

Cancer Association of South Africa (CANSA)



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Fact Sheet on Lymphoedema

Introduction

Lymphoedema is a notoriously debilitating progressive condition with currently no known cure. The unfortunate sufferer faces a lifelong struggle of medical, and sometimes surgical, treatment fraught with potentially lethal complications (Revis, *et al.*). There is no known cure for lymphoedema – it can only be controlled and controlling lymphoedema involves diligent care of the affected limb or body part.

Lymphoedema refers to swelling that is generally mostly seen in an arm or a leg, although it can affect any other part of the body. Lymphoedema usually tends to affect just one arm or leg - sometimes both arms or both legs may be swollen. It is a swelling that develops as a result of an impaired lymphatic system. This may be as a result of the lymphatic system not developing properly, or through damage or trauma caused by surgery or radiation therapy.



[Picture Reference: Lymphoedema]

Grada, A.A. & Phillips, T.J. 2017.

“Lymphedema is a localized form of tissue swelling resulting from excessive retention of lymphatic fluid in the interstitial compartment and caused by impaired lymphatic drainage. Lymphedema is classified as primary or secondary. Primary lymphedema is caused by developmental lymphatic vascular anomalies. Secondary lymphedema is acquired and arises as a result of an underlying systemic disease, trauma, or surgery. We performed PubMed and Google Scholar searches of the English-language literature (1966-2017) using the terms lymphedema, cancer-related lymphedema, and lymphatic complications. Relevant publications were manually reviewed for additional resources. This progressive chronic disease has serious implications on patients' quality of life. It is often misdiagnosed because it mimics other conditions of extremity swelling. There is no definitive cure for lymphedema. However, with proper diagnosis and management, its progression and potential complications may be limited.”

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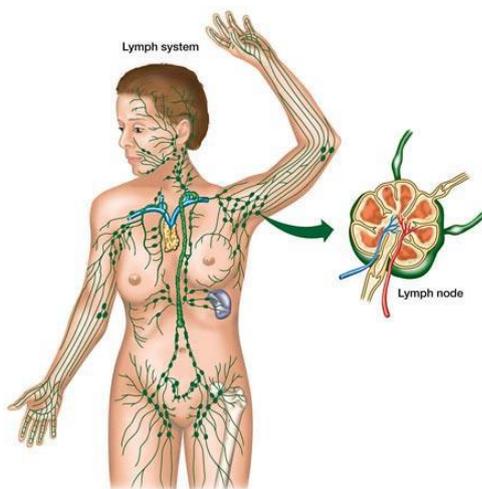
Grada, A.A., & Phillips, T.J. 2017.

Lymphedema is a localized form of tissue swelling resulting from excessive retention of lymphatic fluid in the interstitial compartment. It is caused by impaired lymphatic drainage. Lymphedema is a chronic progressive disease with serious physical and psychosocial implications. It can be challenging to diagnose, especially in obese patients and in those with coexisting venous disease. We performed PubMed and Google Scholar searches of the English-language literature (1966-2017) using the terms lymphedema, lymphedema management, and lymphatic complications. Relevant publications were manually reviewed for additional resources. There are currently no standard guidelines for the diagnosis of lymphedema. There is no cure yet for lymphedema, and the objective for management is to limit disease progression and prevent complications.

The Lymphatic System

The lymphatic system is a system similar to the blood circulatory system and comprises many lymphatic vessels. The main difference between the blood circulatory system and the lymphatic system is that the lymphatic vessels only contain a clear fluid, lymph. Another difference from the blood circulatory system is that blood continually circulates through each part of the body while lymph is only drained away from each part of the body.

