An anatomical illustration of a human leg, showing the venous system. The leg is oriented vertically, with the foot at the bottom. The venous system is depicted with a network of veins, including the superficial and deep veins. The text is overlaid on the leg illustration.

Compression reduces venous diameters: Duplex and MRI findings

B. Partsch

Background

- Graduated compression stockings (20-30 mmHg) do not compress leg veins in the standing position

Lord R, Hamilton D. ANZ J Surg 2004;74:581-5

Elastic stockings:

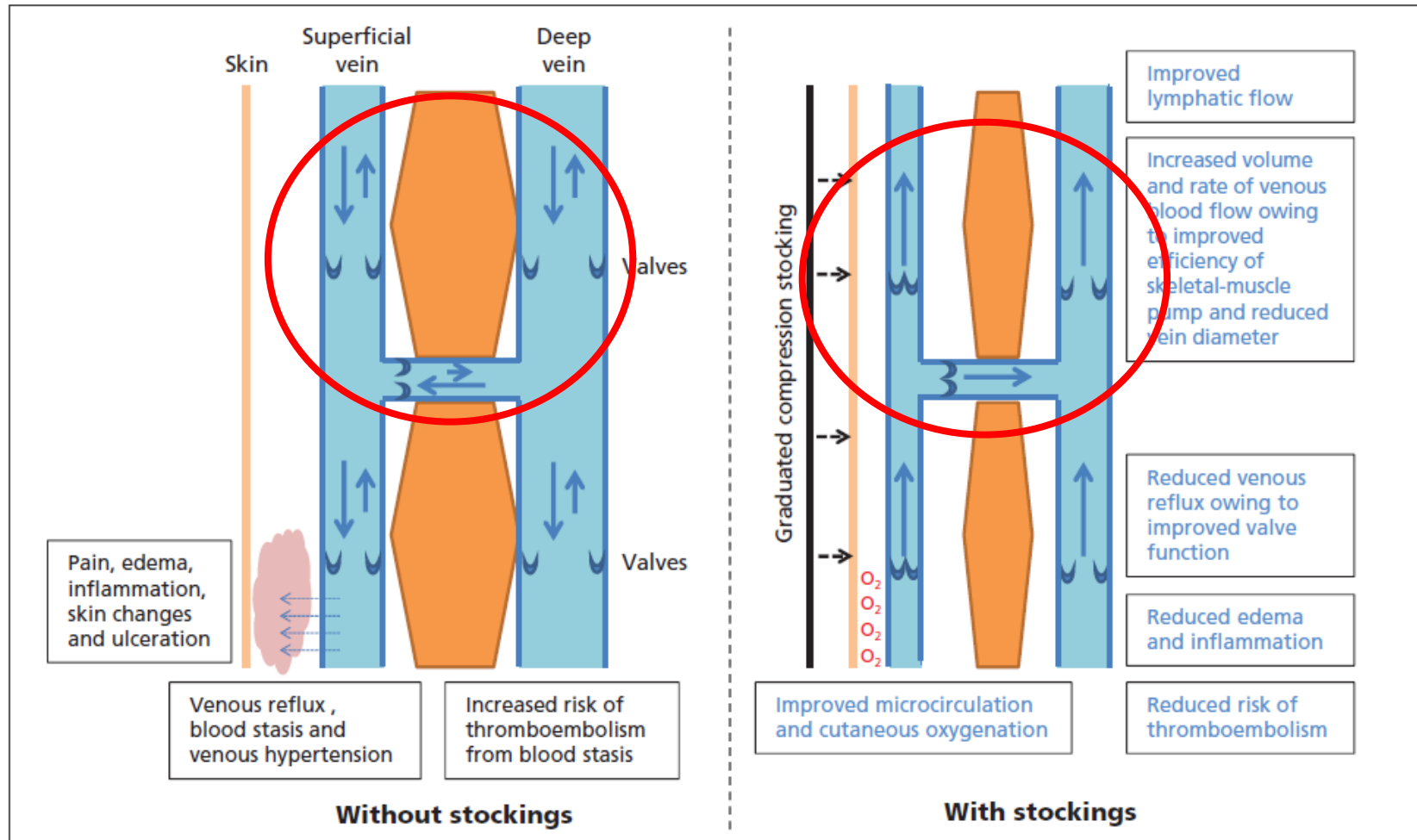


Figure 2: The mechanisms of action of graduated compression stockings.

