Compression for Lymphedema: proof of efficacy

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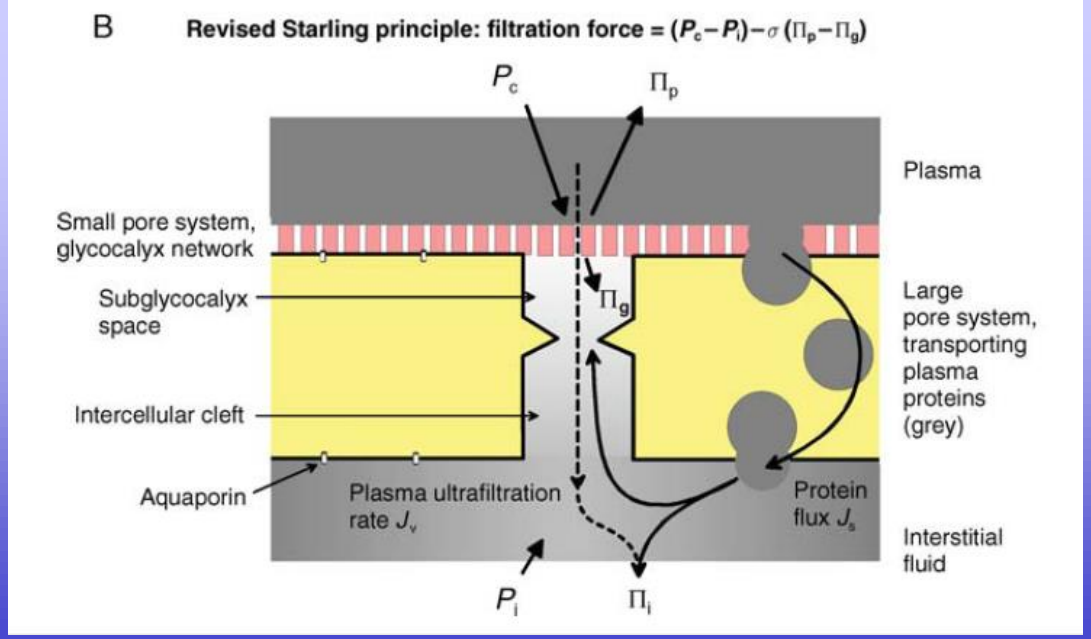
CIRC

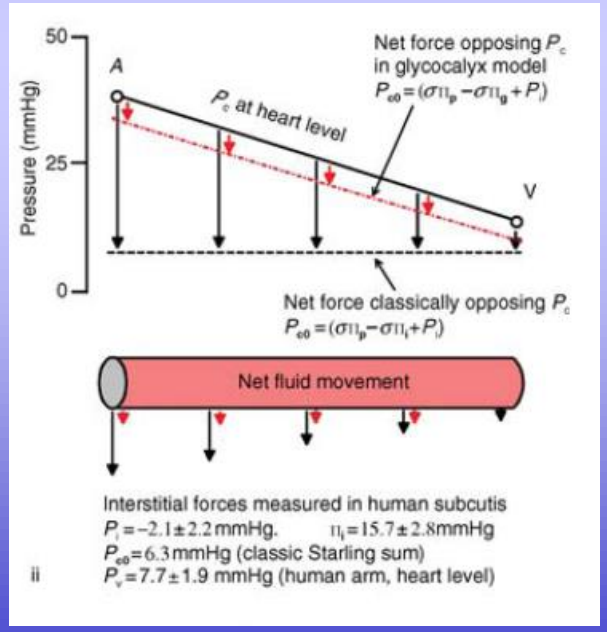
DISCLOSURE OF CONFLICTS OF INTEREST

Medi covered my travel
and accomodation expenses

Revised Starling principle: microvascular fluid exchange

- Steady state: slight filtration prevails in most vascular beds
- Lymph transport , not venous capillary reabsorption, is the main process responsible for interstitial fluid balance





J.R. Levick and C.C. Michel. . Cardiovascular Research 2010

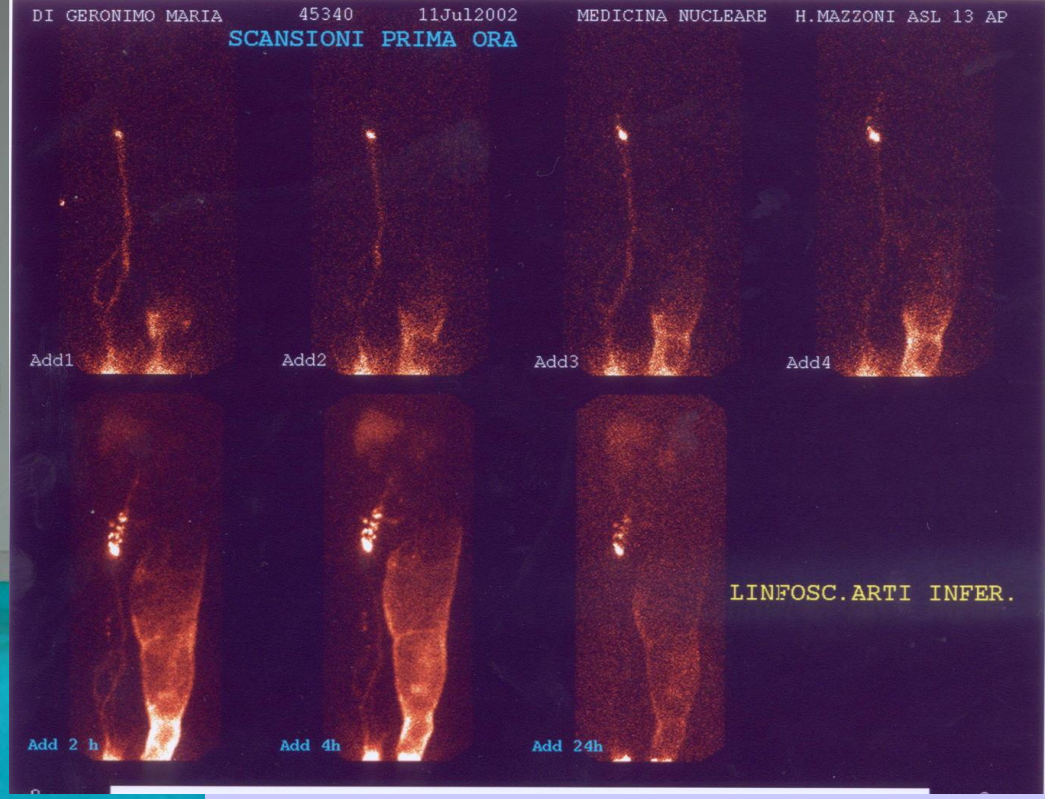
LYMPHEDEMA

A clinical manifestation of lymphatic system insufficiency and deranged lymph transport

The central disturbance is a *low output failure of* the lymphatic system, that is, overall lymphatic transport is reduced

(ISL Consensus Document 2013)

PRIMARY LYMPHOEDEMA, STAGE III, IN OBESE PATIENT


DI GERONIMO MARIA 45340 11Jul2002 MEDICINA NUCLEARE H.MAZZONI ASL 13 AP
SCANSIONI PRIMA ORA
Add1
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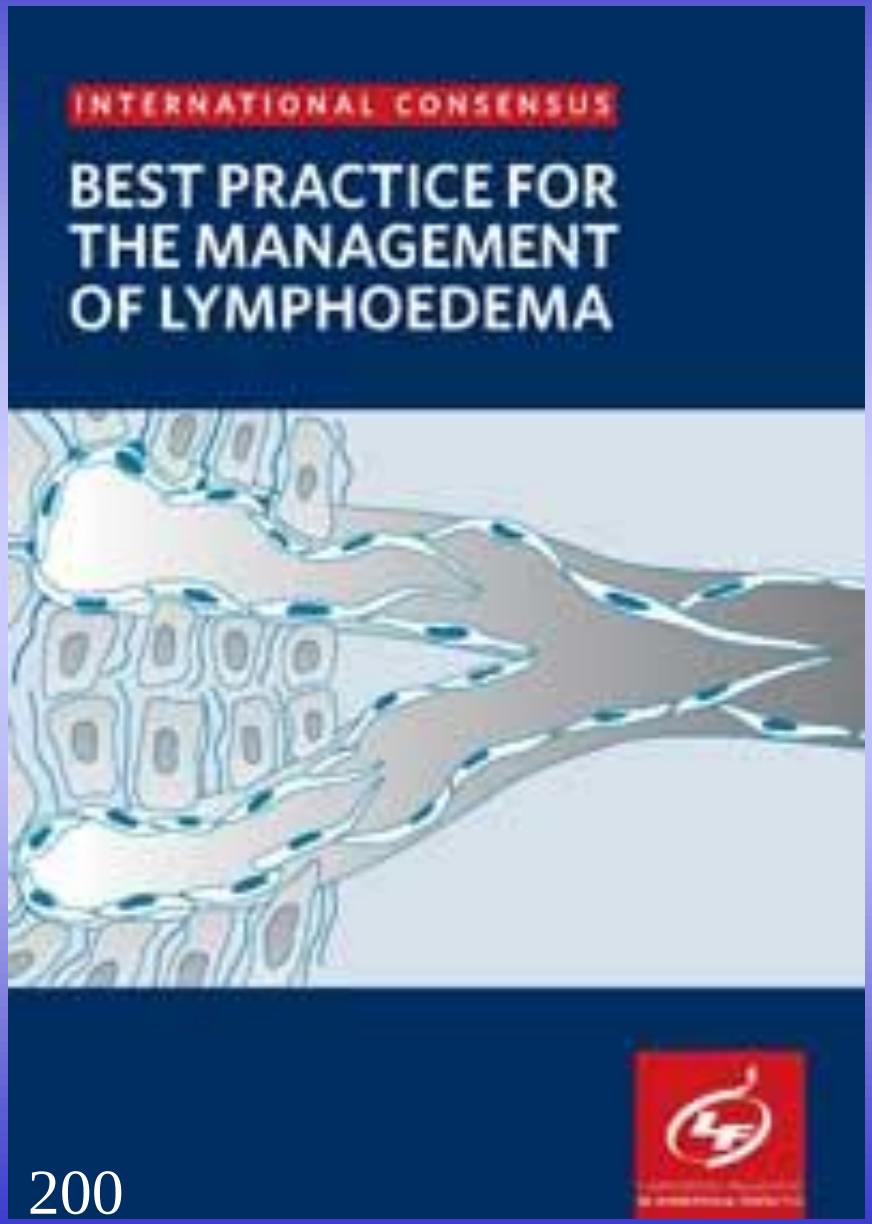
Add 24h
LINFOSC.ARTI INFER.

LYMPHATIC DECONGESTIVE THERAPY

LEG LYMPHOEDEMA

- BANDAGE (sub-bandage pressure > 45 mm Hg), GARMENTS, Velcro devices
- MLD
- exercise/movement
- skin care
- IPC ?
- Drugs ?



