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Does Complex Decongestive Therapy Have an Effect on Balance Parameters in Patients with Breast Cancer-Related Lymphedema?

Preliminary report

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Objectives: Upper extremity lymphedema is a concerning complication after treatment for breast cancer. Functional disability, psychosocial problems, and impaired quality of life (QoL) may be observed in patients with breast cancer-related lymphedema (BCRL). Complex decongestive therapy (CDT) is effective in reducing extremity volume and improving functional status and quality of life.

Background: The purpose of this study was to assess how patients with BCRL responded to CDT in terms of balance parameters.

Methods: The study recruited participants who had unilateral BCRL. All patients received combined phase 1 CDT including skin care, manual lymphatic drainage, multilayer bandaging, and supervised exercises five times/week for three weeks, a total of 15 sessions. The limb excess volumes according to serial circumference measurements were recorded at baseline and the end of the third week. The improvement of functional status and QoL scores were evaluated by Quick Disabilities of the Arm, Shoulder, and Hand (Q-DASH) and Lymphedema QoL-Arm (LYMQOL-Arm) questionnaires. Static and dynamic balance assessments were conducted using the Tecnobody TPK252 isokinetic balance testing system, the one-leg standing test, and the functional reach test.

Results: Fifteen BCRL patients who received CDT were included in this study (mean age 55.40±7.46 years; mean body mass index 29.83±4.62 kg/m²). The mean excess volumes were significantly decreased at the end of therapies (35.7% vs 17% p<0.001). The scores of Q-DASH, as well as subscores of LYMQOL-Arm questionnaires (except symptom subscore), were significantly improved after 3 weeks of CDT (p<0.05). A statistically significant improvement was detected in the results of the one-leg standing test and functional reach test (p<0.05). In the Tecnobody TPK252 isokinetic balance test, it was observed that there was no statistically significant difference in static and dynamic balance parameters.
Conclusions: We determined improvement of the static and dynamic balance in patients with BCRL after 3 weeks of CDT by one-leg standing test and functional reach test although we could not obtain similar results with the Tecnobody TPK252 isokinetic balance test.

Keywords: balance, breast cancer-related lymphedema, functional status, Complex decongestive therapy
Results of Combined Decongestive Therapy in patients with lower extremity lymphedema: Experience of Bursa City Hospital Lymphedema Rehabilitation Center

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**Objectives:** The aim of this study is to present the results of modified combined decongestive therapy (CDT) in patients with lower extremity lymphedema (LEL).

**Background:** Lymphedema is a chronic condition caused by a failure in the lymphatic system that most commonly occurs in the limbs. There is currently no definitive treatment. However, some options have been proposed to mitigate its consequences. Complex Decongestive Therapy (CDT) stands out as one of the main treatment methods of choice. CDT is a noninvasive treatment for lymphedema. The therapy includes a variety of techniques, including manual lymphatic drainage, compression, exercise and skin care.

**Methods:** We retrospectively reviewed 75 patients aged 55.84 ± 15.70 years who had been diagnosed with LEL between December 2021 and December 2023. The patients were treated for 4 weeks with modified CDT, including self-manual lymphatic drainage, self-bandaging, decongestive exercises, and skin care.

**Results:** The mean reduction amounts circumference before and after treatment were 2.05 cm, 3.92 cm, and 4.50 cm for stages 1, 2, and 3 respectively (P = 0.001). There were significant differences between the values before and after treatment in excess extremity volume (EEV) at all stages (P = 0.001). The circumference percentages of the secondary LEL patients were higher than those of the primary LEL patients (P = 0.04). There was no correlation between BMI and treatment response in terms of circumference percentages (r = –0.99; P = 0.36).

**Conclusions:** CDT can be helpful in managing chronic swelling from lymphedema that does not go away on its own. It is non-invasive and can be used alone, or in conjunction with other therapies, to improve symptoms and quality of life for patients with lymphatic conditions. Our results revealed that CDT is more effective in reducing extremity edema volume in secondary LEL than primary LEL. It should be an available method for self-management of LEL at all stages.

**Keywords:** Lower extremity lymphedema; self-management; complex decongestive therapy.
Evaluation of the Effectiveness of Complex Decongestive Therapy and Cold Compression Application in Patients with Breast Cancer-Related Lymphedema

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Objectives: Upper extremity lymphedema is a concerning complication after treatment for breast cancer.

Background: This study aims to evaluate the effects of complex decongestive therapy (CDT) and cold compression application (Game Ready) in patients with breast cancer-related lymphedema (BCRL) in terms of volume reduction, functional status, and symptom scale.

Methods: Patients with unilateral breast cancer-related lymphedema who underwent CDT were included in this retrospective study. All patients received combined phase 1 CDT including skin care, manual lymphatic drainage, multilayer bandaging, and supervised exercises five times/week for three weeks, a total of 15 sessions. Patients were allocated to Group 1 (CDT n=14) and Group 2 (CDT+ cold compression application-Game Ready n=14). The limb excess volumes according to serial circumference measurements were recorded at baseline and the end of the third week. The functional status and symptom scale improvement were evaluated by Quick Disabilities of the Arm, Shoulder, and Hand (Q-DASH) and Lymphedema Symptom Intensity Distress Survey-Arm (LSIDS-A) questionnaires.

Results: This retrospective study included 28 BCRL patients (mean age 56.61±10.66 years and mean body mass index 29.66±3.48 kg/m²). We found no difference between the two groups regarding age, BMI, education, and duration of lymphedema. At the end of CDT, significant improvements in limb volumes were observed in both groups (p<0.05). However, we detected no statistically significant difference regarding improvements in limb volume between the two groups (p>0.05). The scores of Q-DASH, as well as subscores of LSIDS-A questionnaires (except resources and sexuality subscores), were significantly improved after 3 weeks of CDT (p<0.05).
Conclusions: We determined significant improvement in limb volume, functional status, and symptom scale in BCRL patients who received CDT with and without cold compression. Cold compression applications did not appear to have any negative consequences.

Keywords: Complex Decongestive Therapy, Upper extremity lymphedema, breast cancer-related lymphedema, cold compression
Demonstration of the effectiveness of continue decongestive therapy in lymphedema patients who develop after total knee arthroplasty

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Objectives: To present the post-treatment results of patients with lymphedema after total joint prosthesis and to identify the factors affecting the treatment.

Background: The aim of this study is to emphasize total knee arthroplasty, which is one of the causes of secondary lymphedema, and to describe the treatment results in patients who develop lymphedema after total knee arthroplasty (TKA).

Methods: A total of 10 lymphedema patients (15 lower extremities) who were admitted to the lymphedema outpatient clinic of Istanbul Physical Therapy and Rehabilitation Training and Research Hospital between June 1, 2023 and February 1, 2024, and who had undergone total knee arthroplasty at least one year ago, were included in the study. The patients were diagnosed clinically, stage 2-3 lymphedema patients were included, and lipedema patients were excluded. Continue decongestive treatment (Manual Lymphatic drainage (MLD)/ bandage/ exercise) was applied to the patients and leg diameter measurements were taken before and after treatment.

Results: The average age of the 10 female patients analyzed was 69.90 ± 11.19 years (min 50-max 86) and body mass index was 37.5260 ± 6.60. Six patients had a history of bilateral and four patients had a history of unilateral total knee arthroplasty. Arthroplasty duration was maximum 60 months. The response of all patients to continued decongestive treatment was significantly higher but there was no significant decrease at the end of the treatment only in the 30 cm measurements extending from the malleolus to the proximal of both the right and left legs. The proximal region has a higher response to treatment (p<0.05). No significant correlation was found between the time elapsed after knee arthroplasty and the time to lymphedema development. No correlation was found between treatment responses and BMI and right/left extremity.

Conclusions: Continue decongestive treatment is an effective treatment method in the treatment of lymphedema that develops after total knee arthroplasty. The effect of right and left extremity and BMI on treatment responses has not been determined, and studies with larger sample sizes are needed to evaluate the parameters affecting lymphedema treatment responses after TKA.

Keywords: Lymphedema, Arthroplasty, Manual Lymphatic drainage
Effect of digital combined decongestive therapy in patients with breast cancer-related lymphedema: a follow-up study

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Objectives: This study present the feasibility of digital combined decongestive therapy in breast cancer-related lymphedema. At the same time, our study aims to reveal the short and long-term effects of digital combined decongestive therapy.

Background: Breast cancer patients are at high risk for the development of breast cancer-related lymphedema due to axillary lymph node dissection and radiotherapy. Breast cancer-related lymphedema may occur immediately after treatment or may occur years later. Breast cancer-related lymphedema treatment involves intensive combined decongestive therapy followed by long-term maintenance. Digital implementation of combined decongestive therapy is a method that aims to demonstrate its potential to provide a cost-effective, safe and at the same time measurable tool for breast cancer-related lymphedema patients.

Methods: The study population consisted of breast cancer patients who were admitted to the outpatient clinic due to upper extremity lymphedema. The circumferences of the extremities were measured by a trained physiotherapist, by marking reference points at 4-cm intervals from the ulnar styloid to the axillary region, using a standard tape measure. In first face-to-face session, patients received a basic introduction to skin care and risk reduction training. In this session, self-bandaging technique and self-manual lymphatic drainage technique was demonstrated while the caregiver videotaped it. At the same time, decongestive and breathing exercises were taught to the patient and caregiver. After the first face-to-face session, treatment was supervised with the help of electronic information and telecommunication technologies for 4 weeks. Following the intensive treatment phase, maintenance therapy commenced, which included the implementation of compression stockings. Breast cancer-related lymphedema patients were re-evaluated for follow-up after 12 weeks.

Results: Total of 29 breast cancer-related lymphedema patients were included in the study (mean age=54.17±11.10 years). The mean pre-treatment extremity volume was 2998.06±930.61 mL. After digital combined decongestive therapy, the mean extremity volume was 2792.78±870.86 mL. There was a significant positive change in extremity volume in the
patients after treatment (p<0.001). The mean extremity volume at follow-up was 2692.63±693.81 mL. There was also a significant positive change in the extremity volumes of the patients in the follow-up compared to the post-treatment (p<0.05).

**Conclusions:** Our results revealed that digital combined decongestive therapy was effective in extremity volume reduction for breast cancer-related lymphedema. Following maintenance therapy, there was also a noticeable reduction in extremity volume. In conclusion, digital combined decongestive therapy was found to be a usable method for patients who cannot participate in face-to-face therapy due to financial or transportation reasons.

**Keywords:** breast cancer-related lymphedema, combined decongestive therapy, caregiver, self-management
An audit of the efficacy of lymph drainage in the management of lymphedema.

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Objectives: The objectives were to investigate the efficacy of lymph drainage of physical therapy intended to reduce lymphedema in the lower limbs. There is no cure for Lymphedema and so the immediate management of the disease aims to reduce the symptoms.

Background: Lymphedema in the legs is a serious problem for many women, particularly in Saudi Arabia. It is often poorly managed in the early stages. The aim of this study was to evaluate how effective physical treatment is in reducing limb volume.

Methods: The study aimed to compare limb volumes before and after treatment in a group of 30 adult women aged between 23 and 83 years. They completed treatment sessions 4 to 5 weeks (daily for 4 hours treatment including: shock wave, ultrasound and lymph drainage the most important advice faradic current, leg compression and bandaging) over a period of 2 to 12 weeks. Limb girth were measured from the ankle upwards at intervals of 4 cm for 60 cm at each session. These girths were combined to estimate the total limb volume and the three sub-regions, lowest, middle and upper. The girths at the first and last sessions were compared.

Results: Data were obtained from 50 legs. Twenty women had both legs measured. A single leg measurement was made in 10 women. Analysis of the whole limb volumes showed that 49 limbs were reduced in volume and one limb did not change. The range of reductions was 0-23% and the mean reduction was 8%. This was highly significant when before/after comparison were made using a paired t test (p> 0.00001). The changes in volume in the three regions were not significantly different when tested with an ANOVA (p<0.05).

Conclusions: Managing lymphedema is a continuing challenge, particularly in socially conservative regions where women may be reluctant seek treatment. The results reported here represent a cross section of patients attending the clinic. The initial results must be treated with caution. However, the findings reported here show clear improvement in each segment of the limb dimensions in almost all cases 2 cases lost 20 kg from body weight.

Keywords: Lymphedema, physical therapy
Can LSC and ICG help to differentiate lipedema from lymphedema and obesity?

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Objectives: To evaluate and compare the changes in lymph drainage in the lower limb in patients with lipedema, lymphedema, and obesity on LSC and ICG images.

Background: Lipedema is a pathological accumulation of subcutaneous adipose tissue in the lower body and occurs mainly in women. Lymphedema of limbs is a pathological accumulation of tissue fluid in tissue spaces due to damage to lymphatics. Lipedema is often misdiagnosed with lymphedema and obesity, as clinical pictures of these three entities are similar. Without treatment and prevention, both lipedema and obesity can lead to impaired lymphatic vessels, inflammation, and the development of lymphedema. The lymphatic system imaging studies (LSC, ICG) may help make a proper diagnosis and differentiate.

Methods: We analyzed LSC and ICG images of 50 patients with lipedema stages I-III, 50 with lymphedema stages I-III, and 30 with obesity (BMI 32-41). We investigated skin water concentration (LympScanner; Delfin Technologies Ltd.) and skin and subcutaneous tissue stiffness (SkinFibrometer; Delfin Technologies Ltd., Wagner, Seattle, WA). We examined the skin and subcutaneous tissue on USG in some patients in each group. In the LSC and ICG images analysis, we were concerned with lymphatic vessel architecture and appearance (dilated, foggy, intermittent), lymph vessel damage sites, and fluid accumulation in the tissue (dermal backflow). In USG images, we investigated the presence or lack of fluid in the subcutaneous tissue.

Results: In lipedema and obese patients, we observed on LSC and ICG the presence of lymphatic vessels along the entire limb, as well as multiple, dilated, and tortuous LVs (more in advanced stages). In some patients with a history of skin and subcutaneous tissue inflammation, the sites of fluid accumulation in the tissue space were seen in the calves. In lymphedema patients, we observed sites of fluid accumulation in the foot, calves, tights, and groin. The size and location of fluid accumulation depend on lymphedema advancement (stage) and pathological factors that cause lymphedema. Skin water accumulation (40% in lipedema and obesity vs. 57-70% in lymphedema), skin stiffness (0.14 N in lipedema and obese patients vs.
0.35 N in lymphedema), subcutaneous tissue stiffness (1.7 g x 103/cm² in lymphedema vs. 0.7 in lipedema and obesity) were highest in patients with lymphedema.

**Conclusions:** Visualizing the limb lymphatic system with LSC and ICG may help to diagnose and differentiate lipedema and obesity from lymphedema. Additionally, they can support the early diagnosis of lymphatic changes that develop in advanced and poorly treated lipedema and obesity.

**Keywords:** lipedema, lymphedema, obesity, lymph drainage visualization
Status of the Superficial Lymphatic System in Patients with Chronic Venous Disease as Detected by ICG-lymphography

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Objectives: This study aimed to assess the status of the superficial lymphatic system according to the CEAP clinical class in patients with CVD.

Background: The novel hypothesis suggests that lesions of the superficial lymphatic system may be responsible for developing progressive forms of chronic venous disease (CVD) and trophic changes. However, there is not enough strong evidence to support it.

Methods: This cross-sectional single-center study enrolled healthy volunteers (C0a) and patients with primary or secondary CVD (C1-6) without evidence of lymphedema, cancer, and previous venous surgery. Clinical examination and duplex ultrasound scan were followed by indocyanine green (ICG)-lymphography to assess the status of the superficial lymphatic system of the lower limbs. The evaluated parameters included lymphatic pattern: linear (standard) or splash, stardust, diffuse or no visualization (pathological); the presence of interstitial or dermal reflux; segmentation or dilatation of vessels; and visible contractility.

Results: In total, 25 patients aged 25-70 (mean of 51.0±13.1) years, 17 females and 8 males, were included, and ICG-lymphography assessed 43 lower limbs. The CEAP clinical class was C0 (healthy volunteers) in 6; C1 in 9; C2 in 6; C3 in 6; C4 in 12; C5 in 2; and C6 in 2 lower limbs. The prevalence of the standard linear lymphatic pattern decreased in parallel with the CEAP clinical class increase: C0 – 100%; C1 – 88.9%; C2 – 83.3%; C3 – 50%; C4-6 – 25% (p=0.014). In 11.1% of C1 limbs, the splash pattern was found; in 16.7% of C2 limbs – the diffuse pattern; in 33.3% and 16.7% of C3 limbs – splash and diffuse patterns, respectively; and in C4-6 limbs, a diffuse pattern was observed in 37.5%, stardust pattern – in 18.8%, and lymphatic vessels were not visualized in 18.8% (one case of venous ulcer and another case of C4). A significant increase in interstitial (from 16.7% in C0 to 68.8% in C4-6; p=0.03) and dermal (from 0% in C0 to 62.5% in C4-6; p=0.03) reflux was detected. The contractility of lymphatic vessels decreased from 100% in C0 to 56.6% in C4-6 (p=0.022). However, no difference was found in segmentation and dilatation, observed in 16.7% of C0 and 31.3% in C4-6 lower limbs.
Conclusions: The prevalence of normal linear lymphatic patterns decreases in parallel with pathological patterns increasing with the progression of CEAP clinical class in CVD patients. It seems that lesions of the superficial lymphatic system play a pivotal role in the development of trophic changes in CVD.

Keywords: lymphatic insufficiency, ieg-lymphography, Phlebolymphedema, venous insufficiency
The Role of Lymphoscintigraphy in Lower Extremity Peripheral Edema

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The present study authored by Tugba Sahbaz, a faculty member from Beykent University, aims to evaluate the efficacy and diagnostic value of lymphoscintigraphy in distinguishing lymphedema from other causes of lower extremity edema (LEE).

**Objectives**: Lower extremity edema (LEE) presents a diagnostic challenge due to its multifactorial etiology, including but not limited to venous insufficiency, lymphedema, and cardiac or renal conditions.

**Background**: This study aims to evaluate the efficacy and diagnostic value of lymphoscintigraphy in distinguishing lymphedema from other causes of LEE.

**Methods**: In the present study, a comprehensive evaluation of demographic data and lymphoscintigraphic outcomes for a cohort of 56 patients who underwent lymphoscintigraphy over the preceding year was conducted. A dose of 0.5 mCi (18.5 MBq) of ⁹⁹Tc-Nanocolloid radiopharmaceutical was administered subcutaneously into the first webspace of both feet using a 26-gauge needle, in a volume of 0.4 mL. After a brief walking period, scintigraphic scans were conducted at 15 and 120 minutes.

**Results**: Of the 56 patients included in our study, 47 (83.9%) were female, 9 (16.1%) were male and the mean age was 44.86±15.72 years. At the time of admission, 24 patients had bilateral, 17 right and 15 left lower extremity edema. According to the results of lymphoscintigraphy, lymphedema was diagnosed in 45 patients. Of the patients diagnosed with lymphedema, 37 were female and 8 were male with a mean age of 44.27±16.70 years and a mean BMI of 28.94±7.76. Of the patients diagnosed with lymphedema, 21 had bilateral, 12 had right-sided and 12 had left-sided lymphedema. According to lymphoscintigraphy, 34 (75.6%) inguinal lymph nodes, 30 (66.7%) popliteal lymph nodes, 22 (48.9%) main lymphatic duct, 23 (51.1%) collateral duct, and 36 (80%) dermal-backflow pathology were detected.

**Conclusions**: This study underlines the important role of lymphoscintigraphy using the Lee and Bergan classification system in the accurate and early diagnosis of lymphedema in patients presenting with lower extremity edema. Consequently, lymphoscintigraphy emerges as an effective tool in the management of lymphedema.
indispensable diagnostic tool in the management of lower extremity edema, facilitating targeted therapeutic interventions.

**Keywords:** Lymphoscintigraphy, Lower Extremity Edema, Lymphedema, Diagnostic Imaging
IPC effect on edema fluid movement and creation of new roots of fluid drainage - evaluation on ICG lymphography.

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Objectives: To evaluate the effect of Intermittent Pneumatic Compression on edema fluid movement and creating new roots for fluid drainage under ICG lymphography.

Background: Lymphedema of the upper limb is the most common complication in patients after breast cancer therapy (mastectomy, lymphadenectomy, radiation). The conservative treatment consists mainly of compression therapy, bandaging, compression sleeves, and MLD and IPC. Compression therapy aims to evacuate edema fluid from the distal parts of the limbs and create new roots for fluid flow. MLD is primarily applicable when LVs still exist and contract. In advanced lymphedema, IPC is the most useful for moving edema fluid along the tissues.

Methods: The studies included twenty-five patients with upper limb lymphedema after mastectomy in stages II-III. All patients undergo ICG lymphography (Photodynamic Eye; Hamamatsu Photonics). Observation and video recording were done immediately after ICG injection (Pulsion, Munich, Germany) into interdigital spaces, one hour after squeezing the ball, and after 45 min of IPC. We analyzed the areas and patterns of dermal backflow, edema fluid movement (dislocation) under IPC, fluorescent intensity along the entire limb (ICcalc, Pulsion Medical Systems, Munich), and the presence of new roots for fluid flow before and after IPC. Additionally, circumferential measurement, skin water concentration (LympScanner; Delfin Technologies Ltd.), skin (SkinFibrometer Delfin Technologies Ltd.), and subcutaneous tissue stiffness (Wagner, Seattle, WA) were measured before and after IPC.

Results: On ICG, we observed fluid accumulation in the hands in 79% of patients, in the forearms in 92%, and in some parts of the arms in 88 % of patients. We observed dilated lymphatic vessels or their fragments in some patients. After IPC, we observed the movement of edema fluid to the limb's upper parts in most patients. Fluorescent intensity decreased in the hands and forearms, increased in the upper parts of the arms in 63% of patients, and decreased along the entire limb in 37% of patients. In 6 patients (24%) after IPC, we observed lymphatic vessels and supraclavicular nodes, which had not been seen before. All other measured parameters decreased after IPC.
Conclusions: Intermittent Pneumatic Compression effectively moves edema fluid from the distal to the proximal part of the limbs. Movement of fluid can be observed and analyzed semi-quantitatively on ICG. In some patients, IPC can support (force) the lymph flow to existing, additional roots. Compression should be applied even in the early stages of lymphedema in the upper limbs.

Keywords: upper limb lymphedema, edema fluid movement, compression therapy, Intermittent pneumatic compression
Does ultrasonography measurement of upper extremity muscle thickness have value in evaluating post mastectomy lymphedema patients? : A Preliminary Study

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Objectives: The aim of this study is to evaluate the upper extremity (UE) muscle thickness (MT) in post mastectomy lymphedema patients by using ultrasonography. Secondly, the study was also aimed at investigating whether upper extremity muscle thickness has any correlation with the patients’ physical, psychosocial and functional impairment.

Background: It is an established fact that UE are directly related to functionality and independence. One of the common presentation of lymphedema is swelling which will lead to lack of physical activity and later will result in muscle atrophy. Changes in upper limb volume and the muscle loss of the UE, may result in further declining of function. To the best of our knowledge, it is still unknown whether there is actual muscle loss in the UE of the post mastectomy lymphedema patients and if any, whether the MT changes can cause implications towards patients’ functionality and quality of life.

Methods: A total of 23 post mastectomy lymphedema patients were enrolled in this study. The UE muscle thickness (MT) and subcutaneous (SC) thickness of the biceps, triceps, brachioradialis, flexor digitorum profundus (FDP) and flexor digitorum superficialis (FDS) were evaluated with an ultrasonography and the extremity volume were calculated using the truncated cone formula. The hand grip strength was measured using handheld dynamometer. Patients’ physical, psychosocial and functional impairments were also assessed using Lymphedema Life Impact Scale (LLIS).

Results: The mean age of patients was 57.74 ± 11.85 years with BMI of 33.17 ± 6.92 kg/m2 and 22 of our patients were females. The extremity volume was found to be higher in the affected arm with p=0.001 compared to the unaffected arm. We also found that the subcutaneous thickness measurement of triceps and the subcutaneous tissue of the forearm in the affected UE are higher and highly significant with p=0.001 and p=0.0001 respectively.
compared to the unaffected UE. Although the measurements of the MT of the arm and forearm muscles in the affected UE compared to the unaffected UE were not statistically significant, we found that the triceps, brachioradialis, FDP and FDS muscle thickness are smaller compared to the unaffected UE. Nonetheless, the MT values has no significant correlation with patients’ physical, psychosocial and functional impairments.

Table 1. Demographic characteristic of patients

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (mean ± SD)</td>
<td>57.74 ± 11.85</td>
</tr>
<tr>
<td>BMI kg/m2 (mean ± SD)</td>
<td>33.17 ± 6.92</td>
</tr>
<tr>
<td>Gender (% females)</td>
<td>22 (95.7)</td>
</tr>
<tr>
<td>Lymphedema side (%)</td>
<td></td>
</tr>
<tr>
<td>Right</td>
<td>10 (43.5)</td>
</tr>
<tr>
<td>Left</td>
<td>13 (56.5)</td>
</tr>
<tr>
<td>Dominant hand (% Right)</td>
<td>23 (100)</td>
</tr>
<tr>
<td>Lymphedema duration in years – median (minimum-maximum)</td>
<td>4 (0.5-30)</td>
</tr>
<tr>
<td>Lymphedema staging median (minimum-maximum)</td>
<td>1 (0-3)</td>
</tr>
</tbody>
</table>

Characteristic of the study sample (n= 23)

Values of the hand grip strength, muscle thickness (MT) and subcutaneous (SC) measurements

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Affected UE</th>
<th>Unaffected UE</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hand Grip Strength (kg)</td>
<td>15.2 ± 6.3</td>
<td>15.8 ± 6.5</td>
<td>0.745</td>
</tr>
<tr>
<td>Extremity Volume (mls)</td>
<td>3114.95 ± 883.66</td>
<td>2400.63 ± 495.23</td>
<td>0.001*</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Muscle</th>
<th>Mean (mm) ± SD</th>
<th>Mean (mm) ± SD</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biceps brachii MT</td>
<td>23.60 ± 4.11</td>
<td>21.74 ± 5.69</td>
<td>0.100</td>
</tr>
<tr>
<td>Triceps MT</td>
<td>22.17 ± 3.59</td>
<td>23.59 ± 4.42</td>
<td>0.108</td>
</tr>
<tr>
<td>Brachioradialis MT</td>
<td>15.41 ± 3.34</td>
<td>16.83 ± 3.94</td>
<td>0.053</td>
</tr>
<tr>
<td>+FDP-FDS MT</td>
<td>28.16 ± 4.86</td>
<td>30.01 ± 5.45</td>
<td>0.078</td>
</tr>
<tr>
<td>Biceps brachii SC</td>
<td>8.10 ± 3.67</td>
<td>7.46 ± 3.04</td>
<td>0.512</td>
</tr>
<tr>
<td>Triceps brachii SC</td>
<td>14.56 ± 6.31</td>
<td>8.82 ± 3.03</td>
<td>0.001*</td>
</tr>
<tr>
<td>+FDP-FDS MT</td>
<td>8.62 ± 3.14</td>
<td>5.49 ± 1.19</td>
<td>0.0001*</td>
</tr>
</tbody>
</table>

Data are presented as mean ± standard deviation with *p<0.05, according to paired t-test.

**Conclusions:** Our preliminary study showed notable changes in the upper extremity MT of post mastectomy lymphedema patients. However, larger trial is needed to further explore the significance value that will possibly affect the future management of UE lymphedema in this population.

**Keywords:** Lymphedema, Extremity Volume, Ultrasonography, Muscle Thickness
Evaluation of Elastographic Parameters in Patients with Breast Cancer-Related Lymphedema and Examination of Their Relationship with Clinical Data

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²Marmara University Pendik Training and Research Hospital
³Istanbul Private Sante Medical Center

Merve Demirci / Zonguldak Ataturk State Hospital

Objectives: Evaluate the stiffness of the skin and subcutaneous tissues of the arm and forearm of patients with BCRL using shear-wave elastography (SWE) and investigate the relationship between the patients' symptoms.

Background: What is Known? Most BCRL studies focus on volume differences, but patients' primary complaints are stiffness development. In stiffness measurement studies, affected lymphedematous extremities are stiffer than unaffected ones. However, contradictory results exist in skin and subcutaneous stiffness measurements on this subject, and the number of studies conducted is limited. What is New? Unlike the literature, this study reveals that unaffected arms of BCRL patients are affected, with a higher patient count. And also, the skin stiffness increased while subcutaneous tissue stiffness decreased in the lymphedematous extremities of patients; this study identified that these changes were associated with the patients' clinical conditions and functionality.

Methods: Both upper extremities of 72 patients with lymphedema and 72 healthy upper extremities were included in the study. The patients' demographic and clinical data were recorded. The stiffness of the skin and subcutaneous tissues was evaluated with shear-wave elastography. Interobserver and intraobserver reliability analysis was performed elastography measurements. The patients' pain, tension, weight, and stiffness symptoms associated with lymphedema were questioned using a numerical scale. The patients' functionality and participation in daily life activities were evaluated with the Quick DASH and Life Impact Index questionnaires. The relationship between these findings and elastographic and ultrasonographic parameters was analyzed.
**Results**: The skin stiffness of the affected extremity was higher and the subcutaneous tissue stiffness was lower in patients than controls \((p<0.05)\). The skin stiffness of the affected forearm was higher and the subcutaneous tissue stiffness of the affected arm and forearm was lower than their unaffected extremities \((p<0.05)\). There was a correlation between the increase in skin stiffness and functionality and participation of patients. The decrease in subcutaneous tissue stiffness of the arm was associated with heaviness sensation, the increase in skin stiffness of the forearm was associated with tightness and the decrease in subcutaneous tissue stiffness of the forearm was associated with tightness and stiffness sensations.

**Conclusions**: The results of this study suggest that SWE measurements can be useful for diagnosis and follow-up of patients.

**Keywords**: Lymphedema, elastography, stiffness, functionality
Changes in tissue elasticity in upper limbs lymphedema after IPC compression measured in USG elastography.

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Objectives: To investigate the usefulness of USG elastography in estimating changes in skin and subcutaneous tissue elasticity after IPC compression and correlate them with durometry, tonometry, and skin water concentration.

Background: The most common etiology of upper limb lymphedema is breast cancer therapy. Surgery, lymphadenectomy, and radiation therapy impair lymphatic transport and cause the slow process of accumulation of tissue fluid in tissue spaces and overgrowth and remodeling of tissue. Both factors influence tissue biophysical properties and tissue stiffness. The main goal of conservative treatment is the reduction of volume and weight of edematous limbs and the prevention and reduction of tissue fibrosis and stiffness. Our previous studies using skin and deep tissue tonometer prove the effectiveness of IPC on increasing tissue elasticity in lymphedematous limbs.

Methods: Twenty patients with upper limb lymphedema after breast cancer treatment stage I-III were investigated. In all patients, we did ICG lymphography (Photodynamic Eye; Hamamatsu Photonics) to estimate the advancement of edema and sites of fluid accumulation. In the middle part of the inner side of the forearm, we selected a region (10 x 5 cm), where we did USG examination (SE, SWE) (Canon APLIO i800) and), durometry (SkinFibrometer; Delfin Technologies Ltd.), tonometry (Wagner, Seattle, WA), skin water concentration (LympScanner; Delfin Technologies Ltd.). The strain elastography and tissue elasticity (kPa) were measured at four subcutaneous tissue levels (ROIs). After 45 min of IPC (Bio Compression system) with a pressure of 60 mmHg, all measurements were repeated.

Results: After 45-minute sessions with IPC, we observed a reduction in skin water concentration of 11.0 %, skin stiffness by 36.4 %, and subcutaneous tissue stiffness by 28.6 %. We also observed the changes in strain ratio and elasticity (kPa). Before IPC, the strain ratio and elasticity values were different at different tissue levels: dermis, upper, middle, and lower levels of subcutis, and they change differently at different tissue levels.

Conclusions: IPC changes the biophysical properties of tissue and reduces tissue stiffness. Both types of USG elastography can be used to investigate changes in tissue elasticity after IPC.
However, correlation with other methods measuring skin and subcutaneous tissue can help to understand the changes that develop in tissue under the influence of IPC.

**Keywords:** Breast cancer related lymphedema, tissue stiffness, compression therapy, USG elastography
Inter-rater and intra-rater reliability of biomechanical skin stiffness characteristics measurement via MyotonPRO device in patients with breast cancer–related lymphedema (BCRL) and their relationship with ultrasonographic tissue changes

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²Vocational School of Health Services, Department of Therapy and Rehabilitation, Physiotherapy Program, Kahramanmaraş Sutcu Imam University, Kahramanmaraş, Turkey
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Objectives: The aim of this study is to investigate the intrarater and interrater reliability of skin stiffness measurements via the MyotonPRO device. The second aim of this study is to investigate the relationship between ultrasonographic subcutaneous tissue changes and skin stiffness measured via the MyotonPRO.

Background: The MyotonPRO device has been used to detect differences in patients with breast cancer-related lymphedema in previous studies. However, its intrarater or interrater reliability has not been studied before.

Methods: Women with unilateral breast cancer–related lymphedema (BCRL) were included. Patients with bilateral BCRL, other diseases which may affect skin stiffness were excluded. The clinical stage of lymphedema was determined according to the International Society of Lymphology (ISL). The skin stiffness and hardness were measured in fifteen patients with BCRL by two blinded observers with MyotonPRO on five body sites including metacarpophalangeal joint (MCP), wrist, 15cm below and above medial epicondyle (ME), ME. Subcutaneous echogenicity grade (SEG) and subcutaneous echo-free space grade (SEFS) were graded at the same body sites by a physiatrist using ultrasound. The relationship between stiffness measurements and ultrasonographic tissue changes were analysed using Spearman correlation coefficient. Intraclass correlation coefficients (ICC) were calculated for inter-rater and intrarater reliability. ICC values less than 0.5 were considered poor, values between 0.5 and 0.75 were considered moderate, values between 0.75 and 0.9 were considered good, and values greater than 0.90 were considered excellent reliability.
**Results:** Women with unilateral breast cancer–related lymphedema (BCRL) were included. Patients with bilateral BCRL, other diseases which may affect skin stiffness (e.g. skin infection, scleroderma) were excluded. Demographic data and characteristics of patients were recorded. The clinical stage of lymphedema was determined according to the International Society of Lymphology (ISL). The skin stiffness and hardness were measured in fifteen patients with BCRL by two blinded observers with MyotonPRO on five body sites including the metacarpophalangeal joint (MCP), wrist, 15cm below and above medial epicondyle (ME) and ME. Subcutaneous echogenicity grade (SEG) and subcutaneous echo-free space grade (SEFS) were graded at the same body sites by a physiatrist using musculoskeletal ultrasound. The relationship between skin stiffness measurements and ultrasonographic tissue changes were analysed using Spearman correlation coefficient. Intraclass correlation coefficients (ICC) were calculated to determine inter-rater and intrarater reliability.

Table 1: Intrarater and interrater reliability of skin stiffness measurements via the MyotonPRO device measured at different upper extremity levels.

<table>
<thead>
<tr>
<th>Area</th>
<th>ICC for intrarater rater 1</th>
<th>ICC for interrater rater 2</th>
<th>ICC for interrater 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>ME 15cm above</td>
<td>0.55</td>
<td>0.91</td>
<td>0.83</td>
</tr>
<tr>
<td>ME</td>
<td>0.94</td>
<td>0.96</td>
<td>0.93</td>
</tr>
<tr>
<td>ME 15cm below</td>
<td>0.98</td>
<td>0.90</td>
<td>0.73</td>
</tr>
<tr>
<td>Wrist</td>
<td>0.91</td>
<td>0.86</td>
<td>0.67</td>
</tr>
<tr>
<td>MCP</td>
<td>0.76</td>
<td>0.84</td>
<td>0.61</td>
</tr>
</tbody>
</table>

ICC: intraclass correlation coefficient; MCP: metacarpophalangeal joint; ME: medial epicondyle

**Conclusions:** Skin stiffness measurements via MyotonPRO showed moderate to excellent interrater and intrarater reliability, and they exhibited correlations with ultrasonographic tissue changes. This suggests that they can be effectively used as an outcome measurement in future studies.

**Keywords:** stiffness, tissue viscoelasticity, edema, intraclass coefficient
RELATIONSHIP BETWEEN LYMPHEDEMA, PAIN, MUSCLE STRENGTH, EMOTIONAL STATE, AND KINESIOPHOBIA IN PATIENTS WITH OPERABLE BREAST CANCER

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²İzmir Bakırçay University, Medicine Faculty, Internal Medicine, Department of Oncology

Filiz Meryem Sertpoyraz / İzmir Bakırçay University, Medicine Faculty, Department of Physical Therapy and Rehabilitation

Objectives: Breast cancer is the most common cancer in women. Kinesiophobia can develop due to breast cancer and its treatments.

Background: Objective: The aim is to evaluate the relationship between lymphedema, pain, muscle strength, emotional state, and kinesiophobia in patients with operable breast cancer.

Methods: Materials and Methods: Demographic data of patients, their surgical history, pain, lymphedema, hand grip strength, depression, and kinesiophobia were evaluated. Lymphedema presence was assessed by arm circumference measurement, hand grip strength by hand dynamometer, emotional state by Beck Depression Scale, and kinesiophobia by Tampa Kinesiophobia Scale.

Results: Results: Forty-one (41) female patients who underwent surgery due to breast cancer were included in the study. The mean age of the patients was 59.85±11.4 years. The demographic and clinical characteristics of the patients are shown in Table 1 and Table 2. All patients had kinesiophobia. The right hand grip strength of the patients was 19.31±6.84, left hand grip strength was 17.03±6.38, kinesiophobia score was 43.30±8.71, and Beck Depression Scale average was 15.88±11.34. There was no relationship found between lymphedema and pain, muscle strength, emotional state, and kinesiophobia (p=0.295, p=0.638, p=0.779). A positive significant relationship was found between kinesiophobia and Beck Depression Scale (p=0.004, r=0.441).

Table 1: Demographic characteristics of patients with operable breast cancer

<table>
<thead>
<tr>
<th>Occupation</th>
<th>n(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Homemaker</td>
<td>30(73.2)</td>
</tr>
<tr>
<td>Civil servant</td>
<td>3(7.3)</td>
</tr>
<tr>
<td>Clinical Characteristics</td>
<td>n(%)</td>
</tr>
<tr>
<td>---------------------------</td>
<td>------</td>
</tr>
<tr>
<td><strong>Retired</strong></td>
<td>8(19.5)</td>
</tr>
<tr>
<td><strong>Education</strong></td>
<td>n(%)</td>
</tr>
<tr>
<td>None</td>
<td>4(9.8)</td>
</tr>
<tr>
<td>Primary school</td>
<td>7(17.1)</td>
</tr>
<tr>
<td>Secondary school</td>
<td>23(56.1)</td>
</tr>
<tr>
<td>Higher education</td>
<td>7(17.1)</td>
</tr>
<tr>
<td><strong>Body Mass Index</strong></td>
<td>n(%)</td>
</tr>
<tr>
<td>Normal</td>
<td>15(36.6)</td>
</tr>
<tr>
<td>Overweight</td>
<td>22(53.7)</td>
</tr>
<tr>
<td>Obese</td>
<td>4(9.8)</td>
</tr>
<tr>
<td><strong>Chemotherapy</strong></td>
<td>n(%)</td>
</tr>
<tr>
<td>None</td>
<td>14(34.1)</td>
</tr>
<tr>
<td>Yes</td>
<td>27(65.9)</td>
</tr>
<tr>
<td><strong>Radiotherapy</strong></td>
<td>n(%)</td>
</tr>
<tr>
<td>None</td>
<td>6(14.6)</td>
</tr>
<tr>
<td>Yes</td>
<td>35(8)</td>
</tr>
</tbody>
</table>

Table 2: Clinical Characteristics of Patients with Operable Breast Cancer
<table>
<thead>
<tr>
<th></th>
<th>None</th>
<th>Present</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage of Lymphedema (%)</td>
<td>30 (76.8)</td>
<td>11 (26.8)</td>
</tr>
<tr>
<td>Stage 1</td>
<td>30 (73.2)</td>
<td></td>
</tr>
<tr>
<td>Stage 2</td>
<td>7 (17.1)</td>
<td></td>
</tr>
<tr>
<td>Stage 3</td>
<td>3 (7.3)</td>
<td></td>
</tr>
<tr>
<td>Stage 4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Compression Garment Use (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>34 (82.0)</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>7 (17.1)</td>
<td></td>
</tr>
<tr>
<td>Shoulder Pain</td>
<td></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>14 (34.1)</td>
<td></td>
</tr>
<tr>
<td>Present</td>
<td>27 (65.9)</td>
<td></td>
</tr>
<tr>
<td>Shoulder Range of Motion Restrict</td>
<td></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>32 (78.1)</td>
<td></td>
</tr>
<tr>
<td>Present</td>
<td>9 (21.9)</td>
<td></td>
</tr>
</tbody>
</table>

**Conclusions:** Result: It was observed that kinesiophobia is associated with mood disorders in patients undergoing breast cancer surgery.

**Keywords:** Breast Cancer, Kinesiophobia, Lymphedema
Lipoedema: Specialsit training and development tool

Stacy Pugh\textsuperscript{1}, Jane Wigg\textsuperscript{1}

\textsuperscript{1}Lymphoedema Training Academy

Jane Wigg / Lymphoedema Training Academy

**Objectives**: By the end of the session the delegate will:
1. Understand the need for specialist lipoedema education to enhance lipoedema management and advice
2. Be aware of a bespoke assessment tool to assist with prompts and holistic assessment, leading to improved diagnosis

**Background**: Very little lipoedema specific education and training is available or that which is, is often only included as a small section of general lymphoedema training. The assessment of Lipoedema is commonly undertaken within lymphoedema clinics by lymphoedema trained specialist practitioners who may not have current or extensive specific training. The development of Lipoedema specific training and a bespoke assessment form was developed and aimed at Health care professional’s and therapists working within a lymphoedema role. The training was developed with the aim of improving the knowledge and skills of those assessing people with Lipoedema to avoid misdiagnosis and assist in differential diagnosis.

**Differential Diagnosis**

Image shows examples of differential diagnosis of lipoedema

**Methods**: Training was prepared and delivered, selecting relevant content agreed with experts. During training, the specific clinical assessment form was evaluated for its use in practice, considering how it assists in differential diagnosis in the absence of a diagnostic test. Expert keynote speakers covered a wide variety of topics including but not limited to; latest research and trends, history taking; differential diagnosis; specific treatment pathways, diet, gait and mobility. Clinical training skills consisted of specialist bandaging, garment fitting, post operative care skills, gait and activity programmes. The Lipoedema specific assessment form shared with learners enabled them to ensure all elements of condition are considered. The training continues with world experts over 4 days and 35 international CPD points.

**Results**: Evaluation of learner feedback followed successful completion of training. Intercourse evaluation of assessment form led to minor additions and changes. Post course evaluations asked learners to identify their ‘first key change’ in practice. Responses included:
“implementing specific lipoedema assessment”, “initiating self-management”, “opening a dedicated lipoedema service”, Further feedback demonstrated the importance of specific lipoedema training and assessment tool.

**Conclusions:** Specific training on lipoedema with evaluated content and assessment tool, demonstrated need and changes to clinical practice. It is evident with the breadth of knowledge increase, lipoedema training needs to be more specific, detailed and focused to current knowledge, research and recommended treatments.

