International Journal of Innovative Technologies in Social Science

e-ISSN: 2544-9435

Operating Publisher
SciFormat Publishing Inc.
ISNI: 0000 0005 1449 8214

2734 17 Avenue SW,
Calgary, Alberta, T3E0A7,
Canada
+15878858911
editorial-office@sciformat.ca

ARTICLE TITLE	LIPEDEMA: DIAGNOSTIC APPROACHES AND THERAPEUTIC STRATEGIES — A REVIEW
DOI	https://doi.org/10.31435/ijitss.1(49).2026.5126
RECEIVED	28 January 2026
ACCEPTED	14 March 2026
PUBLISHED	25 March 2026
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LIPEDEMA: DIAGNOSTIC APPROACHES AND THERAPEUTIC STRATEGIES — A REVIEW

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ABSTRACT

Lipedema is a chronic adipose tissue disorder characterized by disproportionate subcutaneous fat accumulation, predominantly affecting women and often emerging during periods of hormonal change. Its pathophysiology remains incompletely understood and is thought to involve genetic predisposition, hormonal influences, and lymphatic or vascular dysfunction. The condition is associated with pain, reduced mobility, and significant psychosocial burden, highlighting the need for improved recognition and management. Lipedema-related literature published between 2015 and 2025 was systematically reviewed using databases including PubMed and Google Scholar, with keywords such as lipedema, fat disorder, lymphedema, obesity, lipedema treatment, diet, weight loss, and liposuction. Meta-analyses, review articles, and original studies published in English were selected based on relevance and recency of findings. Diagnosis is primarily based on clinical evaluation supported by characteristic features such as symmetrical limb involvement, pain, easy bruising, and sparing of the hands and feet, with imaging modalities including ultrasonography, MRI, and lymphoscintigraphy serving as adjunctive tools in differential diagnosis. Management requires a multimodal approach combining patient education, conservative therapies, including compression therapy, tailored physical activity, dietary strategies and surgical interventions when indicated. Conservative treatment mainly focuses on symptom control and slowing disease progression. Liposuction, particularly water-assisted techniques, remains the only intervention capable of permanently reducing pathological adipose tissue.

The aim of the work: The objective of this review is to analyze diagnostic methods for lipedema, as well as treatment strategies, including conservative therapies and surgical interventions.

KEYWORDS

Lipedema, Lipedema Treatment, Lipedema Management, Liposuction

CITATION

Zofia Nowakowska, Agnieszka Burzej, Maciej Komenda, Aleksandra Marek, Karolina Dziki, Katarzyna Garncarz, Krzysztof Jamroch, Mateusz Kacalak, Julia Szklarska-Komenda, Wiktoria Dybizbańska. (2026) Lipedema: Diagnostic Approaches and Therapeutic Strategies — A Review. *International Journal of Innovative Technologies in Social Science*. 1(49). doi: 10.31435/ijitss.1(49).2026.5126

1. Introduction

Lipedema is a chronic disorder of adipose tissue characterized by an abnormal and disproportionate accumulation of subcutaneous fat. The condition primarily affects women and typically becomes clinically apparent during periods of hormonal fluctuation, most commonly at puberty and during pregnancy, and less frequently during menopause [1, 2]. These temporal associations suggest a strong hormonal influence on disease onset and progression.

Lipedema is considered to have a genetic background. Autosomal inheritance appears to represent the predominant pattern; however, cases consistent with X-linked dominant inheritance have also been reported, indicating potential variability in genetic transmission [3].

The reported prevalence of lipedema differs considerably across studies, reflecting variations in diagnostic criteria and population characteristics. Current estimates suggest that the condition affects approximately 0.06% to 11% of the female population [4, 5]. Furthermore, a substantial proportion of patients—ranging from 15% to as high as 64%—report a positive family history of the disease, further supporting the role of hereditary factors in its development [1, 6].

