

8. Overview of European best practice consensus on lipoedema

This supplement proposes a paradigm shift in the concept of lipoedema—that there is no component of oedema in lipoedema, and any efforts to address this nonexistent component of the disease are misguided. Neither clinical examination nor diagnostic imaging has shown there to be a significant accumulation of fluid in the tissues of patients with lipoedema, which makes decongestion of the tissues by manual or automated lymphatic drainage techniques obsolete. The term ‘lipoedema’ is, therefore, outdated and should be reconsidered.

On the basis of the authors’ experiences with thousands of patients and the existing medical literature, arguments are made to dispel other myths surrounding lipoedema and clarify certain features of the condition. In addition, research has shown that there is no scientific evidence at all for the pathophysiology previously thought to underlie lipoedema. Although it is often said that lipoedema is a progressive disease, there is no evidence to support this assertion.¹⁷² On the other hand, obesity is often progressive, and lipoedema may worsen as the patient’s weight increases in those with obesity and lipoedema as comorbidities. For this reason, the term ‘lipolymphoedema’ is also obsolete and needs to be reconsidered. Progressive obesity rather than lipoedema is the cause of any lymphoedema. Many patients, therefore, have three diseases that need to be treated: obesity, lipoedema, and obesity-related lymphoedema. The authors’ data also show a high level of psychological vulnerability in the great majority of patients with lipoedema.^{30, 172} However, it must be highlighted that mental health issues were present before the onset of the typical lipoedema symptoms and, therefore, have an influence on patients’ perception of pain. Next, the data have reversed the claim that losing weight has no effect on lipoedema—a view widely shared by many lipoedema experts, especially those who offer liposuction—and they have also dispelled the belief that lipoedema makes patients fat. In fact, it is obesity that makes patients fat. In purely physiological terms, weight gain

involves an increase in the adipose tissue in the legs. Therefore, it would follow that weight loss would involve a reduction in the adipose tissue in the legs.¹⁷³ A recent study of the University of Freiburg together with the Földi Clinic found dramatic improvements in volume reduction of the legs and lipoedema symptoms after bariatric surgery.⁹² And finally, the authors have shown that research on liposuction is severely lacking, and liposuction is not a cure for lipoedema.¹⁷⁴

Despite this lack of reputable studies, the German Ministry of Health has been effectively campaigning for liposuction for lipoedema to be covered by healthcare insurance,¹⁷⁵ and the Federal Joint Committee (G-BA) has approved this. Since 1 January 2020, it is possible to prescribe liposuction for ‘stage 3 lipoedema’ under statutory healthcare insurance.¹⁷⁶ However, importantly, the staging of lipoedema is itself debatable in terms of its value. At present, the classification depends on a subjective assessment by the examiner and is based on morphological criteria alone, without taking the patient’s actual symptoms into consideration. These stages therefore ignore the clinical reality. There are some women with (what was formerly referred to as) stage 3 lipoedema who have highly disproportionate adipose tissue in the legs (or arms) but only mild symptoms or none at all. On the other hand, some women have only mildly disproportionate adipose tissue (formerly, stage 1 lipoedema) but experience intense pain in the soft tissues of the leg. The classic patient with stage 3 lipoedema referred to the authors’ outpatient clinic is a severely overweight woman whose main disease is obesity. Therefore, liposuction for such morbidly obese patients cannot be rationalised, and yet, it is now reimbursed at the expense of the statutory health insurance in Germany.

The paradigm shift

The paradigm shift in lipoedema proposed in this supplement necessitates a radical change in the views surrounding lipoedema. It will mean moving away from the idea of oedema in lipoedema and, hence,

8. Overview of European best practice consensus on lipoedema

away from the idea that decongestion is necessary, and towards the actual problems faced by patients with this condition. Naturally, this paradigm shift in a disease that has been described and approached in a particular way for decades will need widespread efforts for adoption. For this reason, the lead author of this supplement invited renowned lipoedema experts from various European countries to discuss the subject. The first European Lipoedema Forum was held in Hamburg in June 2018, with participants from five countries. The second forum in March 2019 included experts from seven countries. The goal of these meetings was to establish a consensus that would reflect the view shared by these European countries, on the basis of the available literature and the experts' many years of clinical practice with lipoedema patients. To reflect the clinical complexity of lipoedema, the experts provided an interdisciplinary approach and included psychologists, physiotherapists, nutrition and obesity experts, lymphoedema/lipoedema nurse specialists, doctors responsible for conservative treatment, surgeons and patient support groups. Nearly all participants in the European Lipoedema Forum had published work on lipoedema, had been involved in drawing up their own national lipoedema guidelines, or were on the executive board of their respective specialty society.

The consensus was established using the open space technique (OST) and the formation of interdisciplinary working groups that then presented their results to the entire expert group so the consensus could be reached.

The consensus statements on the scientific background and diagnosis of lipoedema are given in **Box 8.1**.³⁴

It is clear that, through the consensus meetings, a substantial change in perspective has taken place, not only in the scientific understanding of but also in the diagnostic approach to lipoedema. There has been a shift in focus: while the disproportionate increase in adipose tissue in the limbs and the symptoms associated with this fatty tissue increase are still considered major symptoms, oedema (and the

tendency to developing haematoma) is now considered to be a very minor symptom in the diagnosis of lipoedema. Instead, greater importance is given to obesity and patients' mental health (which has a significant effect on pain perception).

Pathophysiological model of lipoedema

The lead authors have proposed a pathophysiological model to explain the symptoms associated with lipoedema to the patients. When patients present with a history of being diagnosed with lipoedema, routine practice at the lead authors' is now to ask not only about any changes in weight but also about the time of onset of the pain. It is known that one of the main complaints in patients with lipoedema is weight gain, but this is a result of obesity, not lipoedema: some patients put on only 6 kg, some gain 40 kg or more, but any weight gain is usually accompanied by a disproportionate increase in the legs (and less commonly in the arms). An increase in weight basically means an increase in adipose tissue. A hormonal pattern may develop in the expanded adipose tissue, resulting in low-grade inflammation and hypoxia of the fat cells.¹⁷⁷ In particular, an increase in adipose tissue leads to a local increase in pro-inflammatory hormones (adipokines).^{11, 37} The subcutaneous fatty tissues appear to be associated with chronic inflammation. Further, Rutkowski et al reported that increase in adipose expansion results in tissue hypoxia.³⁸ Fat cells are only able to expand with increased vascular growth. The vessels' inability to keep pace with the expanding adipose tissue may lead to hypoxia, and hypoxic conditions in this tissue lead to an increased expression of hypoxia-inducible factors (HIF1a).¹⁷⁸ HIF1a, in turn, induces inflammation of the adipose tissue.¹⁷⁹ An earlier study also reported similar findings: histological analysis in patients with lipoedema revealed an increase in crown-like structures indicative of dying fat cells.¹⁶ More recent data confirmed the occurrence of inflammatory processes in the subcutaneous adipose

Box 8.1. Consensus on the scientific background of and diagnostic approach for lipoedema

1. There is **NO** scientific evidence that:

- lipoedema is an 'oedema problem'
- manual lymphatic drainage reduces patients' complaints due to its drainage effects
- lipoedema is a progressive disease
- weight loss is not effective
- lipoedema is the cause of lymphoedema
- 11% of the female population has lipoedema
- the onset of lipoedema is during puberty.³⁴

2. Then, the consensus agreement regarding the diagnostic approach for lipoedema states that orthostatic oedema does not have to be present for lipoedema to be diagnosed, since oedema is only present in a small subgroup of lipoedema patients. Thus, oedema is not pathognomonic for lipoedema.

3. The consensus agreement regarding the distribution of adipose tissue is that disproportional fat distribution must be present for lipoedema. Differential diagnoses for lipoedema include obesity, that is, a global visceral and subcutaneous fatty tissue increase, and lipo hypertrophy, that is, subcutaneous fatty tissue increase in the legs and sometimes in arms but **NO** pain/complaints in soft tissue. Further, obesity is often progressive, but lipoedema is usually not. The lipoedema can worsen if the obesity progresses.

4. The consensus statement regarding pain or symptoms in the soft tissues is that other diseases must be excluded as the cause of pain before lipoedema can be diagnosed. Pain must be further differentiated as heaviness, discomfort, spontaneous pain or pain on pressure. Pain must be assessed as objectively as possible, using the visual analogue scale (VAS), pain questionnaire, Central Sensitization Inventory (CSI) or similar well-validated tools.