Elastic stockings: wishful thinking

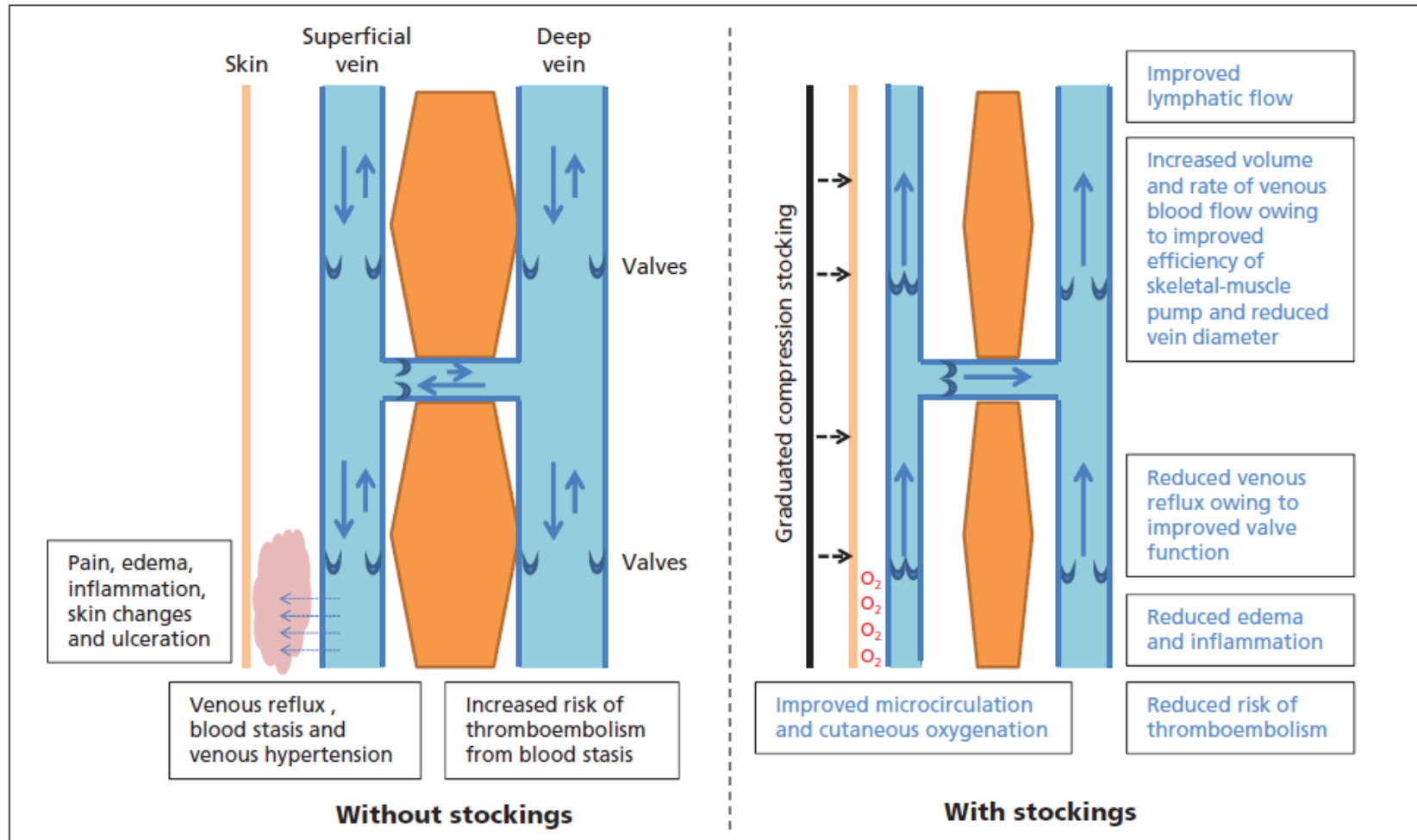
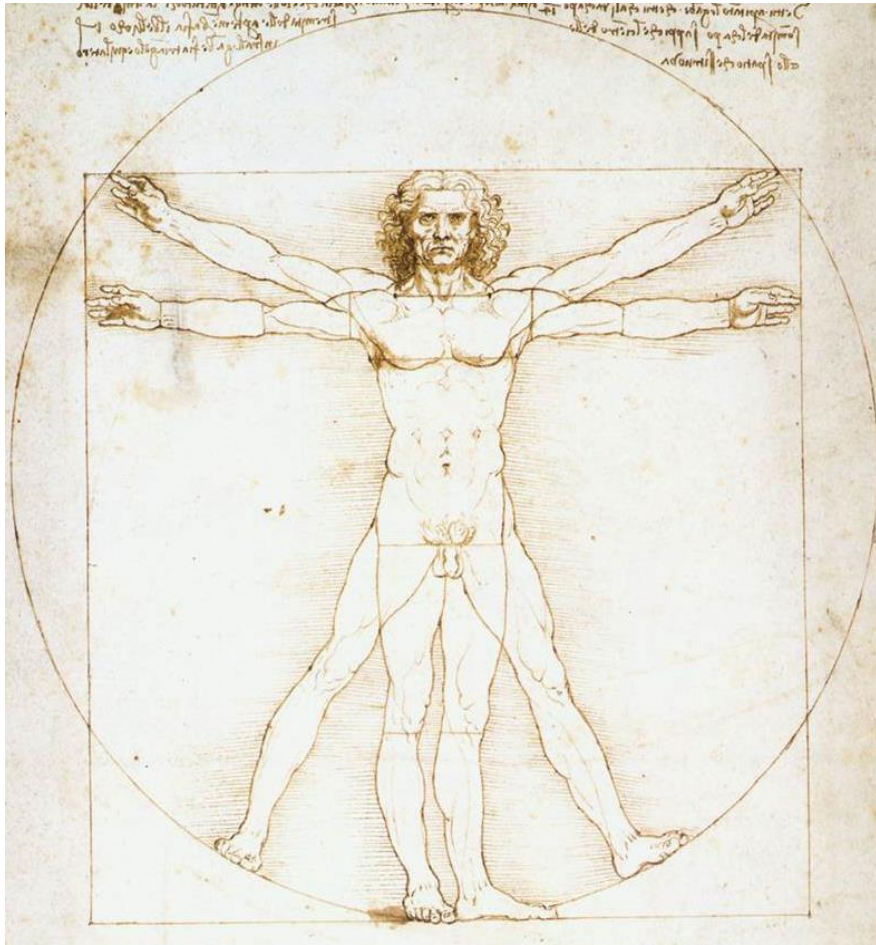
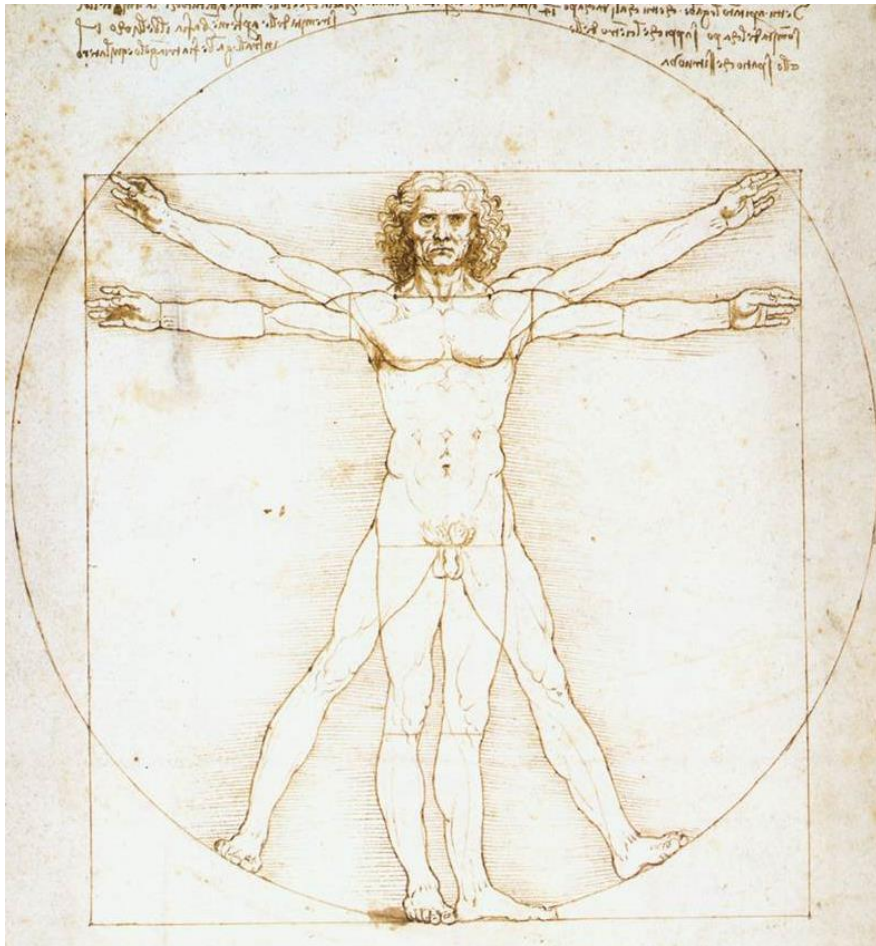


Figure 2: The mechanisms of action of graduated compression stockings.

Which pressure is necessary to compress leg veins?

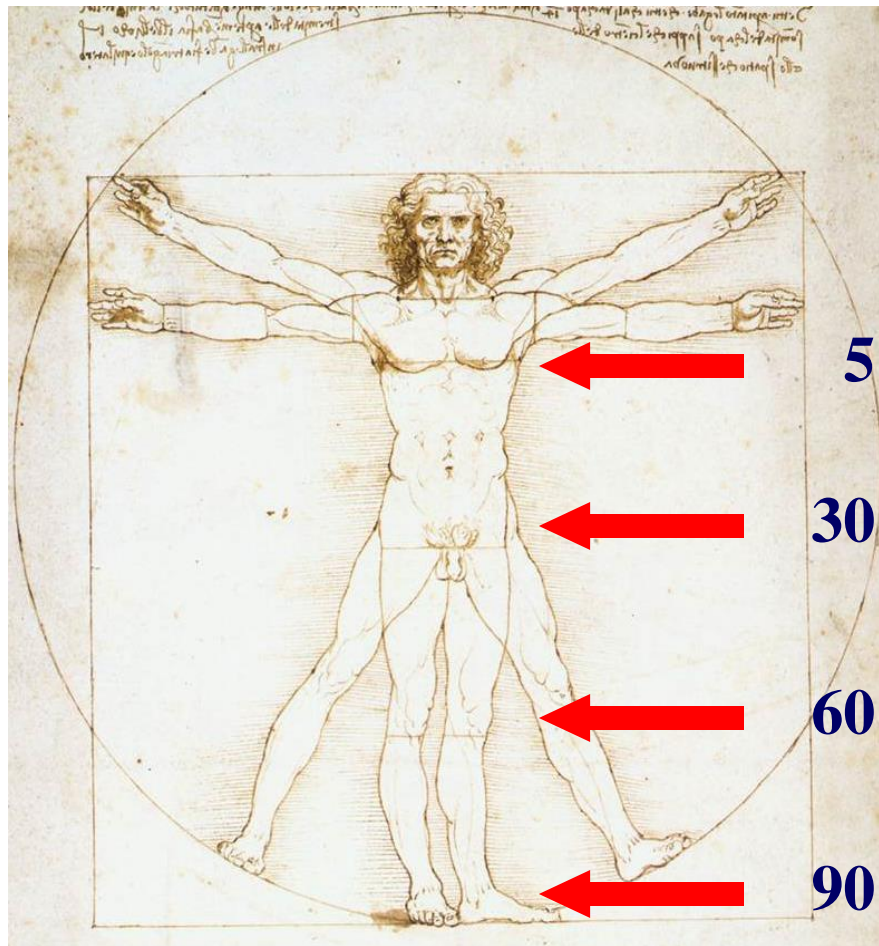


Which pressure is necessary to compress leg veins?



- the pressure of the bandage has to exceed the intravenous pressure

Which pressure is necessary to compress leg veins?