200

Effects of compression therapy in LYMPHOEDEMA

- **INCREASE OF INTERSTITIAL PRESSURE! Hence:**
- **Reduction of capillary filtration**
- **Shift of fluid into non-compressed parts of the body**
- **Increase of lymphatic (protein !!) reabsorption and stimulation of lymphatic transport**
- **Improvement of the VASCULAR-MUSCLE PUMPS**
- **Breakdown of fibrosclerotic tissue**
- **Protection of the skin**

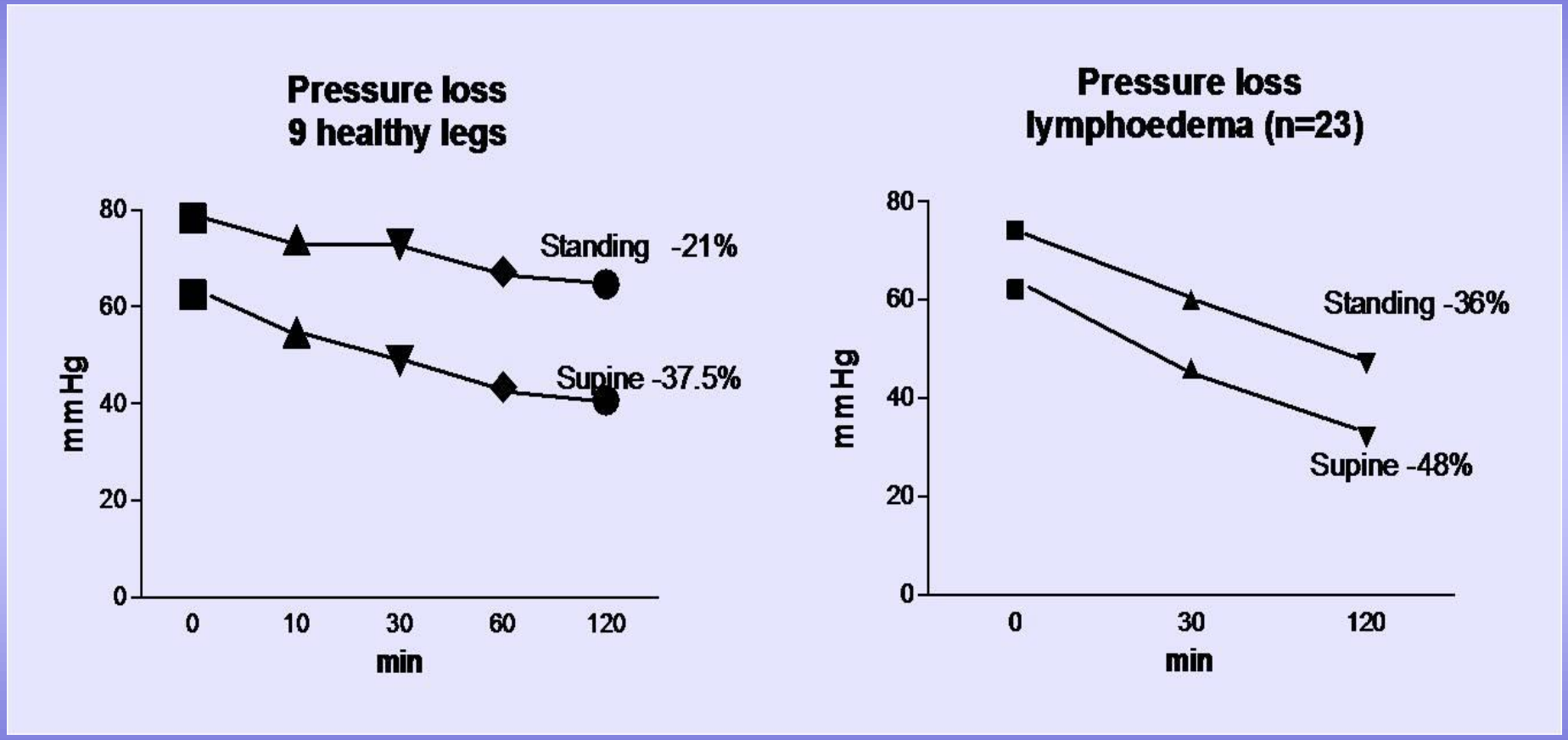
COMPRESSION TREATMENT

* BANDAGES achieve a result in the intensive phase
* Adj.Velcro Devices ??

ELASTIC GARMENTS (stockings/sleeves) maintain the results in the chronic phase

ADHESIVE MULTI-LAYER BANDAGE FOR LYMPHOEDEMA

pressure drop in lymphoedema



Damstra R, et al. Dermatol Surg 2008, 34:773-8

The “Midland” between hosiery and bandages…

- **VELCRO ADJUSTABLE COMPRESSION DEVICES**

- **Circ-aid / Juxta Fit**

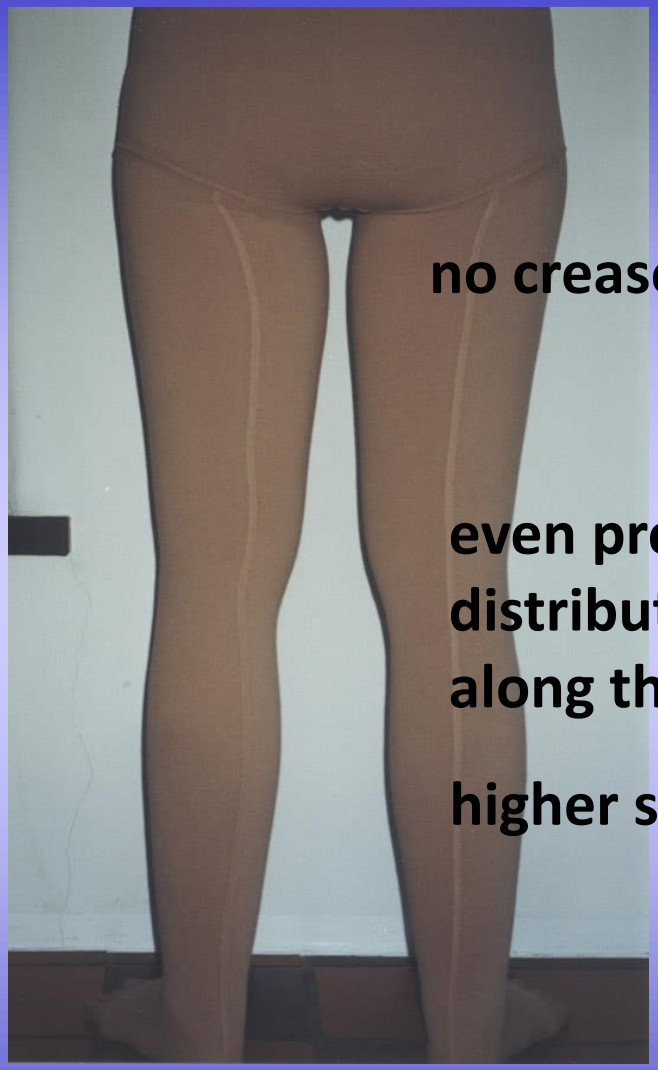
Adjustable Velcro Devices CIRC-AID….

- non-elastic interlocking bands
- sustained and adjustable compression
- patient self-application

Lymphoedema „maintenance phase“

- custom-made flat-knitted compression stockings
- self-compression elastic bandages
- Adjustable Velcro Devices (also in the intensive phase..)
- pumps (at home) ?

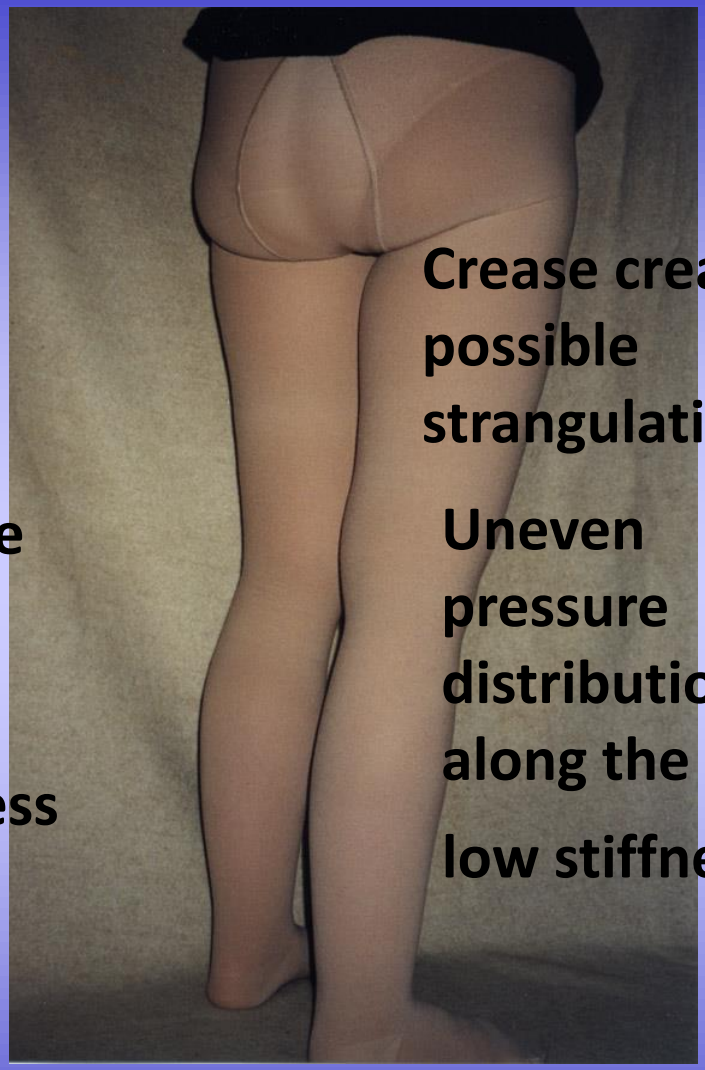
lymphoedema „maintenance phase“



no crease

even pressure distribution along the leg

higher stiffness



Crease creating possible strangulations

Uneven pressure distribution along the leg

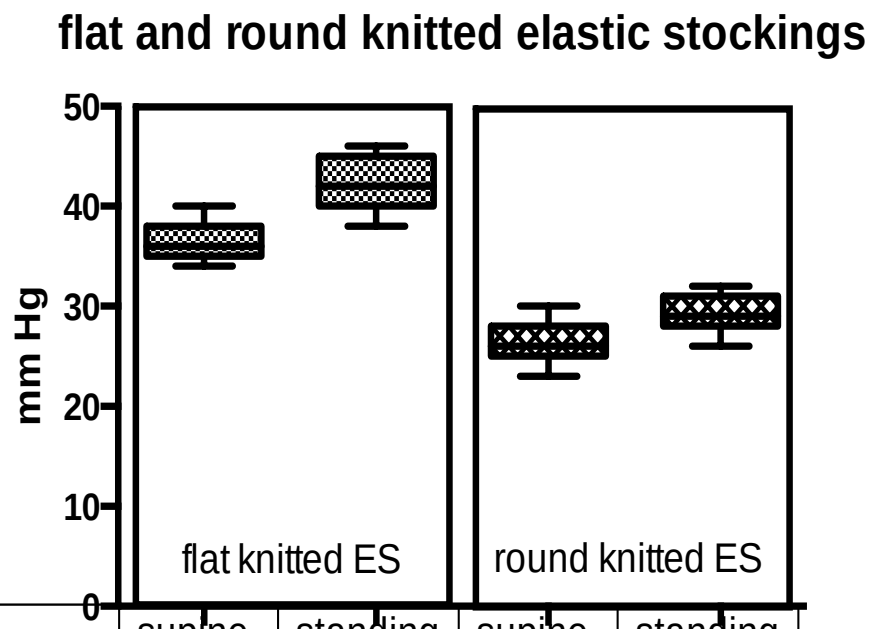
low stiffness

flat knitted stockings lymphology

round knitted stockings phlebology

lymphoedema „maintenance phase“

II class



	supine	standing	supine	standing
Minimum	34.00	38.00	23.00	26.00
25% Percentile	35.00	40.00	25.00	28.00
Median	36.00	42.00	26.00	29.00
75% Percentile	38.00	45.00	28.00	31.00
Maximum	40.00	46.00	30.00	32.00
Mean	36.73	42.00	26.40	29.47
Std. Deviation	1.751	2.699	2.028	1.995
Std. Error of Mean	0.4522	0.6969	0.5237	0.5152

congenital lymphedema before and after 6 weeks of compression

Intensive therapy phase

inelastic multilayer multicomponent bandage

maintenance phase

Compression stockings

„Optimal“ pressure (highest amount of oedema reduction)