5. The consensus statement regarding overweight and obesity is that these conditions are an aggravating factor of lipoedema. The majority of lipoedema patients are obese (80–88%). Most patients try diet and exercise to lose weight and experience yo-yo effect. Weight gain can impair lipoedema, and obese lipoedema patients often experience a lack of fitness and mobility.

6. Finally, the consensus statement regarding the mental health of those with lipoedema is that psychological issues are an additional aspect of lipoedema. The impact of psychological distress in lipoedema is underestimated, and this psychological vulnerability contributes to patients' pain perception. Patients with lipoedema often have eating disorders that need to be treated. Patients also often lack self-acceptance because of beauty ideals.

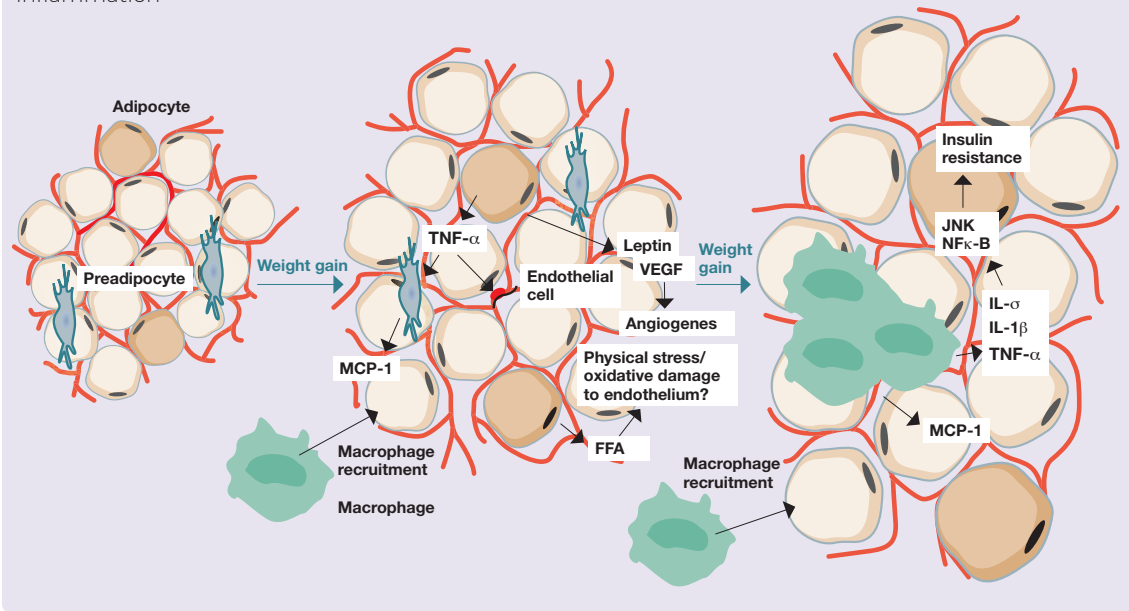
tissue of patients with lipoedema. This study showed an increase in the sodium content of the skin in these patients, which is an emerging hallmark of inflammatory diseases.³⁹ A study published in 2019 also confirmed the inflammatory processes in the adipose tissue; a greater increase in the number of macrophages was found in the fatty tissue of patients with lipoedema than in the control group.¹⁸¹ Similar to the hypoxia, this low-grade chronic inflammation may contribute to the patient's perceived pain.¹⁸¹ **Figure 8.1** depicts these complex pathophysiological processes.

Figure 8.2 shows the somatic aspects of the model that the lead authors use to explain to patients how the

pain develops. This somatic view of lipoedema is just one side of the coin. In the past, the medical profession has viewed pain exclusively as a warning signal for tissue or nerve damage, but more recently, it has come to understand that chronic pain can also be (co-) triggered by stress or even personal conditions. Stress-induced hyperalgesia (SIH) might play a role in lipoedema, especially when patients experience intense pain. The pain that lipoedema patients experience could be less related to tissue damage and more to the way in which the brain and nervous system interpret the stimulus.¹⁸² A study carried out by the lead authors³⁰ (including 150 cases) showed that patients who had

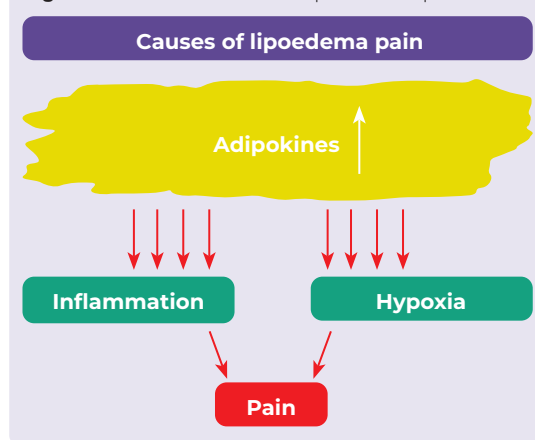
8. Overview of European best practice consensus on lipoedema

Fig 8.1. Complex pathophysiological processes underlying pain in those with chronic low-grade inflammation



sustained mental stress over a long period reported higher estimates of the severity of lipoedema pain (7–8 and even up to 10) on the visual analogue scale (VAS) from 0–10, where 10 was considered by the investigators to be ‘amputation pain’. If there were no pronounced mental stress factors, the severity of the pain was usually rated 2–3. Chronic stress, as well as anxiety and depression,^{183,184} lower the pain threshold. Catastrophic thinking,¹⁸⁵ in which attention is focused on the pain, negative assessments and helplessness reinforce the pain and cause it to become chronic.¹⁸⁴ Patients with pain often avoid movements that may trigger the pain, which restricts everyday activities even more and brings about a feeling of helplessness.¹⁸⁴ In addition, chronic stress itself causes an increase in inflammatory markers. Results from recent studies show this to be the case in patients with rheumatoid conditions,¹³¹ in whom a stress-induced increase in inflammatory mediators can be seen, irrespective of disease activity. At the same time, patients with depression,¹⁸⁶ social stress¹⁸⁷ or posttraumatic stress disorder¹⁸⁸ also show

Fig 8.2. Somatic causes of lipoedema pain



an increase in inflammatory markers that is unrelated to any underlying somatic disease. Given the psychological vulnerability of most patients with lipoedema, a vicious circle may ensue, where chronic stress and psychological symptoms intensify the pain

through inflammatory mediators, which in turn may worsen mental stress. **Figure 8.3** shows the somatic model with these psychosocial factors added in.

Lipoedema is not a mental illness, but psychological factors do play a key role in the associated complaints. Therefore, it is extremely important to be open to the complex interactions between body and mind. This perspective makes it easier to develop effective long-term treatment strategies. Labelling, an additional stigmatisation that many patients with lipoedema have already experienced because of the disproportionality of their limbs or their obesity, is very damaging to mental health and hinders effective therapy.

There are still some questions that need to be answered in the future. For example, why do patients with lipoedema experience pain only in the subcutaneous fatty tissue of the limbs (usually the legs) and not in the subcutaneous fatty tissue over the abdomen or back? Why do treating physicians repeatedly see women with advanced disproportionate fat distribution who do not experience pain (by definition, lipohypertrophy) as well as those with less disproportionality but intense pain in the adipose tissue in these regions?

Consensus on the treatment of lipoedema

A key element in the therapeutic concept proposed by the lead authors is to focus on the actual complaints of lipoedema patients. This element, too, represents a paradigm shift in the view of lipoedema. The traditional approach for treatment focused on the oedema, so was centred around decongestion. Naturally, decongestion cannot have much value in new treatment approaches to lipoedema based on this consensus. Crucial questions in the new treatment concept are as follows: What do patients with lipoedema really suffer from? What is the therapeutic goal from the patient's point of view? Valid scientific data on the patients' perspective are lacking, so responses to these questions must be based on the extensive clinical experience of the experts participating in the European Lipoedema Forum. According to the experts, patients with lipoedema suffer to varying degrees from pain/other symptoms in the soft tissues of the legs or arms; greater psychological vulnerability, which may intensify their pain; a lack of self-acceptance, mainly because of current beauty ideals; overweight or obesity with numerous attempts at dieting; and a lack of physical exercise and fitness, especially in obese patients. **Figure 8.4** shows the main components of treatment defined by the experts, compiled into individual therapeutic modules. The results of the interdisciplinary working group were then discussed in plenary sessions in order to reach agreement and develop a consensus regarding lipoedema treatment, presented below. There are certainly some national differences in how this approach could be adopted across Europe. For example, physiotherapists in the Netherlands have greater responsibility and a wider scope of practice than those in Germany. It may, therefore, not be possible for all European countries to follow the consensus recommendations in an identical manner. However, the broader recommendations remain the same irrespective of the country of practice.

