PRÁTICAS EDUCATIVAS, MEMÓRIAS E ORALIDADES

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# Clinical effects, feasibility and education: ultrasound and lymphatic drainage protocol in the postoperative period of lipedema

ARTICLE

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**Abstract**
Lipedema is characterized by abnormal multiplication of adipocytes due to hormonal changes. The surgical treatment in some cases is necessary. After surgery, proper postoperative management is essential. The objective of this study is to investigate the clinical effects and feasibility of a low mechanical index multifocal ultrasound protocol associated with mechanical lymphatic drainage in the pre and postoperative for lipedema. This is a quasi-experimental pilot study. Participants were assigned to parallel groups, for convenience, with 10 patients in group 1 (G1) and 10 in group 2 (G2). G1 received treatment both pre-surgery and post-surgery. G2 received treatment only in the post-surgery period. The groups, at the end of the follow-up, showed similarity in terms of pain, mobility, bruising, fatigue, mood, and sensitivity. The results showed that both protocols had similar clinical and viability effects and could be used in the rehabilitation of lipedema surgery. The importance of continuing education is highlighted for a more informed, up-to-date, and safe practice.
**Keywords:** Lipohypertrophy. Surgical treatment. lymphatic therapy. Ultrasonic therapy. Continuing education.

## Efeitos clínicos e viabilidade do protocolo de drenagem ultra-sónica e linfática após cirurgia de lipedema

**Resumo**
Lipedema é caracterizado por multiplicação anormal de adipócitos devido alterações hormonais. O tratamento cirúrgico em alguns casos é necessário. Após cirurgia, o manejo pós-operatório adequado é essencial. O objetivo deste estudo é investigar os efeitos clínicos e a viabilidade de um protocolo de ultrassom multifocal de baixo índice mecânico associado à drenagem linfática mecânica no pré e pós-operatório de lipedema. Trata-se de um estudo piloto quase-experimental. As participantes foram designadas em grupos paralelos, por conveniência, com 10 pacientes no grupo 1 (G1) e 10 no grupo 2 (G2). O G1 recebeu o tratamento tanto no período pré-cirurgia quanto no pós-cirurgia. O G2


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recebeu o tratamento apenas no período pós-cirurgia. Os grupos, ao final do acompanhamento, demonstraram similaridade em relação à dor, mobilidade, equimose, fadiga, estado de ânimo e sensibilidade. Os resultados mostraram que ambos os protocolos apresentaram efeitos clínicos e de viabilidade similares, podendo ser empregados na reabilitação de cirurgia de lipedema. Destaca-se a importância da educação continuada para uma prática mais informada, atualizada e segura.
**Palavras-chave:** Lipohypertrofia. Tratamento cirúrgico. Terapia linfática. Terapia por ultrassom. Educação continuada.



## 1 Introduction

Lipedema is a condition defined by the abnormal multiplication of fat cells due to hormonal changes. This disease mainly affects women and its clinical manifestations usually appear during phases of hormonal change such as puberty, pregnancy or menopause (CHILD et al., 2010). A specific characteristic of lipedema is the presence of a visible disproportion between a thin upper body and thickened lower limbs (KRUPPA et al., 2020; TODD, 2010).

Lipedema has a symmetrical bilateral distribution and is associated with symptoms such as pain, edema and bruising (CHILD et al., 2010; FIFE; MAUS; CARTER, 2010; OKHOVAT; ALAVI, 2015). In addition, the disease has a negative physical and psychological impact due to its chronic and progressive nature, resulting in a deterioration in the quality of life of these individuals (DUDEK; BIAŁASZEK; OSTASZEWSKI, 2016).

The prevalence of lipedema in the general population is not well established. Studies carried out in outpatient clinics estimate the prevalence to be between 7% and 10% (REICH-SCHUPKE et al., 2017). In addition, other authors suggest that around 10% of adult Caucasian women are affected by this disease (MARSHALL; SCHWAHN-SCHREIBER, 2011), with a positive family history being observed in up to 60% of cases, thus indicating that there is a genetic component associated with lipedema (CHILD et al., 2010; LANGENDOEN et al., 2009; REICH-SCHUPKE et al., 2017), mainly linked to autosomal dominant disease or linked to the X chromosome (CHILD et al., 2010).