- **LOWER LIMB: compression pressure about 40 mm Hg (initial pressure of 60 mm Hg)**

- **UPPER LIMB: 20-30 better than 40-50 mm Hg;**

Vanscheidt W et al. J Vasc Surg 2009;49:395-402
Damstra R et al Dermatol Surg 2008; 34:773-8
Damstra R et al. J Vasc Surg 2009;49:1256-63

Some Literature….

Yasuhara et al 1996

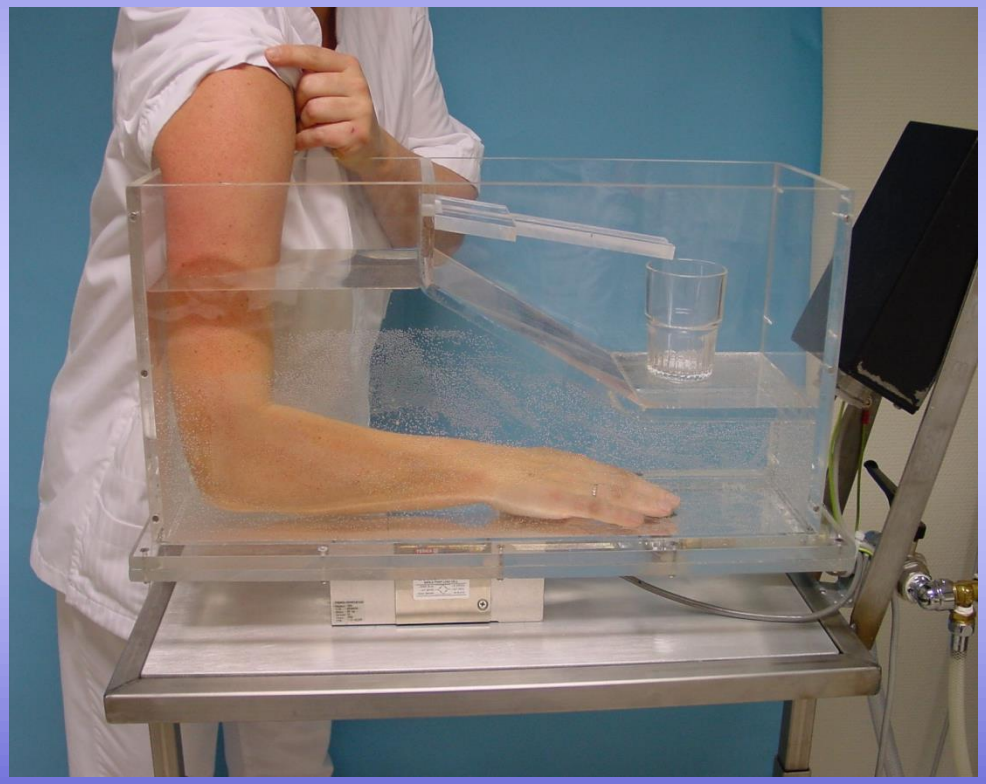
- Observational Study
- Compression Stockings over 5 years reduce leg volume in lymphedema patients (especially secondary lymphedema)

Multilayer bandaging followed by compression hosiery was more effective than hosiery alone in reducing lymphoedema of the limb

*Badger CM, Peacock JL, Mortimer PS. **A randomized, controlled, parallel-group clinical trial comparing multilayer bandaging followed by hosiery versus hosiery alone in the treatment of patients with lymphedema of the limb**. Cancer 2000 Jun 15;88:2832–7.*

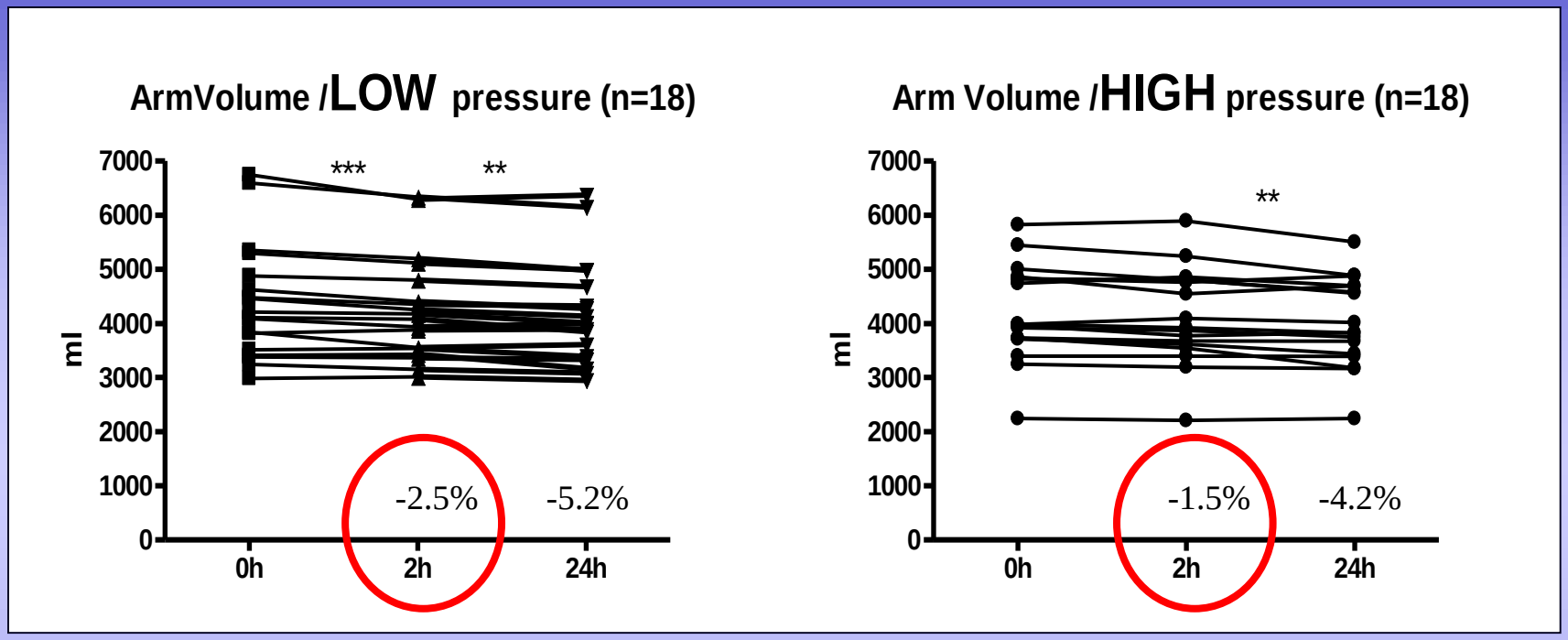
compression therapy in arm lymphoedema

arm volume measured by water displacement



Damstra R, Partsch H. J Vasc Surg. 2009

compression therapy in arm lymphoedema



low pressure (25 mm hg) > effective high pressure (50 mm hg)

Damstra R, Partsch H. J Vasc Surg. 2009 May;49(5):1256-63.

Prospective, randomized controlled trial comparing the effect of CircAid® Juxta-Fit™ versus Trico bandages in the treatment of leg lymphedema.
published in JVLD

R.J. Damstra, dermatologist

H. Partsch, dermatologist

Dutch Expert Center for Lymphovascular Medicine

Nij Smellinghe Hospital, Drachten (NL)

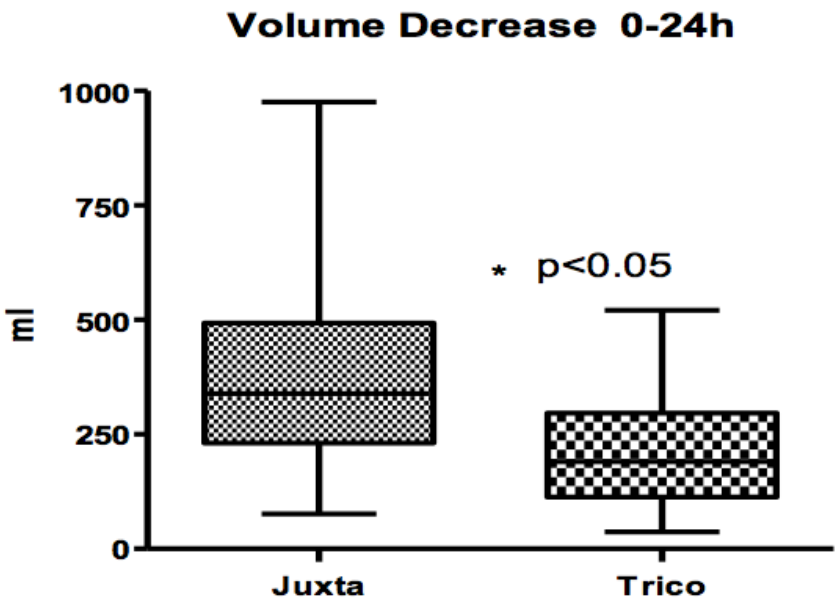
Aim of the study

- Compare a new compression device (ADJUSTABLE VELCRO DEVICE) for the treatment phase versus a traditional inelastic multicomponent compression:
  - In effectiviness: volume / interface pressure / DSI
  - In patient’s participation / selfmanagement