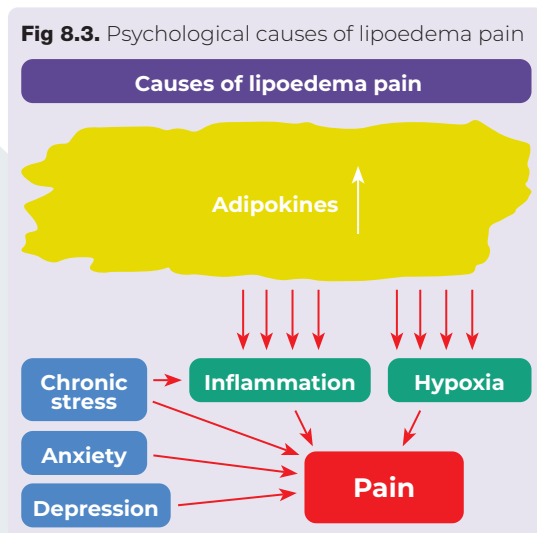


Fig 8.4. Components of holistic treatment for lipoedema



Physiotherapy and movement therapy

Managing expectations prior to treatment is vital in order to know the patients’ precise expectations and treatment goals, as well as their subjective illness beliefs. If the patient’s expectations are unrealistic or inappropriate, it is important that these are discussed with the patient in order to avoid starting the treatment off on the wrong foot. The conversation should begin with a mutual exchange of expectations.

Patients with lipoedema should receive a holistic assessment that does not just focus on the diagnostic and medical aspects of the disease but considers the impact on daily functioning. In order to establish this overall picture, a patient health profile should be made that includes data on (repeated) clinical measurements to provide a more objective personal history and identify specific individual needs. The International Classification of Functioning, Disability and Health (ICF)¹⁸⁹ may be a useful tool for establishing this health profile and determining a detailed picture of the patient’s problems, abilities and goals in all areas. The ICF model offers a fundamental framework for determining human functioning and a classification system based on the biopsychosocial model.^{189, 190} It consists of two parts (**Figure 8.5**). Part 1 describes functional ability and disability based on three components:

1. the physical body (body structures and functions)
2. activities
3. participation.

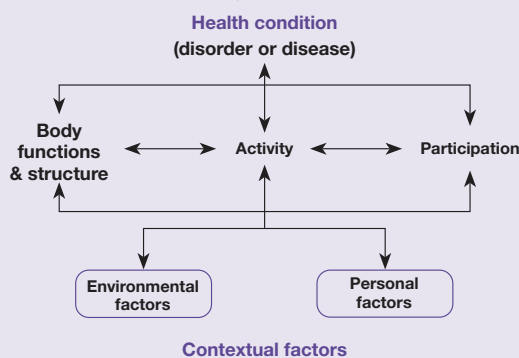
Part 2 is concerned with specific contextual factors and has two components:

1. environmental factors
2. personal factors.

All parts of the ICF model are interdependent.

In order to establish a comprehensive health profile, basic data should be recorded from each patient with lipoedema before they start treatment. The Dutch guidelines^{191, 192} suggest measuring the circumference of the limbs, the body mass index (BMI), abdominal girth and the Dutch standard of normal activity.¹⁹³ In addition, the European experts recommend recording the WHtR to determine body fat distribution. Depending on the individual patient’s history, clinical assessment should be supplemented with additional tests and questionnaires, for example, to capture tiredness, pain, quality of life (QoL) and stress. Use of the ICF in combination with clinimetric

Fig 8.5. ICF model of patient assessment



8. Overview of European best practice consensus on lipoedema

tools offers the possibility of establishing an individual health profile and drawing up an optimally personalised treatment plan. This should lead to an improvement in function and quality of life.^{189, 190, 194, 195} Monitoring the measurements at regular intervals allows us to analyse treatment progress and adapt the treatment plan as necessary.

Physiotherapy or lipoedema management focuses on reducing the subjective complaints and restrictions as well as preventing the condition from worsening. Each treatment session should consist of a selection of interventions that can be combined according to the patient's needs.

Education

It is important for patients to know and understand what lipoedema is and, perhaps even more importantly, what it is not. It should be made clear that lipoedema is a chronic disease that can be negatively impacted by increasing body weight and a lack of physical activity. Patients should be informed that it is their own responsibility to manage their conditions, not only physically but also mentally. It is important for the treating physician to realise that they can only coach patients, not solve their problems. A stepwise approach to behavioural changes (starting with realistic goals and slowly building upon them) and motivational interviewing may be beneficial in treatment of patients

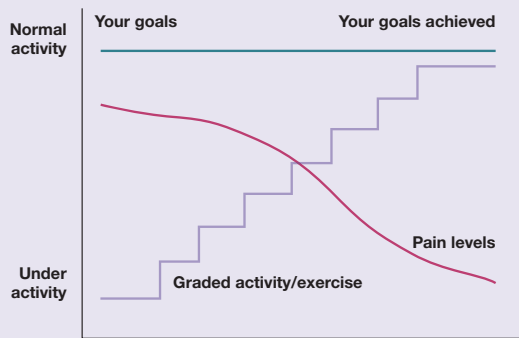
with lipoedema. As with the self-management of lymphoedema, education at an early stage is crucial.¹⁹⁶

Optimising daily functioning and physical capacity

In many cases, patients with lipoedema have a lower level of activity, as well as diminished physical capacity.¹⁹⁷ Graded activity is a structured treatment that is based on cognitive behavioural therapy combined with physiologic principles of training. The goal of gradually increased activity is to augment everyday functional ability; the key training elements are building up muscle strength and aerobic exercises.¹⁹⁸⁻²⁰⁰ The programme starts by determining the baseline based on measurements of pain, activities of daily living (ADLs), physical performance and psychological status. It is incrementally increased, which ensures greater patient compliance.²⁰¹ The method aims to change behaviour to increase the patient's level of activity irrespective of their complaints. Gradual increase in activity improves physical function without increasing pain levels. In a subgroup of patients, graded activity decreases pain levels in the long run²⁰² (**Figure 8.6**). The key element of this programme is the setting of personal goals, which can be used as the basis for determining patient-appropriate physical activities, and the necessity of a sustainable healthy lifestyle is always kept in mind.

The importance of physical activity cannot be overstated. As mentioned previously, inflammatory processes in the adipose tissue are the most likely cause of pain in lipoedema. It has recently been shown that regular physical training leads to a decrease in proinflammatory adipokines and macrophages.²⁰³ In addition, physical exercise increases blood flow and, thus, counteracts the hypoxia in the adipose tissues.²⁰⁴ Physical activity reduces the inflammatory processes in adipose tissue and contributes considerably to pain relief. **Figure 8.7** illustrates the effects of physical activity on the inflammatory processes in adipose tissue. Additionally, physical training acts like a natural antidepressant.²⁰⁵ This is

Fig 8.6. How graded activity reduces pain over time



of great relevance in patients with lipoedema, most of whom have an increased psychological vulnerability or have chronic mental stress. Sporting activity in conjunction with basic psychotherapy is more effective in persons with a depressive tendency than more sophisticated psychotherapy alone.²⁰⁶

Manual lymphatic drainage

Manual lymphatic drainage (MLD) has no effect on the lipoedema itself, as it can only influence oedema and not the distribution of fat or the size of fat cells. Lipoedema neither includes any relevant oedema nor impairs the lymphatic system.^{151, 165} Furthermore, the efficacy of MLD for lipoedema has not been demonstrated.^{207, 208} The perceived pain reduction through the application of MLD may be helpful in the initial stages of treatment. However, it is essential to combine this treatment with adequate information for the patient about the neuro-physiology of pain. In addition, if applied, this therapy should be restricted to 1 month because it is vital to protect the patient from dependency on the therapist.

