JWC International Consensus Document

Lipoedema: a paradigm shift and consensus

SUPPORTED BY JOBST medi

Authors:

Lead authors: Tobias Bertsch, Gabriele Erbacher

Földi Clinic, Hinterzarten–European Center of Lymphology, Germany

Author: Rebecca Elwell

University Hospitals of North Midlands NHS Trust, UK

Foreword written by: Hugo Partsch

Division of General Dermatology, Medical University of Vienna, Austria

Consensus group

Tobias Bertsch, Gabriele Erbacher, Thomas Zähringer: Földi Clinic, Hinterzarten–European Center of Lymphology, Germany

Domenico Corda: Polimedica San Lanfranco, Pavia, Italy

Robert J. Damstra, Kirsten van Duinen, Jose van Esch-Smeenge, Ad Hendrickx, Bea Koet: Center of Expertise in Lymphovascular Medicine, Nij Smellinghe, Drachten, The Netherlands

Joanna Dudek: SWPS University of Social Sciences and Humanties, Warsaw, Poland

Rebecca Elwell: University Hospitals of North Midlands NHS Trust, UK

Gabriele Faerber: Centre for Vascular Medicine, Hamburg, Germany

Sharie Fetzer: Lipoedema UK, UK

Jodok Fink: Department of General and Visceral Surgery at the Medical Center, University of Freiburg, Germany

Annemarieke Fleming: Rehabilitation-Centre Reade, Amsterdam, The Netherlands

Kristiana Gordon: St. George's Hospital, UK

Denise Hardy: Kendal Lymphology Centre, UK

Tobias Hirsch: Practice for Internal Medicine and Vascular Disease, Halle, Germany

Peter Mallinger: Klagenfurt Clinic, Austria

Anya Miller: Practice for Dermatology, Berlin, Germany

Christine Moffatt: Nottingham Trent University, UK

Nestor Torio-Padron: Practice Clinic for Plastic Surgery, Freiburg, Germany

Christian Ure: Lymphology Clinic, Wolfsberg, Austria

Stephan Wagner: RehaClinic, Bad Zurzach, Switzerland

Other KOLs supporting the consensus

Hakan Brorson: Department of Clinical Sciences, Lund University, Plastic and Reconstructive Surgery, Skåne University Hospital, Malmö, Sweden

Leif Perbeck: Karolinska University Hospital, Sweden

Nele Devoogdt: Department of Rehabilitation Sciences, Katholieke Universiteit Leuven, Belgium

Sarah Thomis: University Hospitals Leuven, Belgium

Stéphane Vignes: Lymphology Service, Reference Centre for Rare Vascular Diseases, Hôpital Cognacq-Jay, Paris, France

Michael Oberlin: Földi Clinic–European Center of Lymphology, Hinterzarten, Germany

René Hägerling: Researcher at Charité, University of Berlin, Germany

Katja S. Mühlberg: University of Leipzig, Germany

Erika Mendoza: Practice for Venous Diseases, Wunstorf, Gemany

Andrzej Szuba: Department of Angiology, Hypertension and Diabetology, Wroclaw Medical University, Poland

Acknowledgements: Thanks to the staff of the Földi Clinic for the personal and professional support provided in writing this supplement as well as the articles it is based on. The authors are also grateful to the medical directors Prof. E. Földi and Dr M. Földi and senior consultants Dr K.-P. Martin, Dr U. Walz-Eschenlohr and Dr M. Oberlin. Further, special thanks are due to Dr Kevin Sander and Essity for helping to organise the European Lipoedema Forum. Lastly, the authors thank Rucha Kurtkoti, Editor of the *British Journal of Community Nursing*, for editorial and publication support.

This supplement is supported by: Jobst and Medi

Editor: Rucha Kurtkoti
Project manager: Camila Fronzo
Design: Fonthill Creative
Managing director: Anthony Kerr, anthony.kerr@markallengroup.com

Published by: MA Healthcare Ltd, St Jude's Church, Dulwich Road, London, SE24 0PB, UK
Tel: +44 (0)20 7738 5454 Web: www.markallengroup.com

Cover Image: Adobe Stock: 232856575

To sponsor or if you have an idea for the next JWC international consensus document, please contact Anthony Kerr: anthony.kerr@markallengroup.com +44 (0)7979 520828

Contents

Contents

'The great enemy of truth is very often not the lie—deliberate, contrived and dishonest—but the myth—persistent, persuasive and unrealistic. Too often we hold fast to the cliches of our forebears. We subject all facts to a prefabricated set of interpretations. We enjoy the comfort of opinion without the discomfort of thought.'

John F Kennedy, commencement address at Yale University, 11 June 1962

Foreword

Lipoedema is a chronic condition characterised by a disproportionate increase in adipose tissue and pain in the legs and, sometimes, the arms of women. Its prevalence is largely unknown. The disproportionate increase in weight around the legs usually starts in phases of weight gain that are mostly connected to hormonal changes, such as puberty, pregnancy and menopause. Years later and mostly after further weight gain, pain or the feeling of severe heavy legs may occur, at which point the condition meets the diagnostic criteria for lipoedema. Research on lipoedema is limited and there is a lack of diagnostic testing; therefore, clinicians lack a strong enough evidence base for their practice. This, in turn, hampers patient care.

Lipoedema often is confused with lymphedema; as a consequence, many doctors prescribe decongestive lymphatic therapy. As the authors convincingly demonstrate in this supplement, lipoedema neither includes oedema nor is there any scientific evidence for lymphatic insufficiency. For this reason, decongestive lymphatic therapy is an inadequate treatment for patients with pure lipoedema. There is also considerable variation in how clinicians approach lipoedema among different countries. This lack of homogeneity naturally affects patients, who are already distressed by the pain their condition causes as well as their legs not meeting the standards of the current beauty ideal. Overall, there seems to be an urgent need for standardisation of lipoedema management, based on scientific evidence.

The time has come to establish the diagnosis of lipoedema by eliminating old, never proven concepts from the field. In this supplement, the authors disprove with a high level of scrutiny, several unproven dogmas related to lipoedema. Further, they clarify the clinical situation of this ailment and describe the need to adopt new approaches on handling it, taking into consideration new facts regarding its pathophysiology, which are rather complex. Thus far, the scene has been dominated by case reports, rather than scientifically validated information.

In 2018 and 2019, a group of lymphology experts from seven European countries met in Hamburg to discuss a consensus regarding lipoedema. This group was led by Tobias Bertsch, who is a senior consultant at the Földi Clinic in Hinterzarten, Germany. The consensus proposed by the group attempts to dispel some of the rampant myths surrounding lipoedema and introduces a paradigm shift in the pathophysiology of lipoedema, as it states that lipoedema is not an oedematous condition at all.

