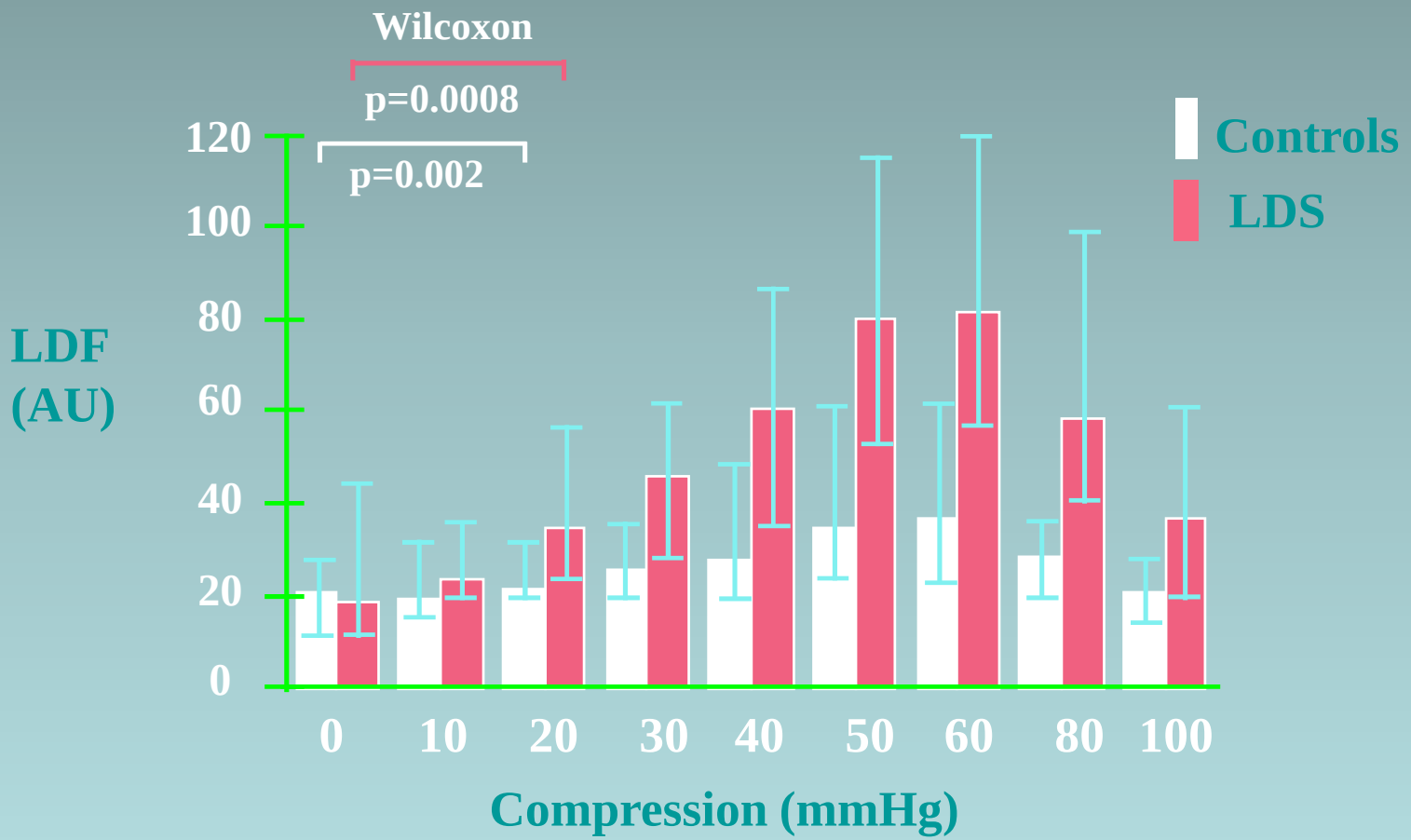
- In normals –
- In venous patients
- In purely arterial patients



nuclear magnetic resonance flowmetry

modified from:
Mayrovitz HN, Larsen PB.
Effects of compression bandaging on leg pulsatile blood flow.
Clin Physiol 1997; 17: 105–117.

