

Best practice skin care management in lymphoedema

Jake Nowicki & Alex Siviour

ABSTRACT

Lymphoedema is a debilitating condition associated with high morbidity. Swelling as a result of lymphatic insufficiency will often lead to pathological skin changes. These skin changes can worsen the degree of swelling in the patient and lead to significant discomfort. This review outlines the ways in which skin changes resultant from lymphoedema can be effectively managed. This includes: good clinical practice in the areas of initial assessment, skin cleansing and moisturisation, treatment of infection as well as wound management and debridement, plus advice on avoiding sunburn and exercising in an appropriate fashion.

Keywords: Skin care, management, lymphoedema, review.

INTRODUCTION

Though the lymphatic system serves highly critical roles such as: immune defence, lipid absorption and interstitium maintenance, it is still one of the most poorly understood and researched physiological systems in the body. The desire for expanding our knowledge of the lymphatic system is, so it seems, largely overwhelmed by its more pathologically significant big brother, the vascular system¹. Considering the significant association of post-surgical cancer survivors (especially breast cancer) and impairment of the lymphatic system with consequent lymphoedema, it can be justified that the lymphoedema condition is largely underestimated, and requires further elucidating for its prevention and effective management of suffering patients².

Lymphoedema is a chronic and debilitating, generally irreversible condition, commonly associated with high morbidity due to progressive functional, emotional and physical appearance alterations.

It is a disease of dysfunction in the lymphatic drainage system, with completely normal capillary filtration. The result is an accumulation of protein-rich interstitial fluid in the affected area, usually the extremities, face, abdomen and genital areas, producing swelling and other physical symptoms that can significantly affect quality of life³.

Lymphoedema is categorised as primary or secondary based on the pathogenesis. Primary lymphoedema is genetically inherited hypoplasia or obstruction of lymphatic vessels, often associated with Milroy's disease, Turner Syndrome, Klinefelter syndrome and other conditions. It can be further subcategorised into lymphoedema congenitum, lymphoedema praecox and lymphoedema tardum according to the time of onset of the first symptoms. Secondary lymphoedema is an acquired condition resulting from damage or obstruction of previously normal lymphatic vessels. Filariasis is the most common cause of secondary lymphoedema worldwide, though surgery and radiation therapy for cancer, as well as recurrent bacterial lymphangitis, are also frequent causes^{3,4}. The incidence of primary lymphoedema is far less common than secondary.

Regardless of the cause, lymphoedema is a progressive condition that can advance through various stages of fibrosis and swelling to produce symptoms such as pain, heaviness and discomfort. Severity of such symptoms depends on the anatomical area and degree of lymphatic dysfunction. With chronic lymphoedema skin changes begin to appear including: skin thickening and hyperkeratosis, hyperpigmentation, and papillomatous or verrucous nodules⁴. Such skin conditions predispose to numerous skin complications, and thus require meticulous management. This review will outline the current and potential treatments that effectively aid in slowing the progression of skin changes such as those described, restoring the functionality of skin, and minimising additional skin complications.

THE ROLE OF SKIN

Skin is the largest organ in the body and is composed of tissue that grows, differentiates, and renews itself constantly. It is divided into

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three layers: the subcutaneous layer, the dermis, and the epidermis (from deepest to most superficial). The epidermis is further divided into five layers: deepest is the stratum basale, followed by the stratum spinosum, stratum granulosum, stratum lucidum and stratum corneum. Because skin acts as a barrier and is the first line of physical, chemical and immune defence between internal organs and the external environment, it is critical that its integrity and functionality is maintained⁵. Healthy skin secretes natural oils, for example sebum, that not only softens skin, but also maintains acidic skin pH below seven to inhibit bacterial and fungal growth⁶. The skin's lymphatic system is a dense network of lymph capillaries and collectors that drain interstitial fluid from the dermis and subcutaneous tissue to the neighbouring blood supply⁷.