The authors of this work should be congratulated for recruiting this outstanding group of international experts as supporters of this work—the number of European countries represented has now grown to ten. It may be hoped that these experts will also be willing to offer opinions on holistic treatment modalities for 'lipalgia syndrome'—which 'lipoedema' should be called henceforth, according to the authors.

Hugo Partsch
Emeritus Professor of Dermatology
Medical University of Vienna, Austria

2. The paradigm shift: there is no oedema in lipoedema

The idea that lipoedema is an oedematous condition seems to be lymphological dogma, and this naturally affects how the condition is managed. This false perception of lipoedema seems to stem from the name given to the condition by Allen and Hines when they first described it in 1940. However, the concept of oedema does not feature prominently in their first two publications.[1,2] In their second publication in 1951, they wrote: 'Particularly at the end of the day, there may be some evidence of [o] edema, although the evidence is not great enough to explain the patient's statement relative to the degree of swelling which has occurred as a result of orthostatic activity'.[2] In both publications, the mental health of the patients with lipoedema seemed more a point of interest, but was explored very briefly. In fact, only 24% of the 119 participants in their first study on lipoedema actually had orthostatic oedema ('minimal to mild pitting oedema'), while 29% reported had an 'associated neurosis'.[2]

By definition, oedema is an accumulation of fluid that manifests the classic pitting appearance of the soft tissues on clinical examination. However, the authors have found no relevant fluid accumulation in their patients with lipoedema who are examined using a high-resolution ultrasound scan (with a 18.6-MH transducer and a Moisture Meter to measure the amount of moisture). Additionally, the findings on clinical inspection and ultrasound scan appear to be identical in patients with lipoedema and those with pure lipohypertrophy (which is painless disproportionate increase in adipose tissue). Figure 2.1 shows a patient with lipoedema, while Figure 2.2 is the ultrasound scan of her thighs (the left and right thighs were identical). There are no abnormalities apart from widening of the subcutaneous tissue; in particular, there is no evidence of fluid. Figure 2.3 shows a patient with lipohypertrophy, Figure 2.4 is the ultrasound scan of her thighs (here, again, the left and right thighs were identical). As can be seen from Figures 2.1 and 2.2, the clinical picture and ultrasound images are virtually identical between a patient with lipoedema and one

Fig 2.1. A patient with lipoedema. **2.2.** Ultrasound scan of the thigh of a patient with lipoedema, showing no evidence of fluid

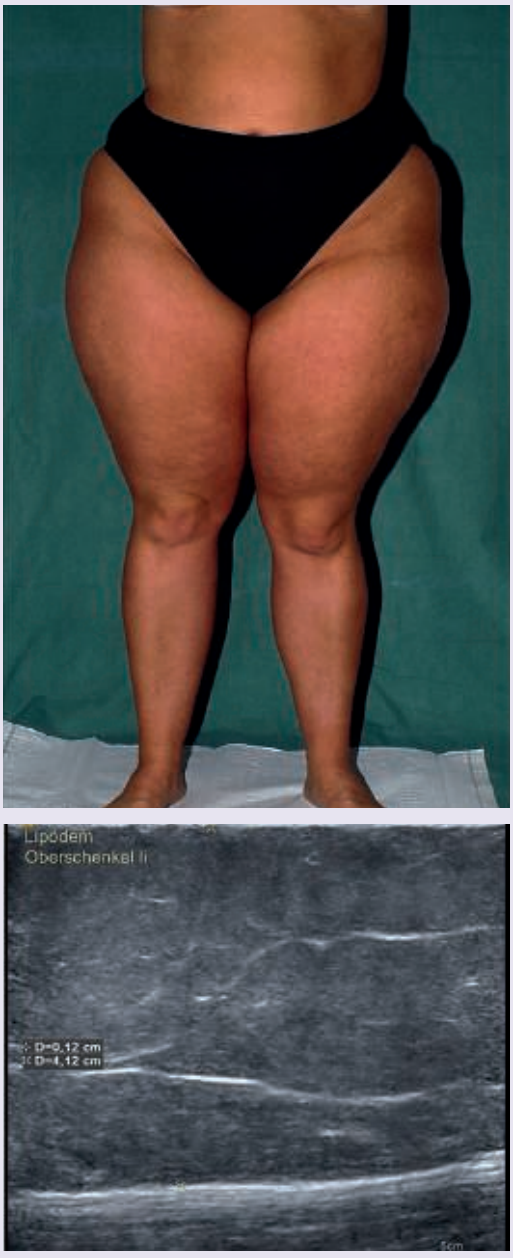
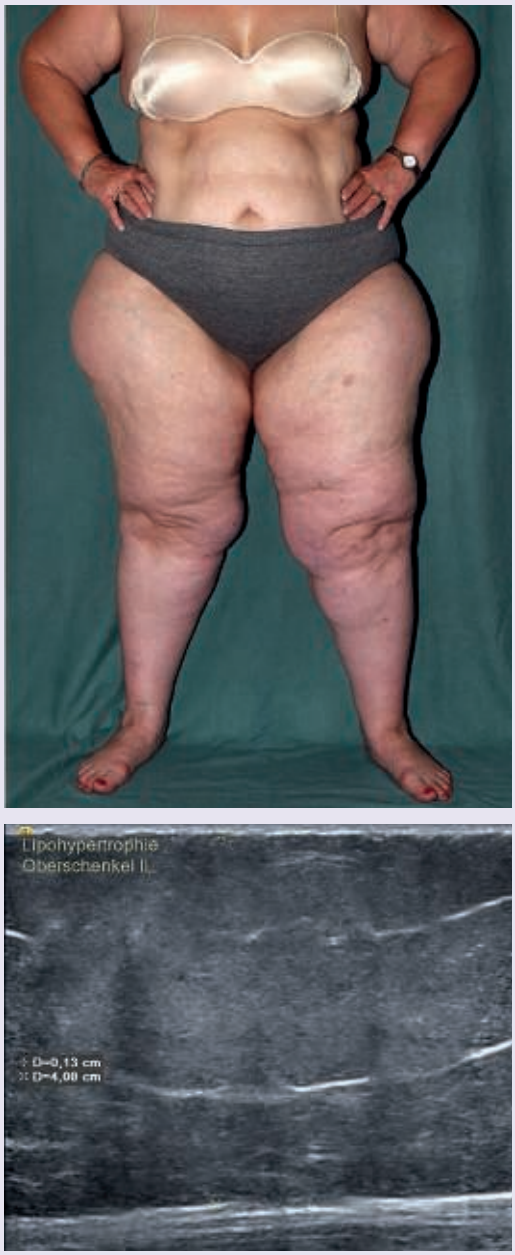


Fig 2.3. A patient with lipohyertrophy. **2.4**. Ultrasound scan of the thigh of a patient with lipohypertrophy



with lipohypertrophy. Figure 2.5 shows a patient manifesting three clinical conditions: lymphoedema of the distal lower leg and forefoot; lipoedema that is restricted to proximal lower leg; and morbid obesity (body mass index (BMI) of 48 kg/m^2). Figure 2.6 shows the sustained pitting present in lymphoedema (lower circle) and the non-pitting nature of the soft tissues in lipoedema (upper circle) in the same patient. Figure 2.7 shows an ultrasound scan of the distal right lower leg depicting stage 2 lymphoedema with partial separation of the soft tissue structures, thickened dermis and fluid in the tissues (small arrows). Figure 2.8 (proximal lower leg) shows the typical ultrasound appearance of lipoedema, that is, an unremarkable dermis, thickening of the subcutaneous tissues, and no evidence of fluid in the soft tissues.