Lipedema can be classified into three stages, based on progressive changes in the skin surface (stage I: smooth; stage II: irregular or wavy; stage III: markedly thickened and hardened) and the findings during palpation (stage I: small nodules, reversible edema;


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stage II: walnut-sized nodules, reversible or irreversible edema; stage III: disfiguring fat deposits, macronodular changes, with associated lymphedema, potentially with a positive Stemmer sign). It is important to note that symptoms and the degree of subjective suffering are not necessarily related to the stage of the disease (WOLLINA; HEINIG, 2018).



Conservative treatment of lipedema aims to relieve symptoms and prevent secondary complications, focusing on reducing pain, edema and decreasing fat deposition, using combined decongestive therapy, such as compression garments, mobilization, lymphatic drainage and therapeutic ultrasound (HEINIG; WOLLINA, 2015; QIN et al., 2023). However, when conservative treatment is not effective and symptoms continue to progress, lipedema surgery, specifically the WAL (Water-Assisted Liposuction) technique, can be considered. This technique involves the use of a slightly pressurized jet of saline solution to dislodge fat and remove fat cells from the body, by means of a cannula introduced into the tissue during local anesthesia (SATTLER; EICHNER, 2013; WOLLINA, 2017).

The patient's effective recovery after lipedema surgery depends on proper postoperative treatment, usually carried out by a trained professional, the dermatofunctional physiotherapist. This professional will assess the patient and employ the most appropriate treatments, such as the use of ultrasound and mechanical lymphatic drainage, with the aim of reducing clinical complications. However, it is important to mention that a standardized post-operative treatment for lipedema has not yet been established.

Therefore, the aim of this study is to investigate the clinical effects and feasibility of a Low Mechanical Index Multifocal Ultrasound (LMIFU) protocol associated with mechanical lymphatic drainage in the pre- and postoperative period of lipedema. The intention is to provide a more precise approach to the post-operative treatment of this condition, contributing to continuing education and evidence-based safe practice (BRANDENBURG et al., 2020).

## 2 Methodology

This is a pilot study, with a quasi-experimental research design, with 20 women chosen non-probabilistically, conducted in the city of Natal/RN. The participants were

assigned to parallel groups, for convenience, with 10 patients in each group. The study was carried out in a physiotherapy clinic and took place between January 8 and June 5, 2023. The study began after approval by the Research Ethics Committee of Universidade Potiguar under CAEE number 70520223.6.0000.5296 and opinion number 6.148.844.



The study included participants aged over 18, referred to the physiotherapy clinic with a medical diagnosis of lipedema and an indication for lipedema surgery using the WAL technique, who had lipedema classified as type 3, preserved local sensitivity and the ability to understand instructions. As for the degree of lipedema, participants with grades 1 to 4 were included.

Participants who were contraindicated in using the mechanical lymphatic drainage device, had abnormal blood coagulation, were using anticoagulants, had polyneuropathies, were pregnant or breastfeeding, had autoimmune diseases, decompensated diabetes, epilepsy, skin infections, keloids or metal implants in the treatment area were excluded from the study. Participants with primary malignant disease (tumors) in the treatment area were also excluded.

The participants were assessed using the Protocol for Physiotherapeutic Assessment of Localized Adiposity (PAFAL), an instrument validated by Mendonça et al. (2008) which allows data to be collected on the anamnesis and physical examination of the condition. A measurement was taken 5 cm below the umbilical scar and on the iliac crest bilaterally for the hip, serving as a reference point for subsequent measurements of the lower limbs, every 10 cm throughout the lower limb, and the triceps skinfold was measured. A bioimpedance scale was used to observe the distribution of the volunteers' localized fat. Photos of the participants were taken in the orthostatic, anterior, right lateral, left lateral and posterior positions.

For the treatment, the volunteers were divided into two equal groups. Group 1 (G1) received treatment both pre-surgery and post-surgery, totaling 10 sessions. Initially, in the pre-surgery period, five sessions were carried out continuously. Then, in the post-surgery period, a further five sessions were carried out, with three sessions every other day and the last two sessions every three days. The participants received treatment with the Deep Slim® UMBIM device, with the following parameters: pre-surgery, 100 Kpa, and post-

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surgery, 20 Kpa, applied to a 10 x 10 cm area, with an application time per area of three minutes. Four areas were covered (anterior thigh, posterior thigh, calf and arm), with 12 minutes of application on each hemibody, totaling 24 minutes. Afterwards, they received mechanical lymphatic drainage lasting 15 minutes on each lower limb, for a total of 30 minutes.