**Keywords:** Lipoedema, Assessment tool
The Effect of A Mobile-Based Lymphedema Self-Care Support Program on Self-Care, The Quality of Life and Lymphedema Symptoms in Women with Breast Cancer-Related Lymphedema: A Single-Blind Randomized Controlled Study

Zeynep Deveci Koçbilek¹, Özgül Karayurt⁴, Özlem Bilik³, Sibel Eyigör²

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²ege university
³dokuz eylul university
⁴izmir university of economics

zeynep deveci koçbilek / pamukkale university

**Objectives:** To examine the effect of a mobile-based lymphedema self-care support program (m-LSSP) on self-care, the quality of life, and lymphedema symptoms in women with breast cancer-related lymphedema (BCRL).

**Background:** Most of the breast cancer survivors could live lymphedema-free with certain self-care management. However maintaining self-care is complicated.

**Methods:** This single-blind, randomized controlled study conducted between January and December 2021. Ethical and institutional approvals were obtained. Informed consent was obtained from the participants. The m-LESSLSP was developed by researchers and the help of a software company. The m-LESSP aims to help women with BCRL access information about lymphedema, facilitate their routine self-care practices and allow them to receive support from the program manager and share their experiences with the program. A control group (n=35) was offered online standard lymphedema education and an intervention group (n=37) was provided with the m-LSSP in addition to the standard education. Data were collected on the phone with the Breast Cancer Related Lymphedema Self-Care Scale, the Quality of Life Measure for Limb Lymphedema–Arm, the Lymphedema Symptom Intensity And Distress Survey-Arm and arm circumference measurements. Data were analyzed with SPSS 24 and Student’s t-test, Chi-square test, variance analysis of repeated measures with one factor and two factors, Mann-Whitney U, Friedman, and Wilcoxon tests. The present study was registered on ClinicalTrials.gov and assigned the project number NCT05058495. This study with project number 2020.KB.SAG.069 was funded by Dokuz Eylul University Scientific Research Projects Coordination Unit.

**Results:** The intervention and control groups were similar in sociodemographic and clinical features at baseline (p>0.05). Group (F=4.171, p=0.045), time (F=15.958, p<0.001), and group-by-time, (F=3.709, p=0.027) interactions in the mean score on the BCRLSS were statistically significant. The effect size was large for time interactions (ƞ²=0.18). There was no significant difference in the mean scores on the quality of life and lymphedema symptoms (p>0.05). The
mean scores on self-care (F=17.350, p<0.001) and the quality of life (F=24.980, p<0.001) increased, lymphedema symptoms (F=14.371, p<0.001) and arm circumferences (p≤0.001) decreased significantly across time in the intervention group. The mean scores on lymphedema symptoms (F=7.741, p=0.002) and arm circumferences (p<0.05) also significantly decreased across time in the control group.

**Conclusions:** The m-LSSP is a beneficial method to enhance self-care and the quality of life and decrease symptoms in women with BCRL. Breast cancer survivors can increase their self-care practices, prevent an increase in their symptoms and arm circumferences, and improve the quality of their lives by using the m-LSSP.

**Keywords:** breast cancer-related lymphedema, mobile application, self-care, quality of life
INVESTIGATION OF THE EFFECT OF LYMPHEDEMA SCHOOL ON FUNCTIONALITY, QUALITY OF LIFE, LYMPHEDEMA VOLUME AND BODY VALUE IN PATIENTS WITH LOWER EXTREMITY LYMPHEDEMA: A QUASI-EXPERIMENTAL STUDY

Sibel Eyigör¹, Zeynep Deveci Koçbilek², Başak Durdu Akgün¹, Menekşe Özgür İnbat¹, Sedef Çalışkan Kabayel¹

¹ege university
²pamukkale university

Zeynep Deveci Koçbilek / pamukkale university

Objectives: This study aims to examine the effect of lymphedema school on patient functionality, quality of life, body value, and lymphedema volume in patients with lower extremity lymphedema.

Background: Lymphedema is defined as the accumulation of protein-rich fluid in the extracellular space resulting from damage to the lymph system. It reduces the quality of life of patients by causing many physiological, psychological, social, and financial problems. There is a lack of patient knowledge in the management of lower extremity lymphedema. One of the effective methods to meet the education needs of patients is patient schools.

Methods: This single-group quasi-experimental study was conducted between September 2021 and June 2022. The sample of the study consisted of 21 patients with primary and secondary lower extremity lymphedema. A face-to-face lymphedema school was organized for three weeks, four hours a week, by a multidisciplinary team, which included self-care management in lower extremity lymphedema. Written and verbal consent was obtained from the participants with the approvals of the ethics committee and the institution. Patient data were collected before school and at 3 and 6 months after school. Patient identification form, "Lower Extremity Functional Scale (LEFS)", "Lymphedema Functionality, Disability and Quality of Life Scale in Lower Extremity Lymphedema (LYMPH-ICF-LL)", "Body Value Scale" and extremity circumference measurement method were used to collect data. Number, percentage, mean, single-factor repeated measures analysis of variance, eta square, and Bonferroni posthoc analyses were used to evaluate the data.

Results: The average age of the patients was 54.85±11.99 years and two-thirds had secondary lymphedema. Six people had right, 5 people had left, and 10 people had bilateral lower extremity lymphedema. In the study, a statistically significant difference was found in the mean scores of LEFS (p<0.001), LYMPH-ICF-LL (p= 0.006) in the 3rd and 6th months, and in the lymphedema volume change (p= 0.031) in the 6th month. Except for the LYMPH-ICF-LL mobility sub-dimension (p= 0.013), there was no statistically significant difference in the other sub-dimensions and body value scale mean score (p>0.005).
**Conclusions:** It was determined that lymphedema school improved functionality and quality of life in patients with lower extremity lymphedema and reduced lymphedema volume. Lymphedema school is a safe and effective training method for self-care management in individuals with lower extremity lymphedema.

**Keywords:** lower extremity lymphedema, self-care, lymphedema school, lymphedema volume
Does D/g/tal Phys/otherapy Demonstrate E8ect/veness /n Both Short and Long- Term Management of Lower Extremity Lymphedema?

Alis Kostanoğlu1, Gökhan Can Törpü2, Selva Otsay2

1Bezmialem Vakıf University, Faculty of Health Sciences, Department of Physiotherapy and Rehabilitation
2Bezmialem Vakıf University, Institute of Health Sciences, Department of Cardiopulmonary Physiotherapy and Rehabilitation, İstanbul

Objectives: The objecti#ve of this study is to demonstrate the appl#cab#l#ty of d#g#tal physiotherapy in treat#ng un#lateral and bilateral lower extremity lymphedema (LEL). The study aimed to examine the effect of digital physiotherapy on extremity volumes in patients with lower extremity lymphedema after a 4-week treatment and a 12-week follow-up.

Background: Lower extremity lymphedema may ar#se as e#ther a pr#mary or secondary cond#tion. Combined decongestive therapy is the gold standard treatment for lymphedema, known for its effect#veness #n both short and long-terms. Digital physiotherapy for lymphedema patients is a modified form of combined decongestive therapy with the help of technology. Digital physiotherapy represents a modern approach that can promote treatment adherence and consistency.

Methods: The study included patients with unilateral and bilateral lower extremity lymphedema who were admitted to the outpatient clinic. The circumferences of the extremities were measured from the first metatarsophalangeal joint to the proximal with 4-cm intervals for each. Circumference measurements were taken pre-treatment (V0), post-treatment (V1), and follow-up (V2). During the initial session, which was conducted face-to-face, patients received basic introduction to skin care and risk reduction training. A trained physiotherapist demonstrated the self-bandaging and self-manual lymphatic drainage techniques while the caregiver videotaped it. Patients learned gluteal sets, knee sets, toe flexion-extension and breathing exercises and received booklets with instructions. After the first session, treatment was provided remotely for 4-weeks using digital telecommunication technologies. After 4-weeks of treatment, self-bandaging was replaced by compression stocking and patients were followed for 12-weeks.

Results: The study involved 82 (n=129 legs) patients with lower extremity lymphedema, with a mean age of 56.53±18.36 years (63 female/19 male, 47 bilateral/35 unilateral LEL, 37 primary/45 secondary LEL). The mean extremity volume of the patients in the pre-treatment evaluation was 5027.71±1826.05 mL. After 4-weeks of digital physiotherapy, mean extremity volume of the patients was 4682.31±1746.05 mL. Digital physiotherapy showed significant positive changes in lower extremity lymphedema patients (V0-V1=345.40±762.03 mL;
p<0.001). The mean extremity volume at 12-week follow-up was 4310.52±1380.24 mL. In the long-term, digital physiotherapy continued to demonstrate significant positive effects in patients with lower extremity lymphedema (V1-V2=371.79±648.66 mL; p<0.001).

Conclusions: Our study found that the application of combined decongestive therapy as a digital physiotherapy method was effective for extremity volume reduction in lower extremity lymphedema patients. This approach has demonstrated both short-term and long-term efficacy for patients with lower extremity lymphedema. Therefore, digital physiotherapy offers lower extremity lymphedema patients an alternative method to combined decongestive therapy.

Keywords: lower extremity lymphedema, combined decongestive therapy, digital physiotherapy, self-management
A Brief Look at the Last 50 Years of Postmastectomy Lymphedema Research: A Bibliometric Study

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Objectives: The objective of this study is to pinpoint the top 50 cited articles on postmastectomy lymphedema (PML) within the past 50 years. We aim to conduct a rigorous statistical analysis of the characteristics of these publications, thereby enhancing the foundational knowledge surrounding PML. Additionally, this investigation aims to facilitate the identification of potential research topics and promote collaboration among researchers in the field.

Background: Throughout the world, successive generations of dedicated scientists have published numerous articles on PML. Conducting a bibliometric analysis of current literature is essential to comprehend the contemporary landscape of lymphedema research output. This endeavor not only aims to gauge the present state but also to strategically advance research on lymphedema in alignment with international research frontiers.

Methods: To conduct the bibliometric analysis, a title-specific search was executed in February 2024 on the Web of Science database by Clarivate Analytics, using "postmastectomy lymphedema" as the primary search term. The selected timespan for the search extended from 1975 to 2024. The utilization of the Web of Science database was imperative, given its recognition as the most authoritative and comprehensive indexing tool for scientific and technological research citations. The top 50 most-cited articles in the last 50 years were reviewed for the analysis.

Results: The articles received a mean citation of 92.82 ± 62.07 per article. The top 10 articles were published between the years 2001 and 2015. The top 4 journals with the most publications were CANCER, BREAST CANCER RESEARCH AND TREATMENT, PLASTIC AND RECONSTRUCTIVE SURGERY and ANNALS OF SURGERY. The top 5 countries with the most publications were Taiwan, Canada, USA, China and Türkiye. The most productive research institutions were the University of Chang Gung, University of Alberta, University of Texas System and University of Toronto. Cheng MH and Mcneely ML were the most productive authors in the field. The majority of the articles (28) fell within the domain of oncology, along with 15 articles focusing on surgical aspects, and 8 contributing to the field of rehabilitation. 3 articles focused on physiology, 2 focused on immunology and 2 focused on imaging and nuclear medicine.
**Conclusions:** An increasing number of scholars are dedicating themselves to the study of PML. It is foreseeable that PML will continue to be a focal point of future research. Simultaneously, this study serves as a valuable resource for researchers to identify potential collaborators and partner institutions, thereby contributing to the advancement of further research in the field.

**Keywords:** Postmastectomy, Lymphedema, Bibliometrical Analysis
Assessing YouTube Videos on Lymphedema for Patient Education: A Comprehensive Evaluation

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¹Gazi University Faculty of Medicine, Physical Medicine and Rehabilitation Department

Objectives: Our principal aim was to critically examine and assess the reliability, accuracy, understandability, actionability and popularity of lymphedema-related videos from the perspective of patient education.

Background: In recent years, the incidence of lymphedema has been on the rise. The global availability of professionals providing health services for lymphedema is severely limited. This situation leads patients to turn to alternative sources of information. YouTube stands out as one of the most frequently consulted platforms. Recent research on YouTube videos indicates notable shortcomings, including deficiencies in content quality, objectivity, reliability, and comprehensibility. There are few studies evaluating the quality and reliability of YouTube videos. However, merely assessing the quality of videos is insufficient to determine their value for patient education. It is also important to utilize tools that evaluate educational materials.

Methods: Using the search keywords "lymphedema" and "lymphedema treatment" we analyzed the 54 most relevant videos. Our video popularity analytics encompassed viewing rate, like ratio, number of comments, and the video power index (VPI). We assessed content quality using the Global Quality Scale (GQS), the modified DISCERN questionnaire score, the Journal of the American Medical Association (JAMA) benchmark criteria score, Patient Education Materials Assessment Tool for Audio/Visual Materials (PEMAT-A/V).

Results: A significant portion of the analyzed videos originated from private health institutions (%25.9) and private health professionals (%24.1). The view rate (11.5) and VPI (11.1) of the videos were relatively modest. Based on the profession of those providing information content quality scale scores were higher in videos where lymphedema specialists/therapists provided information (Table 1). The understandability and actionability of videos correlate with popularity and impact of the videos and also view rate, video duration, and image quality. The quality, flow, and relevance of information in the videos (GQS) were correlated with the popularity and impact of the videos and view rate. The JAMA Benchmark Criteria, which evaluate authorship, appropriate citation of sources, currency of information, and disclosure of conflicts of interest, were correlated with the like ratio and video duration (Table 2).

Table 1. Video analytics and content quality scales based on the profession of information providers.
Table 2. Correlation coefficients between content quality scores and video analytics

<table>
<thead>
<tr>
<th>Video Analytics</th>
<th>GQS</th>
<th>Modified DISCERN</th>
<th>JAMA Benchmark Criteria</th>
<th>PEMAT-A/V Understandability</th>
<th>PEMAT-A/V Actionability</th>
</tr>
</thead>
<tbody>
<tr>
<td>VPI</td>
<td>0.333*</td>
<td>0.186</td>
<td>-0.21</td>
<td>.308*</td>
<td>0.403**</td>
</tr>
<tr>
<td>View rate</td>
<td>0.359**</td>
<td>0.216</td>
<td>-0.038</td>
<td>0.332*</td>
<td>0.492**</td>
</tr>
<tr>
<td>Like ratio</td>
<td>0.033</td>
<td>-0.031</td>
<td><strong>0.310</strong></td>
<td>-0.80</td>
<td>-0.103</td>
</tr>
</tbody>
</table>
Conclusions: Our findings suggest that lymphedema-related videos on YouTube are characterized by average content quality and understandability, but a lack of reliability and actionability. To ensure individuals seeking accurate lymphedema information on social media platforms we recommend directing them to videos uploaded by lymphedema specialists/therapists.

Keywords: lymphedema, youtube, reliability, quality
THE EFFECT OF LYMPHEDEMA SCHOOL ON PREVENTING THE DEVELOPMENT OF BREAST CANCER RELATED LYMPHEDEMA

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¹Pamukkale University
²Ege University

Objectives: This study aimed to investigate the effects of lymphedema school on the prevention of lymphedema, quality of life, body value, hand grip strength, and body mass index in patients who underwent breast cancer surgery.

Background: Breast cancer is the most prevalent form of cancer worldwide. Breast cancer treatment can lead to lymphedema on the affected side. Lymphedema can be prevented with early surveillance and patient education.

Methods: This prospective single-group quasi-experimental study was conducted between May-2021 and June-2023. The study included 27 individuals who had breast cancer surgery from January to September 2021. Lymphedema school is a 3-week course, with 4-hour classes each week. The school covers topics; lymphedema definition, symptoms, diagnosis, risk-reducing behaviors, exercises for arm mobility, self-lymphatic drainage, weight control, skin care, adaptation to life, and psychological support. Ethical and instutional approvals and patient consent were obtained. Patient data was collected at four time points: before the school, and at 6, 12, and 18 months after the school. Patient identification form, quality of life measure for limb lymphoedema-Arm, Cancer-Related Lymphedema of the Upper Extremity (CLUE) tool, Body Value Scale, hand grip strength, and arm circumference measurements were used to collect data. The stages of lymphedema was assessed based on the percentage of volume change, with 5-10% considered subclinical, 10-20% mild, 20-40% moderate, and over 40% severe. Number, percentage, mean, Freidman and Cohrane Q tests were used to evaluate the data.

Results: The study was completed with 19 patients. The patients' mean age was 49.63±9.75. 68.4% had breast-conserving surgery. The mean lymph nodes removed were 15.18±13.83, while the radiotherapy sessions' mean at 28.77±2.90. CLUE score averages showed a statistically significant change (p<0.05). An improvement in hand grip strength was observed over time, which was statistically significant (F = 11.053, p = 0.011). Only in the first follow-up, mild LE was observed in 2 patients (10.5%). There were no statistically significant changes observed in quality of life, body mass index, or lymphedematous arm volume over time (p>0.05).
Change analysis of outcome parameters over time

<table>
<thead>
<tr>
<th>Time</th>
<th>T0</th>
<th>T1</th>
<th>T2</th>
<th>T3</th>
<th>Freidm an</th>
<th>p</th>
<th>KW</th>
<th>Will-coxon</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>X±SD</td>
<td>X±SD</td>
<td>X±SD</td>
<td>X±SD</td>
<td>F</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LMYQOL</td>
<td>35.06±12.55 (20-62.5)</td>
<td>36.83±12.19 (20.9-68.8)</td>
<td>37.11±11.66 (21.1-67.3)</td>
<td>32.89±10.51 (20.6-68.4)</td>
<td>3.189</td>
<td>0.36</td>
<td>0.05</td>
<td>T0&lt;T1, T0&lt;T3</td>
</tr>
<tr>
<td>CLUE</td>
<td>0.13±0.46 (0-2)</td>
<td>3.50±3.90 (0-14)</td>
<td>1.93±3.36 (0-14)</td>
<td>3.02±3.23 (0-10)</td>
<td>12.236</td>
<td>0.007</td>
<td>0.21</td>
<td>T0&lt;T1, T0&lt;T3</td>
</tr>
<tr>
<td>BVS</td>
<td>40.69±7.11 (827-50)</td>
<td>44.11±6.68 (26-50)</td>
<td>42.53±6.22 (29-50)</td>
<td>42.48±5.57 (30-50)</td>
<td>10.641</td>
<td>0.014</td>
<td>0.18</td>
<td>T0&lt;T1</td>
</tr>
<tr>
<td>hand grip strength (affected side)</td>
<td>20.44±5.65 (13-37.50)</td>
<td>21.13±6.02 (12.50-38)</td>
<td>21.55±5.52 (12.50-38)</td>
<td>24.31±6.15 (11.80-40)</td>
<td>11.053</td>
<td>0.011</td>
<td>0.19</td>
<td>T0&lt;T3, T1&lt;T3, T2&lt;T3</td>
</tr>
<tr>
<td>Body mass index (kg/m²)</td>
<td>29.63±4.24 (22.75-39.63)</td>
<td>30.16±4.04 (22.95-38.87)</td>
<td>29.15±3.35 (23.22+35.56)</td>
<td>29.70±3.10 (24.40-34.20)</td>
<td>7.596</td>
<td>0.055</td>
<td>0.13</td>
<td>-</td>
</tr>
<tr>
<td>Affected side arm volume</td>
<td>2654.72±491.52</td>
<td>2730.15±529.54</td>
<td>2669.57±421.78</td>
<td>2700.37±441.70</td>
<td>7.484</td>
<td>0.053</td>
<td>0.13</td>
<td>1</td>
</tr>
<tr>
<td>Contralateral arm volume</td>
<td>2634.56±526.05</td>
<td>2683.08±482.01</td>
<td>2632.52±435.65</td>
<td>2664.98±441.36</td>
<td>5.084</td>
<td>0.166</td>
<td>0.08</td>
<td>9</td>
</tr>
</tbody>
</table>


Examination of lymphedema development status over time

<table>
<thead>
<tr>
<th>Variables</th>
<th>Time</th>
<th>T0 n (%)</th>
<th>T1 n (%)</th>
<th>T2 n (%)</th>
<th>T3 n (%)</th>
<th>Cohrane Q</th>
<th>p</th>
<th>KW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lymphedema</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>not lymphedema</td>
<td></td>
<td>19 (100)</td>
<td>17 (89.5)</td>
<td>19 (100)</td>
<td>19 (100)</td>
<td>6</td>
<td>0.112</td>
<td>0.105</td>
</tr>
<tr>
<td>Mild lymphedema</td>
<td></td>
<td>0 (0)</td>
<td>2 (10.5)</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Conclusions: Following up with patients who have undergone breast cancer treatments is crucial to monitor the development of lymphedema. Educating patients about the risk factors associated with lymphedema and teaching them risk-reducing behaviors at the earliest possible stage can significantly reduce the risk of developing lymphedema. Additionally, if edema occurs, it can be treated effectively and the symptoms may regress. Lymphedema patient school is an effective method for preventing lymphedema development.

Keywords: breast cancer, breast cancer related lymphedema, lymphedema school, patient education
Awareness and knowledge of lymphedema among breast cancer patients: a cross-sectional study

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Objectives: Lymphedema is a chronic condition caused by the accumulation of protein-rich lymphatic fluid in the extracellular space. Breast cancer and its treatments are common causes of lymphedema worldwide. Educating patients about breast cancer-related lymphedema (BCRL) is crucial in preventing lymphedema or treating the disease in the early stages.

Background: This study aimed to determine the awareness of lymphedema in patients with breast cancer.

Methods: The study included 72 consecutive patients with breast cancer aged over 18 years who presented at the Oncology Outpatient Clinic between May 2023 and March 2024. Demographic variables, history of breast cancer and lymphedema treatment, and knowledge about lymphedema were recorded. The extremity volumes were calculated by using truncated cone formula.

Results: The median age of the participants was 59.5 years (IQR, 51.3-66.0). The lymphedema prevalence was 52.8%. The median duration of breast cancer diagnosis was 24.0 months (IQR, 12.0-52.5). Out of the patients with BCRL, 36.8% reported having undergone circumferential limb measurements in the past. Among those who had undergone measurements, 78.6% had their first limb measurement taken after the onset of arm swelling. 50.0% of patients with BCRL and 23.5% of patients without lymphedema reported that they had heard of lymphedema (p=0.021). 26.3% of patients with BCRL reported receiving treatment for lymphedema in the past. 26.3% of patients with lymphedema and 8.8% of patients without lymphedema reported being informed about lymphedema by a physician (p=0.156). 95.8% of the participants were informed to avoid having blood drawn and measuring blood pressure on the affected extremity. 90.3% of the participants were advised not lift heavy objects with their affected limb. 55.6% were informed about daily exercises and 43.1% were informed about weight control. 34.7% were advised to protect the affected limb from traumas. 23.6% was suggested to protect the affected limb from extreme heat and cold. 20.8% were advised of protecting the affected extremity from infections and contacting their physician if signs of infection arise. 11.1% avoided wearing tight clothing or jewelry. 9.7% was informed about preventing sunburn on the affected extremity. 5.6% reported that they were advised to wear gloves while gardening. 4.2%
were advised to take precautions against pet scratches. 2.8% reported being advised to use a thimble while sewing. 8.3% were aware about skin care. 75% of participants reported not knowing which department is responsible for treating lymphedema.

**Conclusions:** Breast cancer patients should be informed about the risk factors and precautions for lymphedema and receive multidisciplinary follow-up.

**Keywords:** breast cancer, lymphedema, awareness
Objectives: The aim of this study is to investigate, through a questionnaire, the skills of Physiotherapists, who deal with lymphology in their clinical practice, in recognizing suspicious dermal lesions in patients with lymphedema, in particular the dermal manifestations of lymphangiosarcoma.

Background: Lymphangiosarcoma represents a rare form of Angiosarcoma. First described in 1948 by Stewart and Treves, it is a malignant tumor and the 5-year survival rate after diagnosis is only 22.4%. It mainly develops in limbs affected by chronic lymphedema and it presents with dermal lesions in the affected area/limb. To increase the chances of survival, early detection of lymphangiosarcoma and timely beginning of treatments are critical.

Methods: A self-reported and self-compiled online questionnaire was developed using the "Google Forms" application. It is composed of 11 questions regarding academic training, practical experience, frequency of lymphatic treatments, ability to recognize suspicious dermal lesions, frequency of referral to a Specialist and opinion regarding the need for more specific training. The questionnaire was submitted to physiotherapists who deal with the management of lymphedema in their clinical practice and carry out their activity in Italy. The disclosure took place from 9 February to 30 March 2024 via email and social channels.

Results: The data collection has already involved 148 physiotherapists, and the number is further increasing. From the current data, it appears that 69.6% of those interviewed have attended lectures on dermal lesions in post-university specialization courses. Despite this, 59.5% declare that they would not be able to recognize lymphangiosarcoma, 28.4% have never seen one, and only 12.2% confirm having already seen at least one case. Additionally, 72.3% of physiotherapists believe it is "absolutely necessary" to provide specific training on skin/dermis lesions in patients with lymphedema at the university or post-university level.

Conclusions: Lymphangiosarcoma represents a rare complication of chronic lymphostasis but given its complexity, the prognosis is often poor. It is necessary that physiotherapists who deal with lymphological conditions receive adequate specific training. In fact, during rehabilitation
sessions with patients, they could identify signs and symptoms of this pathology early. The data collected from this survey highlights the need for greater awareness and training regarding this pathology.

**Keywords:** Lymphangiosarcoma, Stewart-Treves syndrome, Chronic Lymphedema, Lymphangitis
THE EFFECT OF EARLY REHABILITATION ON SUBDERMAL FLUID LEVEL AND QUALITY OF LIFE AFTER BREAST CANCER SURGERY

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2Pamukkale University Enstitute of Health Sciences
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Sozdar SÖĞÜT TEKİN / Pamukkale University Enstitute of Health Sciences

Objectives: This study aims to investigate the effects of rehabilitation on subdermal fluid level and quality of life in individuals undergoing early rehabilitation after breast cancer surgery.

Background: Participants Twenty-one individuals aged between 30-65 years, diagnosed with stage 1-2-3 breast cancer, with at least basic literacy, stable clinical condition, good cooperation, directed by the relevant surgeon, having no contraindications for early postoperative physiotherapy, and no additional diseases affecting their physical and psychosocial functions were included in the study.

Methods: Interventions: Participants were informed by a physiotherapist preoperatively, and a brochure was provided. An exercise program under physiotherapist supervision was initiated from the first day postoperatively during the hospital stay. After discharge, exercises were continued as a home program. Follow-up calls were made every two weeks to monitor exercises, adherence to the program, and continuity. Assessment: Data were collected at preoperative (T1), postoperative discharge (T2), and 3 months after surgery (T3). Tissue dielectric constant (TDC) measurements, assisting in the early diagnosis of lymphedema, were determined by using the Moisture Meter-D compact device. Quality of life was assessed using the Functional Assessment of Cancer Therapy-Breast (FACT-B) questionnaire.

Results: There was a significant difference in subdermal fluid volume measured by TDC between postoperative and 3 months after surgery in the forearm (p=0.026). Significant differences were found in measurements at the biceps level between preoperative and 3 months after surgery and between postoperative and 3 months after surgery (p=0.000). At the thorax level, significant differences were found between preoperative and postoperative measurements and between postoperative and 3 months after surgery (p=0.000). Significant differences were found in FACT-B total scores among the three measurements, particularly between preoperative and 3 months after surgery (p=0.008) (p<0.05). In the social well-being subscale of FACT-B, significant differences were found between preoperative and 3 months after surgery (p=0.001). Emotional well-being showed significant differences between preoperative and postoperative measurements (p=0.01). Functional well-being showed significant
differences between preoperative and 3 months after surgery (p=0.006). Four individuals with TDC ratios ≥1.20 were diagnosed with lymphedema at 3 months after surgery.

TDC measurements

Physical functions

Group 1

Volume of operated limb

T1
2337.43 ± 475.23

T2
2356.43 ± 463.93

T3
2448.52 ± 504.14

Within-group effects
0.000* (fr=19.108) (T1-T3, T2-T3)

Volume of non-operated limb

T1
2350.52 ± 460.78

T2
2340.48 ± 450.75

T3
2427.67 ± 494.28

Within-group effects p-value
0.002* (fr=12.602) (T1-T3, T2-T3)
Volume difference between limbs (operated limb volume- unaffected limb volume)

T1
-13.1 ± 80.44

T2
15.95 ± 100.81

T3
20.86 ± 97.94

Within-group effects
0.097 (F=2.469)

Percentage of volume difference (%)

T1
2.88 ± 2.34

T2
3.85 ± 3.31

T3
3.69 ± 2.4

Within-group effects
0.295 (F=1.26)

Local tissue water value of operated limb of forearm (%)

T1
36.81 ± 4.9

T2
38.19 ± 5.18
T3
35.9 ± 4.43

Within-group effects

0.023* (F=4.158) (T2-T3)

Local tissue water value of operated limb of biceps (%)
T1
37.9 ± 4.07
T2
38.24 ± 4.31
T3
35.33 ± 3.54

Within-group effects

0.000* (F=12.069) (T1-T3, T2-T3)

Local tissue water value of operated limb of thorax (%)
T1
39.38 ± 5.3
T2
49 ± 7.2
T3
41.29 ± 5.72

Within-group effects
0.000* (fr=22.462) (T1-T2, T2-T3)

Local tissue water value of non-operated limb of forearm (%)

T1
38.05 ± 4.26

T2
39.33 ± 4.77

T3
35.71 ± 4.46

Within-group effects

0.000* (F=17.173) (T1-T3, T2-T3)

Local tissue water value of non-operated limb of biceps (%)

T1
37.71 ± 4.68

T2
39.1 ± 4.61

T3
35.9 ± 3.52

Within-group effects

0.000* (F=13.861) (T1-T3, T2-T3)

Local tissue water value of non-operated limb of thorax (%)

T1
40.57 ± 5.15
T2
43.29 ± 5.6

T3
37.71 ± 3.77

Within-group effects
0.000* (F=17.098) (T1-T2, T1-T3, T2-T3)

Interarm local tissue water ratio (T3)

Forearm
0.01 ± 0.09

Biceps
0.98 ± 0.06

Thorax
1.10 ± 0.18

Number of people with local tissue water ratio greater than 1.20 (T3[AKÖ1] )

Forearm
1

Biceps
0

Thorax
3

FACT-B Measurements

FACT-B Total
T1
106.86 ± 29.8

T2
105.95 ± 28.74

T3
115.9 ± 22.63

Within-group effects
0.008* (fr=9.732) (T1-T3)

FACT-B Subgroups
Physical Well-Being

T1
-6.95 ± 6.48

T2
-8.19 ± 7.33

T3
-5.38 ± 4.86

Within-group effects
0.051 (F=3.215)

Social/Family Well-Being

T1
20.14 ± 6.15

T2
21.24 ± 6.65
T3
22.71 ± 6.7

Within-group effects
0.001* (F=8.129) (T1-T3)

Emotional Well-Being
T1
-4.62 ± 6.36
T2
-2.33 ± 5.94
T3
-1.76 ± 4.5

Within-group effects
0.010* (fr=9.123) (T1-T2)

Functional Well-Being
T1
20.43 ± 7.81
T2
19.62 ± 6.63
T3
22.86 ± 6.19

Within-group effects
0.006* (fr=10.254) (T2-T3)

Additional Concerns

T1
-4.52 ± 7.47

T2
-5.05 ± 8.62

T3
-3.81 ± 7.48

Within-group effects

0.425 (F=0.874)

Conclusions: The most important finding of this study is the increase in volume indicating the onset of lymphedema or the absence of lymphedema in individuals undergoing early rehabilitation after breast cancer surgery. It is also observed that early rehabilitation leads to an increase in FACT-B scores, indicating an improvement in individuals' quality of life.

Keywords: Lymphedema, tissue dielectric constant, quality of life
The Preview Study: Effectiveness of Whirlpool Treatment in Patients with Upper Extremity Lymphedema After Mastectomy

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Objectives: Lymphedema is characterized by the abnormal accumulation of plasma protein-rich fluid in the subcutaneous tissue and subfascial compartments. The gold standard among the methods used in treating lymphedema is complex decongestive physiotherapy (CDT) approaches. Whirlpool bath treatment involves submerging the affected limb in warm water, using the water's vortex effect to promote circulation and lymphatic drainage. Therefore, this study was designed to evaluate whirlpool therapy for the effect of upper extremity lymphedema.

Background: This study is carried out to contribute to the literature on the inclusion of different treatments in the treatment plan for lymphedema.

Methods: Upper extremity lymphedema patients who developed a voluntary consent form and block randomization system after the initial assessment were divided into experimental and control groups. 12 healthy individuals participated in this study. The average age of the patients was 56.75 ±11.85 years. Ethics committee approval was received for this study. CDT treatment was given to both groups. An additional 15 sessions of whirlpool treatment were given to the study group. Patients were evaluated before and after treatment with limb diameter measurement, body mass index (BMI) measurement, extremity photography, Lymphedema Quality of Life Scale (LYKO), Upper Extremity Functional Index (UEFI), Brief Pain Inventory (BPI).

Results: 9 out of 12 patients (75%) were housewives. Ten of them (83.3%) were married. 5 of 12 patients (41.6%) had no chronic comorbidities. 11 had stage 2 (91.7%), and 1 (8.3%) had stage 1 lymphedema. The average duration of lymphedema of the patients was 38.42±35.24 months. Whirlpool therapy (6 people) and control (6 people) groups (the initiation of treatment, three weeks) were evaluated, and no statistically meaningful difference was found in the difference between circumference measurements between the two groups (p> 0.05). Regarding UEFI and LYKO scores, there was no statistically meaningful correlation between the control and whirlpool treatment (the initiation of treatment, three weeks) groups (p > 0.05). When the "effect of pain on activity last week" was compared according to BPI, no statistically meaningful correlation was detected (p > 0.05). When the difference in "most pain in the last week" was compared, it was statistically meaningful (p=0.049).

Whirlpool bath therapy
Conclusions: Our results suggest that combined therapy, including CDT and whirlpool therapy, has a positive effect on pain in patients with upper extremity lymphedema. This study sheds light on future studies as it is the first to be done in treating lymphedema. It is a preview study. Recruitment of patients for the study continues.
Keywords: Breast cancer, Lymphedema, Upper extremity, Whirlpool

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Objectives: The aim of this study is to investigate the effects of Complex Decongestive Therapy (CDT) on balance and proprioception applied to patients who developed secondary lymphedema in the lower extremities after cancer surgery

Background: Due to unilateral lower extremity lymphedema, a volume difference occurs between the extremities, the stress on the lower extremity increases and balance losses may occur. Patients with lymphedema may restrict movements in their affected extremities, or the restriction of joint movements and decreased mobility due to lymphedema may lead to the development of muscle atrophy. Muscle atrophy can negatively affect proprioception by reducing the sensitivity of muscle spindles.

Methods: A total of 14 patients who developed LLL after cancer surgery were included in the study. Participants were divided into 2 groups (study group: 7, control group: 7). Patients included in the study group were treated with CDT treatments 5 days a week for 3 weeks. Patients for whom a CDT program was prepared and who were in the treatment queue were included in the control group. Balance and proprioception evaluations were made on the day the treatment was planned, and the final evaluations were repeated 3 weeks later. Balance and proprioception evaluations were made before and after treatment. Balance was assessed with the single-stand test. Proprioception was evaluated with a goniometer at 15-45 and 60 degrees of knee flexion.

Results: In the comparison between groups, the participants’ age, height, weight, BMI, time after surgery, number of chemotherapy/radiotherapy courses are similar (p>0.05). Before the treatment, single standing time and 15, 45 and 60 knee proprioception angles were similar in both groups (p>0.05). After the treatment, single standing time increased in both groups but no superiority was detected between the groups (p = 0.132). Post-treatment knee proprioception values of 15, 45 and 60 were closer to the standard values in the study group (p<0.001, p<0.001, p=0.012, respectively).

Conclusions: According to our results, no significant improvement in balance was observed in patients treated for LLL. Joint proprioception sensation was positively affected in the study group compared to the control group. As a result, balance is a more complex process and its
development may depend on many factors and the continuity of rehabilitation. Therefore, a longer treatment process and specific exercises may be needed. Proprioception may be characterized by a sense of feeling that increases with the load taken from the joints.

**Keywords:** lower extremity lymphedema, complex decongestive therapy, balance, proprioception
Does The Addition of Manual Lymphatic Drainage to Standard Treatment Impact Arm Volume in Patients with Breast Cancer-Related Lymphedema? A Randomized Controlled Trial with Long-Term Results

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Objectives: This study aimed to investigate the effectiveness of combining manual lymphatic drainage (MLD) with multilayer compressive bandage therapy, along with an exercise regimen, in improving arm volume among patients with breast cancer-related lymphedema (BCRL). Additionally, the study aimed to evaluate the efficacy of the second phase of complex decongestive therapy, which included a compression garment and exercise program, in patients with BCRL.

Background: BCRL is a potentially severe consequence of breast cancer and its therapies. Despite MLD being a significant component of complex decongestive therapy, the findings from studies and systematic reviews evaluating its impact on BCRL are inconsistent.

Methods: In this prospective, randomized, single-blind, interventional trial, 40 women diagnosed with BCRL were enrolled. Eligible patients were randomly assigned to either the complex decongestive therapy (CDT) group (n=20) or the standard treatment (ST) group (n=20). Both groups participated in a 15-session program held every weekday for three weeks, which included compressive multilayer bandaging and exercise training. The patients in the CDT group received MLD before bandaging, in addition to the ST. All patients participated in a one-session educational program. All participants were instructed to wear an elastic compression garment and to continue the home-based exercise program after completing all sessions. Arm circumferences were measured bilaterally at six reference points using a measuring tape. The therapeutic response of the treatment approaches was measured by assessing the absolute change in both affected and unaffected arm volumes, as well as the excess arm volume.

Results: The intra-group analysis showed a significant decrease in affected arm volume and excess arm volume in both the CDT group and the ST group at the end of the three-week period (p<0.05). There was also a significant decrease in affected arm volume at the 6-month follow-up after the treatments (p<0.05). However, the excess arm volume increased significantly in both training groups compared to the baseline at the end of six months (p<0.05). The pairwise comparison did not reveal a significant difference among the groups in terms of outcome.
measures over a six-month period (p>0.05), indicating that neither group had a clear advantage over the other.

**Conclusions:** The study findings indicated that both treatment approaches were effective in patients with BCRL. However, no additional benefit from MLD was observed in terms of reducing arm volume over a 6-month period.

**Keywords:** Breast cancer, lymphedema, manual lymphatic drainage, compressive bandage
Pharmacological regulation of lymphatic drainage in experimental stroke

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Objectives: to reveal the features of lymphatic drainage in experimental haemorrhage of rat brain against the background of endonasal administration of pegylated hyaluronidase.

Background: It is known that hyaluronidase can increase the bioavailability of drugs when con-injected. We have previously found that pegylated hyaluronidase administered intranasally against the background of haemorrhagic stroke in rats promoted their faster recovery in coordination of movements combined with a decrease in the degree of ischemia, necrosis and brain edema.

Methods: The experiment was performed on male Wistar rats. Autoblood in the volume of 0.2 ml was injected subdurally by stereotaxic coordinates into the hole in the parietal bone. The animals were further divided into groups. The first and second groups were injected endonasally with physiological solution (PS), pegylated hyaluronidase solution (H-PEG) 15 min after experimental hemorrhage. The third was the control group of intact animals. Microcirculation in deep cervical lymph nodes (LN) was determined by laser Doppler flowmetry, before and 1, 2, 4, 6 h after induced haemorrhagia. Brain and LN were taken at 1 and 6 hours after stroke, tissue samples were fixed and morphological sections were further prepared.

Results: In 1 h after subdural haemorrhage the microcirculation indices of LN by laser Doppler flowmetry decreased by 18% in the group with PS followed by a gradual trend to recovery by 6 h. In animals receiving G-PEG the microcirculation indices were reduced only by 5%, and by 4 h the perfusion rate was completely restored to the initial values. The LN slices had fragmented type (in contrast to the group with PS), and the LN sinuses were filled with erythrocytes by 15% more, which indicated a more active outflow of liquor with blood admixture through the lymphatic system against the background of endonasal administration of G-PEG. The area of perivascular spaces in the brain decreased (relative to control) by 20%. This type of drainage from the interstitium of brain tissues is one of the main ones, but in the experiment the area of pericellular spaces increased reflexively with it. These changes were more pronounced in the group with PS. By 6 h in the group with G-PEG treatment these indices reached intact values.

Conclusions: On the basis of the obtained results it is possible to conclude that G-PEG at endonasal administration has lymphostimulating function and promotes active drainage of
blood from interstitium of nervous tissue, and also reduces development of ischemia, brain oedema, neurological disorders and has protective effect.

**Keywords:** hyaluronidase, lymphatic drainage, haemorrhagic stroke, pegylation
The efficacy of complete decongestive therapy based on fluoroscopy guided manual lymph drainage in 123 Chinese patients with breast cancer-related lymphedema.

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Objectives: To explore the application effects of Complete Decongestive Therapy (CDT) based on Fluoroscopy Guided Manual Lymph Drainage (FG-MLD) in patients with Breast Cancer-Related Lymphedema (BCRL), including changes in limb circumference, improvement in body water composition indices, subjective symptom and quality of life.

Background: Breast cancer is the most common malignant tumor among women. The latest international cancer statistics report in 2020: breast cancer has reached 2.26 million new cases, becoming the largest cancer among women in the world. BCRL is one of the common chronic complications of breast cancer patients after surgery, which is manifested by lymph stasis in the tissue space. It can caused swelling, pain and other discomfort, and even disability. The WHO believes that lymphedema is the second most disabling disease, and treatment is extremely difficult. It causing physical and psychological problem to patients and seriously affecting their quality of life. CDT is currently internationally recognized as the most effective conservative treatment method for BCRL, including Manual Lymphatic Drainage (MLD), elastic bandage wrapping, functional exercise, and skin care. FG-MLD is a innovative technique for lymphatic drainage based on Near-Infrared Fluorescence Lymphatic Imaging (NIRFLI). Compared to traditional MLD, FG-MLD is evidence-based, among which the fill&flush technique is more suitable for irregularly shaped edema and fibrotic areas, which can better promote lymphatic drainage and local tissue softening in edema area. This study applied CDT based on FG-MLD in 123 Chinese BCRL patients and explored its application effect.

Methods: 123 Chinese patients with upper limb lymphedema were treated with FG-MLD, elastic bandage wrapping for 7 days, with skin care, functional exercise, and regular follow-up after discharge.

Results: After 7 times treatment, the circumference, segmental water of the affected limb were significantly lower than before. The extracellular water(ECW) and extracellular water ratio (ECW/Total Body Water,TBW) were significantly lower than before. While the 1kHz bioelectrical impedance value was higher than before, and subjective symptom and quality of life improved after treatment.(All P<0.05)
Observation indices before and after treatment

<table>
<thead>
<tr>
<th>Project</th>
<th>Before treatment</th>
<th>After treatment</th>
<th>Difference</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Circumference of the affected limb (cm)</td>
<td>141.39±13.87</td>
<td>128.37±10.37</td>
<td>13.02±5.65</td>
<td>25.563</td>
<td>P &lt; 0.05</td>
</tr>
<tr>
<td>ECW (L)</td>
<td>11.99±0.79</td>
<td>11.38±0.66</td>
<td>0.61±0.25</td>
<td>26.718</td>
<td>P &lt; 0.05</td>
</tr>
<tr>
<td>Segmental water of the affected limb segment (L)</td>
<td>2.57±0.49</td>
<td>2.24±0.36</td>
<td>0.33±0.26</td>
<td>13.988</td>
<td>P &lt; 0.05</td>
</tr>
<tr>
<td>ECW/TBW</td>
<td>0.3896±0.0041</td>
<td>0.3835±0.0039</td>
<td>0.0061±0.0025</td>
<td>26.651</td>
<td>P &lt; 0.05</td>
</tr>
<tr>
<td>1-kHz Bioelectrical impedance of the affected limb (Ω)</td>
<td>236.71±35.59</td>
<td>272.35±34.10</td>
<td>-35.64±19.76</td>
<td>-20.005</td>
<td>P &lt; 0.05</td>
</tr>
<tr>
<td>Subjective symptom</td>
<td>71.21±25.54</td>
<td>58.31±23.95</td>
<td>12.90±4.67</td>
<td>30.664</td>
<td>P &lt; 0.05</td>
</tr>
<tr>
<td>Quality of life</td>
<td>33.76±7.36</td>
<td>25.34±6.98</td>
<td>8.42±2.53</td>
<td>36.911</td>
<td>P &lt; 0.05</td>
</tr>
</tbody>
</table>

**Conclusions:** Complete decongestive therapy based on FG-MLD can effectively improve BCRL and enhance the quality of life for patients.

