# Classification for elastic tubes, medical socks and soft bandaging?

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# Standard „Bandages“ in UK and Consensus Paper

| Group RAL-GZ | type BS 7505 | level of compression | British standard (mmHg) (bandages) | German standard (mmHg) (stockings) | Consensus (Partsch et al 2008) (bandages) |
|---|---|---|---|---|---|
| KK 1 | 3A | light | up to 20 | 18,4 – 21,2 | < 20 (light) |
| KK 2 | 3B | moderate | 21-30 | 25,1 – 32.1 | 20-40 (moderate) |
| KK 3 | 3C | high | 31-40 | 36,4 – 46,5 | 40-60 (strong) |
| KK 4 | 3D | extra high | 41-60 | >59 | > 60 (extra-strong) |


- British Standards Institute, Specification for the elastic properties of flat, non-adhesive, extensible fabric bandages. BS 7505;1995. *London; British Standards Institute, 1995*.
- Deutsches Institut für Gütesicherung und Kennzeichnung Medizinische Kompressionsstrümpfe (compression stockings) RAL-GZ 387, Berlin: Beuth-Verlag, 1987. (KK= class of compression)
- Partsch H et al. Classification of compression bandages: practical aspects. Derm Surg (2008) 34: 600-609

# CEN (European Prestandard 2001)

| Class | Pressure in mmHg | Level of Compression |
|---|---|---|
| Ccl A | 10-14 | Light |
| I | 15-21 | Mild |
| II | 23-32 | Moderate |
| III | 34-46 | Strong |
| IV | ≥49 | Very strong |

# Clinical indications and compression

| Clinical indication | Intended effect | Pressure required |
|---|---|---|
| Oedema | Prevention (long sitting) | 10-20 mmHg |
| | Therapy | 20-60 mmHg * |
| Thromboprophylaxis | Acceleration of venous flow (lying position) | 10-15 mm Hg |
| Venous occlusion after surgery, endovenous therapy | Occlusion of dissected branches, „empty vein“ Standing: | Lower leg >70 mm Hg, Thigh 30-60 mmHg |
| Chronic venous insufficiency (refluxes) | Intermittent narrowing of veins during walking | 50-80 mmHg ** |