Despite ongoing research, the pathophysiology of lipedema is not yet fully understood. The mechanisms contributing to the development of lipedema include: hormonal fluctuations, notably estrogens, genetic influences, abnormalities of the lymphatic and vascular system [7]. Several theories explain lipedema pathogenesis, focusing on loss of tissue elasticity and lymphatic vascular dysfunction. Adipose tissue expansion reduces lymphatic vessel function, leading to capillary leakage, tissue hypoxia, and activation of VEGF (vascular endothelial growth factor) signaling, which promotes adipose stem cell proliferation [3]. Other studies showed major role of estrogen in lipedema pathophysiology as it modulates lipid and glucose

metabolism of adipocytes and regulates body fat distribution – leading to female-assosiated fat accumulation [5]. A distinguishing feature of lipedema compared to normal adipose tissue is its resistance to dietary interventions and physical exercise. Typically, altered fat tissue accumulates in the lower extremities, including the hips and thighs, and sometimes the arms, usually sparing the hands and feet [8].

Patients with lipedema present with a wide range of symptoms, most notably chronic pain affecting the involved areas, a marked tendency toward easy bruising, and progressive difficulties with mobility. The persistent discomfort and limb enlargement often interfere with daily functioning and reduce overall physical capacity.

In addition to its physical manifestations, lipedema has a profound impact on patients' psychological well-being. The condition is frequently associated with diminished self-esteem, as well as increased prevalence of depression and anxiety. Many patients experience eating disorders, social withdrawal, and heightened stress related to body image and physical appearance. Consequently, lipedema represents not only a somatic disorder but also a condition with significant psychosocial consequences [7, 9, 10, 11, 12, 13].

2. Research materials and methodology

2.1. Data collection and analysis

We included articles published between 2015 and 2025. The search for publications was carried out using following keywords: lipedema, fat disorder, lymphedema, obesity, lipedema treatment, lipedema diet, lipedema weightloss, liposuction. Articles inluding meta-analysiss, reviews, original articles published in English were retrieved from PubMed, Google Scholar and then selected based on relevance and recent findings.

2.2. AI

AI was utilized for two specific purposes in this research. Text analysis of clinical reasoning narratives to identify linguistic patterns associated with specific logical fallacies. Assistance in refining the academic English language of the manuscript, ensuring clarity, consistency, and adherence to scientific writing standards. AI were used for additional linguistic refinement of the research manuscript, ensuring proper English grammar, style, and clarity in the presentation of results. It is important to emphasize that all AI tools were used strictly as assistive instruments under human supervision. The final interpretation of results, classification of errors, and conclusions were determined by human experts in clinical medicine and formal logic. The AI tools served primarily to enhance efficiency in data processing, pattern recognition, and linguistic refinement, rather than replacing human judgment in the analytical process.

3. Results

3.1 Symptoms of lipedema

Lipedema is characterized by a distinctive and symmetrical distribution of pathological adipose tissue, most commonly affecting the hips, buttocks, thighs, and lower legs. This abnormal fat deposition results in a pronounced disproportion between the upper and lower parts of the body, often giving patients a characteristic "column-like" appearance of the legs. The upper body may remain relatively slender, while the lower extremities demonstrate progressive enlargement that is resistant to diet and physical activity.

One of the hallmark clinical signs of lipedema is the so-called *cuff sign*, defined as a sharp and clearly visible demarcation between unaffected and affected tissue at the level of the ankles. This abrupt transition creates the impression of a *cuff* of normal tissue around the feet, which themselves are typically spared. Another characteristic feature is the presence of *riding breeches*, referring to excessive fat accumulation over the lateral hips and upper thighs, leading to a marked discrepancy between hip and waist circumference. This disproportion contributes not only to aesthetic concerns but also to functional impairment, including gait disturbances and mechanical strain on joints.

Based on the anatomical distribution of subcutaneous fat, lipedema has been classified into five distinct types (Figure 1). Type I involves fat accumulation confined to the hips and buttocks. Type II extends from the hips to the knees, whereas Type III includes the entire lower limb from the hips down to the ankles. Type IV is characterized by involvement of the upper extremities, particularly the arms, in addition to lower-limb manifestations. Notably, approximately 80% of women with lipedema present with concomitant arm involvement and are therefore classified as Type IV. In contrast, Type V—limited exclusively to the calves—is relatively rare and represents an uncommon clinical presentation [14].

This anatomical classification is clinically relevant, as it facilitates more precise characterization of disease extent, supports differential diagnosis, and may assist in tailoring therapeutic strategies to individual patient needs.