Self-management

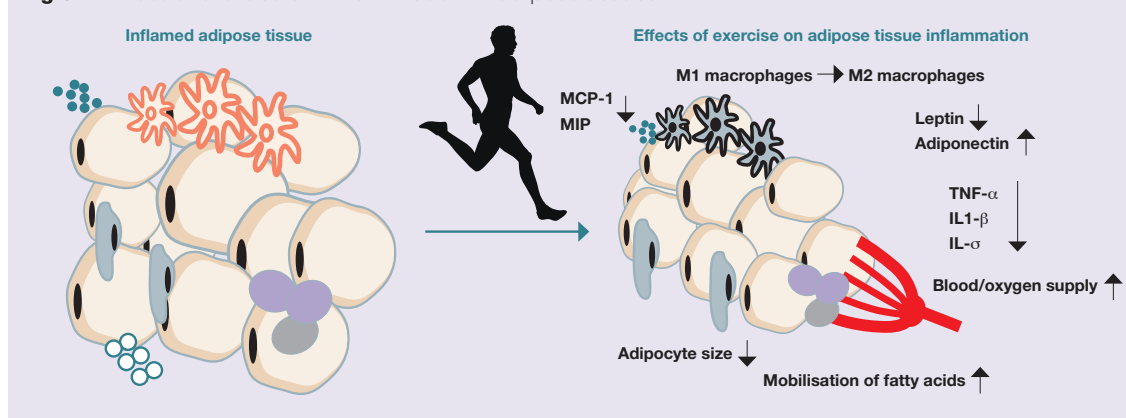
Following the chronic care model (CCM),²⁰⁹ patients should assume a leading role in their treatment in order to achieve behavioural changes. Self-efficacy,

the extent of one's belief in one's own ability to complete tasks and to reach goals, is one of the pillars of self-management.²¹⁰ Because self-management is important, the consensus considers it a mainstay of treatment in its own right.

Compression therapy

Compression therapy has always been and remains an important element of best practice in the treatment of patients with lipoedema. Nevertheless, the change in the pathophysiological view of lipoedema presented above alters the indication for wearing compression stockings. The basis for prescribing compression therapy is no longer the oedema, but rather the frequently demonstrated anti-inflammatory effects it has on the subcutaneous tissue. To the authors' knowledge, no data are available on the anti-inflammatory effects of compression in lipoedema. However, studies in phlebology and sports medicine have shown that compression has a remarkable effect on the inflammatory processes in subcutaneous tissue.^{211, 212} Confocal laser scanning microscopy has been used to show a significant reduction in proinflammatory cytokines and a simultaneous rise in anti-inflammatory mediators in the compressed tissue of patients with venous disease.²¹³ Ligi et al also highlighted these effects in their review,²¹⁴ and Beidler

Fig 8.7. Effect of exercise on inflammation in adipose tissues



8. Overview of European best practice consensus on lipoedema

et al demonstrated a decrease in proinflammatory cytokines and macrophages after 4 weeks' compression therapy in patients with chronic venous insufficiency.²¹⁵ Other studies have reported an improvement in the subcutaneous microcirculation from wearing compression stockings.^{216, 217} One noteworthy study on healthy industrial workers and surgical nurses (who spend most of their working life on their feet) showed that wearing compression stockings resulted in a significant reduction in oxidative stress, a finding that also points to improved microcirculation in the subcutaneous tissues.²¹⁸ All these studies are related to compression of the legs in patients or healthy volunteers when standing or walking. There is much to be said regarding the effects of compression as synergistic with the effects of active movement (when standing or walking). Both these therapeutic options have an anti-inflammatory effect and a positive impact on the tissue hypoxia. Importantly, this is why wearing compression sleeves on the arms for lipoedema is less meaningful. The synergistic effects of compression and movement are particularly remarkable with physical activity in water. In the authors' experience, all their patients with lipoedema have reported an improvement in symptoms with swimming or water aerobics. Consequently, the importance of compression now lies in the reduction of pain and other symptoms due to inflammatory processes.

Conveying this information to the patient is a key task in doctor-patient communication. In addition, discussions with the patient should clarify that compression does not reduce the amount of fatty tissue, nor does it prevent an increase in fat in the legs if the patient gains weight. Depending on the clinical picture, custom-made circular-knit or flat-knit compression garments can be used. Flat-knit are generally preferred, not only because they are more comfortable to wear (and hence encourage compliance) but also because the forum experts have observed that they are more effective. Flat-knit stockings should always be used in severely obese patients with lipoedema who have deep skin folds in

fat lobes, as only the flat-knit manufacturing technology can meet the enormous calibre jumps that are characteristic in these patients. Besides providing symptomatic relief, compression also supports the soft tissues, reduces the mechanical impairment of movement from skin lobes rubbing against each other and improves mobility.^{217, 218} Patients' acceptance of compression as a necessary tool to reduce the symptoms of lipoedema increases with appropriate patient education. Aesthetic criteria with respect to the quality, colour and pattern of the material, as well as the contouring effects of the compression, can also increase patient compliance and enhance social participation. The extent of the lipoedema in the individual case determines whether compression pantyhose, leggings, capri-length compression garments or below-knee stockings are required and which compression class is necessary; the decision is always personalised accordingly. The success of compression therapy in the treatment of lipoedema can be established with appropriate tools for measuring biometric, psychological and social parameters.

Psychosocial therapy

The crucial question to ask is: what do women with lipoedema really suffer from? If we keep the relevant problems and symptoms in focus, we can identify those patients who are suffering from severe mental stress. Mental health issues and pain perception are closely related, so this is particularly relevant to lipoedema patients.^{30, 219} Various treatment options and support services are available for the psychosocial problems of patients with lipoedema. Therefore, there is no single psychosocial or psychotherapeutic option to treat all patients. However, there are some general factors that significantly affect all patients, including those with lipoedema, and, at the same time, there are lipoedema-specific issues that can be found in most patients with this condition. Nearly all patients with lipoedema express difficulties in accepting their own bodies, especially the shape of their legs. In this respect, the media, particularly social media, has an

8. Overview of European best practice consensus on lipoedema

enormous influence on self-perception. The greater a woman's media consumption, the greater is her dissatisfaction with her own appearance and the more she craves a slim body.²²⁰ The beauty ideal among teenage and young adult women is already far below the normal weight for these age groups²²¹ and yet, the media suggests that this ideal can be achieved. This, in turn, puts pressure on girls and women who think that they have to conform to this ideal and may set off a vicious circle of dieting and subsequent weight gain. Further, psychological assessments found a clearly higher proportion of patients with lipoedema who reported physical or sexual abuse in comparison with the general population.²²² In a recent published study with 150 patients diagnosed with lipoedema, 52% reported having experienced severe violence or sexual abuse.³⁰ These experiences also impact body awareness and increase the risk of chronic pain.^{30, 223} The consensus discussions also identified other problem areas in patients with lipoedema, in particular, a diminished feeling of self-esteem, difficulties in coping with stress and, of course, the typical lipoedema pain whose perception depends on the patient's mental health.

Diagnostic screening

To identify patients with lipoedema who need psychotherapy or other psychosocial services, the consensus proposes the use of questionnaires to encompass the most important psychological symptoms, since it is usually difficult to make an appointment for psychological assessment quickly. All health professionals should be able to use these questionnaires to screen for the most common mental health issues or problem areas in patients with lipoedema. If the scores are remarkable, the patient should be referred to a licensed psychotherapist or counselling service for a psychological evaluation. Further treatment can be planned and the necessary services initiated. Until such time when a validated lipoedema-specific questionnaire becomes available, questionnaires that have already been validated and proved their worth in both clinical practice and

research should be used. Of course, screening does not replace a full mental health assessment. However, the use of screening questionnaires provides the outpatient physician with an indication of which patients with lipoedema must definitely be referred for further psychological assessment. A comprehensive view of the patient's symptoms is essential, especially when the pain intensity score is high. Where this is not possible within formal healthcare settings, patients may be directed to voluntary organisations that provide this support.

Therapeutic approach

Taking all the therapeutic options into account, the relationship between the patient and the treating physician or therapist has an important impact. The ideal relationship is based on empathy and an understanding of what the patient is going through; it acknowledges the burden of suffering felt by the patient but also strengthens the patient's resources to cope.²²⁴

Education

Information and education on how pain develops in lipoedema may start to modulate the patient's perception of pain. There is evidence that education on the neuronal basis of pain has a positive effect in various types of pain.²²⁵⁻²²⁷ When patients attribute severe pain entirely to severe tissue damage, they will be more likely to try to protect themselves and possibly be even more sensitive to pain. A comprehensive understanding of pain, seeing it also as a dysregulated reaction or an overreaction of the stress system, allows patients with lipoedema to develop further strategies for pain relief by relieving stress, strategies that they can then employ themselves. Anecdotally, analgesics appears to have limited benefits for lipoedema pain.