After lipoedema was first described by Allen and Hines,[1] the condition received very limited attention until 1980. There were only a few individual case reports on lipoedema or painful adipose tissue in the 1960s and 70s.[3,4] Then, in 1980, Schmitz published an article entitled 'Lipoedema – the fat leg in the healthy woman' in the journal *Gynäkologie*.[5] However, oedema, that is, fluid accumulation, did not feature in this report, nor did it in Brunner's 1982 study, which described the patients' condition as a disorder in the distribution pattern of the subcutaneous fat, stating 'The fat layer has a soft consistency and does not allow pitting even over the tibia'.[6] Gregl described lipoedema as a 'mucoid pseudo-oedema' and stated that, unlike what happened with cardiac and dystrophic oedema, pressing over lipoedema did not cause pitting.[7] Using the American oedema classification, Rudkin reported only 1/4 + oedema in the pretibial area of those with lipoedema (1/4 + means hardly pitting).[8]

It is clear from the existing literature that oedema does not play a relevant role in the development of lipoedema. Despite this, oedema often forms the basis for the treatment of lipoedema. The two most popular treatments under consideration here are liposuction and manual lymphatic drainage. In one study, structural drainage insufficiency was considered the basis of the need for lymphological liposculpture (that

Fig 2.5. A patient with lymphoedema of the lower leg and forefoot, lipoedema of the thigh and proximal lower leg and obesity. **2.6**. Upper circle: non-pitting lipoedema tissue; lower circle: pitting lymphoedema tissue

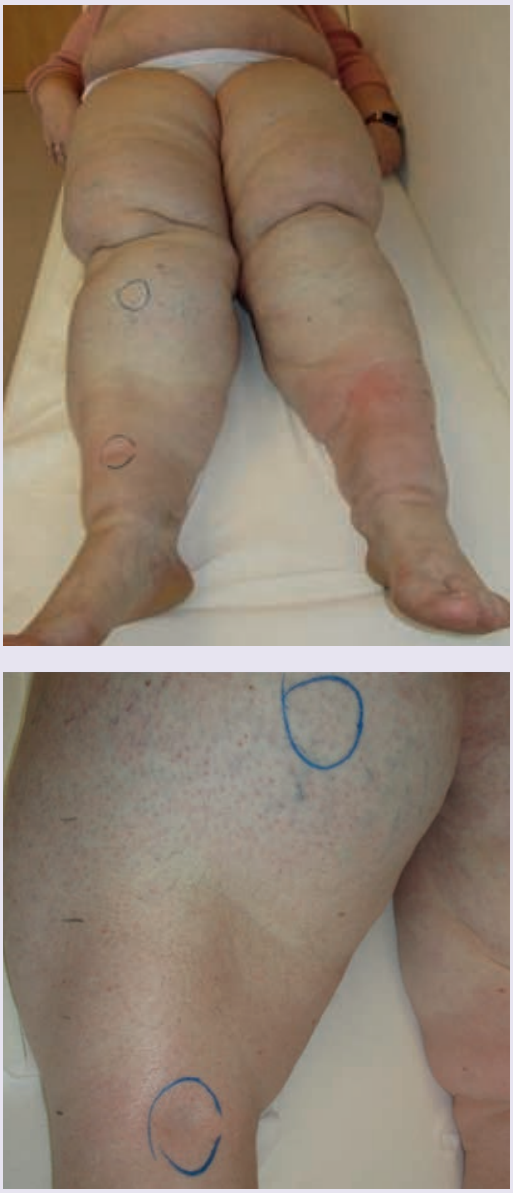
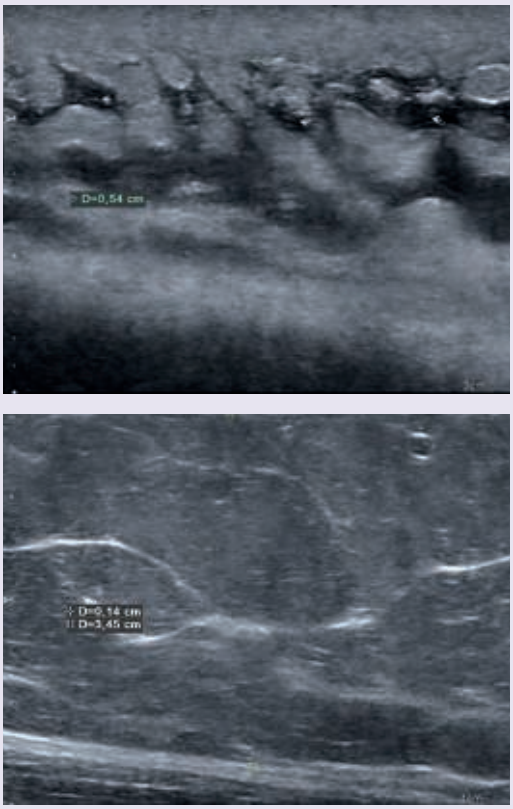


