


Dress for Success
 Integrated therapies for wound healing in the lymphedema patient

Edema Lecture

May 2, 2019
 Klose Conference
 Denver


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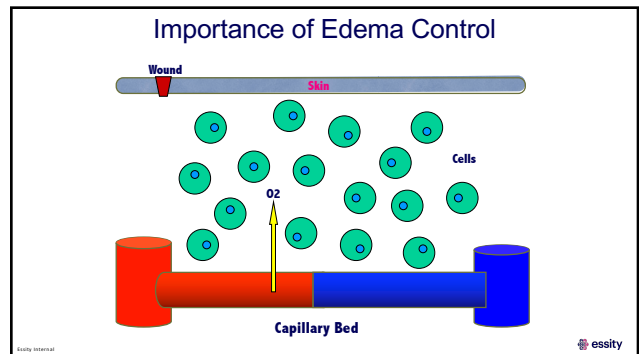
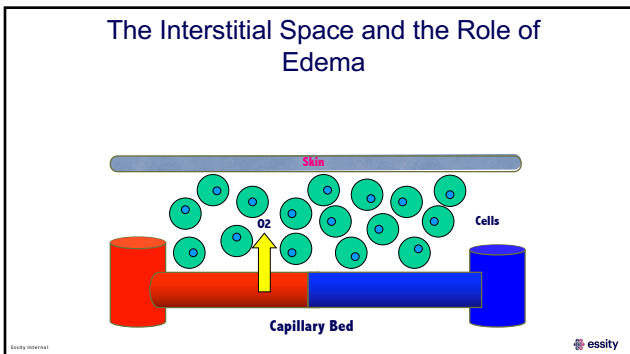
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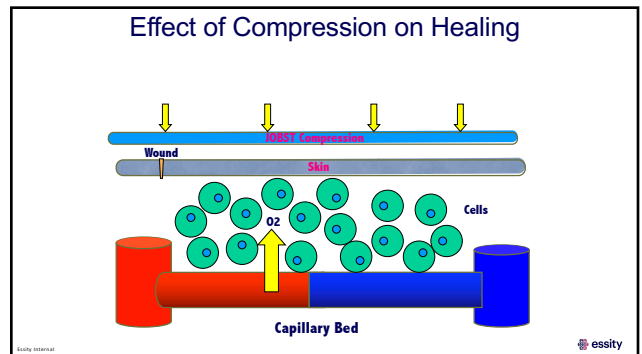
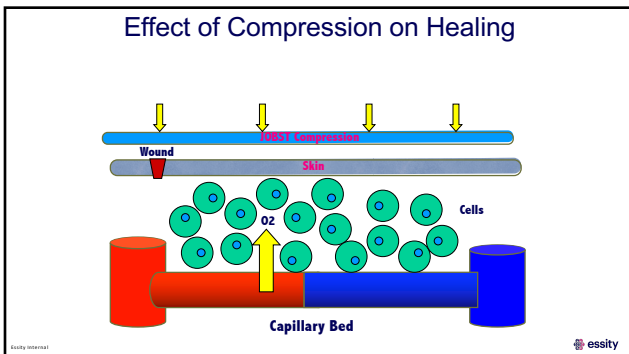
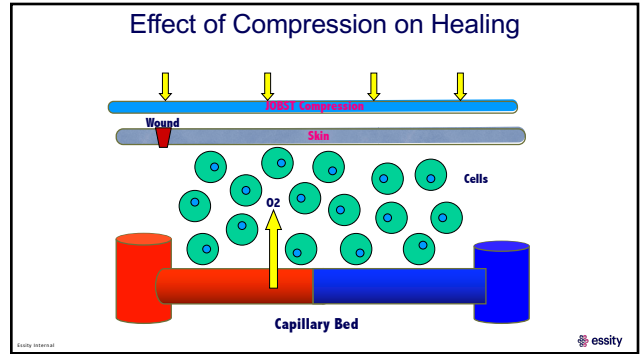
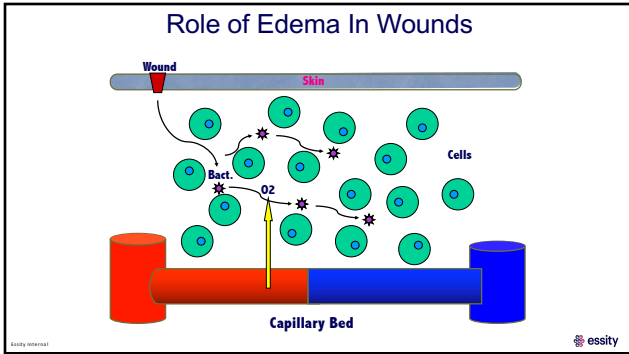
Benefits of Edema Reduction