Laser Doppler Flux
Effect of compression in venous patients (sitting)



Abu-Own A et al. J Vasc Surg 1994;19: 1074-1083

Courtesy Ph. Coleridge Smith

Compression in arterial patients

- 15 patients with PAOD (ABPI 0,5-0,8):
  - inelastic bandages,
  - standing pressure 25-30 mmHg
  - up to 2 weeks:

- Improvement of microcirculation, no skin damage

Jünger M et al. et al. Clinical Hemorheology and Microcirculation 53 (2013) 281–293

Compression effects on arterial circulation

- **Sustained compression**
  - **light pressure enhances arterial flow**
  - **strong pressure reduces arterial flow**

Mayrovitz HN et al. Ostomy Wound Manage 1998;44:56-60

Abu-Own A et al. J Vasc Surg 1994;19: 1074-1083

- **Intermittent compression**

  - enhances arterial flow

Delis KT et al. Ann Surg 2005;241:431

Labropoulos N et al. Vasc Med 2002;7:141

Mayrovitz HN et al. Adv Skin Wound Care 2003;16198

Dai G et al. AJP-Heart and Circ Physiol2002;282:2066

Inrease of blood flow under light compression: Some possible explanations

- Myogenic relaxation in arterial wall
- Release of vasodilating mediators
- Reduction of arterio-venous pressure gradient by improvement of venous return