Group 2 (G2) received treatment only in the post-surgery period, totaling 10 sessions. These sessions were carried out using the same UMBIM device, with 20 Kpa applied to a 10 x 10 cm area, with an application time per area of three minutes. The same four areas were covered (anterior thigh, posterior thigh, calf and arm), with 12 minutes of application on each hemi-body, totaling 24 minutes. Mechanical lymphatic drainage lasted 15 minutes on each lower limb, for a total of 30 minutes per session. The sessions were held five times a week for two weeks.

Table 1 - Breakdown of the differences between G1 and G2

| | | | | |
|---|---|---|---|---|
| **G1** | Pre-surgery | 1st week | 5 sessions, one each day, of 15-minute mechanical lymphatic drainage on each lower limb (30 min). | Multifocal ultrasound of 100 Kpa applied to a 10 x 10 cm area, with an application time of 3 minutes per area. Four areas were covered (anterior thigh, posterior thigh, calf and arm), with 12 minutes of application on each hemibody, totaling 24 minutes. |
| | Post-surgery | 2nd week (72 hours after surgery) | 3 sessions every other day of 15-minute mechanical lymphatic drainage on each lower limb (30 min). | Multifocal ultrasound of 20 Kpa applied to a 10 x 10 cm area, with an application time of 3 minutes per area. The same four areas were covered, with 12 minutes of application on each hemibody, totaling 24 minutes. |
| | | 3rd week | 2 mechanical lymphatic drainage sessions of 15 minutes on each lower limb (30 min) with a 3-day interval | Multifocal ultrasound of 20 Kpa applied to a 10 x 10 cm area, with an application time of 3 |


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| | | | | |
|---|---|---|---|---|
| | | | between sessions. | minutes per area. The same four areas were covered, with 12 minutes of application on each hemibody, totaling 24 minutes. |
| **G2** | Post-surgery | 1st week (72 hours after surgery) | 5 sessions of mechanical lymphatic drainage, one each day, lasting 15 minutes on each lower limb (30 min) | Multifocal ultrasound of 20 Kpa applied to a 10 x 10 cm area, with an application time of 3 minutes per area. Four areas were covered (anterior thigh, posterior thigh, calf and arm), with 12 minutes of application on each hemibody, totaling 24 minutes. |
| | | 2nd week | 5 sessions of mechanical lymphatic drainage, one each day, lasting 15 minutes on each lower limb (30 min). | Multifocal ultrasound of 20 Kpa applied to a 10 x 10 cm area, with an application time of 3 minutes per area. The same four areas were covered, with 12 minutes of application on each hemibody, totaling 24 minutes. |



For the treatment protocol, the volunteers were placed on a stretcher, first in the supine position and then in the prone position, and were treated in the four areas with the UMBIM (Figure 1). In dorsal decubitus, they received the mechanical lymphatic drainage device, where they performed plantar flexion and extension movements for 30 minutes. G1 received 5 sessions of mechanical lymphatic drainage and multifocal ultrasound prior to the surgical procedure and restarted the treatment protocol 72 hours after surgery. G2 started the treatment protocol 72 hours after the surgical procedure.

Figure 1 - Low Mechanical Index Multifocal Ultrasound application sites

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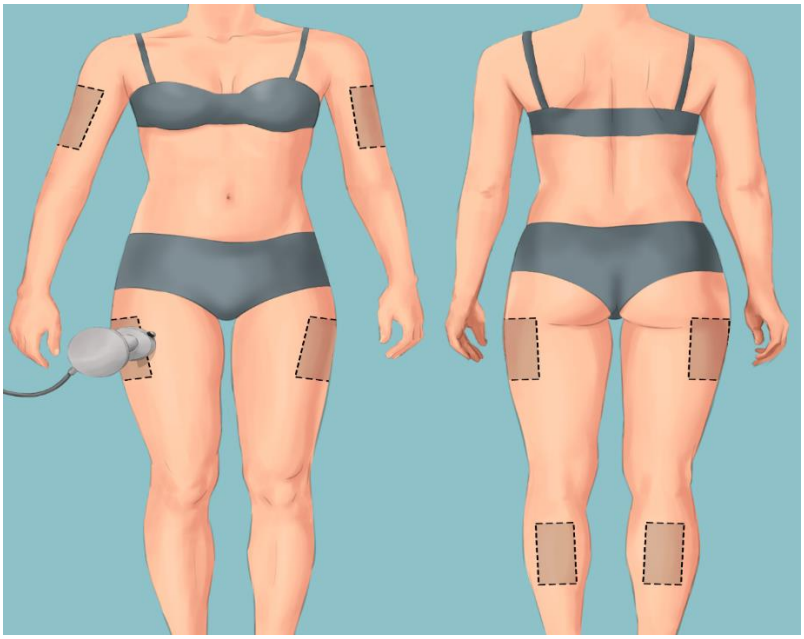