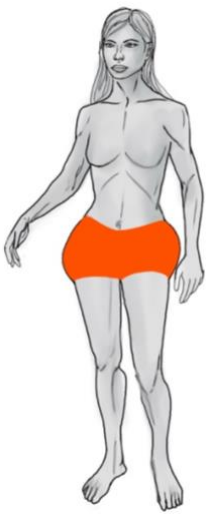
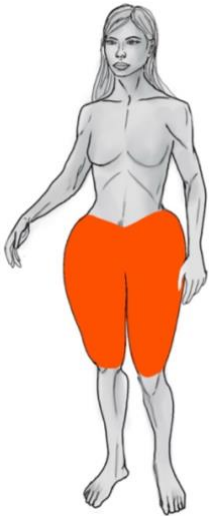
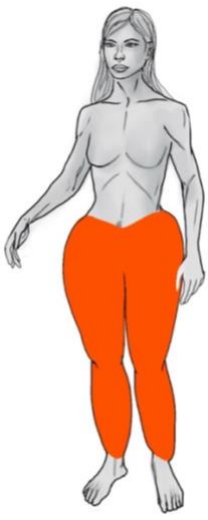
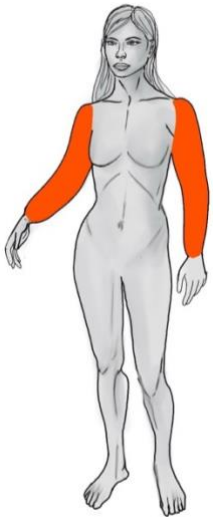
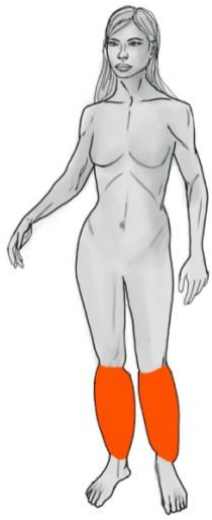
Type	Type I	Type II	Type III	Type IV	Type V
Affected area	Hips Buttocks	From hips to knees	From hips to ankles	Arms	Calves
					

Fig. 1. *Classifiaction of lipedema by morphology*

Lipedema is categorized into clinical stages based on the progression and severity of structural changes within the subcutaneous tissue, as well as associated alterations in the overlying skin (Figure 2). This staging system reflects the gradual evolution of the disease [2].

Stage I is considered the earliest phase of the disease. At this stage, the skin surface appears smooth and soft, without visible irregularities. However, palpation reveals a diffusely thickened subcutaneous fat layer with pearl-sized nodules. [2, 8].

Stage II is characterized by progressive structural remodeling of the subcutaneous tissue. The skin surface becomes uneven and nodular due to the development of palpable fat lobules and increasing fibrosis within the connective tissue septa. The subcutaneous tissue feels more irregular on examination than in stage I.

Stage III represents advanced lipedema. It is marked by large, lobular fat masses and limb enlargement, often resulting in pronounced deformity. The skin may appear irregular, and substantial fibrosis is typically present [2, 8].

The **Stage IV** does not reflect further progression of adipose tissue changes alone but instead denotes the development of secondary lymphedema superimposed on lipedema. This condition, referred to as *lipo-lymphedema*, may occur at any stage; however, it is most frequently observed in patients with Stage III disease. [6, 8].

Stage I	Stage II	Stage III
		

Fig. 2. *Classifiaction of lipedema by stages*

Characteristic symptoms are: pain, feeling of heaviness and tightness, easily bruising and subcutaneous nodules [15]. Pain in lipedema is typically more chronic and severe than the pain reported in lymphedema. This pain is often pathogenic in nature, resembling neuropathic pain, and may be present in up to 90% of patients, independent of body mass index (BMI). Such pain characteristics may serve as an important clinical feature distinguishing lipedema from obesity, particularly if objectively measured and standardized [16].

Additional vascular features include visible telangiectasias and varicose veins, commonly observed in areas of pathological fat accumulation. Patients may also exhibit skin hypothermia, reflected by a lower skin temperature over affected regions, suggesting impaired microcirculation and altered vascular responsiveness [6].