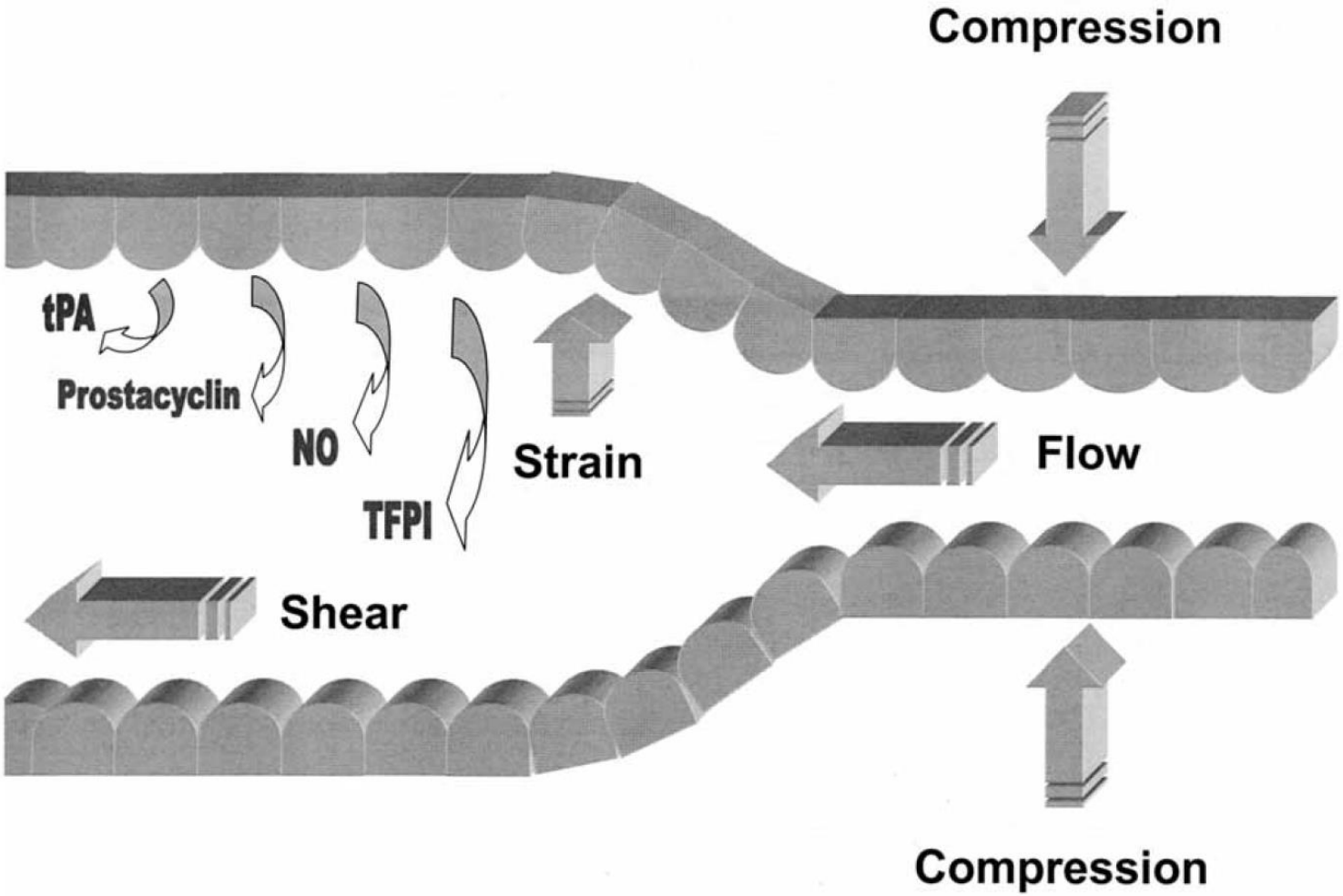
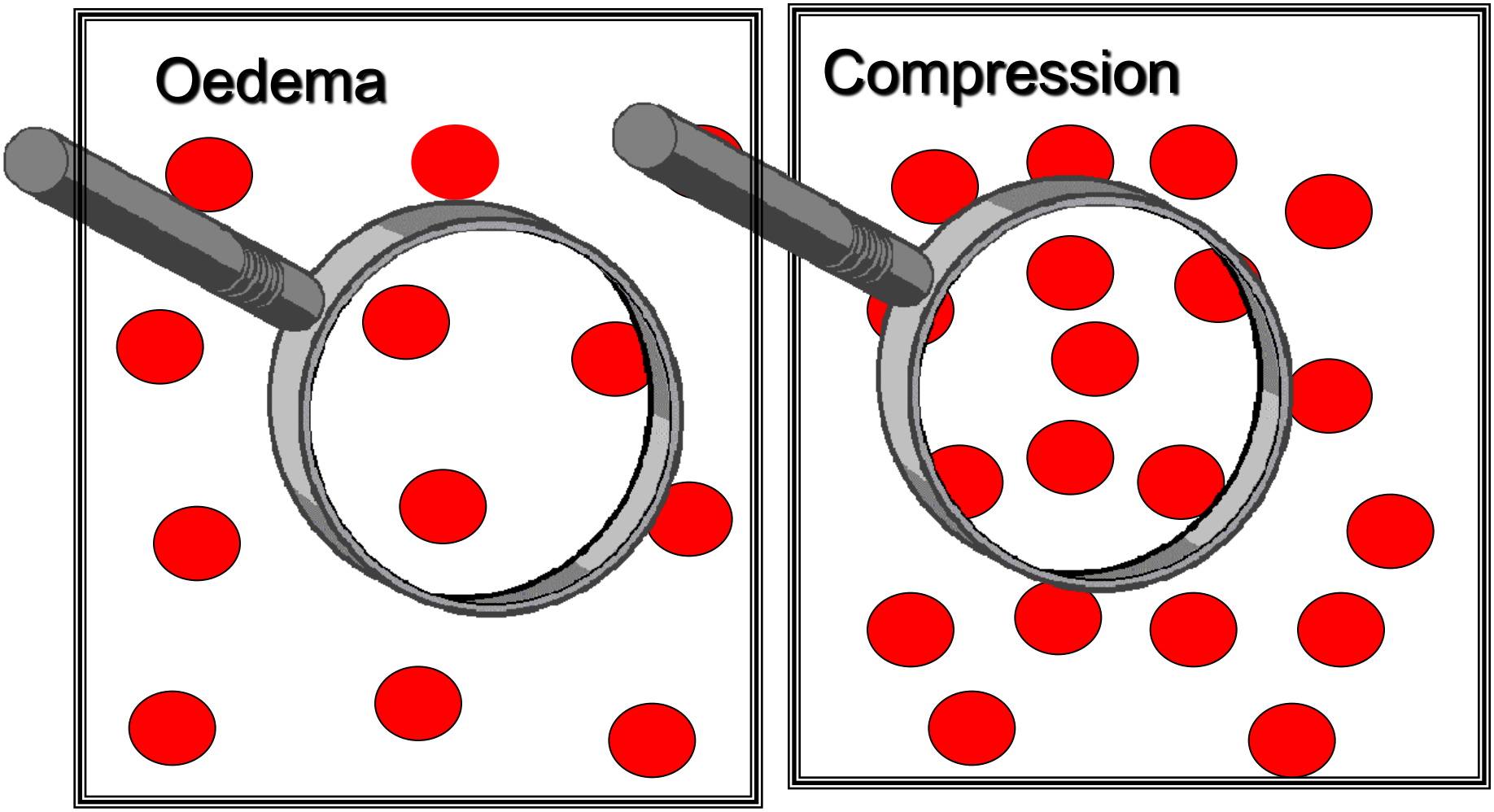


Fig. 1. Mechanical effects of pneumatic compression on a vein or artery. The pneumatic compression increases intravascular flow, shear and compressive strain on endothelial cells with the resulting release of biochemical mediators. tPA: tissue plasminogen activator; NO: nitric oxide; TFPI: tissue factor pathway inhibitor.