Source: The authors (2023).

Demographic data, anthropometric and clinical measurements were assessed, such as the presence of post-surgery complications, the presence of seroma, superficial ulcer, fibrosis, pain, mobility, ecchymosis, fatigue, mood and sensitivity. The presence of seroma was assessed by observing (signs of excessive swelling, floating sensation to the touch, redness, pain or discomfort in the area, presence of secretion or drainage of fluid through the surgical incision). The skin in the operated area was observed for areas of ulcerated skin, including size and depth. The presence of fibrosis was assessed by examining the operated area, palpating the skin to identify areas of hardening or thickening.

Pain was assessed using the visual analog scale (VAS) (0: no pain; 1 to 3: mild pain; 4 to 6: moderate pain; 7 to 9: severe pain and 10: unbearable or maximum possible pain) (MARTINEZ et al., 2011). Mobility was rated from 1 to 5, with the following categories (1: reduced; 2: regular; 3: good; 4: very good and 5: excellent). Bruising was classified according to color and based on visual observation (no bruising: 0; 1: yellow; 2: green-yellow; 3: orange-yellow; 4: orange-green; 5: orange; 6: red). Fatigue was assessed using a visual analog scale and according to intensity (0: no fatigue; 1: very mild fatigue; 2: mild fatigue; 3: moderate fatigue; 4: moderately intense fatigue; 5: very intense fatigue; 6: very intense fatigue; 7: extremely intense fatigue). Tactile sensitivity was assessed by means of


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esthesiometry in the post-operative regions (0: no tactile sensitivity and 1: presence of tactile sensitivity). Mood was classified on a scale from 0 to 3, with the following categories: (0: sad; 1: normal; 2: happy and 3: euphoric). Mobility, ecchymosis, fatigue, sensitivity and mood were assessed using a personalized protocol developed and used by the author in daily clinical practice with patients with lipedema.



To assess the feasibility of the protocols, we counted the time needed to perform the entire procedure (multifocal ultrasound and mechanical lymphatic drainage) during each session, in the pre- and post-surgical period. The clinical variables were assessed during the appointments, from the first to the last day.

Continuous variables are described using mean, standard deviation, median and interquartile range. Categorical variables are presented as absolute values and percentages. A significance level of 5% was assigned to all statistical analysis. The data collected was organized in Excel tables and then exported and analyzed using the Statistical Package for the Social Sciences (SPSS) software version 17.0 for Windows.

## 3 Results and Discussion

During the study period, 20 patients were selected. Ten were allocated to G1 and 10 to G2. Table 2 shows the demographic, anthropometric, clinical and feasibility characteristics of the groups.

Table 2 - Group characteristics

| Variables | Group 1 | Group 2 |
|---|---|---|
| Age, years, mean (SD) | ± 40,8 (10,3) | ± 36,5 (7,3) |
| Weight, Kg, mean (SD) | ± 73,8 (10,6) | ± 64,6 (7,8) |
| Height, cm2, mean (SD) | ± 1,62 (0,09) | ± 1,66 (0,05) |
| **Complications after surgery** | | |
| Seroma, n, % | 1 (10%) | 1 (10%) |
| Ulcer smaller than 1 cm2, n, % | 3 (30%) | 0 (0%) |
| Fibrosis, n, % | 0 (0%) | 1 (10%) |

