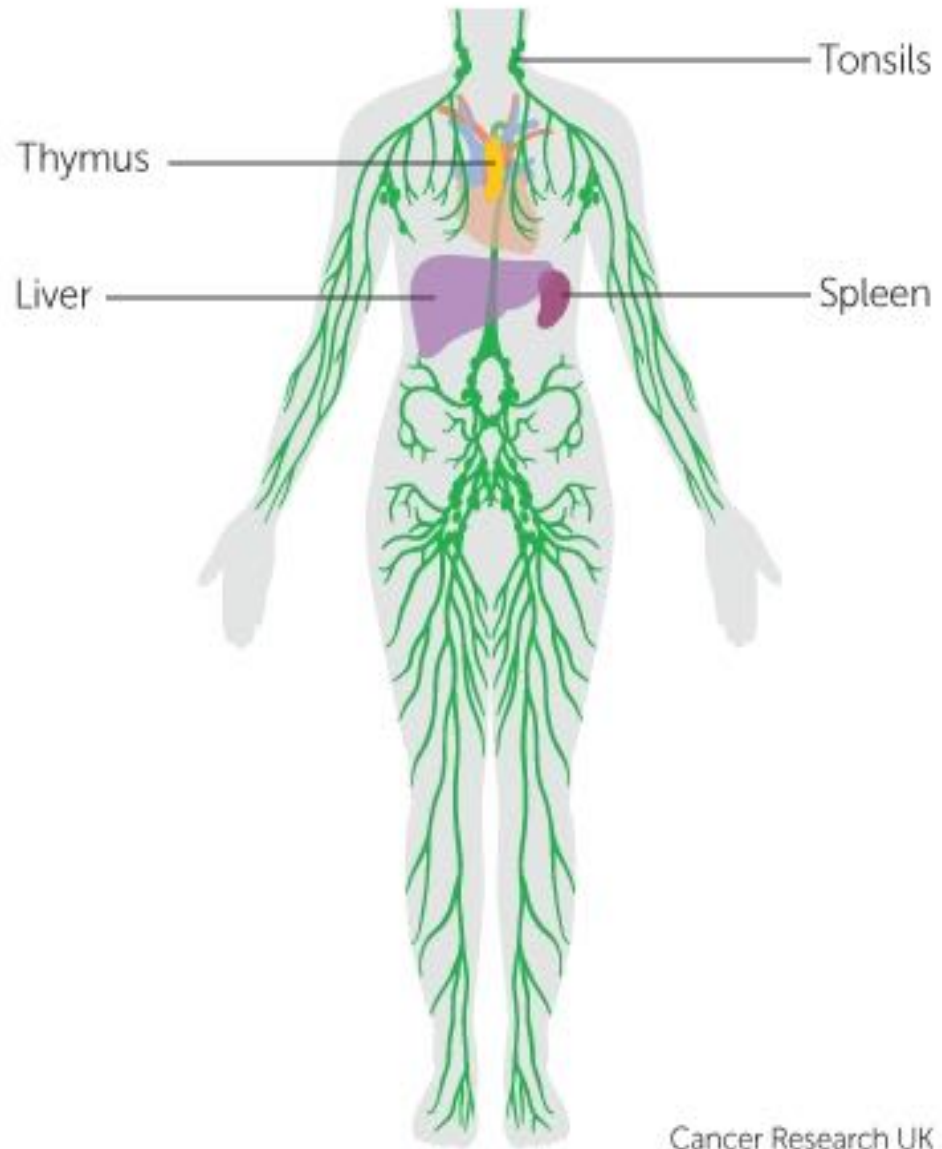


Lymphatics and Lymphedema: Symptoms, Causes, and Treatment

PRESENTED BY: HEATHER GRAGG, MPT, CLWT, OCC, CLT-LANA

A Healthy Lymphatic System

- ▶ Connects throughout the body, similar to your circulatory system
 - ▶ No central pump
 - ▶ Superficial and Deep Lymphatics
- ▶ Transports normal lymph fluid
- ▶ It carries:
 - Water
 - Protein—large protein molecules
 - Fat Cells
 - Waste Products
 - Lymphocytes



Lymphatic System

The Role of the Lymphatic System

- ▶ Transports large protein molecules to the heart where they can rejoin the circulatory system¹
- ▶ Preserves our fluid balance
 - ▶ Fluid filtration and fluid reabsorption¹
- ▶ Removes / filters waste products, cancer cells, pathogens, dust, and bacteria from our body¹
- ▶ Assists with fat reabsorption in the gut¹
- ▶ Stores substances that cannot be processed by the body (ie: silica)