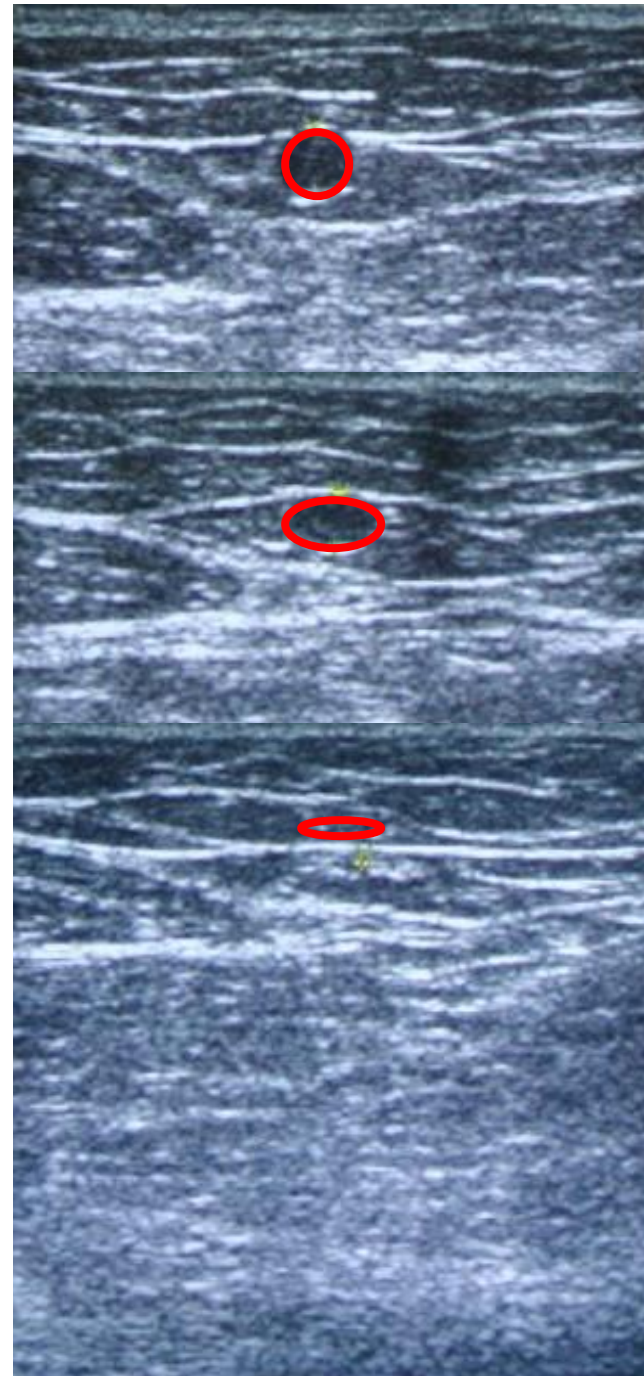
- the pressure of the bandage has to exceed the intravenous pressure

90 mm Hg

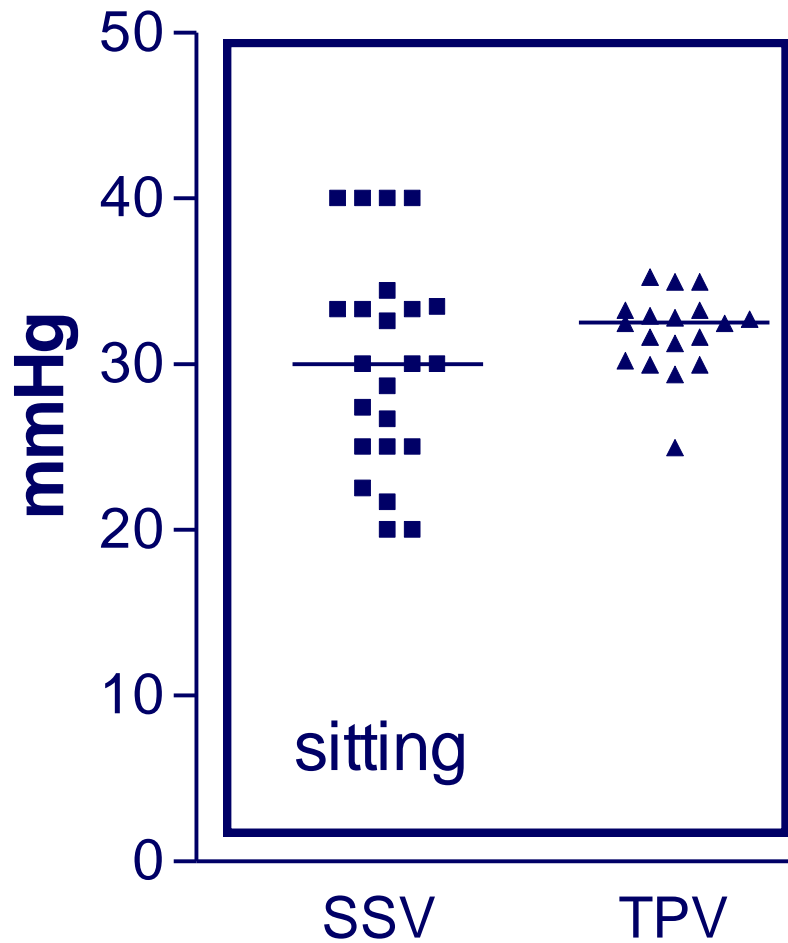
Subjects

- 9 healthy volunteers (C0-C1) (18 legs)
5 m, 4 f, age 28 – 66 y (ø 53,1 y)
- 5 legs with insufficiency of SSV
(2xC6, 1xC4, 2xC2)
1 m, 4 f, age 52-88 y (ø 59,4 y)
- sitting, standing, supine

Which pressure is necessary to compress leg veins?

