

Self-Efficacy: A Major Contributor to Improved Quality of Life in a Patient Undergoing Complete Decongestive Therapy for Filarial Lymphedema: A Case Study

Yuvraj N Athole¹, Jaimala V Shetye²

¹Physiotherapy Resident. Department of Physiotherapy, Seth GSMC & KEMH, Mumbai,

²Professor. Department of Physiotherapy, Seth GSMC & KEMH, Mumbai, India

Corresponding Author: Yuvraj N Athole

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ABSTRACT

Filarial lymphoedema is a tropical parasitic worm illness caused mostly by *Wuchereria bancrofti*. It poses a significant burden in India, accounting to 39% of the global cases. We present a case of a 32-year-old male with lymphatic filariasis for 9 years. Massive disfiguring lymphedema of his lower leg caused difficulty in ambulation and reduced social participation. The patient received complete decongestive therapy (CDT) in an outpatient setting. Interventions included manual lymphatic drainage, multi-layered compression bandaging, aerobic exercise, electrical stimulation, and exercises with elevation to reduce the excess volume of the limb. A 19-day physical therapy program over 14 weeks led to significant improvement in reducing limb volume, enhancing limb shape, increasing functional capacity, and improving the overall quality of life even emphasizing the impact of self-management after discharge.

Keywords: Complete decongestive therapy (CDT), LF-Specific Quality of Life Questionnaire (LFSQQ), Dermatology life quality index (DLQI), Manual lymphatic drainage (MLD), Multi-layer lymphatic bandaging (MLLB), Home exercise program (HEP).

INTRODUCTION

Lymphatic filariasis (LF) is a parasitic disease, commonly known as elephantiasis. In India, 99.4% of the cases are caused by the species *Wuchereria bancrofti*. The persons infected with the parasite may experience frequent acute attacks of Adenolymphangitis when they may have symptoms of fever, pain, redness in the affected body parts, and discharge from the skin with a foul smell.[1]

Lymphatic filariasis poses a significant burden in India, accounting for 39% of the global cases. According to the Indian

Council of Medical Research (ICMR), an estimated 3.1 crore individuals in India are infected with the disease, with over 2.3 crore experiencing associated disabilities. Furthermore, filariasis is prevalent in 256 districts across 21 states and union territories in India, indicating its widespread distribution and the need for comprehensive control measures.[2] In 2023, the Health Minister of India committed to eradicate lymphatic filariasis by 2027 during the launch of the second phase of the nationwide Mass Drug Administration program.

Lymphatic filariasis not only brings physical suffering but also carries a burden of stigma, psychological distress, and economic hardship for those affected and their families. In India, where the disease is widespread, annual economic loss due to lymphatic filariasis was estimated at nearly US \$1.0 billion. India alone represents 43% of the global infected population, making it a significant public health challenge.[3]

The Global Programme to Eliminate Lymphatic Filariasis focuses on halting transmission and alleviating suffering through strategies like morbidity management and disability prevention, particularly emphasizing self-care practices for lymphedema patients. India, along with eight other countries in the Southeast Asia region, faces the challenge of endemic lymphatic filariasis. Lymphedema manifests as impaired lymphatic transport, leading to the accumulation of proteins and lipids in the interstitial space. Consequently, regional tissues undergo extensive structural changes, including adipose tissue deposition and fibrosis, often accompanied by inflammation.[4] Lymphatic filariasis exacts a heavy toll on global health, with approximately 5 million Disability Adjusted Life Years(DALYs) lost each year, ranking it third among Tropical diseases of poverty(TDP), following malaria and tuberculosis.[3]

CASE PRESENTATION

A 32-year-old vegetable vendor presented with a 9-year history of left leg edema due to filariasis. He was apparently asymptomatic nine years prior, but then he reported having fever, chills, and swelling in his left leg. Following a sudden swelling on the leg debulking was performed