The “Mechanics” of the Lymphatic System

- ▶ Connection of vessels and lymph nodes
- ▶ Vessels are a system of swing flaps/doors¹
 - ▶ Stimulated by a stretch from muscle contraction, fluid, or a stretch from the skin
 - ▶ “trap doors” prevent retrograde flow of lymphatic fluid
- ▶ Lymph fluid is propelled by contraction of the vessels 10-12 times per minute¹
- ▶ 600-700 lymph nodes in the body which are connected by lymph vessels¹

The Lymphatic System Filters

- ▶ Vessels drain and filter into regions of lymph nodes
- ▶ Lymph nodes filter fluid and “catch” waste products before the fluid continues through the body¹
- ▶ Lymph nodes break down, destroy, or store unwanted or unhealthy substances¹

The Lymphatic System boosts the Immune System

- ▶ The lymphatic system is an integral part of the “immune defense system”²
- ▶ Lymph nodes produce lymphocytes (white blood cells)¹
- ▶ These lymphocytes circulate in the blood, lymphatic system, lymph nodes and spleen¹
- ▶ Responsible for T Cells and Macrophages directly attacking foreign invaders¹
- ▶ Responsible for B Cells and producing antibodies to indirectly attack foreign invaders¹

Lymphedema

- ▶ An abnormal accumulation of lymph fluid in body tissue¹
- ▶ An excess of protein-enriched lymph fluid^{1,2}
- ▶ A chronic inflammatory condition which increases risk of infection¹
- ▶ Some suggest that ALL swelling is on a Lymphedema Continuum





What Causes Lymphedema?

- ▶ Obstruction of the lymphatic system^{1,2}
- ▶ Damage of the lymphatic system^{1,2}
- ▶ Lymph Node Dissection^{1,2}
- ▶ Congenital Abnormality^{1,2}
 - ▶ Born with fewer lymph nodes; vascular anomalies
- ▶ Filariasis—most common cause of Lymphedema worldwide¹
 - ▶ Caused by a parasitic worm; flu-like symptoms
 - ▶ Spread from person to person by mosquitoes
 - ▶ Destroys lymphatic vessels
- ▶ When the lymphatic load exceeds the transport capacity (ie: CVI, Pregnancy, etc.)^{1,2}

Causes Continued

- ▶ Genetic Factor-fewer lymph nodes
- ▶ Surgery
- ▶ Radiation Therapy
- ▶ Tumors
- ▶ Infection
- ▶ Pregnancy
- ▶ Trauma
- ▶ Lack of ROM in the affected extremity
- ▶ Obesity
- ▶ Sedentary lifestyle
- ▶ Chronic Venous Insufficiency
- ▶ Lipidema

Types of Lymphedema

Mechanical Insufficiency

- Also known as “Low-Volume Insufficiency”¹
- Decreased transport capacity of the lymphatic system due to mechanical failure^{1,2}

Dynamic Insufficiency

- Also known as “High-Volume Insufficiency”¹
- The most common type of lymphatic insufficiency¹
- The lymphatic load exceeds the transport capacity^{1,2}
- Too much load¹

Combined Insufficiency

- Mechanical Insufficiency and Dynamic Insufficiency¹
- The transport capacity is reduced and the lymphatic load is increased beyond normal^{1,2}
- Mechanical failure WITH excessive load

Does Lymphedema Occur Directly After an Insult to the Lymphatic System?

- ▶ Not Always
- ▶ Can occur weeks, months, or years after the lymphatic system has been damaged¹
- ▶ Lymphedema can be triggered by:
 - ▶ Heat¹
 - ▶ Injury¹
 - ▶ Air Travel¹
 - ▶ Unrelated Surgery¹
 - ▶ Bee Stings¹
 - ▶ Overuse of the extremity¹

Types of Lymphedema

- ▶ Primary Lymphedema
 - ▶ Hypoplasia, Hyperplasia, Aplasia of vessels¹
 - ▶ Hereditary Lymphedema (ie: Milroy's Disease)
 - ▶ Congenital: presents within first 2 years of life¹
 - ▶ Lymphedema Praecox-presents after birth but before age 35 (often arises during puberty or pregnancy)¹
 - ▶ Lymphedema Tarda-develops after age 35.¹
- ▶ Secondary Lymphedema
 - ▶ An outside event causes damage to the lymphatic system
 - ▶ Surgery, trauma, radiation, obesity, tumor, filariasis, immobility, CVI, etc.