[Picture Reference: Lymphatic System]



Oedema

Oedema is the medical term that refers to fluid retention in the body. It occurs when there is a build-up of fluid (mainly water) in the body's tissues. It causes swelling to occur in the affected area. It is often a symptom of an underlying condition. It can also be caused by a variety of factors such as high salt intake in the diet or being immobile for long periods of time. Some of the most important underlying conditions include:

- pregnancy
 - kidney disease
 - heart failure
 - chronic lung disease
- liver disease
 - diabetes
 - malnutrition
 - medication, such as corticosteroids or medicine for high blood pressure
 - the contraceptive pill.

Incidence of Lymphoedema

It is unknown how many people in South Africa live with Lymphoedema. The unavailability of statistics is merely part of a worldwide dilemma.

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In 2014, the World Health Organisation (WHO) estimated that worldwide 1-2% of the population suffers from chronic Lymphoedema

In South Africa, with the growing epidemic of non-communicable diseases, emerging infections, longer life expectancies and slow improvements of socioeconomic conditions, it is likely that the prevalence and impact of chronic wounds and Lymphoedema will increase. To put things in perspective, South Africa's population is currently said to be 56 million people; conservatively at 1-2% prevalence in the population, estimates could be as high as 1,3 million people with some form of Lymphoedema.

Lymphoedema

A medical dictionary definition of lymphoedema describes it as a common chronic and debilitating condition in which excess fluid (called lymph) collects in tissues and causes swelling (oedema) in the affected parts. The greatest problems occur in parts of the body that are not surrounded by muscle which helps pump the lymphatic system.



[Picture Credit: Awareness]

Vignes, S. 2017.

Lymphedema results from impaired lymphatic transport with increased limb volume. Lymphedema are divided in primary and secondary forms. Upper-limb lymphedema secondary to breast cancer treatment is the most frequent in France. Primary lymphedema is sporadic, rarely familial or associated with complex malformative or genetic disorders. Diagnosis of lymphedema is mainly clinical and lymphoscintigraphy is useful in primary form to assess precisely the lymphatic function of the two limbs. Erysipelas (cellulitis) is the main complication, but psychological or functional discomfort may occur throughout the course of lymphedema. Lipedema is the main differential diagnosis, defined as an abnormal accumulation of fat from hip to ankle. Lymphedema management is based on complete decongestive physiotherapy (multilayer low-stretch bandage, manual lymph drainage, skin care, exercises). The first phase of treatment leads to a reduction of lymphedema volume and the second phase stabilizes the volume. Multilayer low-stretch bandage and elastic compression is the cornerstone of the complete decongestive physiotherapy. Patient-education programs, including self-management, aim to improve patient autonomy.

Lowering the Risk for Lymphoedema

Lymphoedema is a high protein oedema, but eating too little protein will not reduce the protein element in the lymph fluid; rather this will weaken the connective tissue and worsen the condition. The diet should contain protein that is easily digested, such as chicken and fish.

It is not always possible to totally prevent the occurrence of lymphoedema. There are, however, some steps you can take to assist in lessening the risk of developing lymphoedema:

- maintain your ideal body weight according to your build and height

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- eat a well-balanced diet
- follow a low sodium diet
- ensure the intake of sufficient fibre in your diet
- avoid smoking
- do not use alcoholic beverages. If you do, limit your alcohol intake. Males should not have more than two standard alcoholic drinks per day, whereas females should not have more than one standard alcoholic drink per day.

Caring of a Limb with Lymphoedema

Here are some simple recommendations to combat lymphoedema and to prevent its occurrence:

- Keep the affected extremity clean with moisturising soaps such as Dove©
- Keep the skin moisturised with lotions
- Use an electric razor instead of a blade on the affected extremity/armpit if you are shaving this region
- Protect the skin from the sun with sun-screen, at least SPF-15
- Use insect repellents to prevent insect bites
- Keep the extremity in an elevated position when you are resting - this lets gravity work to move the lymph fluid
- Consider wearing a compression stocking on the extremity when flying in an airplane
- Avoid hot showers, saunas, or steam rooms
- Avoid excess alcohol and smoking
- Do not have any blood pressure measurements, injections, blood draws, or vaccinations on the affected extremity
- Maintain your ideal body weight.