- ❖ Decreases pain
- ❖ Improves cellular transport
- ❖ Improves acid - base balance
- ❖ Increases PO₂:
 - Collagen cross-linking
 - Angiogenesis
 - Epithelialization
 - Improved neutrophil function
 - Improved resistance to infection



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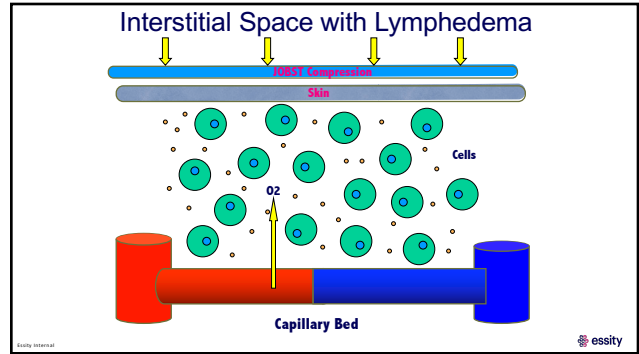




Lymphedema Contains

- Fat
- Cells
- Bacteria / viruses
- Cellular residue
- Matrix metalloproteases
- Cytokines
- Polysaccharides
- Glycoproteins
- Fibronectin
- Vitronectin
- Water

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All That is Red is Not Cellulitis

The top photograph shows a patient's legs from the knees down, exhibiting significant redness and swelling. Below this are two close-up photographs of the lower legs, showing the texture of the skin and the extent of the redness. A finger is pointing to a specific area on the lower leg in the bottom-left close-up.

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Stemmer's Sign

<p>+ Stemmer's Sign</p> <p>Diagnostic of lymphedema</p>	<p>- Stemmer's Sign</p> <p>Lymphedema dx still possible</p>
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The photograph shows a hand being held by another person. The skin on the back of the hand is being pinched, demonstrating the Stemmer's sign, which is a characteristic finding in lymphedema.

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Lymphedema vs Chronic Venous Insufficiency

Lymphedema

- Foot and toes usually involved
- Skin changes
- Diurnal variation
- Proximal involvement

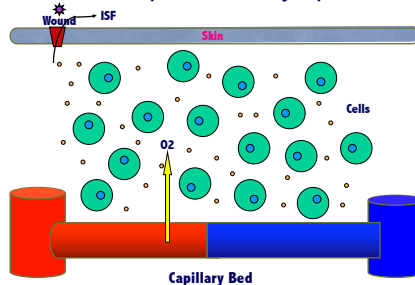
CVI

- Champagne bottle leg
- Hemosiderosis
- No skin changes

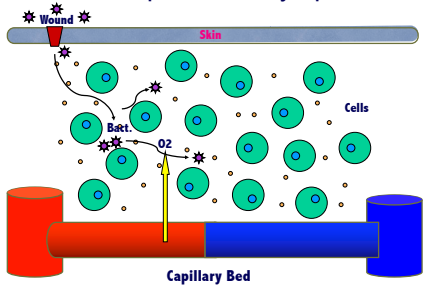


62 y/o diabetic with chronic edema >10 years
Dx: Phlebolympedema w/ extensive nodular fibrosis

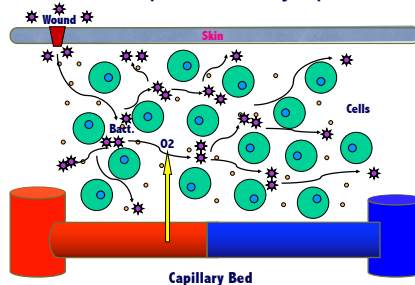
Interstitial Space with Lymphedema



Interstitial Space with Lymphedema



Interstitial Space with Lymphedema



Morbidity of Cellulitis

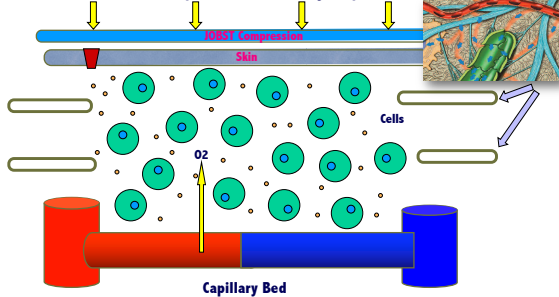


Patient s/p hospitalization for severe cellulitis. Patient with CVI, small VLU, and very mild secondary lymphedema

