



Classification of Compression Stockings

ICC Meeting, Copenhagen, May 17, 2013.

pressure of compression stockings matters
(clinical importance of pressure)

Giovanni Mosti; Lucca, Italy

disclosure

no conflict of interest

pressure of compression stockings matters

pressure and stiffness are the main determinants of the effectiveness of every compression device

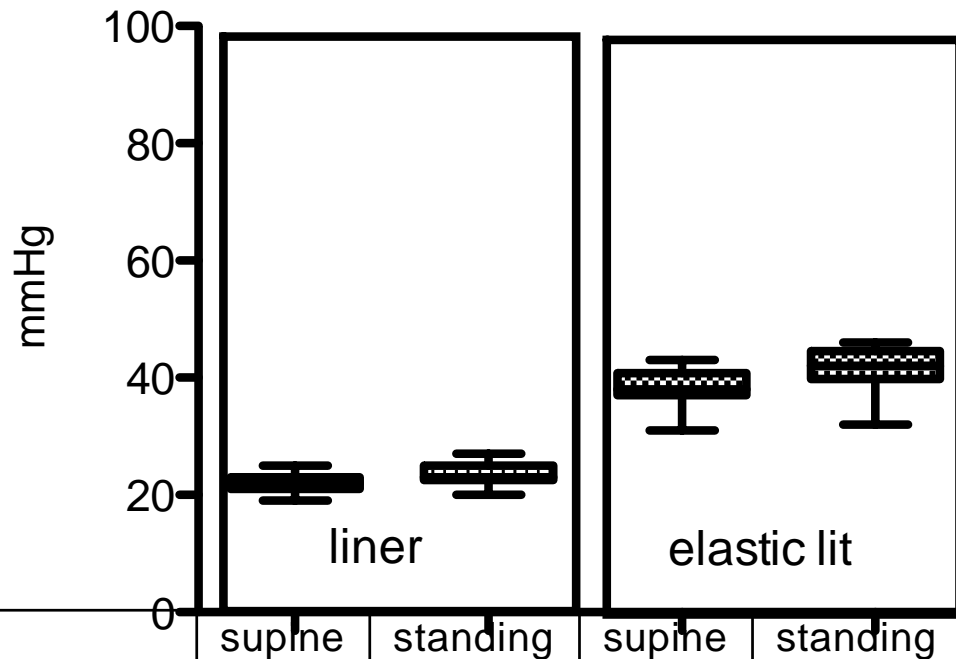
comparing compression materials with the same stiffness does the pressure matter?