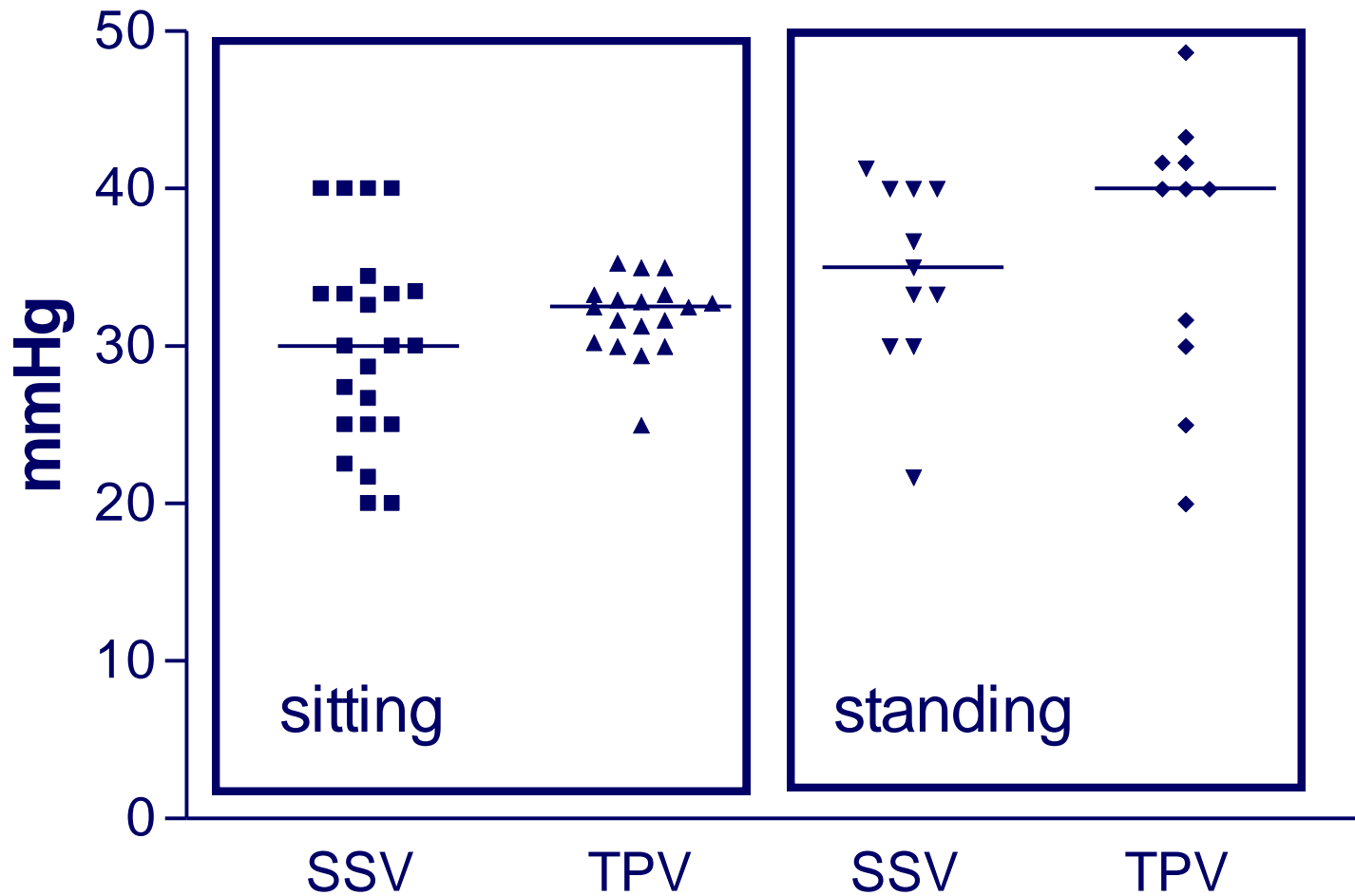


Initial narrowing

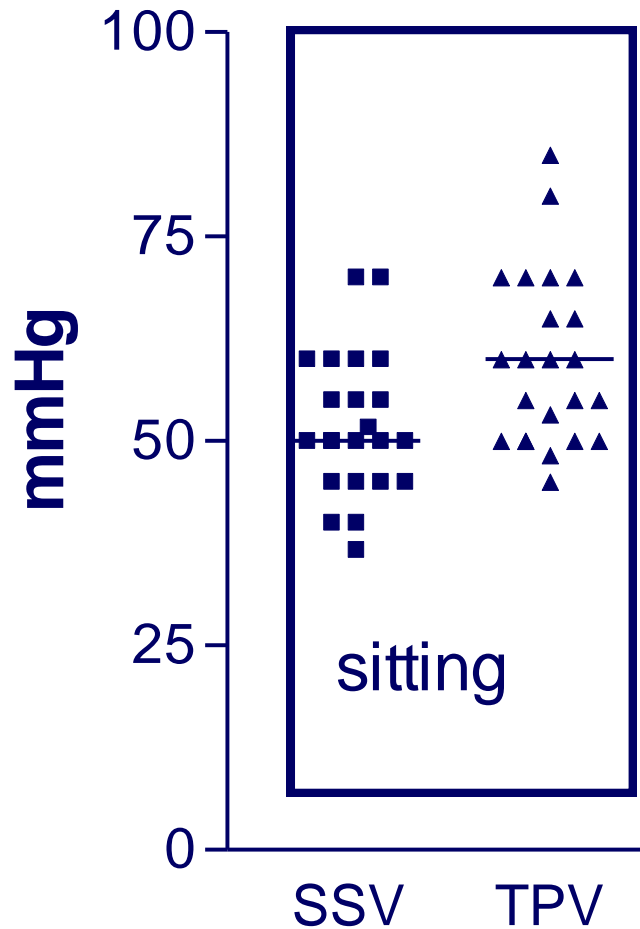


Partsch B, Partsch H. J Vasc Surg 2005 Oct;42(4):734-8.