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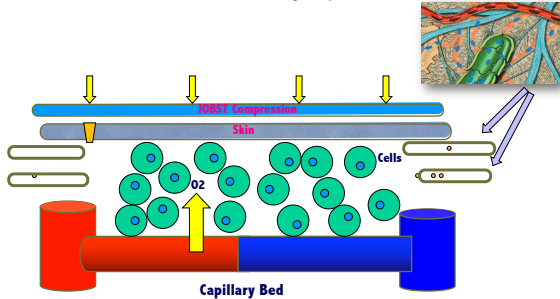
Interstitial Space with Lymphedema



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Effects of MLD on Lymphedema



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Types of Compression

- ❖ Non-Stretch No extension
- ❖ Short-Stretch ex SSMLB, AVCD, Flat-Knit < 70% Extension
- ❖ Medium-Stretch ex Coban, Circular Knit 70%-140% Extension
- ❖ Long-Stretch ex Ace Wraps >140% Extension
- ❖ Intermittent Pneumatic Compression (IPC)

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Non-elastic Compression

Materials with minimal to no stretch

- Ex Unna Boot
- Also used in some inelastic garments



Advantages

- Low potential resting compression with high working compression
- Relatively safe when used correctly

Disadvantages

- Poorly defined resting compression level
- Nurse or physician must apply
- Poor conformability to limb shape
- Tends to slide down as edema reduces
- Inconsistent compression levels as edema / limb size reduces
- Not effective over joints

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Complications of Unna Boot



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Complications of Unna Boots



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Phlebolympheema

- ❖ Lymphedema which occurs secondary to edema, usually associated with CVI
- ❖ Often has underlying medical conditions either causing the edema, or more often exacerbating CVI
- ❖ Lymphatics are usually normal, but can be impaired

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Phlebolymphe'dema

- ❖ Differential Diagnosis for Causes of Phlebolymphe'dema
- ❖ Perform thorough history / physical and labs:

FULL EDEMA WORKUP

- Review Medical Causes of Edema
- Review Meds That Cause Edema
- Check Stemmer's sign for lymphedema
- Venous Duplex
- CBC
- Metabolic panel (basic LFTs, BUN/Cr)
- Albumin
- TSH
- BNP Level
- Cardiac echo if >45 or OSA suspected

COMMON MEDICAL CAUSES OF EDEMA INCLUDES

- Chronic Venous Insufficiency (CVI)
- Heart failure / cardiac
- Obesity
- Medications which can cause or contribute to edema
- Acute thrombosis
- Limb dependency
- Baker's cyst
- Venous outflow obstruction (any cause)
- Lymphedema or phlebolymphe'dema (secondary lymphedema)
- Liver disease / cirrhosis
- Nephrotic syndrome
- Cell muscle dysfunction
- Sleep apnea
- Pulmonary hypertension
- Trauma
- Idiopathic edema

UNCOMMON MEDICAL CAUSES OF EDEMA CAUSES INCLUDES

- Protein-losing enteropathy
- Thiamine deficiency (beriberi)
- Autoimmune inflammatory disease (Polymy'algia rheumatica, Scleroderma...)
- Parvovirus B19
- Pericardial myxoidema (in severe hypothyroidism)

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Phlebolymphe'dema

❖ MEDICATIONS WHICH MORE COMMONLY CAN CAUSE OR CONTRIBUTE TO EDEMA

- NSAIDS (1-5% risk)
- Norval & Sel Cox-2 inh, phenylbutazone
- CARDIAC MEDS
- CCBs - CA CHANNEL BLOCKERS (dose dependent, rates 5-70% reported)
- ACE INHIBITORS - angioedema
- BETA BLOCKERS - Clonidine
- DIRECT VASODILATORS - Hydralazine, Minoxidil, Methylidopa, Clonazepam (3% - 57%)
- Antisymphathetic agents - guanethidine, reserpine
- Progabala (17-27% and dose dependent)
- HORMONES
- Corticosteroids
- Estrogens, Progesterones, Testosterone
- DIABETIC MEDS
- THIAZOLIDINEDIONES - pioglitazone, rosiglitazone

