

Cancer Association of South Africa (CANSA)



Research • Educate • Support

Fact Sheet on Lymphoedema

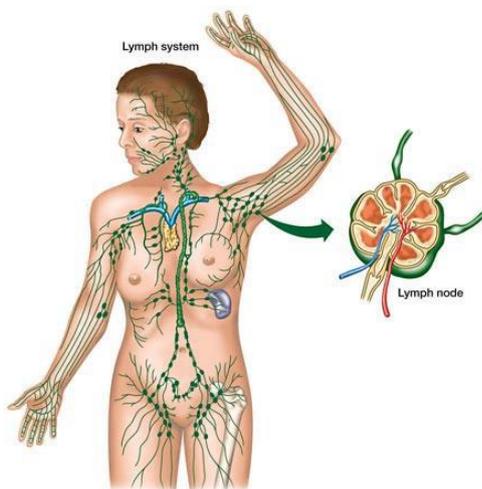
Introduction

Lymphoedema is a notoriously debilitating progressive condition with 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 cure for lymphoedema – it can only be controlled and controlling lymphoedema involves diligent care of the affected limb or body part.
(Mayo Clinic).

Lymphoedema refers to swelling that is generally mostly seen in an arm or a leg, although it can affect any 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.
(Hardy & Mortimer).



[Picture Reference: Lymphoedema]



The Lymphatic System

The lymphatic system is similar to the blood circulatory system and has just as many vessels. The only difference is that the lymphatic vessels contain lymph only, which is a clear fluid. 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]

The lymphatic system drains away the excess protein and water which continually escapes from the blood in small amounts, plus some substances made in the

tissues, and any foreign substances (e.g. bacteria) which enter it. The lymphatic system starts in almost every tissue of the body as tiny vessels which gradually join together into bigger lymphatic vessels.

Lymph is pumped into, and along, these vessels by the movements of adjacent muscles and by the contractions of the walls of the larger lymphatic vessels. This pumping is aided by many valves inside the lymphatic vessels. Finally, the lymphatic system empties into the blood circulatory system, largely in the lower neck. On its way along the lymphatic system, the lymph is filtered in the lymph nodes (lymph glands). These glands remove foreign matter (e.g. bacteria) and will start any immune reactions in the body that may be required. (Casley-Smith & Casley-Smith [a])

Oedema

Oedema is the medical term for fluid retention in the body. It occurs when there is a build-up of fluid (mainly water) in the body's tissues, causing 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.

It may also result from the following:

- a high intake of salt in the diet
- sitting or standing still for long periods of time
- hot weather
- exposure to high altitudes

When doctors cannot find an obvious cause for oedema, it is known as idiopathic oedema. (NHS, United Kingdom).

Incidence of Lymphoedema

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

In 2014, the World Health Organisation (WHO) estimated that worldwide 1-2% of the population suffers from chronic Lymphoedema; 120 million people worldwide suffer from Lymphatic Filariasis and nearly 1.4 billion people in 73 countries are estimated to be at risk of infection; 90 million caused by parasites. An estimated 25 million men suffer with genital disease and over 15 million women are afflicted in the leg; 20 million caused by breast cancer; 2–3 million people with primary Lymphoedema.

The incidence of breast cancer related Lymphoedema ranges between 6% and 83%.

The economic burden of chronic wounds and associated Lymphoedema are better documented in the developed world and appear to be high.

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 53 million people; conservatively at 1-2% prevalence in the population, estimates could be as high as 530 000 to 1,06 million people with some form of Lymphoedema. (Davey, 2014).

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 (MedicineNet). The greatest problems occur in parts of the body that are not surrounded by muscle which helps pump the lymphatic system.

(Guenther).



[Picture Credit: Awareness]

There are two (2) broad categories of lymphoedema:

Primary lymphoedema - which is usually present at birth or shortly thereafter. It arises due to some failure of the lymphatic system itself, e.g. underdevelopment of the lymphatic system. It may develop without any obvious cause at different stages in life, but particularly in adolescence (Hardy).

There are two inherited disorders that may be responsible for primary lymphoedema namely:

- Milroy's Disease which causes lymph nodes to form abnormally
- Meige's Disease which often causes lymphoedema in childhood or around puberty. It causes lymph vessels to form without valves that keep lymph fluid from flowing backward (Mayo Clinic). Meige's Disease is also known as *lymphoedema tarda* when it becomes clinically evident only at the age of 35 years or older. It is the rarest form of primary lymphoedema.