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| | | |
|---|---|---|
| Initial pain, IIQ, min, max | 6 (3 – 7) | 6 (4 – 8) |
| Final pain, IIQ, min, max | 0 (0 – 1) | 0 (0 – 2) |
| Initial mobility, IIQ, min, max | 2 (1 – 3) | 2 (1 – 4) |
| Final mobility, IIQ, min, max | 5 (5 – 5) | 5 (4 – 5) |
| Initial equimose, IIQ, min, max | 6 (6 – 6) | 5 (3 – 6) |
| Final Equimose, IIQ, min, max | 0 (0 – 0) | 0 (0 – 0) |
| Fadiga initial, IIQ, min, max | 4,5 (1 – 7) | 3,5 (0 – 5) |
| Final Fadiga, IIQ, min, max | 0 (0 – 0) | 0 (0 – 0) |
| Post-surgical sensitivity, IIQ, min, max | 1 (1 – 1) | 1 (1 – 1) |
| Initial mood, IIQ, min, max | 2 (0 – 3) | 2 (0 – 2) |
| Final mood, IIQ, min, max | 3 (2 – 3) | 3 (2 – 3) |
| Time spent in pre-surgical care, mean (SD) | ± 59 (2,0) | ± 0 (0) |
| Time spent in post-surgical care, mean (SD) | ± 62 (2,5) | ± 62,5 (2,5) |

SD: standard deviation; n: absolute number; %: percentage; IIQ: interquartile range; min: minimum; max: maximum

The patients in G1 and G2 were homogeneous in terms of age, weight, height and clinical characteristics in the post-operative period, which indicates a balance of these characteristics between the groups and reinforces the reliability of the results.

Lipedema is a condition that can affect women in different age groups, being more common during puberty and more frequent in young adults. After the first pregnancy, there may be an increase in the incidence and severity of lipedema (CHILD et al., 2010). Although not exclusive, this disorder characterized by the disproportionate accumulation of fat in the legs and hips tends to progress over the years, especially during periods of hormonal changes, such as the menopause. However, the age of onset and progression of lipedema can vary individually (FORNER-CORDERO et al., 2012; HALK; DAMSTRA, 2017; WENCZL; DARÓCZY, 2008).

Lipedema is an aesthetic condition that can cause significant damage to women's quality of life, and can result in body disproportion, chronic pain, edema and changes in skin texture (ESTEN et al., 2003). In addition to the physical impacts, lipedema can also have

psychosocial consequences, such as low self-esteem and restrictions on daily activities. Given this context, surgeries and aesthetic procedures related to the treatment of lipedema have become increasingly common in Brazil and around the world, seeking to improve physical appearance, relieve symptoms and promote the well-being of women affected by this condition (SATTLER; EICHNER, 2013).



Lipedema surgery using the WAL technique consists of using a continuous jet of water to dislodge the fat from the connective tissue using a cannula. In addition, it is a technique that uses only local anesthetics and does not require general anesthesia (PEPRAH; MACDOUGALL, 2019). In the literature, the WAL technique is considered an efficient method of surgical treatment for lipedema, leading to a marked decrease in the severity of symptoms and the need for conservative treatment in the postoperative period (WITTE et al., 2020).

In the current scientific literature, the complication rates associated with liposuction using the WAL technique in patients with lipedema have not been clinically significant (WITTE et al., 2020). In our study, the G1 group had a higher incidence of postoperative complications compared to the G2 group, including the occurrence of seromas in 10% of the women and superficial ulcers with a diameter of less than 1 cm2 in 30% of the patients. However, it is important to note that these problems, i.e. the presence of seromas and ulcers, were resolved within 30 days. The formation of seromas is a common complication in plastic surgery (DI MARTINO et al., 2010). However, the current literature does not provide specific data on the incidence of ulcers in the postoperative period of lipedema. In addition, multiple individual factors, such as the degree of lipedema, high Body Mass Index (BMI) and the presence of vascular comorbidities, can influence the evolution of the postoperative period, thus contributing to the development of ulcers.

Participants in G1 and G2 showed similar clinical signs both at baseline and at the end of post-operative follow-up in terms of pain, mobility, bruising, fatigue, mood and sensitivity. These findings are consistent with previous studies. For example, the study by Bauer et al. (2019), which involved 209 women diagnosed with stage II lipedema treated with liposuction, revealed that in 97% of patients, pain decreased significantly after surgery.

In addition, sensitivity and pressure pain decreased significantly after liposuction and 77% of patients reported gradual improvement in bruising from the surgical procedure.