immediately within 2-3 days resulted in a scar on the posterior part of the leg. He was hospitalized for 1 month where he was advised bandaging (long stretch) which the patient continued for 2 months, after which he stopped bandaging, as he was able to perform all his activities easily. He also had psoriasis for the last 10 years on the bilateral anterior lower leg and had completed a diethylcarbamazine (DEC) course for this. His occupation required him to spend prolonged periods sitting with a gravity-dependent leg position while selling vegetables. He experienced three to four episodes of ADLA after a year post-surgery, during which he complained of fever, chills, and discomfort in the affected area. Medication provided some relief, but swelling continued to increase ever since. In the present year, he consulted a local hospital regarding swollen limbs, and he was referred to our tertiary Hospital for further management. The medicine department referred him to the Plastic Surgery and physiotherapy department. The patient came to physiotherapy OPD in a state of mental withdrawal with complaints of swelling, pain, difficulty in walking, getting up from the floor and bed, and feeling of left limb heaviness. There was occasional oozing of watery fluid from the scar tissue as shown in Fig 2. On the first day of assessment, the patient's affected limb volume excess was 261.7% as compared to normal limb. The skin of the affected leg was dry, indurated, rough, and darkly pigmented. Multiple skin folds, more near the ankle with 2 humps on the lateral and medial side, a buffalo-like hump on the dorsum with positive stemmers sign, and square toes were present as shown in Figure 1.



Fig 1: Buffalo-like hump on the dorsum



Fig 2: Scar present on calf muscle

Assessment:

Limb volume measurement was undertaken with the tape measure method, using the cylinder equation formula.[5] Dermatology life quality index (DLQI) was used to assess the Impact of skin conditions on quality of life. Disease-specific Quality of life assessed by the LF-Specific Quality of Life

Questionnaire (LFSQQ) the score ranges from 0 to 100 with a higher score indicating better QOL. The functional capacity was assessed by using the 6-minute walk test.[18] Table no.1 to 4 shows various baseline parameters and their improvement following 19 treatment sessions.

Table 1: Improvement in quality of life

LFSQQ	Total	Mobility	Self-care	Usual activities	Disease burden	Pain, discomfort	Psychological health	Social Discomfort
Pre	35.8%	31.5/100	18/100	50/100	40/100	60/100	25/100	30/100
Post	75.6%	81.8/100	75/100	66.6/100	80/100	70/100	78.5/100	85/100

Table 2: Improvement in right full-length lower limb volume

	Unaffected full-length LL volume(L)	Affected full-length LL volume(L)	Volume excess of normal LL (%)
Pre	9.518.9	36.9808	259.4%
Post (After 14 weeks)	9.518.9	15.5613	56.1%
Difference	0	21.4195	203.3%

Table 3: Improvement in 6 Min Walk test

	6MWD(m)	Percent of age-predicted 6MWD (%)
Pre	336	54.9%
Post	448	76.8%
Difference	80	16.7 %

Graph 1: Excess volume reduction over time

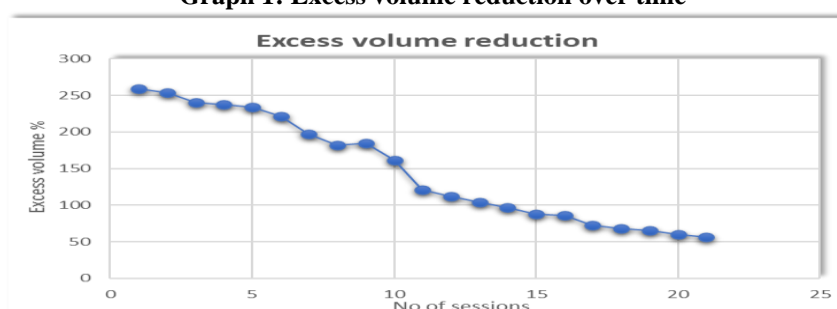


Table 4: Improvement in dermatology Life quality index

Pre	25/30(extremely large effect on patient's life)
Post	7/30(moderate effect on patient's life)
Difference	18