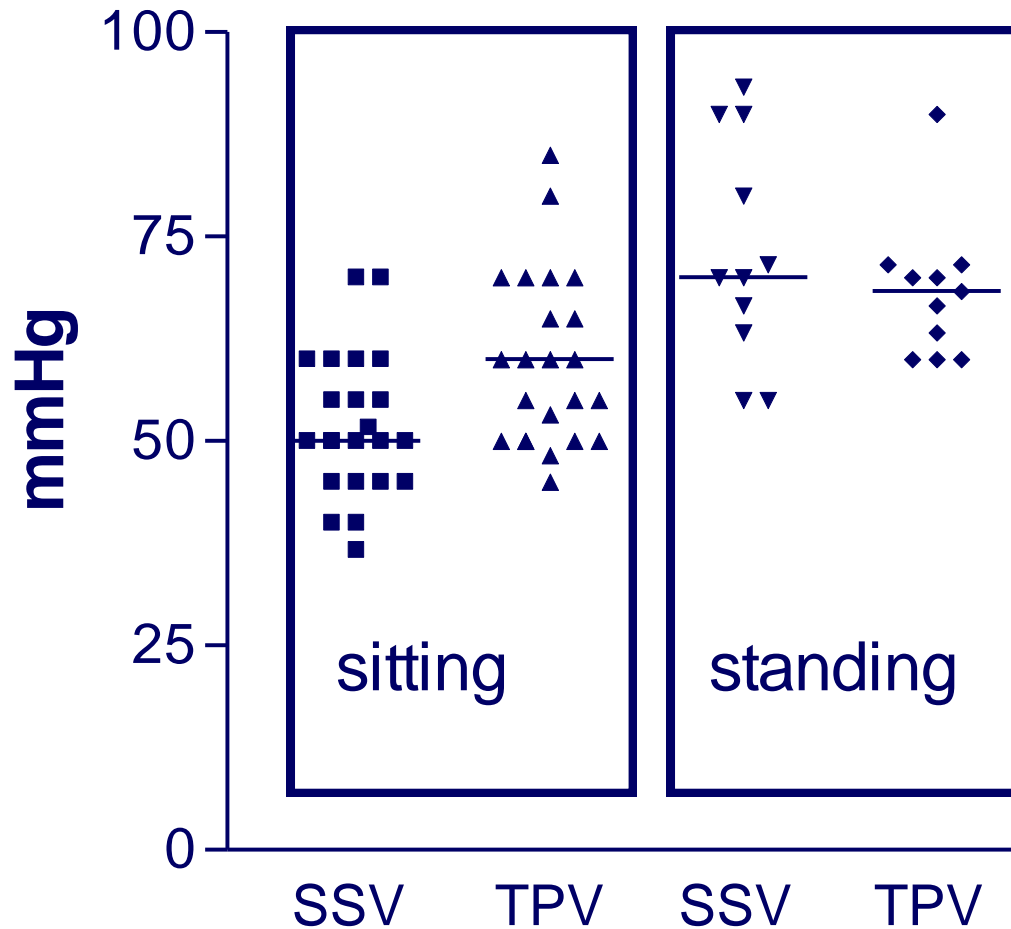
Initial narrowing



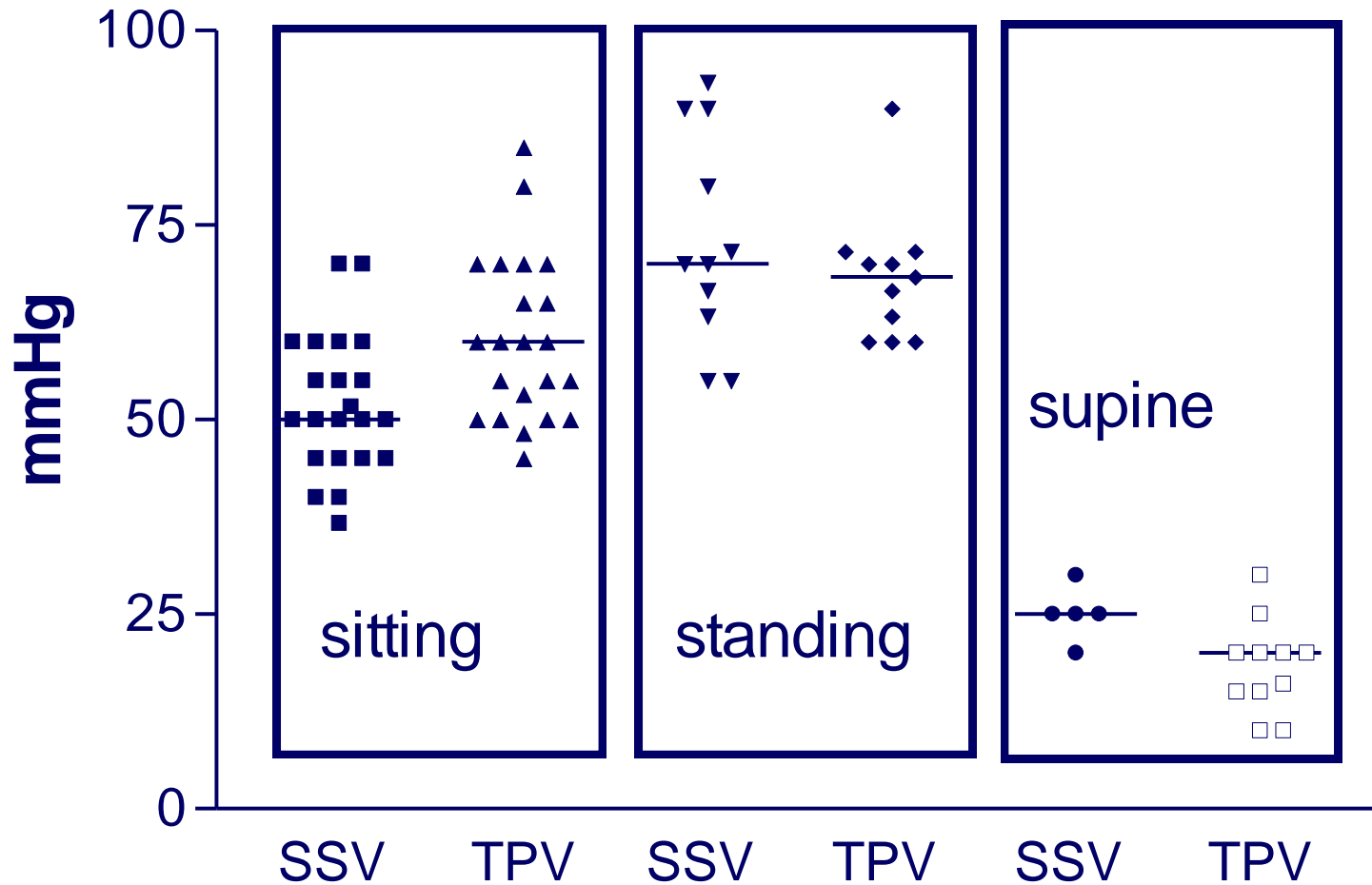
Venous occlusion pressure



Venous occlusion pressure






Venous occlusion pressure



Vasa (2014), 43, pp. 268-277. <https://doi.org/10.1024/0301-1526/a000362>. © 2014 Hogrefe AG.

Impact of compression stockings on calf-vein diameters and on quality of life parameters in subjects with painful legs

[Christina Jeanneret](#)  , [Konstantinos Karatolios](#)  , [Irene von Planta](#) 



Lower Limb Deep Vein Diameters Beneath Medical Compression Stockings in the Standing Position

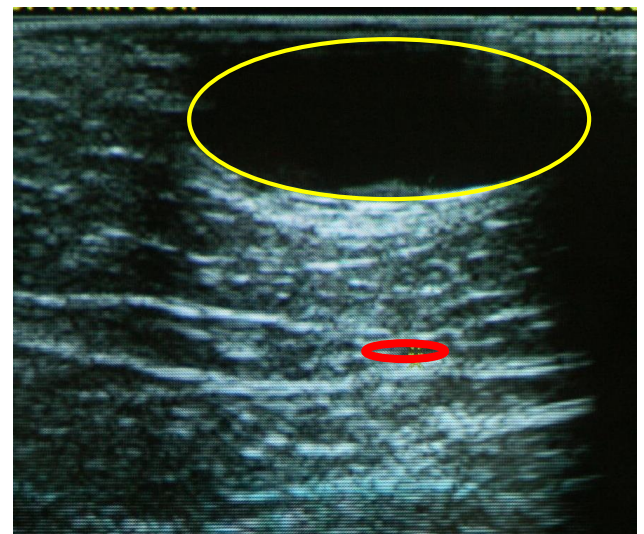
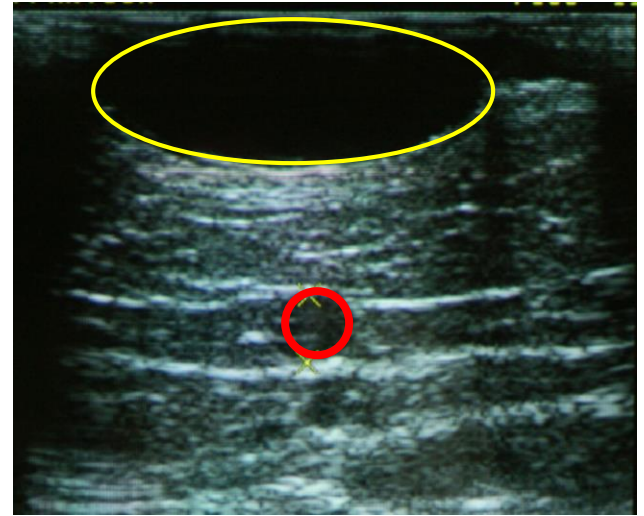
[Didier Rastel](#)   , [Bertrand Lun](#)
SCOTT, Grenoble, France

[February 2019](#) Volume 57, Issue 2, Pages 276–282

How can we achieve high pressures?

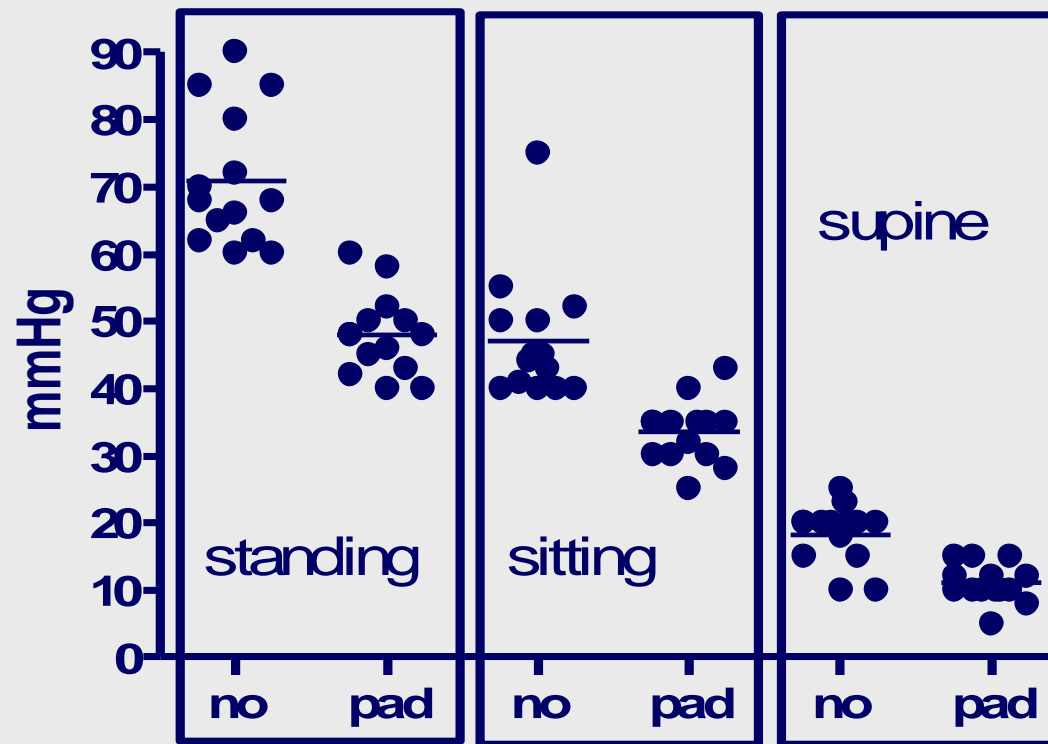
- more-layer short stretch bandages
(Unna boot, Rosidal sys[®],
Por-/Panelast[®], four layer bandage)
- adjustable compression wraps
(velcro products)
- compression stockings
with added pressure pads?

Which pressure is needed to compress veins with excentric compression?