Fig 2.7. Ultrasound scan of the distal right lower leg of the patient in Fig 2.5 showing stage 2 lymphoedema with fluid (small arrows). **2.8**. Ultrasound scan of the proximal lower leg showing the typical ultrasound appearance of lipoedema, with no signs of fluid



is, liposuction) in patients with lipoedema.[9] The researchers believed that lipoedema leads to overproduction of lymphatic fluid in the arms and legs, which manifests as tenderness; further, they claimed that the adipose tissue is flooded with lymph, and this increases the tension in the thickened extremities.[10] However, these notions are not supported by any scientific evidence. Specifically, the flooding of adipose tissue by lymph cannot be demonstrated clinically or ultrasonographically, nor

by other imaging procedures, such as computed tomography and lymphoscintigraphy.[11-14] In a recent publication, researchers examined patients with lipoedema using magnetic resonance lymphography of the lower extremities. They concluded that the fat tissue was homogenous and showed no signs of oedema in pure lipoedema patients.[15] Histological evidence of oedema in the adipose tissue in lipoedema patients is also lacking. Histological examination of the adipose tissue in patients with lipoedema has shown a localised increase in adipose tissue, isolated foci of fat necrosis and increased numbers of anti-CD68+ macrophages in the interstitial tissue.[16] The latter two findings support the hypothesis that inflammatory and hypoxic processes are responsible for the pain in lipoedema. Laboratory tests on patients with lipoedema also argue in favour of this interpretation. The glutathione status in red blood cells (RBCs) and malondialdehyde (MDA) in the plasma have been studied as biomarkers of oxidative stress, and the levels of both markers in patients with lipoedema were found to be higher than those in healthy patients.[17] Surprisingly, oedema has been cited as the cause of lipoedema symptoms by several researchers.[18-20] However, the question then arises: if oedema is the cause of pain in patients with lipoedema, why do patients with cardiogenic oedema or lymphoedema have no pain at all or only very mild discomfort?[21] In these last two types of oedema, both clinical and ultrasound examinations clearly demonstrate fluid in the tissues. A similarly critical approach to the 'oedema' in lipoedema has been taken in both the UK and the Netherlands. The authors of the 2014 Dutch lipoedema guidelines stated that 'Lip[o] edema is an unfortunate term, as it evokes the idea of swelling due to fluid accumulation. However, it refers to swelling—in a sense of an increase in volume—due to increased fat tissue'.[22] Further, the authors of the current Dutch guidelines have not listed 'oedema' in the criteria for lipoedema definition. Similarly, the UK guidelines for lipoedema from 2017 reflect this paradigm shift by defining lipoedema as 'fat swelling', with no reference to a fluid component.[23, 24]

Many national and international publications consider regular manual lymphatic drainage to be the standard treatment for lipoedema.[25-29] This recommendation is based on the belief that oedema is responsible for the pain experienced in lipoedema. However, if no relevant oedema can be demonstrated in patients with lipoedema, the rationale for prescribing manual lymphatic drainage is shaky. Two questions need to be answered in this scenario: (1) Is there any scientific evidence that oedema is the cause of the patient's symptoms? (2) Is there any scientific evidence that manual lymphatic drainage improves the symptoms of patients with lipoedema by its drainage effects? The answer to both these questions is no. At the lead authors' lymphology outpatient department, many attending women with lipoedema request manual lymphatic drainage, and they often encounter patients with lipoedema who have been prescribed manual lymphatic drainage (MLD) twice or even three times a week for many years. Many of these patients report that they benefit from lymphatic drainage, but whether it is medically necessary remains debatable. It is likely that patients find MLD pleasant, which has little to do with its decongestive effect. Many patients with lipoedema have mental health issues that require treatment, such as depressive disorders, anxiety and eating disorders.[30] There could be other aspects of MLD that benefit patients, such as the massage itself reducing stress and exhaustion. Massage therapy is well-known to alleviate psychological symptoms, such as anxiety and depression.[31-33] Further, the touch and personal attention corresponding to MLD also produce positive effects. Last, but not least, for any patient, having treatment prescribed means that their condition is recognised as a disease. Patients with lipoedema often report very long durations between when they first experience symptoms and when their symptoms are finally taken seriously and addressed, with the subsequent diagnosis and treatment of lipoedema. Psychological, psychosocial and societal factors have a considerable impact on the symptoms of patients with lipoedema.[30, 34]

Lipoedema always develops from lipohypertrophy, but only in a small percentage of women.[35] It remains unclear why some women develop pain in the adipose tissue, and the underlying pathology of this symptom is still subject to speculation. Apart from the oedema hypothesis presented above, there are several ideas about the cause of lipoedema-related pain in the scientific literature.[36] There is, however, a consensus that the pain is located in the subcutaneous adipose tissue of the limbs.[28] As patients have usually experienced pain for more than 6 months at the time of diagnosis, it can be considered chronic. The causes of chronic pain are usually degenerative processes in the musculoskeletal system (e.g. osteoarthritis), ischaemia (e.g. peripheral arterial disease), neuropathies (e.g. after a stroke, diabetic polyneuropathy), cancer and inflammatory conditions (e.g. rheumatoid arthritis). The literature on expanding subcutaneous fat mentions two main processes: inflammation and hypoxia.[16, 37, 38] In their recent work, Crescenzi et al compared the adipose tissue between patients with lipoedema and a control group of women without lipoedema. They found an increase in the sodium content of the skin in patients with lipoedema, an emerging hallmark of inflammatory disease.[39] To date, a chronic low-grade state of inflammation[40] and tissue hypoxia are the most plausible explanations for the pain in lipoedema patients; unlike those with lymphoedema, patients with lipoedema do not have a higher risk of cellulitis. Furthermore, the experience of pain is a multifactorial phenomenon involving not only sensory but also cognitive, affective, motivational and behavioral dimensions. Therefore, therapeutic approaches to lipoedema should focus on these causes of pain.[30]

Conclusion

There is no evidence that oedema plays a relevant role in lipoedema, and it is certainly not the cause of the pain experienced by lipoedema patients. Lipoedema is a more complex condition than simply painful, fat legs. Comprehensive treatment of lipoedema should take into account all those aspects that are less apparent than the observable changes and reported symptoms. In addition to alleviating somatic symptoms, lipoedema therapy must also focus on the other aspects of this complex condition and include a thorough work-up, pain management, addressing the psychological vulnerability of women with lipoedema, managing any weight gain and encouraging self-acceptance in an era where skinny is considered aesthetically appealing.

3. Myth: Lipoedema makes patients fat

There are two popular concepts in the field of lipoedema and its common comorbidity—obesity. The first is that lipoedema makes the patient fat and the second is that weight loss has no effect on lipoedema. To the authors' knowledge, there is no evidence to support either of these statements. However, there is also no evidence to support the corollary—that is, that lipoedema does not lead to weight gain and that weight loss does lead to an improvement in lipoedema. It is obvious that there is a close correlation between being overweight or obese and having lipoedema. Of the 2344 women diagnosed with lipoedema at the authors' lymphology clinic in 2015, only 3% were of normal weight; 9% were overweight (BMI=25–30 kg/m^2) and 88% were obese (BMI>30 kg/m^2).[41] Their patient cohort appears largely representative in this regard. For example, Bosman reported that up to 80% of the lipoedema patients in a centre in the Netherlands were overweight and/or obese.[42] In 2011, a British research group reported that only 4% of their lipoedema patients were of normal weight, while 11% were overweight and 85% were obese.[43] In a study by Herbst et al[44] from the US, 76% of the lipoedema patients were obese, and, in another investigation by Dudek in Poland, this number was 80%. Around 50% of the patients in the latter study were morbidly obese, which means they had a BMI of over 40 kg/m^2.[30,43,45] In short, a lipoedema patient of normal weight is a rarity.