What are the Symptoms of Lymphedema?

- ▶ Tightness, swelling, or thickening anywhere on an extremity, head, neck, or groin
- ▶ Burning or tingling sensation in the extremity
- ▶ Feelings of heaviness or aching
- ▶ Inability to wear rings, jewelry, watches, or certain clothing
- ▶ Frequent or chronic skin infections

Why Does Fibrosis Occur With Lymphedema?

- ▶ Lymph fluid is meant to move steadily throughout the body
- ▶ With Lymphedema, fluid accumulates and remains stagnate in an extremity
- ▶ Protein in the fluid causes an “activation” of fibroblasts causing connective and scar tissue formation¹
- ▶ If left unattended, fibrosis hardens and becomes irreversible¹

Where Can Lymphedema Occur?

- ▶ Head and Neck
 - ▶ Mouth/Throat CA
 - ▶ s/p Radiation or surgery
- ▶ Chest
 - ▶ s/p Mastectomy, radiation, or other surgery
- ▶ Back
 - ▶ Melanoma
 - ▶ s/p surgery
- ▶ Extremities
 - ▶ CVI
 - ▶ s/p Radiation
 - ▶ s/p Surgery
 - ▶ Lipidema
 - ▶ Obesity
- ▶ Genitals
 - ▶ s/p surgery
 - ▶ s/p radiation
- ▶ Abdomen
 - ▶ Immobility
 - ▶ s/p surgery

Stages of Lymphedema

THERE ARE 4 DISTINCT STAGES

Stage “0” Latency¹

- No visible swelling
- Patient is “at-risk” to develop Lymphedema
- Is considered a formal Lymphedema diagnosis for patients s/p Mastectomy even with no visible swelling.
- Diagnosed for education, garment fitting, etc

Stage 1 – Reversible Lymphedema¹

- Swelling disappears with bed rest or elevation
- Swelling is soft, no resistance felt
- Pitting is easily induced
- No hardening or fibrosis

Stage 1

Note tendons and knuckles on left hand are not visible. Skin is tight and less mobile on back of hand.

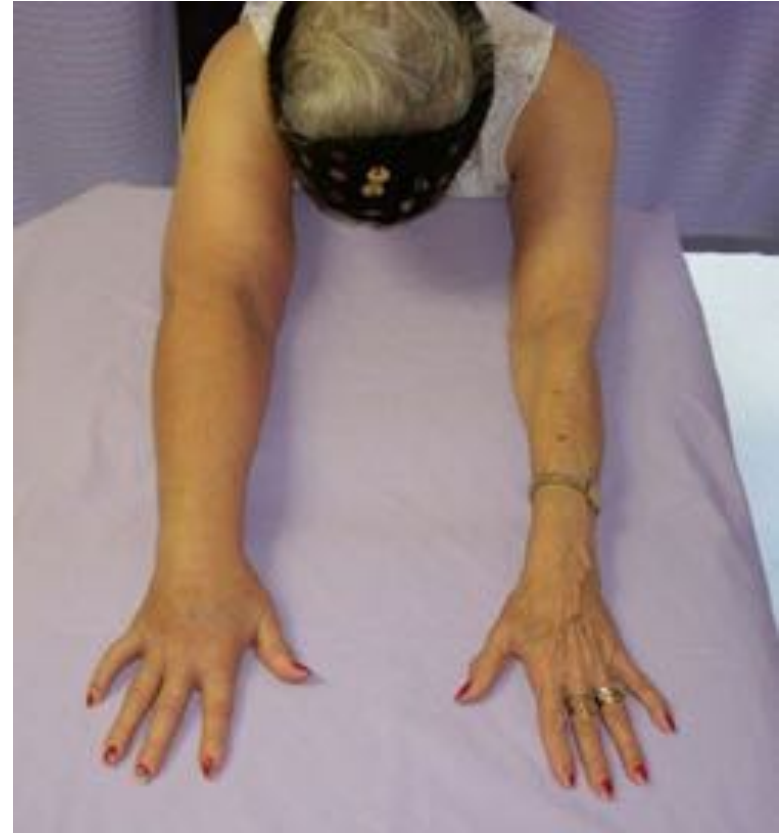
Tendons, knuckles and blood vessels are visible on right Non-LE hand. Skin is wrinkly and easily moved.