pressure of compression stockings matters

1. experimental data
 - ✓ ejection fraction
 - ✓ venous reflux
2. clinical data

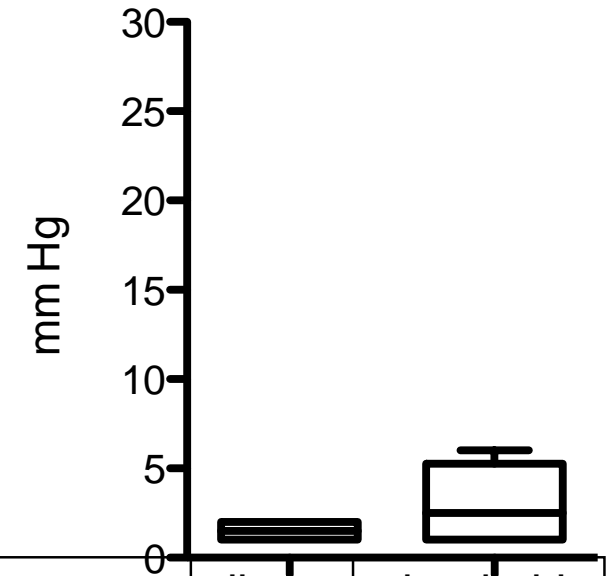
pressure and ejection fraction

Interface Pressure



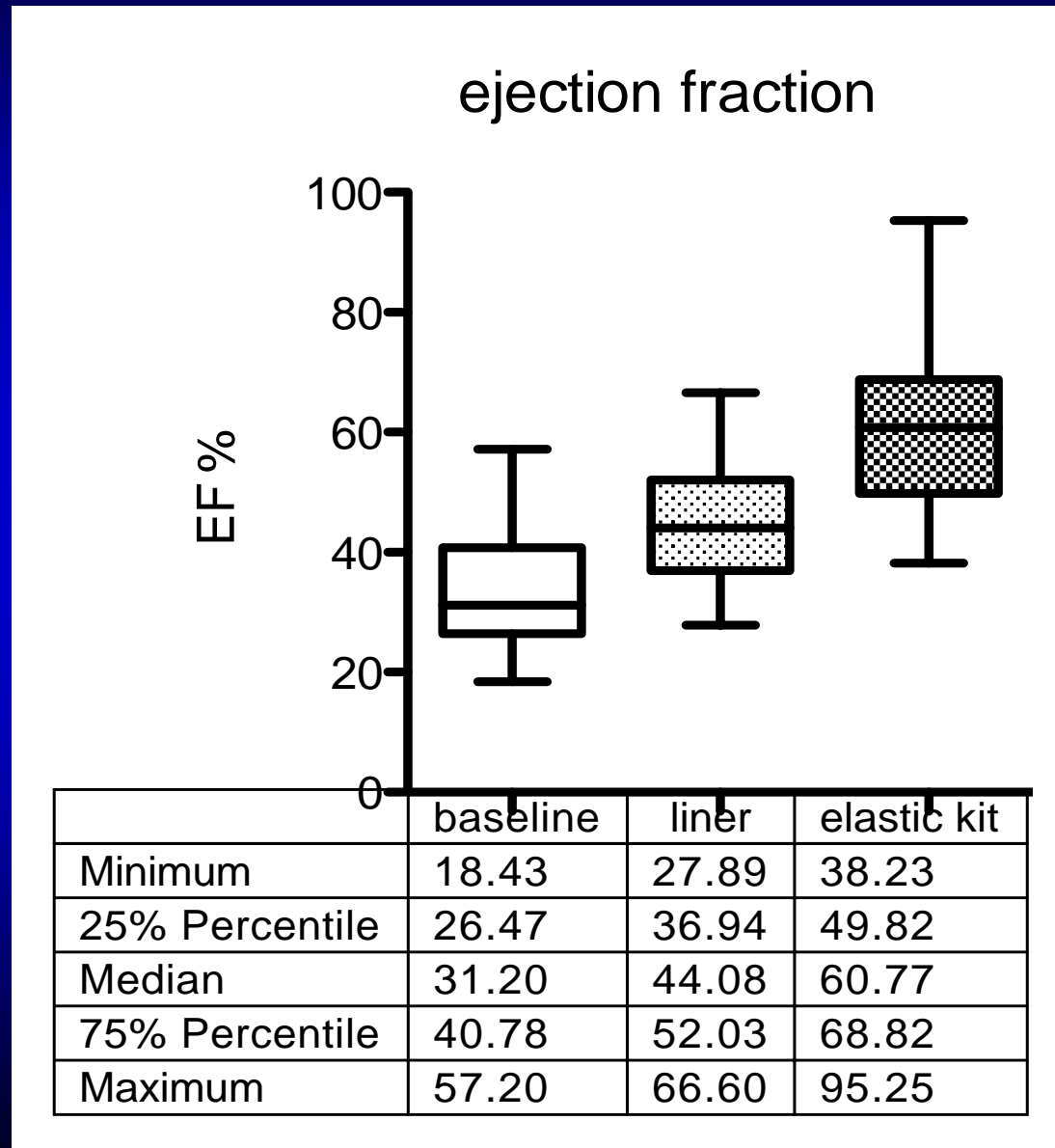
	supine	standing	supine	standing
Minimum	19.00	20.00	31.00	32.00
25% Percentile	21.00	22.50	37.00	39.75
Median	22.00	23.00	38.00	42.00
75% Percentile	23.00	25.00	40.75	44.50
Maximum	25.00	27.00	43.00	46.00

Static Stiffness Index



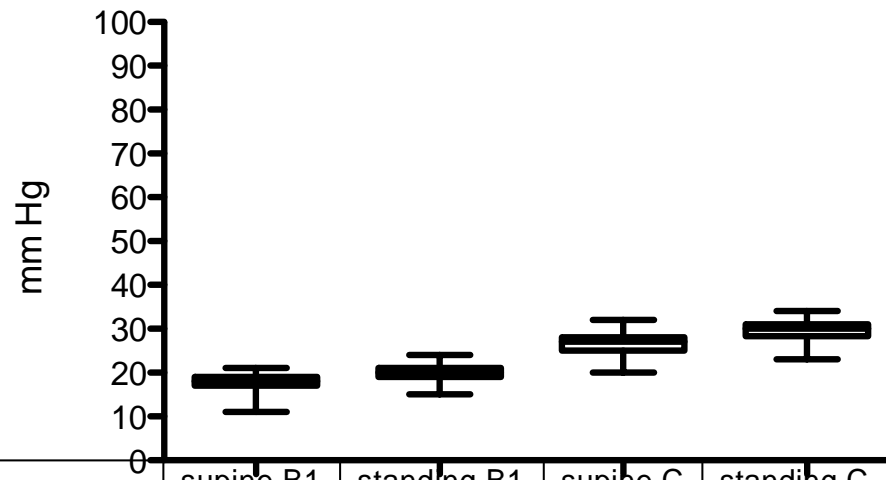
	liner	elastic kit
Minimum	1.000	1.000
25% Percentile	1.000	1.000
Median	1.500	2.500
75% Percentile	2.000	5.250
Maximum	2.000	6.000