In this context, BMI has only limited value in lipoedema patients who are overweight (BMI=25–30 kg/m^2). There is the rare group of patients with a largely slim upper body and marked increase in fat in the extremities. However, in such patients, overweight is an illusion because the fat distribution is uneven, given the lipohypertrophy of the legs. The waist-to-height ratio (WHtR) is the more suitable measure for these patients, as it provides a better indication of the distribution of body fat. At the authors' clinic, both BMI and WHtR are measured in all patients with lipoedema.

So how can this apparent relationship between lipoedema and obesity be explained? Patients as well as the media are keen to explain the connection between lipoedema and obesity as lipoedema being responsible for the weight gain in women with lipoedema.[46-49] This notion is even more widespread in the US, where there is a coalition of doctors and patients who explain their weight gain by the disease lipoedema.[50,51] However, there is no scientific evidence for this view. There is also no conclusive pathophysiological construct to explain how lipoedema leads to weight gain. There is general agreement that a disproportionate increase in fat in the legs (and sometimes the arms) is an important criterion for a lipoedema diagnosis. This initial, often only slight, disproportionality is frequently seen even during puberty, at which point the patients are largely without complaints in the soft tissues; at most, there is mild lipohypertrophy of the legs. The risk of symptoms and, hence, the development of lipoedema usually starts when the weight progresses and the associated disproportionate increase in fat in the lower half of the body occurs. Therefore, the notion that weight gain (often obesity) can, in the case of the relevant (genetic) disposition, result in lipoedema, seems more likely.

The causes of obesity are varied and highly complex, but there is scientific evidence for genetic and especially epigenetic influences.[52-55] Biological factors such as stress or addictive behaviour can also affect weight,[56,57] as can psychological conditions such as depression and eating disorders.[58] Finally, sociocultural changes also play a considerable role in the development of obesity: for example, changes in eating habits, the regular consumption of sugar (particularly in soft drinks) and a sedentary lifestyle, in addition to lack of confidence regarding wearing and being seen in exercise clothing; for example, in the 2016 Lipoedema UK survey, 95% respondents reported difficulty in buying clothes, and 59% stated that embarrassment stopped them exercising in water.[59] Added to these is the beauty ideal that skinny is aesthetically pleasing, and this is closely connected with a diet culture, which often begins in adolescence and whose long-term course does not lead to weight

loss but, in fact, to weight increase.[60-64] In Germany, roughly 25% of the population is now obese (BMI > 30 kg/m^2),[65] and, in the US, this figure had already reached 40% in 2017.[66]

If lipoedema does not make one fat, how can the broad support for this position be explained? The essential basis for the popularity of this view of lipoedema is the stigmatisation of the disease of obesity, which is frequently considered to be the result of incorrect behaviour, a weak will or lack of discipline. Even among medical professionals, and particularly among doctors, weight-related discrimination and stigmatisation is especially marked.[67–69] Stigmatising attitudes towards obese patients can also be found among medical specialists in obesity and dieticians.[70, 71] The causes of obesity are complex, as also recognised by the World Health Organization (WHO). Simultaneously, data concerning the poor prognosis of conservative weight reduction are extensive. Between 80% and 99% of all patients who lose weight conservatively will put it on again in the long term.[72–79] Particularly in women, attempts to lose weight that were started during adolescence lead to a decades-long dieting spiral, with a resultant continuous increase in weight.[64]

The advice to reduce weight is especially concerning in lipoedema. Studies have shown that women (in contrast to men) regain weight after weight loss disproportionately in the lower half of the body,[80] and, as stated above, most who diet regain any lost weight. In other words, any recommendation by a doctor to female lipoedema patients to lose weight actually increases the risk of a further increase in fatty tissue in the leg region and, hence, also increases the risk of their symptoms increasing. In the authors' opinion, the 'boom' in lipoedema is due to the way the obesity has been handled. On the part of patients, lipoedema has developed into an 'excuse' or explanation of sorts for weight gain and overweight. Many lipoedema self-help groups as well as the media have proposed that patients are not fat, but have lipoedema.[81-83] Women believe the lipoedema is responsible for their long history of progressive weight gain. It is laborious and time-consuming to convince patients that they are misinformed and that there are other factors that lead to an increase in weight, and it is certainly not due to lipoedema. It is also challenging to convince patients that the frequently desired treatment options—manual lymphatic drainage or liposuction—will in no way result in a substantial, permanent or even only approximately satisfactory weight loss.

Conclusion

There is no evidence that lipoedema leads to weight gain, although weight gain does exacerbate lipoedema symptoms. Given the right genetic disposition for lipoedema, weight gain appears to be a trigger for lipoedema development. From the authors' observations, there certainly are women with normal weight or those who are slightly overweight with highly disproportional fat distribution and soft tissue symptoms, but in view of the overwhelming majority of obese and morbidly obese women with lipoedema, these individuals form a very small minority.

4. Myth: Weight loss has no effect on lipoedema

It is a matter of grave concern that medical professionals often confuse lipoedema with obesity or lymphoedema.[84,85] Cornely and Gensior stated that lipoedema is rarely diagnosed quickly and accurately.[86] Karen Herbst, endocrinologist and protagonist in the American lipoedema scene entitled her article that mainly discussed lipoedema 'Rare adipose disorders (RADs) masquerading as obesity'. She said that one of the most common misconceptions about lipoedema is that the condition is lifestyle- or diet-induced obesity.[25] Unfortunately, this view is perpetuated by patients and the media, lipoedema self-help groups and internet fora.[87-89] What complicates matters further—and what needs to be highlighted—is that most women with lipoedema are actually also obese; the statistical details have been mentioned in Chapter 3. In fact, a woman of normal weight with lipoedema is very rare. Thus, most women concurrently have two conditions: obesity and lipoedema. Focusing only on lipoedema in a woman with a BMI of 35 kg/m^2 or more seems pointless, as clearly the obesity is a more pressing concern. In the authors' experience, the vast majority of female patients with lipoedema more often complain of a progressive weight increase rather than pain in the legs.