For an Arm:

- Wear rubber gloves when washing dishes
- Wear protective gloves when doing work outside
- Avoid carrying heavy objects with the affected arm
- Carry heavy shoulder bags on the unaffected side
- Do not get a manicure on the affected side
- Do not wear a watch or jewellery on the affected side.

For a Leg:

- Wear shoes or slippers around the house....Do not go barefoot
- Consider having a podiatrist cut your toe nails
- Get good, comfortable shoes
- Wear protective boots when doing chores outside to prevent injury.

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The Treatment of Lymphoedema

There are a number of possible treatments for lymphoedema, many of which can be used together (Casley-Smith & Casley-Smith). Only basic information is furnished here – please consult your doctor or lymphoedema specialist (specially trained professional nurse, physiotherapist, etc) for additional information.

Complex Physical Therapy

This is called Complex Physical Therapy (CPT) because a number of physical therapeutic approaches are combined to produce results. CPT consists of four (4) main parts:

- Regular skin care to improve the skin condition and to prevent any infection which will add to the lymphatic load
- A special form of massage each day, which assists in the removal of excess lymph from the tissues, softens the tissues and opens alternative lymphatic pathways so that unaffected regions can help to drain the affected region
- Compression bandages which are applied to the limb after each massage session to minimise the re-accumulation of lymph and the fitting of a compression garment after the whole treatment to stop the reduced limb from rapidly resuming its former size
- Special limb exercises which supplement the massage.

Medication

Consult your medical practitioner to prescribe specific medication. Do not use alternative or complementary medicines without discussing it with your doctor first.

Compression Garments

The use of compression garments are necessary to:

- prevent lymphoedema occurring or increasing
- try to maintain the size of an affected limb when treatment is unavailable or unaffordable
- maintain the reduction achieved after treatment, and to continue the remodelling of an affected limb.

If no other treatment is used, good compression garments will limit the amount of swelling and thereby slow the advancement of lymphoedema.

[Picture Credit: Compression Garment]



Compression Bandages

The use of compression bandages are essential during complex lymphatic therapy since the limb's size changes

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rapidly and so the size of the compression 'garment' and the amount of compression must also change rapidly. This is necessary partly because of the destruction of the elastic fibres of the skin in lymphoedema, to maintain the reductions gained by massage in the newly lax tissues, and to reshape the affected limb.

Compression bandages should only be applied by specially trained and competent individuals.

The use of Pneumatic Pumps in Treating Lymphoedema



Pneumatic compression pumps are proposed as a treatment option for patients with lymphoedema who have failed conservative measures e.g., compression garments and manual massage. A variety of different pumps are available. It can be single- or multi-chamber pumps, and have varying design and complexity. This type of device should only be used on the recommendation and under supervision of a qualified person.

[Picture Credit: Lymphoedema Pump]

A pneumatic compression garment paired with a pump producing various pressure gradients simulates normal actions of the circulatory system by using external pressure. Inflation of the garment both proximally and distally produces pressure causing lymphatic fluids or blood to circulate out of the affected limb, reducing swelling and preventing potential blood clots and wounds from forming. There are pneumatic compression garments available for application to limbs as well as the torso.

Exercise

A specific exercise program, designed to assist the lymph drainage from your swollen limb is an important part of your overall management for lymphoedema and something that you can do to help yourself.

During exercise, the muscle contraction that occurs when the muscles are tensed puts increased pressure on the lymph vessels. This "muscle pump" squeezes the vessels to enhance the lymphatic pumping mechanism (see diagram), which in turn helps to move lymph fluid into and along the lymph vessels, back towards the chest and away from the affected area. There are one-way valves in the deeper lymphatic vessels which help stop backflow and help to direct the lymph fluid centrally away from the limbs towards the trunk. Specific exercises thus help to drain fluid out of a swollen limb. Exercises are also important to maintain mobility of the joints and to stretch and strengthen muscles.