pressure and ejection fraction



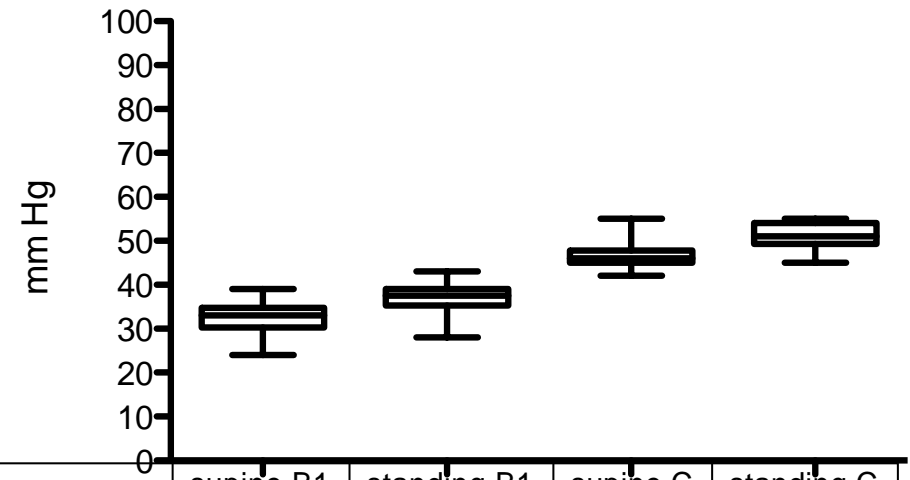
pressure and ejection fraction

Interface Pressure 1 "Progressive"



	supine B1	standing B1	supine C	standing C
Minimum	11.00	15.00	20.00	23.00
25% Percentile	17.00	19.00	25.00	28.25
Median	18.00	20.00	27.00	30.00
75% Percentile	19.00	21.00	28.00	31.00
Maximum	21.00	24.00	32.00	34.00

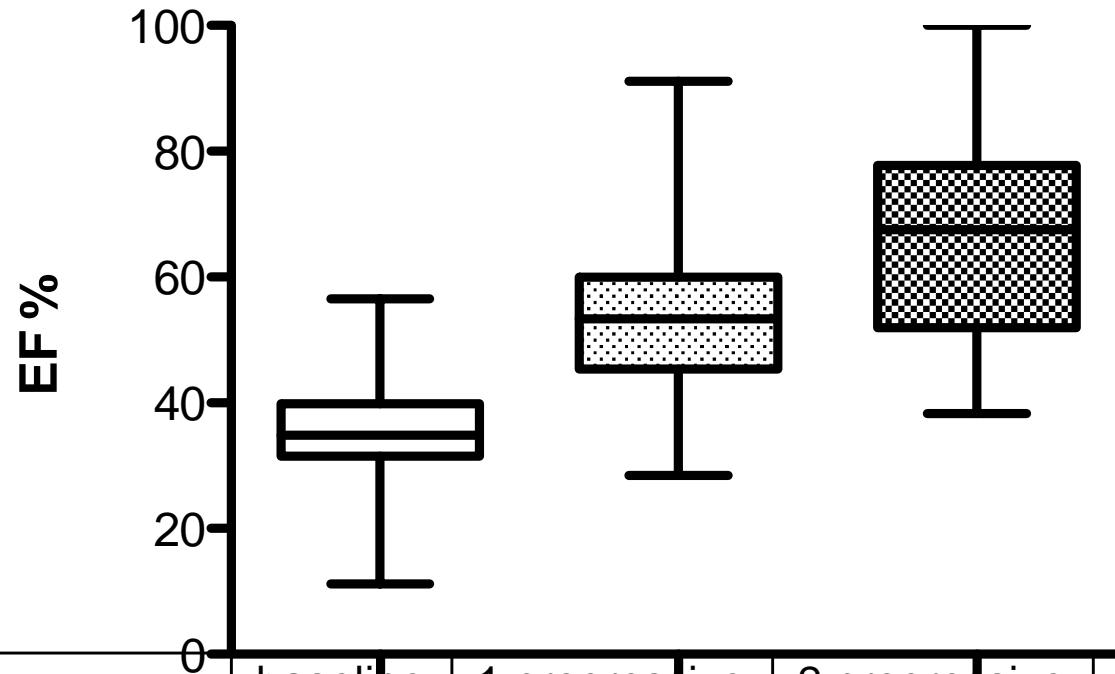
Interface Pressure 2 "Progressive"