**Keywords:** Breast Cancer-Related Lymphedema, Complete Decongestive Therapy, Fluoroscopy Guided Manual Lymph Drainage
The chronic effects of Dragon Boat paddling on Bioelectrical Impedance Vector applied to body composition evaluation of Breast Cancer Survivors

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Objectives: To investigate the long-term training effects on body composition in Breast Cancer Related Lymphedema paddlers. This study specifically concentrated on examining changes in extracellular fluid, muscle mass, and LST measurements.

Background: Dragon boating is the most popular team sport among breast cancer patients. Several studies have shown that it has no impact on lymphoedema, stimulates the production of anti-inflammatory agents in the blood, improves cardiac function and quality of life. With proper rowing technique, the athlete can gain a significant amount of muscle mass and improve the function of the lymphatic system due to the effect of the muscle pump. However, the chronic effects of this type of training on Fat Free Mass have not yet been investigated. The analysis of body composition using bioimpedenceiometric technique can be a valuable tool for monitoring the acute and chronic effects of training and tailoring the correct dosage of exercise.

Methods: 37 breast cancer patients (12 with lymphedema and 18 at risk of lymphedema) and 18 healthy subject as controls were assessed. Bioimpedance analysis was performed using a single frequency BIA (50 kHz) device. Row data and body composition estimates were acquired and analyzed. The raw bioelectrical data were processed by the Bioelectrical Impedance Vector Analysis and RXc Graph method for comparing the tolerance ellipses and vectors of the study populations and of individual subjects compared to reference populations.

Results: The estimates of the sarcopenia indices of the study group are comparable to those of the control group (BC 7 kg/m²; Control 6.8 kg/m²), Resistance and Reactance are lower for the BCRL group (P<0.05); By analyzing the body composition of the upper limbs in lymphedema subgroup compared to the control subgroup (BC), the differences in the R/H and Xc/H appear significantly lower in BCRL (R/H p > 0.01; Xc/H p>0.01) Inversely, the amount of Lean Soft Tissue was significantly higher in the BCRL group (p>0.01) and remains significant when compared with the healthy contralateral limb of the same subjects (p>0.01) with Lymphedema
Vector Analysis with the RXc Graph method

the Tolerance Ellipse of the Italian reference population (Females, White, 16 age 85 yr, 16 BMI 31, Italy, Akern-RJL Systems), available on both software programs that were used, placed all examined subjects within the 50% and 75% tolerance ellipses

Lean Soft Tissue

The amount of Lean Soft Tissue was significantly higher in the BCRL group

Conclusions: Body composition estimates in Breast Cancer patients engaged in dragon boating are comparable to the healthy control group. Lymphoedema appears to have no effect on muscle mass and strength. BIA is a useful tool not only for prevention, but also for monitoring localised extracellular fluids in lymphoedema at any stage. Estimation of LST seems to be a promising and complementary quantitative and qualitative lymphoedema assessment parameter for upper limb lymphoedema assessment

Keywords: breast cancer Lymphedema exercise body composition
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**Objectives**: Presenting the multifocal possibilities of lymphedema rehabilitation in Bulgaria. Clinical: extremity/ties volume reducing, lymphorrhea control; ulcerations, immobility, and severe complications as dermo-hypodermatitis prevention; keeping/restoration of quality of life. Educational: involve patients in the therapy process for successful long-term control of the condition.

**Background**: Our clinical experience in a complex rehabilitation approach to secondary lymphedema in Bulgaria has been presented. It is grounded on the basic principles of complete decongestive therapy as well as on the Bulgarian classical knowledge of medical rehabilitation. The realities in recognition of this interdisciplinary medical problem are presented, too.

**Methods**: In- and out-patients with pelvic and breast operations in their past anamneses with manifested lymphedema in different types and stages have been observed. A complex clinical approach in an individual rehabilitation program in a prospective way has been nominated – decongestive therapy with compressive bandaging, analytical exercises with or without appliances, intermittent centripetal pneumatic massage/drainage and the indicated synergic physiotherapy factors.

**Results**: Reached rehabilitation goals in a controlled clinical medium. The first steps for improving the understanding of lymphedema in Bulgaria as a multisystem and interdisciplinary disease and the motivation of patients for cooperation in the treatment process have been established.

**Conclusions**: The complex, individual rehabilitation program for lymphedema might stabilize and prevent its advancing and the related to this severe complication.

**Keywords**: complex rehabilitation program, long-term results, lymphedema rehabilitation
Influence of physiotherapeutic factors on volumetric flow rate of fluid delivery during lymphotropic therapy

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¹People's Friendship University of Russia

Objectives: Volumetric flow rate during lymphotropically fluid delivery (vfrFD) in the hip joint region and interspinous ligaments at the level of C6-7 were calculated.

Background: Research showed the ability of function management of lymphatic system.

Methods: 6.0 and 9.6 ml/hour volumetric flow rates of syringe pump (vfrSP) were used in 3 patients aged 20, 45 and 46 years, without and with vibroacoustic therapy and massage. 10.0 ml of normal saline with Chondrolone liophyllisate (50 μg) was administered. VfrFD was calculated every 5 minutes.

Results: Only one vfrFD peak in hip joint region, 0.24 ml/min by 65 minute, was observed in 46-year-old patient when vfrSP was 9.6 ml/hour. Time period from 20 to 60 minutes showed a plateau with 0.16 ml/min. At lower vfrSP, 6 ml/h, two peaks in 15th and 75th minutes were found (0.12 and 0.17 ml/min, respectively). Within 30 minutes before the second peak, a plateau formed with 0.12 ml/min. All 5 minute-points of vfrFD were less than those at 9.6 ml/hour. Analysis of vfrFD in hip joint region at 6 ml/hour vfrSP in 20-year-old patient revealed an earlier time second peak and it 1.5 times exceeded (40 minutes and 0.24 ml/min) the same index in 46-year-old patient. The plateau before the second peak was short and amounted to 10 min, and 30 minutes between peaks. Thus, similar qualitative regularities were observed in 46 and 20-year-old patients. However, vfrFD of second peak at 6 ml/h vfrSP exceeded 1.5 times the same time point corresponding to higher vfrSP (9.6 ml/h) (0.24 and 0.19 ml/min, respectively). In 45-year-old patient (interspinous ligaments) at 6 ml/hour vfrSP without physiotherapeutic factors, two vfrFD peak were revealed (0.15 ml/min and 0.16 ml/min), but with a short time interval between them, at 55th and 65th minutes. Further, vfrFD levelled off at 0.10 ml/min. After manual massage of the collar zone lymphotropically injected fluid performed single peak by 35th minute, 0.18 ml/min, which was 1.2 times higher than that of without massage. Further, vfrFD didn’t exceed 0.12 ml/min. Vibroacoustic exposure showed two peaks, in 35th and 70th minutes (0.22 and 0.15 ml/min, respectively). Further, vfrFD was 0.12 ml/min.

Conclusions: Lymphotropically administration of additional fluid volume into interstitium leads to functional activity increase of lymphatic system (vfrFD increase), especially in younger patient. Massage or vibroacoustic exposure contribute to further increase in the reserve capacity of the lymphatic system.

Keywords: lymphotropic therapy, volumetric rate, physiotherapeutic factors
Lower Body Half Compression-associated Effects On Cardiac Function In Secondary Leg Lymphedema

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Objectives: Lower body half compression of bilateral secondary leg lymphedema (LE) without relevant cardiac insufficiency gives rise to the examination whether external leg compression may influence LV function measurable with two-dimensional transthoracic echocardiography (2DTTE) for general assessment and three-dimensional speckle-tracking echocardiography (3DSTE) for precise analysis.

Background: However baseline and posttreatment assessments of LE are usually restricted to local alterations, cardiovascular systemic impacts should also deserve attention. Theoretically, lymphedema-related fluid retention and its evacuation may affect left ventricular (LV) as the heart’s main pump’s mechanics which could be detailed by recent three-dimensional speckle-tracking echocardiography.

Methods: Patients with stage 2 leg secondary LE and age- and gender-matched controls were subjected to baseline 2DTTE then 3DSTE was conducted for the assessment of LV rotational mechanics where apical (AR), basal rotations (BR) and LV strains (local myocardial shortening, thickening and lengthening) were measured before and 1 h after the use of compression class 2 (ccl 2) flat-knitted medical compression pantyhoses (MCP) (pressure range: 23-32 mmHg).

Results: 2DTTE showed significantly larger LV end-diastolic volume and ejection fraction among LE patients compared with control subjects (108.3 ± 20.1 vs. 98.5 ± 21.7 mL, 69.8 ± 4.8 vs. 65.5 ± 4.3%, respectively) and notably smaller LV end-systolic diameter and posterior wall thickness (28.9 ± 3.5 vs. 31.2 ± 3.4 mm, 8.1 ± 1.0 vs. 9.0 ± 1.7 mm, respectively). The rotational parameters of LE patients did not differ significantly from those of matched controls except significant reduction of LV BR following the application of MCP (-2.70 ± 1.26 degrees after 60-minute compression in patient group vs. -4.28 ± 2.18 degrees of the control group; P < 0.05).Baseline global LV circumferential and area strains and mean segmental LV circumferential strain were higher in lymphedema patients compared to controls. One hour after the use of MCP global and mean segmental LV strains remined nearly unaltered however a remarkable tendency of reduction was seen in LV circumferential strain. LV segmental analysis showed a significant increase in midventricular LV radial, circumferential and area strains.
whereas basal LV longitudinal and midventricular LV three-dimensional strains were decreased as compared to controls.

**Conclusions:** The application of MCP moderately but significantly decreased LV BR without a remarkable impact on twisting mechanism in LE patients. LE is featured by increased global LV circumferential strain nevertheless MCP altered LV deformation parameters towards the normal range highlighting some beneficial influences on cardiac function.

**Keywords:** left ventricular rotation, strain, lymphedema compression, echocardiography
Excisional procedures for lymphedema treatment: is Charles procedure relevant?

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**Objectives**: To analyze a combined approach effectiveness for advanced lymphedema forms: a combination of CDT and modified Charles procedure in clinical practice.

**Background**: Excisional procedures, such as the Charles procedure, are used in late stages of lymphedema (ISL-3), when there is significant excess tissue, severe fibrous changes in the subcutaneous fat, and secondary skin changes. This operation was first proposed by Charles in 1912. Since then, many modifications have been described in the scientific literature.

**Methods**: Patients with ISL-3 lymphedema were included in the study. They were divided into two groups: 1 - lymphedema of the upper limb, 2 - lower limb. All patients underwent a course of complex decongestive therapy (CDT) as part of complex treatment. Further surgical intervention involved performing a modified Charles procedure: wide excision of all tissues down to the deep fascia covering the muscles, followed by covering the defect with a full-thickness skin graft. The outcome was assessed by automatically measuring the limb volume, assessing the results of autodermoplasty by measuring the area of graft engraftment, and also analyzing the incidence of erysipelas.
Severe fibrous changes in the subcutaneous fat

Intraoperative view after the procedure was completed
Results: The study included 12 patients with ISL-3 lymphedema: group 1 – 5 people, group 2 – 7 people. The average follow-up period was 24 months. The average volume of the limb in group 1 before surgery was 16546±2405.44 cm³ (CI 95%), 24 months after surgery 6478.42±903.55 cm³ (CI 95%), the average decrease in volume was 55.02±12.55 % (CI 95%). The average volume of the limb in group 2 before surgery was 25013±3443.54 cm³ (CI 95%), 24 months after surgery 9450.42±1 597.66 cm³ (CI 95%), the average decrease in volume was 60.43±15.20% (CI 95%). The number of episodes of erysipelas decreased significantly from 3.2 per year to 0.8 per year during the total observation period. In both groups, the area of engraftment of the transplanted skin was 95±3.4% (CI 95%). Also, normalization of hemoglobin levels was noted in 50% of patients.

Conclusions: Excisional procedures, such as the Charles procedure, are the method of choice in the treatment of terminal forms of lymphedema when other surgical techniques are not possible. The modern treatment approach for this group of patients, the combination of CDT and excisional procedures, has significantly improved long-term treatment results and reduced the incidence of postoperative complications.

Keywords: Charles procedure, Excisional procedures, lymphedema, lymphostasis
Combined treatment of lower limbs of patients affected by elephantiasis as results of multiple bariatric surgery

Arianna Demoro¹, Roberto Risso¹, Elena Parodi¹, Mirco Ponsini¹, Corrado Campisi¹, Lidia Molinari¹

¹Campisi & partners

Arianna Demoro / Campisi & partners

Objectives: Combined treatment of lower limbs of patients affected by elephantiasis as results of multiple bariatric surgery

Background: The study that we are presenting deals with a clinical case of primary lymph. In the lower left limb and of lipofibromatosis in the lower right limb, involving both superficial and deep structures. The patient had multiple bariatric surgeries with weight loss, opposed by worsening lymphatic disease: reaching the 3rd stage of elephantiasis, ulceration, movement difficulties, worsening the general conditions. When the patient first arrived we measured with the perometer a volume of 16753mL for the left leg and 20176 for the right leg.

Before treatment

Methods: After multiple medications on several ulcerations and functional multilayered bandages to reduce the edema, the patient began to perform the CPT.

Results: After one month the clinical status of the patient has improved enough for a MLVA to the left leg. The results were astonishing, showing weight loss, decrease of edema, improved physical abilities. Volumes have decreased, with the right leg measuring 9153mL and the left leg 8670mL.
After the treatment
**Conclusions**: The patient will have more MLVA and FLLA surgeries in order to reach a standard quality of life.

**Keywords**: elephantiasis, Obesity, Lymphoedema, Limbs
Lymphonodulovenous anastomoses in the complex treatment of the lower extremity lymphedema

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**Objectives:** The purpose of the study is to identify possible options for using this method in the complex treatment of low extremity lymphedema in combination with liposuction.

**Background:** Supermicrosurgical version of lymph-node-to-vein anastomosis (LNVA) as a treatment for low extremity lymphedema was first described in 2021.

**Methods:** Female patients with low extremity lymphedema stage 2 ISL were included. Reduction in limb volume was used as a method of effectiveness assessment. All the participants were divided into two groups: in the first group liposuction was performed as treatment. In the second group treatment was carried out in two stages (1st – liposuction, 2nd – LNVA formation in the groin area 3-5 months after the 1st stage). Functionally active lymph node was visualized with a use of fluorescent ICG. Limb circumference measurements were taken at 8 levels before surgery, after 1, 3 and 9 months, respectively, using a patented program [2] for measuring the limb volume.
Intraoperative view. The wall of the lymph node is dissected. The nearby vein is prepared to form an anastomosis.
Performing an opening in the lymph node wall. Then, anastomosis is formed between the lymph node and a nearby vein.

**Results**: Each group included 16 patients with lymphedema of the lower limb ISL2. The average follow-up period was 18 months. Limb volume in group 1 before surgery was 10,314.16±1,884.44 cm³ (CI 95%), 18 months after surgery 8934.42±1,522.72 cm³ (CI 95%), the average decrease in volume was 13.15±11.22% (CI 95%). Limb volume in group 2 before surgery was 10,368.49±1,841.96 cm³ (CI 95%), 18 months after surgery 8,784.42±1,436.66 cm³ (CI 95%), the average volume reduction was 15.01±12.04% (CI 95%).

**Conclusions**: In our opinion, the use of the technique of forming a LNVA looks promising and can be considered as an addition to liposuction in the treatment of lymphedema of the lower extremities.

**Keywords**: Lymphedema, Lymphovenous anastomosis (LVA), lymph-node-to-vein anastomosis (LNVA), Microsurgery
The Multiple Level Vascularized Lymph Node Transfers

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Mehmet Veli Karaaltin / Acibadem Taksim Hospital

Objectives: Vascularized lymph node (VLN) transfer has shown promising results in the treatment of lymphedema patients. However, the selection of appropriate donor sites for VLN is crucial. In this series, we present a novel technique of three and six consecutive free VLN transfers for the reconstruction of lower extremity lymphedema. To the best of our knowledge, this is the first report of such a technique in the medical literature.

Background: A novel surgical technique for lymphedema treatment

Methods: The technique involves harvesting three groups of vascularized lymph nodes (VLN) from the neck region, specifically submental Level Ia,b, II + III, and VB. The VLN's are then transferred to recipient sites: the anterior ankle, posterior knee, and inguinal regions. For the anterior ankle transfer, dorsalis pedis artery and concomitant veins, along with saphenous tributaries, are used as recipient vessels. The posterior knee transfer utilizes medial genicular perforators as recipient vessels, employing an end-to-end super microsurgery technique. In the inguinal region, the femoral artery and great saphenous tributaries are used, with an end-to-side anastomosis. To ensure efficiency, two surgical teams simultaneously perform VLN flap harvesting and recipient site preparation. Additionally, adipose-derived regenerative cells (15cc SVF, BioNTech Inc. Korea) are injected under the pericapsular layer of the lymph nodes to promote neo lymph angiogenesis. In some cases, patent lymphatic vessels are identified using an ICG camera (Spy Elite) to create a shunt to the vein of the transferred VLN. The vitality of all transferred VLN is assessed immediately using the ICG camera after the anastomosis.
Intraoperative view. The level Ia,Ib lymph node flap.

**Results:** A total of 22 patients (4 males and 18 females) underwent the VLN transfer surgery. The mean follow-up period was 48 months. On average, patients experienced a circumference reduction of 17.01 cm (rule of 10). Patient satisfaction, as assessed by the Face-Q questionnaire for the submental incision scar, was found to be statistically high (p<0.05). Postoperative ICG revealed the presence of newly formed lymphatic vessels surrounding the transferred VLN in all patients. In cases of bilateral treatment, a lymphoscintigraphy performed six months after surgery clearly demonstrated a direct shunt of the isotope activity from the injection site to the VLN and subsequently to the urinary bladder.

**Neo Lymphangiogenesis**

The Screen Shot, shows a VLNT via an ICG camera. The red arrow points to the newly formed lymphatic arcade around the transferred lymph node.

**Treatment and outcomes**

<table>
<thead>
<tr>
<th>Patient</th>
<th>SVF</th>
<th>Shunting</th>
<th>Follow-up</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>67, M, Genital</td>
<td>No</td>
<td>No</td>
<td>96 months</td>
<td>No recurrence</td>
</tr>
<tr>
<td>16, F, Lower extremity, unilateral</td>
<td>No</td>
<td>No</td>
<td>96 months</td>
<td>-15.4 cm</td>
</tr>
<tr>
<td>24, M, Lower extremity, unilateral, left</td>
<td>SVF</td>
<td>No</td>
<td>60 months</td>
<td>-40.7 cm</td>
</tr>
<tr>
<td>36, F, Lower extremity, unilateral, left</td>
<td>SVF</td>
<td>No</td>
<td>63 months</td>
<td>-20.3 cm</td>
</tr>
<tr>
<td>67, F, Lower extremity, unilateral, left</td>
<td>SVF</td>
<td>No</td>
<td>61 months</td>
<td>-23.9 cm</td>
</tr>
<tr>
<td>24, F, Lower extremity, unilateral, left</td>
<td>SVF</td>
<td>No</td>
<td>61 months</td>
<td>-16.7 cm</td>
</tr>
<tr>
<td>32, F, Lower extremity, unilateral, left</td>
<td>SVF</td>
<td>No</td>
<td>60 months</td>
<td>-18.4 cm</td>
</tr>
<tr>
<td>Patient ID</td>
<td>Extremity</td>
<td>Technique</td>
<td>Follow-Up</td>
<td>Clinical Outcome</td>
</tr>
<tr>
<td>------------</td>
<td>-----------------------------------------------</td>
<td>-----------</td>
<td>-----------</td>
<td>------------------</td>
</tr>
<tr>
<td>28, F</td>
<td>Lower extremity, unilateral, left</td>
<td>SVF</td>
<td>59 months</td>
<td>-14.8 cm</td>
</tr>
<tr>
<td>36, F</td>
<td>Lower extremity, unilateral</td>
<td>SVF</td>
<td>59 months</td>
<td>-20.1 cm</td>
</tr>
<tr>
<td>19, F</td>
<td>Lower extremity, unilateral, left</td>
<td>SVF</td>
<td>55 months</td>
<td>-83 cm</td>
</tr>
<tr>
<td>36, M</td>
<td>Genital &amp; lower extremity, unilateral</td>
<td>SVF</td>
<td>55 months</td>
<td>-12.4 cm, no recurrence</td>
</tr>
<tr>
<td>42, F</td>
<td>Lower extremity, left</td>
<td>SVF</td>
<td>48 months</td>
<td>-4 cm</td>
</tr>
<tr>
<td>32, F</td>
<td>Lower extremity, left</td>
<td>SVF</td>
<td>48 months</td>
<td>-17.3 cm</td>
</tr>
<tr>
<td>39, F</td>
<td>Lower extremity, left</td>
<td>SVF</td>
<td>45 months</td>
<td>-6.2 cm</td>
</tr>
<tr>
<td>19, F</td>
<td>Lower extremity, left</td>
<td>SVF</td>
<td>36 months</td>
<td>-11.2 cm</td>
</tr>
<tr>
<td>49, F</td>
<td>Upper extremity, left</td>
<td>SVF</td>
<td>36 months</td>
<td>-5.6 cm</td>
</tr>
<tr>
<td>45, F</td>
<td>Lower extremity, right</td>
<td>SVF</td>
<td>35 months</td>
<td>-5.8 cm</td>
</tr>
<tr>
<td>14, F</td>
<td>Lower extremity, bilateral</td>
<td>No</td>
<td>13 months</td>
<td>-4.1 cm</td>
</tr>
<tr>
<td>56, M</td>
<td>Genital</td>
<td>SVF</td>
<td>12 months</td>
<td>No recurrence</td>
</tr>
<tr>
<td>34, F</td>
<td>Lower extremity, bilateral</td>
<td>No</td>
<td>6 months</td>
<td>-6.3 cm</td>
</tr>
<tr>
<td>36, F</td>
<td>Lower extremity, left</td>
<td>No</td>
<td>6 months</td>
<td>10.7 cm</td>
</tr>
<tr>
<td>38, F</td>
<td>Lower extremity, bilateral</td>
<td>No</td>
<td>6 months</td>
<td>15.3 cm</td>
</tr>
</tbody>
</table>

The table shows the treatment, follow-up and clinical outcome

**Conclusions:** This clinical series presents a promising method for improving the quality of life in patients with extremity lymphedema. Although the technique is challenging and requires advanced microsurgical skills, it appears to be reproducible. Overall, the evidence suggests that it can be effective in treatment of lymphedema.

**Keywords:** Lymph nodes, Free, Vascularized, Lymphedema
Lower Leg Liposuction, Is it worth being scared?

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Resat Aktas / Dr Resat Aktas Aesthetic Surgery Clinic

Objectives: One of the most hesitated part of the body for liposuction is lower legs. For minimising the complications, liposuction under tourniquet is one of the safest way to perform liposuction. In my cases I have never experienced complications related to big vein injuries with less than %4 skin irregularities.

Background: Lipedema is an underestimated disease and for years it has been misdiagnosed as obesity. However many of these patients would not lose weight and have to live with heavy legs. The most important reason that plastic surgeons do not want to perform liposuction to lower legs are first they don't trust themselves (lack of experience) second possible complications due to lack of experience. It is absolutely true that lower leg liposuction needs experience but it does not mean that it is impossible. What you need to know is doing the surgery in the right technique.

Methods: 166 patients have been operated since 01/08/2016. All patients were operated with liposuction under tourniquet. First 65 patients have been operated with superdry technique. Due to some problems of dry technique, I changed the technique to wet technique and remaining 101 patients have been operated with wet liposuction under tourniquet. 3 patients who were suffering stage 3 lipedema, have been treated with liposuction and Argo plasma to improve their skin elasticity. Apart from these 3 patients any of the patients have been treated with energy based liposuction devices. 46 patients had fat grafting to the depressed areas at the end of the operation.

Results: There was not any patient had fat embolism or any related big vein complications. Most of the patients had temporary skin sensation problems. Sensation problem continued around 3-4 months. The most common early post complication which needs intervention is seroma. 18 patients suffered seroma complication. Seroma mostly has been seen at high volume liposuction patients (>1.5 lt). 16 patients had minor skin irregularity problems. 1 patient had relapse and operated one more time. 1 patient who was living abroad suffered pyoderma gangrenosum and she has been treated and operated at a local hospital where she lives.
immediate result
long term result

Number of Complications

<table>
<thead>
<tr>
<th>Complication</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seroma</td>
<td>18</td>
</tr>
<tr>
<td>Skin irregularity</td>
<td>16</td>
</tr>
<tr>
<td>Asymmetry</td>
<td>11</td>
</tr>
<tr>
<td>Hyperpigmentation</td>
<td>9</td>
</tr>
<tr>
<td>Skin necrosis</td>
<td>1</td>
</tr>
<tr>
<td>Infection</td>
<td>0</td>
</tr>
<tr>
<td>Fat embolism</td>
<td>0</td>
</tr>
<tr>
<td>Thromboembolism</td>
<td>0</td>
</tr>
<tr>
<td>Total complicated patients</td>
<td>43</td>
</tr>
</tbody>
</table>
Conclusions: Lipedema is a very common disease among women and lower leg is the second most effected part of the body after thighs. Many plastic surgeons would probably hesitate to operate lower legs due to its possible complications. With low complication rates liposuction under tourniquet is a safe method to have satisfactory results.

Keywords: lipedema, liposuction under tourniquet
Pre- and postsurgical protocols: how to decrease risks of lymphatic surgery and increase efficacy

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Objectives: Lymphatic surgery (LS) is developing rapidly, as it can give the results conservative treatment cannot achieve, so many surgeons want to perform it and many patients are willing to be treated with it. Unfortunately very rarely during education of new surgeons there is a module that covers what exactly should be done before surgery and what should be done after to improve the results of intervention and decrease the risks of side effects. It can lead to significant decrease in efficacy of LS and increase of adverse effects after.

Background: Aims: to analyze the current existing individual protocols for pre-op and post-op care in scientific literature, to analyze the situation in Russia with pre-op/post-op care in LS, to work out a draft of recommendations for pre-op/post-op care for LVA, LNT and liposuction.

Methods: Systematic literature - PubMed, Medline, Cochrane, ALF, ILF, LE&RN, LSN resources were observed to collect the different approaches in pre-op/post-op care in LS. The data was collected from Russian clinics who are performing LS – pre-op/post-op care, changes in limb before and after surgery (circumference volumetric method), adverse effects after surgery – 5 clinics, 76 patients. Referring to approaches in literature to discuss with the members of the Russian Lymphology Association (RLA) possible pre-op/post-op protocol guidelines.

Results: In literature there is relatively little to no information regarding pre-op/post-op procedures in LS, though there is a major opinion that a patient before LS should be fully decongested (CDT). Skin care and physical exercises are recommended, though there are no details. Regarding compression therapy and MLD the information is controversial or not sufficient. Analysis of Russian clinics showed that only one clinic is following strict pre-op and post op protocols, and the results of surgery are very good with very few slight adverse effects (liposuction protocol of H.Brorson). The rest of the clinics either do not have pre-op/post-op care at all, either it’s not correct or sufficient, so very often there are no results after surgery or there are adverse effects (increasing/developing of edema, severe seromas, infections, etc). After RLA meeting we made a draft of the pre-op/post-op protocol guidelines.

Conclusions: Preoperative and postoperative care is very significant in LS, in case of poor care the results of surgery may be lost and risk of side effects increases. There should be a consensus on pre-op/post-op protocol guidelines that new lymphatic surgeons should follow. RLA prepared a draft of such protocol.
Keywords: Lymphatic surgery, Preoperative protocol, Postoperative care, Complications and adverse effects
An investigation of body image and quality life among patients with lymphedema and lipedema of the lower extremity

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1SBU İstanbul Physical Medicine and Rehabilitation Training And Research Hospital

Objectives: The present study is aimed to investigate the body image (body dissatisfaction, body investment) and quality life among patients with lymphedema and lipedema of the lower extremity.

Background: In modern times, women see slimness as being an ideal. Shapelessness and lack of physical aesthetics of lower limb lymphedema patients affects Daily life and psychology. The onset of lipedema pathophysiology is thought to occur during periods of hormonal fluctuation and it is affected to patients psychology. It is aimed to investigate the body image and quality life among patients with lymphedema and lipedema of the lower extremity.

Methods: Cross-sectional data was collected from outpatient and inpatient lymphedema management units. Body Image Questionnaire, Beliefs About Appearance Scale (BAAS), Lymphedema Quality of Life for lower limb, body mass index, characteristic of secondary lymphedema and lipedema, demographics were recorded. SPSS statistic programme was used for analysing data of patients with secondary lymphedema and lipedema of the lower extremity.

Results: Participants were included patients with secondary lymphedema (n =14) and lipedema (n =12) of lower extremities. Lymphedema and lipedema presence and severity were evaluated by circumferential measurement and nearly all patiets severity were mild. All participants were female. 76.9% (n=20) were married. 73,1% (n=19) has no work. Ages of patients were 35-80 years. Mean age of all participants was 57,27±11,5 years. Mean Body Mass Index of secondary lymphedema group was 36,57±6,92 and for lipedema group was 36,58±6,72. Score of Lymphedema Quality of Life was 2,34±0,8 in secondary lymphedema group, 2,59±0,57 in lipedema group, Body Image scores were 128,28±29,28 in lymphedema group and 121,08±28,42 in lipedema group. Beliefs About Appearance Scale (BAAS) scores were 40,21±22,71 in lymphedema group and 39,0±21,9 in lipedema group. There were not statistical significance between groups’ Body Image Questionnaire, Beliefs About Appearance Scale (BAAS), Lymphedema Quality of Life for lower limb, body mass index, ages. When 26 patients were evaluated for correlations, there were statistical significant correlations between body image queationnaire and Lymphedema Quality of Life (r=-0.568, p<0.02 spearman test),and BAAS (r=-0.540, p<0.004 spearman test).
**Conclusions:** In this study, Body image negative role is a problem for both groups. It effects psychology and quality of life. Sample size was limited in this study. Large sample sized studies are needed in the future.

**Keywords:** lympeudema, lipeudema, body image, quality of life
Lower limb lymphoedema and quality of life.

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2San Giovanni Battista Hospital Rome Italy
3CMID Torino Italy
4Cagliari University Cagliari Italy

Fabio Romaldini / San Giuseppe Hospital Marino ASL Roma6

Objectives: Italian validation LymQOL-LL scale to measure Qol in patient with lower limb lymphoedema

Background: The measurement of disability induced by lower extremity lymphedema has always been a difficulty for health care providers since common disability scales are usually aimed at patients with neurological or peripheral diseases. For these reasons, AA is conducting this preliminary study which, by administering the items to patients aims to validate the LymQol-LL.

Methods: The validation has been set up in accordance with the international guidelines on the subject and is following the following pathway:- 2 Separate translations of the text from the original language (English) into Italian- A synthesis of the two translations closest to the specific meaning in the original language was made- Reformulation of the final text in english language (back translation)- Review of the document by the Committee of experts (Surgeon, Physiotherapist, Angiologist, Internist, the translators and an expert in the philosophy of language)- 120 patients, subject to informed consent, aged between 18 and 66 years, with primary or secondary lymphoedema of the lower limbs (mono or bilateral), in stages 1, 2 and 3 are studying; the test include: SF36 and LymQol-LL at times: zero (T0) and after one week (T1). The quality of life aspects investigated by LymQol are: function, body image, symptoms and mood.

Results: In the first preliminary study, which is still being completed, there is evidence of easy comprehension of the proposed items, quick administration time, repetitiveness of the test, and a tendency to externalize emerging problems caused by the disease

Conclusions: The importance of the study, which it’s desiderable to be conducted in many other countries, is to have a reliable knowledge of the altered quality of life in patients with primary and secondary lymphoedema in order to better quantify their care needs, depending on the specific data that emerged on the individual aspects investigated, by national public and private healthcare systems.

Keywords: Lower Limb lymphoedema quality of life
The relationship between self-reported swelling and anxiety, depression, quality of life and overall survival post-gynaecological cancer

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Objectives: To explore the relationship between self-reported lower-limb swelling and anxiety, depression, quality of life and overall survival following gynaecological cancer.

Background: Lymphedema is a common and feared survivorship concern following gynaecological cancer. In the breast cancer setting, strong evidence exists on the adverse effects and impact lymphedema has on quality of life, mood and survival. However, evidence in the lower-limb setting following gynaecological cancer is lacking.

Methods: Data from the LEG study, which is a prospective, longitudinal, cohort study including 408 women with gynaecological cancer, contributed to analyses. Outcomes of interest were assessed at baseline (pre-definitive diagnosis of gynaecological cancer) and at 6 weeks to 3 months, 6 months to 12 months and 15 to 24 months post-surgery. Linear regression analyses were undertaken to assess associations between cumulative burden of self-reported lower-limb swelling (that is, any evidence of lower-limb swelling within the first 24 months post-surgery of gynaecological cancer) and anxiety and depression (as measured via the Hospital Anxiety and Depression Scale) and quality of life (as measured via the Functional Assessment of Cancer Therapy-General) assessed at 24 months post-surgery. Logistic regression was used to assess the relationship between cumulative burden of self-reported lower-limb swelling and overall survival at 5-years follow up. Results were described using means (SD) and n (%), and p<0.05 was considered statistically significant.

Results: By 24 months post-diagnosis, 48% of women self-reported lower-limb swelling. Those with swelling reported higher anxiety and depression scores (4.9 (4.2) and 3.5 (3.11), respectively) and lower quality of life (83.6 (16.6)) when compared with those who did not report leg swelling (3.9 (3.8), 2.6 (3.2), and 89.7 (14.5), respectively; p<0.05). Overall survival at 5-year follow up did not differ between groups (those with evidence of swelling: 30% deaths; no evidence of swelling: 36% deaths; p=0.34).
Conclusions: These findings demonstrate the impact of swelling on health outcomes, but not survival. Between now and the ESL conference, our team will also explore these relationships using objective measures of lymphedema.

Keywords: Lymphedema, gynaecological cancer, epidemiology
EFFICACY OF CORE STABILIZATION EXERCISES APPLIED WITH COMPLEX DECONGESTIVE PHYSIOTHERAPY IN PATIENTS WITH CANCER RELATED LOWER EXTREMITY LYMPHEDEMA

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²İstanbul University-Cerrahpaşa Institute of Graduate Studies Department of Cardiology Physiotherapy and Rehabilitation

Objectives: The aim of the study is to evaluate the effect of core stabilization exercises with Phase I Complex Decongestive Physiotherapy (CDP) on edema, exercise capacity, physical activity level, lower extremity functionality, balance and quality of life parameters in unilateral lower extremity lymphedema caused by cancer.

Background: Lower extremity lymphedema due to secondary causes is a life-long complication. The most common factors causing secondary lymphedema in the lower extremities are genital area cancers, surgical interventions, trauma, radiotherapy and recurrent infections. Complex decongestive treatment is now considered the gold standard in the treatment of lymphedema. We evaluated whether core stabilization exercise has an additional effect on complex decongestive treatment in patients with lower extremity lymphedema caused by cancer.

Methods: The study included 26 patients aged 43-79 years with cancer-related lymphedema. Patients were randomly divided into treatment group (n=13) and control group (n=13). The treatment group received phase I CDP and Core Stabilization exercises. In the control group, only phase I CDP was applied. The treatment of both groups was performed 5 days a week for 4 weeks. In the treatment group, core stabilization exercises were performed 3 days a week during the treatment period. Demographic information of the patients was recorded on the evaluation form. The measurements were performed before and after the treatment. Edema was assessed by xvi circumference measurement and frustum formula; exercise capacity by 6 Minute Walking Test (6MWT); physical activity level by International Physical Activity Questionnaire-Short Form (IPAQ); balance by Berg Balance Scale (BBS); quality of life by Lymphedema Quality of Life Scale-Leg (LYMQOL); lower extremity functionality by Lower Extremity Functionality Scale (LEFS). Body mass index (BMI) was also evaluated before and after treatment.

Results: When the demographic characteristics and other evaluation parameters of both groups were compared before treatment, the results were similar (p>0.05). In post-treatment measurements, improvement was observed in all parameters in both groups. In addition, the
treatment group showed more improvement in circumference measurements, physical activity level, balance, lower extremity functionality and quality of life parameters compared to the control group (p<0.05). Improvements in BMI, edema volume and exercise capacity were similar in both groups (p>0.05).

Conclusions: The results of this study showed that core stabilization exercises given to CDP were effective in parameters related to edema, exercise capacity, physical activity level, balance, lower extremity functionality and quality of life. It was concluded that core stabilization exercises are an alternative option for the treatment of lower extremity lymphedema.

Keywords: Cancer Related Lymphedema, Complex Decongestive Physiotherapy, Core Stabilization Exercises, Quality of Life
The effect of clinical pilates exercises on pain, quality of life, depression and aerobic capacity in the treatment of secondary lymphedema

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¹Free physiotherapist
²Hitit University, Faculty of Medicine, Department of Physical Medicine and Rehabilitation
³Istanbul Bilgi University Department of Physiotherapy and Rehabilitation

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Objectives: The aim of this study was to investigate the effect of clinical pilates exercises combined with complex decongestive therapy (CDT) on pain, physical activity, depression, quality of life, aerobic capacity and posture in the treatment of upper extremity lymph edema secondary to breast cancer.

Background: Lymphedema is defined as disruption of lymphatic flow and interstitial accumulation of protein-rich fluid due to injury, infection, or congenital abnormalities of the lymphatic system. Lymphedema that occurs as a result of disease or treatments is secondary lymphedema. When we look at lymphedema cases, it is seen that most of them are secondary and occur due to malignancy or its treatment. Upper extremity lymphedema is seen in 2-83% of breast cancer patients after treatment.

Methods: Twenty-two patients with secondary lymphedema were included in the study. Patients were randomly divided into 2 groups as clinical pilates group (CPG) and control group (CG). Both groups received CDT program for 3 weeks, 5 days a week. For CPG, in addition to CDT, group sessions with clinical pilates exercises were performed every other day, 3 days a week. Edema assessment was performed by circumferential measurement. Pain intensity was assessed by Visual Analog Scale (VAS), quality of life by SF-36 and Quick Questionnaire for Shoulder and Hand Disability (QDASH), depression by Beck Depression Scale (BDS), posture by New York Posture Analysis Method of the Body (NYPAY), and aerobic capacity by 6-minute walking test. All evaluations were performed before and after treatment.

Results: The mean age and body mass index of the groups were similar (p>0.05). In the pretreatment evaluation, all parameters except NYPAY were similar between the groups (p>0.05). Pre- and post-treatment pain, feeling of fullness, depression, NYPAY, QDASH parameters and all subgroups of SF-36 showed improvement in both groups (p<0.05), and significant improvement was found in favor of CPG in intergroup comparison (p<0.05). 6DYT was significantly increased only in CPG (p<0.05) but there was no significant difference between the groups (p>0.05).

Initial and Final Evaluation Results of Research Participants in Clinical Pilates and Normal Treatment Groups with Various Parameters
<table>
<thead>
<tr>
<th></th>
<th>Clinical pilates group</th>
<th>Control group</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pain 1</strong></td>
<td>5,90±2,34</td>
<td>6,81±1,83</td>
<td>0.406</td>
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<tr>
<td><strong>Pain 2</strong></td>
<td>1,36±,674</td>
<td>1,90±1,64</td>
<td>0.023</td>
</tr>
<tr>
<td><strong>p value</strong></td>
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<td>0.003</td>
<td></td>
</tr>
<tr>
<td><strong>Heaviness 1</strong></td>
<td>6,00±2,32</td>
<td>6,90±3,11</td>
<td>0.232</td>
</tr>
<tr>
<td><strong>Heaviness 2</strong></td>
<td>54±820</td>
<td>3,18±1,25</td>
<td>0.000</td>
</tr>
<tr>
<td><strong>p value</strong></td>
<td>0.003</td>
<td>0.005</td>
<td></td>
</tr>
<tr>
<td><strong>6MWT 1</strong></td>
<td>968,4±1756,9</td>
<td>1452,6±2257,03</td>
<td>0.374</td>
</tr>
<tr>
<td><strong>6MWT 2</strong></td>
<td>1594,3±2428,7</td>
<td>1076,8±1227,2</td>
<td>0.793</td>
</tr>
<tr>
<td><strong>p value</strong></td>
<td>0.003</td>
<td>0.286</td>
<td></td>
</tr>
<tr>
<td><strong>Depression 1</strong></td>
<td>16,55±5,98</td>
<td>20,55±8,63</td>
<td>0.340</td>
</tr>
<tr>
<td><strong>Depression 2</strong></td>
<td>7,27±4,62</td>
<td>16,45±7,54</td>
<td>0.002</td>
</tr>
<tr>
<td><strong>p value</strong></td>
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<td></td>
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<tr>
<td><strong>NYPAY 1</strong></td>
<td>48,82±7,23</td>
<td>40,64±8,18</td>
<td>0.029</td>
</tr>
<tr>
<td><strong>NYPAY 2</strong></td>
<td>62,09±2,73</td>
<td>44,64±9,15</td>
<td>0.000</td>
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<tr>
<td><strong>p value</strong></td>
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<td>0.007</td>
<td></td>
</tr>
<tr>
<td><strong>QDASH 1</strong></td>
<td>48,14±20,62</td>
<td>54,55±18,79</td>
<td>0.374</td>
</tr>
<tr>
<td><strong>QDASH 2</strong></td>
<td>10,12±4,91</td>
<td>38,43±13,42</td>
<td>0.000</td>
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<tr>
<td><strong>p value</strong></td>
<td>0.003</td>
<td>0.005</td>
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</tr>
</tbody>
</table>

**Conclusions:** In patients with upper extremity lymphedema due to breast cancer, the effects of clinical pilates exercises combined with CDT on pain, physical activity, mood, quality of life and posture are more effective than standard CDT. However, there is no significant difference between them in terms of aerobic capacity.

**Keywords:** Upper extremity lymphedema, breast cancer, clinical pilates exercises, quality of life
A Comparison of the Efficacy of High-Intensity and Low-Intensity Resistive Exercises Applied to Patients with Upper Extremity Lymphedema

Esra Konur

Biruni University

Objectives: The aim of this study is to compare the efficacy of resistive exercises applied at different intensities in patients with upper extremity lymphedema.

Background: Lymphedema is a condition characterized by the accumulation of protein-rich fluid in the subcutaneous tissue of the affected body regions. Complex Decongestive Physiotherapy (CDP) is considered the gold standard in treatment, and one of the components of CDP is exercise. The literature contains many positive effects of exercise application in lymphedema. One type of these exercises is resistive exercises. To compare the effectiveness of resistive exercises, it is suggested to compare resistive exercises in terms of intensity, volume, and frequency for more effective results in exercise programs.