Stage 2 – Spontaneously Irreversible Lymphedema¹

- Swelling does not decrease with elevation
- Scar tissue forms and causes fibrosis
- Edema becomes hard; difficult to make indentations
- Frequent skin infections
- + Stemmer Sign

Stage 2

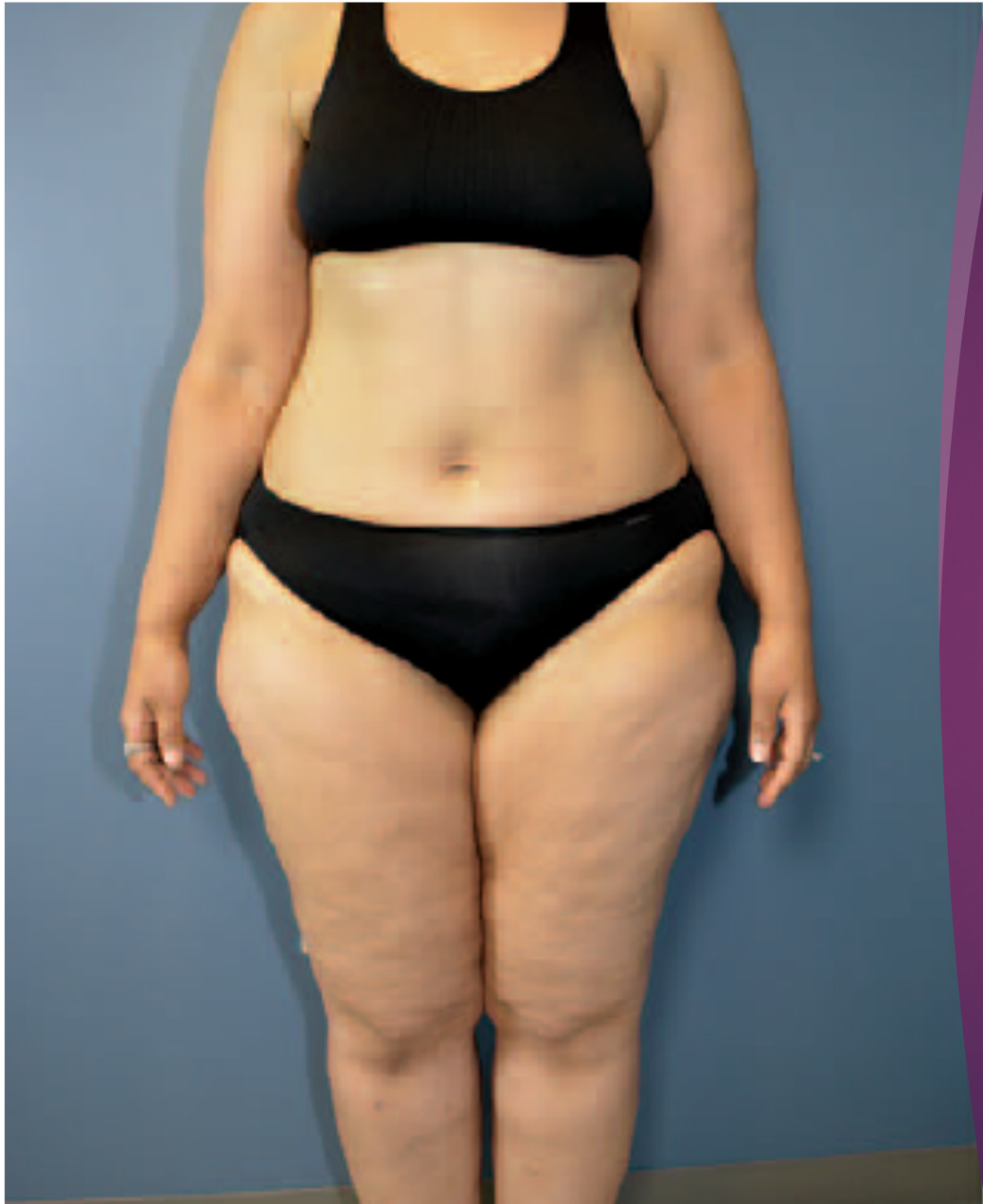


Stage 3 – Lymphostatic Elephantiasis¹

- Extreme increase in volume and tissue texture
- Significant skin changes (papillomas, deep skinfolds, Lymphorrhea, Lymph Cysts, Peau d'orange, etc.)
- Hardening of the skin and tissue below
- Fat deposits; especially around the joints
- Frequent skin infections
- Deepened skin folds