Pre-treatment Post-treatment

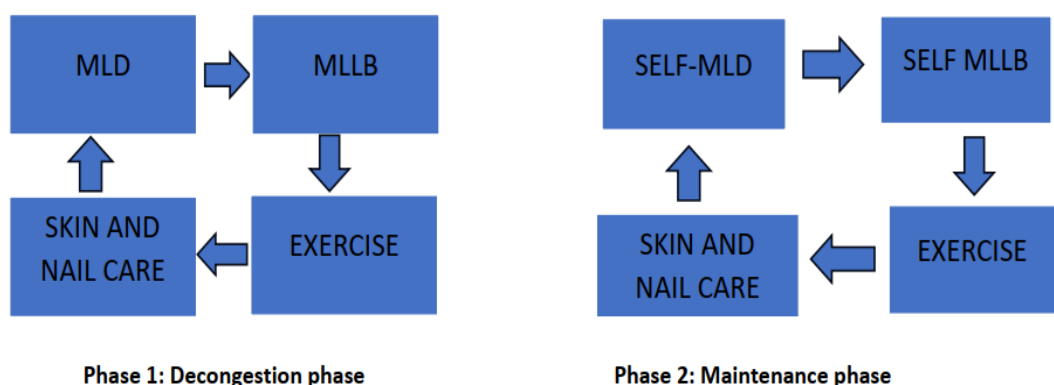
Figure 3: Improvement in limb volume pre-treatment and post-treatment after 14 weeks.

DISCUSSION

After extensive counseling and explanation, the patient agreed to buy the short stretch bandage kit which is conventionally used to control lymphedema in post-operative cancer patients, and come daily to receive physical therapy treatment. The educational support aimed at reducing his stress and anxiety associated with incorporating the lymphedema program into his daily routine. He felt helpless when he was referred for bandaging and had decided to try it as the last option. The DLQI and LFSQQ scores of psychological health, show his state of mind on the first day. Also, the social discomfort component of LFSQQ indicated that he suffered social isolation, he avoided going to any social event as his huge leg would attract attention and inquiries. These

sessions also served as an opportunity for the patient to ask any questions he had regarding disease or intervention. He received the necessary information and guidance to manage his condition effectively. The scores of mobility, disease burden and self-care components of LFSQQ were also low indicating the impact of lymphedema. (Table 1)

The gold standard treatment for lymphedema is Complete decongestive therapy (CDT). It comprises two phases: an intensive phase(Phase I: swelling reduction) and a long-term maintenance phase(Phase II: Self-management). Compression therapy plays a significant role in both phases of CDT, helping in swelling reduction during the initial phase and assisting in long-term management thereafter.[6]



Maintaining good skin care is crucial as it lowers the risk of infection, and also prevents skin breakdown, ulcers, and wounds, which can exacerbate lymphedema. Patients with lymphatic insufficiency often experience various skin changes, including thickening, hyperkeratosis, papillomatosis, deepening of skin folds, fissures, dermal fibrosis, and lymphorrhea. These changes can increase the risk of infection and worsen the severity of lymphedema, impacting both functionality and quality of life. Therefore, implementing a thorough skincare routine is essential in managing lymphedema and minimizing its complications and is the standard of care. The patient was trained under supervision in self-limb hygiene. As the swelling was too large, stimulation of calf muscles was offered using a Surge

faradic current. Initially, the current was not able to reach the muscles due to thickened skin and respond but as the limb size started reducing with MLD, the muscle contractions could be seen which we found effective in reducing the swelling further. The hardened areas also responded to bandaging which was not expected in the beginning as the fluid collection was from 9 years. The first bandage was removed after 24 hours in our presence. The reduction in limb volume was so evident that the patient got convinced that this therapy may work on his limb. From then onwards he became interested in his treatment and cooperated for self-management later. The detailed sequence of therapies offered to this patient over 14 weeks is given in Table No. 5.

Table 5: Intervention and Management Timeline

Treatment day	Setting	Description	Dosage	Excess volume %
1day	CDT	<ul style="list-style-type: none"> • Patient education, counseling, and referral to dermatologist, Maintain hydration 	Once a week	259.4 %
3 rd day	CDT	<ul style="list-style-type: none"> • Start multi-layer lymphoedema bandaging (MLLB) up to the knee only to make a symmetrical shape along with Lymphatic drainage exercises in leg elevation 	24 hr.	240 %
5 th day	CDT	<ul style="list-style-type: none"> • MLD proceeded with MLLB to soften the fibrosis • Lymphatic drainage exercises in a compression environment 		233.7 %
	HEP	<ul style="list-style-type: none"> • Lower extremity AROM exercise, and elevation exercise • Incorporate diaphragmatic breathing exercises, skin care, and limb hygiene 	1 set=10 reps 2 sets per session 3 times/day	
	ELECTRIC STIMULATION	Surge faradic current on the quadriceps, hamstring, and dorsum of the foot	10-12 visible contractions	
7 th day	CDT	<ul style="list-style-type: none"> • MLLB above the knee joint along with MLD with a soft plastic roller. • Lymphatic drainage exercises • Elevated leg cycling • Core strengthening exercises • Teach self-bandaging 		197.5 %
	HEP	<ul style="list-style-type: none"> • Add prone LE AROM exercise to make a symmetrical shape of a posterior calf bump 	1 set=10 reps 2 sets per session 3 times/day	
	ELECTRIC STIMULATION	<ul style="list-style-type: none"> • Continue SF current over LE muscle bulk 	12-15 contraction	
9 th day	CDT	<ul style="list-style-type: none"> • Added isometric calf exercise with Thera band, • Start Treadmill and cross-trainer walking 		184.7 %