Methods: Patients aged between 35 and 60 were included in the study. Participants were randomized into two groups: High-Intensity Resistive Exercise (HIRE) Group (n=18), and Low-Intensity Resistive Exercise (LIRE) Group (n=18). Participants received Manual
Lymphatic Drainage (MLD) and compression therapy with bandages for 5 days a week for a total of 2 weeks. Resistive exercises were applied two days a week. In the HIRE Group, exercises were performed at 80% of one maximum repetition, and in the LIRE Group, at 30% of maximum repetition, with 2 sets of 8/10 repetitions in the first week, and 3 sets of 8/10 repetitions in the second week. In addition, patients were continued home exercises for 2 weeks, and evaluations were repeated at the end of the 4th week. Data collection tools included; perimeter measurement, lymphedema symptom severities, McGill pain questionnaire, disability of arm, shoulder and hand questionnaire (DASH), lymphedema life impact scale, lymphoedema functioning, disability and health questionnaire (LOICF), jamar hand dynamometer, and pinchmeter.

**Results:** At the end of the treatment, all measurements in the LIRE and HIRE groups showed significant improvement, except for the lateral finger grip (p<0.05). Both our primary measurements, such as arm volume, grip strength, percent change of excess volume; our secondary measurements, including swelling, tightness, and heaviness sensations, upper extremity functional status, quality of life, and finger grip strength, showed improvement in both groups. An increase in grip strength, a decrease in PCEV (%), and a reduction in the sensation of tightness showed more significant improvement in the HIRE group, demonstrating differences between the groups.

**Conclusions:** Both LIRE and HIRE training led to similar improvements in perimeter measurements, lymphedema symptoms, pain, muscle strength, and quality of life, both methods can be used in the treatment of lymphedema without increasing symptoms.

**Keywords:** Exercise intensity, Lymphedema, Exercise in Lymphedema
Assessment Of Resting Microcirculation In Lipedema Using Laser Doppler Flowmetry

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Objectives: Our aim was to compare the ankle-brachial index (ABI) and Laser Doppler Flowmetry (LDF) results in persons with and without lipedema.

Background: Lipedema is chronic and usually progressive debilitating disease characterized by symmetric enlargement of painful nodular and fibrotic adipose tissue mostly affecting lower body half. Even in early stages lymphatic circulation appeared to be compromised and lipedema is associated with increased aortic stiffness and altered heart left ventricular mechanics. Regarding capillary circulation patients usually complain of skin coldness and capillary fragility is a typical feature however extensive research of blood microcirculation of lipedematous skin is scarce.

Methods: We have included 14 patients with stage 2 lipedema and 10 control persons in the clinical study. ABI was measured bilaterally. LDF measurements were conducted on medial sides of both lower limbs using Periscan PIM 3 (Perimed AB, Jarfalla, Sweden) at rest in supine position, measuring the peak and mean Doppler Perfusion Units (pDPU and mDPU; respectively).

Results: Patient and control demographics did not show differences in ABI, blood pressure (RR), waist-to-hip and waist-to-height ratios (p>0.05). There were statistically non-significant differences in mDPU and pDPU between patient and control groups (p>0.05).

Conclusions: Resting cutaneous microcirculatory values measured by LDF did not show differences between lipedematous and non-lipedematous legs.

Keywords: lipedema, laser doppler flowmetry, blood microcirculation
Lipedema or Lipalgia?: An ultrasonographic study protocol

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¹Ankara Bilkent City Hospital, Physical Medicine and Rehabilitation

Objectives: The aim of the study is to identify patients as lipalgia or lipedema by imaging with ultrasound. What percentage of what we think is lipedema is actually lipedema?

Background: Lipedema is an adipose tissue disorder and characterized by deposition of abnormal fat in upper, lower limbs and/or trunk. Significant enlargements, especially in the lower extremities, are generally seen in female patients and are painful. It does not leave a pit and ends at the ankles. Pathological fat tissue deposition may have an orange peel appearance or nodular shape. Although the name lipedema can mean an edematous subcutaneous tissue, edema is generally not detected in the subcutaneous tissue by ultrasonographic imaging in all cases, so the definition of lipalgia has recently entered the literature (1,2).

Methods: It is planned as an cross sectional study. Clinically lipedema diagnosed patients that > 18 year-old are going to participate the study and carry out in the Ankara Bilkent City Hospital, Physical medicine and Rehabilitation outpatient clinics. Patients with cardiovascular diseases, lymphedema, chronic renal or liver disease, any rheumatologic disease or neurologic disease that can cause immobility are going to exclude from the study. Sociodemographic and clinical characteristics will be recorded and participants will be evaluated physically and ultrasonographically (1-3).

Results: This study is started to carry out in Ankara Bilkent City Hospital, Physical medicine and Rehabilitation clinics and preliminary results would be presented at the time of congress.

Conclusions: This study is started to carry out in Ankara Bilkent City Hospital, Physical medicine and Rehabilitation clinics and preliminary results would be presented at the time of congress.

Keywords: Lipedema, Lipalgia, Ultrasound
Multifaceted Treatment of Lipedema: A Case Series

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\textsuperscript{2}Gülhane Eğitim ve Araştırma Hastanesi Kalp ve Damar Cerrahisi
\textsuperscript{3}Prof. Dr. Suat Doğancı Muayenehanesi
\textsuperscript{4}Dr. Rengin Yılmaz Muayenehanesi

Hatice Durmuş / Hacettepe Üniversitesi Fizik Tedavi ve Rehabetasyon Fakültesi

**Objectives:** This study was planned to investigate the efficacy of a treatment protocol consisting of Low Intensity Extracorporeal Shock Wave Therapy (LiESWT), pneumatic compression application and recommendations on lipedema patients.

**Background:** We aimed to see whether the versatile designed treatment is effective in the treatment of lipedema and to measure the effect of LiESWT on lower extremity circumference measurement.

**Methods:** A total of 12 female patients diagnosed with lipedema were included in the study. The patients’ lower extremities underwent treatment twice a week for five weeks, involving both Low-Intensity Extracorporeal Shock Wave Therapy (LiESWT) and pneumatic compression device application. LiESWT was administered using the Modus ESWT® Focused Shockwave Therapy (İnceler Medikal Ankara) device, targeting the anterior part of the extremities in one session and the posterior part in another session. A total of 6000 pulses were delivered along the length of the extremities at a rate of 4 pulses per second. The average intensity used was 0.23 mJ/mm\textsuperscript{2} for the thigh and 0.18 mJ/mm\textsuperscript{2} for the lower leg. Subsequently, patients underwent 30 minutes of pneumatic compression device treatment. At the beginning of the treatment, patients were advised to follow a diet under the guidance of a dietitian and engage in exercise. To assess effectiveness, circumference measurements were taken from specific points before and after treatment for both groups.

**Results:** In the patient group with a mean age of 44.4±13.8, significant improvements were found in the circumference measurements at all levels measured in both extremities, compared to before treatment (p<0.005). The demographic data and treatment outcomes of the patients are presented in Table-1.

<table>
<thead>
<tr>
<th></th>
<th>Right Thigh 1</th>
<th>Left Thigh 1</th>
<th>Right Below Knee 1</th>
<th>Left Below Knee 1</th>
<th>Right Ankle 1</th>
<th>Left Ankle 1</th>
<th>Right Thigh 2</th>
<th>Left Thigh 2</th>
<th>Right Below Knee 2</th>
<th>Left Below Knee 2</th>
<th>Right Ankle 2</th>
<th>Left Ankle 2</th>
</tr>
</thead>
</table>

Table-1
Conclusions: The treatment protocol consisting of LiESWT, pneumatic compression and recommendations is among the methods that are effective, reliable and can be used in the treatment of lipedema.

Keywords: Lipedema, Low Intensity Extracorporeal Shock Wave Therapy, Pneumatic Compression, Modus ESWT ® Focused Shockwave Therapy
Two diseases of soft tissue: Fibromyalgia and Lipedema

Mihrinur Dilvin TÜRKÖZ¹, Benay SARI¹, Zerrin KASAP¹

¹Giresun University

Objectives: The aim of this study was to determine how many patients with lipedema met the diagnostic criteria for FMS, the effect of lipedema and FMS on pain, fatigue, and quality of life, and the relationship of lipedema disease data with fibromyalgia.

Background: Fibromyalgia and lipedema are health conditions that have a serious impact on chronic pain and quality of life. Fibromyalgia is a chronic condition characterized by widespread pain, sleep disturbances, fatigue and mood symptoms. Lipedema is a disease characterized by excessive fat accumulation, usually in the legs, buttocks and arms, and is associated with pain, swelling and tenderness. Researches has demonstrated that lipedema and fibromyalgia often coexist.

Methods: Thirty-one female patients diagnosed with lipedema and 31 volunteers without known disease were included in the study. Symptom Severity Scale (SSS), Widespread Pain Index (WPI) and Fibromyalgia Severity Score (FS), were calculated for FMS diagnosis. Pain intensity was evaluated by Visual Analog Scale (VAS) and Pressure Pain Thresholds (PPT) by algometry. Lower extremity volumes of the lipedema group were measured by circumferential measurements and fat mass were measured by dual X-ray absorptiometry. The 36-Item Short Form Health Survey (SF-36), fatigue severity scale (FSS) and fibromyalgia impact questionnaire (FIQ) were applied to both groups.

Results: The rate of people who met the diagnostic criteria for FMS was higher in the lipedema group (%64.5 vs %16.7) (p<0.001). WPI, FS, FIQ, VAS, and FSS scores were higher, and bilateral PPTs (R/L) were lower (p=0.003, p=0.004, p=0.001, <0.001, p=0.024, p=0.001/p=0.01 respectively). Also, physical function, role-emotional, vitality, pain, and general health parameters of the SF-36 were lower in the lipedema group (p=0.001, p=0.012, p=0.011, p=0.05, p=0.008, respectively). When the lipedema group was divided into two groups as lipedema with and without FMS, there weren’t statistically significant differences in terms of lower extremity volumes, total and lower extremity fat mass, and SF-36 scores (p>0.05).

Conclusions: The results show that fibromyalgia is quite common in lipedema and lipedema patients' quality of life is poorer than controls. There wasn't any relationship between lipedema disease data and FMS. Lipedema and FMS usually accompany each other and it is difficult to distinguish them. If lipedema patients are co-diagnosed with FMS, its treatment should also be considered to improve the quality of life of patients and reduce their pain.

Keywords: Lipedema, fibromyalgia, soft tissue thickness, pain
The Role Of Inflammation in Lipedema: Neutrophil Lymphocyte Ratio, Platelet Volume, Platelet Distribution Range

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¹Hitit University Faculty of Medicine, Department of Physical Medicine and Rehabilitation, Çorum
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Ayla Cagliyan Turk / Hitit University Faculty of Medicine, Department of Physical Medicine and Rehabilitation, Çorum

Objectives: In this study, we aimed to examine the neutrophil-lymphocyte ratio, platelet volume and platelet distribution range in order to demonstrate the role of inflammation in lipedema.

Background: Although various distinctive morphological features such as hyperproliferation of fat cells, fibrosis and inflammation have been identified in lipedema progression, the mechanisms underlying these changes are not yet fully known.

Methods: Our retrospectively designed study included 60 lipedema and 40 healthy controls. Age, height, weight, body mass index (BMI), lipedema type and stage of the patient group were recorded from retrospective records. Additionally, the patients' hemogram results were obtained. The healthy group was selected from hospital staff. Hemoglobin, leukocyte, lymphocyte, neutrophil, platelet, mean platelet volume (MPV), platelet distribution width (PDW), neutrophil lymphocyte ratio (NLR), C-reactive protein (CRP) and erythrocyte sedimentation rate (ESR) of all participants were evaluated.

Results: The mean age was 45.45±10.17 years in Group 1 and 44.90±10.69 years in Group 2, there was no significant difference between the groups (p>0.05). Body mass index was 32.15±5.05 in the patient group and 30.94±4.98 in the control group, which were similar (p>0.05). While Type 2 Lipedema was the most common type, ESR was similar between groups (p>0.05). CRP was 4.97±3.15 in Group 1 and 3.46±0.54 in Group 2, and there was a statistically significant difference between them (p<0.05). While hemoglobin, leukocyte, lymphocyte and neutrophil counts were similar between groups, platelet count was significantly higher in the patient group (p<0.05). NLR was 2.10±0.76 in the patient group and 1.68±0.40 in the control group, and the difference between them was significant (p<0.05). MPV and PDW were similar between groups (p>0.05). A positive correlation was detected between BMI and leukocyte and CRP, and a positive correlation was found between age and leukocyte (p<0.05).
Comparison of demographic and laboratory parameters of patient and control groups

<table>
<thead>
<tr>
<th></th>
<th>Lipedema</th>
<th>Control</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year</td>
<td>45.45±10.17</td>
<td>44.90±10.69</td>
<td>0.796</td>
</tr>
<tr>
<td>BMI</td>
<td>32.15±5.05</td>
<td>30.94±4.98</td>
<td>0.242</td>
</tr>
<tr>
<td>Hemoglobin</td>
<td>13.33±1.03</td>
<td>13.29±1.33</td>
<td>0.941</td>
</tr>
<tr>
<td>Leukocyte</td>
<td>7.44±1.79</td>
<td>6.89±1.27</td>
<td>0.098</td>
</tr>
<tr>
<td>Monocyte</td>
<td>0.52±0.14</td>
<td>0.48±0.11</td>
<td>0.126</td>
</tr>
<tr>
<td>Neutrophil</td>
<td>4.47±0.89</td>
<td>3.89±0.57</td>
<td>0.059</td>
</tr>
<tr>
<td>Lymphocyte</td>
<td>2.25±0.57</td>
<td>2.36±0.52</td>
<td>0.327</td>
</tr>
<tr>
<td>NLR</td>
<td>2.10±0.76</td>
<td>1.68±0.40</td>
<td>0.002</td>
</tr>
<tr>
<td>Platelet</td>
<td>300.52±81.02</td>
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</tr>
<tr>
<td>MPV</td>
<td>10.59±0.85</td>
<td>10.56±0.79</td>
<td>0.844</td>
</tr>
<tr>
<td>PDW</td>
<td>12.34±1.85</td>
<td>12.28±1.21</td>
<td>0.855</td>
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<tr>
<td>25 OH Vit D</td>
<td>18.63±11.04</td>
<td>16.95±8.40</td>
<td>0.673</td>
</tr>
<tr>
<td>Vitamin B12</td>
<td>352.59±136.28</td>
<td>370.65±193.64</td>
<td>0.784</td>
</tr>
<tr>
<td>ESR</td>
<td>18.62±10.25</td>
<td>17.05±7.55</td>
<td>0.855</td>
</tr>
<tr>
<td>CRP</td>
<td>4.97±3.15</td>
<td>3.46±0.54</td>
<td>0.001</td>
</tr>
</tbody>
</table>

**Conclusions:** In our study investigating inflammation in lipedema, the etiology of which is still unknown, neutrophil-lymphocyte ratio and platelet count were found to be high in the patient group. The increase in body mass index, leukocyte and CRP. This situation is important in terms of elucidating the etiopathogenesis of the disease and we think that it will shed light on new studies on the subject.

**Keywords:** Lipedema, Inflammation, Neutrophil Lymphocyte Ratio, Platelet Volume
Is The Pain In Lipedema A Neuropathic Pain?

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Nihan Erdinç Gündüz / Dokuz Eylül University, Faculty of Medicine, Department of Physical Medicine and Rehabilitation, İzmir, Turkey

Objectives: The aim of this study is to investigate whether the pain in lipedema has the character of neuropathic pain and to evaluate the effects of lipedema on patients’ quality of life and psychosocial status.

Background: Pain is a common symptom among patients with lipedema. The mechanism of pain in lipedema is uncertain. The unclear nature of the pain adversely affects the diagnosis and treatment process. There is a lack of studies in the literature investigating whether the pain in lipedema patients is nociceptive or neuropathic.

Methods: The study included 43 patients diagnosed with lipedema and complaining of pain who applied to the Physical Medicine and Rehabilitation Outpatient Clinic, as well as a control group consisting of 42 patients diagnosed with acute subacromial impingement syndrome (SIS) and experiencing shoulder pain for less than 3 months as a nociceptive pain model. Patients’ pain characteristics were assessed using the LANSS Pain Scale and the PainDETECT Pain Questionnaire. Quality of life was evaluated using the Nottingham Health Profile. The presence of depression and anxiety was assessed using the Hospital Anxiety and Depression Scale questionnaires. Data were evaluated comparatively between the lipedema and control SIS groups.

Results: 65.1% of lipedema patients were type 3 lipedema. 69.8% of patients were classified as Stage 2. There was no statistically significant difference between the groups in terms of age, height, education level, occupation, or presence of comorbidities (p>0.05). The mean BMI was statistically significantly higher in the lipedema group compared to the SIS group (p=0.03). According to the LANSS Pain Scale and PainDETECT Pain Questionnaire, prevalence of neuropathic pain in the lipedema group was significantly higher(p<0.001). Also, in the lipedema group, LANSS and PainDETECT scores were found to be statistically significantly higher compared to the SIS group (p<0.001). No correlation was present among the LANSS and PainDETECT with the duration of symptoms and the lipedema stage (p>0.05). Nottingham Health Profile scores were significantly higher in the lipedema group, indicating lower quality of life compared to the SIS group (p<0.001). There was no statistically significant difference in the presence of anxiety and depression between the groups (p>0.05).
Conclusions: These findings suggest that neuropathic pain may be present in patients with lipedema, highlighting the importance of accurately identifying pain to improve quality of life and psychosocial well-being, as well as to facilitate diagnosis and treatment processes. Further studies are warranted to confirm these findings and explore potential therapeutic interventions for neuropathic pain in lipedema patients.

Keywords: Lipedema, Neuropathic Pain, Acute Subacromial Impingement Syndrome
Relationship of the Tissue Stiffness Measured Using Shear Wave Elastography with the Pain Threshold and Quality of Life of Patients with Lipedema: A Cross-sectional Study

Feyza Akan Begoğlu¹, Gülcan Öztürk¹

¹Fatih Sultan Mehmet Research and Training Hospital

Objectives: This study aimed to assess the relationship between disease severity in patients diagnosed with lipedema and tissue stiffness measured using shear wave elastography (SWE) concerning pain threshold and quality of life as well as determine differences in subcutaneous tissue stiffness between patients with lipedema and healthy subjects.

Background: Lipedema is a chronic connective tissue disorder characterized by abnormal subcutaneous adipose tissue storage and distribution. Pain is a prevalent symptom in patients with lipedema. The pathogenesis of pain in lipedema and morphological changes in subcutaneous fat tissue have not yet been fully elucidated.

Methods: Seventy-one participants were subjected to measurements using subcutaneous tissue elastic modulus with SWE imaging of lower limbs at three anatomical levels. The participants were divided into two groups: those diagnosed with lipedema (group 1) (n=35) and those without a lipedema diagnosis (group 2) (n=36). Patients with lipedema were further categorized into three stages based on disease severity. Pain levels were assessed using the visual analog scale (VAS), algometric measurement, and EQ-5D general quality of life scale.

Results: The mean elastic modulus for the right thigh, left thigh, and right pretibial was statistically significantly lower in group 1 than in group 2 (p<0.05). The mean right thigh elastic modulus in patients with stage 3 lipedema was significantly lower than that in the control group (p<0.05). The mean right pretibial region elastic modulus in stage 3 cases was significantly lower than that in stage 2 cases and the control group (p<0.05). No statistically significant differences were observed in elastic modulus between various stages for the right thigh and right pretibial region (p>0.05). Similarly, no statistically significant differences in elastic modulus were observed between patients with lipedema and controls for the left thigh, left pretibial region, and right and left supramalleolar regions (p>0.05). The mean spontaneous and palpation VAS scores in stage 1 cases were significantly lower than those in stage 2 and 3 cases (p<0.05). No statistically significant difference was observed between stage 2 and 3 lipedema patients (p>0.05). The EQ-5D VAS scores of the control group were significantly lower than those of stage 1, 2, and 3 cases (p<0.05). No significant difference was observed in algometric measurements and EQ-5D total scores between the stages of lipedema (p>0.05).
Conclusions: SWE revealed increased subcutaneous tissue elasticity in patients with lipedema. Notably, stage 3 lipedema patients exhibited higher subcutaneous tissue elasticity. Moreover, pain parameters and disability were not related to disease severity.

Keywords: Lipedema, shear wave elastography, pain, quality of life
Body Composition by Bioelectrical Impedance and Ultrasonographic Findings in a Group of Patients with Lipoedema and Lower-limb Lymphedema: Relation with Quality of Life and Functional Status

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¹University of Health Sciences Ankara City Hospital, Rehabilitation Hospital, Ankara 06800, Turkey

Kerim Demirsöz / University of Health Sciences Ankara City Hospital, Rehabilitation Hospital, Ankara 06800, Turkey

**Objectives:** The aim of our study was to comparatively evaluate body composition in patients with lymphedema and lipoedema and to investigate the relationship between the body composition variables and quality of life (QoL), functional status and ultrasonographic (US) measurements.

**Background:** There is no study in the literature that uses bioelectrical impedance analysis and ultrasonographic measurements in the same study, compares their results, and investigates their relationship with quality of life and functional status.

**Methods:** This single-center observational case-control study included women with lower-extremity lymphedema and lipoedema, and control subjects. The demographic and clinical variables of the subjects were recorded. The body composition was measured by bioelectrical-impedance, in regard to whole fat-free mass, fat-mass ad total body water. Skin and subcutaneous tissue thickness measurements were made by US examination. In addition EQ-5D-3L/LYMQOL, LEFS and VAS-pain scales were applied to the subjects to determine generic/disease-specific-QoL, functional status and pain intensity respectively.

**Results:** According to the inclusion and exclusion criteria; 44 subjects (22 lower-extremity lymphedema, 22-lipoedema), who submitted to the outpatient-clinic of PMR in a tertiary hospital, and 22 volunteered control subjects, were included to the study. The demographic variables were similar but disease duration was longer in lipoedema group. The lipoedema patients had a higher total fat-mass and a lower body-water than in other groups. The thigh and crus subcutaneous tissues and skin tissues of lipoedema and lymphedema patients respectively, were thicker and more hypoechoic than in other subjects. The generic and disease-related quality of life and functional status of lymphedema and lipoedema patients were similar and lower than in control group. Pain intensity was higher in lymphedema patients than in lipoedema group. The US variables were correlated with body composition variables, pain, QoL and functional scores in both patient groups.

**Conclusions:** The body components and US characteristics of lymphedema and lipoedema patients were different and correlated with pain, quality of life and functionality. The
subcutaneous tissue was affected in patients with lipedema and skin involvement was prominent in patients with lymphedema. Lymphedema caused more pain than in lipedema and but both conditions had similar impact on QoL and functional status. In conclusion body components and US findings may be helpful in differential diagnosis of these chronic conditions. Early diagnosis and treatment are important in order to improve quality of life and functionality in patients suffering from lower extremity lymphedema and lipedema.

**Keywords**: lymphedema, lipedema, bioelectrical impedance, ultrasonography
BEHIND THE SCENES: THE DIELECTRIC VALUES OF MALES WITH OR WITHOUT SUFFERING FROM BREAST CANCER-RELATED LYMPHEDEMA: A PILOT STUDY

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¹İzmir Bakırçay Üniversitesi

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Objectives: Although there is no study exists in which TDC values are measured in males with or without breast cancer-related lymphedema (BCRL), this pilot study showed that males with BCRL showed higher TDC values than those without.

Background: Male breast cancer is worth to be noticed due to its increasing incidence recently. Not only for early diagnosis of BCRL but also for tracking changes objectively is of utmost importance. In this regard, the Tissue Dielectric Constant (TDC) method carries a great opportunity to measure and quantify dielectric values that are directly related to local tissue water. To the best of our knowledge, there is no study in which the TDC values are compared in patients with BC in males with or without BCRL.

Methods: Moisture Meter-D was used to assess patients’ dielectric values in both upper extremities in the following measurement sites after marking with a soft pen: 8 cm upper and 6 cm lower sites of the cubital crease and 10 cm lower site of the axilla for the arm, forearm, and thorax points, respectively. A triplicate measurement was performed on each reference point and the mean of them was recorded for each different penetration depth probe as follows: 0.5, 1.5, 2.5-, and 5.0 mm.

Results: 7 male patients with a history of BC (5 BCRL, 2 non-BCRL) were included in this study. Mean age and BMI were found as 61.43±8.42 years and 27.14±2.24 kg/m², respectively. Group comparisons in TDC ratios (affected/unaffected) patients with and without BCRL showed significant differences in 1.5-mm depth probe in the arm (.95 vs 1.43, p=.029) and thorax (.93 vs. 1.19, p=.002). The forearm TDC ratio reached significance only in the 5.0-mm depth probe between groups (.94 vs. 1.53, p=.023). All TDC values gathered from four different probes showed significant differences in affected sites’ reference points in the arm and forearm except for thorax reference points (p<.05).

Comparison of TDC values and ratios of patients with and without BCRL

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**Conclusions:** The findings of this pilot study showed that patients with BCRL had significantly higher TDC values than those without BCRL in the affected sites’ reference points as expected. Yet, when considering and comparing these values to the reported values of TDC in women with or without BCRL, males showed greater TDC values. Although this was a pilot study and we only had 2 males without BCRL, setting the threshold for 1.25-1.30 for inter-arm TDC ratio (Mean±2SD) whether having BCRL or not might be plausible to expect for further studies according to our findings.

**Keywords:** Breast Cancer, Breast Cancer Related Lymphedema, Tissue Dielectric Constant, Male Breast Cancer
Moisturemeter: Can we measure different values in the breast before cancer really develops: a pilot study

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**Objectives:** Generally, 1 on 7 women develop breast cancer. In Belgium, women from 50 years old are invited by the government, to have a mammography by the radiologist to check their breasts. For 95% of the women this is an appropriate age to check, but perhaps we can make this number higher, with a non-invasive technique. If we divide the breast in 4 quadrants, we see that the quadrant, closest to the axillary region is the lowest PWC (percentage water content).

**Background:** The moisture meter was developed by Delfin and is a useful device for measuring changes in BCRAL and other edemas. As physiotherapist and Drs-lecturer, I wondered if we could find out if there was a quicker way to find out if the lymph system is disturbed. Together with radiologists, who are doing the mammography, we tried to find out if there is a connection between a positive mammography and the measurements in the 4 quadrants of the breast.

**Methods:** The breasts of our patients will be measured at the 4 quadrants between 2-3 cm away from the nipple. Included: all patients who come to the radiologist for a breast controlling mammography. Control group: 100 young and healthy women without any complaints. Excluded: women breast feeding, women who already had breast operations.

**Results:** In progress

**Conclusions:** In normal situations the subclavicular quadrant (quadrant 4) is the lowest value. Is the value higher when women have a positive mammography for breast cancer or does it stay lower? Can we use the moisturemeter to check already earlier the breast of the patient and prevent worse situations?

**Keywords:** bral, moisturemeter, prevention
MULTIFUNCTIONAL EDEMA TRACKING DEVICE

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Objectives: TECHNICAL FIELD The invention relates to a device that can be used automatically and manually, can be integrated with patient monitors, can be used for measurements such as head circumference, abdominal circumference, arm circumference in infants and children, and can measure edema in infants, children and adults.

Background: BRIEF DESCRIPTION OF THE INVENTION The invention has a touch screen where patient data can be entered in order to be used in people of all ages, it can connect with other medical products, it is easy to determine the ankle circumference in the inpatients and edema in the early period, and it can be used for measuring, recording and also for tracking of the head circumference, abdomen circumference, arm circumference in infants and children.

Methods: DETAILED DESCRIPTION OF THE INVENTION The edema tracking device subject to our invention comprises;
- Integrated connection gateway that allows connection to devices such as intravenous pumps, ventilators, beds and other patient monitors,
- Automatic usage that allows measurement at specified time intervals when plugged in, and manual use modes that allow it to measure (single) by adjusting manually when desired,
- Touch screen interface where patient data can be entered so that it can be used in people of all ages,
- Wireless network protocol to enable connection with other medical products,
- Battery that allows external use,
- For keeping the data records of the measurements made, the healthy/sick individuals once enter gender, day / month / year, chronological age calculation (thanks to the program) height, weight, head circumference; for babies younger than 18 months, the ability to measure head circumference in older adults and evaluate it with special formulas.

Results: The device can be used for one measurement when desired, or it can be used for more than one measurement per day. In healthy individuals, at least two measurements are recommended daily, once in the morning and once in the evening. The number of measurements can be increased by determining this number according to individual differences in patients with circulatory system, renal system and cardiovascular system diseases.

Conclusions: It will be easy to determine the edema in the early period by measuring the ankle circumference, especially since inpatients' weight cannot be monitored daily. Apart from edema follow-up, possible fluid losses can be identified, especially in infants. It can also be used for measuring, recording and monitoring the head circumference in infants (younger than 18 months).

Keywords: Multifunctional, Edema, Tracking Device, Technological Application
Objectives: To enhance the MR lymphography protocol in order to evaluate secondary vascular changes at the injury site, facilitating treatment and rehabilitation planning for patients with comminuted ankle joint fractures.

Background: Success in treating patients with multifragmented ankle joint fractures is hindered by the development and spread of limb edema. Post-traumatic edema is often underestimated in when manifesting as secondary lymphedema and can lead to functional pathology in the affected joint. MR lymphography is an optimal method for visualizing deep lymphatic vessels damaged in limb fractures.

Methods: From 2021 to 2023, 33 patients (26 males, 7 females; mean age 41.6±3.8 years) were observed. The study included patients with unstable fractures involving two or more components of the ankle joint. After cast removal, significant edema of the injured limb was observed. All patients underwent contrast-enhanced MR lymphography using a 1.5 Tesla MRI machine. Gadopentetate dimeglumine 0.1 mmol/kg and 2% lidocaine solution was injected subcutaneously in the interdigital spaces on the dorsal aspect of the injured and healthy limbs. Real-time assessment was done on T1, T2, and T2-STIR-weighted MR images in three projections, both native and with contrast enhancement. Lymphatic vessels were visualized in dynamic studies at 5, 15, 25, 35, 55, 60 minutes.

Results: Based on the data, patients were divided into three groups. The first group (17 patients) showed diffuse skin and subcutaneous tissue edema around the ankle joint on MR images, with fluid in the subtalar joint cavity and increased signal on T2-weighted images, indicating post-traumatic edema without anatomical disruption of lymphatic collectors. The second group (n=11) exhibited dilated lymphatic vessels distal to the injury site, collateral lymphangiectasia, subcutaneous edema, and extravasation at the fracture site. The smallest third group (5 patients)
showed lymphatic vessel hypoplasia at the fracture level and partially visualized contralateral lymphatic transport pathways above the knee joint. Treatment and rehabilitation plans were developed individually for each patient group based on these findings and clinical presentation.

Post-traumatic edema of the right lower limb

3D frontal spoiled gradient-echo MIP(Maximum Intensity Projection) after 55 minutes the lymph flow is not disrupted, collateral vessels are clearly visible. There is diffuse edema of the subcutaneous tissue around the right ankle joint.

Contrast-enhanced MR lymphography of the lower extremities after gadopentetate injection

MRL in a 51-year-old women with secondary lymphedema of the left lower limb, fractures of the lateral malleolus and calcaneus, and a history of rheumatoid arthritis

Conclusions: 1. Minimum requirements for MR lymphography protocol: scanner of at least 1.5 Tesla, image sequences with T1, T2, and T2-STIR weighting, evaluation after 30 minutes post-contrast administration, and a maximum examination time of about one hour for clinical significance. 2. An optimized MR lymphography protocol allows visualization of peripheral lymphatic system anatomy, giving detailed insight into post-traumatic edema pathology for personalized treatment and rehabilitation planning.

Keywords: MR lymphography, secondary lymphedema, post-traumatic edema, comminuted ankle joint fractures.
Objectives: Lower extremity lymphedema is a chronic condition that occurs mostly due to gynecologic malignancies and frequently affects the female population. It is a chronic disease that often requires lifelong treatment and psychosocial support that impairs quality of life in patients. The etiology of pain in patients with lower extremity lymphedema can be categorized under three headings: vascular, neurologic and musculoskeletal causes. The aim of this study was to determine the frequency and etiology of pain in patients with lower extremity lymphedema and to evaluate the effect of pain on quality of life.

Background: The word "lymphedema" describes a progressive and chronic collection of protein-rich lymphatic fluid in the interstitial space due to disruption of the lymph nodes and/or lymphatic vessels. Although lymphedema is not life-threatening, it can have detrimental consequences in terms of pain, functional impairment and reduced quality of life and infections. Pain is known to be a major problem in patients with lymphedema and affects quality of life.

Methods: The study included 38 patients with lower extremity lymphedema. Demographic and clinical information of the patients participating in the study were recorded. The differential diagnosis of lower extremity pain is divided into three categories as vascular, neurologic and musculoskeletal causes through doppler ultrasound, X-ray, MRI and ultrasound. Health-related quality of life was measured with in patients with The Lymphedema Life Impact Scale. The pain was evaluated with VAS and LANSS scores.

Results: Our study included 32 female and 5 male patients. The mean age of the patients was 55.6 years. As a result of the detailed evaluation and recording of the examination findings, 27 patients had lower extremity pain (72.9%), 1 patient had neuropathic pain (2.63%), 8 patients had only vascular pain (21.05%), 10 patients had mechanical pain (26.31%), and 9 patients had combined vascular and mechanical causes (23.68%). The intensity of pain was 6.2 in movement and the mean VAS was 2.1 at rest. According to these results, it was determined that the most common pain in patients with lymphedema was mechanical.

Conclusions: Pain is common in patients with lower extremity lymphedema and impairs quality of life. We suggest that a multidisciplinary approach may be useful in making the diagnosis and initiating the treatment plan.

Keywords: Lymphedema Life Impact Scale, Pain, Lymphedema
Turkish Translation, Reliability and Validity of the tool of Myofascial Adhesions in Patients after Breast Cancer (MAP-BC)

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Objectives: The aim of this study is to create a Turkish version of the MAP-BC (Myofascial Adhesions in Patients after Breast Cancer) Tool and to test its validity and reliability.

Background: Myofascial adhesion is an important cause of upper extremity dysfunction among breast cancer patients. Manipulation of muscles during surgery, scarring, soft tissue adhesions, adaptive posture after surgery, radiotherapy fibrosis may result in myofascial adhesions. MAP-BC is a quantitative evaluation method developed for the scar tissue and adhesions. The aim of this study is to create a Turkish version of the MAP-BC Tool and to test its validity and reliability.

Methods: This is a cross-cultural adaptation and validation study including 80 female patients aged between 18 to 90 years who have undergone breast cancer surgery. Translation and cross-cultural adaptation were performed in compliance with the international guidelines. After translation to Turkish and back to English, the researchers agreed on the final version. For convergent validity, the patients were evaluated with MAP-BC and POSAS (Patient and Observer Scar Assessment)-observer subscale. For test-retest reliability a single researcher evaluated the patients on day 0 and 14, without any therapeutic intervention. For inter-rater reliability 29 patients were additionally evaluated by a second researcher blinded to first researchers’ evaluation.

Results: The validity was found to be fair to good (rho:0.631). The ICC values of the subgroups and total scores calculated for the test-retest reliability ranged from 0.798 to 0.954, with a test-retest ICC value for the total score of 0.948; indicating good to excellent test-retest reliability of the questionnaire. Inter-rater ICC values ranged from 0.417 to 0.949, with a total score inter-rater ICC value of 0.938. This suggests good to excellent inter-rater agreement, except for the "frontal chest wall" subsection.
Conclusions: The Turkish form of MAP-BC is a valid and reliable tool for evaluating myofascial adhesions and scars after breast cancer surgery and adjuvant treatments. Clinicians are encouraged to use this tool in detection of myofascial adhesions and evaluating treatment efficacy; as this is the first tool in Turkish language to evaluate myofascial adhesions after breast cancer treatment. (Conflict of interest: There are no conflicts of personal and financial
Development And Validity of Breast Cancer Related Lymphedema Knowledge, Attitude, Practice Questionnaire-Pilot Study

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Objectives: Since there is no valid questionnaire in the literature that assesses knowledge attitudes and practice in individuals with breast cancer related lymphedema (BCRL), the aim of this study was to develop a questionnaire to objectively assess the knowledge, attitudes, and practice about BCRL in breast cancer survivors.

Background: Most breast cancer survivors have lack of awareness and knowledge about breast cancer related lymphedema itself and management. Hence, they often miss the opportunity for prevention and early interventions. Since there is no valid questionnaire in the literature that assesses knowledge attitudes and practice in individuals with BCRL, the aim of this study was to develop Breast Cancer Related Lymphedema Knowledge Attitude Practice Questionnaire (BCRL-KAP).

Methods: A pool of questions was prepared by reviewing the literature under KAP survey model. The initial BCRL-KAP Questionnaire had 21-items. Number of items were increased to 28 based on the suggestions of 6 experts. Of the 28 items, the first 10 items assess knowledge, 6 items assess attitude, and 12 items assess practice. Validity of the questionnaire was made with content and face validity. For content validity, the questionnaire was sent to 6 experts who were asked to evaluate the relevance of the items to the sub-dimension. The relevance of the items was scored on a 4-point Likert scale. While evaluating the relevance of each item for the sub-dimension, the experts were asked to give 1 point if the items were "not relevant", 2 points if they were "partially relevant", 3 points if they were "quite relevant" and 4 points if they were "very relevant". Items scoring 1 and 2 were considered irrelevant to the sub-dimensions, while items scoring 3 and 4 were considered relevant to the sub-dimensions. 13 breast cancer survivors with BCRL (n:11) and without BCRL (n:3) was participated for comprehensibility of the questionnaire for face validity.

Results: Average proportion of items judged as relevance across 6 expert was 0.98. Scale-level content validity index (S-CVI) based on the average method and S-CVI based on universal agreement method was 0.98, 0.93, respectively. Item level-CVI of items, except 13th (0.66) and 16th items, (0.83) were 1. The questionnaire was easily understood and filled by individuals.

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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Propotion revealance</td>
<td>0,96</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0,93</td>
<td>1</td>
<td><strong>0,98</strong></td>
<td><strong>0,98</strong></td>
<td><strong>0,93</strong></td>
</tr>
</tbody>
</table>

Items with 1 and 2 points were considered irrelevant to the sub-dimensions and given 0 points for analysis. Items scoring 3 and 4 were considered relevant to the sub-dimensions and given 1 point for analysis.

**Conclusions:** The BCRL-KAP Questionnaire has content and face validity. After this pilot study, it is planned to apply the questionnaire to a larger population, and then conduct internal consistency and Rasch analysis within the context of reliability.

**Keywords:** Validity, Knowledge, Breast cancer related lymphedema
A new accurate and reproducible methodology to standardize limb circumferences and volume in lymphedema

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3Belgian Society of Lymphology, Young Lymphologists Group (Belgium)

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Objectives: Precise measurements of the volume and/or circumference of a limb are essential in different pathologies (Lymphedema, lipedema, …) to ensure good medical follow-up of the patient. The aim of this new methodology (Harfouche) is to help standardizing the measurements and ease the measurement acquisition (inter assessors), by giving 2 steady landmarks (the “Reference Point” (RP) and the “Confirmation Point” (CP)).

Background: There are many different methods of measuring volume and circumference, each with its own specificities, but none of them being at the same time accurate, repeatable, reproducible, transportable, practical and easy to be used.

Methods: 57 healthy subjects took part in this study. This choice prevents the bias of edema variability. Any change in the measurements is considered as an inaccuracy. The circumference measurements were taken by the PeriKit on the upper limb. each 4 cm starting from the wrist joint as This new methodology is based on 2 points: “Reference point” on a bony steady landmark (styloide) and a “Confirmation point” That is specific and can characterise each limb (Mole, scar, tattoo,…). The measurements were retaken independently by 2 assessors with the PeriKit. The PeriBase consisted of a graduated tapeline, installed longitudinally on the limb in order to: prevent marking the skin with the ink at the landmarks - thanks to the aperture at each cm, the measurements are taken during the whole procedure exactly at the precise distance. The measurements are taken with the PeriTape, equipped with an isotonic spiral to decrease the bias of the variable tension The measurements are downloaded in the app, displaying the measurements, comparing them, and calculating the volume simultaneously.

PeriKit: Taking Measurements with the PeriTape (blue) when the PeriBase (white) insures the reproducibility of the exact place
**Results:** The results showed that, concerning the CLM, the interclass correlation (ICC) was 0.99. The Bland and Altman test confirmed the reproducibility of the concept. Concerning the reference points taking/retaking, differences were less than 2mm between the first and the second assessor.

**Conclusions:** This Methodology shows high accuracy in retaking the bony landmark RP, that can be exactly at the same place confirmed by the CP. and the mean difference between the assessors was less than 2 mm. It solved the classic error of inaccuracy accumulations between each landmark and the following one. High reproducibility: 96% of the measurements showed a difference between 0 and 0.5 cm. The Perikit can ease the measurements of the hand and the fingers. The Perikit meets the requirements to standardize the measurements taking.

**Keywords:** Volume Measurements, Circumferential Measurements, Perikit
Treatment of malignant lymphedema: importance of holistic approach

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Objectives: to develop and substantiate recommendations for the treatment of malignant lymphedema (ML), evaluate the effectiveness of the CDT technique for the treatment of such patients.

Background: according to various literature sources, secondary lymphedema of the upper limb occurs in 40-70% of patients diagnosed with breast cancer. Conservative treatment is successfully used for these patients (CDT - complex decongestive therapy) and surgery. But in some patients, lymphedema of the upper limb can be malignant (as a result of damage to the lymph lymphatic pathways (lymph nodes and vessels) due to compression or spread of tumor process). Such swelling is difficult to treat, it’s often accompanied by skin defects (skin metastases or lymphorrhea), impaired limb mobility and pain. Due to the lack of official recommendations, very often such patients are denied treatment for edema, which significantly reduces the quality of life

Methods: Scientific papers on the treatment of ML (PubMed, ResearchGate, Science Direct, etc.), as well as international recommendations and consensus documents (ISL consensus, ILF, etc.) were analyzed. According to the recommendation, a treatment plan was drawn up for patients with malignant lymphedema in 2019-2023 – 14 people. The CDT method (MLD, compression multilayer bandaging with low-tensile bandages, skin care, exercise therapy) was used with limitations (MLD was not performed in areas of metastasis; for skin defects additional antiseptic treatment and wound dressings were required; if active movements were impossible, passive movements were performed within the exercise therapy). Treatment results (quality of life, limb dimensions, motor function of the upper limb) were analyzed

Results: 14 patients were treated with CDT followed by wearing flat knitwear or bandage Velcro systems. As a result of treatment, all patients experienced a significant decrease in limb volume (20%-90%) and an increase in quality of life (the ability to self-care and usual activities, reducing the need for outside care, etc.). Patients whose movement limitation was due to edema rather than paralysis/paresis had significant improvement in upper extremity motor function. During observation no side effects of CDT were noted

Conclusions: The use of CDT for the treatment of malignant lymphedema is safe, significantly improves limb condition and function, improves the patient's quality of life. The recommendations for the ML treatment were written, which were included in the draft of
Clinical Guidelines for the treatment of lymphedema of the extremities, developed by the Russian Association of Lymphologists and the Association of Phlebologists of Russia.

**Keywords:** Malignant lymphedema, CDT in active cancer.
Kinesiophobia, physical activity levels and barriers of patients with breast cancer and breast cancer survivors compared to healthy controls

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Objectives: The aim of the present case-control study is to investigate kinesiophobia, physical activity levels and barriers to physical activity in women with breast cancer (BC) and breast cancer survivors (BC-S) compared with healthy controls (HC).