Stage 3





Lipedema

Lipedema

- ▶ Chronic metabolic disorder of the adipose tissue.¹
- ▶ Bilateral and symmetrical swelling of the lower extremities with extensive deposits of subcutaneous fatty tissue¹
- ▶ Corkscrew vessels trap fat molecules¹
- ▶ Pear-shaped body type¹
- ▶ Hands and feet are typically very small / thin¹
- ▶ Often large fat deposits over the ankles¹
- ▶ Typically have large pendulous upper arm¹
- ▶ Medial knee bulges¹

Lipedema

- ▶ Hereditary¹
- ▶ Associated with hormonal disorders¹
- ▶ Often manifests during puberty¹
- ▶ Diet and exercise not effective to reduce size of fatty tissue / distribution¹
- ▶ Over time, sedentary lifestyle and venous problems lead to the development of lymphedema¹
- ▶ Gastric Bypass is ineffective in reducing lipedemic fat from the hip down¹
- ▶ Compression therapy can reduce size of fatty deposits¹
- ▶ Occurs more often in women; 3:1
- ▶ If it occurs in men, it is typical to have “massive” hormonal changes or liver dysfunctions¹

Severity Varies with Lipedema



“

Lipedema very frequently transitions to Lipolymphedema (Lipedema + Lymphedema) due to a mechanical insufficiency over time.¹

”

Complications in Lymphedema¹

- ▶ Lymphatic Cysts—entryway for infection
- ▶ Radiation Fibrosis—fragile skin
- ▶ Infection—bacterial and fungal
- ▶ Hyperkeratosis—papillomas, possible infection
- ▶ Scars—block lymph flow
- ▶ Malignancies—block lymph flow
- ▶ Paresis or Paralysis—immobility is detrimental to lymphatic return
- ▶ Genital Swelling—40-60% of male lymphedema population

Scar Tissue Impedes Lymph Flow

Gun Shot Wound after surgery



Lymph flow impeded by scar tissue



Common Comorbidities with Lymphedema¹

- ▶ Cardiac Insufficiency
- ▶ Obesity
- ▶ Orthopedic Injury
- ▶ Venous Insufficiency
- ▶ Paralysis/Paresis

Upper Extremity Lymphedema

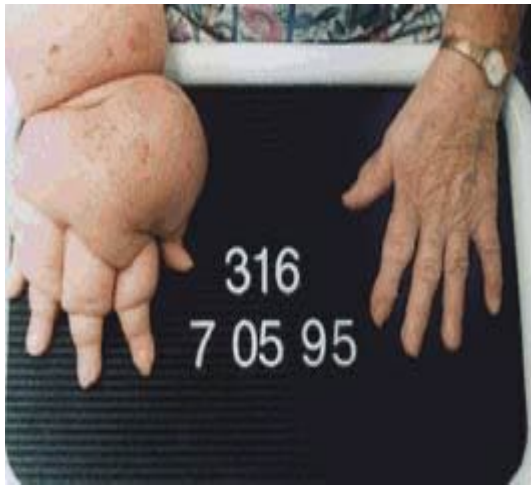
Before Treatment



After Treatment



Upper Extremity Lymphedema



Lower Extremity Lipolymphedema



Lower Extremity Lipolymphedema



Lower Extremity Lymphedema / Phlebolymphe



Lower Extremity Lymphedema / Phlebolymphe



What is the Treatment For Lymphedema?

- ▶ Lymphedema is not curable but it is treatable
- ▶ Some patients are prescribed diuretics
 - ▶ Does not move the protein out of the tissue
 - ▶ Removing the fluid without removing the protein expedites fibrosis
 - ▶ Not been proven to be effective
 - ▶ Research published in *Angiology* and the *Journal of Support Oncology* report that the use of diuretics for pure lymphedema is “physiologically unsound” and cannot be recommended

Treatment Continued

- ▶ Some patients are prescribed a Lymphedema Pump
 - ▶ The pump removes fluid from the tissue but does not stimulate the lymphatic system to remove the large protein molecules (with the exception of the Flexitouch evacuation system)
 - ▶ If the protein is not mobilized, it draws water molecules back to it through osmosis causing a cycle of dependency
 - ▶ Increases the risk of hardening tissue / fibrosis
 - ▶ Patients must set aside 2 hrs. per day to use the pump for temporary relief
 - ▶ Not as functional as a compression garment
 - ▶ Can be \$5,000-6,000 to buy or patient must rent
 - ▶ Flexitouch Tactile Systems Pump DOES stimulate lymph node groups and does provide lighter pressure therefore stimulating the lymphatics.
 - ▶ Flexitouch Tactile Systems Pump is acceptable for use after Complete Decongestive Therapy has been performed and pt. has been D/C from therapy

Treatment Continued

- ▶ Some patients are prescribed a compression garment as primary treatment
 - ▶ Can help prevent the extremity from getting larger but it does not reduce the current size of the extremity
 - ▶ A compression garment alone does not break up fibrosis or improve skin quality
 - ▶ Be cautious not to exhaust the patient's resources

What is the BEST Treatment for Lymphedema?