3.2 Diagnosis

Lipedema is diagnosed based on clinical evaluation and exclusion criteria. It is often under-recognized or misdiagnosed, which can result in delays in diagnosis lasting even several decades. The primary diagnostic assessment involves a history- taking, physical inspection, and palpation, with special focus on the features outlined in the table (table 1).

Table1. Diagnosis criteria for lipedema

Diagnosis criteria for lipedema- adapted from [15]
• Bilateral, symmetrical, and disproportionate hypertrophy of subcutaneous fat in the limbs • Sparing of the hands and feet • Negative Stemmer sign • Sensation of heaviness and tension in affected limbs • Tenderness and pain on touch and palpation • Easily bruising • Stable limb circumference despite weight loss or caloric restriction • Symptoms worsening over the course of the day • Presence of telangiectases and visible vascular markings around fat deposits • Local skin hypothermia

Amato and colleagues proposed a diagnostic questionnaire for patients with suspected lipedema, based on the assessment of clinical features characteristic of the disease. The questionnaire includes items addressing pain, limb heaviness, easy bruising, and other typical manifestations of lipedema. Studies demonstrated that predictive models based on both individual question scores and the total questionnaire score achieve a high

probability of accurate diagnosis. It can be a simple and efficient tool that aids in identifying potential lipedema patients and supports clinical evaluation [18].

The differential diagnosis of lipedema encompasses disorders characterized by limb swelling or excessive fat accumulation, primarily including lymphedema and obesity [14]. Other entities Other entities to consider in the differential diagnosis are: lipohypertrophy, phlebedema, Decrum's disease, Madelung's disease [19].

In the Table 2 we proposed differential diagnosis of lipedema based on the works of Buso et al. and Mendoza.

Table 2. Differential diagnosis of lipedema

	Lipedema	Lymphadema	Obesity
Symmetrical occurance on both legs	Yes	Possible	Yes
Disproportion between legs and body	Yes	Possible	No
Tenderness, pain	Yes	Yes	No
Easily bruising	Yes	No	No
Stemmer Sign	No*	Yes	No
* positive Stemmer Sign can occur in case of secondary lymphedema)			

Distinguishing lipedema from lymphedema can be challenging, particularly in advanced disease stages where both conditions may coexist. In contrast to lymphedema, digital pressure in lipedema typically elicits pain, and swelling is usually bilateral and symmetrical, whereas primary lymphedema is usually asymmetrical. Lymphedema commonly begins in the toes and progresses proximally, while lipedema generally affects the thighs first. A key clinical differentiator is the Stemmer sign (the inability to pinch the skin over the proximal phalanx of the second toe), which is usually positive in lymphedema and negative in pure lipedema. additionally, pain and easy bruising are characteristic features of lipedema, although secondary lymphedema may develop at any stage of the disease [14, 19, 20]. A study by Goss and Green demonstrated that the Stemmer sign is a sensitive predictor of lymphedema, with a reported sensitivity of 92%. However, due to its moderate specificity (57%), a negative Stemmer sign does not exclude lymphedema; therefore, in patients with a high clinical suspicion of the condition, additional diagnostic investigations such as lymphoscintigraphy are recommended to establish the diagnosis [21].

Lipedema is often misdiagnosed as obesity; however, unlike obesity, it predominantly affects the upper and/or lower limbs while sparing the hands and feet. Patients with lipedema show marked resistance to fat and limb volume reduction despite dietary restriction, exercise, or even weight loss following bariatric surgery. Although both conditions present with symmetrical fat accumulation, obesity typically demonstrates a central fat distribution and lacks pain or tenderness. Additional distinguishing features of lipedema include easy bruising, characteristic anatomical fat distribution, and the presence of the *cuff sign* [14, 19, 20]. Although BMI can offer some guidance in the differential diagnosis of lipedema and obesity, its clinical usefulness is limited, particularly because obesity may develop as a comorbidity in advanced stages of lipedema [14, 15, 22].

3.2.1 Ultrasonography

Ultrasonography represents a useful diagnostic tool in the evaluation of lipedema, providing a safe, noninvasive, and cost-effective imaging modality for clinical assessment and diagnosis [23].