	supine B1	standing B1	supine C	standing C
Minimum	24.00	28.00	42.00	45.00
25% Percentile	30.25	35.25	45.00	49.25
Median	33.00	37.50	46.00	51.00
75% Percentile	34.75	39.00	47.75	54.00
Maximum	39.00	43.00	55.00	55.00

pressure and ejection fraction

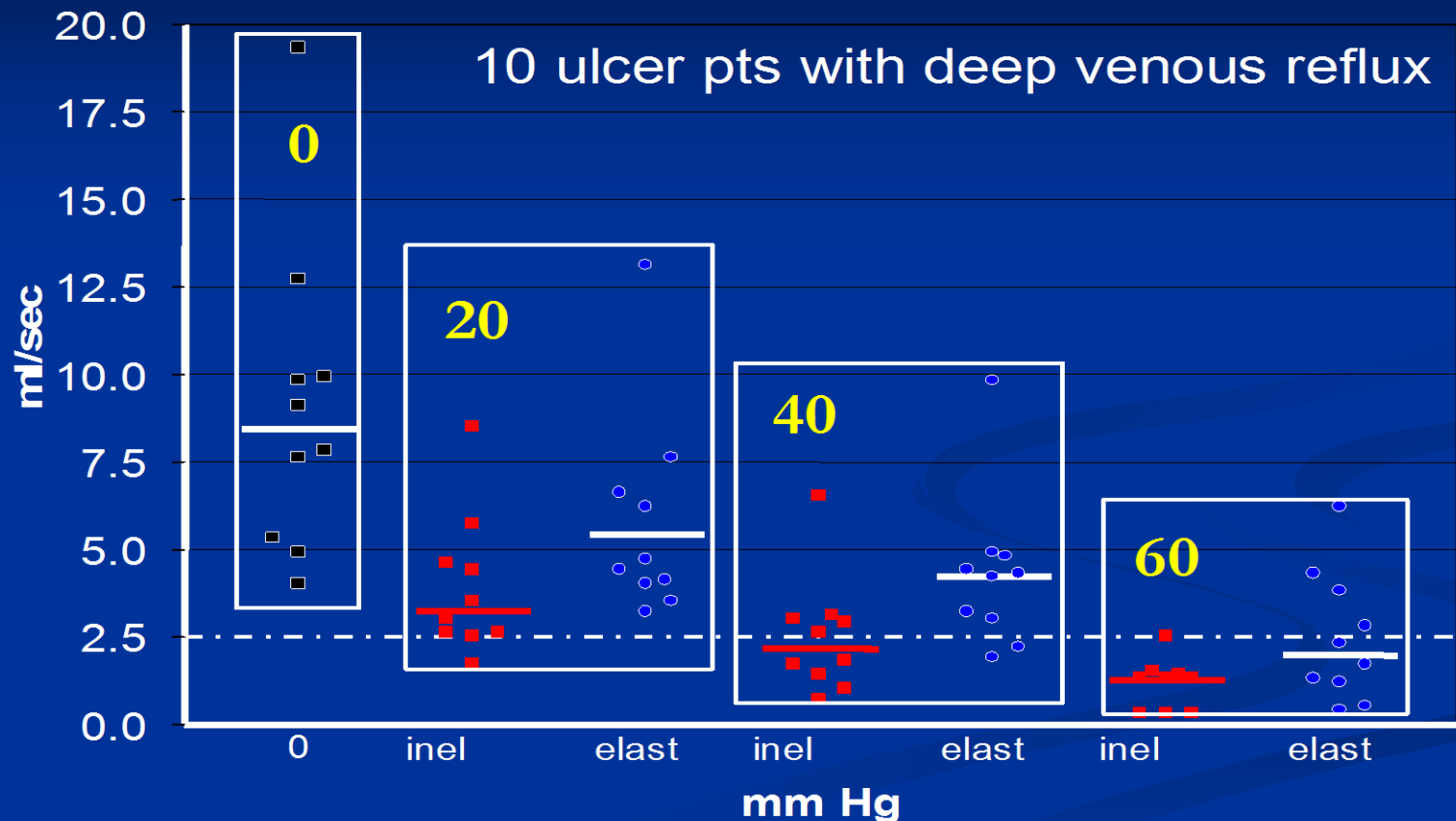
Ejection Fraction



	baseline	1 progressive	2 progressive
Minimum	11.22	28.45	38.32
25% Percentile	31.54	45.40	51.96
Median	34.90	53.33	67.53
75% Percentile	39.85	59.99	77.68
Maximum	56.54	91.09	100.0