SKIN CHANGES IN LYMPHOEDEMA

Any disruption to the transporting capacity of lymphatic channels and lymph nodes will cause a build-up of fluid in that area. In the early stages of lymphoedema, accumulation of protein-rich fluid in the interstitium causes soft oedema that pits easily with pressure⁴. As prolonged fluid stasis occurs, substances that penetrate the surface of the skin accumulate with lymph fluid in the tissues, triggering a progressive, chronic inflammation and accumulation of fibroblasts, adipocytes and keratinocytes. Macrophage activity is reduced, and an overgrowth of interstitial connective tissue manifests⁸. This transforms the soft limb into inelastic, fibrotic tissue with hard, thickened skin⁷. Skin thickening occurs primarily in the epidermal layer of the skin, at different rates per individual.

Lymphoedema also predisposes the skin to dryness and undernourishment by skin being stretched and reduction of oil secretion by sebaceous glands. The skin may, therefore, crack and lose its function as a first-line immunity barrier to bacteria and allergens, making it prone to acute complications such as cellulitis, as well as worsening the lymphoedema by overloading an already compromised lymphatic system⁶.

Table 1 outlines other, more complex skin changes that occur with fluid stasis in lymphoedema⁸.

Table 1: Skin changes that can occur with fluid stasis in lymphoedema

SKIN CHANGE	APPEARANCE
Lymphangioma	Dilated lymph vessels in the dermis bulge out on the skin surface giving the appearance of blisters.
Hyperkeratosis	A horny scale builds up on the surface of the skin; skin creases adjacent to regions of hyperkeratosis are highly prone to the development of fungal and bacterial infection.
Papillomatosis	Dilated skin lymphatics surrounded by brawny fibrous tissue protrude from the skin as elevated nodules; extended papillomatosis gives the skin a cobblestone appearance.

CURRENT SKIN CARE MANAGEMENT FOR LYMPHOEDEMA

In recent years, physiotherapy and limb management of lymphoedema has experienced a breakthrough with the development of complete decongestive physiotherapy (CDP) or complex decongestive therapy (CDT)⁹. The objectives of CDT are: to decrease fluid in affected limbs by increasing the function of lymph vessels, to sanitise the skin to prevent opportunistic infections and to improve the tissue integrity by reducing the increased connective tissue and by softening the fibrosclerotic indurations^{9,10}.

This therapy is divided into two stages:

1. The intensive or manual lymph drainage phase, which involves manually mobilising accumulated fluid and draining it, after which skin care and a low-stretch bandage are applied. This phase should take four to six weeks, with therapy sessions ideally occurring five times weekly. The patient also completes various exercises in stage one, which will be described later.
2. The second stage is a long-term maintenance phase individualised to each patient. It primarily involves compression therapy, ideally with made-to-measure compression garments that have anti-oedematous effects by reducing the lymphatic water load and by increasing the formation of lymph fluid from interstitial fluid⁹. Important in this is the establishment of a good pressure gradient and of avoidance of tourniquet effects.

Important to both stages is a meticulous skin care regime aimed at achieving healthy, clean, well-moisturised and intact skin^{10,11}. Each stage involves the application of skin care products beneath limb bandaging to maintain skin integrity and to manage problems such as dryness of skin, hyperkeratosis and papillomatosis.

Assessment and observation of skin

There have been proposed grading systems for assessing the condition of a patient's skin, though none yet have been validated⁸. Subjective observation and assessment by health care professionals and patients is currently the only means to analysing skin changes with lymphoedema and measuring the outcome of an implemented skin care regime⁸. Visual observation and an accurate history are the first and most vital tools of evaluation⁸. Inspection by palpation of the skin and Stemmer's sign are secondarily used in assessment of the affected limb. Palpation allows for detection of heat if chronic inflammation or infection has occurred, and Stemmer's sign is used to detect increased skin turgor that progressively occurs in lymphoedema². A positive Stemmer sign, whereby the tissue at the base of the second toe cannot be pinched, indicates epidermal remodelling due to fluid stasis within the tissues³. Additional methods for detecting skin changes include: CT, magnetic resonance imaging, ultrasound examination, and perometry of the affected limb³.