VELCRO device (juxta fit®) original for maintenance phase used

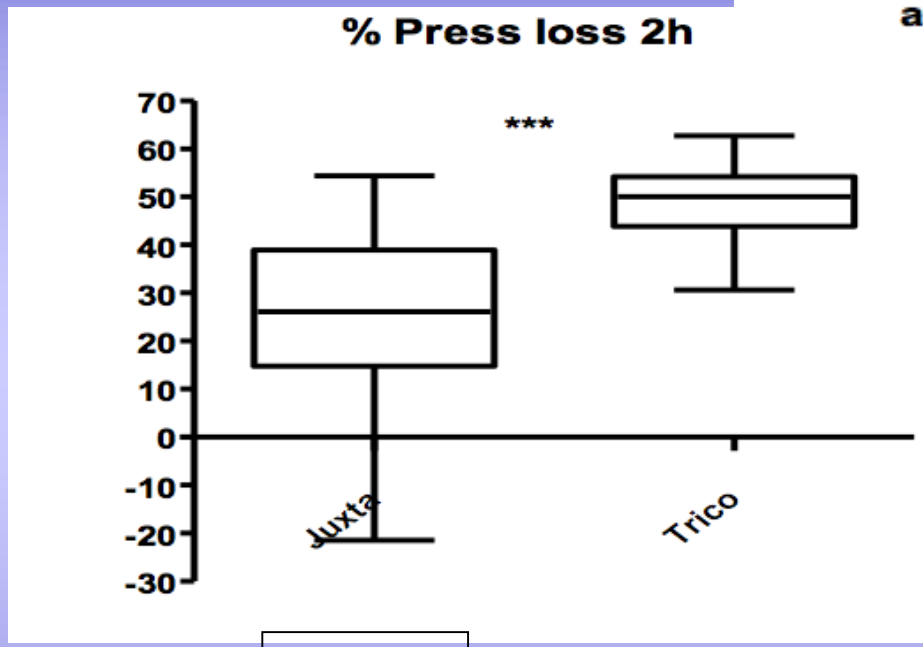
Volume reduction 0-24 hours

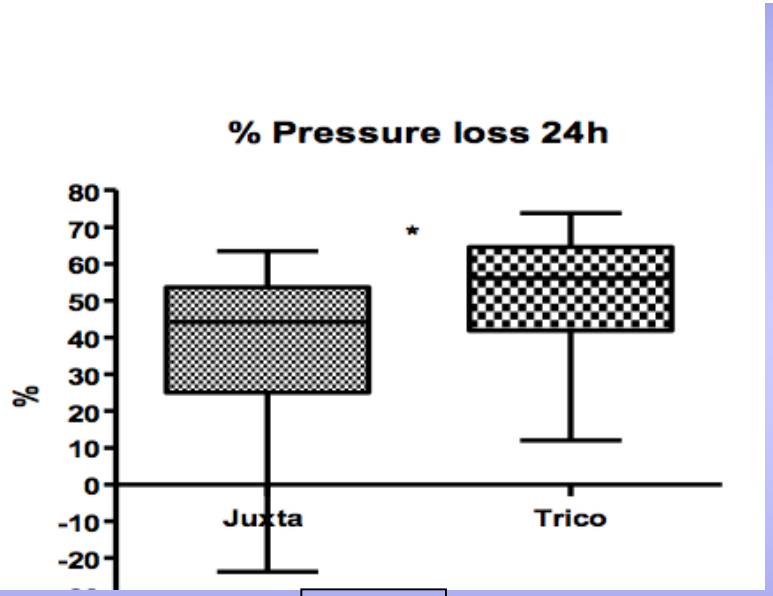
Juxtafit achieves a significantly more effective volume reduction than Trico after 24 hours (p<0.05)



Interface pressure loss B1 T0 – T2 – T24

Juxta looses significantly less pressure than Trico, after 2 h (p<0.001) and 24 h (p<0.05)





Juxta fit

Trico

T0-T2:	md 53 ➔	41 (22.6%)	md 67 ➔	38 (43%):	**p<0.001**
T2- T24:	md 55 ➔	42 (23,6 %)	md 65 ➔	33 (49,2%):	**p< 0.05**

Conclusions of trico vs juxta fit in initial treatment phase of lymphedema

- Juxta fit is more effective in volume reduction
- JF has lower SSI / DSI
- Self-management of the patient is contributory to better clinical effect
- JF is effective in the initial treatment phase of lymphedema AND the maintenance phase

Compression garments versus compression bandaging in decongestive lymphatic therapy for breast cancer-related lymphedema: a randomized controlled trial

King M, Deveaux A, White H et al. , Support Care Cancer 2012, 5, Vol 20

* The group receiving bandaging experienced greater median volume reductions at 10 days (70 vs. 5 mL; $p = 0.387$) and at 3 months (97.5 vs. 50 mL; $p = 0.182$).

* The bandaging group also experienced a greater increase (WORSE RESULTS…) in median DASH (disability) scores at 10 days (+20.9 vs. +5; $p = 0.143$) and at 3 months (+18.4 vs. +3.3; $p = 0.065$)

Lymphology 46 (2013) 120-131

NO EVIDENCE OF BENEFIT FROM CLASS-II COMPRESSION STOCKINGS IN THE PREVENTION OF LOWER-LIMB LYMPHEDEMA AFTER INGUINAL LYMPH NODE DISSECTION: RESULTS OF A RANDOMIZED CONTROLLED TRIAL

M.M. Stuiver, J.D. de Rooij, C. Lucas, O.E. Nieweg, S. Horenblas,
A.N. van Geel, M. van Beurden, N.K. Aaronson

No difference in:

- Incidence of limb or genital LYM
- Median time of occurrence of LYM
- Frequency of complications
- QOL
- Body image

Clinical Study

Effect of Kinesiology Taping on Breast Cancer-Related Lymphedema: A Randomized Single-Blind Controlled Pilot Study

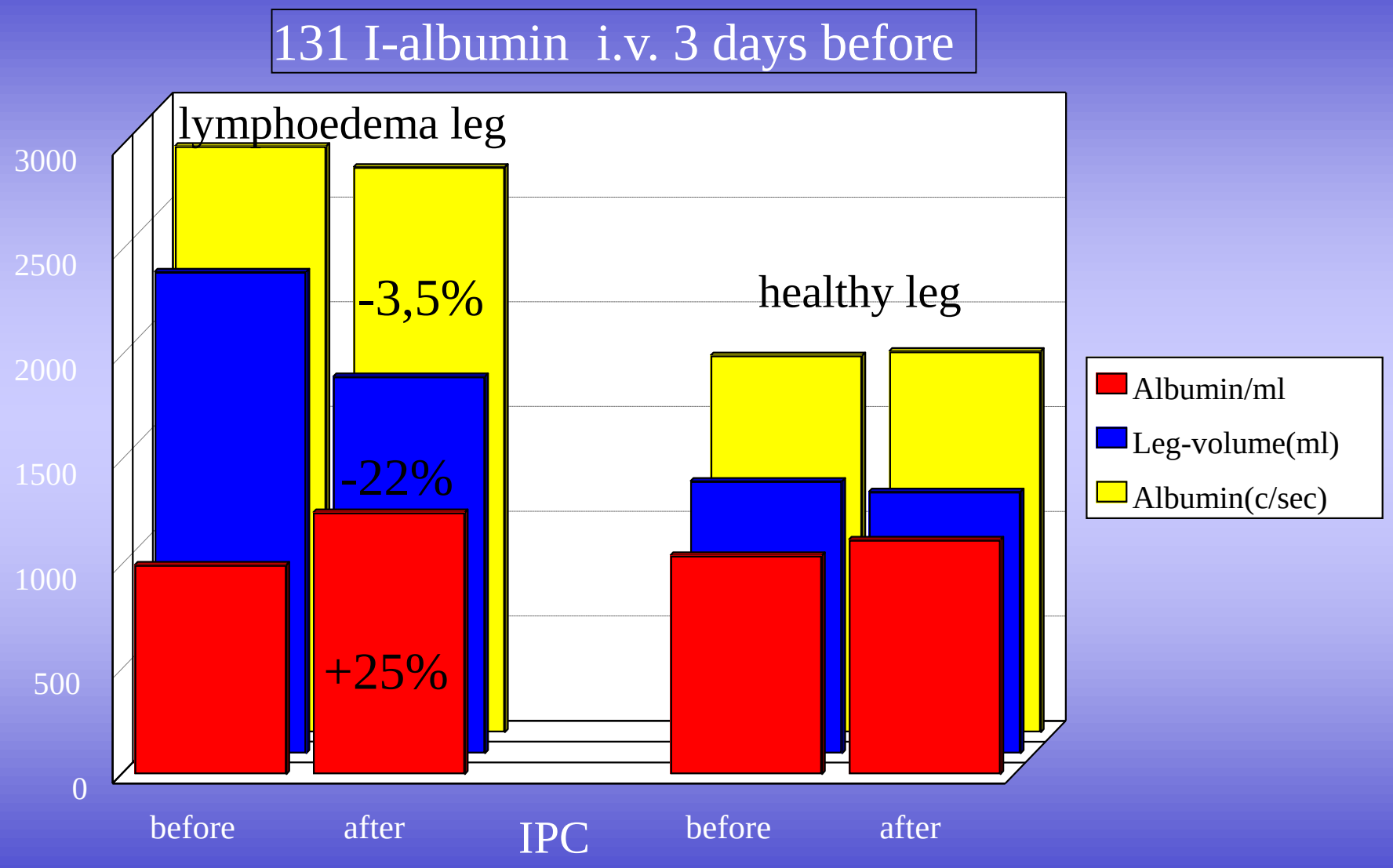
A. Smykla,[1] K. Walewicz,[1,2] R. Trybulski,[3] T. Halski,[4] M. Kucharzewski,[5] C. Kucio,[6] W. Mikusek,[7] K. Klakla,[7] and J. Taradaj[1,2]

- Multilayer Bandage achieved much better outcomes than K-Taping
- K-Taping at the moment is NOT an alternative to compression bandage in BCRL

Intermittent Pneumatic Compression

- IPC is a model for short stretch bandage + walking
- additional value especially in immobile patients
- may shift fluid into non compressed parts
- should always be supplemented by compression as not able to remove protein content of edema

limb volume and protein content after IPC



Partsch H et al Z. Lymphol 1981;5:35-39

limb volume and protein content after IPC

11 legs with LE

before and 48 hours later after 3 h IPC

- decrease of leg volume
- no improvement of lymphoscintigraphy

Miranda F Jr et al. Lymphology 2001;34:135-41

limb volume and protein content after IPC

additional problem
risk of genital edema after pump compression

	Pump	No pump
Genital lymphedema	23/53	2/75

$p<0,0001$

Boris M, Weindorf S, Lasinski BB. Lymphology 1998; 31: 15-20

Efficacy of manual lymphatic drainage and intermittent pneumatic compression pump use in the treatment of lymphedema after mastectomy: a randomized controlled trial

Uzkeser U, Karatay et al. Breast Cancer 2015, 22, vol 3: 300-307

Significant differences in both groups before and after therapy. The baseline median volume difference of group 1 (CDT) was 630 (180–1,820), and after therapy it was 480 (0–1,410). In group 2 (CDT + IPC) , the beginning median volume difference was 840 (220–3,460), and after therapy it was 500 (60–2,160)

No significant differences were observed between the two groups in terms of the above-mentioned parameters.