Partsch H. Physics of compression

# Stage-orientated Compression Therapy – eg in Leg Ulcer

## 18 (20) – 60 mmHg (or higher)

**Bandages** (Multilayer systems)
up to healing of ulcer
oedema reduction
„Therapy phase – acute therapy“

**Stockings**
after healing,
prevention of recurrence/relapse
„Maintanence Phase“

# Early prevention with TPS, Medical Socks and Elastic Tubes

14 – 18 mmHg

8 – 14 mmHg

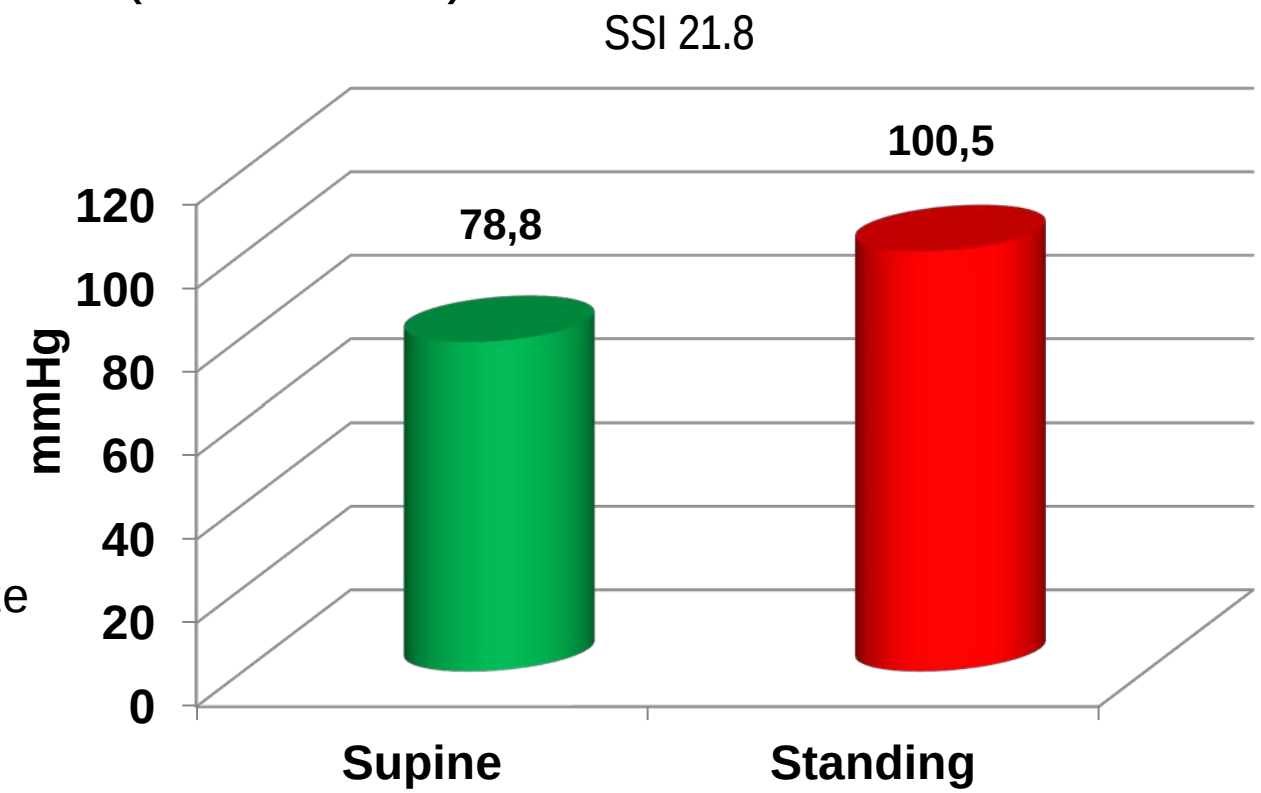
TPS Stockings

Elastic tubes

Support wear

# Soft bandaging

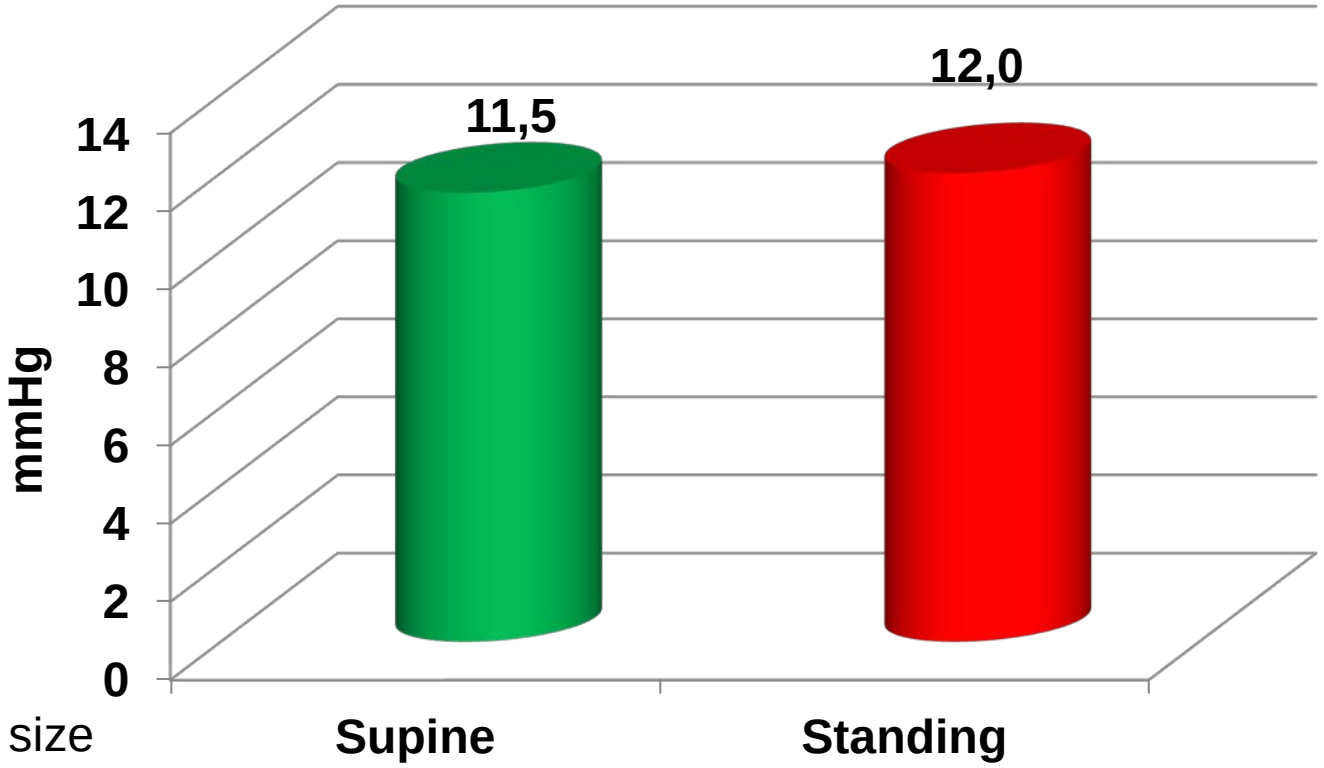
## Rosidal K (with tension)