Background: Physical inactivity, which has a significant impact on quality of life, is one of the issues that should be investigated during and after breast cancer treatment. The most common and persistent barriers to physical activity during and after breast cancer treatment include pain, fatigue, bad mood, depression, anxiety, apathy and kinesiophobia.

Methods: The study included patients with BC (n=70) and BC-S (n=70) and HC (n=72). The primary outcome measures were physical activity levels, barriers to physical activity and kinesiophobia levels, and the secondary outcome measures were levels of anxiety and depression, fatigue and quality of life.

Results: The HC group had better physical activity levels, fatigue and quality of life scores than the other groups, but they had worse perceptions of physical activity, more individual, psychosocial and environmental barriers to physical activity compared to the other groups (p<0.05). The BC group had more barriers to exercise related to fear of overall body pain, poor balance, fear of falling and fear of feeling worse after exercise compared to the other groups (p<0.05). Subjects in the BC-S group, on the other hand, were more afraid that lymphedema might be exacerbated if they exercised (p<0.05).
Conclusions: The present study found that women with breast cancer and breast cancer survivors had worse scores for physical activity levels, fatigue, and quality of life compared to the healthy controls. Furthermore, all the groups were found to have a variety of barriers to physical activity. Thus, we suggest that barriers to physical activity should be treated with a special emphasis in order to promote participation in physical activity.

Keywords: Breast Neoplasms, Healthy Volunteers, Kinesiophobia, Survivors
Evaluation of Balance and Functional Status in Patients with Breast Cancer-Related Lymphedema

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Objectives: Lymphedema patients commonly experience secondary musculoskeletal problems.

Background: This study aims to evaluate functional status and balance in patients with breast cancer-related lymphedema (BCRL).

Methods: In this case-control designed trial, patients diagnosed with breast cancer-related upper extremity lymphedema were compared with health volunteers in terms of balance and functional status. Demographic and clinical characteristics of the participants were recorded. Functional status was assessed with Quick Disabilities of the Arm, Shoulder, and Hand (Q-DASH). The Tecnobody PK252 isokinetic balance measurement system, the one-leg standing test, and the functional reach test were also evaluated for static and dynamic balance measures.

Results: This study recruited 33 BCRL patients and 33 healthy individuals. The mean age of the participants was 53.74±8.29 years (patient group 56.18±7.69, control group 51.31±8.25 p<0.016) and the average body mass index was 28.32±4.23 kg/m² (patient group 29.72±4.43 kg/m², control group 26.92±3.56 kg/m² p<0.006). Q-DASH score was 43±18.43 in the patient group and 1.33±3.09 in the control group (p<0.001). The one-leg standing test and functional reach test results were statistically significantly lower in the patient group (36.85±26.40 and 17.42±5.05 vs. 23.24±5.04 p<0.001). In Tecnobody measurements, stability index, average center of gravity, forward-backward standard deviation, and average track error were determined to be statistically different between the two groups.

Conclusions: We detected deteriorations in static and dynamic balance parameters in patients with breast cancer-related lymphedema. We suggest that balance and coordination exercises be added to the exercise programs of patients with breast cancer-related upper extremity lymphedema.

Keywords: breast cancer-related lymphedema, functional status, balance
The co-morbidities in breast cancer related lymphedema

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1Atılım University School of Medicine, Department of Physical Medicine and Rehabilitation
2Atılım University School of Medicine

Fikriye Figen Ayhan / Atılım University School of Medicine, Department of Physical Medicine and Rehabilitation

Objectives: 1. Investigate the impact of comorbidities on the severity and progression of BCRL. 2. Asses the prevalence and types of comorbidities experienced by BCRL patients. 3.

Background: Breast cancer-related lymphedema (BCRL) is a chronic progressive disabling disorder if left untreated. Comorbidities seen in patients with BCRL are generally underestimated because of the focus on cancer climate, cancer-related treatments, and their side effects. We aim to investigate patients’ breast cancer surgeries and management, and their relations with comorbidities in patients with BCRL.

Methods: The retrospective data from the medical record of Enzim HIMS searching ICD code I97.2 (breast cancer-related lymphedema) was extracted as an xlsx file. The prospective data was obtained by phone calls to these patients. To determine the proportion of BCRL patients with comorbidities and the rate of related treatment, one hundred thirty-one patients (mean age 54.56 ±11.15) with BCRL were evaluated in the aspects of their comorbidities. Patients with comorbidity were identified and then investigated to analyze the treatments for comorbidity. The types of surgery were mastectomy (53.4%), tissue expander-silicon implant (12.8%), and breast-conserving surgery (46.6%). Pathologically confirmed unilateral and bilateral (12.2%) cases who underwent breast cancer surgery were included. Chemotherapy (84%) and radiotherapy (75.2%) history for breast cancer were detected. The tendency of the body mass index (BMI) profile was overweight (mean BMI 27.0 ±4.66).

Results: Most of the patients (58%) were admitted to the cancer rehabilitation unit for lymphedema-complete decongestive treatment (CDT). There was a small difference in rehabilitation admissions regarding comorbidities (p=0.04). However, the type of surgery was not different regarding comorbidity (p=0.329). Of the 131 patients, 64.09% had at least one, comorbidity. According to present comorbidities, hypertension (20.0%), coronary artery disease (15.3%), allergy (15.27%), hypothyroidism (9.9%), and diabetes (4.6%) were not uncommon. Cardiovascular comorbidities were the most common co-existed medical diagnosis in this sample. Regarding surgery types, there were negative correlations between breast implants and body mass index (r= -0.395, p=0.025), and between mastectomy and obesity (r= -0.485, p=0.005). The diagnosis of Diabetes is associated with age (r= 0.430, p=0.014),
aromatase inhibitor usage ($r= 0.438$, $p=0.012$), and the diagnosis of hypothyroidism ($r= 0.400$, $p=0.023$).

**Conclusions**: Our findings suggest that patients with BCRL have a high incidence of hypertension. This highlights the importance of paying close attention to the cardiac and metabolic comorbidities that co-existed with BCRL. The effects of CDT on hypertension, diabetes, and allergy should not be ignored before starting CDT.

**Keywords**: breast cancer, lymphedema, comorbidity, management
Evaluation of the Relationship Between Lymphedema Symptoms and Edema Assessments in Patients with Breast Cancer-Related Lymphedema

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Objectives: The aim of this study was to investigate the relationship between subjective lymphedema symptoms reported by breast cancer patients and edema evaluations.

Background: Lymphedema is a common and distressing complication that may arise from breast cancer treatments. Patients report symptoms associated with lymphedema, such as swelling, feeling of heaviness, tightness, and pain in the affected upper extremities. Objective evaluation of edema severity often involves methods such as circumference measurement, volumetric measurement, and Bioimpedance Spectroscopy (BIS). In addition to objective methods, it is important to ask patients about their subjective lymphedema symptoms. The presence of subjective lymphedema symptoms can contribute to early diagnosis, especially when objective methods are insufficient to detect lymphedema-related changes in the affected extremity.

Methods: This study included 120 women (n = 68 with lymphedema, n = 52 non-lymphedema; mean age = 52) who completed their breast cancer treatment. Subjective symptoms of lymphedema, such as swelling, heaviness, tightness, and pain, were assessed using the Visual Analog Scale (VAS). The presence of lymphedema was assessed using circumference measurement, Bioimpedance Spectroscopy (BIS), and Moisture Meter Compact device (Delphin Technologies, Finland). The study analyzed the correlation between measurement methods and subjective lymphedema symptoms using Pearson and Spearman Correlation Analysis. Statistical significance was considered at p<0.05.

Results: The frequency of swelling, heaviness, tightness and pain symptoms in patients with breast cancer-related lymphedema were 86.8%, 89.7%, 79.4% and 79.4%, respectively. In non-lymphedema patients, the frequency of swelling, heaviness, tightness and pain symptoms were 44.2%, 46.2%, 53.8% and 57.7%, respectively. There was a weak to moderate correlation (r= 0.24–0.52, p<0.05) between the severity of lymphedema, determined by circumference
measurement, and the severity of symptoms such as swelling, heaviness, tightness and pain, as well as the level of distress. No significant correlation was found between pain severity and distress level, and the L-Dex score obtained by BIS measurement. A weak to moderate correlation was observed between the severity of other symptoms and distress level and BIS measurement (r=0.33–0.46, p<0.05). There was a weak, significant correlation found between the PWC (%) score obtained with the Moisturemeter and the severity of all symptoms and distress levels (r = 0.22–0.37, p <0.05).

**Conclusions:** The evaluation of lymphedema in the clinic involves objective methods that are related to subjectively reported symptoms such as swelling, heaviness, tightness, and pain. Therefore, in addition to objective methods, it is important to consider the subjective symptoms of patients in evaluating lymphedema.

**Keywords:** Breast cancer, lymphedema, symptom, distress
Investigation of Myofascial Pain Syndrome Co-occurrence in Patients with Breast Cancer Related Lymphedema

Özden Tömek¹, Gökçenur Yalçın¹, Feyza Nur Yücel¹, Yeliz Bahar-Özdemir², Emre Ata¹, Canan Şanal-Toprak²

¹Sultan 2.Abdulhamid Han Training and Research Hospital, Clinic of Physical Medicine and Rehabilitation
²Marmara University Faculty of Medicine, Department of Physical Medicine and Rehabilitation

Özden Tömek / Sultan 2.Abdulhamid Han Training and Research Hospital, Clinic of Physical Medicine and Rehabilitation

Objectives: The aim of this study is to investigate the relationship between the stage of lymphedema and the frequency of myofascial pain syndrome (MPS) in breast cancer patients. The second objective is to determine the pressure-pain threshold (PPT) values of the muscles that are most frequently affected following breast cancer surgery (BCS).

Background: Lymphedema and MPS are among the most prominent causes of upper-limb dysfunction in women with breast cancer. It is important to detect treatable conditions in order to restore upper extremity functionality and increase quality of life. The co-occurrence of MPS and lymphedema following BCS has not been determined previously. This study aims to investigate the relationship between the presence of lymphedema and accompanying MPS in breast cancer patients.

Methods: This cross-sectional, single-center study involved a total of 71 female patients aged between 18 and 75 years with a history of BCS. Patients were divided into two groups: latent lymphedema (stage 0) (n=35) and clinical lymphedema (n=36). The primary endpoint was to determine the frequency of trigger points (MTrP) in muscles commonly observed MTrP in breast cancer patients in each group. Secondary endpoints included determination of the PPT for those muscles with algometry, VAS pain scores, volumetric measurements of upper extremities (Limb Calculator Excel program), LYMQOL-Arm, and Quick DASH questionnaires.

Results: Patient distribution according to lymphedema stages: 36 (53.7%), 18 (25.4%), 13 (18.3%), and 4 (5.6%) for stages 0, 1, 2, and 3, respectively. MTrPs were present in all muscles, ranging from 52.1% to 84.5%, with a higher prevalence on the affected side (Table 2). MTrP frequencies were significantly higher for the latissimus dorsi and serratus anterior muscles on the affected side (Table 2). A comparison of the latent and clinical lymphedema patient groups revealed no significant difference in MTrP frequency on the affected sides (p>0.05). PPT values were significantly lower on the affected side for all muscles (p = 0.001 for trapezius and latissimus dorsi, p<0.001 for infraspinatus, serratus anterior, and pectoralis).
Table 1. Demographic and clinical data of the enrolled patients

<table>
<thead>
<tr>
<th>Age (year), mean (SD)</th>
<th>57.11 (10.24)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMI (kg/m²), mean (SD)</td>
<td>28.12 (4.90)</td>
</tr>
<tr>
<td>Affected side, %(n)</td>
<td></td>
</tr>
<tr>
<td>Right</td>
<td>50.7 (36)</td>
</tr>
<tr>
<td>Left</td>
<td>49.3 (35)</td>
</tr>
<tr>
<td>Dominant side, %(n)</td>
<td></td>
</tr>
<tr>
<td>Right</td>
<td>88.7 (63)</td>
</tr>
<tr>
<td>Left</td>
<td>11.3 (8)</td>
</tr>
<tr>
<td>Treatment, %(n)</td>
<td></td>
</tr>
<tr>
<td>Chemotherapy</td>
<td>83.1 (59)</td>
</tr>
<tr>
<td>Radiotherapy</td>
<td>83.7 (62)</td>
</tr>
<tr>
<td>Hormonotherapy</td>
<td>73.2 (52)</td>
</tr>
<tr>
<td>Surgery, %(n)</td>
<td></td>
</tr>
<tr>
<td>Mastectomy</td>
<td>53.5 (38)</td>
</tr>
<tr>
<td>Breast conserving surgery</td>
<td>46.5 (33)</td>
</tr>
<tr>
<td>Lymph node dissection, %(n)</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>63.4 (45)</td>
</tr>
<tr>
<td>No</td>
<td>36.6 (26)</td>
</tr>
<tr>
<td>Metastasis, %(n)</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>28.2 (20)</td>
</tr>
<tr>
<td>No</td>
<td>71.8 (51)</td>
</tr>
<tr>
<td>Lymphedema duration, median (IQR)</td>
<td>0.75 (3.25)</td>
</tr>
<tr>
<td>Upper extremity volume of the affected side, (ml), median (IQR)</td>
<td>1991 (568)</td>
</tr>
<tr>
<td>VAS-Pain, median (IQR)</td>
<td>4 (5.25)</td>
</tr>
<tr>
<td></td>
<td>VAS-Tension, median (IQR)</td>
</tr>
<tr>
<td>----------------------------------------</td>
<td>---------------------------</td>
</tr>
<tr>
<td></td>
<td>3 (5.25)</td>
</tr>
</tbody>
</table>

BMI: Body Mass Index, VAS: Visual Analogue Scale, QuickDASH: Quick Disabilities of the Arm, Shoulder and Hand, LYMQOL: Lymphoedema Quality of Life, SD: Standard deviation, IQR: Interquartile range

Table 2. Trigger point frequency and pain pressure thresholds of the examined muscles

<table>
<thead>
<tr>
<th></th>
<th>Presence of MTrP</th>
<th>PPT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>% (n)</td>
<td>mmHg/cm²</td>
</tr>
<tr>
<td><strong>Trapezius</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Affected side</td>
<td>77.5 (55)</td>
<td>4.32 (1.64)</td>
</tr>
<tr>
<td>Spared side</td>
<td>70.4 (50)</td>
<td>4.46 (2.20)*</td>
</tr>
<tr>
<td>p</td>
<td>0.267</td>
<td><strong>0.001</strong></td>
</tr>
<tr>
<td><strong>Infraspinatus</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Affected side</td>
<td>62.0 (44)</td>
<td>4.25 (1.52)</td>
</tr>
<tr>
<td>Spared side</td>
<td>54.9 (39)</td>
<td>4.44 (1.59)</td>
</tr>
<tr>
<td>p</td>
<td>0.383</td>
<td>&lt;<strong>0.001</strong></td>
</tr>
<tr>
<td><strong>Latissimus dorsi</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Affected side</td>
<td>77.5 (55)</td>
<td>3.0 (1.37)*</td>
</tr>
<tr>
<td>Spared side</td>
<td>52.1 (37)</td>
<td>3.50 (1.36)</td>
</tr>
<tr>
<td>p</td>
<td><strong>0.002</strong></td>
<td><strong>0.001</strong></td>
</tr>
<tr>
<td><strong>Serratus anterior</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Affected side</td>
<td>84.5 (60)</td>
<td>2.10 (1.10)*</td>
</tr>
</tbody>
</table>
### Table 1: Comparison of MTrPs and PPT in BCS Patients

<table>
<thead>
<tr>
<th></th>
<th>Spared side (n)</th>
<th>Affected side (n)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MTrP</td>
<td>56.3 (40)</td>
<td>76.1 (54)</td>
</tr>
<tr>
<td>PPT</td>
<td>2.76 (1.27)*</td>
<td>2.38 (0.83)</td>
</tr>
<tr>
<td>Pectoralis</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>62.0 (44)</td>
<td>62.0 (44)</td>
</tr>
<tr>
<td>p</td>
<td>&lt;0.001</td>
<td>0.052</td>
</tr>
<tr>
<td>PPT</td>
<td>&lt;0.001</td>
<td>2.76 (1.26)*</td>
</tr>
</tbody>
</table>

MTrP: Myofascial trigger point, PPT: Pain pressure threshold, * Paired T test. Wilcoxon test is used for other comparisons.

**Conclusions:** BCS patients have more frequent MTrPs in the serratus anterior and latissimus dorsi muscles on the affected side compared to the unaffected. Patients present decreased PPT in the trunk muscles of the affected side, regardless of the presence or stage of lymphedema. Clinicians are advised to consider these findings when evaluating pain in patients who have undergone BCS. (Conflict of interest: There are no conflicts of personal and financial interest within the scope of the study.)

**Keywords:** lymphedema, breast cancer-related lymphedema, myofascial pain syndrome, myofascial trigger point
BREAST CANCER-RELATED LYMPHEDEMA: EVALUATION OF SARCOPENIA WITH ULTRASONOGRAPHY

Zeliha Ünlü¹, İlhan Celil Özbek¹, Emir Onaḡ¹

¹Celal Bayar University, Department of Physical Medicine and Rehabilitation

Objectives: We aimed to evaluate sarcopenic in patients with lymphedema secondary to breast cancer by measurement of biceps muscle thickness in ultrasonography. Also the patients were assessed by skin and subcutaneous ultrasonography features to compared healthy side.

Background: We aimed to evaluate sarcopenic in patients with lymphedema secondary to breast cancer by measurement of biceps muscle thickness in ultrasonography.

Methods: Female patients aged 18-65, diagnosed with unilateral lymphedema secondary to breast cancer treatment, were included in the study. Two groups were formed for comparison: the affected arm with lymphedema and the unaffected arm, serving as the control group. Demographic information, lymphedema forms, and LYMQOL-Arm (LYMQOL-ARM) questionnaires were recorded in patients. Circumferential measurements of the arms were taken, and limb volumes were calculated along with the Edema ratio. Ultrasonography was performed at three different points: the midpoint between the lateral and medial epicondyles, 10 cm below, and 10 cm above this point, measuring echogenicity, echo-free space, skin-subcutaneous tissue thickness, and shear wave elastography (pic-1). Skin-subcutaneous tissue thickness measurements were taken with relaxation measurements first, without compression, followed by measurements under compression, and compression ratio was calculated. Biceps muscle full thickness was measured without compression in ultrasonography (pic-2).
Shear wave elastography measurement

Biceps muscle full thickness measurement

**Results:** Limb volumes were calculated based on circumferential measurements of the included group, showing a statistically significant difference between the healthy and lymphedematous arms (p<0.001). The calculated Edema ratio value was 0.23±0.22 mls. When comparing SWE values and compliance ratio between the healthy and lymphedematous arms, no statistically significant difference was found. Biceps thickness of the lymphedematous arm was found significantly lower than healthy side (p=0.025).
Conclusions: The study reveals that the majority of patients diagnosed with lymphedema were in clinical stages in 1-2 lymphedema. Ultrasonographic examinations suggest that lymphedematous arms were generally similiar clinical findings in earlier stages. In addition, measurements in shear wave elastography and compliance ratio showed similar tissue elasticity changes between lymphedematous and non-lymphedematous arms. These findings considered to absence of fibrosis in the skin of the lymphedematous arm. The arm with lymphoedema has statistically significantly less muscle thickness, which can be interpreted as sarcopenia. Considering the lack of a significant difference in tissue elasticity between lymphedematous and non-lymphedematous arms, the decrease in muscle thickness (sarcopenia) might be occurred in patients even before the development of advanced-stage lymphedema. Therefore, it is important to recommend regular exercise including strength muscle exercise after the post-operative period, before lymphoedema manifests itself in lymphedema patients.

Keywords: Lymphedema, Sarcopenia, Ultrasonography, Shear wave elastography
Evaluating Response to Treatment in Breast Cancer-related Lymphedema

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Objectives: The aim of this study was to assess and compare the response to the breast cancer-related lymphedema (BCRL) treatment with ‘Breast Cancer-Related Lymphedema of the Upper Extremity (CLUE)’ scores, bioimpedance spectroscopy (BIS) and the volume-assessments /measurements. A secondary aim of the study was to show whether CLUE has a place in the treatment response and its correlation with the other measures of lymphedema.

Background: CLUE (Breast Cancer-Related Lymphedema of the Upper Extremity) is a tool that was developed by Spinelli et al. to assess the presence and severity of the lymphedema in these patients. Having both objective and subjective measures, CLUE scores are shown to be a valid and reliable scale to assess BCRL. While there are many therapeutic approaches in the management of BCRL, the gold standard method is considered the complete decongestive therapy (CDT). The lack of a consensus is also valid for the measures of follow-up in the course of the therapy, with volume-related methods preferred more often, like the diagnostic measures. The use of bioimpedance spectroscopy and CLUE scores also requires more evidence for justification of their use in evaluating the effectiveness of the therapy. The aim of this study was to assess and compare the response to the BCRL treatment with CLUE scores, bioimpedance spectroscopy, and assessments/measurements. A secondary aim of the study was to show whether CLUE has a place in the treatment response and its correlation with the other measures of lymphedema.

Methods: The design of our study is a retrospective study. A total of 40 patients were included in the study. Patients were evaluated with CLUE score, assessment of the upper extremity volumes, Quick DASH score, BIS and hand-grip strength before and after the complete decongestive therapy.

Results: Correlation analyses showed that CLUE total score and BIS values were correlated with the reduction in the volumes (p=0.04 and p<0.001, respectively). Moreover, the CLUE total score was also found to be positively correlated with the BIS values (p=0.001). Hand grip
strength and Quick DASH scores were not found to be correlated with the changes in the volume and CLUE total scores.

Changes before and after the treatment

<table>
<thead>
<tr>
<th></th>
<th>Pre-treatment</th>
<th>Post-treatment</th>
<th>p</th>
<th>% (Difference before and after the treatment in percentage)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume Measurement (extremity with lymphedema) (Mean ± SD)</td>
<td>3840.5 ± 820.3</td>
<td>3285.95 ± 560.11</td>
<td>&lt;0.001</td>
<td>14.43</td>
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<tr>
<td>BIS value (Mean ± SD)</td>
<td>54.85 ± 31.88</td>
<td>29.48 ± 15.51</td>
<td>&lt;0.001</td>
<td>46.25</td>
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<tr>
<td>Hand Grip Strength (Mean ± SD)</td>
<td>18.34 ± 5.64</td>
<td>17.68 ± 5.47</td>
<td>0.177</td>
<td>3.59</td>
</tr>
<tr>
<td>Quick DASH score (Mean ± SD)</td>
<td>39.03 ± 18.67</td>
<td>38.5 ± 17.86</td>
<td>0.572</td>
<td>1.35</td>
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<tr>
<td>CLUE (Mean ± SD) Total</td>
<td>37.45 ± 17.36</td>
<td>25.6 ± 14.56</td>
<td>&lt;0.001</td>
<td>31.77</td>
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</tbody>
</table>

Correlation of change in clinical parameters after treatment

<table>
<thead>
<tr>
<th>Volume Measurement</th>
<th>BIS value</th>
<th>Handgrip strength</th>
<th>Quick DASH score</th>
<th>Clue Total Score</th>
<th>Clue Anatomic Score</th>
<th>Clue Tissue Score</th>
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<tr>
<td></td>
<td>BI S value</td>
<td>Handgrip strength</td>
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<td>.312*</td>
<td>.124</td>
<td>.200</td>
<td>.593**</td>
<td>.383*</td>
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</tbody>
</table>

**Conclusions:** In conclusion, the development of a structured clinical assessment like CLUE provides clinicians with a standardized evaluation for BCRL. For the novel studies aiming to assess treatment responses to patients with BCRL, the use of CLUE and BIS alongside routinely used volumetric methods is encouraged.

**Keywords:** Lymphedema, rehabilitation, physical therapy.
The effectiveness of lymphedema rehabilitation in patients with breast cancer-related lymphedema; Ankara University Faculty of Medicine PMR clinic experience

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Seçilay Güneş / Ankara University Faculty of Medicine, Department of Physical Medicine and Rehabilitation

Objectives: Breast cancer-related lymphedema represents a lifelong risk for breast cancer survivors and, once acquired, becomes a lifelong problem.

Background: This study aimed to investigate the clinical characteristics of patients treated for breast cancer-related lymphedema at Ankara University Faculty of Medicine, Department of Physical Medicine and Rehabilitation, Lymphedema Unit.

Methods: Patients who were admitted to the lymphedema rehabilitation program secondary to breast cancer at Ankara University Faculty of Medicine Lymphedema Unit between April 2016 and July 2019, were evaluated by retrospective file scanning. Demographic characteristics of the patients, type of surgery performed, pain intensity, duration of lymphedema development, and lymphedema-related complications were recorded. Extremity volume measurements were evaluated before and after rehabilitation.

Results: A total of 80 women and 1 man with complete records, were included in the study. The mean ages were 58.33 ± 11.51 years and the mean time from surgery to the emergence of lymphedema symptoms was 13.38 ± 20.60 months. Most patients underwent (74.6%) non-breast-conserving surgery. The duration of lymphedema was 48.82 ± 66.28 months before rehabilitation and the pain intensity (VAS) was 2.77 ± 3.11 in the affected extremity. A total of 9.46 ± 3.93 sessions of lymphedema rehabilitation were applied to the patients. The most common accompanying findings were joint movement limitations (26.3%), superficial fungal infections (14.9%), cyanotic skin changes (10.3%) and fibrotic changes (7.7%). Extremity volume measurements of the patients before and after treatment were determined as 2889.17 ± 764.85 ml and 2459.88 ± 562.98 ml, respectively (<0.001). Extremity volume changes were correlated with age (r=0.362, p=0.001), number of therapy sessions (r=0.359, p=0.001), and the duration of lymphedema (r= 0.229 p=0.05).

Conclusions: Complete decongestive therapy in breast cancer patients with lymphedema leads to clinical improvement in all patients. The effectiveness of therapy is improved with the increase in the number of therapy sessions. Even in patients with older age or longer duration of lymphedema, an acceptable level of treatment success was achieved.Acknowledgment: We
would like to thank physiotherapists Zahide Pala and Ayşe Kutlu, who work in our lymphedema unit, for their valuable efforts during therapy sessions

**Keywords:** Complete decongestive therapy, Breast cancer, Lymphedema
Qatar’s Breast Cancer-Related Lymphedema and Functional Impairment: A Three-Year Data Collection Study

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Emad Abdalla / Hamad Medical Corporation

Objectives: To determine the prevalence and severity of breast cancer-related lymphedema (BCRL) among breast cancer survivors in Qatar over a three-year period, using standardized assessment tools and diagnostic criteria. To investigate the functional impairment and quality of life impact associated with BCRL among breast cancer survivors in Qatar, examining factors such as age, cancer stage, treatment modalities, and comorbidities, to inform tailored survivorship care strategies and interventions.

Background: Breast cancer-related lymphedema (BCRL) is a debilitating condition affecting the physical and psychological well-being of patients. Despite its significant impact, there is limited data on BCRL prevalence and associated functional impairments in the Middle Eastern context, particularly in Qatar.

Methods: This study presents a comprehensive analysis of BCRL and its functional implications based on a three-year data collection effort in Qatar. A cohort of breast cancer survivors was followed up longitudinally, assessing lymphedema occurrence, severity, and functional limitations using standardized measures.

Results: Preliminary findings reveal a notable prevalence of BCRL among breast cancer survivors in Qatar, with varying degrees of functional impairment observed across different stages of lymphedema. Factors such as age, cancer stage, treatment modalities, and comorbidities were found to influence the onset and progression of BCRL and its impact on daily activities and quality of life.

Conclusions: This study underscores the importance of addressing BCRL as a significant health concern among breast cancer survivors in Qatar. The findings provide valuable insights into the prevalence, risk factors, and functional consequences of BCRL, thereby informing targeted interventions aimed at improving patient outcomes and enhancing survivorship care strategies in the region. Further research is warranted to elucidate optimal management approaches tailored to the unique cultural and healthcare landscape of Qatar and the efficacy of a national BCRL screening program.

Keywords: Breast cancer, Lymphedema, Qatar, Surveillance
The role of physical activity in lymphedema patients. Myths vs Reality

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**Objectives:** The study was conducted to investigate whether resisted exercise programs are safe and beneficial to BCRL patients, and how this affects their function and QoL.

**Background:** Breast Cancer Related Lymphoedema (BCRL) can cause pain, discomfort, heaviness, tightness, distortion and reduced mobility and function of the affected limb (Hormes et al., 2010), and these symptoms heavily impact self-image, while also increasing anxiety, possible depression and frustration (Fu, Mei R. and Kang, 2013) affecting the psychosocial function and the QoL of patients (Vassard et al., 2010). The consensus is to advise patients to maintain an active lifestyle however there are limited guidelines on what types of activities may be beneficial or not (Lane, Worsley and McKenzie, 2005).

**Methods:** The study investigated the safety and effectiveness of adding a moderate/high intensity resisted exercise (RE) program for 6 weeks on arm circumference, muscular strength, and quality of life (QoL) measure including function, appearance, symptoms, and mood in patients with BCRL. This study included thirty-five patients with a history of breast cancer who were in phase two of their lymphoedema rehabilitation. They were assigned to either the intervention (n=18) or control (n=17) groups. The intervention consisted of resistance band exercises 4 times a week for 6 weeks. These were performed independently and unsupervised during the study period using pre-recorded exercise programs. Limb circumference measurements, muscular strength, Disabilities of Arm, Shoulder, and Hand (DASH), Lower Extremity Functional Scale (LEFS) and Lymphoedema Quality of Life (LYMQOL) questionnaires were administered at baseline and at 6 weeks.

**Results:** After 6 weeks, the intervention group demonstrated statistically significant improvements (p<0.01) in the DASH and LYMQOL scores. There was a significant change in UL and LL strength between both groups (p<0.05). Unexpectedly, there was a significant decrease in UL measurements in the hand, forearm, elbow, and proximal arm in the intervention group (p<0.05).

**Conclusions:** The results indicate that RE demonstrates a positive effect on arm function, symptoms and QoL without increasing arm volume in breast cancer-related lymphedema. Future work should assess longer term effects of such exercise. It could also assess whether RE can be performed without compression garments or whether RE can decrease the reliance of compression garments following lymphoedema diagnosis.
Keywords: Exercise, Resisted exercise, Rehabilitation, QoL
Ultrasonographic Evaluation of Lipedema Progression in Pediatrics

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Objectives: This case study aimed to longitudinally evaluate the progression of lipedema in a pediatric patient using ultrasonography, focusing on changes in subcutaneous tissue thickness, hypoechoogenicity, and fascia over a six-year period.

Background: Lipedema presents significant diagnostic challenges, especially in pediatric populations, due to its similarity to other conditions. Accurate diagnosis and monitoring are crucial for effective management and treatment.

Methods: The case study involved annual ultrasonographic evaluations of a female pediatric patient aged 10 to 16, using a Terason 3200 model with a 15 MHz probe. Assessments were performed at four anatomical sites to document changes in skin, subcutaneous tissue, and fascia.

Results: Results showed a consistent increase in subcutaneous fat thickness and fascial changes, highlighting ultrasonography's value in diagnosing and monitoring lipedema. These findings emphasize the importance of early diagnosis and the potential for ultrasonography to guide treatment strategies.

Comparison

Conclusions: The study demonstrates ultrasonography's utility in tracking lipedema progression in pediatric patients, reinforcing the need for early and accurate diagnosis. The insights gained underscore the importance of incorporating ultrasonography into the diagnostic and monitoring protocols for pediatric lipedema, potentially influencing future treatment approaches.
Keywords: Pediatric Lipedema, Ultrasonography, Longitudinal Study, Subcutaneous Tissue
Primary lymphedema of childhood: Treatment results from a tertiary center

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¹Ege University School of Medicine, Dept. of Physical Medicine and Rehabilitation
²Izmir City Hospital, Dept. of Physical Medicine and Rehabilitation

Ece Cinar / Ege University School of Medicine, Dept. of Physical Medicine and Rehabilitation

Objectives: In this study we aimed to assess the effects of Complex Decongestive Therapy (CDT) on pediatric patients.

Background: Primary lymphedema is the most common form of lymphedema presenting in the pediatric age group. Pediatric lymphedema management is a difficult and less well studied area in lymphedema rehabilitation.

Methods: In this retrospective study, we have examined the patient files from the lymphedema treatment unit of our university hospital and recorded patient information and treatment results belonging to pediatric lymphedema subjects that received CDT. files were examined and 30 treatment sessions from 24 patients were included in the study. The main outcome was the volume of lymphedema reduction and secondary outcome was the duration of treatment.

Results: Pre- and post-treatment volume differences were compared only in the unilateral lower extremity lymphedema patients since other patient groups did not contain enough subjects to permit a proper statistical analysis. Excess volume percentage change between pre- and post-treatment volumes was found to be statistically significant (p<0.05) and CDT was found to be effective in controlling lymphedema volumes in these patients. Although in upper extremity lymphedema patients, no statistical analysis was carried out, there was visible clinical improvement in most patients.

Conclusions: Although our numbers were limited, we believe our results will contribute to the current literature, since ours is the first study focusing on the results of CDT in a pediatric population.

Keywords: cancer rehabilitation, complex decongestive therapy, lymphedema, pediatric lymphedema
Case Report: Family-Centered Comprehensive Treatment of Pediatric Lymphedema in Early Childhood (6 months - 4 years)

Elena Parodi¹, Corradino Campisi¹, Corrado Campisi¹, Arianna Demoro¹, Roberto Risso¹, Mirko Ponsini¹

¹Campisi Clinic

Elena Parodi / Campisi Clinic

Objectives: The objective of this abstract is to highlight the importance of a family-centered approach in the comprehensive treatment of pediatric lymphedema during early childhood (6 months - 4 years). Following early diagnosis by lymphologist Campisi, treatments commenced, with clinic visits every two weeks and interventions such as massages and daily bandaging, facilitated through parental education. This integrated therapeutic approach aims to maximize functionality and quality of life for pediatric patients, minimizing the risk of lymphedema-related complications through collaborative and personalized care.

Background: Pediatric lymphedema poses a clinical challenge that demands a comprehensive, family-centered approach, particularly in very young children. This study aims to examine an integrated therapeutic approach that considers not only traditional methods of lymphedema management but also the essential role of the family in the treatment process. Through active and ongoing collaboration with parents, treatment is personalized to meet the specific needs of the child. Therapies include physiotherapeutic techniques, MLD, compressive therapy, management of wearing stockings, and home self-care instructions. The primary goal is to maximize the child's functionality and quality of life while minimizing the risk of lymphedema-related complications. This integrated, family-centered approach proves crucial in ensuring optimal outcomes in the treatment of pediatric lymphedema during early childhood.

Methods: The treatment protocol involved continuous follow-up appointments at least every two months. Due to the constant growth of the child, traditional measurement methods in centimeters were deemed unreliable. Instead, photo documentation was utilized as a method of evaluation. Additionally, the firmness of the lymphedema and the condition of the skin were assessed through both photographic evidence and clinical reports documented in the patient's medical records.

Results: The current results indicate that the child is in a stable phase of lymphedema. Presently, the child wears a compression stocking that enables them to engage in all daily activities, including walking and playing with their kindergarten peers. The child's ability to participate in regular daily activities while wearing the compression stocking suggests significant improvement in lymphedema management.

Conclusions: In the future, it may be necessary to perform a lymphoscintigraphy to assess the state of the lymphatic pathways in the child. Medical and physiotherapeutic follow-up will be
essential to potentially modify the approach of home care based on the manifestation of the child's condition. The ultimate goal of treatments both in the clinic and at home is to ensure a life free of obstacles and promote the best possible psychomotor development for the child.

**Keywords:** Pediatric lymphedema, home self-care instructions., family-centered approach
Klippel-Trenaunay syndrome: what to do?

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¹Center of Vascular Pathology

Amriddin Rakhimov / Center of Vascular Pathology

Objectives: To find new approaches in Klippel-Trenaunay syndrome treatment.

Background: Klippel-Trenaunay syndrome (KTS) is a complex, combined disorder characterized by capillary, lymphatic and venous malformation with overgrowth of the affected limb. KTS is associated with mosaic activating mutations in the PIK3CA gene. Capillary malformations are also called “port-wine stains” and are regarded as the most common vascular cutaneous malformation in KTS, seen in 98% of cases. The superficial veins are dilated, the deep veins may be normal, dilated or absent. Lymphatic vessels may be involved with aplasia and hypoplasia of the lymphatics but also of the lymph nodes, either independently or together. Lymphatic malformation (LM) lesions are observed in KTS patients and include primary lymphedema and lymphangiectasia (truncular LMs), as well as skin vesicles (containing lymph fluid) draining lymph fluid and cystic hygromas (extratruncular LMs).

Methods: A 23-year-old female with KTS, with dilated veins in her right leg since childhood which did not initially bother her, but since the age of 11 she has been having swelling and pain in her leg. There was however no history of trauma or surgical procedures performed on the right lower limb. Physical examination showed angiokeratomas on the lateral surface of the right knee. Doppler ultrasonography was done and showed dilated veins with small arteriovenous fistulas (AVFs) in the lateral aspect of the right lower limb starting from foot and continuing up to the upper thigh. The maximum diameter of the vein was 25 mm; deep vein hypoplasia. Computed Tomography, Venogram and 3D reconstruction showed the venous network and abnormal perforators. Our team performed 2 open surgery sessions to remove varicose veins with AVFs and to cut the marginal vein. After that, the patient was recommended to undergo physical therapy and to wear compression stockings.

Results: A 1-year post-treatment follow-up using Doppler ultrasonography showed resolution of the lateral marginal vein along with the absence of abnormal perforators. However, there are some residual varicosities, for which sclerotherapy has been planned, other symptoms have completely subsided.

Conclusions: There is no radical therapy for KTS. The role of comprehensive approaches in KTS treatment (conservative, laser correction, surgery) is of utmost importance to improve the quality of life and to control complications: pain, thromboembolism, pulmonary hypertension, local bleeding and ulceration.
Keywords: Klippel-Trenaunay syndrome, lymphatic malformation, vascular anomaly
The Relationship Between Joint Hypermobility and Primary Lymphedema

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1Fatih Sultan Mehmet Research and Training Hospital

Feyza Akan Begoğlu / Fatih Sultan Mehmet Research and Training Hospital

Objectives: The aim of this study is to investigate the relationship between joint hypermobility and primary lymphedema.

Background: The lymphatic system begins to develop at the end of the fifth gestational week. Lymphatic vessels and lymph nodes develop from the mesoderm. The relationships between some structures that develop from the same mesoderm-derived structures and ligament, muscle, tendon structures and joint hypermobility have been examined. There are studies showing that hypermobility may be a risk for venous insufficiency. Primary lymphedema and hypermobility have not yet been studied in the literature.

Methods: Our study included 35 patients with primary lymphedema in the lower extremity, male and female, between the ages of 18-65, and 32 healthy volunteers in the same age range who did not have complaints such as edema or lymphedema in the lower extremity. Demographic information of all patients was obtained. While Beighton scoring was applied to all volunteers and patients for generalized joint hypermobility (GJH), Brighton criteria were questioned for benign joint hypermobility syndrome (BJHS).

Results: There was no statistically significant difference in terms of Beighton score averages between cases with and without lymphedema (p>0.05). 27.8% of the cases with lymphedema and 25% of those without lymphedema had GJH, and there was no statistically significant difference between them (p>0.05). 13.9% of the cases with lymphedema and 15.6% of those without lymphedema had BJHS, and there was no statistically significant difference between them (p>0.05).

Conclusions: In this study, although Beighton scores were higher in the lymphedema group than in the healthy group, no significant difference was found between the lymphedema group and the control group in terms of GJH and BJHS.

Keywords: Primary lymphedema, joint hypermobility, being joint hypermobility syndrome
Lymphatic connection between palatine tonsils and heart (literature review)

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¹People's Friendship University of Russia

Hung Vu Duy / People's Friendship University of Russia

Objectives: Variants of the lymphatic connection between palatine tonsils and heart was the aim of this paper.

Background: Knowledge about the lymphatic connection can explain the routes of pathology spreading between the organs and allows to choose the optimal lymphotropic approach during lymphotropic therapy to block the channels of infection.

Methods: Justification of close relationship between lymphatic bed of the tonsils and heart was shown in papers of different scientific schools, which were carried out by means of polychrome interstitial injections. 101 papers were analyzed.

Results: According to literature, the lymph nodes (LNs) of the first order for the palatine tonsils are the following: upper, middle and rarely lower internal jugular LNs (including the jugulodigastric node); lateral retropharyngeal; submandibular; submental; LNs located along accessory nerve and sternocleidomastoid artery at the level of the roots of lingual and ascending pharyngeal arteries (rarely); anterior superficial cervical LNs. The LNs of the second and subsequent orders include: middle and lower internal jugular LNs; paratracheal; LNs located on the posterior surface of the right brachiocephalic vein (sometimes). Lymph fusion from the palatine tonsils and heart can be observed in four groups of LNs: most often the common LNs are the lower deep cervical LNs (internal jugular LNs), in 10% of cases the lymph fusion occurs in the paratracheal LNs, in 20% - in jugular trunk and rarely in the regional nodes of the heart on posterior surface of the right brachiocephalic vein. Lymph fusion can be also observed in lymphatic vessel anastomoses, of which five types are distinguished. In three types, the connection between the lymphatic vessels of these organs doesn’t perform any lymph node; in other two types, there is one or more LNs which are on the way of lymph outflow. Lymph can perform retrograde flow from the LNs common to these two organs and anastomosis of lymphatic vessels appearing from the palatine tonsils and the heart. Direct fusion of lymphatic vessels or formation of the lymphatic capillary network between them are responsible for such anastomosis organization. One should also take into account the possibility of spreading of pathological microorganisms through non-vascular pathways of lymph transport: interstitial channels (prelymphatics), interfascial spaces, perineural and perivascular spaces (typical for children).

Conclusions: Lymphatic connection between the palatine tonsils and heart showed the numerous variants which is the possibility of spreading of infectious agents through the lymphatic system.
**Keywords:** palatine tonsils, heart, regional lymph nodes
An immunohistochemical study on distribution of podoplanin-positive lymphatic vessels and podoplanin deposition in colorectal neoplastic lesions.

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Objectives: To make an immunohistochemical study on distribution of podoplanin-positive lymphatic vessels and podoplanin deposition in colorectal neoplastic lesions

Background: We presented a study on distribution of podoplanin expression in polypoid colorectal lesions at ISL meeting held in Genoa last year. We present the results of the same manner of study with larger number of cases including advanced colorectal cancers in addition to polypoid lesions.

Methods: Polypoid lesions (hyperplastic polyp, tubular adenoma, tubulovillous adenoma, serrated adenoma, SSA/P(sessile serrated adenoma/polyp), carcinoma in adenoma) and advanced cancers (adenocarcinoma) excised from human colon and rectum were studied by immunohistochemistry using anti-podoplanin antibody (D2-40, Dako M3619). Hematoxylin and eosin and elastica van Gieson-stained specimens of the same sites as the immunohistochemically processed were also prepared and observed for comparison.