Pressure induced vasodilation

- Compression triggers an arteriolar vasodilatory axon reflex response, mediated by nervous and biomechanical signals (Fromy B et al.)
- Increase of skin blood flow under compression stockings (Mayrovitz HN 2013, Grenier et al. 2014)

Increase of capillary density



Bollinger A, Fagrell B. Clinical capillaroscopy, Hofgreve & Huber 1990

Warning!!!
Ankle pressure < 50=
Critical ischemia=
Contraindicaction sustained compression

Sustained bandage pressure should never exceed the arterial perfusion pressure (= ankle pressure)!

Persisting or increasing pain: Remove the bandage!

Consider neuropathy!

Hazards of compression treatment of the leg: an estimate from Scottish surgeons

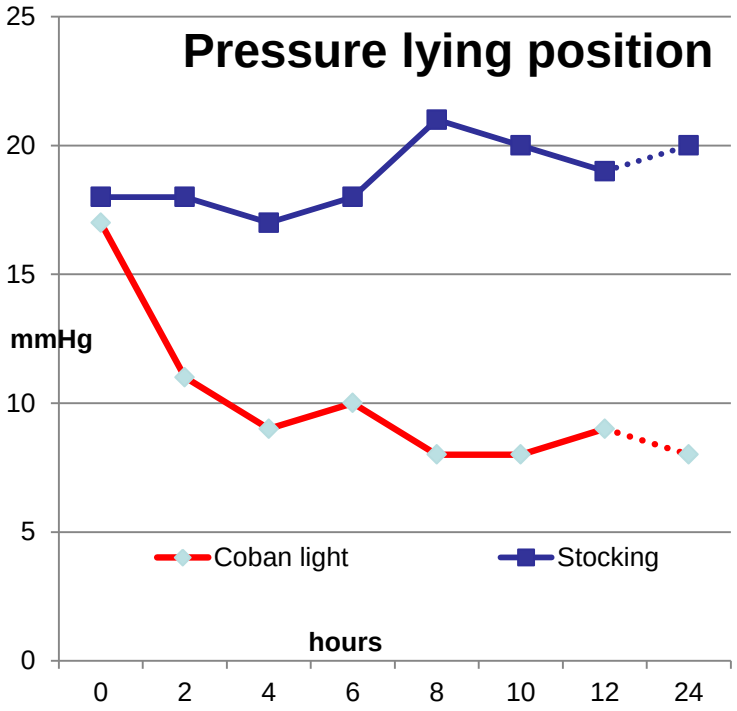
Callam MJ, Ruckley V et al.
Br Med J (Clin Res Ed). 1987 Nov 28;295(6610):1382

- 38 cases of skin necrosis after antiembolism stockings
- 36 cases after compression stockings
- 73 cases after compression bandages