Skin cleansing

It is important that a patient suffering from lymphoedema has their skin cleaned of pathogenic organisms, dust and dirt on a daily basis to reduce the risk of infection². However, in doing this, it is critical

that the natural sebum secreted to protect the skin from drying out is not also removed¹². The use of mild, unscented soaps is controversial, with some encouraging its use and others endorsing any soap to be discarded^{6,8}. The argument for this is that even mild soaps are highly alkaline, with a pH of 10–12, and thus destroy the natural acidic pH of the skin. In addition, soap strips away the layer of sebum, leaving the skin dry and susceptible to infection. All abrasive soaps and scented soaps are highly discouraged. The best alternative to soap is a soap-free cleaner available at most pharmacies⁶. Care must also be taken when drying the skin, with patting motions encouraged over rubbing, which may disturb the skin even when performed gently.

Moisturising

Moisturising is a crucial and indispensable part of the care of all patients with, or at risk of developing, lymphoedema. The regular application of moisturisers on the skin assists in replacing the skin's lost sebum and encouraging moisture retention by the skin^{6,8}. Emollient agents are endorsed as they provide a surface lipid layer on top of the epidermis, which traps and conserves water within the skin to prevent it from drying out¹³. Emollients can be divided into three categories, and the condition of the skin determines which one or combination should be used:

1. Moisturisers:

- These may come in the form of a cream, lotion or ointment.
- A small subpopulation is allergic to lanolin, so it is recommended to use a lanolin-free moisturiser.
- They are indicated for maintenance of well-hydrated skin and for relief of dry, flaky skin and are best absorbed when applied on already moist skin before limb bandaging.
- Application once a day is generally sufficient unless the skin is very dry or hyperkeratotic, whereby twice a day is more appropriate.

- Sorbolene is a highly recommended moisturiser, especially those that are vitamin E free as this may rapidly degrade the garments^{6,14}.
2. **Soap substitutes:** are used in combination with a moisturiser to soften areas of scaly/hyperkeratotic skin so that they may later be removed¹⁴.
 3. **Bath oils:** are effective when used in combination with both moisturisers and soap substitutes¹⁴.

Anti-fungal and anti-bacterial

Fungal infections can occur when skin is dry and flaky or moist and macerated¹⁵. They involve skin and/or nails, and most commonly occur between toes, in the axilla and under breast folds¹⁶. Swollen toes enclosed within socks and shoes provide an opportune environment for *tinea pedis* infection and it is, therefore, a common complication¹⁵. Infected nails will typically develop a yellow colour, split, flake, and substantially thicken¹⁶. Symptoms of fungal skin infections are severe itching, crusting and scaling¹⁶. Current treatment involves meticulous skin hygiene and thorough drying of moisture between the toes. A topical antifungal powder or cream should also be applied daily until the infection disappears¹⁵.

Drying and cracking of the skin also allows a point of entry and colonisation of bacteria, with consequent cellulitis (especially *Streptococcal*). Clinical symptoms of cellulitis are: fever, skin rubor with ill-defined margins, and tenderness. Episodes of cellulitis generally require a course of antibiotics, and if infections are recurrent then the patient may be on prophylactic antibiotics¹⁶.

Debridement and wound bed preparation

Debridement refers to the removal of necrotic tissue. In the context of skin, it usually relates to hyperkeratosis and wound management. Hyperkeratosis is a potential complication of advanced lymphoedema. It involves hypertrophy of the stratum corneum with consequent

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overproduction of keratin and eventual loss of skin elasticity and function¹². Wounds are common in patients with advanced lymphoedema and hyperkeratosis due to exceptionally fibrotic skin, which is more likely to develop fissures. Local inflammation that results from the presence of wounds places further strain on the lymphatic system, potentiating swelling. Wound management is, therefore, critical to maintaining the integrity and condition of the skin in those with lymphoedema.