(Revis, *et al.*)

Secondary lymphoedema - results from some problem outside of the lymphatic system that prevents it from working properly. Examples of identifiable causes that destroy or render lymphatic vessels and nodes inadequate include:

- surgery involving lymphatic vessels and nodes for example removal of lymph nodes during surgery for cancer. In cancer patients the most common cause of lymphoedema is lymph node dissection for treatment of cancers, especially cancer of the breast, prostate, head and neck and melanoma

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- radiation therapy of the axillary or shoulder-area which can obliterate lymphnodes and lymphatic vessels
 - accidental trauma to lymphatic vessels and nodes
 - infection of lymphatic vessels and/or nodes
 - infections following on certain insect bites (in Australasia the white tailed spider is specifically mentioned)
 - tumour invasion of lymphatic vessels and/or nodes
 - compression, especially around limbs
 - vein stripping in the treatment of varicose veins
 - other forms of superficial blood vessel surgery
 - lipectomy (liposuction) – surgical removal of fatty tissue
 - burns, especially burns involving limbs
 - burn scar excision
 - problems with veins not working well, e.g. varicose veins and after deep vein thrombosis
 - worldwide the most common cause is *filariasis* which is the direct infestation of lymph nodes by the parasite *Wuchereiria bancrofti*
- (vascular.co.zn; Hardy; Revis, et al.; Casley-Smith & Casley-Smith [a]; Guenther)

Stages of Lymphoedema

According to the International Society of Lymphology, lymphoedema is divided into four (4) stages:

Stage 0-Latent Stage

- No visible changes
- Oedema is not evident despite an impaired lymphatic drainage system
- System is still effectively compensating

Stage 1- Reversible Lymphoedema

- Early accumulation of protein-rich oedema fluid with visible oedema
- Pitting oedema noted
- Oedema reduced by elevation of the limb but returns when limb is reverted to normal position

*Prompt treatment can control the condition and may prevent it from becoming more severe.

Stage 2-Spontaneously Irreversible Lymphoedema

- Increase of protein-rich oedema fluid and noted tissue changes in the skin
- Increase risk of fibrosis, infections, and skin problems
- Pressure against limb produces only a slight indentation - pitting or no indentation at all
- Elevation of limb will not completely reduce oedema

*Can improve with intensive treatment.

Stage 3-Lymphostatic Elephantiasis

- Increased protein-rich oedema fluid causing skin tissue to become extremely oedematous and fibrotic
- Normal skin elasticity is lost and skin may hang in folds

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- Skin may change colour
- Papillomas - small solid benign tumours that project above the surrounding tissue may develop
- Hyperkeratosis-increase in the thickness and hardening of the dermal layer of the skin may develop
- Limited mobility
- Pressure does not produce pitting
- Infections become more common - cellulitis
- Increased risks of breaks in skin - fungal infections and open wounds may form within the fold of skin

*Requires intensive treatment.

(Davey, 2014).

What Lymphoedema Feels Like

Individuals with lymphoedema usually experience:

- a feeling of tightness and/or heaviness in the affected limb
 - 'burning' pains in the affected part
 - aching buttocks in the event of lymphoedema of the leg
 - aching pain in the back of the shoulder in the event of lymphoedema of an arm
 - a feeling of 'pins and needles' in the affected part
 - 'shooting pains' up the affected limb
 - painful joints, e.g. elbow, knee or ankle. It is similar to arthritis and is often diagnosed as such
 - tenderness in the groin of an affected leg
 - 'blown up' abdomen if a leg is affected or in 'lymphoedema-all-over'
 - the affected limb or area is warmer than other body parts – but NOT red, which suggests infection
 - gradual increase in the size and circumference of the affected body part. This may present as mild swelling to severe disabling enlargement with potentially life-threatening complications depending on the affected area or body part
 - impairment of daily activities depending on degree of lymphoedema
 - embarrassment in public when lymphoedema is severe
- (Revis, *et al.*; Casley-Smith & Casley-Smith [a]).

Grades of Lymphoedema

Lymphoedema is typically graded into three grades:

- Grade 1- the swelling will pit (cause an indentation) if the skin is pressed - swelling is reduced if the limb is elevated
- Grade 2 – there is much more excess fibrous tissue present, so the swelling usually does not pit, and swelling is not much reduced by elevation, e.g. in bed overnight or for 2-3 days. The limb gradually 'hardens' because of the excess fibrous (scar) tissue resulting from chronic inflammation
- Grade 3 – gross changes occur in the skin with many protrusions and huge bulges. It is also referred to as elephantiasis.

(Casley-Smith & Casley-Smith [a]).

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
- 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.

(LymphoedemaPeople).

Patient Expectations (Prognosis)

Lymphoedema is a chronic condition that usually requires lifelong management. In some cases lymphoedema may improve with time, however, some swelling is usually permanent. (PubMed; Dugdale & Zieve).