		<ul style="list-style-type: none"> as limb weight was reduced Short-stretch bandages include foot and toe and the use of tailored foam pads along with soft rubber tubes to cover the crease above the ankle. Teach self MLD Ankle toe exercise with elevation 		
	HEP	<ul style="list-style-type: none"> Self-MLD start Lymphatic drainage exercises 	1 set=10 reps 2 sets per session 3 times/day	
	ELECTRIC STIMULATION	Rheobase of SF current reduces as excess fluid reduces		
15 th day	CDT	<ul style="list-style-type: none"> Self-MLD under supervision Self-MLLB under supervision Monitor skin for tolerance to materials and pressure. Combinations of flexibility, resistance, and aerobic exercise 		88%
	HEP	<ul style="list-style-type: none"> Self-MLD followed by Self-MLLB Lymphatic drainage exercises 	1 set=10 reps 2 sets per session 3 times/day	
19 th day	CDT and HEP	<ul style="list-style-type: none"> Self-MLD Self-MLLB Advice compression hosiery Lymphatic drainage exercises in elevation Aerobic exercise including walking, treadmill, and chair aerobics LE resistance exercises 		65.5%
	HEP	<ul style="list-style-type: none"> Self-MLD & Self-MLLB Lymphatic drainage exercises 		

The instructions regarding skincare management emphasized several key practices, including washing the limb with mild unscented soap and water regularly. Additionally, attention was given to cleaning web spaces and skin folds with a soft cloth roll. The patient was advised to trim his nails carefully at regular intervals to prevent accidental skin damage. Furthermore, the importance of applying insect repellents to the affected extremity was highlighted to avoid insect bites and potential infections. Finally, the patient was instructed to use ointments or lotions before applying lymphedema bandages during the decongestive phase of treatment, aiming to moisturize and protect the skin.[8] The webspace were powdered with odorless absorbent powder. Compression therapy plays a crucial role in managing lymphedema, utilizing a multilayer bandage

to achieve various therapeutic effects. This bandage functions by reducing capillary filtration, enhancing lymphatic flow, redistributing fluid to non-compressed areas, and breaking down fibrosclerotic tissue. It also increases interstitial pressure and improves the pumping ability of muscles and joints. The bandage was worn continuously for 24 hours, with removal only for self-cleaning of the limb and for limb measurement by the therapist. The patient was instructed to remove the compression bandages as soon as he experienced any intense discomfort, tingling, or numbness in the limb. One of the primary challenges for therapists was to reshape irregularly shaped extremities into cylindrical shapes. To address this, padding materials such as rubber pads, rubber tubes, and soft foam were used to ensure even pressure distribution between skin folds.[9]

On the second day, due to the unavailability of the short stretch bandage kit, bandaging commenced using a long stretch bandage. Over the subsequent 2-3 days, the treatment transitioned to multilayered bandaging with MLD and exercise. The therapist actively encouraged the patient to progress toward self-management, including self-MLD, self-bandaging, and performing exercises independently. Learning self-bandaging aimed to enhance the patient's autonomy, independence, and self-efficacy in managing lymphedema. Short-stretch bandages exert minimum resting pressure on the tissues and the vascular systems that could lead to a tourniquet effect therefore the certified lymphoedema therapist applied a bandage until the patient mastered self-bandaging as assessed by the therapist. The patient continued daily wound care and exercise, applying compression bandaging on his own on days when he did not have therapy sessions.[10]