It typically shows thickening of subcutaneous fat with increased echogenicity, described as a "snow flurries" pattern with echo-rich connective tissue septa, compared to unaffected areas. Fluid-filled clefts are absent in pure lipedema and appear only after the development of lipolymphedema [22]. A study conducted in 2019 showed that lipedema may be associated with increased thickness and hypoechogenicity of subcutaneous adipose tissue. The findings suggest that ultrasonography may be useful in distinguishing between lipedema and lymphedema [24]. Another study published in 2021, which analyzed 89 female patients, demonstrated that measurement of subcutaneous tissue thickness can be used for the diagnosis of lipedema in the lower limbs. The recommended measurement sites and their corresponding cutoff values are as follows: pre-tibial region: 11.7 mm, thigh: 17.9 mm, and lateral leg: 8.4 mm [25].

Moreover, duplex ultrasound is a useful tool for evaluating lower extremity edema of unclear origin. It can help identify deep vein thrombosis, venous reflux, and other causes with a sensitivity and specificity exceeding 90% [26].

3.2.2 Lymphoscintigraphy

Lymphoscintigraphy (LSG) is a minimally invasive imaging technique that utilizes a radiotracer to map the lymphatic system and is effective in the detection of lymphedema [23]. LSG been shown to be well-tolerated, and easily implemented in clinical practice [27].

LSG can detect lymphatic system dysfunction with a high specificity of 97–100%; however, it cannot reliably differentiate between lymphedema and lipedema [23, 28].

3.2.3 Magnetic Resonance

Magnetic resonance imaging (MRI) is a valuable imaging modality for the diagnosis and differentiation of lymphedema and lipedema, particularly when the extent of lymphatic involvement cannot be clearly established. By providing comprehensive anatomical and functional information, MRI supports accurate assessment and clinical decision-making. Moreover, it is considered a safe and reproducible technique suitable for routine clinical use [23, 29, 30].

Magnetic resonance lymphography (MRL) is a specialized imaging technique dedicated to visualization of the lymphatic system, allowing detailed assessment of lymphatic vessels and flow patterns. MRL can be performed using either contrast-enhanced or non-contrast techniques. A study published in 2020 demonstrated that non-contrast magnetic resonance lymphography (NCMRL) may serve as a useful tool for differentiating between lipedema and lipolymphedema [29]. NCMRL enables the identification of increased subcutaneous adipose tissue characteristic of lipedema, while also revealing epifascial fluid collectionsm that are characteristic of lipolymphedema [23, 29].

3.2.3 Computed Tomography

Computed tomography (CT) may serve as a supportive imaging modality in the evaluation of lipedema, as it allows detailed visualization of subcutaneous tissue, assessment of its architecture, and objective volumetric measurement [30, 31].

CT scans demonstrate a specificity of 95% and a sensitivity of 100%, allowing for accurate diagnostic evaluation. Patients with lipedema typically exhibit symmetrical and homogeneous enlargement of subcutaneous soft tissues, without associated skin thickening, subcutaneous edema, or muscle hypertrophy [30].

3.3 Treatment

Lipedema remains a clinical challenge, as its pathophysiology is not yet fully understood. Currently, there is no specific treatment for this condition, and further research is required. The goals of treatment are:

- Reduction of symptoms
- Slowing or halting the progression of lipedema
- Prevention of complications

Management requires a multimodal approach, including patient education, conservative therapies, and surgical interventions [2, 14, 15, 17].

3.3.1 Patient Education

Once the diagnosis is established, patients should be provided with comprehensive information to facilitate understanding of their condition. As lipedema is a chronic and progressive disease, available treatment strategies should be clearly explained, along with access to professional psychological support and contact information for relevant self-help organizations, to support long-term disease management and coping [14, 15].

3.3.2 Conservative strategies

Decongestive therapy

Complex decongestive therapy (CDT), the current gold standard in the management of lymphedema, has also been shown to provide therapeutic benefits for patients with lipedema. CDT consists of manual lymphatic drainage, compression therapy, myolymphokinetic exercises, and structured skin care. Evidence indicates that CDT, particularly in the early stages of lipedema, contributes to the reduction of pain, alleviation of lower-limb discomfort, and improvement in quality of life [6, 32]

Compression therapy plays a key role in the conservative management of lipedema, despite having no effect on adipose tissue volume. Its primary benefit lies in symptom control, as compression garments improve lymphatic and venous flow, limit secondary edema formation, and reduce sensations of pain, heaviness, and limb discomfort. By supporting limb function and patient comfort, compression therapy represents an essential element of a comprehensive, symptom-oriented treatment strategy [2, 14, 32, 33].