The Role of Tamoxifen in Lymphoedema

Dr Marisa Weiss, M.D., Breastcancer.Org President and Founder said the following about Tamoxifen and lymphoedema: Every person is unique. You may discover when you take a medication that it may affect you, even if it's not a well-described side effect of that medication. If you take a medication and it seems to aggravate the problem, then talk to your doctor about your concern over this side effect. Tamoxifen can increase the risk for blood clots, primarily in your legs, but it can also happen in other parts of your body, including your arms. When a blood clot occurs, there can be associated swelling that is a result of back-up of the veins, rather than a primary back-up of lymphatic fluid. This is a well-described, but thankfully, rare side effect of Tamoxifen. There are no other specific medications that we are aware of that are known to increase the risk of lymphedema.

(Breastcancer.org).

Diagnosing Lymphoedema

Your doctor, specialist nurse or physiotherapist will know which cancer treatments you've had in the past and will assess whether your symptoms are caused by lymphoedema. Not all swelling is caused by lymphoedema and sometimes tests are needed to rule out other possible causes, such as a blood clot. Some people may need to have scans to find out if the lymphoedema is caused by a cancer spreading to, or pressing on, the lymph nodes or lymphatic vessels.

Once lymphoedema is diagnosed you'll usually be referred to a specialist lymphoedema nurse, breast care nurse, doctor, or a physiotherapist for a full assessment. Different health professionals and massage therapists are involved in treating lymphedema. (MacMillan Cancer Support).

Tests may be recommended to assess the extent and severity of your symptoms. These tests include:

- Tape measure - A tape measure is used at 4cm intervals up the leg or arm to measure the limb circumference and then calculate limb volume
- Water displacement method - The water displacement method is based on the principle that you can calculate the volume of an object by measuring how much water it displaces (the amount of water that is pushed out of the way when an object is placed in water)
- You will be asked to place the affected limb in a tank of water and the amount of water that is displaced will then be measured. This measurement can be used to calculate the volume of your limb
- Perometry - Perometry is a technique that uses infrared light to measure the volume of your limb. This process can accurately calculate how swollen your affected limb is
- Bioimpedance test - During a bioimpedance test, electrodes (small metallic discs) are placed on different parts of your body. The electrodes release a small and painless electric charge that is measured using a handheld device. Changes in the strength of the current can indicate the presence of fluid in your tissue
- Imaging tests may be used to help with the diagnosis. These include:
 - a *lymphoscintigraph*, where you are injected with a radioactive dye that can be tracked using a special scanner. The scanner can show how the dye moves through your lymphatic system and can check for any blockages
 - a *magnetic resonance imaging (MRI) scan*, which uses a strong magnetic field and radio waves to produce detailed images of the inside of your body
 - an *ultrasound scan*, which uses high-frequency sound waves to create an image of the inside of your body
 - a *computerised (axial) tomography (CT or CAT) scan*, which uses X-rays and a computer to create detailed images of the veins or lymph nodes

These scans can be used to create a clearer picture of the affected tissue. They are also useful for ruling out another condition called lipoedema. Lipoedema is swelling of the limbs as a result of abnormal fat deposits.

(NHS, United Kingdom).

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 the 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 the 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.

(OnkoLink).

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. (Casley-Smith & Casley-Smith [b]).

[Picture Credit: Compression Garment]



Compression Bandages

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

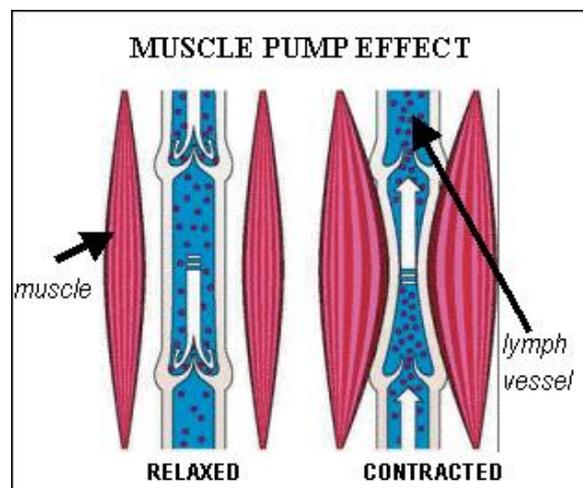
reducing swelling and preventing potential blood clots and wounds from forming. There are pneumatic compression garments available for application to limbs as well as the torso.

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.

[Picture Reference: Lymphoedema Support Group].