Psychotherapy

If anxiety, depression or severe psychological distress can be lessened by psychotherapeutic intervention, it has a positive effect in reducing pain.^{76, 228} Non-disorder-specific interventions include mindfulness techniques or acceptance and commitment therapy

8. Overview of European best practice consensus on lipoedema

(ACT), based on mindfulness, which improve mental wellbeing and increase psychological flexibility. According to the German Association for Psychiatry, Psychotherapy and Psychosomatics treatment guidelines, evidence-based disorder-specific psychotherapy may be used when there is a psychological disorder, such as depression, an eating disorder or anxiety.²²⁹

Additional procedures

Psychotherapy in patients with lipoedema seems to reduce pain more effectively when used in combination with physically oriented techniques, such as embodiment-focused procedures. This may be attributed to a calming effect on the stress system, in addition to the effect of the words at the neuronal level. Under the new ICD-11 terminology, much of the psychological vulnerability found in patients with lipoedema can be described as a stress-related disorder.²²⁴ However, this initial experience needs to be reinforced by research.

Self-help groups

Experiencing self-efficacy and optimism as well as social support from positive, like-minded people in a self-help group increases resilience. According to a review article, well-developed resilience is associated with better mental health in people with physical health problems.²³⁰

Weight management

Obesity is often progressive, while lipoedema is usually not, but if obesity progresses, the lipoedema can get worse. In tertiary referral centres, 80–88% of patients with lipoedema also have obesity.⁴¹⁻⁴³ Therefore, in order to treat lipoedema effectively, obesity must be addressed, and weight management plays a major role in the treatment concept. The recommendation for conservative management or additional surgical treatment depends on the patient's weight and their wishes. Nevertheless, the basic precepts of conservative treatment (weight management) must still be followed after surgery.

Recommended conservative approach

There has also been a change in perspective regarding weight management. The consensus does not consider weight loss as the primary concern for moderately obese patients. Instead, both therapists and patients should focus on achieving a state of wellbeing and fitness. Weight management is absolutely mandatory where severe obesity-related disease exists or threatens to develop. The expert panel has drafted a nutritional medicine concept to achieve this purpose:

1. Short-term diets must be avoided by all means. They almost always fail and often result in a yo-yo effect.^{64, 72-79} Instead, patients should be educated on how to change their eating habits towards an individually appropriate and adapted healthy diet that they can follow sustainably for the rest of their lives.

2. The concept of energy balance must be accepted. This does not imply mere calorie counting, since it is by now evident that the different nutrients have different metabolic effects.²³¹ Instead, emphasis must be placed on intake and expenditure of energy.

3. Patients should be informed about the pro- and anti-inflammatory effects of their dietary habits and food choices. In this context, the reduction of hyperinsulinemia and insulin resistance, which are present in most patients with additional visceral obesity, is vital for lipoedema patients.²³² Hyperinsulinemia is the main cause of chronic inflammation; the vicious circle of obesity and gradually increasing hyperinsulinemia leads to a further increase in adipose tissue.^{233, 234} To reduce hyperinsulinemia, the following is recommended: sufficiently long intervals should be maintained between meals: 4–6 hours are recommended during the daytime, and at least 12 hours during the night.²³⁵⁻²³⁷ Constant grazing should be strictly avoided, especially on sweets and other snacks that raise blood glucose levels. Foods containing refined carbohydrates or sugar should be avoided,^{232, 238, 239} as should processed foods. Consumption of healthy fats should be encouraged (olive oil, wild-caught oily fish,

pasture-raised meat and milk products), and industrial trans-fats should be avoided.²⁴⁰⁻²⁴²

4. For long-term weight stabilisation, support and coaching are mandatory during and after nutrition therapy in order to prevent relapses.²⁴³

Recommended surgical approach

1. Bariatric surgery is recommended for patients with lipoedema who have a BMI of ≥ 40 kg/m².

2. Bariatric surgery may be considered for patients with lipoedema who have a BMI of 35–40 kg/m².

It has been shown that bariatric surgery is the most effective treatment for losing weight. A comprehensive meta-analysis with 25 prospective studies showed significantly better weight loss after surgical procedures, irrespective of the type of operation, the duration of postoperative care or the severity of the obesity.²⁴⁴ The BMI threshold for recommending obesity surgery is based on historical developments and is in line with the European²⁴⁵ and American interdisciplinary guidelines for bariatric surgery.²⁴⁶ Preoperative examination and preparation for bariatric surgery should be carried out in accordance with the European guidelines.²⁴⁵ The bariatric surgery itself should also be carried out within the framework of this interdisciplinary guideline. A recent study could show the great benefit severe obese patients with lipoedema experience after bariatric surgery.⁹² For patients with a BMI of 35–40 kg/m², the WHtR should also be taken into consideration to identify over-proportional fat distribution in patients with lipoedema. Patients with lipoedema and a WHtR < 0.5 probably do not have a metabolic risk, so bariatric surgery is not necessary for this group.²⁴⁷

Liposuction

The European Lipoedema Forum experts believe that the benefits of liposuction depend strongly on clearly defined patient selection, as not every patient with lipoedema would benefit from liposuction. In order for patients to benefit from this procedure, the participants agreed on the following criteria.

1. The symptoms persist despite at least 12 months of conservative treatment mentioned above

2. The patient has considerable functional disabilities (e.g. restricted mobility)

3. The patient's weight has been stable for at least 12 months. This reduces the risk of the effects of liposuction being cancelled out by postoperative weight gain.¹⁷⁴

4. A preoperative psychological assessment is available, to rule out any eating disorders or relevant mental health issues that might hamper sustained treatment success.

5. BMI no more than 35 kg/m².

Liposuction is not a treatment option for patients with a BMI > 35 kg/m² and central obesity (WHtR > 0.5). In the absence of the latter, liposuction can be carried out in patients with a higher BMI, although this is extremely rare. A lipoedema/liposuction task force comprising members of the executive committee of the German Society of Phlebology (DGP) and the German Society of Lymphology (DGL) has issued a statement to the G-BA, in which they include criteria that should be met by physicians treating lipoedema. According to this task force, the diagnosis of lipoedema is frequently found to be a mistaken diagnosis on referral. For this reason, the physician referring patients for liposuction should also have an additional lymphology or phlebology qualification. It is obvious that clear requirements for the surgeons must be formulated. To ensure the necessary quality standards, doctors performing liposuction must have specialist certification. Patients will then have the possibility of finding a surgeon who meets the defined quality criteria.

Figure 8.8 shows a patient who fulfills all the mentioned criteria. **Figure 8.9** shows the same patient 3 years after liposuction. She was happy with the results and experienced good pain relief, although she still has to wear compression garments.

Self-management

Successful self-management is necessary for patients with lipoedema to reduce their symptoms in the long

8. Overview of European best practice consensus on lipoedema

Fig 8.8. A patient with lipoedema who meets all the criteria for liposuction. **8.9.** The patient at 3 years after liposuction



Kindly provided by Prof. Nestor Toro Padron

term. The available studies on self-management are very consistent in terms of their messaging: good self-management improves the state of health, everyday functioning and the quality of life in patients with chronic disease.^{248, 249} The authors regularly see patients with lipoedema who have achieved a considerable long-term reduction in their symptoms with successful strategies to improve their self-esteem, and some even describe themselves as symptom-free. Treating physicians and therapists have high expectations of their patients with

lipoedema: old and relatively unhealthy habits should be relinquished as soon as possible and replaced by new healthier self-management strategies. Following the chronic care model (CCM), patients should adopt a leading role in their treatment.^{209, 250} Nevertheless, the feasibility of establishing new habits is overestimated. Old habits are difficult to overcome, and implementing change depends on the basic principles of motivation. Neurobiology offers a basic insight as to why people adhere to unhealthy habits: unfavourable behaviour often reduces stress quickly and easily. From the

8. Overview of European best practice consensus on lipoedema

neurobiological aspect, binge eating can be viewed as a coping method for frustration, and lowers stress levels in the short term,²⁵¹ which the brain interprets as a reward. In motivational interviews, patients talk about the disadvantages of their old automatic behaviour and/or the advantages of the new healthier behaviour.²⁵⁰⁻²⁵³ Many treatment models wrongly assume that sharing information and providing education are sufficient for patients to change their patterns of behaviour. However, even the best advice often has hardly any effect in changing behaviour. Instead, it is important that treating physicians show empathy,²⁵⁴ rather than commenting on behaviour that produces guilt or shame or trying to shock the patient into changing their behaviour.²⁵⁵ Patients often fail to meet their own demands. If they do not reach a set goal (e.g. more physical activity with compression therapy three times a week), they often give up totally. However, studies have shown that deviating from a new habit on a single day it has no measurable influence on long-term success. Not having to feel ashamed or guilty if something does not immediately go according to plan unburdens the patient, reduces stress and increases the likelihood of them establishing new healthier habits.