- n=4 (measurement)
- male volunteers
- 8 and 10cm bandage size
- without any padding
- bandaged direct on the healthy skin
- PicoPress, small probe
- B1 position
- circumference (calf): 40.6 cm
- circumference(ankle): 22,4 cm

Schrovenwever K, Griesshammer K, Abel M (2013)

# Soft bandaging

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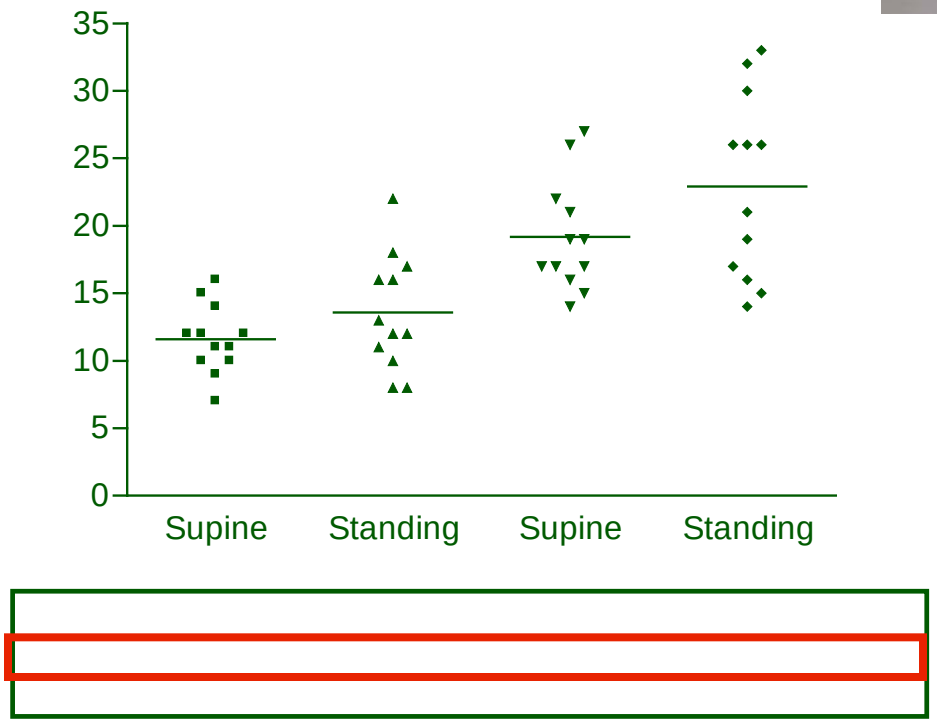
# Padding bandage – soft bandaging