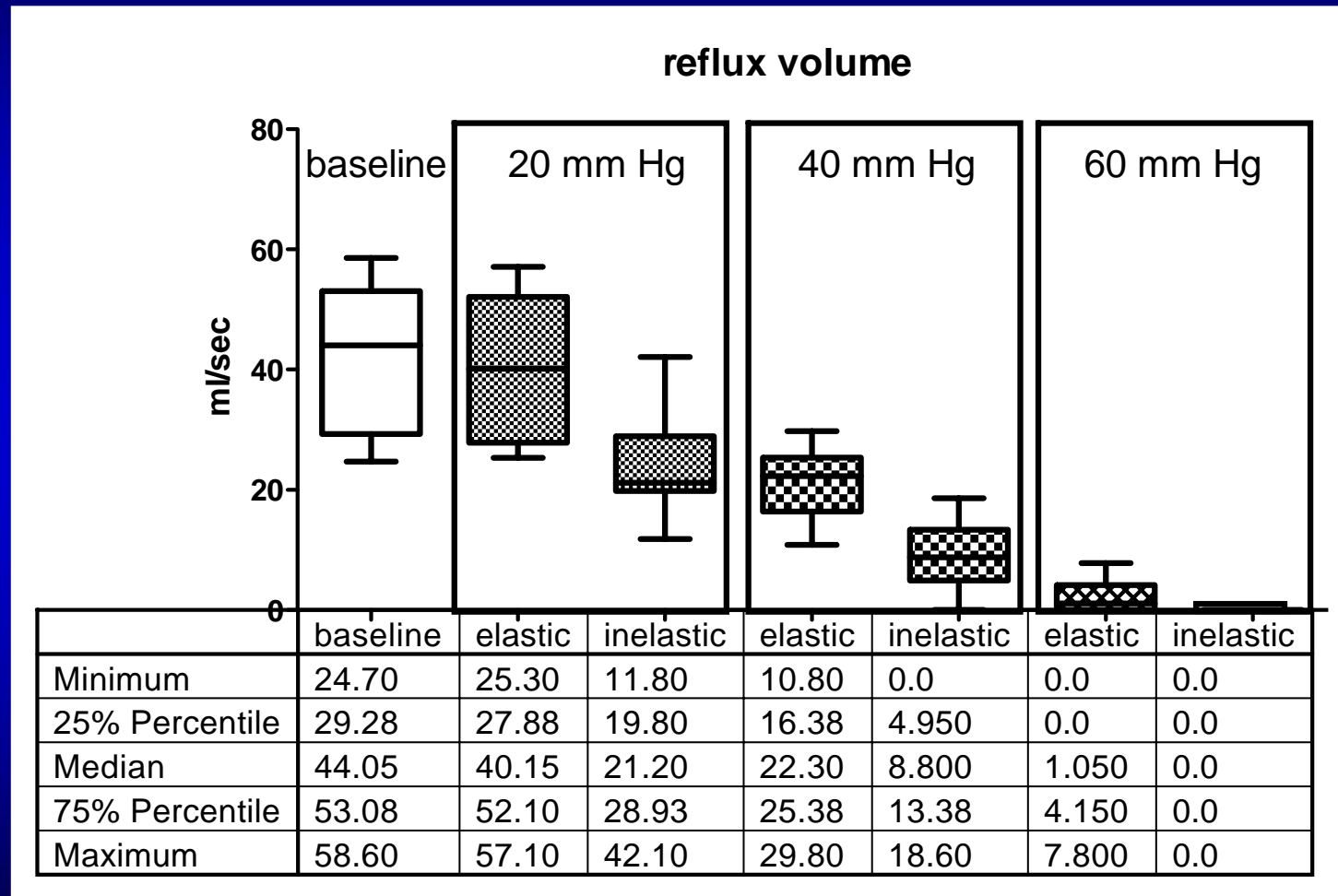
pressure and reflux in patients with DVI

Venous filling index (APG)
(Venous reflux, normal <2,5 ml/sec)