The management of wounds associated with hyperkeratosis includes chemical debridement of necrotic tissue and bacteria through the application of topical emollient creams and ointments containing proteolytic enzymes¹⁷. Proteolytic enzymes are effective in wound management as they minimise the risk of infection, keeping the wound bed clear of necrotic tissue and bacteria. Wound management in patients with lymphoedema can involve the treatment of both acute and chronic wounds. Chronic wound management needs to also involve wound bed preparation with debridement of necrotic non-viable tissue as well as management of chronic inflammatory exudate¹⁸. Surgical debridement is another, faster option for the removal of necrotic tissue but can put the patient at risk of infection. The use of chemical debridement has also been shown to be effective treatment for skin hyperkeratosis. This is likely to be a result of the proteolytic breakdown of overproduced keratin.

Papain is a cysteine protease and an example of a proteolytic enzyme. It has been shown to be effective in the treatment of hyperkeratosis as a result of pressure ulcers¹⁹. In the study by Baldwin and Bonham, opal-A cream was applied to a chronic pressure ulcer with hyperkeratosis for 60 days. Opal-A cream consists of the pulp of the paw paw fruit (*carica papaya*), which contains papain. Hyperkeratosis was found to be markedly reduced and evidence of ulcer healing was seen after two weeks of treatment. After five weeks, all hyperkeratosis was absent and further improvement in the state of the ulcer was seen. After the 60 days of application, the hyperkeratosis had remained absent and granulation tissue was found on the surface of the ulcer with healthy surrounding tissue.

Another study has shown the beneficial effects of opal-A on chronic pressure ulcers, including clear financial savings from reduced costs of nursing care and wound product application as a result of improvement in the state of patient pressure ulcers²⁰. Opal-A is a cream produced by the Phoenix Eagle Company based in Western Australia for clinical trials and is not as yet available commercially. Lucas' Papaw ointment is a commercially available product derived from the paw paw fruit. It contains fermented paw paw pulp at 3.9% by weight. Opal-A claims to contain 30% paw paw pulp by weight and is not prepared by fermentation but rather combination with sodium bicarbonate.

Papain-urea preparations are thought to be twice as effective chemical debriding agents over papain alone²¹. It has been argued that papain-urea chlorophyllin is less likely to irritate the skin than papain-urea²². However, papain is a non-specific digestive enzyme and consequently it has been associated with an inflammatory response when used in a chronic setting¹⁸. The enzyme degrades any protein with cysteine

residues, which excludes collagen but few others. Papain-urea has been found to be more effective at removing necrotic tissue and encouraging the formation of granulation tissue than collagenase²³. However, collagenase has been proposed as an alternative more selective and slowly acting enzyme for chronic wound bed preparation, as it induces a less marked inflammatory response.

Avoiding sunburn

Sunburnt skin requires healing and repair, which the body achieves by significantly increasing blood flow to the affected area⁶. This causes increased capillary filtration and a subsequent rise in interstitial fluid. In a healthy individual this poses no threat, as the lymphatic system is able to compensate and remove fluid at a faster rate. However, for someone with lymphoedema, or at risk of developing it, overloading a compromised lymphatic system may induce limb swelling.

Exercise

Patients suffering from lymphoedema should be encouraged to lose weight and exercise regularly, as exercise enhances lymph flow from six beats per minute at rest up to 20 beats per minute³. Twenty to 30 minutes of exercise daily whilst wearing compression garments and bandaging is the recommended duration. It is important that patients gradually warm up and down before and after exercise as rapid changes in vascular flow promote limb swelling. Exercises that require large amounts of exertion should be avoided, as this may impose excessive load on the lymphatic system. Gentle rhythmic muscle contractions and relaxation seem to be most effective³. While they result in changes in tissue pressure, helping to propel interstitial fluid into the lymphatics and along them, they do not result in an increased load per se on the lymphatic system. Extremity elevation whilst performing contractions can also be a beneficial adjunctive therapy³. Full body exercise activities such as Nordic walking and swimming are also very effective and highly recommended for reducing limb swelling².

CONCLUSION

This review has discussed the areas important for the management of skin health in those with lymphoedema. Skin health management by health care professionals involves treatment of problematic cases. It also extends to a responsibility to educate patients about how to take good care of their skin so that their condition may be self-managed, preventing skin deterioration and further complications. Patients (and their partners) can then feel informed about their condition, and actively help in slowing the progression of their lymphoedema.

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