Physical therapies for reducing and controlling lymphoedema of the limbs

C Badger, N Preston, K Seers, P Mortimer

The Cochrane Database of Systematic Reviews 2006 Issue 1

- Only three studies involving 150 randomised patients were included
- One crossover study concluded that MLD provided no extra benefit at any point during the trial over sleeves
- The bandage plus hosiery versus hosiery alone trial, concluded that bandage plus hosiery resulted in a greater reduction in limb volume

- **Currently not enough evidence to draw conclusions about the best physical therapy to use in the treatment of lymphoedema**

Oremus *et al. BMC Cancer* 2012, **12**:6
http://www.biomedcentral.com/1471-2407/12/6

BMC Cancer

RESEARCH ARTICLE Open Access

Systematic review: conservative treatments for secondary lymphedema

Mark Oremus[1,2], Ian Dayes[3], Kathryn Walker[1,2] and Parminder Raina[1,2*]

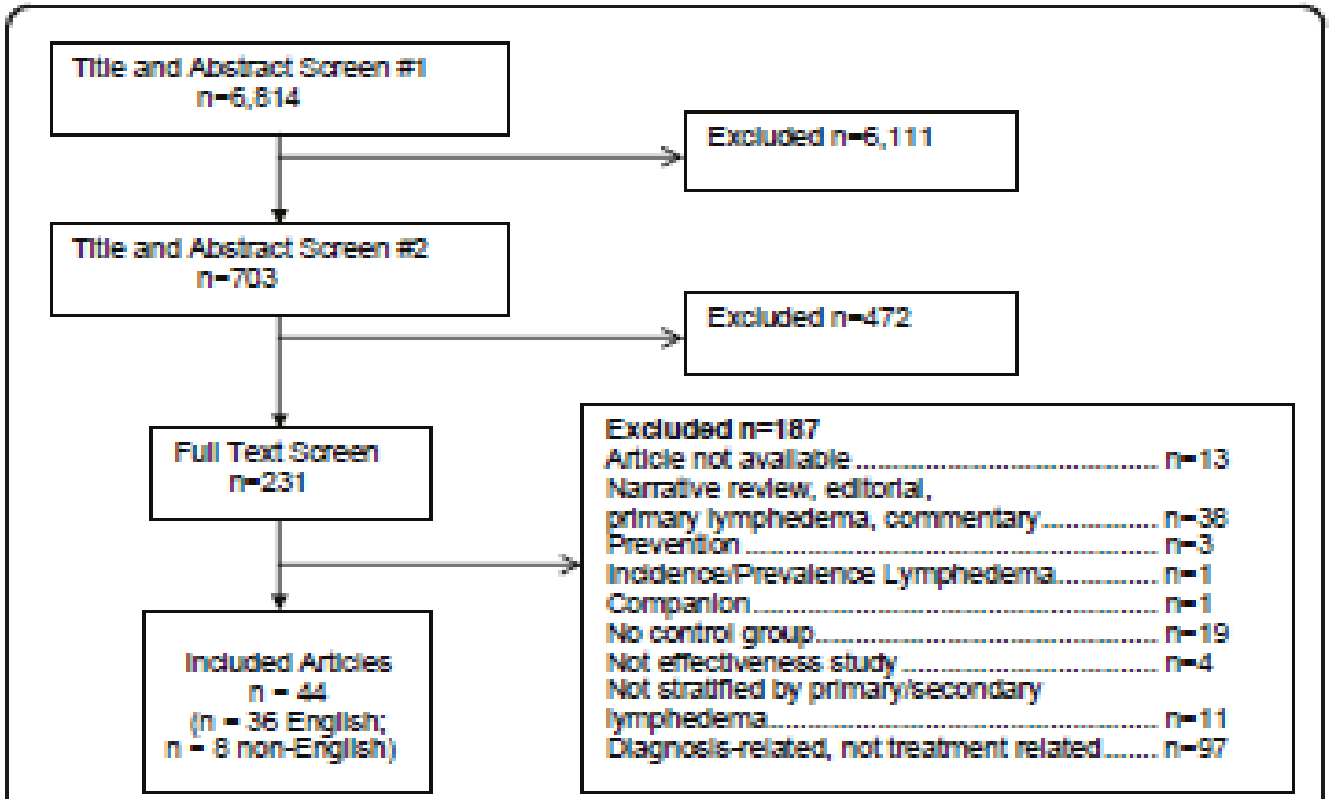


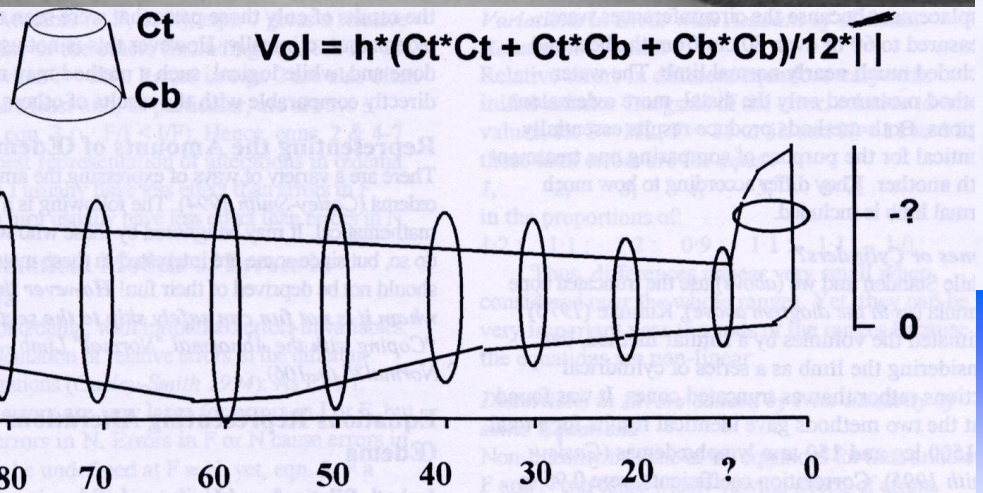
Figure 1 Study flow diagram.

Conclusions of the Review

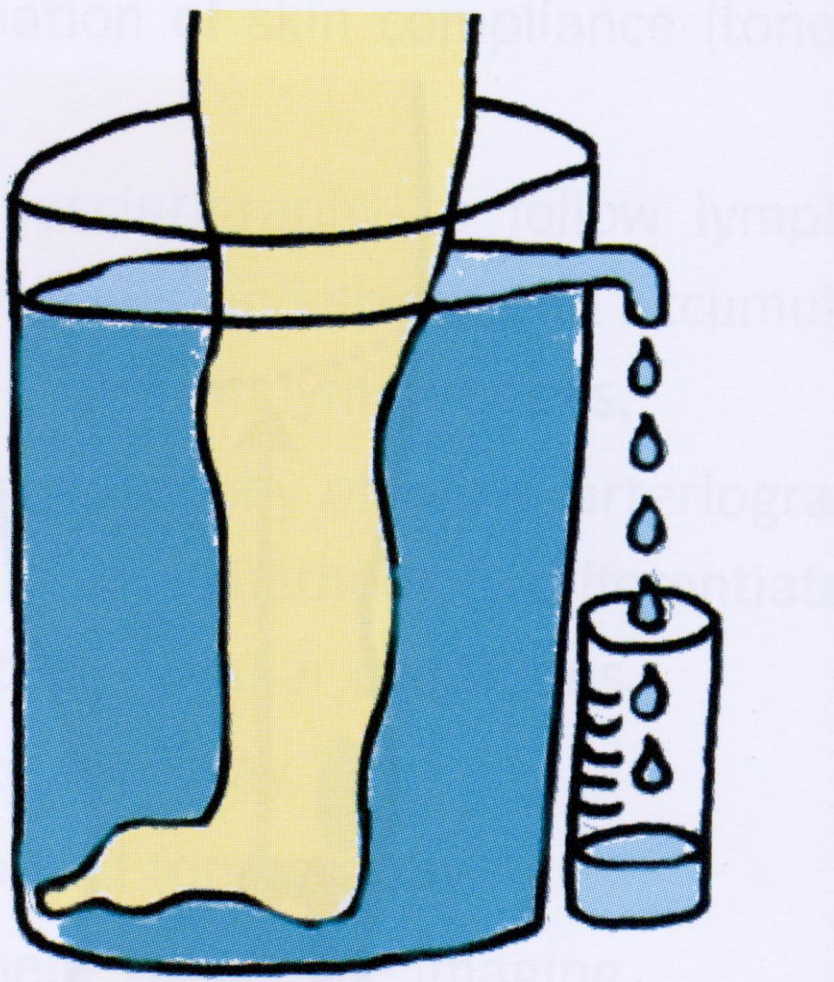
- Literature contains no evidence to suggest the most effective treatment.
- Harms from treatment are minor and likely to have little clinical impact. The field of research into treating secondary lymphedema is open to advancement

Indications for future studies

- P.La.C.E. in case of bandages
- Interface pressure, Static/dynamic stiffness index
- Volume assessment (water displacement, circumferences, Ultrasound, Optoelectronic devices, RM, CT)
- Lymphatic system function: lymphoscintigraphy (quali-quantitative)