When exercising, remember the following:

- Perform exercises slowly and smoothly, in a gentle manner, it should not be painful
- Wear bandages/compression sleeve while exercising if available – this will further enhance the pumping action of the lymphatic vessels
- Exercises start with the trunk to help with lymph drainage centrally, followed by exercises of the affected limb
- An exercise programme should always be tailored to an individual and will depend on their age, occupation, lifestyle, level of fitness and current health

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- Always get a doctor or lymphoedema therapist's approval and guidance for any exercise programme. If any exercise seems to cause any problems or seems to result in further swelling, STOP, and seek professional advice.

Gutierrez, C., Karni, R.J., Naqvi, S., Aldrich, M.B., Zhu, B., Morrow, J.R., Sevick-Muraca, E.M. & Rasmussen, J.C. 2019. Head and neck lymphedema: Treatment response to single and multiple sessions of advanced pneumatic compression therapy. *Otolaryngol Head Neck Surg.* 2019 Jan 29:194599818823180. doi: 10.1177/0194599818823180. [Epub ahead of print]

"Ten head and neck cancer survivors diagnosed with head and neck lymphedema (HNL) were imaged using near-infrared fluorescence lymphatic imaging (NIRFLI) prior to and immediately after an initial advance pneumatic compression device treatment and again after 2 weeks of daily at-home use. Images assessed the impact of pneumatic compression therapy on lymphatic drainage. Facial composite measurement scores assessed reduction/increase in external swelling, and survey results were obtained. After a single pneumatic compression treatment, NIRFLI showed enhanced lymphatic uptake and drainage in all subjects. After 2 weeks of daily treatment, areas of dermal backflow disappeared or were reduced in 6 of 8 subjects presenting with backflow. In general, reductions in facial composite measurement scores tracked with reductions in backflow and subject-reported improvements; however, studies are needed to determine whether longer treatment durations can be impactful and whether advanced pneumatic compression can be used to ameliorate backflow characteristic of HNL."

Invernizzi, M., Michelotti, A., Noale, M., Lopez, G., Runza, L., Giroda, M., Despini, L., Blundo, C., Maggi, S., Gambini, D. & Fusco, N. 2019.

"Breast cancer related lymphedema (BCRL) is frequent but strategies for an individualized risk assessment are lacking. We aimed to define whether tumor-specific pathological features, coupled with clinical and therapeutic data, could help identify patients at risk. Data from 368 patients with node-positive breast cancers were retrospectively collected, including 75 patients with BCRL (0.4-25.6 years follow-up). BCRL was assessed during the standard follow-up oncology visits using the circumferential measurement. Clinicopathologic and therapeutic factors associated with BCRL were integrated into a Cox proportional hazards regression model. Lymphovascular invasion (LVI) was more common in BCRL patients ($n = 33, 44\%$ vs. $n = 85, 29\%$, $p = 0.01$), akin extra nodal extension (ENE) of the metastasis ($n = 57, 76\%$ vs. $n = 180, 61\%$, $p = 0.02$). Sentinel lymph node excision without axillary dissection and extra-axillary radiotherapy were BCRL-unrelated. A higher number of BCRL-positive patients were treated with taxane-based chemotherapy with or without trastuzumab, compared to BCRL-negative patients ($p < 0.01$). Treatment with trastuzumab and/or taxanes, adjusted for systemic infections, laterality, therapy, and pathological features (i.e., LVI and ENE), had a significant impact in BCRL-free survival ($p < 0.01$). This work offers new insights on BCRL risk stratification, where the integration of clinical, therapeutic, and tumor-specific pathological data suggests a possible role of anti-human epidermal growth factor receptor 2 (HER2) therapy in BCRL pathogenesis."

Brahma, B. & Yamamoto, T. 2019.