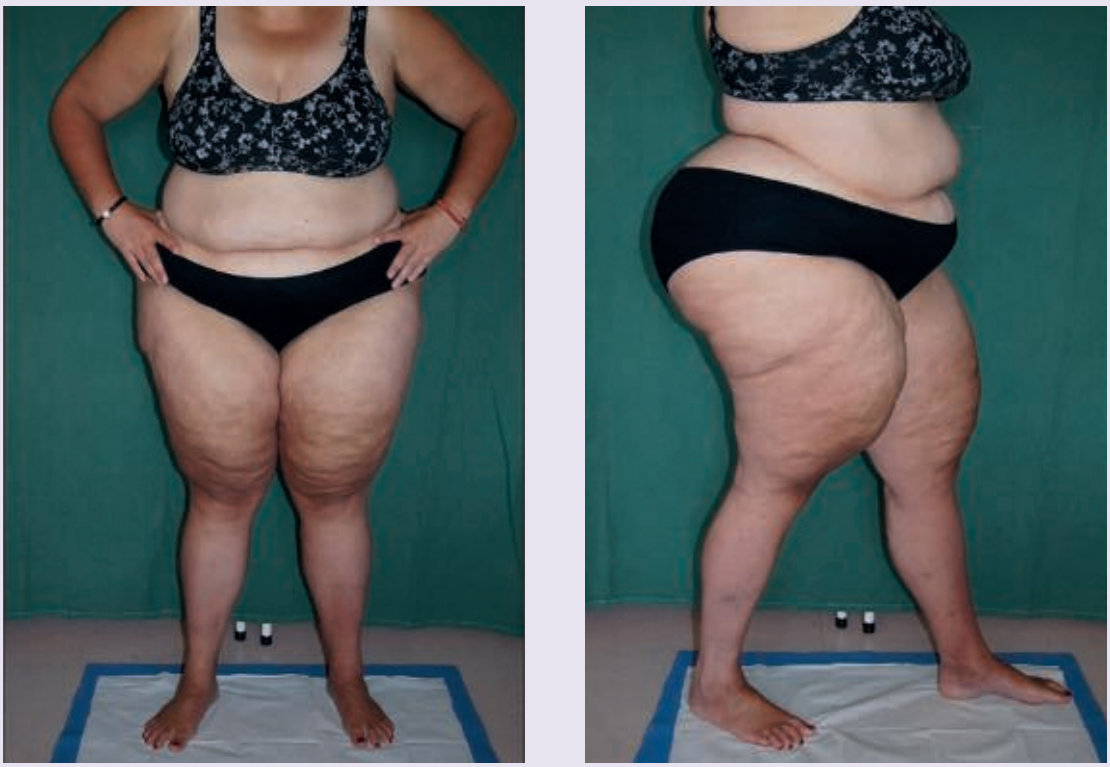
Many self-proclaimed lipoedema experts and, consequently, patients believe that weight loss has no effect on lipoedema, only on obesity. Herbst mentioned that, although lifestyle changes and bariatric surgery are effective interventions to address the obesity component, these treatments do not routinely reduce the abnormal subcutaneous adipose tissue seen in lipoedema.[25] Similarly, Schmeller reported that weight loss helps only in the case of concomitant obesity, and it merely reduces truncal circumference. As a result, however, the disproportionality between the trunk and extremities worsens, since lipoedema-specific fat accumulations cannot reduce through weight loss.[84] Stutz argued that the fat pads on the legs are not the same as stored reserve fat in obesity, declaring that this fat has a different structure and, cannot be lost through dieting and exercise.[90] This view is also frequently adopted by patients and lipoedema self-help groups.[91]

The lead authors of this supplement sought to identify the basic pathophysiological construct for the assumption that weight reduction in obese lipoedema patients does not also lead to substantial loss of fat in the extremities, as well as reduction of lipoedema symptoms. The self-proclaimed experts mentioned above provide no explanatory model in their publications that justifies the published statements. What has been propagated is just the myths, ones that have been passed on and adopted by women with lipoedema for years. The fact that mostly the doctors practising liposuction play a considerable role in propagating these myths gives pause for thought. These myths certainly contradict the publications of Allen and Hines, the first people to describe lipoedema in 1940 and 1951, who wrote that, in cases of generalised obesity, a sharp reduction in weight may help alleviate symptoms.[1,2] In the lead authors' experience as well, weight loss through conservative therapy has helped reduce the volume of fat in the region of the extremities of women with lipoedema, but this reduction is only temporary, because of weight gain after weight loss. Through the clinic's multimodal obesity programme, in which lymphoedema and also lipoedema patients with a BMI upwards of 40 kg/m^2 are prepared for surgical obesity treatment, patients have achieved more permanent and more substantial weight loss. The weight reduction achieved with this programme also produces a generally proportional reduction in the circumference of the extremities. In other words, the weight loss achieved within the framework of bariatric surgery (gastric bypass or sleeve gastrectomy) by women with lipoedema occurs substantially and permanently in the region of the arms and legs, although some disproportionality of the legs usually remains after successful weight loss. Nonetheless, asymptomatic disproportionality of the legs is generally not a pathological condition. The overwhelming majority of the authors' patients experience a marked improvement in their symptoms as a result of the fat reduction in their legs, and many even become pain-free. This is what the authors term

'lipoedema in remission'. If body weight remains largely stable in subsequent years, it is unlikely that lipoedema symptoms will recur. Thus, the condition becomes a generally mild lipohypertrophy that has no pathological significance. The positive outcomes of weight loss on lipoedema have been examined in a study at the University of Freiburg in conjuction with the Földi Clinic.[92] The authors of this study found a 33.7% adjusted leg volume reduction in lipoedema patients following bariatric surgery.

Obese patients with a BMI below 40 kg/m^2 or those ineligible for surgery for obesity are advised to undertake long-term weight stabilisation. At the same time, patients at the authors' clinic are explicitly advised against diets or conservative weight reduction programmes. This approach is justified based on the disastrous long-term prognosis of attempts at conservative weight reduction as proved by the consistent data[72-79] and confirmed by the authors' clinical experience with patients whose weight has continuously increased during their 'dieting careers'. Instead of 'diet and exercise', the authors recommend 'stabilise and exercise'. The promotion of self-acceptance is of overriding importance for patients. Only when this is achieved is it possible for them to escape from the vicious circle of diets, its yo-yo effects and worsening of the lipoedema. As well as experiencing improvements in their lipoedema symptoms, women who have undergone bariatric surgery also experience a marked increase in mobility and, therefore,