Physical activity

Physical activity constitutes an important component of the conservative management of lipedema and should be encouraged and individually tailored to the patient's abilities, limitations, and lifestyle. Regular exercise contributes to weight maintenance or modest weight reduction, improves mobility and muscle strength, and enhances venous and lymphatic return, reduces inflammation thereby supporting symptom control. In addition to its physical benefits, physical activity offers psychological advantages, helping to mitigate negative emotions associated with lipedema [34]. Low- to moderate-impact activities such as swimming, aquatic therapy, cycling, yoga, elliptical training, whole-body vibration, and walking are particularly suitable, as they are generally well tolerated and promote long-term adherence [17]. Overall, exercise in lipedema should focus on symptom management and realistic weight goals, however, the absence of standardized exercise prescription guidelines and long-term management strategies underscores the need for evidence-based recommendations and further research to optimize therapeutic outcomes in this patient population [2, 34].

Dietary interventions

Dietary interventions alone are insufficient to reduce the pathological adipose tissue accumulation characteristic of lipedema; however, when combined with obesity management, they may improve overall prognosis and patient well-being [2]. Although no specific diet has been formally approved for lipedema, nutritional management remains an important supportive component of treatment, particularly in addressing secondary obesity and low-grade inflammation [2, 33]. Early implementation of weight and dietary modifications may help reduce local inflammatory processes and potentially prevent worsening of clinical symptoms [33].

Patients with lipedema commonly exhibit increased body mass index values and are frequently categorized as overweight or obese; therefore, strategies aimed at weight reduction and obesity prevention play a key role in the management of lipedema [6].

The modified Mediterranean diet (mMeD) has been proposed as a supportive dietary approach in lipedema management, emphasizing hypocaloric intake with antioxidant and anti-inflammatory components. Although lipedema is typically resistant to localized fat loss, studies by Di Renzo et al. showed that mMeD led to reductions in upper and lower limb fat mass without loss of lean mass, along with improved functional capacity. These findings suggest that mMeD may provide metabolic and functional benefits as an adjunct to comprehensive lipedema treatment [35].

A pilot study on a eucaloric low-carbohydrate, high-fat (LCHF) diet in women with lipedema showed significant reductions in body weight and perceived pain, as well as improvements in quality of life. Pain reduction appeared independent of weight loss, suggesting additional metabolic or anti-inflammatory effects. These findings support the potential of LCHF diets as a supportive intervention, though larger randomized trials are needed to confirm efficacy [36].

Research by Keith et al. has suggested the ketogenic diet as a potential therapeutic approach in lipedema management. By restricting carbohydrate intake and inducing ketosis, this dietary strategy promotes fat utilization and ketone production, leading to favorable effects on hormonal regulation of lipid and energy metabolism. Emerging evidence indicates that ketogenic diets may reduce pain independently of weight loss, improve lymphatic vessel integrity and lymph transport, and exert anti-inflammatory effects, partly mediated by β-hydroxybutyrate (BHB) [37].

In particular, very low-calorie ketogenic diets (VLCKD) offer a targeted nutritional intervention, combining low-calorie intake with a high-fat, low-carbohydrate composition. VLCKD has been shown to produce rapid and significant reductions in body weight, subcutaneous adipose tissue, and inflammation, while improving glycemic control, thereby addressing the pain, edema, and metabolic disturbances associated with lipedema [38].

Additionally, a study conducted by Lundanes et al. investigating the effect of a low-carbohydrate diet on pain occurrence in patients with lipedema demonstrated both greater weight loss and a greater reduction in pain compared with the control group. However, no association was observed between changes in pain and weight loss [39].

A meta-analysis conducted by Amato et al. evaluating the efficacy of the ketogenic diet in the treatment of lipedema demonstrated significant reductions in body mass index (BMI), waist and hip circumferences, as well as the waist-to-hip ratio [40].