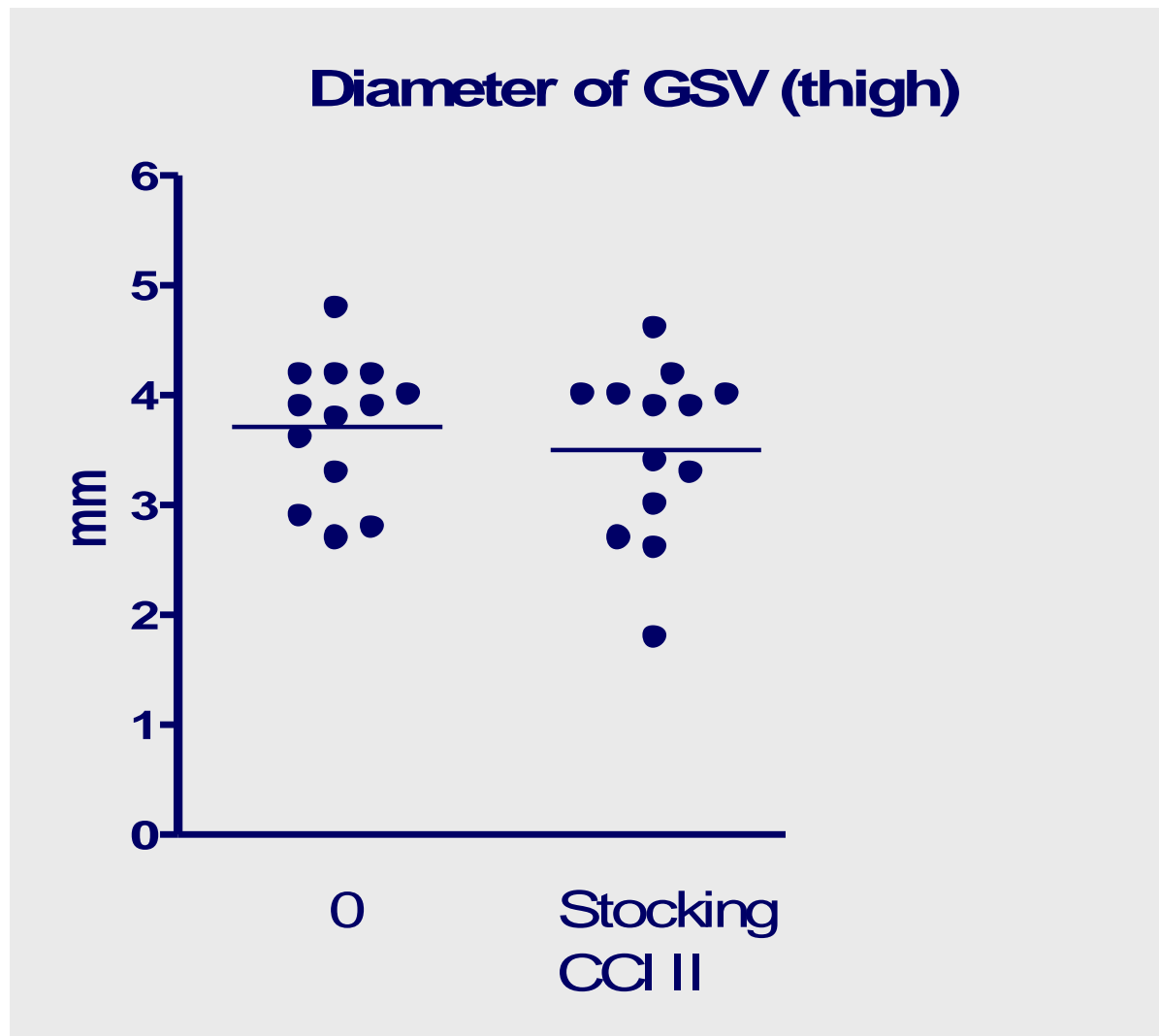


Excentric compression with pad

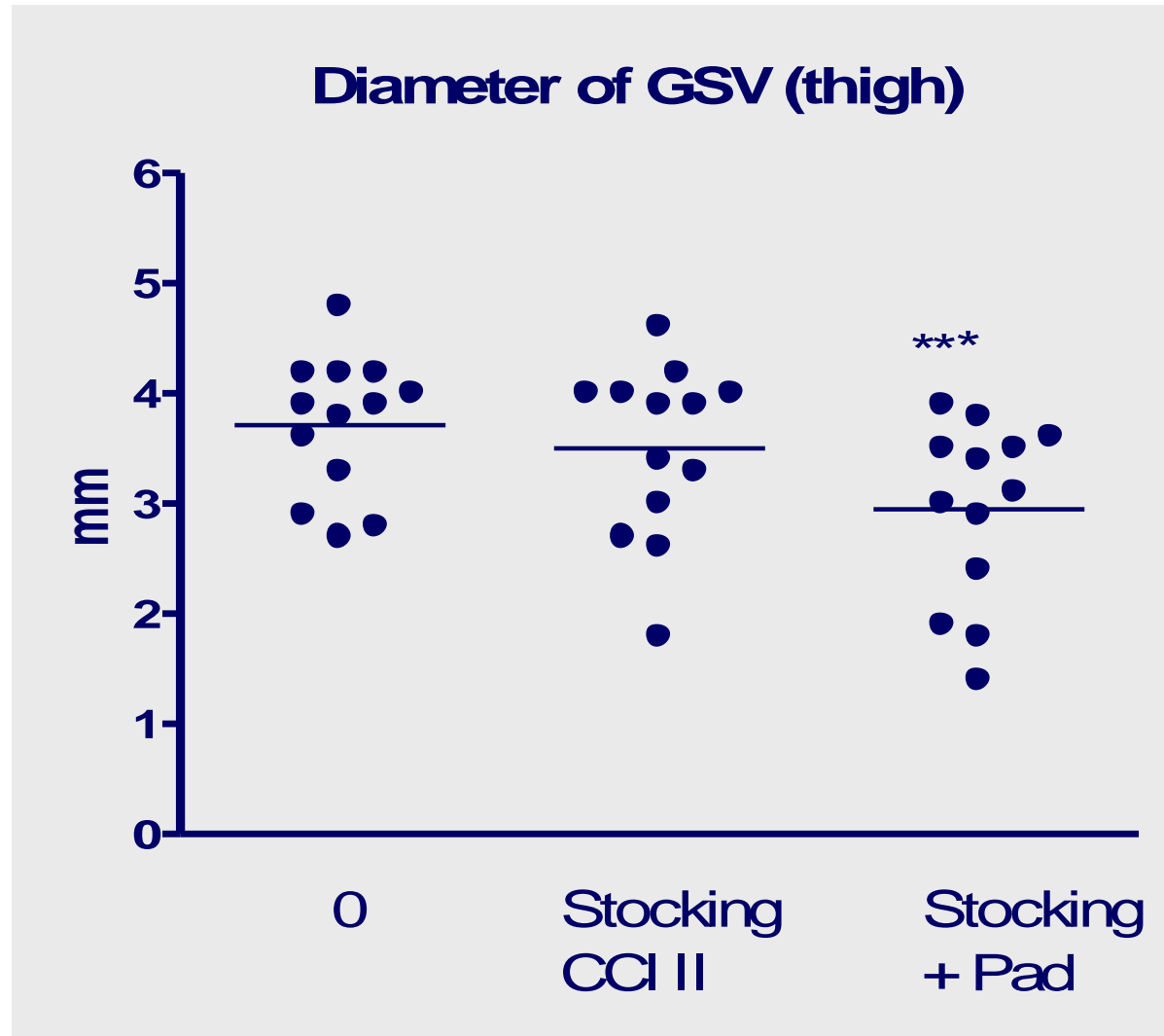
Pressure needed to occlude GSV at thigh level (n=14)



Compression with compression stockings CCl II



Compression with compression stockings CCl II and pad



Compression stockings in superposition

	standing position	2 stockings CI II	p
GSV mid thigh	4.1	3.3	<0.05
GSV mid calf	2.8	2.2	<0,01
SSV	2.7	1.9	<0,01