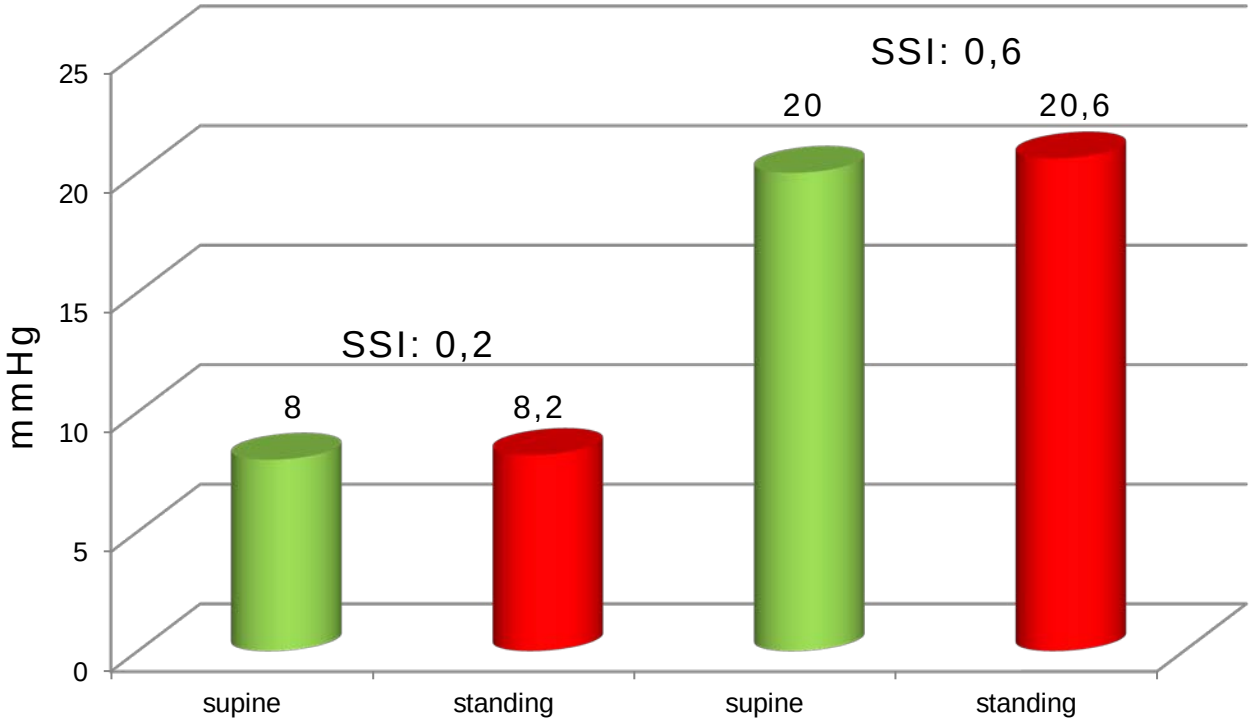
## Rosidal soft
### (padding)




b1-Position, Kikuhime, small probe

(Partsch H. 2005)

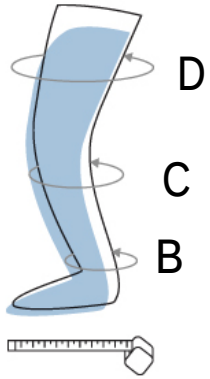
# Elastic Tube - tg grip




Position B

Position C

- n= 5 (measurements)
- PicoPress, small probe
- tg grip F (10 cm)  for leg
- circumference position B (ankle):  22,9 cm
- circumference position C (calf):  40,4 cm
- application directly on the healthy skin




(Koggel 2012)

# Light compression increase the venous blood flow

In the supine position, light stockings with a pressure range on the distal leg of **10–20mmHg are able to narrow the veins and to increase venous blood flow velocity.** This has been seen to be effective in preventing deep vein thrombosis in non-ambulatory patients.

Partsch H, Kahn P.
Venöse Strömungsbeschleunigung in Bein und Becken durch Anti-Thrombosestrümpfe.
Klinikarzt 1982;11:609–12

In:
Partsch H.
Do we still need compression bandages? Haemodynamic effects of compression stockings and bandages.
Phlebology 2006; 21: 132–138

# Liberal selection of mild compression material

Partsch H, Winiger J, Lun B.
**Compression stockings reduce occupational leg swelling.**
Dermatol Surg. 2004 May;30(5):737-43; discussion 743.

In 12 volunteers, the volume of both lower legs was measured in the morning and 7 h later, the difference being defined as evening edema (mL).

**RESULTS:** The average evening edema of the noncompressed legs was 62.4 mL on the left side and 94.4 mL on the right side (n.s**.). Evening edema was significantly reduced to 40.3 mL by light support stockings, to -34.1 mL by compression class A, to -39.6 by compression class I, and to -59.1 mL by compression class II. Mainly stockings exerting a pressure above 10 mmHg improved subjective symptoms.**
**CONCLUSION:**
Calf-length compression stockings with a pressure range between **11 and 21 mmHg are able to reduce or totally prevent evening edema** and may therefore be recommended for people with a profession connected with long periods of sitting or standing.