"Breast cancer is the most common cancer in Dharmais hospital. The treatment can give rise to breast cancer treatment-related lymphedema (BCRL) that will cause significant morbidities. Based on author's (BB) patient series in Dharmais hospital, BCRL occurred in 27.7% after axillary lymph nodes

dissection (ALND). The development of diagnostic modalities as well as lymphatic microsurgery have become promising instruments for lymphedema treatment.”

Medical Disclaimer

This Fact Sheet is intended to provide general information only and, as such, should not be considered as a substitute for advice, medically or otherwise, covering any specific situation. Users should seek appropriate advice before taking or refraining from taking any action in reliance on any information contained in this Fact Sheet. So far as permissible by law, the Cancer Association of South Africa (CANSA) does not accept any liability to any person (or his/her dependants/estate/heirs) relating to the use of any information contained in this Fact Sheet.

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Sources and References Consulted or Utilised

Awareness

https://www.google.co.za/search?q=lymphoedema&source=lnms&tbm=isch&sa=X&ei=oFSZU7C7LcH9ygP434DADw&sqi=2&ved=0CAYQ_AUoAQ&biw=1517&bih=714&dpr=0.9#facrc=_&imgdii=_&imgrc=GWbAVG25HcuoQM%253A%3BgXPiQrjCbWK3kM%3Bhttp%253A%252F%252Fwww.amylhwilliams.com%252Flymphedemaawareness.gif%3Bhttp%253A%252F%252Fwww.amylhwilliams.com%252Flymphedemaawareness.html%3B568%3B232

Brahma, B. & Yamamoto, T. 2019. Breast cancer treatment-related lymphedema (BCRL): an overview of the literature and updates in microsurgery reconstruction *Eur J Surg Oncol.* 2019 Jan 4. pii: S0748-7983(19)30004-6. doi: 10.1016/j.ejso.2019.01.004. [Epub ahead of print].

Casley-Smith, Judith.R. & Casley-Smith, J.R. No Date [a]. What is Lymphoedema? Lymphoedema Association of Australia. <http://www.lymphoedema.org.au/treatment.html> (Accessed on 2012-01-26).

Casley-Smith, J.R. & Casley-Smith, Judith R. No Date [b]. Other Treatments for Lymphoedema. University of Adelaide, Australia. http://www.lymphoedema.org.au/tret_oth.html (Accessed on 2012-01-26).

Casley-Smith, Judith.R. 2002. Compression Bandages in the treatment of Lymphoedema. Lymphoedema Association of Australia. <http://www.lymphoedema.org.au/bandages.html> (Accessed on 2012-01-26).

Casley-Smith, Judith.R. No Date. Compression Garments for the Treatment of Lymphoedema. Lymphoedema Association of Australia. <http://www.lymphoedeam.org.au/garments.html> (Accessed on 2012-01-26).

Compression Garment

https://www.google.co.za/search?q=lymphoedema&source=lnms&tbm=isch&sa=X&ei=oFSZU7C7LcH9ygP434DADw&sqi=2&ved=0CAYQ_AUoAQ&biw=1517&bih=714&dpr=0.9#facrc=_&imgdii=_&imgrc=kJSu7wP7I3Af8M%253A%3B3xxlKuuZRdM4fM%3Bhttp%253A%252F%252Fwww.nhs.uk%252FConditions%252FLymphoedema%252FPublishingImages%252FBEAHEM_lymphoedema_342x198%255B1%255D.JPG%3Bhttp%253A%252F%252Fwww.nhs.uk%252FConditions%252FLymphoedema%252FPages%252FTreatment.aspx%3B342%3B198

Davey, S. 2014. Lymphoedema and Wound Healing in South Africa. *Wound Healing in Southern Africa*, 7 (2).

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Dugdale, D.C. & Zieve, D. 2010. Lymphatic obstruction – PubMed. <http://www.ncbi.nlm.nih.gov/pubmedhealth/PMH0002106/> (Accessed on 2012-01-25).