❖ MEDICATIONS WHICH UNCOMMONLY CAUSE OR CONTRIBUTE TO EDEMA

- ANTIBIOTICS Levofloxacin
- ANTIDEPRESSANTS - Monoamine oxidase inhibitors
- DMARDs - disease modifying antirheumatic drugs
- ENDOTHELIN RECEPTOR ANTAGONISTS Ambrisentan, Bosentan
- ERYTHROPOIETIC AGENTS

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JOBST® Compression Stockings



- Sustained compression
- Often the "go to" Maintenance modality
- Can roll down impairing circulation
- Will not work with fluctuating swelling
- Stockings can be difficult to don and doff
- Usually long-term standard for compliant patients

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Patient Compliance



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Silicone Band

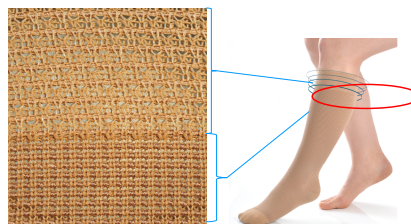


Surface needs to be cleaned periodically with alcohol pad

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New Non-Slip Stocking Technology



- ❖ No attached silicone band needed at welt. Seamless
- ❖ Decreased slippage
- ❖ Increased wear comfort because decreased tension of top band

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Top band (D)
60%

Upper calf (C)
64%

Lower calf (B1)
84%

Ankle (B)
100%

EFFECTIVE

NON-SLIPPING

COMFORTABLE

GRADIENT COMPRESSION TEST

SoftFit™ technology provides lessened popliteal compression to mimic natural venous blood pressure.

- Gradient compression with SoftFit™ technology
- Competitors
- Natural venous blood pressure

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SoftFit™ technology provides lessened popliteal compression to mimic natural venous blood pressure.

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*Average pressure profile of stockings with SoftFit™ technology measured by Weissenhof Textile Testing Institute



Flat Knit Compression



Traditional Softer / seamless 3D Knitted

- ❖ Usually custom, so expensive
- ❖ Less stretch, so better containment of swelling
- ❖ Options of several fabrics
- ❖ Works very well for serious edema, lymphedema

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Flat Knit vs Circular Knit Garments

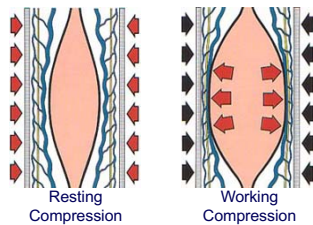
- ❖ Circular Knit:
 - Knitted on a round cylinder with a fixed number of needles
 - The more needles a machine has, the wider the garment
 - These garments are seamless and tubular shaped
 - They have a bit more stretch than flat-knit and are best suited for mild to moderate lymphedema patients with normally shaped limbs
- ❖ Flat Knit:
 - Custom-made garments on special machines that have a double row of needles at 90-degree angles
 - The advantage is that more complex shapes can be knitted
 - Less stretch than circular and provide better edema control
 - Require custom fitting
 - They are manufactured flat and must be sewn together at a later stage
 - Best suited for moderate to severe lymphedema patients with larger or unusually shaped limbs

Short-Stretch Lymphedema Bandaging

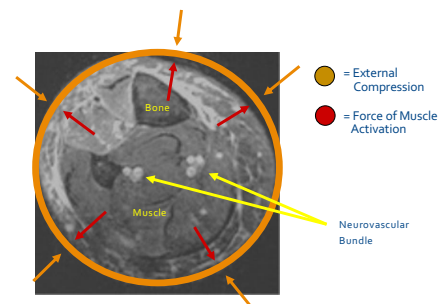
- ❖ Special technique that requires specific training
- ❖ Short-stretch wraps (up to 6-8 for lymphedema)
- ❖ Foam to break up fibrotic areas
- ❖ Cotton batting
- ❖ Reusable up to 2mo




Short-Stretch Augments the Calf Muscle Pump



Calf Cross-Section with Short-Stretch Applied

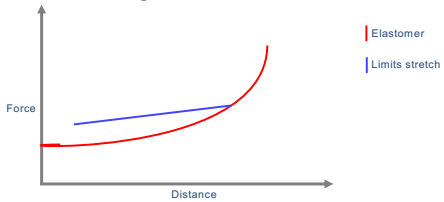


Eureka!