- ▶ Conservative management should be attempted first to reduce risk and cost to the patient
- ▶ Complete Decongestive Physiotherapy under the care of a Certified Lymphatic Therapist (CLT) consisting of:
 - ▶ Manual Lymphatic Drainage
 - ▶ Compression Bandaging
 - ▶ Skin Care
 - ▶ Therapeutic Exercise
 - ▶ Education / Home Management

BEST Treatment (continued)

- ▶ Manual Lymphatic Drainage (MLD)
 - ▶ Very light massage; a stretch of the skin
 - ▶ Facilitates lymph vessels to contract at a higher rate
 - ▶ Moves fluid through more quickly; prevents backup
 - ▶ Must be in a specific order to enhance the flow
 - ▶ MLD moves all of the lymph fluid including protein
 - ▶ Special techniques break up fibrosis / protein deposits and improve skin quality

BEST Treatment (continued)

- ▶ Compression
 - ▶ Bandaging of the entire extremity
 - ▶ Bandages are comfortable but cumbersome
 - ▶ Must be worn at all times unless at therapy or showering
 - ▶ Forces lymph fluid out of the extremity and back into the lymphatic system
 - ▶ Once back into system, fluid is returned to the venous system
 - ▶ Friction from bandages also breaks up fibrosis

Lower Extremity Bandaging



When is PT Management of Lymphedema Complete?

- ▶ When measurements of the affected extremity plateau or are equal to the non-affected extremity
- ▶ When the patient has a compression garment and is able to don/doff the garment independently, with a donning aid, or with caregiver assistance

How Do You Prevent the Fluid From Returning?

- ▶ Near the end of treatment, the therapist will measure the patient for a compression garment
- ▶ The amount of pressure can vary (20-30, 30-40, 40-50, or 50+ mmHg) and it prevents lymphedema from forming in the interstitial space
- ▶ The garment is to be worn every day but may be removed while sleeping
- ▶ Some patients will need a night garment for compression
- ▶ The patient may choose to order 2 garments—one to wear and one to launder
- ▶ If the garment is **not** worn daily, lymphedema will reoccur
- ▶ Garments should be replaced every 6 months
- ▶ The patient should perform MLD or utilize a Flexitouch pump daily

Managing Compression Garments

- ▶ The Certified Lymphatic Therapist will...
 - determine the least effective amount of compression needed to maintain results for a garment
 - determine the most effective but least restrictive style of garment
 - provide the patient with options for choosing a company who can order the garments
 - Educate the patient on how to donn/doff the garment with or without the use of donning aids

Compression Garment for the Upper Extremity



Compression Stocking for the Lower Extremity





Velcro Garment for the Upper Extremity



Velcro Compression Garment for the Lower Extremity

Are There Precautions or Contraindications to PT Management?

▶ Precautions

- ▶ Thyroid Disorders
- ▶ Breaks or tears in skin
- ▶ Decreased circulation
- ▶ Pain with Bandaging
- ▶ Pre-cancerous areas
- ▶ Asthmatics where attacks are triggered by the vagus nerve
- ▶ Radiated Skin
- ▶ Arterial Compromise

▶ Contraindications

- ▶ Acute CHF
- ▶ Skin Infection
- ▶ Renal Failure
- ▶ Active Bleeding
- ▶ Untreated Cancers
- ▶ Acute DVT
 - ▶ Non-Therapeutic
- ▶ Bronchial Asthma
- ▶ Aortic Aneurysm
- ▶ Arterial Compromise with an ABI of 0.8 or less

Benefits of Physical Therapy Management for Lymphedema

- ▶ Decreased girth of the limb
 - ▶ Weight loss
 - ▶ Decreased risk of cellulitis and other skin infections
 - ▶ Improved ROM and mobility
 - ▶ Decreased pain
 - ▶ Decreased need for diuretics
- ▶ Reduction in skin conditions
 - ▶ Lymphorrhea
 - ▶ Papillomas
 - ▶ Lymph Cysts
 - ▶ Peau d'orange
 - ▶ Fibrosis

Questions?



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