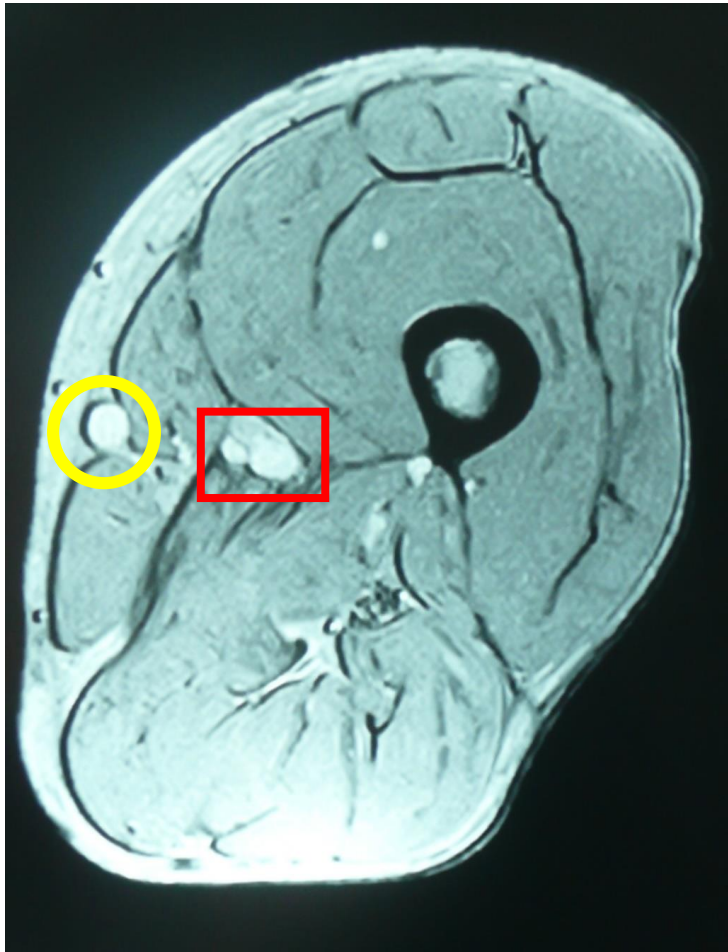
MRI

supine/prone



Downie SP et al. J Magn Reson Imaging 2007 Jul;26(1):80-5.
Partsch H, Mosti G. Int Angiol. 2010 Oct;29(5):408-10
Leung TK et al. Int Angiol. 2012 Dec;31(6):534-43

Thigh - supine

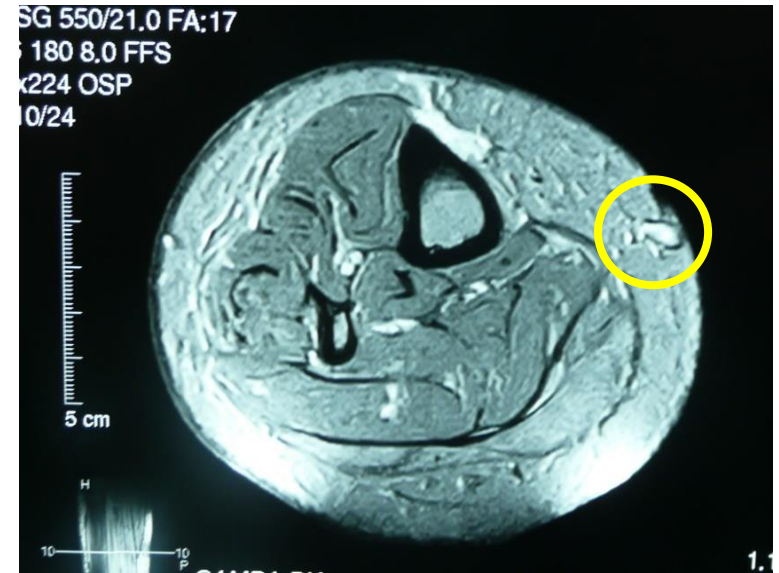


no compression



7 mmHg (stocking CCl II)

Calf - supine



18 mmHg (ulcer kit, Liner)



35 mmHg (ulcer kit, 2 layer)

Light compression is able to narrow the veins in the horizontal position

MRI calf - prone

- The right calves of eight healthy volunteers were imaged in the prone position, with and without the presence of a compression stocking.
- The mean cross-sectional area reduction was found to be **greater in the deep veins (64%) than in the superficial veins (39%)**