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Limiting the Stretch...



- ❖ Elastomer (ex a Rubber band) has an exponential force – distance curve
- ❖ By limiting the stretch, we can safely operate on the flatter part of the curve

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JOBST FarrowWrap®





Excellent alternative to compression stockings and bandaging

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Who Benefits? - Anyone who has difficulty or is unable to don stockings*

Obesity

Age

Fragile skin

Frequent edema fluctuations

Poor hand strength

Poor dexterity

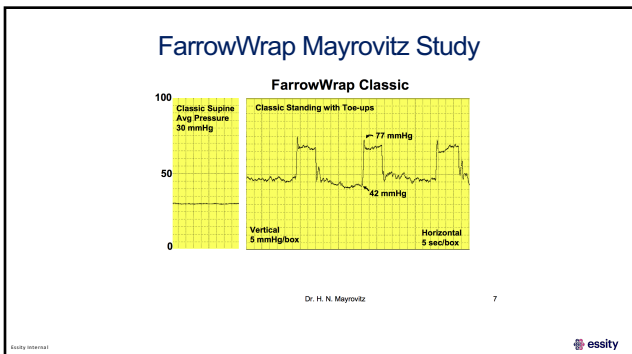
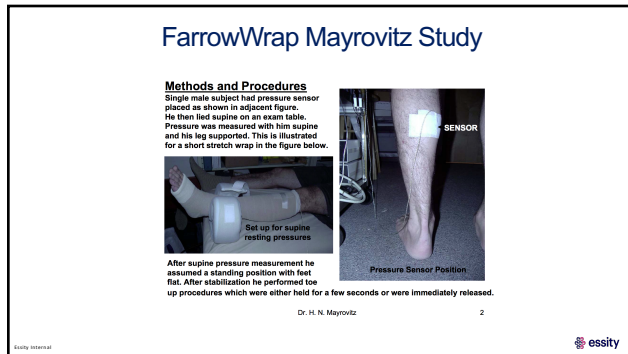
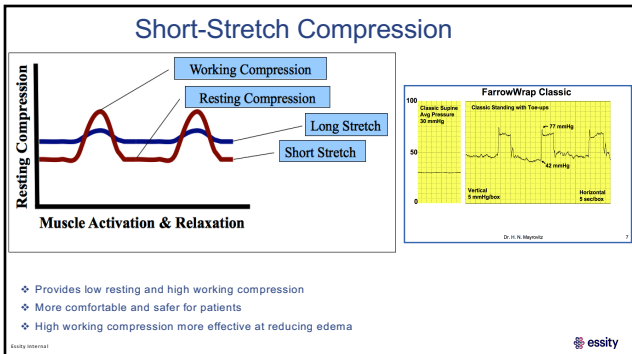
Peripheral Arterial Disease

Back Issues

Limited caregiver ability

*UT Medical School study shows patients with low Activities of Daily Living (ADL) scores unable to don compression stockings could don FarrowWraps themselves (Smith et al 2005)


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JOBST® FarrowWrap® Medicare Reimbursable


BASIC


- ❖ Double-sided Velcro® and trimmable bands
- ❖ Economical / Medicare reimbursable (A6545)
- ❖ Double-sided Velcro® and trimmable bands
- ❖ Includes FarrowHybrid



4000

- ❖ Only 4 straps for donning ease.
- ❖ Includes donning sleeve
- ❖ Economical / Medicare reimbursable (A6545)
- ❖ Includes FarrowHybrid



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FarrowWrap Lite and Fragile Skin

Challenges of Managing Chronic Lymphoedema in Patient with Dominant Dystrophic EB (Clapham 2012)




Before After FarrowWrap Lite (20-30mmHg)


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Clinical Evidence

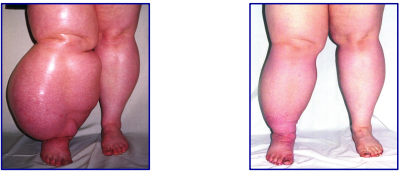
Supervised self-management of lower limb swelling using JOBST FarrowWrap (Wigg 2012)



Before After Maintenance


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Clinical Evidence



Before Treatment After Treatment

- ❖ Treatment over time can reverse chronic lymphedema changes
- ❖ Patient treated with MLD, bandaging, then self management with FarrowWrap over 1 yr (Wigg 2012)

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Before FarrowWrap



After FarrowWrap



The FarrowWrap® should be the next step for patients who are unable to wear compression stockings.