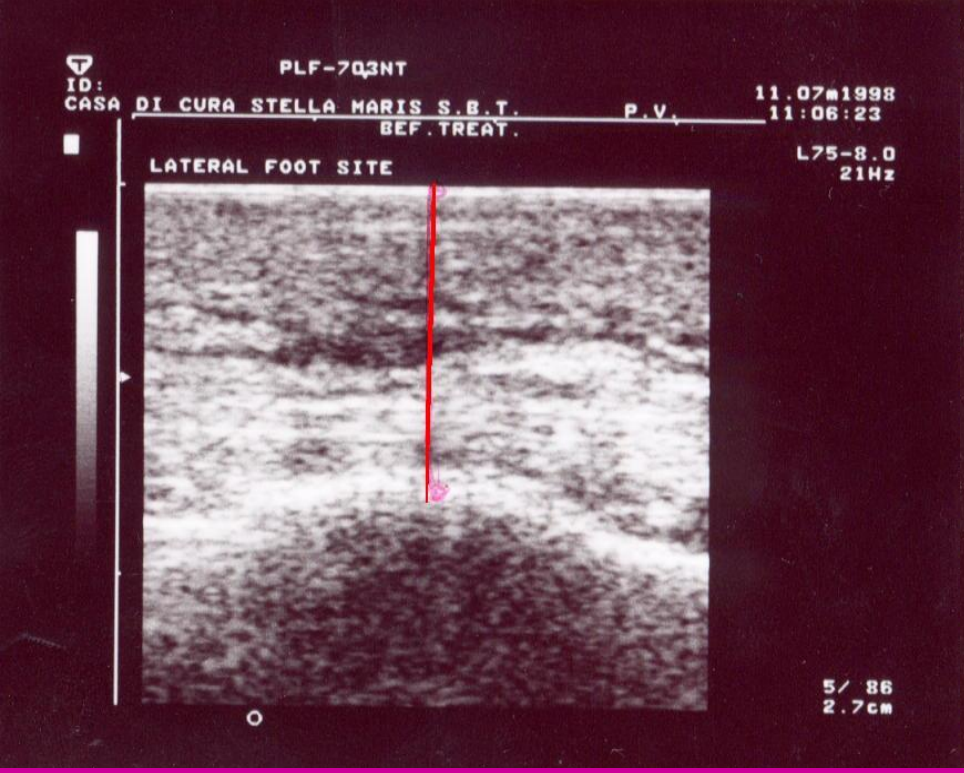


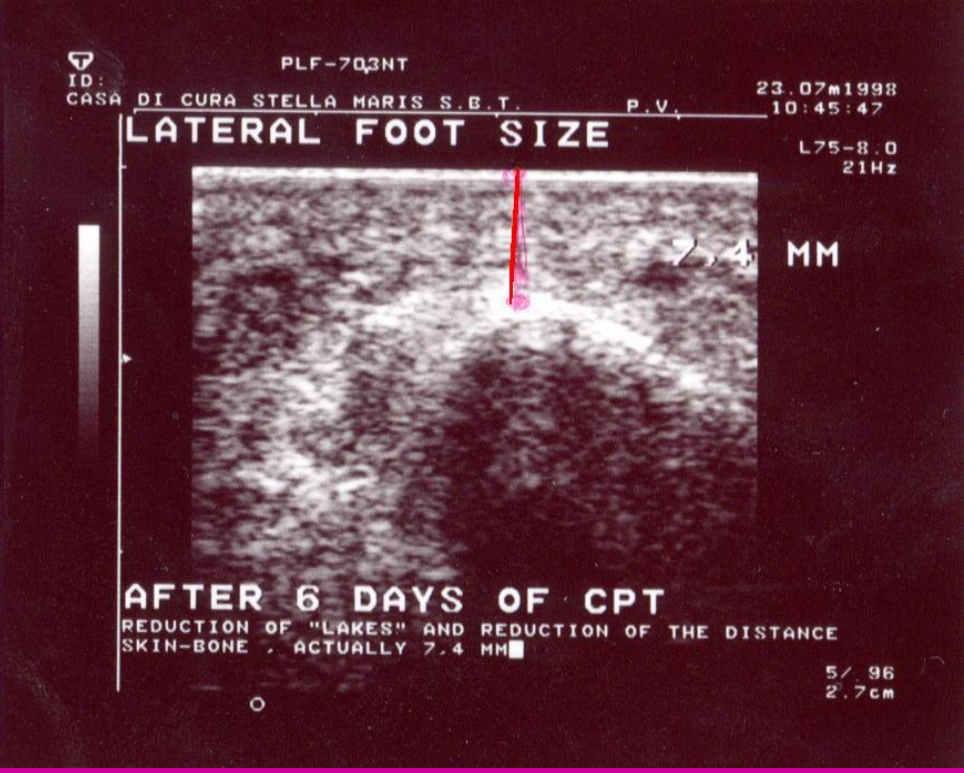
he volume of a limb can be estimated from a number of circumference measurements. Each two are estimate the volume of the limb between them, considering this segment to be a truncated cone, using tion given. These segments are then added together. The mid-foot or mid-hand and smallest ankle or used and their position (?) noted for future reference. Vol = volume of segment, 'Ct' and 'Cb' the rences at each end, and 'h' the distance between them (e.g. 10 cm). The sum of these = total volume.



MEASUREMENT OF OEDEMA IN ONE OF TWO LIMBS


esaote MyLab
STUDIO ECOGRAFICO
27 LUG 2010
18:25:17
B F 18 MHz G 76% CFM F 6.6 MHz G 70%
P 2 cm XV C PRF 1.0kHz
PRC 9-5-A PRS 4 PRC 3-B-A PRS 4
PST 4 FP M
NER LINF LA435
MALLEOLAR SITE
+0.06
-0.06
m/s
GSV
LYMPHATIC TRUNK
PHLEBOLYMPHEDEMA IN POST-THROMBOTIC SYNDROME
395/398