Consider a patient with lipoedema who is hardly moving about on a daily basis due to her complaints. This patient should be guided to rate each potential self-management strategy (in this case regular physical exercise under compression) on a scale of 0 to 10. For example: How important is it for you to exercise for 30 min while wearing compression three times a week from now on? The second question to be considered is: How much do you trust your own ability to carry out this strategy (e.g. how do you estimate the chances of your being able to exercise for half an hour, three times a week, and what sort of exercise would you enjoy the most)? If the goal is important to the patient, and they are sure that they can achieve it, then they are already highly motivated. If this is not the case, then motivational interviewing would be required. Studies have shown that the effects of such motivational interviews last for a long time after the

end of treatment.²⁵³ In summary, the best way to support patients with lipoedema is to help them develop new self-management strategies by meeting them on an equal footing—as experts on themselves.

9. Renaming the term 'lipoedema'

As already suggested decades ago, it is necessary to change the term 'lipoedema'.²⁵⁶ In terms of histology, indications of both hyperplasia^{9, 256} and hypertrophy²⁵⁷ of the fatty tissue have been found in those with lipoedema. Therefore, the deliberately non-specific term 'lipalgia syndrome' (from the ancient Greek 'lipos' = fat and 'algos' = pain) appears the most appropriate nomenclature. Redesignating 'lipoedema' as 'lipalgia syndrome' also shifts the focus of the illness, which previously was the presence of oedema and its drainage.

This renaming became necessary, as the word 'oedema' proved deceptive. To sum up the notions conveyed in this supplement, oedemas are defined as pathological accumulations of fluid in the tissue. However, relevant oedema caused by the syndrome previously described as a 'lipoedema' has not been detected, either on clinical examination or through imaging studies.¹⁵⁰ A multi-centre study using high-resolution ultrasound focusing on patients diagnosed with lipoedema failed to identify any indication of fluid in the soft tissue in the legs.¹⁶⁴ In a study published in 2020, in which patients with lipoedema were examined using MR lymphography, the authors summarised that 'The fat tissue was homogenous, without any signs of edema in pure lipedema patients.'¹⁵ In addition, even histological studies have not found the presence of oedema in those with 'lipoedema'.^{34, 150, 164} In a seminal article published in 2012, Reich-Schupke et al called the term 'lipoedema' misleading, stating that 'it is not an oedema or a fluid retention in the tissue'.²⁰⁸ This was also confirmed by the authors of the Dutch Lipedema Guidelines, in which they describe 'lipoedema' as an 'unfortunate term', as it suggests fluid in the tissue when no fluid is present.²² In a statement to the Federal Joint Committee in 2019, a task force comprising board members of the German Society of Lymphology and the German Society of Phlebology said that the idea that lipoedema involves oedema is no longer valid.²⁵⁸ The European Lipedema Forum—a high-ranking international group of experts from seven European countries—then concluded in a noteworthy consensus

paper that there is **no** scientific evidence that lipoedema is an oedema problem.³⁴

It should be clarified that patients diagnosed with lipoedema can certainly present with orthostatic oedema, and it is important to ensure that these cases are recognised and managed appropriately. However, this is neither pathognomonic for the diagnosis of lipoedema nor causes symptoms for the patient. Even healthy people experience mild fluid retention in the lower extremities, which is situational and temporary (e.g. after standing for long periods or during the hot summer months).

The renaming of the term 'lipoedema' to 'lipalgia syndrome', which focuses on the soft-tissue pain that is actually experienced by patients, rather than oedema, also shifts the therapeutic focus from oedema treatment to pain management, which has obvious benefits for patients. As described in this supplement, pain is considered to have driven neurobiological research over the last few years, as a complex experience that also includes biographical and psychosocial experiences.³⁰

In order to increase acceptance of the new term while avoiding confusion, both terms should be used in parallel initially, for example, 'lipalgia syndrome (previously, lipoedema)'. It is hoped that the new term 'lipalgia syndrome' will quickly become established and gain widespread usage.

10. Final remarks

The paradigm shift in lipoedema has been gaining greater acceptance over the last two years. Large sections of the executive committees of the professional associations in Germany responsible for lipoedema have adopted this altered perspective. The previously lipoedema/liposuction task force has issued a statement on the fact that lipoedema does not include oedema.²⁵³ The European Lipoedema Forum, with 25 renowned experts from seven European countries, has developed the European Best Practice of Lipoedema outlined here and thus also supports the paradigm shift in lipoedema. After reading the consensus, numerous other national and international experts and opinion leaders from 10 European countries have also pledged their support for changing perspectives in lipoedema. Further, Guenter Klose, founder and CEO of Klose Training in Denver/Colorado, one of the largest and most renowned training institutes for lymphoedema therapy in the world, has also championed the new perspective on lipoedema and will integrate the new treatment concept into the organisation's training catalogue. Thus, it is hoped that this new way of approaching and treating lipoedema will become established in the US.

As always when things change, there is resistance, and even experts in the field of lymphology are challenging the paradigm shift and consensus. It is difficult to accept that the established doctrines of many decades are suddenly proving to be wrong, and people find it painful to question their beliefs and position. It is also associated with a fear of loss: a loss of acquired expertise, a loss of familiar certitude, a loss of control.

Patients who have lipoedema face a different concern when confronted with this change in the perspective of their disease. At a time when patients are stigmatised and discriminated against because of being overweight or because of the shape of their legs, it is easier for them to believe that a medical condition is responsible for all past adversity. Instead, however, it would be more helpful for them to better understand the complex background of lipoedema.

Understandably, it is easier to believe in the accumulation of fluid in the body and receive MLD sessions rather than undertake regular enforced physical activity under compression. It is also easier to think of liposuction as a solution than to deal with psychological vulnerability or problems of self-acceptance. Nonetheless, with patient education and motivation, they can change their way of thinking from the passive attitude of being a victim to adopting an active, positive and self-aware approach to lipoedema, and, therefore, themselves.

The treatment strategy presented in this supplement should show physicians and therapists treating patients with lipoedema the direction in which to guide their patients. The European center of lymphology, the Földi Clinic in Hinterzarten, has radically altered its treatment concept for patients with lipoedema and adapted it to the patient's individual symptoms.²⁵⁹ Nevertheless—and this needs to be emphasised—many patients referred to the specialist clinic with a diagnosis of lipoedema also have two other diseases in need of treatment: obesity and obesity-related lymphoedema. Obesity treatment and complete decongestive therapy are, of course, still the mainstays of treatment for these two conditions, but they are certainly not suitable to treat the complex disease of lipoedema. In the authors' opinion, there is no alternative to the paradigm shift in lipoedema, which is gradually gaining acceptance worldwide. The changes in perspectives on lipoedema described here bring the patient's real symptoms to the forefront, allowing for more comprehensive and sustainable treatment.