Results: In the tubular adenomas and the tubulovillous adenomas, the lymphatic capillaries distributed around the adenomatous glands in some areas, and they were thought to be caused by the lift-up of the lymphatic capillaries in deep location of the lamina propria. There was also mild to moderate diffuse podoplanin deposition in the peri-glandular interstitium. In the serrated adenomas, the lymphatic capillaries distributed around the glands, but the density was lower than in tubular adenomas. No podoplanin deposition was present in the stroma of serrated adenomas and SSA/P. In the lesions of carcinoma in adenoma, there was an increase in podoplanin-positive lymphatic capillaries around the cancer components in adenomas, and we observed moderate to dense podoplanin deposition in the interstitium. In the lesions of advanced cancers, we observed lymphatic vessels around neoplastic glands and diffuse podoplanin deposition in the interstitium.
podoplanin in cancer in adenoma

**Conclusions:** The distribution of podoplanin-positive lymphatic vessels and podoplanin deposition in interstitium may have important pathogenetic implications in colorectal neoplastic legions.

**Keywords:** podoplanin, colorectal neoplastic legions, immunohistochemistry
Automated Detection and Classification of Cancerous Cells Using Machine Learning Algorithms

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SHIV SINGH SARANGDEVOT / JANARDHAN RAI NAGAR RAJASTHAN VIDHYAPEETH UNIVERSITY

Objectives: The study evaluates the performance of state-of-the-art machine learning algorithms, including convolutional neural networks (CNNs), support vector machines (SVMs), decision trees, and random forests, in detecting and classifying cancerous cells from digitized histopathological images. A comparative analysis of these algorithms is conducted based on their sensitivity, specificity, precision, and computational efficiency.

Background: The rapid advancements in machine learning algorithms have revolutionized the field of cancer diagnostics by enabling automated detection and classification of cancerous cells from histopathological images. This research paper presents a comprehensive analysis of various machine learning techniques utilized for the automated detection and classification of cancerous cells, with a focus on their accuracy, efficiency, and clinical applicability.

Methods: Furthermore, the paper explores the challenges and limitations associated with automated cancer cell detection and classification, such as dataset imbalance, variability in staining techniques, and interpretability of results. Strategies to mitigate these challenges are discussed, including data augmentation, transfer learning, and ensemble methods.

Results: The research findings demonstrate the efficacy of machine learning algorithms in accurately detecting and classifying cancerous cells, with high sensitivity and specificity rates comparable to human experts. The potential clinical implications of automated cancer cell detection and classification are also discussed, including early diagnosis, personalized treatment planning, and prognosis prediction.

Conclusions: Overall, this research paper highlights the significant contributions of machine learning algorithms in advancing cancer diagnostics and emphasizes the importance of continued research and development in this promising field to improve patient outcomes and accelerate the pace of cancer research and treatment.

Keywords: Automated detection, Classification, Cancerous cells, Histopathological images
The Effect of Neoadjuvant Chemotherapy on Lymphedema Formation:
Preliminary Results of a Prospective Clinical Study

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Objectives: Researches that evaluating the effectiveness of chemotherapy on lymphedema mostly relies on postoperative data and retrospective studies. Despite the studies carried out in this field, the effect of chemotherapy on lymphedema is still controversial.

Background: The aim of this prospective clinical study is to determine the impact of chemotherapy regimens administered to breast cancer diagnosed patients who are receiving neoadjuvant chemotherapy, on the development of lymphedema.

Methods: Thirty-one patients receiving neoadjuvant chemotherapy for breast cancer diagnosis were included in the study. Demographic, clinical, and pathological data of the patients were recorded. Circumference measurements of both arms and bioimpedance measurements with the L-DEX U400® device were conducted before starting chemotherapy. The second evaluation of the patients was performed one week after the completion of chemotherapy. Measurements were conducted and recorded by an experienced physiotherapist in this regard. In 20 patients, chemotherapy regimens of 4 AC + 12 Paclitaxel were administered, in 6 patients, 4 AC + 12 Paclitaxel + Trastuzumab + Pertuzumab, in 1 patient, 4 AC + 12 Paclitaxel + 4 Pembrolizumab, in 1 patient, 4 AC + 12 Paclitaxel + Trastuzumab, and in the other 3 patients, 4 AC + 12 Paclitaxel + Carboplatin were applied.

Results: The average age of the patients was 49.6±10.5 years and body mass index was 26.09±3.7. According to the LDEX score evaluation before and after NCT, it was determined
that the LDEX score increased by at least 7 units in 7 patients (22.5%) after NCT, and the LDEX score decreased by at least 7 units in 5 patients after NCT. While 57% of the patients with an increase in the LDEX score had a pathological complete response, no pathological complete response was detected in the patients with a decrease in the score. In the group with no change, pathological complete response of 21% was detected.

**Conclusions:** Despite the limited number of patient data in this study, data suggesting that chemotherapy may initiate lymphedema by causing an increase in extracellular fluid due to the fibrosis effect.

**Keywords:** Lymphedema, Breast Cancer, Neoadjuvant Chemotherapy
Is There a Difference Between Right and Left Upper Extremity Involvement in Breast Cancer Related Lymphedema?

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¹Ankara Training and Research Hospital, Physical Medicine and Rehabilitation
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Busem ATAR / Ankara Training and Research Hospital, Physical Medicine and Rehabilitation

**Objectives:** The lymphatic currents of the right and left halves of our body reach the heart via different pathways. The ductus thoracicus, which opens into the venous system, carries the lymphatic load of right and left lower extremities, left upper body half and left upper extremity, while the right lymphatic ductus collects the lymphatic flow of only the right upper extremity and right upper body half. We aimed to investigate whether there is a difference in lymphedema related breast cancer (BCRL) in the right and left upper extremities and whether surgery in the right or left upper extremity affects the response to CDT.

**Background:** To our knowledge, there is no other study investigating the difference between right and left upper extremity lymphedema

**Methods:** The data of 102 patients with BCRL who were followed up in our clinics were retrospectively analyzed. Duration of lymphedema, duration of lymphedema development after surgery, type and stage of lymphedema, duration of follow-up in our clinics, years of first and last visits to our clinics, volumetric volume and volume differences measured in the lymphedematous extremity, and the number of CDTs received in our clinics over the years were noted.

**Results:** Among 102 patients, 52 patients had right and 50 patients had left upper extremity lymphedema. The mean age of these two groups was 54±25.3 years. There was no difference between the right upper extremity lymphedema group and the left group in terms of initial admission volume, the two groups in terms of the number of lymph nodes removed, number of metastatic lymph nodes, estrogen, progesterone, cerb2 receptor positivity. The stages and durations of the patients were similar. In the group of patients with right lymphedema, there was no difference between the first visit volumes and the last visit volumes (p>0.05 for all). However, in patients with left lymphedema, a statistically significant increasing trend was observed between the first visit volumes and the last visit volumes (p=0.049). A volume increase trend was also observed in the intact extremities of patients with left lymphedema, so there was a decreasing trend in the volume difference due to the closing of the difference in the intact extremity.
**Conclusions:** These findings suggest that patients with left BCRL had a greater increase in intact and diseased extremity volumes over the years compared to patients with right BCRL. Considering that left upper extremity lymphedema may also be considered as a risk factor considering the anatomically higher left lymphatic load.

**Keywords:** breast cancer, left lymphedema
Incidence of cancer-related lymphedema: a protocol and the conduct of a living systematic review with meta-analysis

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²Allied Health and Human Performance, Alliance for Research in Exercise, Nutrition and Activity, University of South Australia, Adelaide, Australia
³Cancer Council Queensland, Queensland, Australia

SANDI HAYES / Cancer Council Queensland, Queensland, Australia

Objectives: To describe the protocol and conduct a living systematic review with meta-analysis that provides the most up-to-date estimate of the incidence of cancer-related lymphedema. It is also an objective to use the collected data to evaluate the strength and consistency of the association between lymphedema and treatment and non-treatment-related risk factors.

Background: With a projected increase in the incidence of cancer treatment-related conditions such as lymphedema, alongside a lack of lymphedema research beyond good prognostic cancers, a more comprehensive understanding of cancer-related lymphedema incidence and associated risk factors across all cancers is warranted.

Methods: A systematic and grey literature search will be conducted to identify studies reporting the incidence, prevalence of lymphedema or associated risk factors in individuals who have undergone treatment for any type of cancer. Two investigators will independently extract data and assess risk of bias using the Cochrane Risk of Bias Tool Version 2.0, the Risk Of Bias in Non-randomised Studies – of Interventions (ROBINS-I), or the National Institutes of Health (NIH) Heart, Lung, and Blood Institute (NHLBI) Study Quality Assessment Tools, depending on study design. Overall strength of evidence will be appraised with the Grading of Recommendations, Assessment, Development and Evaluations tool. Random effect models will be used to produce pooled overall lymphedema incidence estimates. Subgroup analyses that explores relationships between lymphedema incidence and lymphedema measurement method, time since cancer diagnosis and treatment, and diagnosis, treatment and behavioural characteristics will be conducted dependent on available data.

Results: This living systematic review with meta-analysis is registered on PROSPERO (PROSPERO registration number: CRD42022333291), and the protocol paper has been submitted for peer-review. Screening will commence February 2024. Preliminary results will be available for presentation at the ESL conference.

Conclusions: This living systematic review enables clinicians and researchers to consult a contemporary, comprehensive overview of the incidence of cancer-related lymphedema, and the association between lymphedema and other treatment and non-treatment-related risk factors.
Keywords: Oncology, lymphoedema, edema, cancer
Incidence and Identification of plantar oedema

Jane Wigg¹, Stacy Pugh¹

¹Lymphoedema Training Academy

Jane Wigg / Lymphoedema Training Academy

**Objectives:** By the end of the session the delegate will understand the incidence of plantar lymphoedema and the need for assessment and treatment

**Background:** Near Infrared lymphofluoroscopy imaging (NIRFLI) can identify plantar oedema. Following many years of assessment with ICG imaging, plantar oedema is identified and treatment protocols and assessment tools need to change to assess for this. These finding are present in 50% of lower limb lymphoedema patients following NIRFLI. The use of tissue dielectric constant analysis (TDC) allows for the measurement of superficial tissue fluid. The combination of NIRFLI and TDC has allowed the assessment of plantar oedema in a convenience sample. This study aimed to identify the incidence of plantar oedema and ascertain if TDC is a suitable tool for identification, in addition to other signs of plantar oedema.

**Methods:** An assessment tool and diagrammed was developed to capture the type of oedema and data. Data collection included, palpation of plantar oedema at assessment, foot temperature and TDC measurements taken in 3 places (sole, arch and ball of the foot). The foot was left for five minutes pre TDC reading to reduce any temperature or localised changes. The identification of plantar oedema was accepted as a TDC value of above 47% for bilateral oedema or ratio volume of 1.2 if unilateral. In addition NIRFLI was used to confirm the presence of plantar oedema. The cohort consist of a convenience sample of 20 oedema patients and 40 ‘normal’ subjects.

**Results:** The results demonstrate that TDC is a useful tool to identify plantar oedema and this is quantified through NIRFL. In addition the presence of slight skinfolds to the arch of the affected foot and skin thickening assit diagnosis in the absence f TDC or ICG imaging

**Conclusions:** Early identification of planter oedema and implementation of treatment could reduce the impact of mobility issues in this group. Plantar oedema should be routinely assessed in all patients when using NIRFLI and added to assessment forms. General lymphoedema assessment forms should include an area for planar oedema assessment. This study is the precursor to treatment decisions which may include, MLD, KT or the use of orthotist inserts for the prevention of, or treatment of plantar oedema.

**Keywords:** Plantar oedema, assessment, Near Infrared Lymphofluoroscopy Imaging (NIRFLI), Tissue Dielectric constant (TDC)
Association of Stemmer Sign Presence with Demographic and Clinical Data in Lymphedema Patients

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²University of Health Sciences, Kayseri Faculty of Medicine, Department of Physical Medicine and Rehabilitation, Kayseri, Turkey
³Kayseri City Training and Research Hospital, Kayseri, Turkey

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Objectives: Stemmer's sign is a physical examination finding used in the diagnosis of lymphedema. If the examiner cannot pinch the skin on the dorsum of the feet or hands, this positive finding is associated with lymphedema. If the test is positive, there is a high probability that the patient has lymphedema. Stemmer's sign is a useful method to distinguish lymphedema from other diseases. However, if the exam is negative, the patient may still have lymphedema, depending on the severity of the condition and the duration of the disease. The aim of the study was to compare demographic and clinical data with the presence of Stemmer's sign.

Background: Demographic and clinical data of lymphedema patients will be determined, risk factors will be evaluated and will contribute to lymphedema treatment and follow-up management.

Methods: Local ethics committee approval was received for the research (Decision No:11.07.2023/ 867). In the single-center planned study, patients who applied to Kayseri City Hospital Physical Medicine and Rehabilitation Lymphedema outpatient clinic; 75 lymphedema patients, whose lymphedema diagnosis was confirmed by physical examination and lymphoscintigraphy, were included in the retrospective study by scanning the archives from the file. They were divided into two groups: 31 patients with positive Stemmer sign and 44 patients with negative Stemmer sign, and the demographic data and examination findings of the groups were compared.

Results: In our study, no statistically significant difference was found between the groups in terms of demographic data, comorbidities, course of lymphedema, and complications accompanying lymphedema. In the group with a negative Stemmer sign, the number of undergraduate graduates, the presence of a feeling of heaviness in the extremities, and the number of patients admitted to the hospital for lymphedema in the first 6 months were significantly higher. There were more lymphedema patients with lower extremity involvement in both groups. In the group with a positive Stemmer sign, the presence of deformity in the affected extremity was significantly higher. According to the International Society of
Lymphology (ISL) swelling degree stages, stemmer positivity was significantly higher in the 2nd and 3rd stages, while stemmer negativity was significantly higher in the 1st stage (Table1).

Table 1. Results

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Stemmer Positive N:31</th>
<th>Stemmer Negative N:44</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>n</td>
<td>%</td>
<td>n</td>
</tr>
<tr>
<td>Woman/Man</td>
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<td>87.1/12.9</td>
<td>42/2</td>
</tr>
<tr>
<td>Educational Status</td>
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<td>%</td>
<td>n</td>
</tr>
<tr>
<td>Illiterate</td>
<td>1 a</td>
<td>3.2</td>
<td>7a</td>
</tr>
<tr>
<td>Primary education</td>
<td>20 to</td>
<td>64.5</td>
<td>22 a</td>
</tr>
<tr>
<td>High school</td>
<td>9 a</td>
<td>29.0</td>
<td>7a</td>
</tr>
<tr>
<td>University</td>
<td>1 a</td>
<td>3.2</td>
<td>8b</td>
</tr>
<tr>
<td>Previous Surgery</td>
<td>n</td>
<td>%</td>
<td>n</td>
</tr>
<tr>
<td>Yes/No</td>
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<td>71/29</td>
<td>26/18</td>
</tr>
<tr>
<td>Marital status</td>
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<td>%</td>
<td>n</td>
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<td>Married/Single</td>
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<td>87.1/12.9</td>
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</tr>
<tr>
<td>Lymphedema Duration</td>
<td>n</td>
<td>%</td>
<td>n</td>
</tr>
<tr>
<td>&lt;6 Months</td>
<td>1 a</td>
<td>3.2</td>
<td>8b</td>
</tr>
<tr>
<td>6 Months-1 Year</td>
<td>4 a</td>
<td>12.9</td>
<td>3 a</td>
</tr>
<tr>
<td>1-2 Years</td>
<td>2 a</td>
<td>6.5</td>
<td>6 a</td>
</tr>
<tr>
<td>2-5 Years</td>
<td>5 a</td>
<td>16.1</td>
<td>9 a</td>
</tr>
<tr>
<td>5-10 Years</td>
<td>10 a</td>
<td>32.3</td>
<td>8 a</td>
</tr>
<tr>
<td>&gt;10 Years</td>
<td>9 a</td>
<td>29.0</td>
<td>10 a</td>
</tr>
<tr>
<td>Starting Zone</td>
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<td>%</td>
<td>N</td>
</tr>
<tr>
<td>Proximal/Distal</td>
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<td>13.3/86.7</td>
<td>7/37</td>
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<tr>
<td>Beginning</td>
<td>n</td>
<td>%</td>
<td>n</td>
</tr>
<tr>
<td>Acute/Insidious</td>
<td>4/27</td>
<td>12.9/87.1</td>
<td>5/39</td>
</tr>
<tr>
<td>Family History</td>
<td>n</td>
<td>%</td>
<td>n</td>
</tr>
<tr>
<td>Yes/No</td>
<td>4/27</td>
<td>12.9/87.1</td>
<td>3/41</td>
</tr>
<tr>
<td>Pain</td>
<td>n</td>
<td>%</td>
<td>n</td>
</tr>
<tr>
<td>Yes/No</td>
<td>17 / 14</td>
<td>54.8 / 45.2</td>
<td>30 / 14</td>
</tr>
<tr>
<td>Feeling of Heaviness</td>
<td>n</td>
<td>%</td>
<td>n</td>
</tr>
<tr>
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<td>17/14</td>
<td>54.8/45.2</td>
<td>35/9</td>
</tr>
<tr>
<td>Wound discharge</td>
<td>n</td>
<td>%</td>
<td>n</td>
</tr>
<tr>
<td>Yes/No</td>
<td>3/38</td>
<td>9.7/90.3</td>
<td>2/42</td>
</tr>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
</tr>
<tr>
<td>----------------</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
</tr>
<tr>
<td>Infection</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes/No</td>
<td>24/7</td>
<td>22.6/77.4</td>
<td>3/41</td>
</tr>
<tr>
<td>Prophylactic</td>
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<td></td>
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<tr>
<td>Antibiotic Use</td>
<td>n</td>
<td>%</td>
<td>n</td>
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<tr>
<td>Yes/No</td>
<td>3/28</td>
<td>9.7/90.3</td>
<td>3/41</td>
</tr>
<tr>
<td>Diuretic Use</td>
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<td></td>
</tr>
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<td>Yes/No</td>
<td>4/27</td>
<td>12.9/87.1</td>
<td>6/38</td>
</tr>
<tr>
<td>Wound</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes/No</td>
<td>2/29</td>
<td>6.5/93.5</td>
<td>1/43</td>
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<td>Deformity</td>
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<td></td>
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<td>Yes/No</td>
<td>16 / 15</td>
<td>51.6 / 48.4</td>
<td>8 / 36</td>
</tr>
<tr>
<td>Lymphedema</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zone</td>
<td>n</td>
<td>%</td>
<td>n</td>
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<tr>
<td>Right arm</td>
<td>1 a</td>
<td>3.2</td>
<td>6 a</td>
</tr>
<tr>
<td>Left arm</td>
<td>7 a</td>
<td>22.6</td>
<td>5 a</td>
</tr>
<tr>
<td>Right Leg</td>
<td>5 a</td>
<td>16.1</td>
<td>9 a</td>
</tr>
<tr>
<td>Left Leg</td>
<td>3 a</td>
<td>9.7</td>
<td>6 a</td>
</tr>
<tr>
<td>Both Lower</td>
<td>15 a</td>
<td>48.4</td>
<td>18 a</td>
</tr>
<tr>
<td>Extremities</td>
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<tr>
<td>Stemmer Positive N:31</td>
<td></td>
<td></td>
<td>Stemmer Negative N:44</td>
</tr>
<tr>
<td>Parameters</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age(years)</td>
<td>54.09±13.08</td>
<td>56.84±13.22</td>
<td>0.377*</td>
</tr>
<tr>
<td>Body Mass Index((kg/m²))</td>
<td>35.89±7.73</td>
<td>34.84±7.98</td>
<td>0.572*</td>
</tr>
<tr>
<td>ISL Swelling Degree</td>
<td>2.12±0.71</td>
<td>1.38±0.53</td>
<td>0.001*</td>
</tr>
<tr>
<td>SS:Standard Deviation. n: number of people.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>%: percent value</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>*Mann Whitney U test was used for statistical analysis.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>**Chi-Square test was used for statistical analysis.</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>*** Chi-Square test with Bonferroni correction was used.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ab There is no difference in the ratios between groups with the same letter.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>p&lt;0.05 indicates statistical difference.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Conclusions: Absence of Stemmer's sign does not exclude the diagnosis of lymphedema. Stemmer negativity is more common in lymphedema patients with symptoms of feeling of heaviness, especially those who are educated and present to the hospital early. Stemmer positivity is higher in patients with ISL Stage 2 and 3 or lymphedema with deformity.

Keywords: Lymphedema, Stemmer's Sign, International Society of Lymphology (ISL) staging
Covid-19 Vaccination in Patients with Breast Cancer Related Lymphedema

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¹Health Science University, Ankara Bilkent City Hospital, Physical Therapy and Rehabilitation Hospital

Gül Mete Civelek / Health Science University, Ankara Bilkent City Hospital, Physical Therapy and Rehabilitation Hospital

Objectives: In this study, we aimed to evaluate the side effects of COVID-19 vaccine and behaviours and attitudes towards COVID-19 vaccination in patients with breast cancer related lymphedema (BCRL).

Background: Patients with BCRL are concerned about the effects of the COVID-19 vaccination. Generally, authorities recommend COVID-19 vaccination to patients with breast cancer and it has been reported that COVID-19 vaccine is safe. However, COVID-19 vaccination causes various side effects, including lymphadenopathy. Although the prevalence of BCRL was high during the COVID-19 pandemic, patients with BCRL experienced difficulties in accessing medical services. Yet, there is no published data reporting side effects of COVID-19 vaccine and behaviours and attitudes of towards COVID-19 vaccination in patients with BCRL.

Methods: This prospective clinical study included 100 female patients with BCRL who attended oncologic rehabilitation unit of Ankara Bilkent City Hospital, Physical Treatment and Rehabilitation Hospital between May 2022 and December 2022. Demographical and clinical data of patients were noted. A questionnaire about COVID-19 vaccination including side effects, sources of information, reasons for vaccine refusal, COVID-19 fear and anxiety levels and COVID-19 infection history was applied to all participants. Patients with and without COVID-19 vaccination were compared.

Results: COVID-19 vaccination rate was high (82%) in patients with BCRL. Most common side effects were local reactions (pain, redness, swelling) in injection site (54.9%), fatigue or tiredness (40.2%), joint pain (35.4%), myalgia (31.7%), high fever (31.7%). Only 6.1% of patients reported increase in lymphedema symptoms. Most common sources of information about COVID-19 vaccine were television (37%) and internet sources including social media (25%). Most common reasons for not receiving COVID-19 vaccine were being afraid of side effects of the vaccine (27.7%), disrupting cancer treatment (22.2%) and already having had COVID-19 infection (22.2%). When patients with and without COVID-19 vaccination were compared, self-reported good adherence to COVID-19 precautions and COVID-19 fear and anxiety levels were significantly higher and COVID-19 infection rate was significantly lower in vaccinated group (p=0.038, p=0.022, and p=0.047, respectively).
<table>
<thead>
<tr>
<th><strong>Table 1. Demographic and Clinical Characteristics of Patients</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age (years)</strong></td>
</tr>
<tr>
<td><strong>BMI (kg/m²)</strong></td>
</tr>
<tr>
<td><strong>Education status</strong></td>
</tr>
<tr>
<td>Illiterate, n (%)</td>
</tr>
<tr>
<td>Primary School, n (%)</td>
</tr>
<tr>
<td>High School, n (%)</td>
</tr>
<tr>
<td>University, n (%)</td>
</tr>
<tr>
<td><strong>Marital status</strong></td>
</tr>
<tr>
<td>Married, n (%)</td>
</tr>
<tr>
<td>Single, n (%)</td>
</tr>
<tr>
<td><strong>Number of household members</strong></td>
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<tr>
<td>1, n (%)</td>
</tr>
<tr>
<td>2, n (%)</td>
</tr>
<tr>
<td>3, n (%)</td>
</tr>
<tr>
<td>4, n (%)</td>
</tr>
<tr>
<td>5, n (%)</td>
</tr>
<tr>
<td>6, n (%)</td>
</tr>
<tr>
<td><strong>BMI classification</strong></td>
</tr>
<tr>
<td>Underweight, n (%)</td>
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<tr>
<td>Normal-weight, n (%)</td>
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<tr>
<td>Overweight, n (%)</td>
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<tr>
<td>Obese, n (%)</td>
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<tr>
<td>Morbid obese, n (%)</td>
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<tr>
<td><strong>Axillary dissection</strong></td>
</tr>
<tr>
<td>Yes, n (%)</td>
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<tr>
<td>No, n (%)</td>
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<tr>
<td><strong>Surgery type</strong></td>
</tr>
<tr>
<td>Radical mastectomy, n (%)</td>
</tr>
<tr>
<td>Modified radical mastectomy, n (%)</td>
</tr>
<tr>
<td>Lumpectomy, n (%)</td>
</tr>
<tr>
<td>Cancer Stage (TNM)</td>
</tr>
<tr>
<td>-------------------</td>
</tr>
<tr>
<td>Stage 1, n (%)</td>
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<tr>
<td>Stage 2, n (%)</td>
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<tr>
<td>Stage 3, n (%)</td>
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<tr>
<td>Stage 4, n (%)</td>
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<tr>
<td>Chemotherapy</td>
</tr>
<tr>
<td>Yes, n (%)</td>
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<tr>
<td>No, n (%)</td>
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<tr>
<td>Radiotherapy</td>
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<tr>
<td>Yes, n (%)</td>
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<td>No, n (%)</td>
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<tr>
<td>Hormonotherapy</td>
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<tr>
<td>Yes, n (%)</td>
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<tr>
<td>No, n (%)</td>
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<tr>
<td>Lymphedema stage (TNM classification)</td>
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<tr>
<td>Stage 1, n (%)</td>
</tr>
<tr>
<td>Stage 2, n (%)</td>
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<tr>
<td>Stage 3, n (%)</td>
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<tr>
<td>Increase in lymphedema symptoms after COVID-19 infection</td>
</tr>
<tr>
<td>Yes, n (%)</td>
</tr>
<tr>
<td>No, n (%)</td>
</tr>
<tr>
<td>Did not have COVID-19 infection, n (%)</td>
</tr>
<tr>
<td>Adherence to COVID-19 precautions</td>
</tr>
<tr>
<td>Good, n (%)</td>
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<td>Bad, n (%)</td>
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<td>Average, n (%)</td>
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<tr>
<td>Vaccination Status for Influenza virus</td>
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<td>Yes, n (%)</td>
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<tr>
<td>No, n (%)</td>
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<tr>
<td>Vaccination Status for COVID-19</td>
</tr>
<tr>
<td>Yes, n (%)</td>
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<tr>
<td>No, n (%)</td>
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</tbody>
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### Side-Effects after COVID-19 Vaccination

<table>
<thead>
<tr>
<th></th>
<th>Yes, n (%)</th>
<th>No, n (%)</th>
</tr>
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<tbody>
<tr>
<td><strong>Any side-effect</strong></td>
<td>64 (78.5)</td>
<td>18 (21.5)</td>
</tr>
<tr>
<td><strong>Injection site reactions</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(pain, redness, swelling)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes, n (%)</td>
<td>45 (54.9)</td>
<td>37 (45.1)</td>
</tr>
<tr>
<td>No, n (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Fatigue or tiredness</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes, n (%)</td>
<td>33 (40.2)</td>
<td>49 (59.8)</td>
</tr>
<tr>
<td>No, n (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Joint pain</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes, n (%)</td>
<td>29 (35.4)</td>
<td>53 (64.6)</td>
</tr>
<tr>
<td>No, n (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>High fever</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes, n (%)</td>
<td>26 (31.7)</td>
<td>56 (68.3)</td>
</tr>
<tr>
<td>No, n (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Myalgia</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes, n (%)</td>
<td>26 (31.7)</td>
<td>56 (68.3)</td>
</tr>
<tr>
<td>No, n (%)</td>
<td></td>
<td></td>
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<tr>
<td><strong>Headache</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes, n (%)</td>
<td>12 (14.6)</td>
<td>70 (85.4)</td>
</tr>
<tr>
<td>No, n (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Nausea/Vomiting</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes, n (%)</td>
<td>4 (4.9)</td>
<td>78 (95.1)</td>
</tr>
<tr>
<td>No, n (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Dizziness</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes, n (%)</td>
<td>3 (3.7)</td>
<td>79 (96.3)</td>
</tr>
<tr>
<td>No, n (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Rash</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes, n (%)</td>
<td>2 (2.4)</td>
<td>80 (97.6)</td>
</tr>
<tr>
<td>No, n (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Diarrhea</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes, n (%)</td>
<td>1 (1.2)</td>
<td></td>
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</tbody>
</table>
Conclusions: COVID-19 vaccine receipt was high among patients with BCRL. Similar type of side-effects were seen with general population. No life threatening side-effects were observed. Only very small percentage of patients had worsening of lymphedema symptoms. COVID-19 infection rate was significantly lower in vaccinated group which shows that vaccination is effective in this patient group. Providing adequate information about vaccines and their possible side effects are suggested for patients with BCRL.

Disclosure of interest: None declared

**Keywords:** COVID-19, breast neoplasms, breast cancer lymphedema, vaccination
Objectives: Develop compression stockings, based on proprietary shape-memory yarns that exert pressures conforming to RAL GZ 387 standard. Realise thermally induced recovery of the developed compression stockings to the programmed fit and compression strength with recovery ratio over 98%.

Background: Compression therapy is arguably one of the oldest medical technologies that is used until today. The state-of-the-art textiles that we use for compression stockings are 70 years old and no significant innovation has been introduced since the beginning of 1990s. This leads to accumulation of problems that patients face in their everyday therapy, which cannot be solved by extensive improvements in the textile knit. To the major issues belong imperfection of fit and compression profile, unpredictable creep of compression force, and most importantly, difficulties with pulling the stockings on and off. This leads to incompliances of up to 70% of patients giving up on the therapy facing condition progression in a half of the cases and billions of euros burdening healthcare systems, as it was shown in our study.

Methods: Compression stockings in this work were knitted with industry-standard circular knitting machines. Compression strength was evaluated with a balloon test.

Results: In this project, we use an intensive technological approach going one step deeper and changing the chemical composition of the knitted yarns. For this, we have developed a new polymeric material, shape-memory yarns, that is capable of recovering their original, or memorised, shape in response to external stimuli as heat in a controllable and predictable manner. With this technology, we can change the size of a compression stocking on-demand with an uncomplicated procedure. In different, but overlapping embodiments of this technology, compression stockings can become easier in pulling on and off for weakened patients, each model – individually fitted, and compression strength – more resilient. Due to similarity in mechanical properties of our materials and elastane, typically used in compression stockings, we have successfully achieved compression strength within requirements of RAL GZ 387 standard with flexible opportunities for knitting different sizes and compression classes.
Shape-memory yarns in the knit of compression stockings make it easier to pull them on and off.

**Conclusions**: The developed textile has a genuine potential to revolutionise the technological field of compression therapy, solving issues with patient, therapeutic, and technical non-compliance as well as reducing financial burden of secondary costs for the healthcare system. As the following steps, the technology of shape-memory textile will be validated with patients and medical specialists, paving the way to clinical trials and applications.

**Keywords**: compression stockings, innovative textile
Can it be a miracle? Kinesiologic taping for lower extremity swelling in a patient with Factor V Leiden mutation

Erkan KAYA¹, Selma KIZILTOPRAK¹, Nehar SAHIN¹, Beyza ISIK¹, Demet CANBAZ¹, Tolga CANBAZ¹, Ömer Berkan OZCAN¹, Hatice Sümeyye GUCLU¹, Olgun GENC¹, Semih YILDIRIM¹, Taner DANDINOGLU¹

¹Bursa City Hospital, Physical Medicine and Rehabilitation, Bursa, Türkiye

Selma KIZILTOPRAK / Bursa City Hospital, Physical Medicine and Rehabilitation, Bursa, Türkiye

**Objectives:** To show the effects of kinesio taping on pain, edema, range of motion, muscle strength, functional level and quality of life in a patient with lower extremity swelling due to Factor V Leiden mutation.

**Background:** Factor V Leiden is a genetic disorder characterized by a poor anticoagulant response to activated Protein C and an increased risk for venous thromboembolism. Deep venous thrombosis (DVT) and pulmonary embolism are the most common manifestations, but thrombosis in unusual locations also occurs.

**Methods:** This report describes a previously healthy 50-year-old woman who presented with simultaneous bilateral lower extremity DVT after 2 hours airplane trip. She had bilateral lymphedema for 5 years. She presented to the our outpatient clinic with a 5-years history of bilateral thigh swelling and pain. She hadn’t taken any rehabilitation program. We applied her kinesiologic taping per a week during two months. The outcome measures were limb circumference, Disability of Arm, Shoulder and Hand (DASH), hand grip strength, and quality of life at the baseline and end of 2 months.
Kinesiologic Taping

Fan-shaped kinesiologic taping

**Results**: The sum of limb circumferences, DASH, hand grip strength, and quality of life significantly improved after treatment. Our patient said that KT was a miracle.

**Conclusions**: Primary lower extremity DVT, or effort thrombosis, typically occurs in young, healthy individuals with a history of repetitive lower extremity movement while secondary lower extremity DVT is associated with a number of predisposing factors. The role of factors such as hypercoagulability in the development of effort thrombosis is less well described. KT had significant changes in limb circumference, DASH, hand grip strength and overall quality of life.

**Keywords**: kinesiologic taping, factor V Leiden mutation, lower extremity swelling
A Rare Cause Of Lymphedema: Compression of The Vein by Osteophyte Formation

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¹Health Sciences University Ankara Training and Research Hospital, Department of Physical Medicine and Rehabilitation

Cevriye Mülkoğlu / Health Sciences University Ankara Training and Research Hospital, Department of Physical Medicine and Rehabilitation

Objectives: Lymphedema is a chronic disease marked by the increased collection of lymphatic fluid in the body, causing swelling, which can lead to skin and tissue changes. Two types of lymphedema exist: primary and secondary. Primary lymphedema can be present at birth (congenital) or develop at the onset of puberty (praecox) or in adulthood (tarda). Secondary lymphedema can be caused by infection, surgeries or radiation treatments and is a common complication of cancer treatments that remove or damage lymph nodes or vessels.

Background: In this article, lymphedema caused by osteophyte formation in a patient without any trauma, malignancy or congenital disorder will be discussed.

Methods: A 78-year-old female patient presented to our clinic with swelling in her left leg that had been present for 15 years (Image 1). The patient had no history of trauma, malignancy, operations or chronic illness. She had no family history of lymphedema. The patient had grade 2 lymphedema and the diameter difference between both lower extremities was 87.2 %. Abdominal CT scan with contrast revealed compression of the vein by osteophyte formation proximal to the level where the left common iliac vein drains into the inferior vena cava and focal dilatation of the vein was observed distal to this level (Image 2).
A 78-year-old female presented to our clinic with swelling in her left leg that had been present for 15 years.
Abdominal CT scan with contrast revealed compression of the vein by osteophyte formation proximal to the level where the left common iliac vein drains into the inferior vena cava and focal dilatation of the vein was observed distal to this level.

**Results**: Fluid exchange across the capillary wall was determined by the balance of hydrostatic and colloid osmotic forces in the capillary and interstitial fluid. In general, the capillary hydrostatic and colloid osmotic pressures are considered to be of primary importance. There is an increase in capillary filtration due to compression of the left iliac vein by osteophyte formation (Venous hypertension), then lymphatic drainage will increase until it reaches its maximum transport capacity when edema will occur. Edema only occurs when the lymphatic system fails to deal with the increased capillary filtration and, therefore, can be considered as lymphedema. In situations of persistent increased capillary filtration and lymphatic drainage, over time the lymphatics become damaged and flow reduces, resulting in a conventionally understood secondary lymphedema.

**Conclusions**: Secondary lymphedema can have a number of different causes. We believe that in our patient, the osteophyte formation in the anterior part of the L5 vertebral corpus increased the pressure in the vessel as a result of its contact with the left iliac vein, and as a result, lymphedema occurred.

**Keywords**: secondary lymphedema, osteophyte
Liposuction for lymphedema: techniques, results and patients’ compliance

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²Department of Plastic and Reconstructive Surgery, Skåne University Hospital, Malmö, Sweden
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Håkan Brorson / Department of Clinical Sciences in Malmö, Lund University; Plastic and Reconstructive Surgery, Skåne University Hospital, Malmö, Sweden

Objectives: To show the efficacy and superiority of liposuction to treat chronic, non-pitting lymphedemas leading to complete long-term outcomes at all stages.

Background: Absent lymph flow and chronic inflammation leads to excess subcutaneous adipose tissue deposition. Chronic non-pitting lymphedema does not respond to conservative treatment or microsurgical procedures because they do not target the adipose tissue. Removing the adipose tissue using liposuction seems thus to be a logic treatment strategy.

Methods: Arms: 190 women, mean±SEM age of 62±0.8 years, with a duration of arm swelling of 8.6±0.5 years underwent liposuction. Age at breast cancer operation, interval between breast cancer operation and lymphedema start, and duration of lymphedema were 51±0.8 years, 2.8±0.4 years, and 8.6±0.5 years respectively (Figure 1, 2) Legs: 128 patients with a mean age of 49±1.4 years and with a duration of leg swelling of 13±0.9 years underwent liposuction. There were 64 primary (PL) and 64 secondary lymphedemas (SL) following cancer therapy. Age at cancer treatment and interval between cancer treatment and lymphedema start were 2.5±0.7 years and 42±1.7 years respectively. Age at onset of PL was 10 years.

Results: Arms: Preoperative mean excess volume was 1404±52 ml. Postoperative reduction was 104±2.0% at 3 months and 117±2.1% at 1 year, and more than 100% during 28 years’ follow-up (Figure 1, 2) Legs: Preoperative excess volume was 3580±153 ml. Postoperative reduction was 82%±2.3% at 3 months and 101±2.3% at 1 year, and more than 100% during 23 years’ follow-up (Figure 3, 4).
Arm outcomes

Figure 1: A 57-years-old woman with a non-pitting secondary lymphedema of 4 235 ml since 5 years following breast cancer treatment. Complete reduction 6 months after liposuction.

Figure 2: Mean pre- and postoperative excess volume reduction following liposuction of arm lymphedema.

Leg outcomes

Figure 3: A 50-years-old woman with a non-pitting secondary leg lymphedema of 1 127 ml preop. 12 weeks following ligation of cephalic vein. 6 months after ligation.

Figure 4: Mean pre- and postoperative excess volume reduction following liposuction of leg lymphedema.
Conclusions: Liposuction is effective for treatment of chronic lymphedema in patients who do not respond to conservative treatment. Removal of the hypertrophied adipose tissue leads to complete reduction. Constant use of compression garments maintains the outcome.

Keywords: liposuction, lymphedema, adipose tissue, long-term outcomes
Objectives: This presentation shows how Controlled Compression Therapy (CCT) works in practice and over time. The need of compression garments is discussed in relation to the patients’ activity levels and the severity of the lymphedema.

Background: Lymphedema can successfully be treated with liposuction and CCT. The aim of CCT is to increase compression until the volume of the lymphedematous arm or leg is smaller or equal to the healthy one and then to maintain the outcome.

Methods: Three patient cases will be presented to illustrate this: two patients with arm lymphedema and one patient with leg lymphedema. The excess volumes were measured preoperatively and at 0.5, 1, 3, 6, 9, 12 and 18 months postoperatively, then annually. Extra check-ups were planned when needed. At the check-up, the outcome was evaluated and complementary measures were added if necessary. At each occasion the treatment strategy was identified.

Results: The treatment strategies used in CCT are: (1) decrease circumferential measurements of compression garments, (2) increase compressions class, (3) use of several compression garments (multilayer), (4) increase the amount of garments prescribed at the same time, and (5) taking in existing garments by use of a sewing machine. For arm lymphedema the decrease of the circumferential measurements of compressions garments is the most useful strategy. For leg lymphedema it is effective to combine several of these strategies. The choice of strategy depends on where increased compression is needed on the whole leg or part of it. It also depends on the patients’ abilities to put on the compression garment and their preferences and motivation.

Conclusions: Varying strategies can be used and combined to increase compression until complete reduction is achieved. The compression then needs to be maintained and evaluated at regular check-ups to keep a good result over time. If the excess volume increases, the strategy needs to be adjusted in order to get the patient back on track.

Keywords: Compression therapy, Liposuction, Volume measurement, Follow-up
Bandaging In Acute Lymphangitis

Alberto Macciò

1Humanitas Medical Care & Gavazzeni - Bergamo

Alberto Macciò / Humanitas Medical Care & Gavazzeni - Bergamo

Objectives: We will explain in detail the technique we used to make a bandage in case of lymphangitis.

Background: The treatment of lymphangitis involves two types of intervention: antibiotic prescription and bandaging. The type of systemic antibiotic prescribed may be broad spectrum or guided by clinical signs. For what concern the term "bandaging" in lymphology is a very broad definition that includes different types of bandages that differ from one another according to the material from which they are composed and to the function that they are called to perform. In case of lymphangitis different types of bandaging are used, packaged with zinc oxide bandages or new Manuka honey dressings, to reduce edema improve peripheral lymphatic flow and, in the case of Manuka, control local bacterial overload.

Methods: We will show you our specific experience on the use of a particular type of bandage born and modified over time following the indications provided by the patients themselves during twenty years of clinical experience. A special bandage that lasts up to 7 days, packaged with a high index of static Stiffness (SII) and with reduced pressure on the foot.

Results: In our experience, by packaging this type of bandage perfected over time, we have reached 99.8% of perceived comfort for up to 7 days from the packaging.

Conclusions: The success of an effective bandage and that it is well tolerated by the patient, depends both on the correct execution of the bandage and on the specific knowledge of the materials used to make it.

Keywords: compression therapy, lymphangitis, wound care, bandaging
The role of exercise in the prevention and treatment of lymphoedema

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Sandi Hayes / Cancer Council Queensland, Queensland, Australia

Objectives: The purpose of this work was to evaluate effects of exercise on (i) the prevention of cancer-related lymphoedema (CRL), and (ii) the treatment of CRL, lymphoedema-related symptoms, and other health outcomes among individuals with CRL including quality of life, fatigue, upper- and lower-body strength, aerobic fitness, body weight, body mass index and body fat. It was also an objective to evaluate whether prevention or treatment effect differed according to exercise mode, length of exercise intervention, degree of exercise supervision, lymphoedema type and extent of lymph node removal (for prevention only).

Background: Since the late 1990’s, there has been an exponential increase in the number of studies evaluating the role of exercise, including beyond resistance-based exercise alone, in the prevention and treatment of lymphoedema.

Methods: An electronic search of multiple databases (such as, Cochrane Library and PubMed) was undertaken to identify exercise studies measuring lymphoedema and involving individuals at risk of developing or with CRL, published prior to March 1, 2021. Study quality and overall quality of evidence were assessed using the Effective Public Health Practice Project Quality scale and the Recommendation, Assessment, Development and Evaluation (GRADE) approach, respectively. Meta-analyses were performed to evaluate effects of exercise on CRL incidence, existing CRL status, lymphoedema-associated symptoms (pain, heaviness, tightness) and health outcomes.

Results: Twelve (n=1,955; 75% moderate-high study quality) and 36 studies (n=1,741; 58% moderate-high study quality) were included in the prevention and treatment aim, respectively. Relative risk of developing CRL for those in the exercise group compared with the non-exercise group was 0.90 (95% CI: 0.72, 1.13) overall, and 0.49 (95% CI: 0.28, 0.85) for those with 5 or more lymph nodes removed. For those with CRL in the exercise group, the standardised mean
difference of CRL pre- to post exercise was -0.11 (95% CI: -0.22, 0.01), and compared with usual care post-intervention was -0.10 (95%; CI -0.24, 0.04). Improvements post-intervention, compared to pre-intervention, were observed for pain, upper-body function and strength, lower-body strength, fatigue and quality of life for those in the exercise group (effect size: 0.3-0.8; p<0.05).