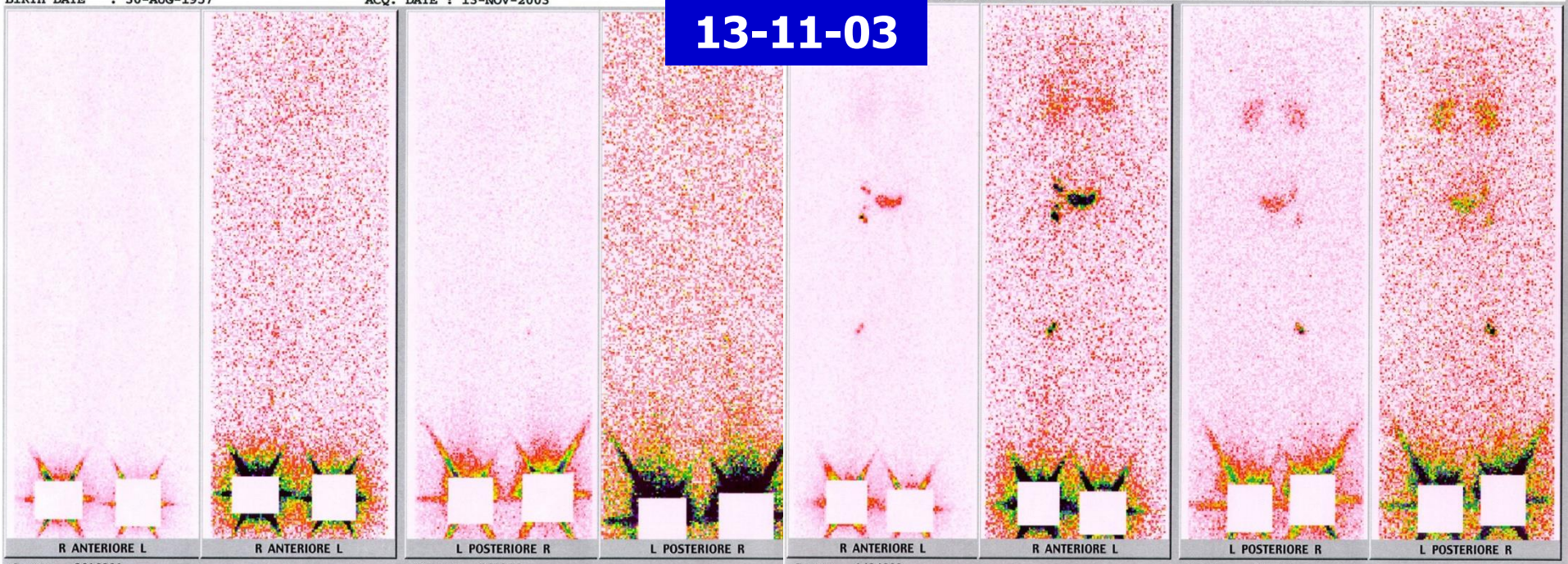
LYMPHOEDEMA

CLOSE FOLLOW-UP OF THE PHYSICAL-REHABILITATION TREATMENT (6 DAYS) WITH HIGH FREQUENCY ULTRASOUND

13-11-03

PATIENT NAME :
PATIENT ID : 723867
BIRTH DATE : 30-AUG-1957

INSTITUTE : AO UMBERTO I' ANCONA - U.O. MED NUCLEARE
PROTOCOL : WHOLE BODY DUAL INTENSITY
ACQ. DATE : 13-NOV-2003



Counts: 2010291
Dose:74.0 MBq 99mTc-nanocoll
Time post inj.: 5 min

Counts: 872356

Counts: 1434802
-nanocoll
Time post inj.: 180 min

Counts: 605749

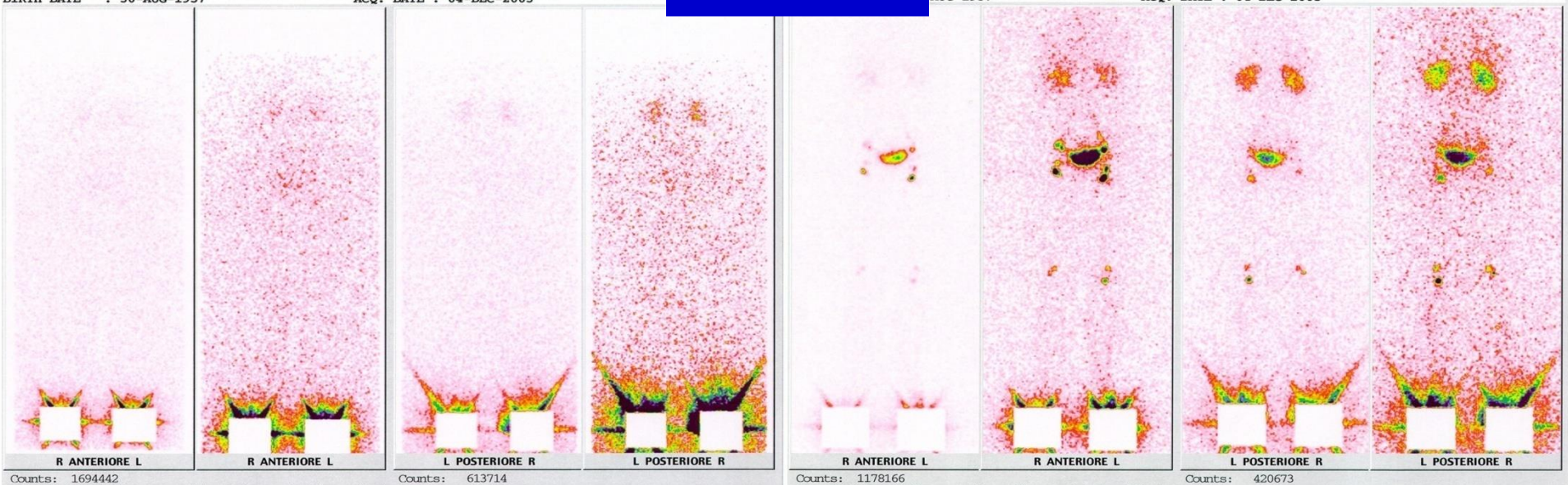
04-12-03

PATIENT NAME :
PATIENT ID : 723867
BIRTH DATE : 30-AUG-1957

INSTITUTE : AO UMBERTO I' ANCONA - U.O.
PROTOCOL : WHOLE BODY DUAL INTENSITY
ACQ. DATE : 04-DEC-2003

867
AUG-1957

INSTITUTE : AO UMBERTO I' ANCONA - U.O. MED NUCLEARE
PROTOCOL : WHOLE BODY DUAL INTENSITY
ACQ. DATE : 04-DEC-2003



Counts: 1694442
Dose:74.0 MBq 99mTc-nanocoll\
Time post inj.: 5 min

Counts: 613714

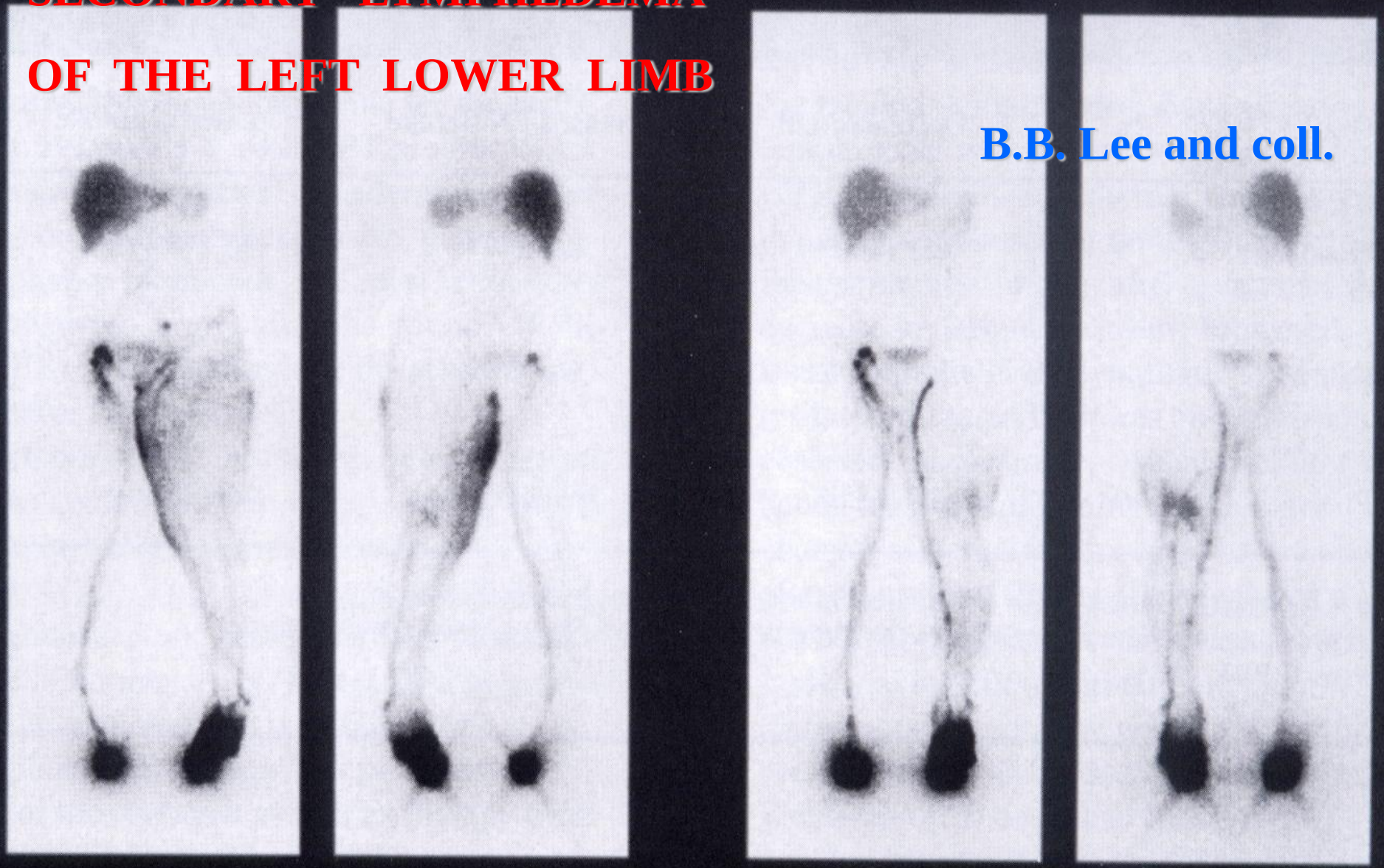
Counts: 1178166
Dose:74.0 MBq 99mTc-nanocoll
Time post inj.: 180 min

Counts: 420673

SECONDARY LYMPHEDEMA OF THE LEFT LOWER LIMB

F/46

B.B. Lee and coll.



Anterior Posterior

Pre CPT

Anterior Posterior

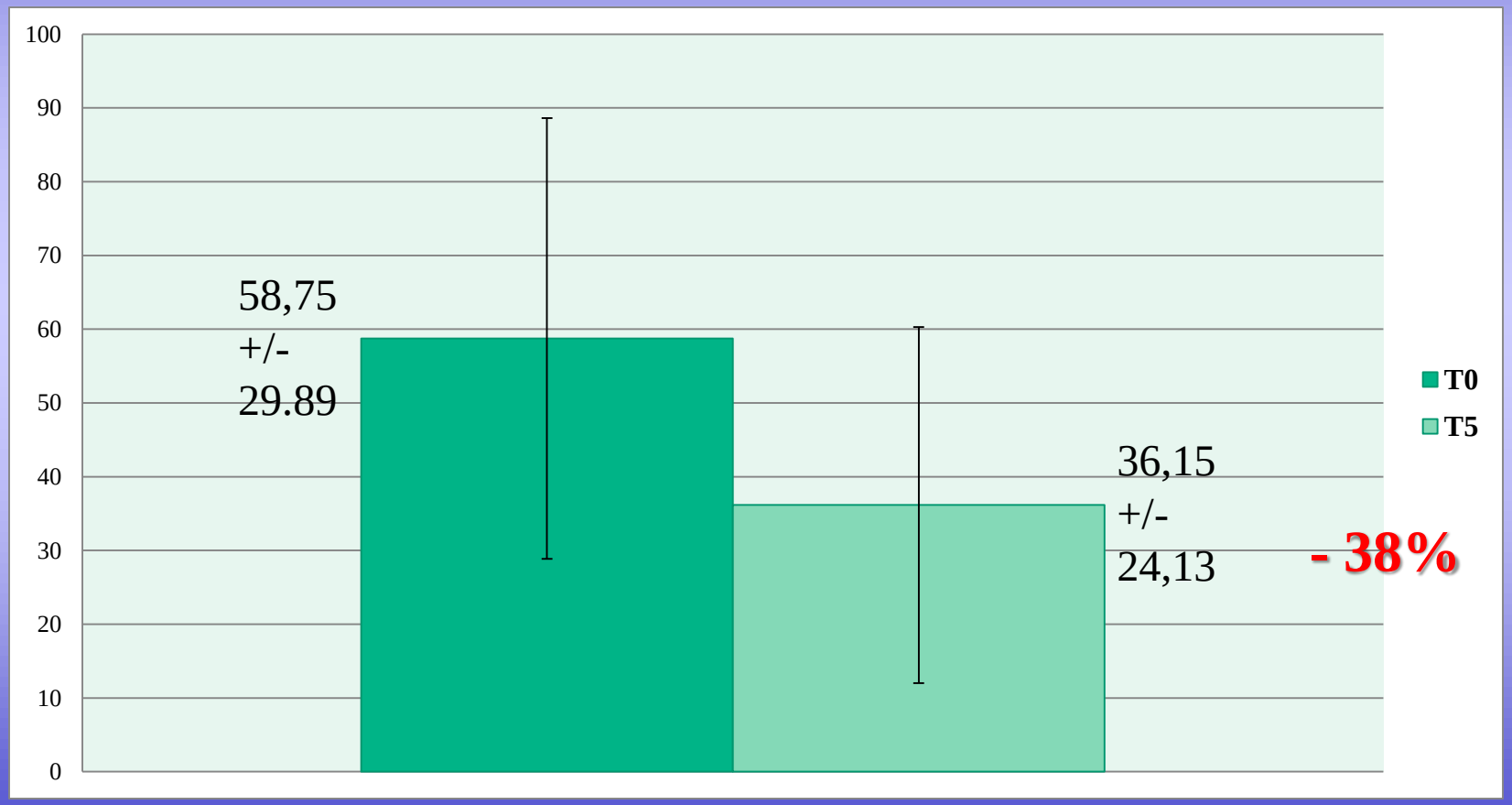
Post CPT 3mo

Indications for future studies

- Fluid assessment (BIS)
- Tissue (Ultrasound, BIS, Tonometry)
- Moisture measurement?
- Disability ? QOL ?
- Compliance to compression device


ImpediMed
L-Dex U400
28/10/2009 19:07:44

LYMPHEDEMA TREATMENT
L-DEX (mean value and S.D.)
REDUCTION



Raw Data Assessment

Unilateral or bilateral edema

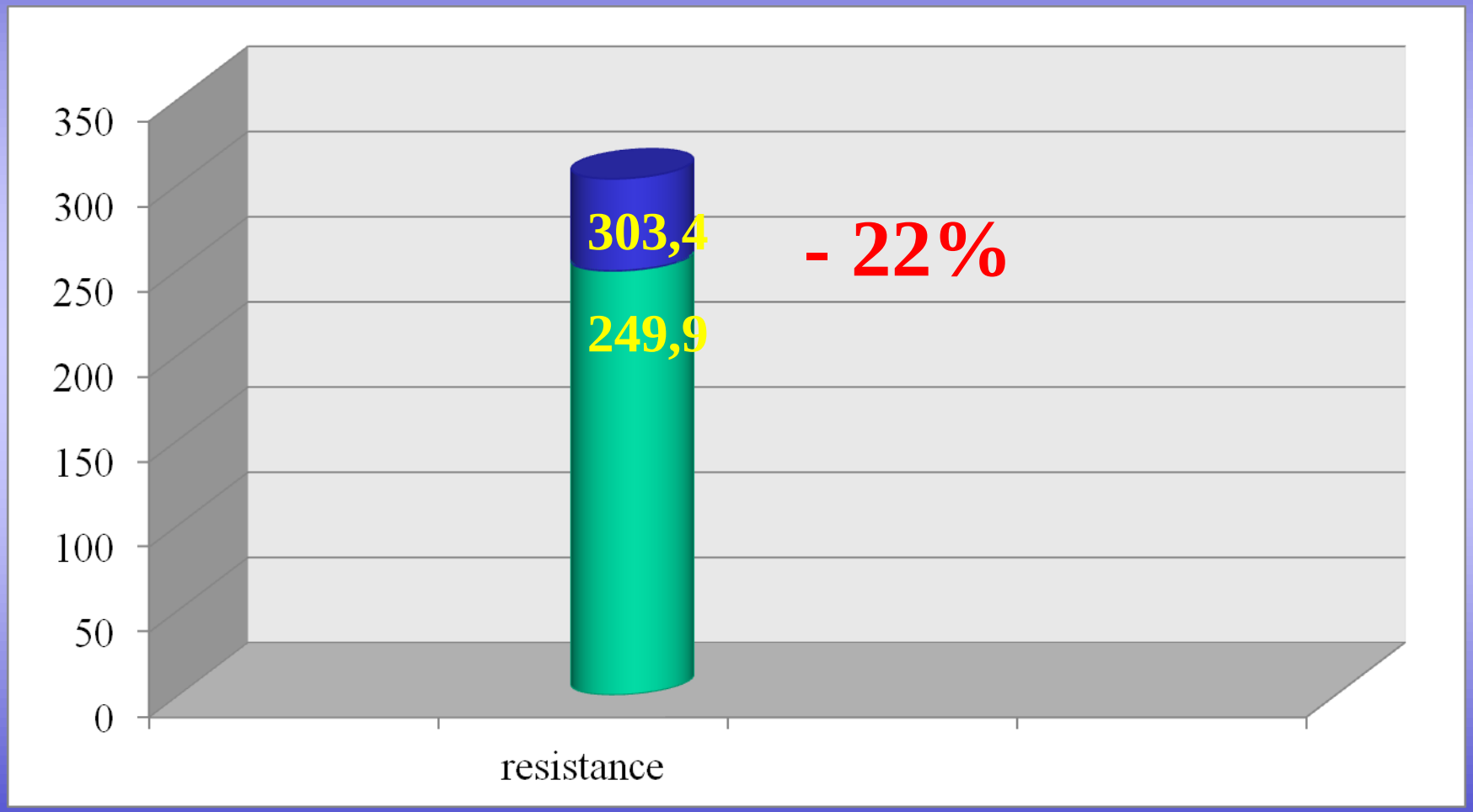
Limb Segment (thigh and/or leg)