# New classification (proposal)

| ~~Class~~ Range | Pressure (in mmHg) | Level of Compression |
|---|---|---|
| I | < 14 (eg 5 or 8 - 14) | Extra mild |
| II | 14 - 20 | Mild |
| IV | 21 - 30 | Moderate |
| V | 31 - 40 | Strong |
| VI | > 40 | Very strong |

# Open Questions and Conclusion

- Improve the compliance of the patient
  - Liberal selection of compression material
  - Depending of the indication (patient or healthy volunteer)
- Increase the early prevention with low pressure compression devices like TPS, Medical Socks, Elastic Tubes, Soft Bandaging
  - Increase of the compliance for compression (and their tolerance/adaption), especially if the disease deteriorate over time
- Integrate the low pressure devices in the compression classification system
  - prove their clinical effects in patients and on compliance / quality of life

# Early prevention – early compression

- start early with an adequate compression level
- adapted on the daily life and individual situation of the human beings
- improve the tolerance/adaption of the patient for compression

**Extra mild compression**

**- better than no compression -**

# Thank you for your attention!

# Additional slides

# What are compression leveles?

| Daylong Classification | Daylong mmHg Range | EU/ RAL Standard | EU/ RAL mmHg Range | UK Standard | UK mmHg Range | US Standard | US mmHg Range |
|---|---|---|---|---|---|---|---|
| EXTRA LIGHT UP TO 14 MMHG | < 14 mmHg | - | - | - | - | - | - |
| LIGHT 14 - 17 MMHG | 14 - 17 mmHg | - | - | UK Class 1 | 14 - 17 mmHg | - | - |
| MODERATE 18 - 24 MMHG | 18 - 24 mmHg | EU Class 1 | 18 - 21 mmHg | UK Class 2 | 18 - 24 mmHg | US Class 1 | 15 - 20 mmHg |
| FIRM 25- 35 MMHG | 25 - 35 mmHg | EU Class 2 | 23 - 32 mmHg | UK Class 3 | 25 - 35 mmHg | US Class 2 | 20 - 30 mmHg |
| EXTRA FIRM OVER 35 MMHG | Over 35 mmHg | EU Class 3 | 34 - 46 mmHg | - | - | US Class 3 | 30 - 40 mmHg |

http://www.daylong.co.uk/compression/compression-definition.html

# Liberal selection of mild compression material

J Vasc Surg. 2013 Feb 12.

**Compression stockings significantly improve hemodynamic performance in post-thrombotic syndrome irrespective of class or length.**
Lattimer CR, Azzam M, Kalodiki E, Makris GC, Geroulakos G.

**Tested**
class 1 (**18-21 mm Hg**) and class II (**23-32 mm Hg**), below-knee (BK) and above-knee thigh-length (AK).

**Conclusion:**
Compression significantly improved all hemodynamic parameters on air plethysmography. However, the hemodynamic benefit did not significantly change with the class or length of stocking.

These results support the **liberal selection** of a Graduated Elastic Compression (GEC) stocking based on patient preference.

# Liberal selection of mild compression material – long term

Phlebology. 2013 Apr 5

**Efficacy and comfort of medical compression stockings with low and moderate pressure six weeks after vein surgery.**

Reich-Schupke S, Feldhaus F, Altmeyer P, Mumme A, Stücker M.

Female patients undergoing **vein surgery** were randomized for a compression therapy with low (**18-21 mmHg**, group A) or moderate (**23-32 mmHg**, group B) pressure MCSs. Follow-up was done by a phlebological experienced, blinded physician (pressure control, clinical aspect, duplex scan, and questionnaire) one and six weeks after surgery.

**CONCLUSION:**
Compression stockings with a pressure of 23-32 mmHg facilitate a **faster** resolution of clinical and ultrasound verified edema and the subjective feelings of pain, tightness, and discomfort of the leg in the early period after surgery **but have no difference in the longer post-surgical period compared to stockings with a pressure of 18-21 mmHg.**

Eur J Vasc Endovasc Surg. 2011 Aug;42(2):261-6.

**Compression stockings with a negative pressure gradient have a more pronounced effect on venous pumping function than graduated elastic compression stockings.**

Mosti G, Partsch H.

30 patients with **severe superficial chronic venous insufficiency** were enrolled. Two elastic stocking designs exerting a **pressure at ankle between 15 and 25 mmHg** were compared; a conventional GECS and a stocking exerting a higher pressure over the calf than over the ankle producing a "progressive" increase in compression (PECS).

In our present study, it was shown that **the significantly higher pressures over the calf achieved by the PECS (29 mmHg in supine, 33.5 mmHg during walking)** are significantly more effective than lower pressures in improving a disturbed venous pumping function. Despite this significant improvement, PECS are not able to restore a normal EF from the lower leg as it happens using inelastic bandages exerting comparable resting pressures.

The significantly improved efficacy of PECS stockings on the venous calf pump may not be extrapolated to other effects of such stockings like thromboprophylaxis, chronic oedema or lymphoedema reduction and deep venous damage following DVT.