- When exercising, remember the following:
- Perform exercises slowly and smoothly, in a gentle manner, they 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: firstly using the proximal muscles (i.e. the muscles closest to the centre of the body e.g. shoulder/upper arm; hip/thigh) then the distal muscles of the limb last (i.e. muscles furthest from the centre of the body e.g. forearm and fingers; calf, ankle and toes). Do exercises in the order provided, as by draining the trunk and central areas back to the general circulation first, this gives the fluid from the limbs somewhere to drain. It is like emptying a bucket so more fluid can be put into it
- Include deep breathing – this causes a pressure change which acts like a vacume inside the ribcage, helping to drain lymphatic vessels towards the trunk
- Get into a routine, a time of day that fits in with your lifestyle
- A person’s exercise programme should be tailored to the individual and will depend on their age, occupation, lifestyle, level of fitness and current health
- Always get your doctor or lymphoedema therapist’s approval and guidance for any exercise programme. If any exercise seems to cause you any problems or seems to result in further swelling, STOP, and seek professional advice. (Lymphoedema Support Group).

Latest Lymphoedema Research

Researchers have found an underlying mechanism that could eventually lead to the first drug therapy for this debilitating condition. The findings come from research in mice and human cells. There is already a 2017 clinical trial underway to see whether these lab discoveries will translate into a new lymphoedema treatment.

People with lymphedema have excess fluid buildup in parts of the body, usually the arms or legs. Most often, the condition arises after certain cancer treatments damage the lymphatic system, preventing lymph fluids from draining properly. At present there is no cure or drug therapy for lymphoedema.

Lymphedema is not just a cosmetic issue: It can be uncomfortable, hinder range of motion, and make people vulnerable to infections, according to the American Cancer Society. In the new study, it is aimed to get a clearer understanding of the molecular mechanisms that drive lymphoedema. So they turned to a drug called Ketoprofen.

The drug, Ketoprofen, a painkiller, has been studied as a lymphedema treatment. The problem is that Ketoprofen can have side effects for the heart, gastrointestinal tract and kidneys. To zero in on Ketoprofen's good side - its action against lymphedema - the researchers used lab mice induced to have a lymphoedema-like condition. The scientists found that the drug prevented tissue injury and fluid buildup by blocking a protein called leukotriene B4 (LTB4).

It turned out that the same protein was elevated in cell samples from lymphedema patients. And not only Ketoprofen battled lymphedema in mice. Another drug called Bestatin worked just as well. Bestatin has been used for years in Japan as a cancer treatment.

The advantage of the drug is that it has more "selective" action against LTB4 - and fewer side effects - than Ketoprofen. Based on laboratory findings, a clinical trial testing Bestatin against lymphoedema is already underway.

Eiger BioPharmaceuticals, based in Palo Alto, California, is funding that trial (and acquiring the drug from its Japanese manufacturer).

The role of Bestatin - if any – will not be clear until the clinical trial results are in. The "mouse model" of lymphoedema does not exactly replicate what happens in cancer patients who undergo radiation therapy or surgical removal of the lymphnodes. And, treatments that work well in animals do not always pan out in people.

The new findings offer a clearer understanding of the underlying process in lymphoedema. Hopefully, the new understanding will lead toward eventually preventing the condition altogether.

The Bestatin trial results are a few years away, but patients can take heart in the fact that the work is happening. Historically lymphoedema patients have been largely ignored, and that has led to a certain sense of hopelessness. But now one can say answers are on the horizon.

The study was published May 10 in *Science Translational Medicine*. (Rockson, 2017).

Medical Disclaimer

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Sources and References

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

Breastcancer.org. Breast Cancer and Tamoxifen.

http://www.breastcancer.org/tips/lymphedema/ask_expert/2002_07/question_07.jsp
(Accessed on 2012-02-02).

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.lymphoedema.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%3B3xxIKuuZRdM4fM%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).

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

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).

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).

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).

MacMillan Cancer Support. Diagnosing Lymphoedema.

<http://www.macmillan.org.uk/Cancerinformation/Livingwithandaftercancer/Symptomssideeffects/Lymphoedema/Diagnosis.aspx> (Accessed on 2012-02-12).

Mayo Clinic. No Date. Lymphedema.

<http://www.mayoclinic.com/health/lymphedema/DS00609/DSECTION=treatments-and-drugs>
(Accessed on 2012-01-240).

MedicineNet.

<http://www.medterms.com/script/main/art.asp?articlekey=4219>

NHS, United Kingdom. Diagnosing Lymphoedema.

<http://www.nhs.uk/Conditions/Lymphoedema/Pages/Diagnosis.aspx>
<http://www.nhs.uk/Conditions/Oedema/Pages/Introduction.aspx>

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.

Oncolink. Preventing Lymphoedema.

<http://www.oncolink.org/oncotips/article.cfm?c=1&s=4&ss=9&id=62> (Accessed on 2012-02-02).

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.

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Vascular.co.zn. Secondary causes of lymphoedema.
[http://www.vascular.co.nz/lymphoedema.htm#Secondary lymphoedema](http://www.vascular.co.nz/lymphoedema.htm#Secondary%20lymphoedema) (Accessed on 2012-02-02).