Drugs and supplements

Dietary interventions employed to treat and/or alleviate the symptoms and complications of lipedema may contribute to the depletion of certain vitamins and minerals. This review explores micronutrients and bioactive compounds that may support the management of lipedema symptoms and identifies potential deficiencies arising from medical nutrition therapies (Table 3), drawing on the findings of Pınar [41] and Cannataro [42].

Table 3. Micronutrients and bioactive compounds that may support the management of lipedema

Dietary suplements	Mechanism of action	Dosage
Vitamin C	• Antioxidant effect with potential to reduce inflammation in lipedema • Supports collagen synthesis • May modulate pain	500-1000 mg/d
Vitamin B12	• Pain relieving, particulary for neuropatic pain • Supports neuropathy treatment	500-1000 mcg
Vitamin D	• Immunomodulatory • Supports healthy adipose tissue function	2000 IU/d
Omega-3 fatty acids	• Anti-inflammatory • May alleviate pain	1-2 g/d
Polyphenols	• Anti-inflammatory • Antioxidant	100-150 mg/d
Fat-burning supplements		
Chitosan	• Reduces fat absorption	
L-carnitine	• Participates in the transport of fatty acids into mitochondria for energy production via β-oxidation.	
Chromium	• Reduces insulin resistance	
Synephrine	• Stimulates thermogenic pathways	
Oedema Modulating Agents		
Serratiopeptidase	• Proteolytic and fibrinolytic effect - potentially useful for edema management in lipedema	
Bromelain	• Fibrynolytic and lipid-dissolving effects on clots, however, no dedicated studies have been conducted	

3.3.3 Surgical interventions

Surgical treatment of lipedema should be considered only after conservative management. Surgery is currently the only intervention capable of permanently removing pathological lipedema tissue, reducing limb volume, and slowing disease progression, particularly when performed before complications develop [2]. Patients at any stage of the disease with a body weight exceeding 120 kg or a body mass index (BMI) greater than 32 kg/m² should undergo obesity management in accordance with current clinical guidelines before liposuction is considered as a potential therapeutic option [15].

The main surgical options are liposuction and lipectomy, with liposuction being the most commonly used approach. Lipedema reduction surgery has been shown to significantly improve pain, mobility, gait, joint alignment, quality of life, and lymphatic function, reducing the need for compression and manual therapy [17]. Nevertheless, surgical intervention—especially liposuction—is costly, and concerns remain regarding the potential risk of secondary lymphedema, leading some authors to advise caution [2, 33]. Commonly used techniques are based on tumescent liposuction, with water-assisted (WAL) and power-assisted liposuction (PAL) also employed to minimize tissue trauma [17].

Dry liposuction has largely been superseded by wet techniques, which involve fluid infiltration throughout the treatment area to protect lymphatic structures. Wet liposuction includes wet, super-wet, and tumescent approaches, differentiated by the volume of solution used, typically less than the volume of aspirated fat (ratio ~1:1.5–2). The infiltrate generally contains a local anesthetic and vasoconstrictor in saline, allowing a safer, less traumatic procedure with consistently superior outcomes compared to dry liposuction [4]. Tumescent liposuction is considered the gold standard for lipedema surgery, enabling effective fat removal

while preserving lymphatic structure [17]. This technique offers several advantages, including minimal blood loss and enhanced procedural precision and safety [43].

Lipectomy, an invasive debulking procedure targeting substantial localized adipose deposits, is generally reserved for advanced lipedema with pronounced mechanical impairment or limb deformities [2]. This approach, however, carries a notable risk of inducing lymphatic insufficiency [4].

Lipedema reduction surgery may be considered in patients in good general health and can be effective at any age, provided that conservative treatment is attempted first. The procedure is therapeutic rather than cosmetic and often requires larger aspirate volumes and staged interventions to achieve improvements in pain, mobility, and function. Pre- and postoperative care by a certified lymphedema therapist is essential, including manual therapy and compression management. Postoperative compression is recommended for 2–3 months in early-stage lipedema, while patients with advanced disease or lipolymphedema may require long-term or lifelong compression therapy [17].

A recent study by Amato et al. demonstrated that liposuction is effective in alleviating spontaneous pain, bruising, and edema. Furthermore, the intervention was associated with improved patient mobility, which is particularly crucial in this patient population. Postoperative quality of life was also significantly improved. However, despite these benefits, 51% of patients continued to require conservative therapy following liposuction [44].