Similarly, the study by Witte et al. (2020), which assessed 155 patients with lipedema who underwent liposuction using the WAL technique, found a significant improvement in symptoms after surgery, as evidenced by the drop in the pain score scale from 6.5 to 1.4. In addition, the study highlighted that postoperative treatment techniques are also relevant, as demonstrated by the need for 45% of patients who were already receiving lymphatic drainage preoperatively to continue using this technique postoperatively in order to achieve symptom improvement.



Mechanical lymphatic drainage and the use of UMBIM have played an important role in the post-surgical treatment of lipedema. Mechanical lymphatic drainage, using specialized devices, stimulates the lymphatic system, reducing edema and improving lymphatic circulation. This approach helps to reduce discomfort, speed up recovery and optimize aesthetic results. In the study conducted by Witte et al. (2020) which evaluated 155 women who had undergone liposuction due to lipedema, lymphatic drainage therapy was started on the second postoperative day, performed twice a week and maintained for at least 8 weeks, with the aim of obtaining better results.

On the other hand, UMBIM acts on the lipolysis of fat cells, stimulating the reabsorption and remodeling of adipose tissue. In addition, UMBIM promotes collagen production, which helps to improve skin texture. The combination of these techniques in the post-operative treatment of lipedema has shown promising results, providing faster recovery, reduced edema, improved quality of life and satisfactory aesthetic results. Studies such as that by Mendes et al. (2012) highlight the importance of ultrasound, pointing out that its early use can reduce postoperative time due to the acceleration of metabolism, which can contribute to more favorable results. However, it is essential that these procedures are carried out by qualified professionals, taking into account the individual characteristics of each patient and following a personalized protocol, in order to guarantee the best possible results.

This study found that the time dedicated to pre-surgical and post-surgical care proved to be viable in clinical practice. In addition, the protocols of mechanical lymphatic drainage and the use of the UMBIM revealed their viability in the post-surgical context of lipedema.

Rev. Pemo, Fortaleza, v. 5, e11297, 2023
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These protocols have been supported by studies and scientific research that show their effectiveness in reducing edema, improving lymphatic circulation, remodeling adipose tissue, producing collagen and improving skin quality (MENDES et al., 2012; WITTE et al., 2020). These promising results reinforce the importance of including these therapeutic approaches in appropriate treatment plans in order to achieve a more efficient recovery and satisfactory results for patients with lipedema. However, it is essential to continue investigating and improving these protocols through long-term controlled studies in order to further validate their effectiveness and safety in the clinical context.



## 4 Final considerations

The aim of this study was to investigate the clinical effects and feasibility of a low mechanical index multifocal ultrasound protocol associated with mechanical lymphatic drainage in the pre- and post-operative periods of lipedema. G1 received 5 sessions, one session each day (1st week, pre-surgery) of mechanical lymphatic drainage (30 min) and 100 Kpa multifocal ultrasound on the anterior thigh, posterior thigh, calf and arm, totaling 24 minutes. In the 2nd week, 72 hours after surgery, she received 3 sessions of mechanical lymphatic drainage (30 min) and multifocal ultrasound of 20 Kpa in the same regions, totaling 24 minutes. In the 3rd week, they received 2 sessions, with an interval of 3 days between them, of mechanical lymphatic drainage (30 min) and multifocal ultrasound of 20 Kpa, totaling 24 minutes. G2, in the first week, 72 hours after surgery, received 5 sessions, one session each day of mechanical lymphatic drainage (30 min) and 20 Kpa multifocal ultrasound on the anterior thigh, posterior thigh, calf and arm, totaling 24 minutes. In the 2nd week, they received 5 more sessions of mechanical lymphatic drainage (30 min) and 20 Kpa multifocal ultrasound, for a total of 24 minutes. The homogeneity of the groups in terms of demographic characteristics, post-operative clinical characteristics (seroma, ulcer, fibrosis, pain, mobility, ecchymosis, fatigue, sensitivity and mood) and feasibility (time taken to perform the protocol) reinforces the reliability of the results. The results obtained showed that both protocols had similar clinical effects and could be used in the rehabilitation of lipedema surgery.

Rev. Pemo, Fortaleza, v. 5, e11297, 2023
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However, further studies with larger samples and long-term follow-up are needed to assess the effectiveness of these approaches and their influence on patients' quality of life. Based on the results obtained in this study, it is hoped that this research will contribute to the continuing education of health professionals, improving clinical practices in the post-operative management of lipedema.



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