Grada, A.A. & Phillips, T.J. 2017. Lymphedema: pathophysiology and clinical manifestations. *J Am Acad Dermatol.* 2017 Dec;77(6):1009-1020. doi: 10.1016/j.jaad.2017.03.022.

Grada, A.A., & Phillips, T.J. 2017. Lymphedema: diagnostic workup and management. *J Am Acad Dermatol.* 2017 Dec;77(6):995-1006. doi: 10.1016/j.jaad.2017.03.021.

Guenther, J.M. No Date. What Every Breast Cancer Survivor Needs to Know about Lymphedema. (Surgical Oncologist, specialising in Breast Cancer Surgery). <http://elymphnotes.dyndns.org/detail.asp?ci=164> (Accessed on 2012-01-18).

Gutierrez, C., Karni, R.J., Naqvi, S., Aldrich, M.B., Zhu, B., Morrow, J.R., Sevick-Muraca, E.M. & Rasmussen, J.C. 2019. Head and neck lymphedema: Treatment response to single and multiple sessions of advanced pneumatic compression therapy. *Otolaryngol Head Neck Surg.* 2019 Jan 29:194599818823180. doi: 10.1177/0194599818823180. [Epub ahead of print]

Hardy, D. & Moritmer, P.S. 2011. What is Lymphoedema? Royal Marsden and St George's Hospitals, London. <http://www.lymphoedema.org/Menu3/Index.asp> (Accessed on 2012-01-25).

Invernizzi, M., Michelotti, A., Noale, M., Lopez, G., Runza, L., Giroda, M., Despini, L., Blundo, C., Maggi, S., Gambini, D. & Fusco, N. 2019. Breast Cancer Systemic Treatments and Upper Limb Lymphedema: A Risk-Assessment Platform Encompassing Tumor-Specific Pathological Features Reveals the Potential Role of Trastuzumab. *J Clin Med.* 2019 Jan 24;8(2). pii: E138. doi: 10.3390/jcm8020138.

Lymphatic System
www.science-art.com

Lymphoedema
<http://lymphedematreatments.org/pictures-lymphedema/>

LymphoedemaPeople. http://www.lymphedemapeople.com/wiki/doku.php?id=how_to_prevent_lymphedema (Accessed on 2012-02-02).

Lymphoedema Pump
<http://www.biohorizonmedical.com/pneumatic-compression-devices-lymphedema-pumps>

Lymphoedema Support Group
<http://www.lymphoedemasupport.com/articles/exercises-for-lymphoedema> (Accessed on 2012-02-15).

LymphoedemaTherapy
<http://www.lymphedema-therapy.com/lymphedema-exercise.html> (Accessed on 2012-02-15).

Norman, S.A., Localio, A.R., Kallan, M.J., Weber, A.L., Simoes Torpey, H.A., Potashnik, S.L., Miller, L.T., Fox, K.R., Demichele, A. & Solin, L.J. 2010. Risk factors for lymphedema after breast cancer treatment. *Cancer Epidemiol Biomarkers Prev.*, Oct.

PubMed. 2010. Lymphatic obstruction – Lymphoedema. <http://www.ncbi.nlm.nih.gov/pubmedhealth/PMH0002106/> (Accessed on 2012-02-01).

Revis (Jr), D.R., Talavera, F. & Geibel, J. No Date. Lymphoedema. <http://emedicine.medscape.com/article/191350-overview> (Accessed on 2012-01-26).

Rockson, S. & Gills T. 2017. Center for Lymphatic and Venous Disorders, Stanford University School of Medicine, Stanford, Calif. May 10, 2017.

Vignes, S. 2017. Lymphedema: from diagnosis to treatment. *Rev Med Interne.* 2017 Feb;38(2):97-105. doi: 10.1016/j.revmed.2016.07.005. Epub 2016 Aug 31.

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