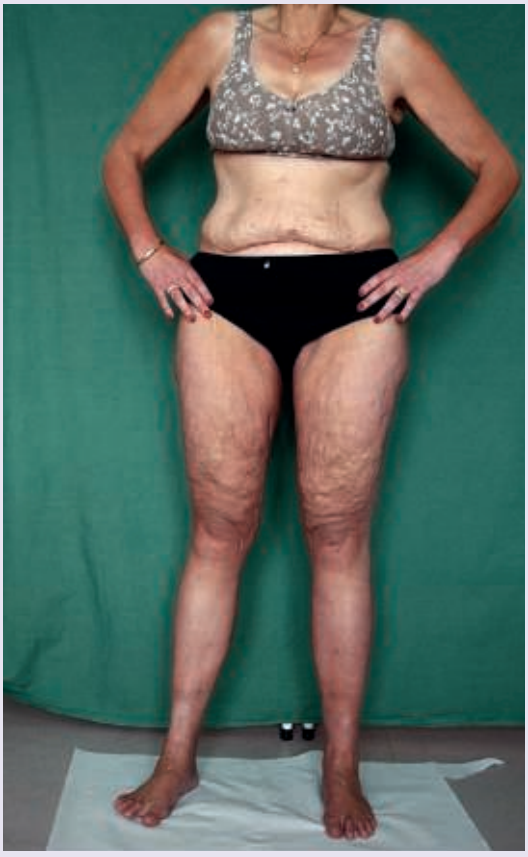
Fig 4.1 and 4.2. Front and side views of a patient with lipoedema before a sleeve gastrectomy (leg volume=19 L)



improvements in their quality of life.[93, 94] There are also cardiovascular benefits to surgical treatment of obesity: diabetes mellitus, high blood pressure and sleep apnoea syndrome improve, or are often resolved completely.[95-100] Finally, several large-scale studies have shown the efficacy of bariatric surgery in reducing long-term mortality. Following sleeve gastrectomy or gastric bypass operations, patients live longer and healthier lives than comparably obese patients who do not undergo such procedures.[101-103] The assertion that the outcomes of conservative nutritional programmes are comparable to those of sleeve gastrectomy or gastric bypass lacks scientific evidence. In fact, the failure of conservative weight reduction programmes in the long term has been documented in many high-quality studies.[72-79, 104, 105]

There are concerns surrounding bariatric surgery that must be acknowledged. Patients require intensive postoperative care, including the nutrition and psychological aspects. Nonetheless, the authors are convinced that more widespread training of nutritional specialists and dieticians in the postoperative care following bariatric surgery would be more useful than dissuading patients from

Fig 4.3 and 4.4. Front and side views of the same patient 11 months after sleeve gastrectomy (leg volume=9 L)



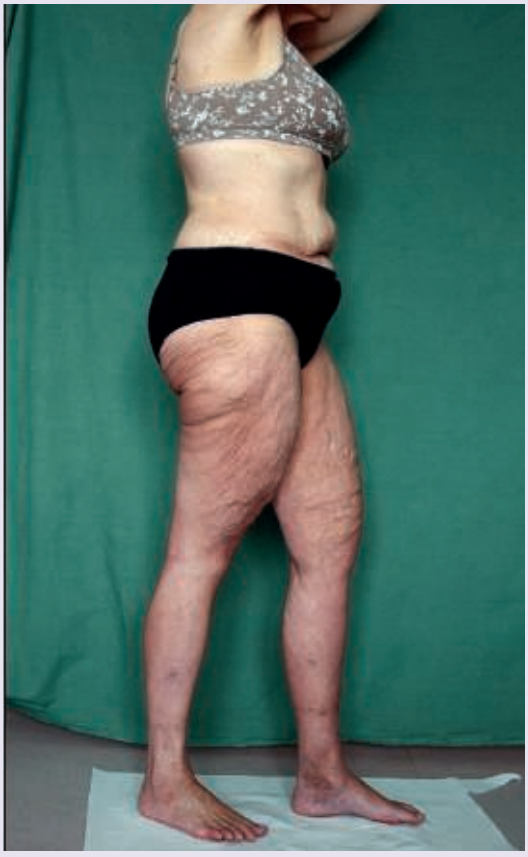
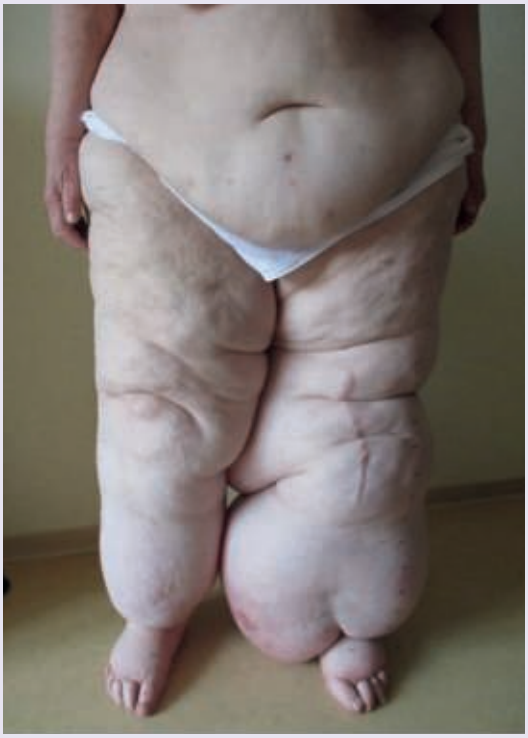
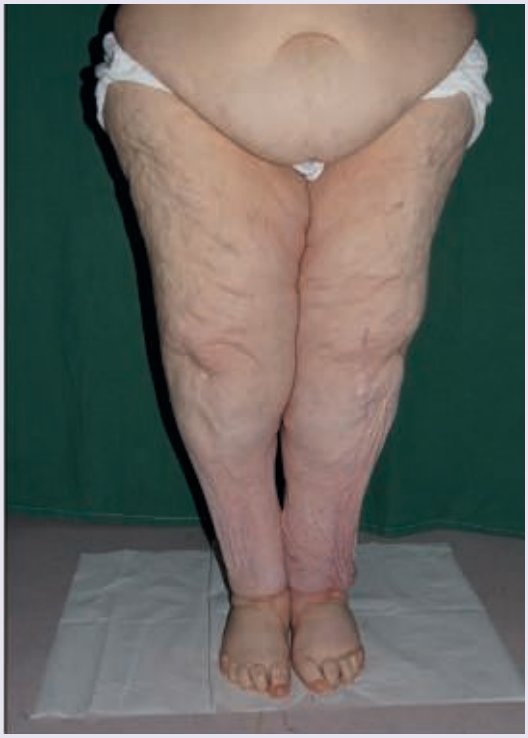


Fig 4.5. Patient with lipoedema and obesity-related lymphoedema before gastric bypass. **4.6**. The same patient 1 year later after gastric bypass and dermatilipectomy of the left leg