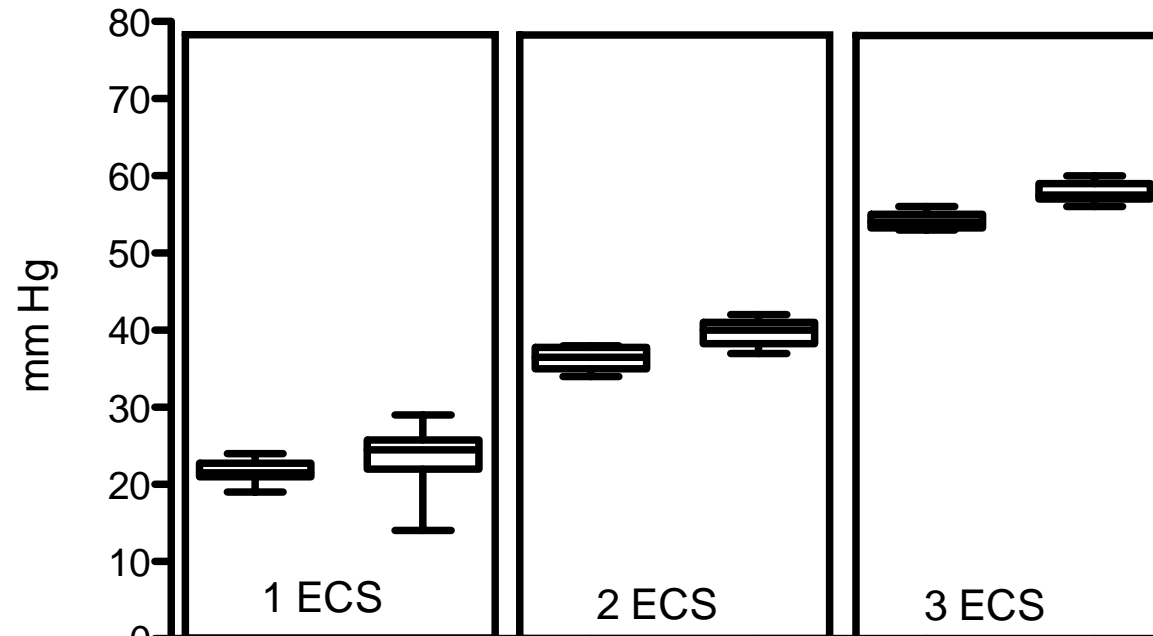
venous reflux and compression

12 patients with severe axial GSV reflux



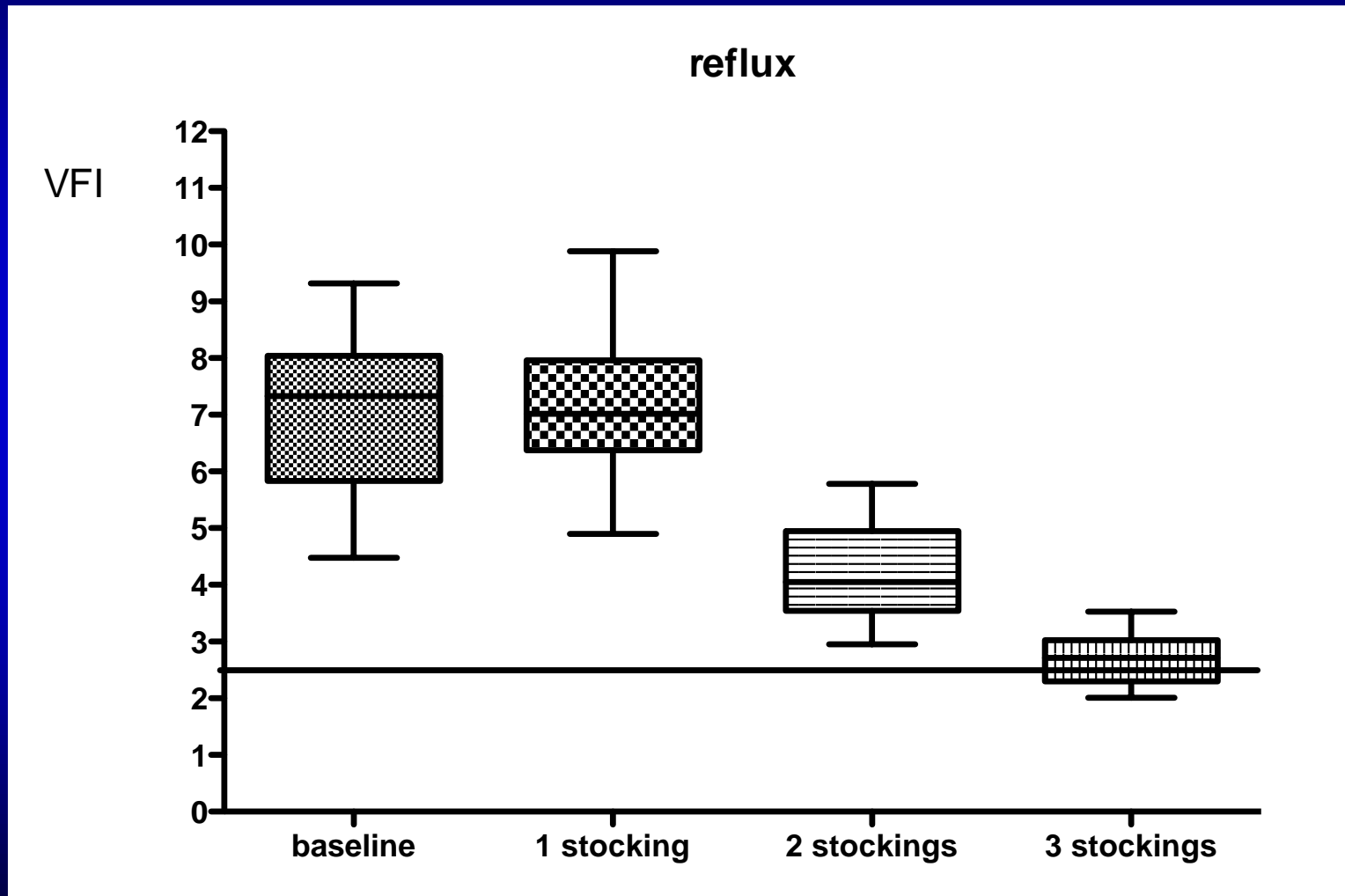
venous reflux and compression

interface pressure



	supine	standing	supine	standing	supine	standing
Minimum	19.00	14.00	34.00	37.00	53.00	56.00
25% Percentile	21.00	22.00	35.00	38.25	53.25	57.00
Median	21.50	24.50	36.50	40.00	54.00	57.50
75% Percentile	22.75	25.75	37.75	41.00	55.00	59.00
Maximum	24.00	29.00	38.00	42.00	56.00	60.00

venous reflux and compression



clinical data

C1-C3s:

French class 1 stocking is effective in reducing pain and improving quality of life

Benigni JP et al. Efficacy of class 1 elastic compression stockings in the early stages of chronic venous disease. *Int Angiol* 2003; 23: 383-93

clinical data

C2-C4:

there is no evidence that elastic stockings exert any beneficial effect therefore that pressure counts.

This severe conclusion despite the fact that all studies report beneficial effects on symptoms comparing ECS with different pressure ranges or ECS vs no compression is due to poor quality of the studies

“Future research should consist of a large RCT of participants with trunk varices either wearing or not wearing compression stockings to assess the efficacy of this intervention.”

clinical data

C2-C4:

there is no evidence that elastic stockings exert any beneficial effect therefore that pressure counts.

“If compression stockings are found to be beneficial, further studies assessing which length and pressure is the most efficacious could then take place.”

clinical data