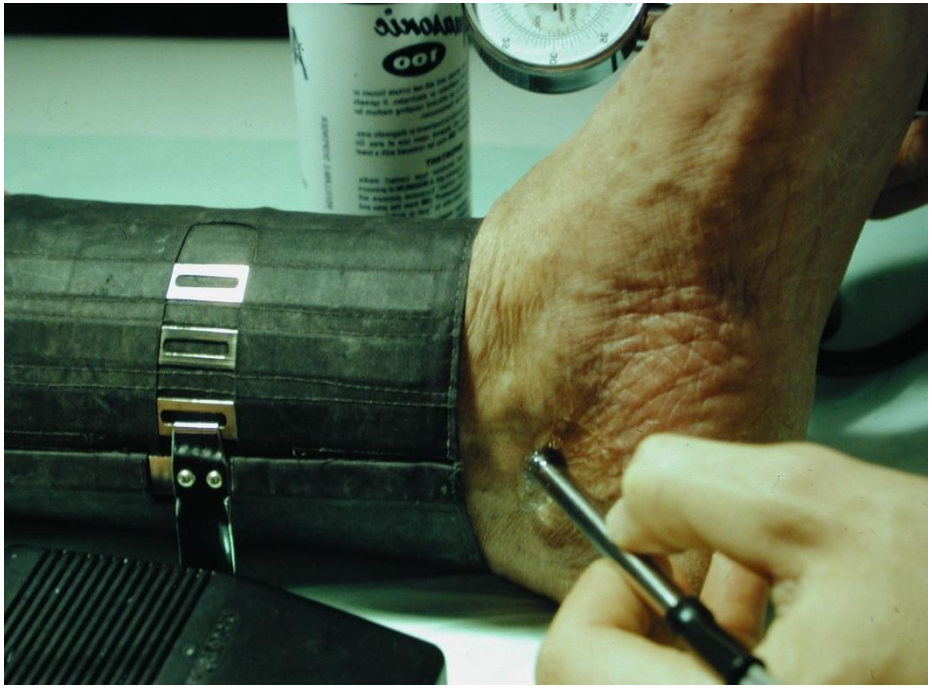
Avoid sustained compression

- Elastic material provides sustained compression
- Inelastic compression produces high pressures intermittently during walking only, loses pressure immediately

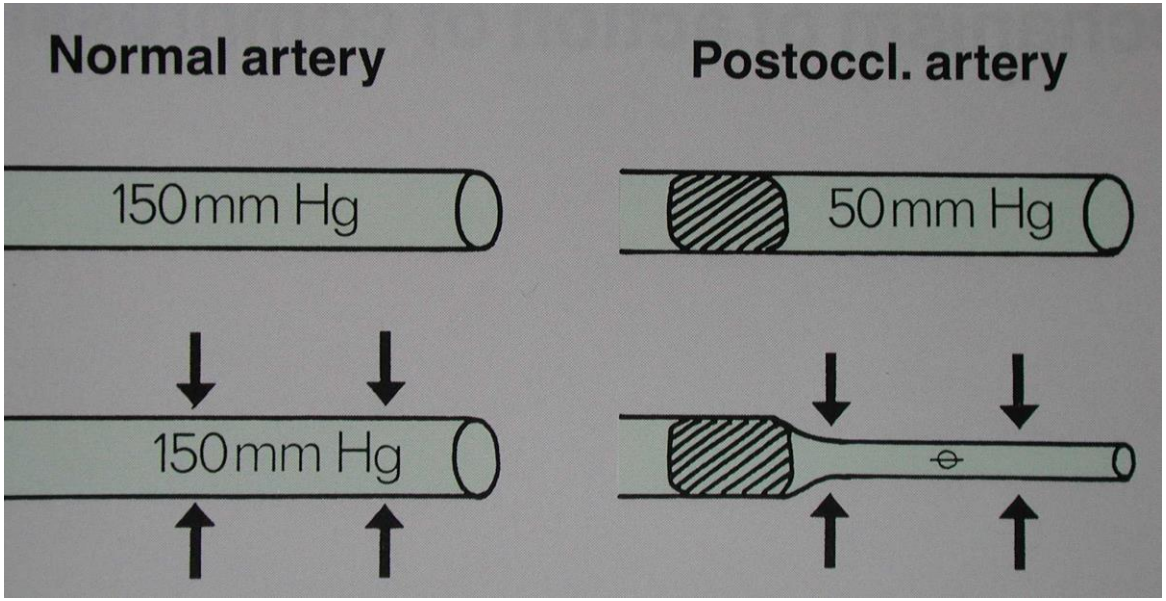
Sustained compression : elastic stockings



- Elastic fibers: maintain pressure
- Inelastic bandage: immediate pressure loss



Sustained compression pressure should never exceed the ankle pressure



High sustained pressure in a patient with unrecognized AOD

Conclusions

- Sustained compression pressure should never exceed the intraarterial pressure (ankle pressure)
- Stiff, light pressure bandages (<40 mmHg) reduce venous oedema, improve nutritional flow and venous pumping function
- Intermittent pressure waves (pumps, stiff bandages+movement) enhance arterial inflow
- „Modified inelastic bandages“ are the basic treatment in mixed arterial-venous-lymphatic disease

ICC Bari: Cinderella indications

- *Oct* 9, 2015

5TH CONGRESS

WORLD UNION OF WOUND HEALING SOCIETIES

WUWHS 2016
FLORENCE
ITALY

25 – 29 Septemb

One Vision, One Mission

www.wuwhs2016.com