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Chipped Foam Night Time Technology


- Chipped foam garment technology
- Alternative to night time bandaging
- Lacking strong clinicals, but many therapists believe in channeling

- Use for:
- 1) Patients who swell at night
- 2) Patients whose swelling is not optimal after the day
- 3) Patients with irreversible changes

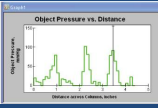






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Continuous Flow Channeling At Work







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Whitaker 2016

- 5 western country (Australia, Germany, Sweden, UK, US 45 minute telephone survey (Whitaker 2016) showed over 1/3 of participants questions had initiated night time compression themselves.
- Reasons for not wearing night time compression:
 - Too exhausted and tired to put on compression at night (27%)
 - Heat or temperature (20%)
 - Edema was already stable (18%)
 - Wanted to 'give myself a break' (14%)
 - Skin problems (5%)
- Drawbacks to current night time products (MLLB, wrap systems, daytime garments):
 - They were too uncomfortable to wear
 - Too hot and caused sweating
 - Made the skin itchy
 - Slipped down the limb during the night
 - Were time consuming to don at the end of the day
 - Disturbed their sleep
- 89% of patients reported their swelling increased when their night-time compression was not used
- Subjective reports were that night-time compression reduced swelling, and thus reduced pain and led to better sleep

➢ ILF position document discusses a 'transition phase', which occurs when patients move from DLT to self management (ILF, 2006). During this phase, some patients will need 24h compression to prevent rebound edema, and reverse other symptoms associated with lymphedema

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Newer Night Time Garment Technology



- ❖ Custom only (15-20mmHg upper, 15-20 & 20-30mm lower extr)
- ❖ Gradient compression
- ❖ Monofilament spacer fabric
- ❖ Less tight, breathable, easier to don (2017 BJCN Supplement)

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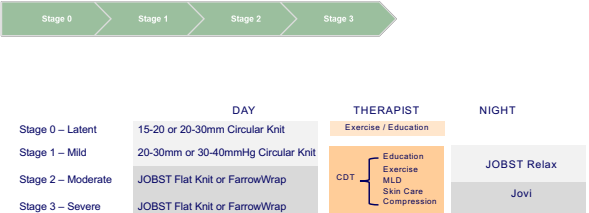
OBSERVING THE BENEFITS OF NIGHT-TIME COMPRESSION



- Many patients experience a reswelling of their treatment within one year (Quere et al, 2014). Patients are highly heterogeneous, and many comorbidities can affect their swelling.
- Despite improved surgical techniques, approximately 25% of patients still develop lymphedema (Moffatt et al 2003). Complications (infections, seroma) increase risk.
- The main outcome which facilitates adherence with treatment is patient comfort. Patients have been deterred from wearing night time compression due to it being too hot, uncomfortable, and difficult to put on (Whitaker, 2016).
- Jobst Relax was used in patients with brachial plexopathy, as well as patients receiving palliative care
- Jobst Relax was found to improve symptoms, improve patient's control of their swelling, and provide improved comfort and relief. Patients also found it aesthetically pleasing.

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Four Stages of Lymphedema



	DAY	THERAPIST	NIGHT
Stage 0 – Latent	15-20 or 20-30mm Circular Knit	Exercise / Education	
Stage 1 – Mild	20-30mm or 30-40mmHg Circular Knit	CDT { Education Exercise MLD Skin Care Compression	JOBST Relax
Stage 2 – Moderate	JOBST Flat Knit or FarrowWrap		Jovi
Stage 3 – Severe	JOBST Flat Knit or FarrowWrap		

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Clinical Evidence

Partsch H, *Indications for compression therapy in venous and lymphatic disease: Consensus based on experimental data and scientific evidence under the auspices of IUP.* International Angiology, June 2008;27(3):193-219