C1 after sclerotherapy:

compression (E.S. 23-32 mm Hg) is more effective than no compression in getting better outcomes (more effectiveness, less pigmentation)

→ pressure counts (if we do not have comparison between 2 different pressure ranges)

Kern P, Ramelet AA, Wütschert R, Hayoz D. Compression after sclerotherapy for telangiectasias and reticular leg veins: a randomized controlled study. *J Vasc Surg.* 2007;45:1212-6.

clinical data

C2 post procedures:

comparison of elastic stockings exerting 23-32 mm Hg at ankle versus the same stocking on top of an eccentric compression device (local pressure significantly increased)

better outcomes concerning pain, haematoma, bruising, bleeding with higher pressure

Mosti G, Mattaliano V, Arleo S, Partsch H. Thigh compression after great saphenous surgery is more effective with high pressure. *Int Angiol.* 2009 Aug;28(4):274-80.

Lugli M, Cogo A, Guerzoni S, Petti A, Maleti O. Effects of eccentric compression by a crossed-tape technique after endovenous laser ablation of the great saphenous vein: a randomized study. *Phlebology.* 2009 Aug;24(4):151-6.

clinical data

C2s pregnancy

comparison of 3 groups

1: no compression

2: class 1 compression stockings

3 class 2 compression stockings

compression prevent reflux at SFJ and symptoms

no difference between the 2 compression classes

clinical data

C3 prevention:

compression (15-20 mm Hg) is more effective than no compression in preventing oedema in long haul flight

compression (E.S. 11-21 mm Hg) is more effective than no compression in preventing occupational oedema