Fluid accumulation and tissue composition

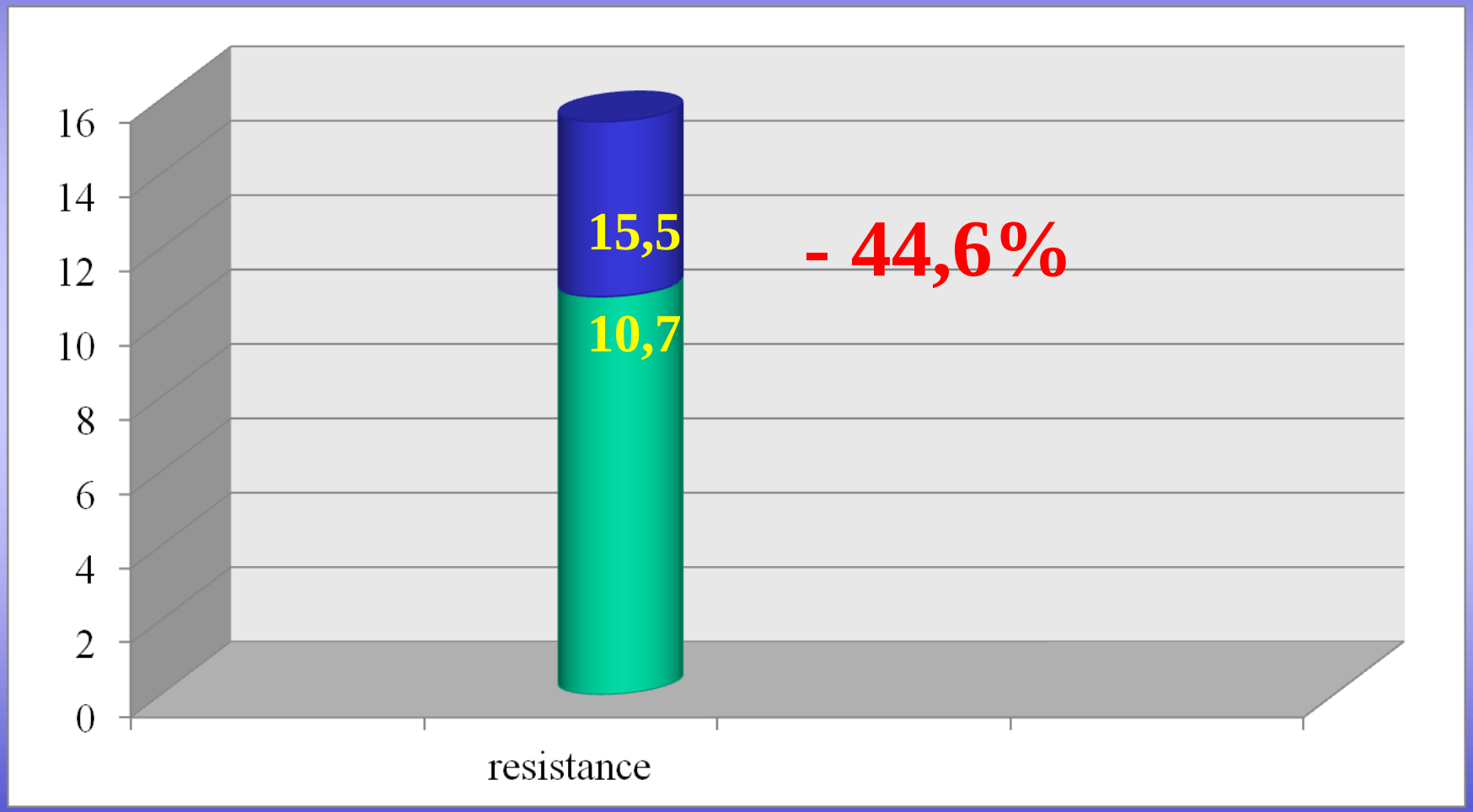
BIOIMPEDANCE SPECTROSCOPY in LYMPHEDEMA

- 42 patients (10 male and 32 females, mean age 58,8) with primary or secondary lymphedema
- 11 patients were submitted to intensive decongestive treatment

Resistance percentage difference between limbs with vs without lymphedema

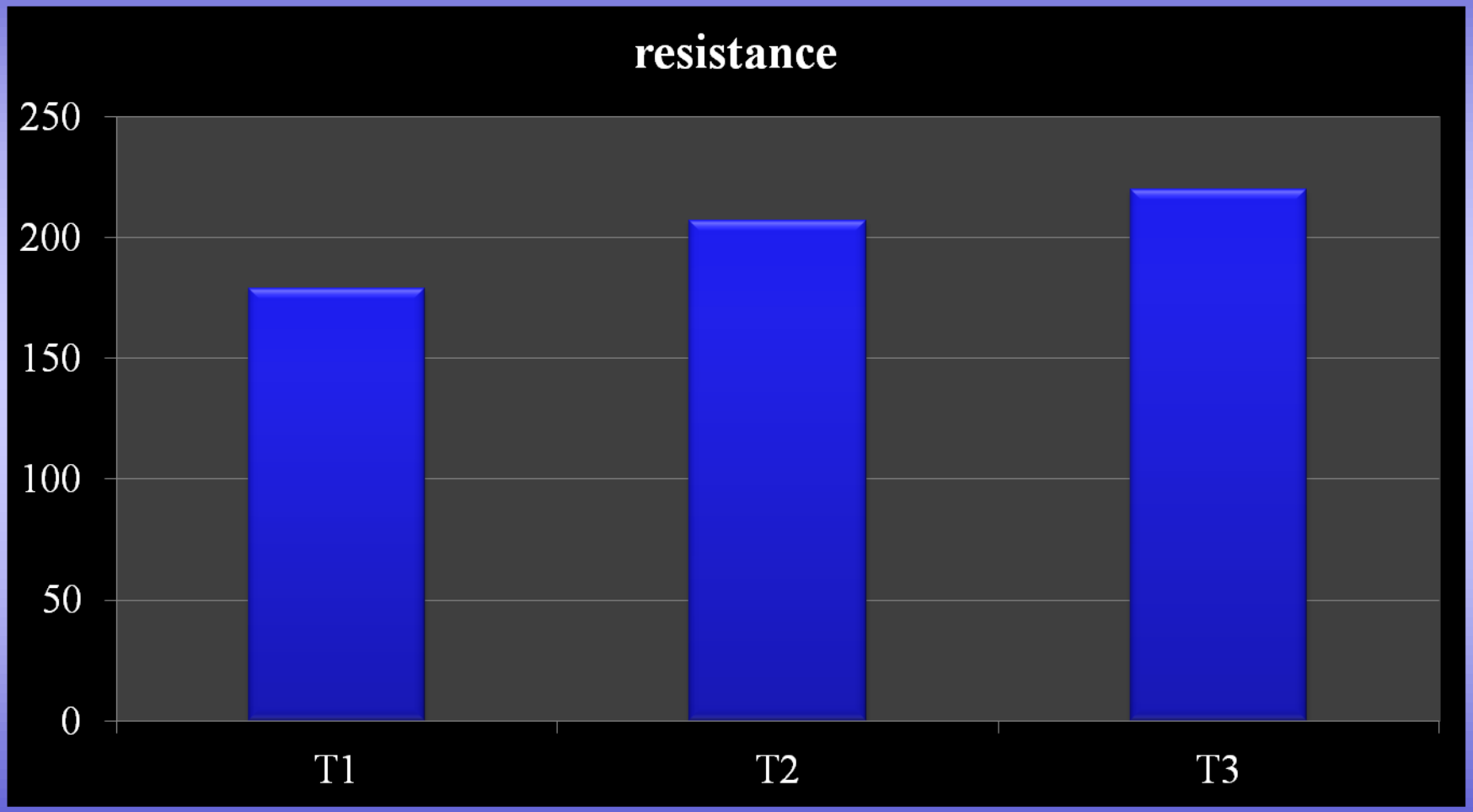


Reactance percentage difference between limbs with vs without lymphedema



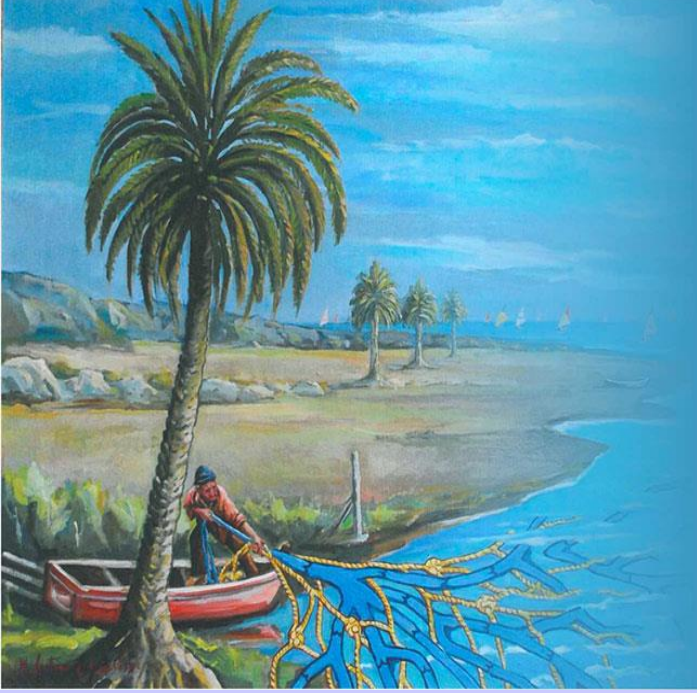
Resistance during treatment

11 patients



1 day 3 days 6 days

compression therapy: a rewarding challenge



venalinfa
EUROCENTER
ITALY

Thanks for your attention.and thanks to Hugo, Robert and to the … ghost of Giovanni