References

1. Allen EV, Hines EA Jr. Lipedema of the legs: a syndrome characterized by fat legs and orthostatic edema. *Proc Staff Mayo Clin.* 1940; 15:184–187
2. Wold LE, Hines EA Jr, Allen EV. Lipedema of the legs: a syndrome characterized by fat legs and edema. *Ann Intern Med.* 1951; 34(5):1243–1250
3. Greer KE. Lipedema of the legs. *Cutis.* 1974; 14:98–100
4. Müller W. Panniculosis [in German]. *Z Rheumaforschung.* 1973; 32:169–176
5. Schmitz R. Lipedema [in German]. *Gynäkologie.* 1980; 13:102–105
6. Brunner U. Vascular diseases in lipedema of the legs [in German]. *Schweiz Med Wschr.* 1982; 112(33):1131
7. Gregl A. Lipoedema [in German]. *Lymphologie.* 1987; XI:41–46
8. Rudkin GH, Miller TA. Lipedema: a clinical entity distinct from lymphedema. *Plast Reconstr Surg.* 1994; 94(6):841–849
9. Cornely M. Lipedema of the arms and legs. Part 1: pathophysiology [in German]. *Phlebologie.* 2011; 40(1):21–25
10. Cornely M. Lipedema of the arms and legs. Part 2: For conservative and operative therapy of lipedema, called lipohyperplasia dolorosa. *Phlebologie.* 2011; 40(3):146–151
11. Peled AW, Kappos EA. Lipedema: diagnostic and management challenges. *Int J Womens Health.* 2016; 8(1):389–395. <https://doi.org/10.2147/IJWH.S106227>
12. Monnin-Delhom ED, Gallix BP, Achard C, Bruel JM, Janbon C. High resolution enhanced computed tomography in patients with swollen legs. *Lymphology.* 2002; 35(3):121–128
13. Tietjen KU, Schulz-Ehrenburg U. Isotope lymphographic findings in lipedema. In: Holzmann H, Altmeyer P, Hör G, Hahn K (eds). *Dermatology and nuclear medicine.* Berlin, Heidelberg (Germany): Springer; 1985 [in German]
14. Strößenreuther RHK. Lipedema. New aspects of pathophysiology, diagnosis and therapy as well as further differential diagnostic considerations. Unpublished dissertation. Technical University of Munich; 1999
15. Cellina M, Gibelli D, Soresina M et al. Non-contrast MR lymphography of lipedema of the lower extremities. *Magnetic Resonance Imaging.* 2020; 71:115–124. <https://doi.org/10.1016/j.mri.2020.06.010>
16. Kayserling E. On the histology of lipedema. In: Strößenreuther RHK (ed). *Lipedema and cellulitis, as well as other adipose tissue disorders.* Köln (Germany): Viavital Verlag; 2001 [in German]
17. Brenke R, Siems WG. Indications for the involvement of free radicals in the pathogenesis of lipedema. In: Strößenreuther RHK (ed). *Lipedema and cellulitis, as well as other adipose tissue disorders.* Köln (Germany): Viavital Verlag; 2001 [in German]
18. Schmeller W, Meier-Vollrath I. Lipedema: new possibilities of therapy. *Schweiz Med Forum.* 2007; 7:151
19. Schmeller W, Meier-Vollrath I. Lipedema. 2020. <https://tinyurl.com/y3ewjx9r> (accessed 17 September 2020)
20. Rapprich S et al. Liposuction is an effective treatment for lipedema – results of a study with 25 patients. *J Dtsch Soc Dermatol.* 2011; 1(9):33–40. <https://doi.org/10.1111/j.1610-0387.2010.07504.x>
21. Földi M, Földi E. *Földi's textbook of lymphology.* 3rd edn. Munich (Germany): Urban & Fischer; 2012
22. Damstra RJ, Habbema L, Hendrickx A et al. Lipedema: guidelines in the Netherlands 2014. 2014. <https://tinyurl.com/yxw3lwfy> (accessed 17 September 2020)
23. Wounds UK. Best practice guidelines: management of lipoedema. 2017. <https://tinyurl.com/w72z9qw> (accessed 17 September 2020)
24. Harwood CA, Bull RH, Evans J, Mortimer PS. Lymphatic and venous function in lipoedema. *Br J Dermatol.* 1996; 134(1):1–6
25. Herbst KL. Rare adipose disorders (RADs) masquerading as obesity. *Acta Pharmacol Sin.* 2012; 33(2):155–172. <https://doi.org/10.1038/aps.2011.153>
26. Buck W, Herbst KL. Lipedema: a relatively common disease with extremely common misconceptions. *Plast Reconstr Surg Glob Open.* 2016; 4(9):e1043. <https://doi.org/10.1097/GOX.0000000000001043>
27. AWMF Online. S1 guideline on lipedema. 2015. <https://tinyurl.com/y3eudt96> (accessed 17 September 2020)
28. Schmeller W, Meier-Vollrath I. Lipedema. In: Weissleder H, Schuchhardt CH (eds). *Diseases of the lymphatic system.* 5th edn. Köln (Germany): Viavital Verlag; 2011 [in German]
29. Herpertz U. *Edema and lymphatic drainage.* 3rd edn. Stuttgart (Germany): Schattauer; 2006
30. Erbacher G, Bertsch T. Lipoedema and pain: what is the role of the psyche? Results of a pilot study with 150 lipoedema patients [in German]. *Phlebologie.* 2020; 49(5):305–316. <https://doi.org/10.1055/a-1238-6657>
31. Rauchfuss M, Listing M, Klapp BF, Reisschauer A. Massage therapy reduces pain, exhaustion and stress in breast cancer patients *Geburtsh Frauenhk.* 2010; 70:870–824. <https://doi.org/10.1055/s-0030-1250400>
32. Baumgart S, Mueller-Oerlinghausen B, Schendera CFG. Effectiveness of massage therapy in depression and anxiety disorders and in depression and anxiety as comorbidities: a systematic review of controlled studies. *Phys Med Rehab Kuror.* 2011; 21(4):167–182. <https://doi.org/10.1055/s-0031-1279760>
33. Ajilchi B, Aminiv HR, Kargar FR, Jamali S. The effectiveness of massage therapy on reducing depression in students. *Indian J Fundament Appl Life Sci.* 2015; 5(S3):1937–1942
34. Bertsch T, Erbacher G, Corda D et al. Lipoedema: myths and facts, part 5. European best practice of lipoedema – summary of the European Lipoedema Forum consensus. 2020. <https://doi.org/10.1055/a-1012-7670>
35. Herpertz U. Lipedema. *Z Lymphol.* 1995; 19:1–11
36. Brenner E. How is pain involved in lipedema? *LymphForsch.* 2017; 21(1):40–47
37. Pou KM, Massaro JM, Hoffmann U et al. Visceral and subcutaneous adipose tissue volumes are cross-sectionally related to markers of inflammation and oxidative stress. The Framingham Heart Study. *Circulation.* 2007; 116(11):1234–1241. <https://doi.org/10.1161/CIRCULATIONAHA.107.710509>
38. Rutkowski J, Davis KE, Scherer PE. Mechanisms of obesity and related pathologies: the macro- and microcirculation of adipose tissue. *FEBS J.* 2009; 276(20):5738–5746. <https://doi.org/10.1111/j.1742-4658.2009.07303.x>
39. Crescenzi R, Marton A, Donahue PMC et al. Tissue sodium content is elevated in the skin and subcutaneous adipose tissue in women with lipoedema. *Obesity.* 2018; 26(2):310–317. <https://doi.org/10.1002/oby.22090>
40. Mancuso P. The role of adipokines in chronic inflammation. *Immotargets Ther.* 2016; 5:47–56. <https://doi.org/10.2147/ITT.S73223>
41. Bertsch T, Martin KP. Obesity prevalence among lipoedema patients in a lymphological outpatient clinic with statutory health insurance in 2015 (unpublished data)
42. Bosman J. Lipoedema: poor knowledge, neglect or disinterest? *J Lymphoedema.* 2011; 6(2):109–111
43. Child AH, Gordon KD, Sharpe P. Lipedema: an inherited condition. *Am J Med Genet A.* 2010; 152A(4):970–976. <https://doi.org/10.1002/ajmg.a.33313>
44. Herbst KL, Mirkovskaya L, Bharhagava A, Chava Y. Lipedema fat and signs and symptoms of illness, increase with advancing stage. *Arch Med.* 2015; 7:10
45. Dudeck JE, Bialaszek W, Ostaszewski P, Smidt T. Depression and appearance related distress in functioning with lipedema. *Psychol Health Med.* 2018; 23(7):846–853. <https://doi.org/10.1080/13548506.2018.1459750>
46. Sputnik.de. Mysterious disease that makes you fat: what is lipedema? [in German] 2017. <https://tinyurl.com/y538sqx2> (accessed 17 September 2020)
47. Evidero.de. Fat from illness and medication: fat or sick? These diseases affect weight and appearance. [in German] 2020. <https://tinyurl.com/y5euvxvo> (accessed 17 September 2020)
48. NDR.de. Lipedema: health insurance does not pay for the treatment. [in German] 2018. <https://tinyurl.com/yyp1pakvr> (accessed 17 September 2020)
49. YouTube. Lipedema in the stomach - is that even possible? YES! [in German] 2017. <https://www.youtube.com/watch?v=tjbdntLfo2Q> (accessed 17 September 2020)