In the review by Bejar-Chapa et al., encompassing a total of 1204 patients, liposuction was identified as an effective therapeutic option for lipedema. The authors reported reductions in pain and bruising, decreased dependence on compression therapy, improvements in mobility, and a significant enhancement in postoperative quality of life [45].

Liposuction is generally considered a well-tolerated treatment option [46]. However, as with any surgical intervention, adverse effects may occur. In a study by Wollina and Heinig involving 111 patients, serious adverse events were reported in 1.2% of cases. Notably, the infection rate was 0%. Transient hemoglobinemia was observed in all patients, while 82% reported a temporary burning sensation and 98% experienced bruising. Less frequent complications included arm vein phlebitis (1.8%), microscopic pulmonary fat embolism (0.9%), an epileptic seizure associated with methemoglobinemia (0.9%), and acute pulmonary edema (0.9%). [47]. Another study by Dadras et al. reported infections in rate 1.4% [48].

4. Discussion

Despite numerous studies and many years of research, the exact pathophysiology of lipedema remains uncertain. Although several predisposing factors have been identified—such as female sex, hormonal influences, and genetic susceptibility—the precise underlying cause of the disease has not yet been fully elucidated. Further research is necessary to clarify these mechanisms and to facilitate the development of more effective therapeutic strategies.

The diagnosis of lipedema is based primarily on clinical evaluation and careful differentiation from other disease entities and potential causes of edema, particularly lymphedema. Nevertheless, several diagnostic modalities are currently available to support clinical assessment, help differentiate ambiguous cases, and confirm the diagnosis. Ultrasonography, which is widely accessible and commonly used in clinical practice, enables identification of the underlying cause of edema with specificity exceeding 90%. It may therefore represent a valuable tool in the routine diagnostic work-up of patients with suspected lipedema.

Another important challenge is the lack of a curative treatment. At present, lipedema remains a chronic condition, and therapeutic approaches focus mainly on slowing disease progression and alleviating symptoms. Promising results have been reported with the use of the ketogenic diet in patients with lipedema. In a study conducted by Cannataro et al., a 22-month ketogenic dietary intervention resulted in a substantial body weight reduction of up to 41 kg [49]. However, although supplementation may provide certain benefits, its role in lipedema management is not yet clearly defined and requires further investigation to determine its clinical efficacy.

Compression therapy continues to play a central role in management, significantly reducing edema and improving symptoms, although it does not directly reduce pathological adipose tissue. Surgical approaches may be considered to remove abnormal fat deposits, particularly wet (tumescent) liposuction. However, this method also has limitations, and more than half of patients may still require ongoing compression therapy after surgery [44]. Further refinement of invasive treatment strategies is necessary to achieve more durable outcomes while minimizing the risk of complications.

5. Conclusions

Lipedema affects up to 11% of the population, yet awareness of the condition remains limited. Its exact pathogenesis is not fully elucidated. Early diagnosis is essential to slow disease progression and prevent complications, including edema, pain, and functional impairment. Diagnosis is leaned on clinical examination Stemmer sign is a sensitive predictor of lymphedema, with a reported sensitivity of 92%.Management should be multimodal, beginning with conservative interventions. The primary therapeutic objectives are symptom relief, deceleration of disease progression, and complication prevention. Compression therapy has been shown to significantly reduce discomfort and enhance quality of life. Lifestyle modifications, including tailored physical activity and dietary strategies—particularly ketogenic, low-carbohydrate, or Mediterranean diets—are important. They not only help to reduce weight and fat tissue but also reduction of pain. Also proper supplementation may provide additional benefits. It includes Vitamin B12, vitamin C, vitamin D, omega fatty-acids, polyphenols and other substanecs moddlating fat metabolism anreducing oedema. In cases where conservative management is insufficient, surgical interventions should be considered to alleviate pain, bruising, and edema, and to improve mobility, with water-assisted liposuction being the preferred technique.

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All authors have read and agreed with the published version of the manuscript.

Funding Statement: The authors did not receive special funding.

Conflict of Interest: The authors declare no conflict of interest.

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