- Strong evidence MCS 30-40mmHg to reduce lipodermatosclerosis (CEAP 4b)
- Strong evidence of compression bandaging for VLU (CEAP 6), lymphedema
- Max upper limit for sustained compression over bony prominences is 60-70mmHg in normal subjects
- Best healing of VLUs with pressure >40mmHg and with high static stiffness index (short-stretch, IB, MLB, adhesive/cohesive bandages)
- AVCD faster VLU healing than with 4 layer bandages
- Garments applied at end-stretch have more pronounced hemodynamic effects than elastic

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Clinical Evidence

Mosti G, Iabichella M, Partsch H. *Compression therapy in mixed ulcers increases venous output and arterial perfusion.* J Vasc Surg 2012; 55:122-128

Findings

- Sub-bandage pressures of inelastic garments decreases by 30% after 2 hours
- Walking program w End-stretch garments recommended for mixed ulcerations. With muscle contractions, End stretch application produces massaging effect similar to cycles of IPC (peak pressures of 10-20mmHg) and improves arterial flow during ambulation (Helps BOTH venous and arterial systems)
- End-stretch augments arterial flow, mediated by increase release of vasoactive mediators in microcirculation (NO, prostacyclin), along with decrease proinflammatory cytokines and increase in venous pump function, leading to higher AV pressure gradients and helps heal mixed ulcers
- Mixed AV ulcers with systolic ankle pressures >60mmHg can tolerate up to 40mmHg with significant improvement of venous EF. More clinically relevant b/c it represents the perfusion of the distal leg independent of blood pressure

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Clinical Evidence

Mosti G, Cavezzi A, Partsch H, Urso S, Campana F. *Adjustable Velcro compression devices are more effective than inelastic bandages in reducing venous edema in the initial treatment phase: A randomized controlled trial.* Eur J Vasc Endovasc Surg. 2015; 50: 368-374

- RCT m/f 18-85 w chronic LE edema > 3 years (CEAP 3) comparing AVCD and IB
- AVCD w moderate compression ~40mmHg. Allowed to adjust

Findings

- Both systems reduced leg volume D1 and D7
- ACVD was found to be significantly more effective than IB after 1 day and after 7 days. Median decrease of 19% and 26% for AVCD and 13% and 19% for IB
- No comfort difference, but better cosmetic outcome with ACVD
- AVCD were better able to maintain pressure due to self re-adjustment by patient
- "As long as patient can put on shoes and handle shoe laces, an ACVD can be used"
- AVCD are effective during initial phase of treatment for edema reduction, and are more cost-effective

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Latest Clinical Evidence-MCS

Rabe et al, *Indications for medical compression stockings in venous. And lymphatic disorders: An evidence-based consensus statement,* Phlebology 2018.

Noteable Lymphedema Findings

- Recommend MCS for improvement of lipodermatosclerosis in pts with CVD (significantly reduced in 6-12mo)

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Latest Clinical Evidence

Mosti G, Cavezzi A. *Compression therapy in lymphedema: Between past and recent scientific data,* Phlebology 2019 Jan 9

Conclusions

- Lower Extremity: pressure range of 40-50mmHg is more efficacious
- Upper Extremity: pressure 20-30mmHg provides the best outcome (likely due to lower filtration pressures)
- It was shown that AVCDs are more effective than inelastic bandages in reducing leg volume due to device self-adjustment by pts leading to better pressure maintenance over time
- Foot compression of up to 40mmHg increases intra-lymphatic pressure while evoking spontaneous vessel contractions. No benefit of higher pressures
- A Higher stiffness does not seem to be a pre-requisite in lymphedema compression, in light of outcomes achieved by garments and AVCDs. Suggests moderate / strong pressure is main characteristic to pursue, and stiffness plays a minor role

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Case Studies



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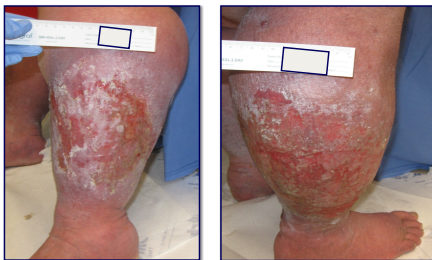
Case Studies



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Case Studies



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THANK YOU!

Questions?

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