MRI

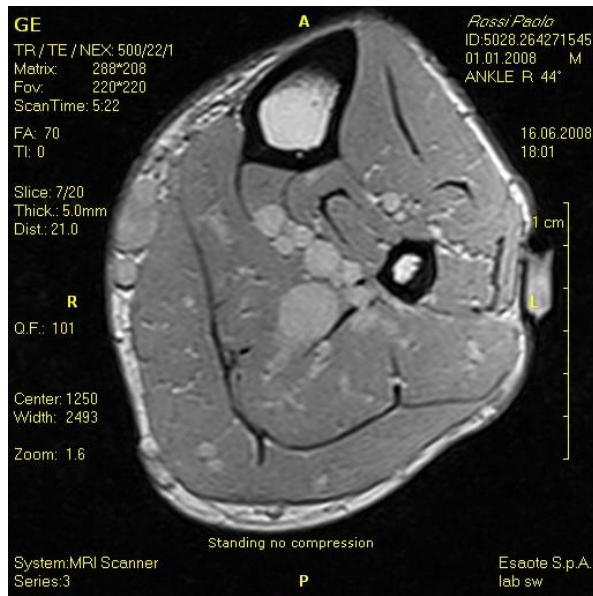
supine/prone



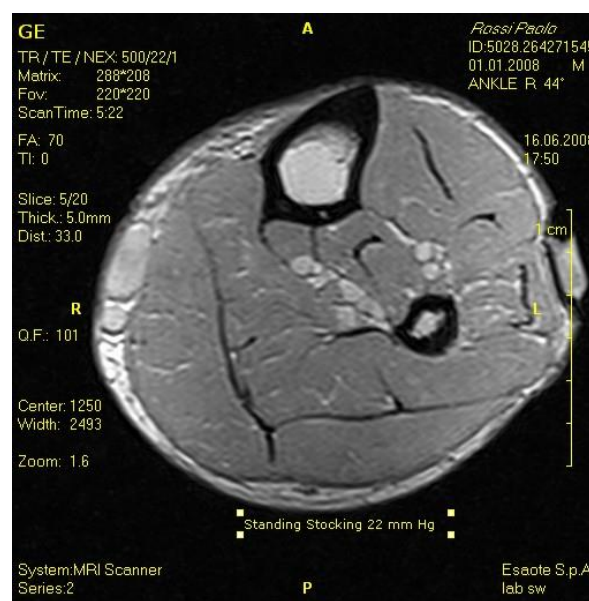
standing



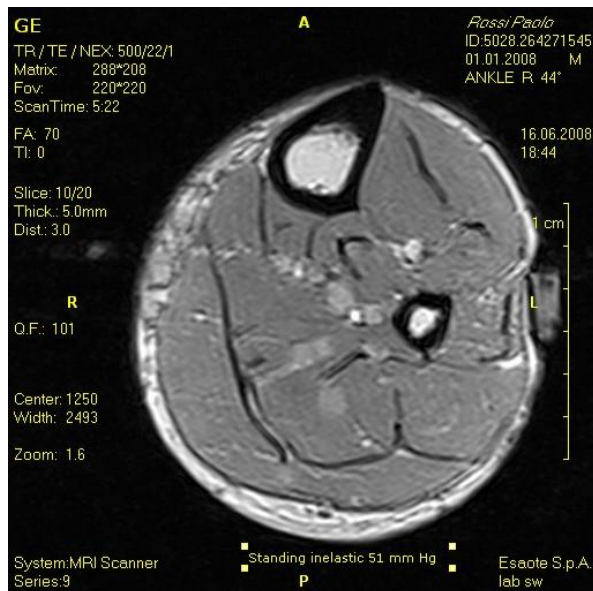
Calf - standing



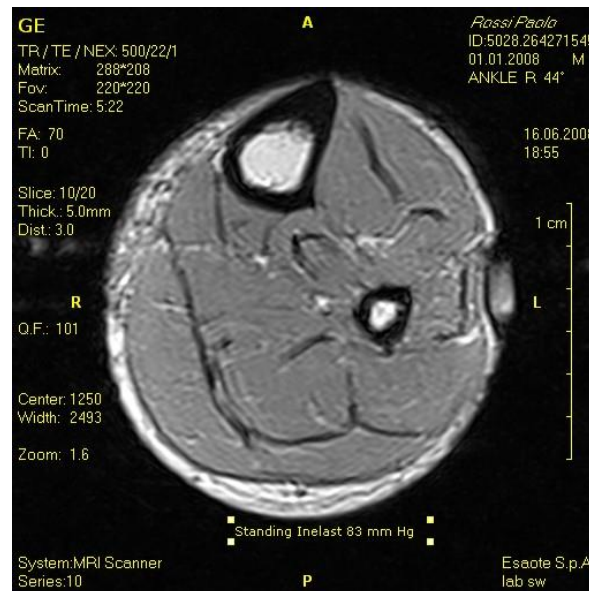
no compression



Stocking 22 mmHg



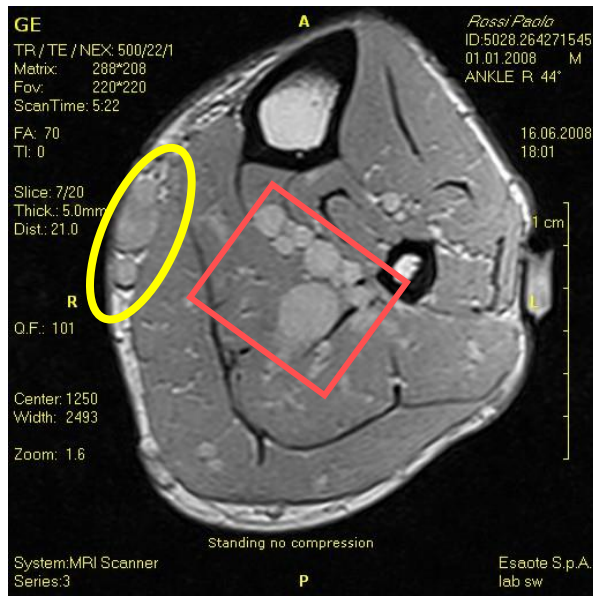
Bandage 51 mmHg



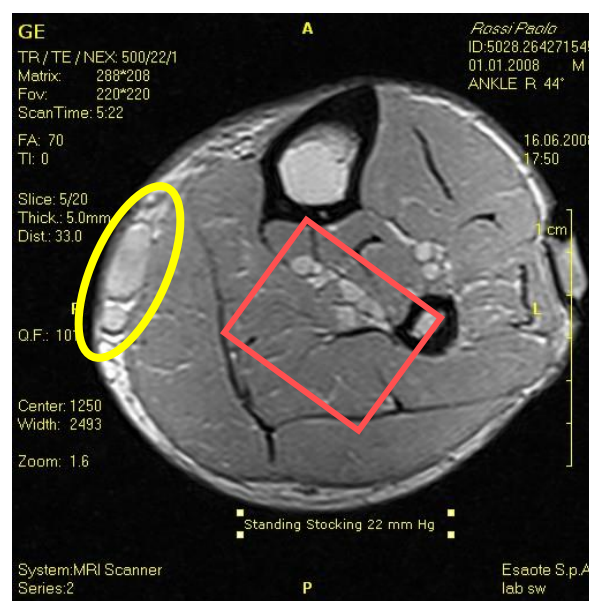
Bandage 83 mmHg

Partsch H, Mosti G et al
Int Angiol. 2010
Oct;29(5):408-10.

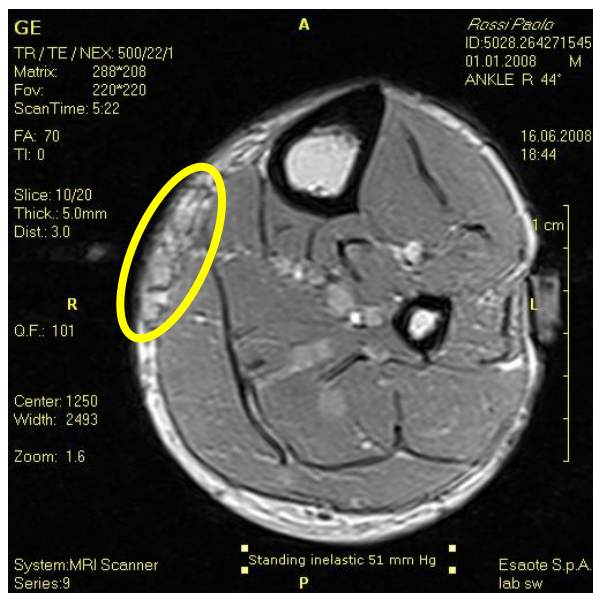
Calf - standing



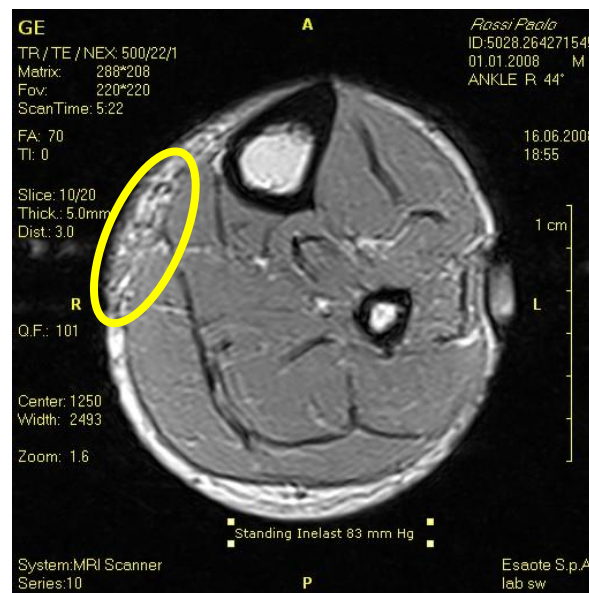
no compression



Stocking 22 mmHg



Bandage 51 mmHg



Bandage 83 mmHg

Partsch H, Mosti G et al
Int Angiol. 2010
Oct;29(5):408-10.

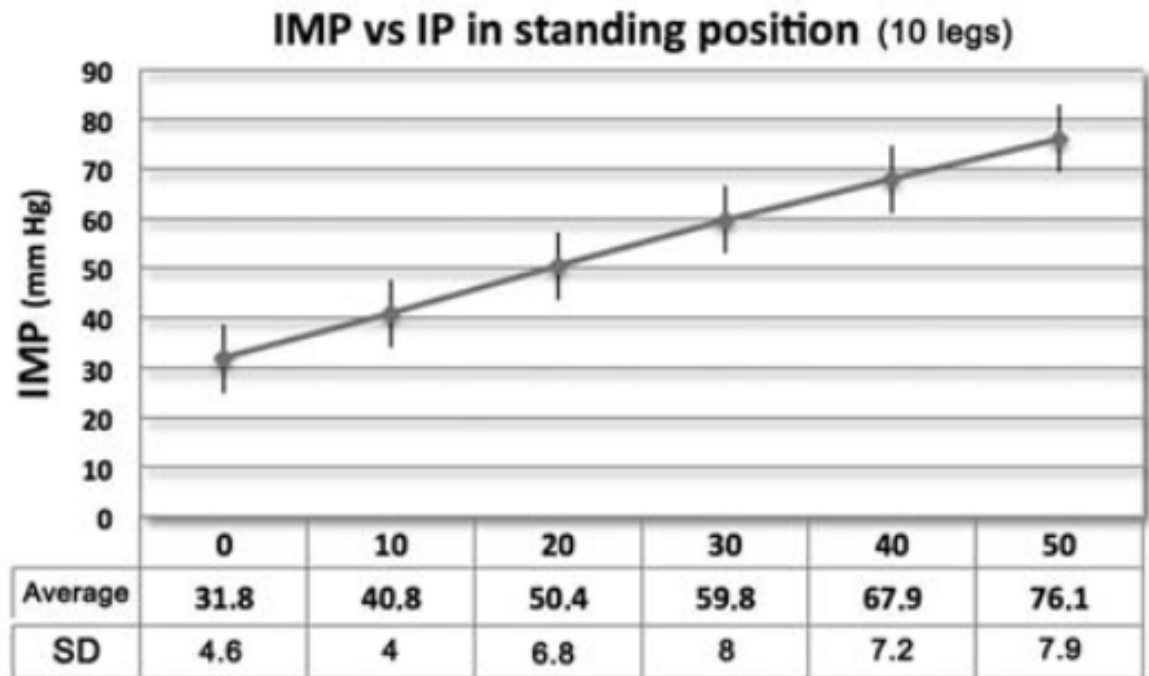
Practical consequences

- Compression stockings (23-32 mmHg) reduce venous diameter in horizontal, but not in upright position
- Especially true for superficial refluxing veins
- Deep veins are affected more by compression than superficial veins
- Compartment pressure adds to the compression pressure so that deep veins may be narrowed even by a stocking
- Pressure > 50 mmHg is required to reduce superficial reflux and to improve venous hemodynamics

Thank You for
Your attention



External pressure adds to compartment pressure



Uhl JP, Benigni JP et al. Phlebology. 2015 Jun;30(5):331-8.