**Conclusions:** Findings from this review lend support for the application of physical activity and exercise guidelines for the wider cancer population to those with or at risk of CRL. This includes promotion of aerobic and resistance exercise, and not just resistance exercise alone, as well as unsupervised exercise guided by symptom response.

**Keywords:** exercise, physical activity, cancer-related lymphoedema
Novel Genetic Findings on Heterogeneity of Primary Lymphedema

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¹De Duve Institute, UCLouvain

Miikka Vikkula / De Duve Institute, UCLouvain

Objectives: To elucidate the pathophysiological bases of primary lymphedema (PL).

Background: PL can be present at birth or develop in childhood or later in life. Thus, it may be a developmental disorder and/or due to a dysfunction of lymphatic vessels that develops with time. Since the discovery in 2009 of the first gene mutated in primary congenital lymphedema or Milroy's disease, the VEGFR3 gene, mutations in numerous genes involved in the initial formation of lymphatic vessels (including valves), in the growth and expansion of the lymphatic system and in associated pathways have been identified in syndromic and non-syndromic forms of PL. Thus, the current hypothesis is that the majority of cases of PL has a genetic origin. A causative pathogenic variant can be identified in only about one-third of affected individuals, and penetrance is often below 100%, making identification of mutations more difficult, but also suggesting that important genetic and/or environmental modifiers exist. Most mutations cause loss-of-function, although some, such as in the genes associated with Noonan syndrome, gain-of-function. Various functional pathways seem to be involved. Based on current knowledge, an algorithm dividing lymphatic anomalies into those with underlying hyperplasia or hypoplasia, and associating them with known genetic mutations, gives clues as to possible medicinal drug intervention on some of them.

Methods: We use whole exome sequencing and variant filtering using Highlander on our large PL Brussels cohort to identify likely pathogenic genetic variants underlying various forms of PL. We use in vitro and in vivo analyses to study the functional effects of the identified candidate variants.

Results: We find a likely pathogenic variant in about 30% of our samples. Likely pathogenic variants have been identified in novel genes associated with PL.

Conclusions: PL is very heterogeneous, and novel genes underling PL development are identified. Some cause increased intracellular signaling allowing to target them with inhibitors. The era of theragnostics has entered the field of syndromic primary lymphedema.

Keywords: Primary Lymphedema, Gene, Mutation
PERCUTANEOUS SCLEROTHERAPY OF LYMPHOCELE USING POVIDONE IODINE AND LAUROMACROGOL 400

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Objectives: Treatment of lymphocele

Background: The Lymphoceles (LE) can be treated by sclerotherapy: sclerosis using doxycycline, sclerosis applying amidotrozoate, sclerosis using alcohol and povidone-iodine. Lymphoceles are a possible complication after trauma, surgery and biopsy. Their treatment is considered to be as less traumatic as possible because it is intended for patients already operated. We propose the efficacy of the percutaneous sclerotherapy lymphocele using povidone-iodine and Lauromacrogol 400.

Methods: We studied 18 patients, 7 men and 11 women aged from 32 to 82 years who presented lymphatic complications with LE. The LE occurred in men after radical prostatectomy and in 10 women after breast cancer surgery. The last woman had a deep abdominal LE after lymph node dissection. We have treated all the patients by percutaneous sclerotherapy using povidone-iodine combined with Lauromacrogol 400. In deep lymphoceles an ultrasound’s guidance was necessary.

Results: The evolution was favorable with complete but late closure of LE in 17 patients. Multiple sclerosis were necessary to treat the patients. No major complication was reported.

Conclusions: In certain cases, the treatment of choice LE would possibly be the percutaneous sclerotherapy using povidone-iodine combined with Lauromacrogol 400.

Keywords: Povidone iodine, sclerotherapy, Lauromacrogol, lymphocele
Dietary supplements and Nutriceutical approach in Lymphedema and Lipoedema

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²MAGIS LAB, Rovereto (TN)_Italy.
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⁴Vascular Rehabilitative Service San Giovanni Battista Hospital, Rome_Italy

Serena Michelini / San Giovanni Battista Hospital, Rome_Italy

Objectives: The work aims to highlight the benefits of several dietary supplements and nutriceutical approach that cause fat burning and weight loss, acting synergistically with a healthy diet and physical exercise, and that could help in alleviating the edematous state, inflammation and symptoms in patients with Lymphedema and Lipoedema.

Background: Nutrition is considered a basic component in the management of any vascular and adipose tissue disease. Lymphedema is characterised by an increase of interstitial fluid due to a lymphatic system morphological and/or functional alteration. Lipoedema is a chronic disease that mostly manifests in females as the abnormal distribution of subcutaneous adipose connective tissue, usually coupled with bruising, pain, and edema. Complex decongestive therapy (CDT) has always been the mainstay of conservative treatment in Lymphoedema and is partly used in therapeutic management of Lipoedema. In both disorders weight control and anti-edema and anti-inflammatory diet are two additional necessary components of the holistic therapy, as these are two clinical conditions in which inflammation leads to a worsening and clinical progression of disease.

Methods: A careful analysis of the data available in the literature identified which nutritional and nutriceutical supplements could help in the therapeutic management of patients with Lymphoedema and Lipoedema.

Results: Fat burning supplements that have been shown to have the strongest evidence are green tea, caffeine, chromium, carnitine, and conjugated linoleic acid; they seem to promote mobilization and break down triglycerides in adipocytes, boost metabolism and lipogenesis inhibition. At the same time hesperidin, spermidine, polyphenols, omega-3 and vitamin A are some of supplements with an anti-inflammatory and which could potentially be important in the treatment of Lymphoedema and Lipoedema

Conclusions: Dietary supplements cited could contribute to a greater effectiveness in controlling body weight and preventing disease progression in patients with Lymphoedema and Lipoedema. More targeted and human studies are needed to assess the role of food and diet on
the chronic progressive degeneration of inflammation, edema and fibroadiposis and to confirm the effectiveness of dietary supplements in those pathological conditions.

**Keywords:** Lymphedema, Lipoedema, Nutrition, Dietary supplements
Treatment of phlebolymphedema

Franz-Josef Schingale

1Lympho-Opt

Franz-Josef Schingale / Lympho-Opt

Objectives: Chronic edema if it is venous or lymphedema has to be treated in two phases. Phase of reduction and phase of optimization and maintenance

Background: Introduction Phlebolymphedema is not a new concept. Indeed, this “combined” condition of venolymphatic disorders has been well recognized and reported all along for many decades, but the term “phlebolymphedema” has not been properly defined. Edema Edema is an excess of interstitial fluid and is an important sign of ill health in clinical medicine. The developing of edema finds its reason in the lymph system. But not all edema are lymphedema. Edema develops when the microvascular filtration rate exceeds lymph drainage for a sufficient period. Lymph drainage is intimately linked with venous drainage in health and disease. Evidence exists to support the view that lymphatics frequently fail in venous disease, particularly in its advanced stages. The difference of lymphatic insufficiency High volume insufficiency Depends on an overload of fluid like in inactivity edema, CVD stage 1 (C3, CEAP-classification), hypoproteinemia and premenstrual syndrome. Mechanical or low volume insufficiency The lymph system is damaged and as result a lymphedema develops. Lymphedema means a primary or secondary damage of the lymph system. Combined insufficiency The TC is normal at the beginning but due to the growing of the LL the TC starts to go down, for example in phlebolymphedema

Methods: Treatment of phlebolymphedema Two phases, in reality three phases Phase 1 Reduction Phase 2 transitional phase Phase 3 maintenance Phase 1: Decongestive lymphatic therapy (DLT) is the recommended treatment which consists of intensive and long-term management phases. Phase 2 There is still more than 15% of swelling which has to be reduced by the patient himself with flat knit stockings during the daytime and bandaging or AVW during night time. Phase 3 To maintain the result in most cases the patient has to wear flat knit stockings, in limbs where the shape is nearly normal round knit garment with stiff material can be used too.

Results: After phase 1 there is a good reduction of the edema.

Conclusions: Phlebolymphedema is a condition in venous disease and often misdiagnosed and has to be treated like lymphedema

Keywords: venous insufficiency, lymphedema, decongestion, compression
Workshop: Pressure profile under different compression systems
Illustration in real time.

Jean-Paul Belgrado

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Jean-Paul Belgrado / Université Libre de Bruxelles

**Objectives:** Today's technology provides reliable measuring instruments that enables us to record pressure profiles in real time on curved surfaces where temperature is changing. These surfaces can be, for example, the skin of limbs during activity. Pressure sensors placed under various compression systems, such as elastic compression stockings, multi-component bandages of different materials, or static and dynamic wraps, communicate data in real time in wireless modality. This technology enables the analysis of different pressure profiles in decubitus or orthostatic positions, or during activities such as walking, running, cycling, etc. After discussing and evaluating the measurement quality of these instruments, we will equip volunteer participants with the pressure sensors. The analyzed limb will be covered by various static and dynamic compression systems. We will observe the pressure profile during simple activities such as walk, run and cycle. Based on the results of that pressure profile we will launch the discussion. The workshop takes 01:30 hours

**Background:** /

**Methods:** /

**Results:** /

**Conclusions:** /

**Keywords:** Pressure sensors
TREATMENT OF LOWER LIMB LYMPHEDEMA ASSOCIATED WITH PERIPHERAL ARTERIAL DISEASE

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Objectives: Treatment of lymphedema in patient with peripheral arterial disease

Background: Normally multilayer low-stretch bandage and elastic compression (SBEC) is contraindicated in patients with severe peripheral arterial disease of the lower limbs (PAD). The problem becomes serious when PAD is associated with lower limb lymphedema (LLL).

Methods: In all patients with LLL, we measure the ankle-brachial systolic pressure index (ABI). When the ABI is less than 0.50, the EC is not indicated and we try to revascularize the limb before any treatment. When 0.50<ABI <0.60, we complete the examination with transcutaneous oxygen pressure (TcPO2); if TcPO2 is greater than 30mmHg, the patient is treated. When 10<TcPO2<30mmHg, the arterial reserve is studied by a hanging legs TcPO2 and when it is greater than 40mmHg, the SBEC is proposed. In diabetics with medialcalcosis and LLL , we perform the toe brachial index (TBI) and TcPO2 before CE. In case of significant lymphedema of the foot, TcPO2 is not reliable, an ABI and an TBI are performed.

Results: This protocol allowed us to treat 14 patients with LLL associated with PAD without an adverse effect of SBEC.

Conclusions: SBEC should be used with caution in patients with LLL associated with PAD . ABI, TcPO2 and TBI are necessary before each treatment.

Keywords: PAD, Lymphedema, ABI, TcPO2
Management of Penis with Lymphedema

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Objectives: The management of Penis with Lymphedema: combination of conservative and surgical treatment

Background: Penile lymphoedema is a rare case, but lymphedema in the genitalia area is frequently after Ca prostate with lymphadenectomy. It creates significant physical and psychosexual morbidity and presents considerable therapeutic challenges.

Methods: He underwent an operation with the removal of the prostate node and of 27 lymph nodes due to the cancer of his prostate node. He did not need any chemotherapy and radiation therapy but after 5 months from the surgery he presented lymphedema only in penis. He did not report any infection, but we found out very small skin bumps like papillomas in the genitalia area but not on his penis.

Results: He came in our lymphological center. He had very long and very thick lymphedematous penis. Our dermatologist confirmed our suspicion concerning the presence of warts of HPV. Dermatologist made ablations on these HPV skin disease and we followed the conservative complex decongestive treatment (CDT). The penis become weaker and thinner after three weeks of this special treatment.

Conclusions: Penile lymphoedema creates a heavy physical and psychosexual morbidity. The knowledge of the lymphatic status and of the comorbidities diseases of the patient with the combination of conservative and surgical treatment (here dermatologist, lymphologist and surgeons) can give excellent and permanent results in very special cases.

Keywords: penis, Lymphedema, treatment, management
Exercise and lifestyle changes in Lipoedema

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Objectives: The purpose of this study was to investigate in patients affected by Lipoedema the association between the level of intensity of physical activity and sitting time as part of their daily lives through the administration of the International Physical Activity Questionnaire - Short Form (IPAQ-SF), the degree of pain with Visual Analogic Scale (VAS score) and the stage of the disease.

Background: Lipoedema is a chronic disease characterized by abnormally increased of subcutaneous adipose tissue deposition and distribution, which appears poorly responsive to diets and physical activity. Patients often report poor adherence to exercise due to the pain at the affected areas, which tends to exacerbate during and after physical activity. Nevertheless, following a proper diet and exercising are essential to avoid further weight gain and prevent some of the complications of Lipoedema including obesity and musculoskeletal diseases.

Methods: Patients (n=112) aged between 18 and 64 years, with Lipoedema of the lower limbs (58 type 3, 36 type 2 and 18 type 5) in stages 1, 2 and 3 were recruited for the study. Physical activity was measured using the IPAQ-SF for the past 7 days. VAS score was recorded at the time of questionnaire administration together with the assessment of the clinical stage and type of the disease.

Results: The data analysis demonstrated the presence of a correlation between level of physical activity and pain; VAS values greater than 6 correlate with a lower level of physical activity resulting from the questionnaire administered as "inactive patient" that is the lowest level of physical activity. Lower level of physical activity, in turn, has been shown to be present mainly in patients with advanced stage with involvement of the entire lower limb region (Stage III, Type 3).

Conclusions: This preliminary study highlighted the impact of pain on the level of physical activity performed by patients with Lipoedema and its negative correlation with advanced clinical stages. Physical activity in these patients should be encouraged in any case because aims to prevent chronic pain by improving joint mobility and ensuring adequate muscle tone-trophism and greater joint stability, improve systemic and local circulation and avoid further weight gain. More studies are needed to validate the administration of the IPAQ questionnaire in the assessment of physical activity levels in Lipoedema.
Keywords: Lipoedema, physical activity, IPAQ-SF
Liposuction after CDT

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**Objectives:** Chronic inflammation leads to adipose tissue increase and concomitant muscle tissue increase in patients with lymphedema.

**Background:** There is a rising interest generated by the recognition of increased adipose tissue deposition in patients with chronic lymphedema. Recent studies suggest that inflammation plays a great role in the formation of excess adipose tissue.

**Methods:** The following methods were used: 1. Analysis of aspirate. 2. VR-CT (Volume Rendered Computer Tomography). 3. DXA (Dual emission X-ray Absorptiometry). 4. MRI (Magnetic Resonance Imaging). 5. Size of lymphedema cells were compared to controls using ImageJ program. 6. Costs were analyzed using Monte Carlo simulation.

**Results:** 1. Consecutive analyzes of the aspirate removed under bloodless conditions, using a tourniquet, showed a very high content of adipose tissue in arm (94%) and in leg (100%) lymphedemas. 2. Investigation with VR-CT (Volume Rendered Computer Tomography) in 11 patients also showed a significant preoperative increase of adipose tissue, 81%, in the swollen arm, followed by a normalization at 3 months paralleling the complete reduction of the excess volume. 3. Analyses with DXA (Dual emission X-ray Absorptiometry in 18 women with arm lymphedema showed a significant increase of adipose tissue (73%) and muscle tissue (47%) due to heaviness in the non-pitting swollen arm before surgery. The adipose tissue deposition starts already when the lymphedema starts. In a 1-year follow-up study the excess adipose tissue was completely removed and muscle tissue decreased due to less load on the arm. This paralleled the complete reduction of the excess volume. 4. MRI (Magnetic Resonance Imaging) showed that lymphedema leads to adipose tissue deposition in muscle. 5. Adipocytes are significantly larger in lymphedematous extremities than in controls, and larger in lymphedematous arms than in legs. 6. Liposuction is cost-effective.
Arm lymphedema: Pre-and postoperative outcome

A 57-years-old woman with a non-pitting secondary lymphedema of 4 235 ml since 5 years following breast cancer treatment. Complete reduction 6 months after liposuction.

Leg lymphedema: Pre-and postoperative outcome

A 32-years-old woman with a non-pitting secondary leg lymphedema of 7 070 ml since 12 years following treatment of a synovial sarcoma in the right groin (left). Postoperative result 6 months after liposuction (right).

Conclusions: Patients with chronic, non-pitting, lymphedema develop large amounts of subcutaneous adipose tissue, which prevents complete limb reduction utilizing microsurgical reconstruction or conservative treatment. This adipocyte proliferation has important pathophysiologic and therapeutic implications. Liposuction can be performed in patients who fail to respond to conservative management. So far, after more than 25 years, we have not had any complications, i.e. no deaths from fat embolism and no damage to blood supply or nerves. The technique has been implemented in many other centers world wide and is cost effective. Long-term outcomes of liposuction of arm and leg lymphedemas will be presented showing not only complete reduction, but also increased Health Related Quality of Life.

Keywords: liposuction, lymphedema, complete reduction, adipose tissue
Latest pathophysiology and genomics in lipedema

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Objectives: This study originate to help better understand the behaviour of the cells in the areas affected by Lipedema, which do not respond to the common self-regulating mechanisms of adipose tissue.

Background: There is much discussion about the etiological hypotheses of the disease. Female hormones certainly play an important role, but the genetic hypothesis, also linked to the evidence that the disease is hereditary in most cases, is gaining ground similarly to what happened for primary lymphedema.

Methods: The AA. selected 20 patients suffering from stage I and II lipedema, aged between eighteen and sixty years, strictly from a clinical point of view, by taking biopsy samples in affected areas, in the inferior-medial third of the thigh, and in healthy areas, in the interscapular region. Samples were analysed genetically (germinal and somatic), anatomically (using light and electron microscopy as well as histochemistry techniques), and biochemically (for the analytical study of more than eight hundred micro-RNA). All three types of studies, which started from a careful clinical selection and were directed towards the specific deepening of knowledge, as far as relevant to the individual branches, are ongoing.

Results: For genetics, we identified at least three more candidate genes and segregation studies on family members are underway. Metabolomics studies are also underway on material taken. The genetic study on affected tissue also revealed an important polymorphism of the PPARG gene, which is not present in healthy tissue. Anatomical studies have, in particular, shown an average increased volume (up to doubling) of adipocytes compared to those in healthy areas, increase in vascularisation, in particular of pericytes (which could be pre-adipocytes), an increase in collagen fibres and noticeable calcium deposits in endothelial cells and affected adipocytes. Calcium inhibits intracytoplasmic phospholipases and in this sense could contribute to the increase in intracellular lipid deposits resulting in increased cell volume. The biochemical studies, also still in progress, highlight the presence of 13 different micro-RNAs in the affected areas, out of a total of eight hundred analyzed in the two samples of each subject. One of these
seems to have a particular activity for which it could represent a possible marker of the disease, which as is known, today has an exclusively clinical diagnosis.

**Conclusions:** In conclusion, Lipedema also requires great clinical attention, both for the management of the disease and for in-depth research. It is a genetic disease in which many aspects of epigenetics determine the different clinical aspects of individual cases.

**Keywords:** Lipedema genetics pathophysiology
Treatment of obese patients with lymphedema

Franz-Josef Scchingale

1Lympho-Opt

Franz-Josef Scchingale / Lympho-Opt

Objectives: There is a high number of obese patients developing edema.

Background: We developed a special inpatient program to treat these patients according to the principles of CDT.

Methods: Phase 1: skin care, manual lymphatic drainage, compression bandaging, exercises, self-management. Phase 2: skin care, manual lymphatic drainage, compression garments, exercises, self-management. Bariatric lymphedema is a challenge for treating: manual lymph drainage can require two therapists working simultaneously. So we combine manual therapy with technical assistance from pneumatic compression therapy (IPC), in case the patient fits into the garment, Flowave, which applies audible sound waves for softening the tissue. After compression- in most cases with adjustable velcro devices- we do physiotherapy and exercises. Nutritional and psychological education is essentially required.

Results: After weight reduction we send some of the patients after decongestion to the plastic surgery for skin resection.

Conclusions: The in-patient program is very effective as a starting point for patients selfcare at home. The psychosocial aspect is very important, as bariatric lymphedema patients are often isolated and bed-ridden for long periods before they reach successful treatment.

Keywords: obesity, monstrous edema, treatment options, surgical treatment
Characterization of molecular mechanisms involved in the development and age-dependent regression of meningeal lymphatics

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Objectives: Here, we aimed to investigate the organ-specific functions of CCBE1 in developmental lymphangiogenesis and maintenance of meningeal lymphatics during aging.

Background: Recent studies have described the importance of lymphatics in numerous organ-specific physiological and pathological processes. The role of meningeal lymphatics in various neurological and cerebrovascular diseases has been suggested. It has also been shown that these structures develop postnatally and are altered by aging and that the vascular endothelial growth factor C (VEGFC)/vascular endothelial growth factor receptor 3 (VEGFR3) signaling plays an essential role in the development and maintenance of them. However, the molecular mechanisms governing the development and maintenance of meningeal lymphatics are still poorly characterized. Recent in vitro cell culture-based experiments, and in vivo studies in zebrafish and mouse skin suggest that collagen and calcium binding EGF domains 1 (CCBE1) is involved in the processing of VEGFC. However, the organ-specific role of CCBE1 in developmental lymphangiogenesis and maintenance of lymphatics remains unclear.

Methods: Conditional knockout mouse strain were used, which enables for the induced deletion of CCBE1 in vivo in newborn and adult animals.

Results: We demonstrated that inducible deletion of CCBE1 leads to impaired postnatal development of the meningeal lymphatics and decreased macromolecule drainage to deep cervical lymph nodes. The structural integrity and density of meningeal lymphatics are gradually altered during aging. Furthermore, the meningeal lymphatic structures in adults showed regression after inducible CCBE1 deletion.

Conclusions: Collectively, our results indicate the importance of CCBE1-dependent mechanisms not only in the development, but also in the prevention of the age-related regression of meningeal lymphatics. Therefore, targeting CCBE1 may be a good therapeutic strategy to prevent age-related degeneration of meningeal lymphatics.

Keywords: Meningeal lymphatics, Aging, Lymphatic development, CCBE1
Symptomatic Lymphoedema in cancer diseases

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Objectives: Malignant tumours, irrespective of whether they metastasise via the lymphatic or haemetic route, may clinically manifest themselves in the early stages as symptomatic lymphoedema indicative of impaired lymphatic transport secondary to fibrotic obstruction of the lymphatic pathway or its compression from outside. The study underline the importance of a correct interpretation of clinical data to keep an early diagnosis and treatment of cancer.

Background: Even today, it is still common for symptomatic lymphoedema to be mistaken for loco-regional lymphatic system failure, whether congenital or acquired, and consequently treated as such with decongestive physical therapy, delaying the etiological diagnosis and the necessary related etiological treatment.

Methods: Sixty-nine subjects with lymphoedema of the upper or lower limbs were examined, 37 male, 32 female, aged between 48 and 75 years. In all subjects, the oedema was of recent onset and not related to any apparent cause. The subjects underwent a thorough clinical examination and instrumental investigations (HR ultrasound, CT, MRI), as well as laboratory tests.

Results: Out of a sample of 69 patients, 13 subjects (20%) were identified on close clinical and instrumental examination as having an impairment of the lymphatic pathway and its transport function due to primary localisation at lymphoglandular stations or compression of ab extrinsic lymphatic pathways by tumour formations. Prominent clinical cases were represented by metastatic pulmonary cancer with upper limb lymphoedema, bone metastases from breast cancer with upper limb lymphoedema, pelvic cancer with involvement of lymphatic trunks and pelvic lymphoglandular bundles with lower limb lymphoedema, clinical flare-up of Waldenstrom's macroglobulinemia with upper limb lymphoedema.

Conclusions: The lymphatic system with its clinical manifestations is capable of expressing itself in a language that the lymphologist clinician must understand in order to make an early diagnosis of symptomatic lymphoedema and allow for an etiological diagnosis that, depending on timeliness, may even safeguard the same patient's life.

Keywords: Symptomatic lymphoedema in cancer
Management of inflammation via nutrition in lipedema and lymphedema

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**Objectives**: Elucidate and summarize the link between inflammation in lipedema and lymphedema management.

**Background**: Inflammation is probably a point in common between lymphedema and lipedema; even if the classic markers of inflammation, such as CRP and ESR, are not significantly altered, if the cytokines are analyzed, an imbalance is noted therefore, the management of inflammation in both conditions should be considered as a fundamental point

**Methods**: .

**Results**: one of the main aspects is that of glycemic peaks and the consequent production of AGEs; another fundamental point is that of food intolerances, to be considered after a careful medical history, without avoiding the use of any food in the first analysis; finally, the use of supplements must be directed in this direction but with a solid scientific rationale

**Conclusions**: Overall, nutrition can be a valid support for therapy, but it must be remembered that both conditions are chronic and without a cure. Therefore, the palatability and the patient's compliance must also be considered strongly.

**Keywords**: AGEs, Inflammation, Glycaemic peaks, Food intolerance
Workshop. ICG lymphofluoroscopy: the added value in the diagnostic and treatment strategy in lymphedema Illustration by clinical cases

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Jean-Paul Belgrado / Université libre de Bruxelles

Objectives: The lymphatic system is invisible to the human eye because of its transparency. After an intradermal injection of highly diluted ICG, the superficial lymphatic system draining the injected area becomes visible, thanks to a dedicated near infrared camera. Based on different clinical cases, the workshop aims to show the added value of the use of ICG lymphography exam to complete and orientate other examinations or guide treatment strategy. Based on videos from clinical cases, we will show and discuss: the diffusion of the dye from the injection point, the lymph progression in normal and pathological conditions, the contingencies of lymphangion valves and other characteristics of updated knowledge of lymphatic physiology and physiopathology. Impress your eyes: In this workshop you will see the superficial lymphatics and the lymph flow in real time in normal and pathological conditions. Surgeons, Clinical Physicians, Radiologist and Therapists will find new knowledge on the lymphatics for their own practice. The workshop takes 01:30 hours

Background: /

Methods: /

Results: /

Conclusions: /

Keywords: ICG lymphography
Musculoskeletal Pain Treatment in Cancer Patients: Rational use NSAIDs, myorelaxants, and analgesics

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Objectives: Many adult cancer survivors have chronic pain after treatment with the prevalence estimated to be up to 40% (1). The pharmacologic management of entities such as post-surgical pain, chemotherapy-induced neuropathy, aromatase inhibitor musculoskeletal syndrome (AIMSS), and checkpoint inhibitor-related pain are the main problems in these patients (2).

Background: Chronic pain in this population needs a different approach to that used for people with an estimated survival and prognosis.

Methods: Neuropathic pain (post-cancer surgery, chemotherapy-induced peripheral neuropathy, post-RT) and nociceptive pain (musculoskeletal pain post-surgery or RT, AIMSS, rheumatic and musculoskeletal pain associated with checkpoint inhibitors, joint and fascia manifestations of chronic graft vs host disease) are common in cancer survivors. Among chemotherapy agents, paclitaxel and oxaliplatin are neurotoxic. Rarely, chronic pain can occur as a late effect, remote in time from the administration of treatment such as radiation (RT)-plexopathy or tumoral invasion of the brachial plexus, or both seen in Fig.1 (pregabalin user-patient with right arm lymphedema and flask upper extremity).

Fig.1. The right arm lymphedema and paresis
Patient with right arm paresis due to brachial plexopathy caused by both RT and tumoral invasion of brachial plexus 6 months ago (54 years of age, breast cancer survivor under immunotherapy and pregabalin 150mg twice daily)

**Results**: A biopsychosocial approach to pain management is recommended for cancer survivors. AIMSS is often described as symmetrical pain and soreness in the joints, musculoskeletal pain, and joint stiffness seen in approximately half of breast cancer survivors. To date, evidence for safe and effective systemic therapies for the prevention or treatment of AIMSS has been minimal (3). One of them, Duloxetine may decrease AIMSS symptoms, although some patients experienced intolerable adverse effects. Opioids, adjuvant analgesics (paracetamol and NSAIDs, antidepressants, anticonvulsants, NMDA receptor antagonists such as ketamine, and magnesium, topical analgesics such as capsaicin, and lidocaine), Cannabinoids, and new drugs may be chosen in selected cases with chronic cancer pain (2). Novel opioids, α-adrenergic agonists, and oxytocin have been identified as potential candidates for new drugs. Common adjuvant analgesics include paracetamol, NSAIDs, selected antidepressants, anticonvulsants, N-methyl-D-aspartate (NMDA) receptor antagonists, and steroids. Other agents such as benzodiazepines, α2-agonists (e.g. clonidine or tizanidine), bisphosphonates, or monoclonal antibodies. The challenges related to opioid prescriptions in survivors are given special attention. Long Term Opioid Therapy should not be recommended in cancer survivors who have chronic pain from pre-existing non-malignant comorbidities such as osteoarthritis, musculoskeletal painful disorders, or spondylosis, because they are ineffective for this purpose.

**Conclusions**: Adjuvant analgesics have an important role, and they are now often prescribed as first-line or monotherapy before opioids in the management of cancer treatment-related pain. ASCO and NCCN guidelines on pain management in cancer survivors recommend a combination of pharmacologic and non-pharmacologic interventions.

**Keywords**: musculoskeletal pain, cancer, survivor, pharmacologic management
Surgical Treatment of Genital Elephantiasis

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Objectives: Lymphoedema and/or elephantiasis in the region of male and female external genital is caused either by insufficient development of the regional lymphatic system (primary cause) or by damage due to tumour, inflammation, iatrogenic or any other injury of the regional lymphatic vessels and lymph nodes (secondary causes).

Background: From a pathophysiological point of view it is lymphatic insufficiency that leads to these clinically visible complications (oedema, lipohypertrophy, and/or soft tissue fibrosis, lymphatic cysts, verrucosis, lymphorrhrea and infection). All these complications of lymphatic insufficiency affect the patient’s quality of life (motion, personal hygiene, pain and attacks of erysipelas).

Methods: Causal treatment would be a microsurgical procedure creating lympho-venous or lympho-lymphatic anastomoses. Such an approach is rather sporadic, as patients usually present an advanced stage of the disease with fibrotic remodelling of the foreskin, skin of the penis and scrotum, or labia majora, and very often affecting also soft tissues of the pubic area. In such cases, a resection is the optimal approach that improves all aspects of the patient’s quality of life.

Results: If lymphatic reflux is found from lower limbs and/or the abdominal wall, an anti-reflux procedure with a lymph-venous anastomosis is suitable.

Conclusions: The lecture presents the results of surgical treatment in patients with elephantiasis of the external genital with an emphasis on indications for surgery, particular steps of the surgical procedure, post-operative care and complications.

Keywords: Genital elephantiasis, surgery, complications
The role of early diagnosis in prevention and treatment of lymphedema

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Objectives: The aim of this study was to examine (i) the proportional difference in progression/no progression in mild breast cancer related arm lymphedema (BCRL), and (ii) changes in arm volume and local tissue water at 9- and 12-months follow-up, when treated with compression sleeve or not for 6 months.

Background: Chronic lymphedema in the arm is a rather common side-effect of breast cancer treatment and prevention is desired. The most important and evidence-based treatment of arm lymphedema is daily use of compression sleeve. In a randomized controlled trial (RCT), progression/no progression of mild BCRL was examined among women randomized to a compression group (CG; compression sleeve (ccl 1)) or not (NCG) for 6 months. The RCT was followed by a prospective, observational study, where BCRL in the CG and NCG was followed for 12 months.

Methods: Seventy-five women treated for unilateral breast cancer, with axillary node dissection and diagnosed with mild arm lymphedema at the Lymphedema Unit, Skåne University Hospital and at the Physiotherapy Cancer Unit, Karolinska University Hospital were included in the RCT for 6 months. At the end of the RCT, 33 women with mild BCRL were eligible in CG and 37 in NCG. Proportional differences in no progression/progression of BCRL were defined as >2% increase from start of RCT or exceeding 10% in lymphedema relative volume (LRV). Also changes in LRV and tissue dielectric constant (TDC) ratio were examined at end of RCT, and then at 9- and 12-months. End of RCT was followed by a one-month treatment break in CG after which only women with progression resumed compression and continued.

Results: A larger proportion of women in the NCG (p<0.001, 0.005, 0.012) showed progression (57%, 61%, 67%) compared to the CG (16%, 22%, 31%) at 6, 9 and 12 months, respectively. More than 30% of NCG did not progress at all compared to start of RCT. No changes of LRV and local tissue water were found at any follow-ups but were stable on a low level.

Conclusions: To avoid progression of mild BCRL to become chronic, compression sleeve ccl 1 may be applied immediately at early diagnosis of mild BCRL.
Keywords: Arm lymphedema, Prevention, Early diagnosis, Early treatment
microRNA expression in lipedema adipose tissue

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Objectives: Analyze microRNA expressed by lipedema tissue, highlighting possible mechanism and biomarkers.

Background: microRNAs are small non-coding nucleotide sequences (20-25 nucleotides) but capable of regulating protein synthesis, therefore with epigenetic action, even if each microRNA can pair with more than one mRNA; they are strongly conserved between species and present in all tissues; they meet again, via extracellular vesicles, in all body fluids

Methods: our analysis compared the expression of 800 microRNAs in healthy and lipedema-affected adipose tissue, via Nanostrin platform.

Results: We identified one downregulated microRNA (therefore increased relative protein expression) and 12 upregulated ones (decreased expression); through bio-informatic analysis, the significantly influenced pathways are steroidogenesis, glycemic regulation, and AGEs.

Conclusions: We conclude that microRNA could be a valid tool to elucidate better the etiopathogenesis and outcome of lipedema. Still, it could be an insight to find reliable and easy-to-use biomarkers.

Keywords: microRNA, Epigenetic, AGEs, Biomarker
LYMPHOLOGY / THE PAST THE PRESENT THE FUTURE

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Objectives: Since Aselli, many great pionners of lymphology had build , stone by stone our present : Harvey, Cruishank, Mascagni, Pecquet, Sappey, Gerota, Rouviere, Papamiltiades and each put his stone in the field of his own speciality : anatomy, physiology, radiology, surgery, physiotherapy, biology, genetics, psychology, social management …

Background: So in 1965 in New Orleans, invited by Mayerson, Ruttiman and Foldi decided to create a peculiar and new society : unice and only focused on lymphatic system. In 1966, was born in Zurich the international society of lymphology (ISL): many glorious colleagues : M.and C. Witte, Gruwez, Godart … Thirteen years after, some months before the 7th ICL, and on the initiative of Albert Leduc eight persons decided to create in Brussels an european society : GEL(Groupement Européen de Lymphologie)This successfull initiative drove to the development of ESL( European Society of Lymphology)

Methods: Many challenges : rules and by-laws, language; at the beginning there was a competition but quickly became a boon; the way of those two societies were coming together to form a common platform: all the presidents of ESL till 1987 are members of ISL: Pissas, Campisi, Bourgeois, Micheline, Boccardo … Many other national lymphological societies were created in each country: the more important are the american, the japonese and in europe the german. And so, slowly but with determination new colleagues new ideas were born. ESL held its 26th congress in Assisi in 2022 and ISL its 29th in Genoa in 2023. Many new topics were opened concerning imaging: classical lymphography was left, CT Scan, MRI, lymphoscintigraphy, lymphofluorescence. Some surgeons involved in oncology proposed the concept of Sentinel Lymph Node

Results: Lymphedema considered as inevitable before 1960 was treated by manual drainage, or some surgeons tried to supply decrease of lymph flow by lympho venous anastomosis; eventually transplantation; some colleagues prefer liposucction to reduce volume. Psychology and quality of life, social approach went on with the evolution of north societies. But the very great progresses were done in molecular biology, genetics: try to identify some parts of DNA of our chromosoms linked to lymphatic pathologies
Conclusions: We do not know the future: maybe surgery will disappear and perhaps the biological surgeon in the future will cut and sew up DNA chains.

Keywords: history, anatomy, lymphedema
D Vitamin and Its Importance for Lymphedema and Lipedema

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Objectives: This article aims to emphasize the importance of Vitamin D for the body's overall health and well-being, highlighting its role in regulating mineral absorption, immune system function, bone health, and muscle function.

Background: Vitamin D deficiency is a significant concern that can lead to various health problems such as osteoporosis, weakened immune system, muscle weakness, and psychological symptoms. While sunlight is the primary source of Vitamin D, it can also be obtained from certain foods and supplements.

Methods: The study utilized a comprehensive approach to explore the relationship between Vitamin D deficiency and health conditions, including lymphedema and lipedema. It involved analyzing data from various sources, including clinical studies and research articles, to understand the impact of Vitamin D on different physiological functions.

Results: The findings revealed that Vitamin D plays a crucial role in maintaining bone health, immune system regulation, cardiovascular health, and metabolic balance. Adequate levels of Vitamin D are essential to prevent health issues associated with its deficiency.

Conclusions: In conclusion, ensuring sufficient intake of Vitamin D through sunlight exposure, diet, and supplementation is vital for overall health and well-being. Further research is needed to fully understand the relationship between Vitamin D deficiency and specific health conditions like lymphedema and lipedema.

Keywords: lymphedema, lipedema, vitamin D
VASCULAR MALFORMATIONS RELATED WITH LYMPHEDEMA?

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Objectives: To improve the diagnostic procedure by selecting the most effective investigations-To improve the selection of the best treatment in the specific case

Background: Vascular malformations are inborn errors in the development of vessels that may involve arteries, veins and lymphatics. There are two types of defects: truncular, which defects of the main vascular trunks and extratruncular forms which manifest with masses of abnormal vessels in the context of tissues. Truncular lymphatic defects cause primary lymphedema, while extratruncular forms manifest with local masses in different parts of the body. Association with other type of defects is possible. The result may be extreme variable clinical pictures which requires a correct diagnostic approach necessary to be able to choose the best treatment. Mandatory is the recognition of the type of extratruncular defect (microcystic, macrocystic or mixed), combination of the different size of cyst and existence of also other type of defect, like venous malformations. Sometimes the selection of diagnostic procedures may be difficult as well as the decision of the strategy to approach and the technique to use.

Methods: A group of 116 cases of extratruncular lymphatic malformations were studied retrospectively by clinical examination and review of the investigations that were performed. Location of the malformation, type of the defect (microcystic, macrocystic and mixed) were recorded as well as the combination with other type of vascular malformations. Type of treatments were also signed as well as results.

Results: Location of the malformations were head 27%, upper limbs 22%, lower limbs, 22% , thorax 10%, abdomen 9%, neck 5% and gluteus 5%. Type of defects were: microcystic 50%, macrocystic 21%, mixed (micro + macro) 15% and combined with other defects 14%. Treatments incidence were: medical treatment 14%, surgery 38%, ethanol sclerosis 24%, laser 22% and electroporation 2%. Result of the echo Doppler examination was the most effective method to determine the size of the cysts which was the main data for the decision between sclerosis and other procedures. Surgery is the most frequent technique used in this study, followed by ethanol sclerosis. Limited masses had the best result by surgery. Macrocystic forms had an excellent regression by ethanol sclerosis.

Conclusions: Diagnostic of lymphatic extratruncular malformations should follow a precise progression by steps, from the easiest method (clinical examination), to echo Doppler and to
MR. Only after obtaining a complete diagnosis, a treatment strategy should be decided, preferable in a multidisciplinary group.

**Keywords**: lymphangioma, lymphatic malformations
BioBridhge in combination with CDT - a novel approach in lymphedema treatment

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**Objectives**: Development of new therapeutic approach to complement and improve the long-term outcome of CDT through utilization of recent advancements in research on lymphatic drainage by combining CDT with a minimally invasive implantation of BioBridge. Development and validation of treatment protocol to evaluate the efficacy of the combination therapy that can be applied in clinical practice.

**Background**: Effective treatments for lymphedema of the limb(s) are limited. Traditionally, the golden standard of care is the Complete Decongestive Therapy (CDT) which includes MLD, multilayer short stretch bandaging/flat knit compression garments, exercise, and skin care. While CDT has been shown to successfully reduce excess limb volumes, it cannot restore the functional capacity of the lymphatic system. The challenges of CDT are that it requires patient commitment to a life-long diligence to limit the progression of the disease and maintain treatment results and creates a costly time-consuming dependency on compression garments and ongoing CDT sessions. Microsurgery for lymphedema treatment has shown promising results but has many limitations and requires highly qualified personnel, specific equipment, may not be easily accessible and affordable. Combination of microsurgery with BioBridge® Collagen Matrix(BioBridge) - aligned nanofibrillar collagen scaffold - has already demonstrated its safety and efficacy in further reducing limb volume and tissue fibrosis, but still has similar issues with accessibility and cost because includes microsurgery.

**Methods**: ICG lymphography will be used to map the lymph drainage pattern in lymphedema patients, and BioBridge scaffolds will be implanted to enhance the existing and/or create a complementary drainage routes, to direct the flow of extracellular fluid along the BioBridge to the regions with identified viable lymphatic system improved with CDT. Identification of the functional lymph drainage route increases the efficacy of CDT; BioBridge scaffold implantation increases lymph drainage along the scaffold, therefore the efficacy of this approach will be evaluated by comparing pre- and post-treatment lymph flow pattern by ICG lymphography and limb volume by tape measurements/perometry.

**Results**: A single-arm, prospective, open-label pilot study has been designed to evaluate efficacy of combining CDT with BioBridge implantation in patients with unilateral secondary lymphedema of the upper limb, based on ICG lymphography and volumetric analysis. A treatment protocol has been developed to implement the combination of CDT with BioBridge in clinical practice.
Conclusions: Using BioBridge collagen scaffolds in combination with classic conservative treatment is a promising technology for lymphedema treatment, and final conclusions we will have in the end of the study.

Keywords: BioBridge, Collagen scaffolds, Lymphangiogenesis, Combination with CDT
Implementing changing treatment protocols for greater success

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Objectives: By the end of the session the delegate will: 1. have an understanding of differing treatment protocols and their cost effective outcomes 2. understand how to induce anoikis during a DLT treatment to assist improved outcomes.

Background: Lymphoedema Management has continued the same linear path for several decades, with little change from traditional treatment programmes of Complex Decongestive therapy (CDT) or Decongestive Lymphatic Therapy (DLT). Despite this there have been advances in: understandings of cellular and biological pathology and inflammation; the introduction of ICG has informed lymphatic pathways and drainage routes; and, there have been advancements in compression garments. Our organisation has published treatment protocols to reflect these advancements in clinical evidence. Our protocols include lifestyle and dietary advice, including, assisting gut microbiome reducing inflammation. This presentation will discuss the changes in treatment protocols, respecting science and including innovation to improve outcomes.

Methods: Cases studies will be presented describing the DLT treatment protocols used to treat six people with lymphoedema. The outcomes evaluated include limb volume, tissue changes, limb circumference and skin thickening to determine if new protocols were of use. Patients were assessed at day 1, and 3. Protocols consisted of daily Multi component bandaging, exercises, application of top layer bandage, exercise, removal and MLD to root of limb, and application of Velcro wrap for self reduction therapy. Treatment was for three or four days.

Results: Evaluation of new protocols (Belgrado Method) in these cases, demonstrate optimised treatment protocols reduce and maintain lymphoedema. MCB carried out over 3-5 days induced anoikis, with MLD carried out to the root of the limb only reduced lymphoedema. The number of treatment days was reduced and faster volume reduction and improved wellbeing were observed.

Conclusions: To ensure cost effect treatment, change is warranted embedded by improved understanding of physics and biology. This understanding has reduced the number of treatment days required to obtain reduction with DLT.

Keywords: Multi component Bandaging, Treatment protocol, Anoikis
Superdry liposuction in treatment of lipedema-20 year experience

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Objectives: Lipoedema, which is referred to with different definitions in the medical literature, is still an unknown entity and its treatment is not standardized, although its awareness is increasing day by day in social platforms.