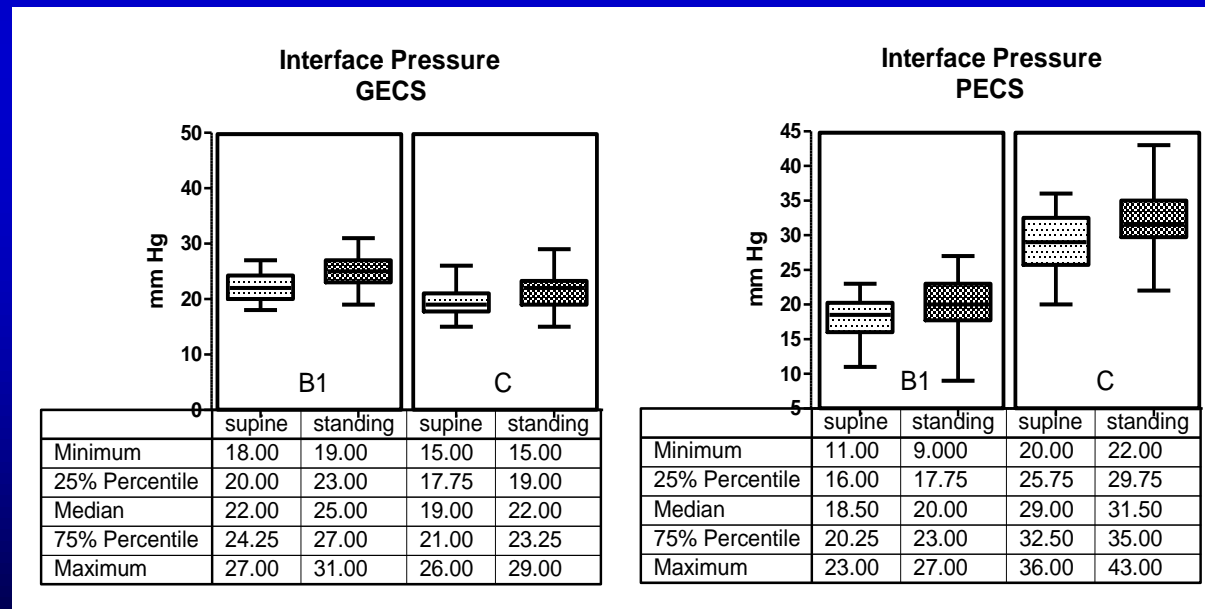
Hagan MJ, Lambert SM. A randomised crossover study of low-ankle-pressure graduated-compression tights in reducing flight-induced ankle oedema. *Med J Aust.* 2008 Jan 21;188(2):81-4.

Partsch H, Winiger J, Lun B. Compression stockings reduce occupational swelling. *J Derm Surg* 2004; 30:737-43.

clinical data

C3 prevention:

graduated vs anti-graduated elastic stockings in preventing occupational oedema: higher pressure over the calf is more effective



Mosti G, Partsch H. Occupational Leg Oedema is More Reduced by Antigraduated than by Graduated Stockings. Eur J Vasc Endovasc Surg. 2013 May;45(5):523-7.

clinical data

C4b:

elastic stocking exerting 30-40 mm Hg versus no compression.

significant reduction of lipodermatosclerosis with ECS was reported

clinical data

C5:
comparison of class II and class III ECS to prevent ulcer recurrence

in the prevention of ulcer recurrence the higher the pressure the lower the recurrence rate

Nelson EA: prevention of recurrence of venous ulceration: randomized controlled trial of class 2 and class 3 elastic compression. J Vasc Surg 2006;44:803-8

clinical data

C6: three groups:

1. tubular elastic device (36 mm Hg)
2. the same compression device + 1 elastic bandage (54 mm Hg)
3. the same compression device + 2 elastic bandages (74 mm Hg)

healing rate of the third group significantly > the second group
significantly > the first group: the higher the pressure the greater
the healing rate

attention: poor compliance with higher pressure

Milic D et al. The influence of different sub-bandage pressure values on venous leg ulcers healing when treated with compression therapy. J Vasc Surg. 2010 Mar;51(3):655-61.

clinical data

Prevention of DVT: metanalysis of 18 studies

Elastic stockings vs no compression: ES reduce the occurrence of DVT by 50% (13% vs 26%)

Elastic stocking + another prevention system vs nothing: in the treatment group the occurrence of PTS is reduced by 75% (4% vs 16%)

clinical data

Prevention of PTS: elastic stocking vs no compression.

Elastic stockings (30-40 mm Hg) reduce the occurrence of PTS.

1. Brandjes DPM, Büller H, Hejboer H et al. Randomised trial of effect of compression stockings in patients with symptomatic proximal-vein thrombosis. *Lancet*. 1997 Mar 15;349(9054):759-62.
2. Prandoni P, Lensing AW, Prins MH et al. Below-knee elastic compression stockings to prevent the post-thrombotic syndrome: a randomized, controlled trial. *Ann Intern Med*. 2004 Aug 17;141(4):249-56

conclusion

1. pressure of elastic stockings counts
 2. when higher pressure is compared with lower pressure, higher pressure is always more effective
 3. when a pressure of 23-32 mm hg or higher is compared with nothing any pressure is more effective
-
1. caution with strong pressure exerted by elastic devices: it can be hardly tolerated

thank you for your attention