According to the Position Statement of the National Lymphedema Network, lymphedema exercises when coupled with compression therapy, help the body's natural muscle pump mechanism to augment venous and lymphatic fluid return to the circulatory system, thereby reducing swelling. The prescribed lymphedema exercises consisted of a spectrum of movements, including hip and knee flexion, ankle and toe movement, gluteal setting exercises, and elevated bed cycling. By inducing dynamic muscle contractions, these exercises stimulate both passive and active phases of lymph drainage, facilitating the resorption of lymph into remaining functional lymphatic channels.[11] The strengthening of Gastrocnemius and soleus was overemphasized. Moreover, breathing exercises were integrated simultaneously with lymphedema exercises to further optimize lymphatic fluid reduction. The rhythmic intra-abdominal pressure change caused by active movement of the diaphragm during breathing exercises plays an important role in facilitating lymphatic fluid return to the bloodstream.[12]

At the end of the first week, the therapist initiated MLD preceding the bandaging procedure. MLD involves stimulating lymphangiomotoricity in these areas, as a "suction effect" is generated and facilitates the movement of accumulated lymph fluid from regions with inadequate lymph flow to those with normal lymphatic drainage. Self-manual lymphatic drainage was taught to the patient as effleurage stroking from distal to proximal with paraffin oil.[13]

Electrical stimulation is effective in reducing edema by inducing muscle contraction, leading to enhanced lymph and blood flow. Evidence suggests that rhythmic muscle contractions can increase blood flow by up to 30 times. On the third day, faradism under pressure was administered at intervals of 2 seconds on, with a 4-second off time, targeting specific areas such as the dorsum of the foot, calf muscle, quadriceps, and hamstring muscles of the affected lower limb. Approximately 10-12 contractions were applied to each area, with electrodes secured using elastic bandages wrapped distally to proximally in a pressure gradient manner in a figure-of-eight pattern with limb elevation. The patient was asked to synchronize muscle contractions with the electric stimulus.[14]

Several challenges were encountered throughout the intervention process, including excessive limb bulkiness, which hindered wearing normal footwear, and issues such as bandage slippage and bunching, which disrupted the even distribution of pressure. However, by the tenth day of treatment, significant progress was observed. The patient's leg had attained a cylindrical shape, that made easier limb movement and walking as seen in Fig 3. Remarkably, excess volume had reduced from an initial 260% to 65% as seen in Table 2.

There is a growing body of evidence supporting the idea that obesity impairs lymphatic transport capacity, while compromised lymphatic function contributes to adipose deposition.[15] As a result, a combination of aerobic, strength,

and flexibility exercises with short-stretch multilayered bandages enhanced the effective drainage of lymph. This intervention consequently led to a reduction in BMI from 40.6 kg/m² to 34.5 kg/m² and an improvement in functional capacity, as indicated by an increase in 6-minute walk distance by 80m.



Figure 4: Multi-layered lymphedema bandaging

The combination of reduced body weight, a decrease of 18 points in the DLQI index as shown in Table 4, along with improved mobility and leg shape, significantly elevated the overall quality of life by 39.8% on LFSQQ (Table 1) and helped the patient return to work and actively participate in social events, thereby greatly enhancing his well-being. The improved QOL scores indicate a positive change in this patient's life.[16]

In the Patient's own words, people used to come to see his huge leg before our treatment, and after the 19 sessions, people came to see the surprising reduction in limb size.

The case reports by Dangre et al. describe a model for the successful management of physiotherapy intervention in filarial lymphedema post-lymph node transfer, while a study by Shetey et al. highlights the importance of a home program of self-bandaging and self-limb hygiene in reducing the swelling before free lymph

node transfer surgery. In contrast to that, the present case report sheds light on complex but non-invasive interventions for severe limb deformity and disability resulting from delayed intervention due lack of awareness and the role of physiotherapy in filarial lymphedema.[17,19]

CONCLUSION

Although the patient's disease was recognized, it was not appropriately treated for several years. This case report demonstrates the successful outpatient treatment of a patient with severe unilateral lower extremity lymphedema associated with large excess volume and impaired ambulation. The physical therapist's advocacy for outpatient care, transportation, mobility aids, and compression materials was crucial to the patient's successful treatment. However, managing this chronic condition requires long-term commitment and patience from both the patient and the healthcare team. The case study also highlights the need for early referral for physical therapy intervention.

Declaration by Authors

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