Background: In this article, we will present the clinical results of a total of 295 female patients aged between 19 and 67 years who were diagnosed with lipedema according to standard diagnostic criteria between 2003 and 2022 and treated for lower leg lipedema with the standardized superdry liposuction technique by the same surgeon. The main criteria for patient selection were: BMI≤26, no metabolic and hormonal disease, hemoglobin ≥10g/dl, no venous insufficiency of grade 2 or higher in the lower extremities, no prominent varicose veins and packs, no stage IV lipolymphedema. BMI, proximal to distal thigh and leg circumferential measurements were performed and recorded in all patients at preop and postop controls.

Methods: Of the patients who underwent surgical treatment, 88 were classified as stage I, 177 as stage II, and 30 as stage III. All patients underwent superdry liposuction of the lower leg-distal thigh to midfoot regions-in a single session under general anesthesia with special liposuction cannulas during the operation period ranging from 2. Class 2 medium pressure compression stockings were applied intraoperatively and used continuously for at least 3 months in all patients, Manual lymph drainage massage was applied for 2-3 months with 2-3 sessions per week starting from the 3rd postoperative day. Controls were performed at the earliest postoperative 3 months and then at the first postoperative year and compared with preoperative values.

Results: The postoperative success rate was 93%, with a significant reduction in limb thickness, limitation of movement, spontaneous pain, bruising, and tightness, and a significant increase in psychosocial status, self-confidence, and quality of life.

Conclusions: The advantages and disadvantages of the superdry liposcution technique, which has been applied by a single surgeon for 20 years and no recurrence or relapse has been encountered, will be presented.

Keywords: lipoedema, lipedema, superdry liposuction.
Multidisciplinary approach to difficult lymphedema cases with obesity.

Franz-Josef Schingale¹

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Franz-Josef Schingale / Lympho-Opt

**Objectives:** Obesity is a worldwide disease. In Germany about 54% of women and 68% of men are overweighting. In our hospital we see more obese patients than in the normal population.

**Background:** Obesity puts the lymphatic system at risk. We recognize that obesity confers a higher risk of progression of lymphedema. Lymphostatic edema of the legs is very often seen in morbidly obese patients with BMI >40kg/m². We call this type of lymphedema “dependency syndrom” because fat deposition is causing edema and skin changes. It is explained by a passive calf muscle pump, resulting venous hypertension, and inactivity.

**Methods:** Treatment DecongestionTransition to healthier ways of eatingMeal replacements / low energy diet, low carbMore physical activityBehavioural therapy, psychological therapyAnti-obesity medicationsBariatric surgery

**Results:** Reduction of weight and decongestion reduces lymphedema

**Conclusions:** Gastric banding and gastric bypasses are offered as “the only solution” for lymphedema in obesity. The gastric surgery causes weight reduction, but most of the patients are still morbidly obese even after reduction is obtained. Patients may even return to their previous weight as the underlying causes of the weight gain are unresolved.

**Keywords:** obesity, lymphedema, decongestion, treatment of obesity
Case studies indicating an improvement in secondary lymphoedema using medical ozone therapy (OT).

Jane Wigg¹

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Jane Wigg / Lymphoedema Training Academy

**Objectives:** By the end of the session the delegate will be aware of the benefits of ozone therapy, how it works and its place in lymphoedema management. You will be aware of how ozone therapy is delivered and areas of use and benefit.

**Background:** Ozone therapy (OT) is used in traditional and complementary medicine combining 3 oxygen molecules. Studies demonstrate that systemic application of OT is effective in reducing organ damage from inflammation and oxidative stress. It has some cytoprotective effects against tissue damage in inflammatory disease and by reducing pro-inflammatory cytokines, it offers an adjuvant treatment for lymphoedema. It can be delivered either via direct blood infusion (Major Autohemotherapy- MAHT), or intra joint in addition to rectal or vaginal application.

**Methods:** Two highly adherent patients with secondary lymphoedema and previous lymphatic surgery were offered OT and an adjunct therapy to their lymphoedema management. Pre and post treatment assessment included location/extent of oedema, skin condition, subcutaneous tissues and tissue dielectric constant (TDC) measurements. Patients completed pre and post questionnaire including impact upon their mobility, mood, relationships, occupation, hobbies/interests, appearance and quality of life. Both received weekly Major Autohemotherapy (MAHT) OT for 4 weeks followed by 2 fortnightly treatments. All other treatment remained the same.

**Results:** Both patients reported an improvement in the subcutaneous tissues, with the limb ‘wobbling’ and improved movement. The post questionnaire demonstrated improvement of mood, appearance and improved effect on occupation. Therapist post assessment demonstrated quantifiable changes as reduced TDC and softer subcutaneous tissue.

**Conclusions:** Evaluations have indicated; softening of fibrosed areas; visible reduction in oedema and reports of improved skin tension. In addition, general improvement of increased wellbeing and energy. OT provides targeted anti-inflammatory treatment for lymphoedema. Larger studies are required to monitor the effectiveness of OT for lymphoedema. These initial case studies offer a promising set of results and a possible new approach to addressing the inflammation associated with lymphatic conditions. In addition MAHT is used to support cancer journey and side effects of treatment.
Keywords: Ozone therapy, MAHT, Lymphoedema
Incidence of lymphoscintigraphic abnormalities in the healthy lower limb in patients with unilateral secondary lymphedema. Preliminary experience with hybrid imaging

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¹IRCCS San Martino Hospital1

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Objectives: The aim of this study is the evaluation of bilateral lymphedema in patients with clinically secondary unilateral lymphedema of the lower limbs

Background: Population and method: 123 consecutive patients (average age 61 years, 35 males and 88 females) with confirmed or clinically very suspicious unilateral secondary lymphedema of a lower limb underwent lymphoscintigraphy of the superficial and deep circulation respectively by subcutaneous and intrafascial injection of 99mTc-nanocolloid. The examination was carried out on different days for each circle. The total body images were recorded 20, 60 and possibly 120 minutes after the injection of the radiopharmaceutical. A multifactorial quantitative parameter (Transport Index) was calculated for each lymphatic circulation studied, both in limbs affected by edema and in clinically negative limbs In 18 patients the examination was completed with SPET tomoscintigraphic examination combined with CT (hybrid imaging).

Methods: The total body images were recorded 20, 60 and possibly 120 minutes after the injection of the radiopharmaceutical. A multifactorial quantitative parameter (Transport Index) was calculated for each lymphatic circulation studied, both in limbs affected by edema and in clinically negative limbs In 18 patients the examination was completed with SPET tomoscintigraphic examination combined with CT (hybrid imaging).

Results: The lymphoscintigraphic study demonstrates pathological findings in 92% of limbs with edema; among the affected limbs, abnormalities of only the superficial circulation were found in 16%, only the deep circulation in 18% and both pathological in 58%. A pathological TI was found in 31% of limbs without evidence of disease (superficial only 6%, deep only 14%, both 11%). Addition of SPECT/CT to planar scintigraphy has shown a very high rate of change compared to the planar study (Baulieu F, 2014; Hai-Jeon Yoon, 2023). In our initial experience, hybrid SPECT/CT appears to be able to provide more in-depth information on the extension and localization of dermal flow and on more accurate anatomical identification of inguinal-iliac vessels and lymph nodes.

Conclusions: Our data confirm the need to study both circles and both limbs in order to understand the lymphatic anomalies responsible for lymphedema and to establish the most
effective therapeutic strategy. Actually, the association of planar and hybrid imaging provide useful and additional information in lymphatic disorders

**Keywords:** Lymphoscintigraphy
DOT-IPC Mechanical Lymph drainage new combined technique

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**Objectives:** To demonstrate the effectiveness of the complex decongestive therapy treatment in patients affected by primary and secondary lymphedema in the lower limbs, using Intermittent Pneumatic Compression combined with the use of the Dots. The aim is to establish whether this new therapeutic protocol can lead to a faster and more effective reduction of edema, thus reducing the number of patients’ visits to healthcare facilities. We consider this approach an upgrade compared to the standard uses of Intermittent Pneumatic Compression.

**Background:** We have recently experienced the global pandemic of COVID-19, which has led us to reflect on how to refine and improve the possibility for patients to be more independent at home, thus minimizing their access to healthcare facilities as much as possible. With this purpose in mind, the use of Intermittent Pneumatic Compression has been reconfigured, integrating it into the treatment plan and ensuring that the patient can reach the maintenance phase more quickly, making it more manageable at home.

**Methods:** Between 01/01/2023 and 30/05/2023, 23 patients [Table 1] suffering from lymphedema in the lower limbs (primary/secondary) were enrolled and underwent a treatment cycle: 4 sessions scheduled weekly, lasting 50 minutes at 35mmHg pressure. The patients wore stockings equipped with Dots applied under the machine’s calf section. The machine had a peristaltic sequential pattern with a minimum of 8-12 sectors. Volumetric measurements were taken using a 3D perometer at the beginning and end of the treatment cycle.

**Results:** Compared to the GOLD standard treatment, which involves an average of 8-12 sessions of attack therapy required to reach the flat line and the maintenance phase, a significant reduction in the time needed to achieve the flat line and a shorter number of sessions required for positioning the stocking has been observed.

**Conclusions:** Based on the results obtained, we can assert that a significant improvement in the clinical picture is possible thanks to the use of the DOT IPC protocol, and that this treatment, along with the accurate use of elastic stockings, could lead patients to undergo follow-up checks at healthcare facilities with lower frequency and enable them to manage the condition more independently.

**Keywords:** Lymphedema, Compression therapy
Volume Assessment In Lymphedema: Perometer In Clinical Practice

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Objectives: In lower limbs lymphedema the monitoring of the progress of the therapies and their effectiveness takes place using both the clinical / instrumental evaluation of the tissues both the measurement of limbs volumes. The water volumetry has historically been considered the reference, although it has the limit of poor practicality in daily use. Several studies have subsequently shown how the perometer produces results superimposable (for precision and repeatability) to those of water volumetry with the advantage of simplicity of execution. Therefore, in order to evaluate the results of the therapy over time, it is essential to be able to evaluate, accurately and in a non-invasive way, the volume variations of the limb during the therapeutic process.

Background: our study aims to define a protocol that can help the specialist in managing the timing of treatment, both to better define in terms of quantitative assessment the transition from attack therapy to maintenance therapy and for better management of follow-up.

Methods: patients diagnosed with lower extremity lymphedema (primary or secondary) who referred to Alberto Macciò Medical Office underwent perometric scanning with Bodytronic®600 for volumetric assessment of the lower extremities and related Body Mass Index calculation

Results: Perometric scanning performed regularly at each visit allows the patient's condition to be monitored and possibly, in a timely manner, detect volumetric changes and investigate their cause.

Conclusions: volumetric monitoring of the limb in patients with lymphedema helps in the management of therapy as it allows identification of the maximum volumetric decrease achieved and consequently placement of the elastic stocking at the most correct time. In addition, at follow-up, changes can be highlighted quantitatively and timely intervention is possible.

Keywords: Perometer, Lymphedema
Dosage of CDT in multicausal lymphoedema compared to lymphedema in pure form

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Lymphedema caused by impaired lymphatic drainage in both forms: primary and secondary. New investigation possibilities have opened up for the visualisation of transport disorders in the drainage system. What has remained largely unexplored is the level of the lymphatic load, which is largely the result of microvascular filtration. When microcirculation is impaired lymphatic load can be elevated. Both primary and secondary lymphoedema can occur in combination: Impaired drainage function with increased amount of fluid to be drained. The clinical consequences are rapid oedema progression and an increased need for therapy. We then speak of primary or secondary lymphoedema, aggravated by multimorbidity.

The number of patients suffering from lymphoedema has increased over the last 20 years, particularly in older patients with no evidence of primary or secondary forms of lymphoedema in their medical history. Based on findings from animal experiments, we have assumed that multimorbidity with an increase in lymphatic loads can cause an originally healthy lymphatic system to decompensate over time. We then described the resulting chronic oedema as multicausal. In the literature, we found numerous clinical pictures in which an increase of capillary permeability is described, resulting in elevated lymphatic load. We analysed the frequency of these diseases (diabetes, neuropathy...).

The lecture deals with multicausal lymphoedema and the need for multimodal therapies.
The importance of the correct compression garment in conservative and surgical lymphedema treatment

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Introduction: Compression garments are still one of the core stones of effective maintenance of the results of lymphedema treatment: it is one of the irreplaceable components of the 2nd phase of CDT, which is the golden standard of the conservative lymphedema management, and the same time it is a well known way to improve and maintain results of different types of surgical lymphedema treatment. Still the compression garment topic is not widely spoken, or educated to medical personnel or put attention to. In different clinics the measuring for custom made flat knit garments and fitting of garments are done by different specialists, sometimes even without medical background (e.g. personnel of orthopaedic shop), or by not experienced in lymphedema treatment personnel. The protocols of supervising of fitting and effectiveness of the garment are absent in many places. That can lead to several problems, which result in compromising and losing the effectiveness of the treatment done before putting on a garment.

Aims: To analyse the frequency of the incorrect fitting of compression garments in patients in our clinics, to search for correlation between medical background in lymphedema treatment of a fitter and frequency of incorrect garments, to work out the educational program for measuring/fitting the garments, to work out a protocol of supervision a patient after fitting a garment.

Methods: a systematic literature - PubMed, Medline, Cochrane, and ALF, ILF, LE&RN, LSN resources were observed. As well, the analysis of patients in our clinics was done (2 years observation) – the frequency of incorrect fitting of custom made flat knit compression garments in patients, who got it from orthopedic shops or in clinics with personnel not trained in lymphedema treatment and who got it in our clinics where the measuring was done by experienced lymphologists. We also analyzed the outcome of the treatment (conservative – CDT, and surgical – LVA, LNT, liposuction), both physical and psychological (satisfactory level with the treatment) that have been performed before fitting a compression garment, on a 5-7 days and 1 month perspective in cases of correct and incorrect compression garments. We also analyzed the situations when patient after receiving a garment is fitting it himself without supervision.

Results: The number of incorrect garment fitting is the highest in the group when measures are done by personnel of orthopaedic shops or without medical background about lymphedema – 87 out of 105 cases. When the measuring was done by lymphology experts in specialized clinic – 15 out of 160 cases had complaints on fitting. The incorrect garments compromised the results of conservative and surgical treatment – the recurrence of edema more than 10 % in volume
happened in 95 out of 102 patients with incorrect garment in 1 month after treatment. In cases when patient was supposed to fit his garment himself after receiving it, 75% fitted and were wearing it in incorrect way.

**Conclusions:** If possible, the measuring for custom made compression garments should be done by medical personnel trained in lymphedema treatment, who is understanding the behaviour and nuances of oedema in individual cases and who knows and can evaluate the background medical history of the patient. The incorrect garment results in compromising the effects of conservative and surgical treatment and recurrence of lymphedema, but in patient’s mind he is not satisfied with the treatment itself, not connecting the problem with incorrect garment, and that can discredit the treatment method. It is strongly advisable to fit the garment in clinic under supervision and check the patient in 5-7 days after wearing it to confirm the correct fitting and no recurrence of oedema.
Liposuction of Lipoedema: The Swedish Perspective

Anders Liss

In Sweden lipoedema is not included in the group of diagnosis that the welfare-program admits. Patients are not even accepted to have free compressions garments for prophylactic treatment or manual treatment. Lipoedema is considered equivalent to over-weight problem. Liposuction is offered in private clinics offering different techniques and the results varies. Women are organizing to put pressure on the public health system.

Keywords: Lipoedema, liposuction
Characterization of molecular mechanisms involved in the development and age-dependent regression of meningeal lymphatics

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Background: Recent studies have described the importance of lymphatics in numerous organ-specific physiological and pathological processes. The role of meningeal lymphatics in various neurological and cerebrovascular diseases has been suggested. It has also been shown that these structures develop postnatally and are altered by aging and that the vascular endothelial growth factor C (VEGFC)/vascular endothelial growth factor receptor 3 (VEGFR3) signaling plays an essential role in the development and maintenance of them. However, the molecular mechanisms governing the development and maintenance of meningeal lymphatics are still poorly characterized. Recent in vitro cell culture-based experiments, and in vivo studies in zebrafish and mouse skin suggest that collagen and calcium binding EGF domains 1 (CCBE1) is involved in the processing of VEGFC. However, the organ-specific role of CCBE1 in developmental lymphangiogenesis and maintenance of lymphatics remains unclear.

Objectives: Here, we aimed to investigate the organ-specific functions of CCBE1 in developmental lymphangiogenesis and maintenance of meningeal lymphatics during aging.

Methods: Conditional knockout mouse strain was used, which enables for the induced deletion of CCBE1 in vivo in newborn and adult animals.

Results: We demonstrated that inducible deletion of CCBE1 leads to impaired postnatal development of the meningeal lymphatics and decreased macromolecule drainage to deep cervical lymph nodes. The structural integrity and density of meningeal lymphatics are gradually altered during aging. Furthermore, the meningeal lymphatic structures in adults showed regression after inducible CCBE1 deletion.

Conclusions: Collectively, our results indicate the importance of CCBE1-dependent mechanisms not only in the development, but also in the prevention of the age-related regression of meningeal lymphatics. Therefore, targeting CCBE1 may be a good therapeutic strategy to prevent age-related degeneration of meningeal lymphatics.

Keywords: Aging, CCBE1, Lymphatic development, Meningeal lymphatics
Background: Traditionally, compression has been considered to be contraindicated in uncontrolled heart failure, due to concerns about making the heart failure worse. Caution has also been recommended about the use of compression in kidney failure where fluid overload is present, again due to concerns about causing heart failure. However, currently, this approach is being questioned and guidelines have been developed which include the use of compression to manage oedema in certain stages of heart failure. Unfortunately, there is very little published evidence on the risks and benefits of compression in these settings.

A practical approach:

a) Congestive heart failure.

Heart failure may present to lymphoedema services in a variety of forms and management should be adapted accordingly: Examples are:

i) Lower limb oedema due solely to heart failure (which may be previously undiagnosed). Heart failure is a life limiting condition which should be managed by appropriate specialists e.g. cardiologists. In exceptional circumstances, e.g. lymphorrhoea local light compression bandaging should be considered to control the lymphorrhoea and reduce the risk of cellulitis.

ii) Lower limb oedema may be due to a number of causes, especially in the elderly. These could include heart failure, reduced mobility, obesity and medication. Initial management of the heart failure as above is appropriate. Following optimisation of the heart failure management, the oedema should have reduced and modified reduced compression may be appropriate to treat other contributory causes.

iii) Chronic leg oedema in controlled chronic heart failure. Modified reduced compression can be appropriate.
iv) New heart failure in a patient with known lower limb lymphoedema, which causes the oedema to worsen. Again, treating the heart failure is paramount but modified reduced compression may be appropriate in parallel to this.

b) Kidney failure.

Fluid balance becomes increasingly a problem in advanced kidney failure (e.g. eGFR <=15ml/min). At this stage, dialysis is likely to be used. This should help to control the fluid balance. Oedema may vary in the time between dialysis treatments. Compression probably has a limited part to play (e.g lymphorrhoea, wounds).

If the kidney failure is associated with nephrotic syndrome, hypoalbuminaemia will exacerbate the oedema. In this situation, compression of the lower limb may push the fluid proximally in the limb resulting in increased thigh / genital oedema.
Tumescent liposuction technology for lipoedema treatment

Anders Liss

Liposuction of lipoedema is a drastic and effective treatment. There are many pitfalls in this treatment. In order to reach a final good outcome many decisions are needed. The diagnostic challenge, the choice of the liposuction device, the choice of compression garments post-op, the need to prevent the patient from increasing in weight are discussed.

**Keywords:** Lipoedema, liposuction
Treatment of Malignant Lymphedema: Importance of Holistic Approach

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Introduction: according to various literature sources, secondary lymphedema of the upper limb occurs in 40-70% of patients diagnosed with breast cancer. Conservative treatment is successfully used for these patients (CDT - complex decongestive therapy) and surgery. But in some patients, lymphedema of the upper limb can be malignant (as a result of damage to the lymph lymphatic pathways (lymph nodes and vessels) due to compression or spread of tumor process). Such swelling is difficult to treat, it’s often accompanied by skin defects (skin metastases or lymphorrhea), impaired limb mobility and pain. Due to the lack of official recommendations, very often such patients are denied treatment for edema, which significantly reduces the quality of life.

Aims: to develop and substantiate recommendations for the treatment of malignant lymphedema (ML), evaluate the effectiveness of the CDT technique for the treatment of such patients.

Methods: Scientific papers on the treatment of ML (PubMed, ResearchGate, Science Direct, etc.), as well as international recommendations and consensus documents (ISL consensus, ILF, etc.) were analyzed. According to the recommendation, a treatment plan was drawn up for patients with malignant lymphedema in 2019-2023 – 14 people. The CDT method (MLD, compression multilayer bandaging with low-tensile bandages, skin care, exercise therapy) was used with limitations (MLD was not performed in areas of metastasis; for skin defects additional antiseptic treatment and wound dressings were required; if active movements were impossible, passive movements were performed within the exercise therapy). Treatment results (quality of life, limb dimensions, motor function of the upper limb) were analyzed.

Results: 14 patients were treated with CDT followed by wearing flat knitwear or bandage Velcro systems. As a result of treatment, all patients experienced a significant decrease in limb volume (20%-90%) and an increase in quality of life (the ability to self-care and usual activities, reducing the need for outside care, etc.). Patients whose movement limitation was due to edema rather than paralysis/paresis had significant improvement in upper extremity motor function. During observation no side effects of CDT were noted. Conclusions: The use of CDT for the treatment of malignant lymphedema is safe, significantly improves limb condition and function, improves the patient's quality of life. The recommendations for the ML treatment were written, which were included in the draft of Clinical Guidelines for the treatment of lymphedema of the extremities, developed by the Russian Association of Lymphologists and the Association of Phlebologists of Russia.
Low-Energy Extracorporeal Shockwave Therapy as a Therapeutic Option for Patients with a Secondary Late-Stage Fibro-Lymphedema After Breast Cancer Therapy: A Pilot Study

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Affiliations expand

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- DOI: 10.1089/lrb.2020.0033

Abstract

Background: Secondary lymphedema (LE) can occur after breast cancer (BC) therapy with axillary lymph node surgery and/or radiotherapy. Reported incidence varies around 20%. The aim of this study was to see whether low-energy extracorporeal shockwave therapy (ESWT) is a therapeutic option in end-stage secondary upper limb fibro-LE. Methods and Results: A pilot study was performed on 10 adult patients who presented with an end-stage LE after BC treatment. They were all treated with usual physical therapy and all had lymphatic surgery before. Eight sessions of ESWT were applied, 2600 shocks at 0.1 mJ/mm\textsuperscript{2}, 2/week during 4 weeks. Upper limb volume decreased nonsignificantly, from 3086.4 ± 539.47 to 2909.1 ± 471.60 mL. Mean circumference of the upper limb was significantly decreased from 32.3 ± 3.01 to 31.4 ± 2.71 cm at the height of the upper arm, from 29.1 ± 2.89 to 28.1 ± 2.71 cm at the height of the elbow, and from 27.5 ± 4.08 to 26.8 ± 3.75 cm at the height of the forearm. Subjective measurements by visual analog scale showed significant decrease in both hardness from 57.3 ± 15.84 to 24.4 ± 21.89 mm and subjective feeling of edema from 44.2 ± 16.90 to 23.2 ± 21.16 mm. No adverse features were reported. Conclusion: We added some evidence that low-energy ESWT is well supported and has additional benefits also in longstanding fibro-lipo-LE on swelling of the arm leading to more subjective comfort for the patients.
The Use of Noninvasive Imaging Techniques in the Assessment of Secondary Lymphedema Tissue Changes as Part of Staging Lymphedema

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Abstract

Too often, in clinical settings, the diagnosis and evolution of lymphedema is determined by limb circumference measurements and/or volume calculations. Besides the unrecognition of small lymphedemas, these techniques provide little to no information concerning the stage of the lymphedema. This latter is important in choosing appropriate treatment modalities and making an accurate prognosis. Different imaging techniques are described in literature giving insights in tissue changes due to lymphedema. The aim of this article is giving an overview of possible texture changes linked to the different edema stages, visualized with noninvasive imaging procedures like ultrasonography, computed tomography, dual-energy x-ray absorptiometry, or magnetic resonance imaging.
**Abstract**

**Objectives:** (1) The ETS-family transcription factor, ERG, also has a role in the lymphatic system and (2) pathogenic variants in the *ERG* gene can cause a form of primary lymphoedema.

**Background:** Primary lymphoedema (PL) is caused by abnormal development of lymphatic vessels or failure of lymphatic function due to genetic abnormality. To date, the genetic causes of about 10-25% of PL cases are known.

**Methods:** Through whole genome analysis of PL cases included in the Genomics England 100,000 Genomes Project, six proband with novel variants in the *ERG* gene were identified. Verification and co-segregation analysis of the four frameshift and two nonsynonymous variants were completed by Sanger sequencing. Plasmids containing wildtype-ERG or mutant-ERG were overexpressed in human dermal lymphatic endothelial cells (hdLECs), and qRT-PCR, western blotting and immunofluorescence carried out.

**Results:** Wildtype-ERG was correctly localised in the nucleus with endogenous ERG. However, overexpression of mutant-ERG resulted in a diffuse distribution in the cytosol of hdLECs. Our studies showed that ERG expression colocalise with PROX1, a LEC marker, in vivo by immunostaining of ear skin from mice.

**Conclusion:** this study identifies novel heterozygous pathogenic variants in *ERG* causing dominantly inherited primary lymphoedema. ERG is a transcription factor, and its role is well known in the blood vascular endothelium as preserving adhering cell junctions, angiogenesis and blood vessel stability. However, the role of ERG in the lymphatic system is not clearly established and will need further study as understanding the underlying causes plays a huge role in the potential for the development of future therapies.

Disclosure of conflict of interest — No conflict of interest

**Keywords:** *ERG*, genetics, primary lymphoedema,
Classifications of Primary Lymphatic anomalies – where do we stand?

Main author: Pia Ostergaard – invited speaker

Chairs: Isabel Quere (France), Resa Aydin (Turkey), Meltem Vural (Turkey)

Abstract

Objectives: (1) Clinical testing of a selective group of primary lymphoedema patients gives a diagnostic yield of approx. 11%. (2) Primary lymphoedema is a heterogeneous disease.

Background: Building on more than 20 years of experience in our Primary Lymphoedema Clinic at St George’s Hospital, London, a classification of this condition has been proposed. This tool has been useful in our research department as well as molecular genetics and defines the genes being tested in the NHS.

Methods: An audit of all primary lymphoedema patients who underwent genetic testing in 2021 was carried out to get an overview of numbers of cases who ended up with a molecular diagnosis.

Results: The audit showed that only 11% of patients undergoing genetic screening using the Genomics England Primary Lymphoedema (v3.11) R136 gene panel were given a diagnosis. This low yield is despite our experience in selecting lymphoedema cases of clearly primary origin. A large proportion of patients have a variant of uncertain significance (VUS) in one of the known primary lymphoedema gene, but with current knowledge these findings cannot be reported.

Conclusion: This suggests that primary lymphoedema is a very heterogeneous disease and that we still have a long way to go in unravelling the genetic cause of primary lymphoedema. Finding the genetic causes of lymphatic dysfunction in Primary Lymphoedema, increases our understanding of the development of the lymphatic system, and can aid the development of therapies.

Disclosure of conflict of interest — No conflict of interest

Keywords: audit, primary lymphoedema, clinical testing
Other Microsurgical Techniques: Peripheral LVA, Lymph Nodal Transplants – Pros and Cons

Sarah Thomis

Lymphovenous anastomosis (LVA) and lymph node transplantation are reconstructive surgical procedures used to treat lymphedema. LVA involves creating direct connections between lymphatic vessels and nearby veins to bypass blocked lymphatic pathways. This procedure aims to improve lymphatic fluid drainage and reduce swelling.

One advantage of LVA is its minimally invasive nature, often performed under local anesthesia, which can lead to quicker recovery times compared to more extensive surgeries. LVA can be particularly beneficial for early-stage lymphedema or in cases where localized lymphatic dysfunction is present.

However, LVA may not be suitable for all patients, especially those with advanced lymphedema or extensive lymphatic damage. The success of LVA can vary depending on individual factors such as the severity and cause of lymphedema, and not all patients experience significant improvement.

On the other hand, vascularized lymph node transplantation involves transferring healthy lymph nodes from one part of the body (often from the groin or abdomen) to the affected area. This procedure aims to restore lymphatic function and reduce swelling by introducing healthy lymphatic tissue.

One major advantage of lymph node transplantation is its potential for long-term improvement, as the transplanted lymph nodes can establish new drainage pathways over time. This procedure is typically considered for patients with more advanced lymphedema who have not responded well to other treatments.

However, lymph node transplantation is a more complex procedure than LVA, often requiring general anesthesia and a longer recovery period. Complications such as donor site morbidity and wound problems are also considerations.

In conclusion, both lymphovenous anastomosis and lymph node transplantation offer potential benefits for treating lymphedema, but they also come with considerations and limitations. The choice of procedure and timing should be carefully discussed between the patient and their healthcare team based on imaging techniques, individual circumstances and treatment goals.
Pre-operative and post operative protocols in lymphedema surgery: How to decrease risks of lymphatic surgery and increase efficacy

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Introduction: Nowadays lymphatic surgery is developing rapidly in many countries, as it can give the results that conservative treatment cannot achieve (microsurgery can partly restore the damaged lymphatic transport; can make a person more independent from compression garments; liposuction can remove all excessive fat and fibrotic tissues, making limbs symmetric), so many surgeons want to perform these types of operations and many patients are willing to be treated with it. The problem is that very rarely during education of new surgeons there is a module that covers what exactly should be done before surgery and what should be done after to improve the results of intervention and decrease the risks of side effects. It can lead to significant decrease in efficacy of lymphatic surgery and increase of adverse effects after.

Aims: to analyze the current existing individual protocols for pre-op and post-op care in scientific literature, to analyze the situation in Russia with pre-op and post-op care in lymphedema surgery, to work out a draft of recommendations for pre-op and postoperative care for LVA, LNT and liposuction.

Methods: a systematic literature - PubMed, Medline, Cochrane, ALF, ILF, LE&RN, LSN resources were observed to collect the different approaches in pre-op and post-op care in lymphedema surgery. The data was collected from Russian clinics who are performing lymphedema surgery – pre-op and post-op care, changes in limb before and after surgery (circumference volumetric method), adverse effects after surgery – 5 clinics, 76 patients. Referring to approaches in literature to discuss with the members of the Russian Lymphology Association (RLA) possible pre-op and post-op protocol guidelines.

Results: In literature there is relatively little to no information regarding pre-op and post-op procedures in lymphatic surgery, though there is a major opinion that a patient before lymphedema surgery should be fully decongested (CDT). Skin care and physical exercises are recommended, though there are no details. Regarding compression therapy and MLD the information is controversial or not sufficient. Analysis of Russian clinics showed that only one clinic is following strict pre-op and post op protocols, and the results of surgery are very good with very few slight adverse effects (liposuction protocol of H.Brorson). The rest of the clinics either do not have pre-op and post-op care at all, either it’s not correct or sufficient, so very often there are no results after surgery or there are adverse effects (increasing/developing of edema, severe seromas, infections, etc). After RLA meeting we made a draft of the pre-op and post-op protocol guidelines.
Conclusion: Preoperative and postoperative care is very significant in lymphedema surgery, in case of poor care the results of surgery may be lost and risk of side effects increases. There should be a consensus on pre-op and post-op protocol guidelines that new lymphatic surgeons should follow. RLA prepared a draft of such protocol.
Vascular malformations related to lymphedema

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Vascular malformations are the result of an inborn error in the process of angiogenesis and vasculogenesis in the fetus, mainly due to genetic mutations. Defects of arteries, veins and lymphatics are possible as well as a combination. Two types of defects are possible according to the vessels involved: truncular forms, when main conduits are involved and extratruncular forms if the defect manifest with an abnormal area of small vessels inside the tissues. Truncular lymphatic are anomalies of the main draining lymphatic channels which manifest often with lymphedema, while extratruncular forms are masses of dysplastic lymphatics which may be sited in many parts of the body: the most frequent site is head and neck, but also limbs, thorax and abdomen may be involved. The second group, even if congenital like the first, is completely different and has also different treatment options.

Main diagnostic goal is to distinguish LM from other malformations as well as to recognize the site of the defect, the extension and the size of the cysts. A specific duplex scan examination combined with MR is the most effective diagnostic approach.

Treatment options are different: surgery, sclerosis, laser treatment and medical therapy are available. For macrocystic forms the preferable treatment is sclerosis which can be done with different sclerosing agents, like ethanol, bleomycin, polidocanol, OK-432, doxycycline and others. In very large cysts, surgery is preferred. Microcystic and combined lymphatic malformations, sclerosis is less effective as it is impossible or difficult to inject inside the cysts. Surgery can be performed in limited forms sited in an area easy to approach. In infiltrating and extensive forms, where surgery may be difficult or even impossible, medical treatment can improve symptoms by reducing the dysplastic mass. The most known agent is Sirolimus which needs to be given for a longer time (up to 3 years). Encouraging results has been reported even if recurrence after interrupting the therapy is possible. A new treatment which has shown very interesting results, is electroporation with Bleomycine, a treatment by which the sclerosing effect of the drug is increased by up to 700 times even in microcystic forms by the application of a current for a short time.

Further studies are necessary to demonstrate the efficacy of this treatments in microcystic infiltrating lymphatic malformations which are the most difficult type to handle.
Fifty years for Lymphatic Surgery: Advances and Future Perspectives

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Abstract: The Author presents the 50 years of Research and Experience on Surgical Therapy of Lymphatic and Chylous Disorders with Related Syndromes. The development of surgical techniques to restore lymphatic flow offers a treatment that targets more than symptomatic relief, but above all functional repair of the underlying problem of lymph or chylous stasis. Lymphatic Microsurgery has a basic role in the treatment of these disorders and of their related complications.
New techniques have also emerged for the combined treatment of advanced stages of chronic peripheral lymphoedemas, where there are significant fibrotic adipose tissue deposits with disease progression, which contributes to residual lymph stasis and increased risk of infection.
The original technique of Fibro-Lipo-Lymph-Aspiration using a Lymph Vessel Sparing Procedure (FLLA-LVSP) was developed to improve chronic swelling of patients with advanced lymphoedema.
In the diagnostic protocol and for the follow-up Lymphoscintigraphy of superficial and deep system represents, in the experience of the Author, a fundamental study for the surgical indication, including the Whole Body Lymphoscintigraphy to detect gravitational and/or chylous systemic disorders.
On the diagnostic and prognostic point of view, histopathologic staging by immuno-histochemistry is of basic importance.

Keywords: Lymphatic Disorders – Lymphedema – Chylous Disorders – Lymphatic Surgery & Microsurgery – Liposuction
Recent studies, primarily conducted on rodents, have unveiled the crucial role of the skin lymphatic system in maintaining sodium (Na⁺) homeostasis, water balance, and blood pressure. Skin is an extensive reservoir of Na⁺ ions stored in an osmotically inactive form on glycosaminoglycans (GAGs). Accumulation of Na⁺ in the skin of rodents fed a high-sodium diet resulted in hypertonic stress and subsequent stimulation of a pathway that started with infiltration of the skin by macrophages and activation of the nuclear factor of activated T cells 5 (NFAT5), also known as tonicity-responsive enhancer binding protein (TonEBP). The next step was macrophage secretion of vascular endothelial growth factor C (VEGF-C) and activation of lymphangiogenesis in the skin. Blocking the macrophages–VEGF-C–lymphangiogenesis axis in rodents’ skin fed a high-sodium diet by genetic or pharmacological interventions resulted in salt-sensitive arterial hypertension. Recently, observational studies demonstrated that the NFAT5–VEGF-C–lymphangiogenesis pathway might also be present in humans.

The regulatory pathway, proposed in the experimental rodent model, holds significant promise as a potential protective mechanism against arterial hypertension. The primary stimulator of lymphangiogenesis, vascular endothelial growth factor C, also regulates the pump activity of lymphatic vessels and induces the expression of endothelial nitric oxide synthase (eNOS), which is associated with vasodilation and potentially, blood pressure reduction through NO elevation. Moreover, the formation of new lymphatic vessels might facilitate the removal of Na⁺, water and hyaluronic acid from the skin interstitium.

The lecture is intended to provide a comprehensive summary of the most recent findings regarding the role of the skin lymphatic system in the pathophysiology of arterial hypertension.
THE NOVEL APPROACH IN LYMPHEDEMA TREATMENT: COMBINING BIOBRIDGE AND COMPLEX DECONGESTIVE THERAPY

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Introduction: Effective treatments for lymphedema of the limb(s) are limited. Traditionally, the golden standard of care is the Complete Decongestive Therapy (CDT) which includes manual lymph drainage, multilayer short stretch bandaging/flat knit compression garments, exercise, and skin care. While CDT has been shown to successfully reduce excess limb volumes, it cannot restore the functional capacity of the lymphatic system. The challenges of CDT are that it requires patient commitment to a life-long diligence to limit the progression of the disease and maintain treatment results and creates a costly and time-consuming dependency on compression garments and ongoing CDT sessions.

Microsurgery for lymphedema treatment has shown promising results but has many limitations and requires highly qualified personnel and specific equipment, and may not be easily accessible and affordable. Combination of microsurgery with BioBridge® Collagen Matrix (BioBridge) - aligned nanofibrillar collagen scaffold - has already demonstrated its safety and efficacy in further reducing limb volume and tissue fibrosis, but still has similar issues with accessibility and cost because includes microsurgery.

Aims: To develop a new therapeutic approach to complement and improve the long-term outcome of CDT through utilization of recent advancements in diagnostics and research on lymphatic drainage by combining CDT with a minimally invasive implantation of BioBridge. To develop and validate a treatment protocol to evaluate the efficacy of the combination therapy and to serve as a basis for application in clinical practice.

Methods: ICG lymphography will be used to map the lymph drainage pattern in lymphedema patients, and BioBridge scaffolds will be implanted to enhance the existing and/or create a complementary drainage routes and to direct the flow of extracellular fluid along the BioBridge to the regions with identified viable lymphatic system with the help of CDT. Identification of the functional lymph drainage route increases the efficacy of CDT; BioBridge scaffold implantation increases lymph drainage along the scaffold, therefore the efficacy of this approach will be evaluated by comparing pre- and post-treatment lymph flow pattern by ICG lymphography and limb volume by standard tape measurements.
Results: A single-arm, prospective, open-label pilot study has been designed to evaluate efficacy of combining CDT with the BioBridge implantation in patients with unilateral secondary lymphedema of the upper limb, based on ICG lymphography and volumetric analysis. A treatment protocol has been developed to implement the combination of CDT with BioBridge in clinical practice.
Education and patient projects in lymphology: why and how to develop a system

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Introduction: Russia – as many countries in the world – has many problems with lymphedema treatment: no insurance coverage; high cost of treatment and compression garments; no local production of flat knit compression garments; no LE treatment/diagnostics standards; no past education about lymphedema so lack of lymphology specialists; lack of information about lymphedema for doctors and patients, so most of patients are usually not diagnosed/misdiagnosed and get wrong treatment/no treatment; no cooperation between CDT specialists and lymphatic surgeons, etc. But the approximate number of LE patients in Russia is over 5300000. 10 years ago only one clinic for lymphedema treatment existed.

Aim: to build a system of lymphology treatment and education in Russia, to increase number of lymphology specialists, to increase number of patients who get right treatment on time, to improve providing information to patients and doctors about lymphedema, to manufacture local compression products.

Methods: Development of The Russian Lymphology Association to establish official medical standards for LE diagnostics and treatment, to establish lymphological educational programs in universities, to build connections with international lymphology societies and specialists, to provide information and support about lymphedema to patients and doctors (schools for patients, lectures and conferences for doctors, YouTube channel, journal “LIMPHA”, social nets), to establish local manufacturing of the flat knit garments.

Results: The Russian Lymphology Association was developed, as a part of public healthcare system it can establish official medical standards for lymphedema treatment and diagnostics, which are currently being written by experts, according to ILS, ILF & ELS recommendations. Accredited educational program in lymphology was established in two medical universities, 102 specialists were educated during last 6 years. Russian lymphology specialists are members of ELS, ILS, LE&RN and regularly participate in international lymphological conferences and courses. 28 private clinics treat lymphedema in 23 Russian cities and in Belorussia. 392 schools for patients, 46 lymphology conferences were organized (with international speakers), 3 years participating in The WLD project with total audience over 5000 people, the internet resources audience (YouTube channel, social nets, journal) is over 70000 people. That helps to get good results in prevention and early effective treatment of lymphedema. In 2023 first flat knit CM compression garments of local origin were produced in Moscow. Still financial and social problems exist, the main aim for future is to establish a productive dialogue with Healthcare
Ministry about including lymphedema treatment into medical insurance programs and reimbursement of compression garment cost.
Adapting CDT for Pediatric Patients

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Pediatric lymphedema is generally represented by developmental lymphatic vascular deficiency which can be either congenital or hereditary but it rarely occurs in children with an intact lymphatic system, due to secondary causes consisting infection, trauma, and other conditions. Diagnosis is based mainly on clinical findings but physicians have to take detailed anamnesis, perform extensive physical examination for coexisting systemic involvement and secondary causes, and carry out required imaging modalities. Prevention of progression, early diagnosis and proper treatment are crucial in the management of pediatric lymphedema. There is no cure for this lifelong condition, but complete decongestive therapy -CDT (skin care, manual lymphatic drainage, multilayer bandaging, exercise, pressure garments, self-care education) as a gold standard of lymphedema treatment, reduce the volume, decrease the incidence of complications and improve quality of life in pediatric patients. The CDT principles resemble to those for adults but some modifications may be needed in compression degrees and pressure garments. As the tissues in pediatric cases are delicate, great care should be taken to avoid discomfort or injury. In MLD; depending on the age and size of the child, soft stationary circles and pump techniques may be used. Children are generally active and will not lie still the entire length of treatment session, bringing a favorite toy, game or book may be helpful. The MLD as home-program, can be applied when the child is asleep. Materials and techniques used in bandaging depend on child’s age and developmental situation (decreased number of layers, extrasoft padding for delicate tissue). Multilayer short stretch bandages are not applied before the ambulation (toddler period), toes are not wrapped in small children. Bandages must not interfere with normal growth and should not greatly compromise the ability to walk or daily living activities. It is necessary to check the bandage several times during the day/slipping-tourniquet and they may have to be renewed multiple times per day during the intensive phase. Compression garments are not recommended for children younger than 1 year of age. 18-21 mm Hg of compression (Class 1) should not be exceeded in children younger than 4 years of age. Custom garments according to site and severity of LE should be used. The use of compression garments during the day generally does not affect normal activities but frequently control for skin breakdown is needed. Colorful patterned garments may increase the compliance. In addition to wearing the compression garment during the day, in many cases it may be necessary to apply bandages during the night time. The garments should be checked every 4-6 months for general condition, proper compression and size. Children should be encouraged to engage in sports and recreational activities (walking, swimming, cycling). Limitations in activities of children should be avoided. Exercises should preferably be performed with pressure garments. The positive effects of pumps especially with new models have been shown in some pediatric patients. The pressures should be adjusted to the age of child, site and grade of lymphedema. Previous studies indicated better effects of kinesio-taping on decreasing lymphedema, when performed in addition to CDT. Caution is needed for
childrens’ delicate skin and allergic reactions, a small test strip may be needed before the application.

In conclusion CDT is the gold standard for treatment in pediatric lymphedema patients and resemble to those with adults but should be applied with modifications according to age, lymphedema site, and stage and great care should be taken to avoid discomfort or injury in their delicate skin.