50. Herbst KL. Obesity and lipedema—what's the link? 2020. <https://tinyurl.com/y5xy6dey> (accessed 17 September 2020)
51. Obesityhelp.com. Could you have lipedema? 2020. <https://tinyurl.com/y443usgj> (accessed 17 September 2020)
52. Stunkard AJ, Sørensen TI, Hanis C et al. An adoption study of human obesity. *N Engl J Med*. 1986; 314(4):193–198. <https://doi.org/10.1056/NEJM198601233140401>
53. Stunkard AJ, Harris JR, Pedersen NL, McClearn GE. The body-mass index of twins who have been reared apart. *N Engl J Med*. 1990; 322(21):1483–1487. <https://doi.org/10.1056/NEJM199005243222102>
54. Plagemann A (ed). Perinatal programming—the state of the art. Berlin/Boston: Walter de Gruyter; 2012:11–22
55. Herrera B, Keildson S, Lindgren CM. Genetics and epigenetics of obesity. *Maturitas*. 2011; 69(1):41–49. <https://doi.org/10.1016/j.maturitas.2011.02.018>
56. Hewagalamulage SD, Lee TK, Clarke IJ, Henry BA. Stress, cortisol and obesity: a role for cortisol responsiveness in identifying individuals prone to obesity. *Domest Anim Endocrinol*. 2016; 56(Suppl):112–120. <https://doi.org/10.1016/j.domaniend.2016.03.004>
57. Volkow ND, Wang GJ, Tomasi D, Baler RD. Obesity and addiction: neurobiological overlaps. *Obesity Rev*. 2013; 14(1):2–18. <https://doi.org/10.1111/j.1467-789X.2012.01031.x>
58. Nemiary D, Shim R, Mattox G, Holden K. The relationship between obesity and depression among adolescents. *Psychiatr Ann*. 2013; 42(8):305–308. <https://doi.org/10.3928/00485713-20120806-09>
59. Fetzer A, Fetzer S. Lipoedema UK big survey 2014 research report. 2016. <https://tinyurl.com/y5wsf6ut> (accessed 17 September 2020)
60. Seese B. Pathophysiology of obesity [in German]. <https://tinyurl.com/yy4ew25e> (accessed 17 September 2020)
61. Taubes G. The case against sugar. New York (NY): Alfred A Knopf; 2016
62. Malik VS, Hu FB. Sweeteners and risk of obesity and type 2 diabetes: the role of sugar-sweetened beverages. *Curr Diab Rep*. 2012; 12:195. <https://doi.org/10.1007/s11892-012-0259-6>
63. Wang JW. Consumption of added sugars and development of metabolic syndrome components among a sample of youth at risk of obesity. *Appl Physiol Nutr Metab*. 2014; 39(4):512. <https://doi.org/10.1139/apnm-2013-0456>
64. Pietiläinen KH, Saarni SE, Kaprio J, Rissanen A. Does dieting make you fat? A twin study. *Int J Obes*. 2012; 36(3):456–464. <https://doi.org/10.1038/ijo.2011.160>
65. Gößwald A, Lange M, Kamtsiuris P, Kurth BM. German health interview and examination survey for adults. A nationwide cross-sectional and longitudinal study within the framework of health monitoring conducted by the Robert Koch Institute. *Bundesgesundheitsblatt Gesundheitsforschung Gesundheitsschutz*. 2012; 55(6-7):775–780. <https://doi.org/10.1007/s00103-012-1498-z> [in German]
66. Sifferlin A. 40% of americans are obese—and the trend isn't slowing. 2017. <https://tinyurl.com/y2t4wwcp> (accessed 17 September 2020)
67. Hilbert A, Ried J, Zipfel S, de Zwaan M. Obesity stigma [in German]. *Adipositas*. 2013; 7(3):150–153. <https://doi.org/10.1055/s-0037-1618820>
68. Jung FUCE, Luck-Sikorski C, König HH, Riedel-Heller SG. Stigma and knowledge as determinants of recommendation and referral behavior of general practitioners and internists. *Obes Surg*. 2016; 26:2393–2401. <https://doi.org/10.1007/s11695-016-2104-5>
69. Gudzone KA, Beach AC, Roter DL, Cooper LA. Physicians build less rapport with obese patients. 2013; 21(10):2146–2152. <https://doi.org/10.1002/oby.20384>
70. Brownell KD, Puhl RM, Shwartz MB, Rudd L (eds). *Weight bias: nature, consequences and remedies*. New York (NY): Guilford Press; 2005
71. Hilbert A, Geisert M. Obesity stigma: implications for communicating with obese patients. In: Lewandowski K, Bein T (eds). *Obesity in anesthesia, intensive care and emergency medicine*. Berlin (Germany): Medizinisch-Wissenschaftliche Verlagsgesellschaft; 2012:71–77
72. Stunkard A, McLaren-Hume M. The results of treatment for obesity. A review of the literature and report of a series. *AMA Arch Intern Med*. 1959; 103(1):79–85. <https://doi.org/10.1001/archinte.1959.00270010085011>
73. Bennett W, Gurin J. The dieter's dilemma: why diets are obsolete—the new setpoint theory of weight control. New York (NY): Basic Books; 1982
74. Cogan JC, Rothblum ED. Outcomes of weight-loss programmes. *Genet Soc Gen Psychol Monog*. 1993; 118(4):385–415
75. Perri MG, Fuller PR. Success and failure in the treatment of obesity: Where do we go from here? *Med Exer Nutr Health*. 1995; 4:255–272
76. Hensrud DD, Weinsier RL, Darnell BE, Hunter GR. A prospective study of weight maintenance in obese subjects reduced to normal body weight without weight-loss training. *Am J Clin Nutr*. 1994; 60(5):688–694. <https://doi.org/10.1093/ajcn/60.5.688>
77. Mann T, Tomiyama AJ, Westling E, Lew AM, Samuels B, Chatman J. Medicare's search for effective obesity treatments: diets are not the answer. *Am Psychol*. 2007; 62(3):220–233. <https://doi.org/10.1037/0003-066X.62.3.220>
78. Nordmann AJ, Nordmann A, Briel M et al. Effects of low carb vs low fat diets on weight loss and cardiovascular risk factors: a meta analysis of randomized controlled trials. *Arch Intern Med*. 2006; 166(8):285–293. <https://doi.org/10.1001/archinte.166.3.285>
79. Fildes A, Charlton J, Rudisill C, Littlejohns P, Prevost TA, Gulliford MC. Probability of an obese person attaining normal body weight: cohort study using electronic health records. *Am J Public Health*. 2015; 105(9):e54–e59. <https://doi.org/10.2105/AJPH.2015.302773>
80. Bosy-Westphal A, Schautz B, Lagerpusch M et al. Effect of weight loss and regain on adipose tissue distribution, composition of lean mass and resting energy expenditure in young overweight and obese adults. *Int J Obes*. 2013; 37(10):1371–1377. <https://doi.org/10.1038/ijo.2013.1>
81. Goddard S. I'm not fat, I've got lipedema. 2017. <https://tinyurl.com/y2rtxumq> (accessed 17 September 2020)
82. Seo C. The disease they call fat. 2020. <https://diseasestheycallfat.tv> (accessed 17 September 2020)
83. Jonas A. Diagnosis of lipedema: the daily struggle with pathological fat. 2017. <https://tinyurl.com/yy4wb4nt> (accessed 17 September 2020)
84. Schmeller W, Meier-Vollrath I. Lipedema - news about a largely unknown clinical picture. *Akt Dermatol*. 2007; 33(7):251–260. <https://doi.org/10.1055/s-2007-966651> [in German]
85. Schmeller W, Meier-Vollrath I. Modern therapy for lipedema: combination of conservative and surgical measures [in German]. *LymphForsch*. 2004; 8(1):22–26
86. Cornely M, Gensior M. Lipedema and lymphedema [in German]. 2020. <https://tinyurl.com/y4dkm3ax> (accessed 17 September 2020)
87. Stern TV. What you should know about lipedema [in German]. 2017. <https://tinyurl.com/y3s5tulk> (accessed 17 September 2020)
88. Kaniuth M. Fat legs despite a diet: my life with lipedema [in German]. Munich (Germany): MGW-Verlag; 2015
89. Lipödemportal.de. All about lipedema [in German]. 2020. <https://tinyurl.com/y3bqwtel> (accessed 17 September 2020)
90. Dr. Stutz. Lipedema [in German]. 2002. <https://tinyurl.com/y5cehdrg> (accessed 17 September 2020)
91. Lymphverein.de. The typical characteristics of lipedema [in German]. 2020. <http://www.lymphverein.de/lipoedem.html> (accessed 17 September 2020)
92. Fink JM, Schreiner L, Bertsch T. Leg volume in patients with lipedema following bariatric surgery. *Visc Med*. 2020. <https://doi.org/10.1159/000511044>
93. Herpertz S, Kielmann R, Wolf AM, Langkafel M, Senf W, Hebebrand J. Does obesity surgery improve psychosocial functioning? A systematic review. *Int J Obes Relat Metab Disord*. 2003; 27(11):1300–1314. <https://doi.org/10.1038/sj.ijo.0802410>
94. Buddeberg-Fischer B, Klaghofer R, Sigris S, Buddeberg C. Impact of psychosocial stress and symptoms on indication or bariatric surgery and outcome in morbidly obese patients. *Obes Surg*. 2004; 14(3):361–369. <https://doi.org/10.1381/096089204322917891>
95. Buchwald H, Estok R, Fahrenbach K et al. Weight and type 2 diabetes after bariatric surgery: systematic review and meta-analysis. *Am J Med*. 2009;