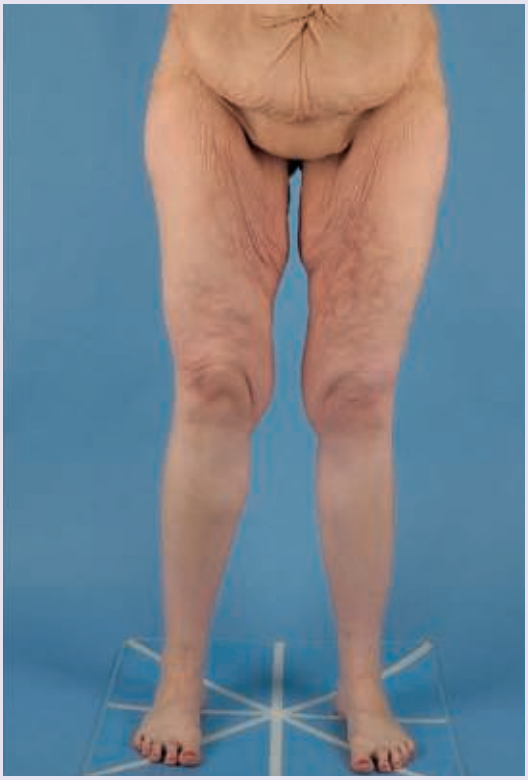


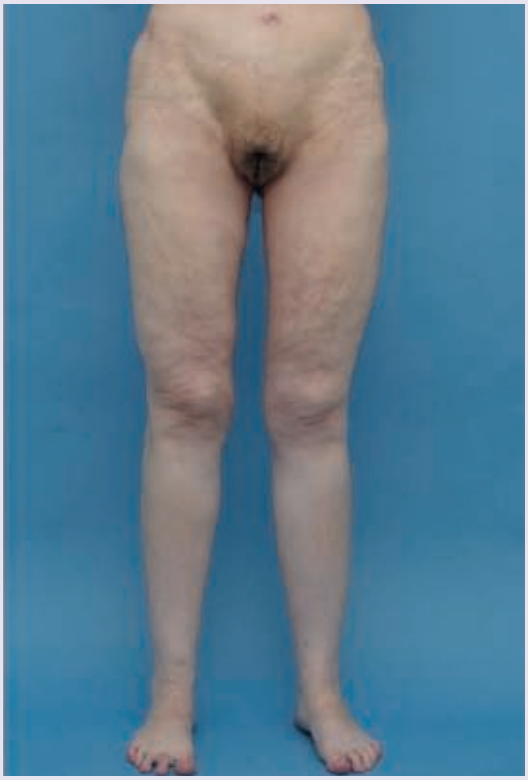


undergoing a treatment that could give many of them the chance of a healthier, longer and easier life. Opponents of surgery for obesity have cited a higher rate of suicide among those who have undergone bariatric surgery compared with the general population.[106-108] However, on critical reflection, it becomes apparent that this comparison is not appropriate. This view does not take into consideration the fact that people with a higher BMI—which those who undergo bariatric surgery are likely to have—also tend to have mental health conditions.[109] If obese patients prepared to undergo a bariatric procedure are compared with a group of obese patients from the general population, then the groups do not differ in terms of self-harming behaviour or the frequency of attempted suicide.[110] Therefore, the assumption that those who undergo bariatric surgery have a higher rate of suicide is incorrect; it is rather a consequence of the psychological vulnerability of patients with severe obesity.[107] Importantly, this vulnerability must be addressed through thorough preparation and aftercare of patients who undergo surgery for obesity, and it is essential that patients who require psychotherapeutic support are identified and provide it promptly and competently. The treatment of morbidly obese people is only successful in the long term if specialised professional groups collaborate effectively: nutritionists, psychotherapists, specialists in internal medicine, GPs, as well as surgeons.

Figures 4.1 and **4.2** show a lipoedema patient (weight=122 kg; height=168 cm; BMI=43 kg/m^2) before a sleeve gastrectomy. The volume of each leg is 19 L.

Fig 4.7. Patient with lipoedema at 14 months after sleeve gastrectomy. **4.8.** After weight stabilisation for 1 year after that, the hanging abdomen overlying the genital region was tightened, and the loose thigh skin was removed





Figures 4.3 and **4.4** show the same patient 11 months after bariatric surgery. Her weight was 74 kg (BMI=26 kg/m^2) and the leg volume per leg was 9 L. The patient was completely free of symptoms, or in other words, her lipoedema was in remission. Plastic surgery to tighten the thigh skin was not requested by the patient. **Figure 4.5** shows a patient with lipoedema and distal obesity-related lymphoedema of the legs, and **Figure 4.6** shows the same patient 1 year later after gastric bypass and dermatolipectomy of the excess skin on the left leg. The lipoedema symptoms are mild and infrequent; the obesity-related lymphoedema of the legs is also greatly improved. The lipoedema patient shown in **Figures 4.7** and **4.8** lost 65 kg within 14 months after a sleeve gastrectomy. After weight stabilisation for 1 year, the hanging abdomen overlying the genital region was tightened, and the loose thigh skin was removed. She did not experience any symptoms of lipoedema. In the case of this patient, there was certainly no longer any lipohypertrophy.

Conclusion

There is neither any scientific nor any empirical evidence for the notion that weight loss does not improve lipoedema. Persistent weight loss leads to a marked improvement in symptoms, and patients' lipoedema can be in remission.

5. Myth: Lipoedema is a progressive disease

A progressive disorder is one that gets worse with time and leads to a general decline in health and body function. Various scientific publications, as well as lipoedema portals on the internet and magazines produced by lipoedema self-help groups,[111-114] state that lipoedema is a progressive condition. The current German S1 Lipoedema Guidelines also define lipoedema as a 'progressive disorder',[27] and the internet portal 'Lipoedema Help Germany', which is frequently accessed by patients, even states: 'Lipoedema is always progressive, meaning that it gets worse'. Some patients present with a hugely disproportionate increase in fatty tissue, usually isolated in the legs, although these patients form a very small minority of the patient population. The term 'progressive' suggests that this tendency to develop disproportionate fatty tissue, which is usually genetic in origin,[43] increases virtually autonomously and independently of general weight gain.[26, 115] This increase in fatty tissue occurs in three stages (or four, according to some publications).[18, 44, 116] The NDR Health Advice Booklet states: 'Fat cells reproduce in an uncontrolled way'.[117] However, to the authors' knowledge, there is no scientific evidence for this pathophysiological construct. There does not seem to be any data to confirm the progression of lipoedema. Allen and Hines, who initially described lipoedema and, in their 2nd publication in 1951 (together with Wold) first used the term 'progressive enlargement of the limbs ...',[2] are often cited. However, Allen et al subsequently realised that the progressive course of lipoedema is ordinarily associated with weight gain. This weight gain in lipoedema had already been emphasised in their first publication in 1940.[1] A current Spanish investigation on this question confirms the correlation of lipoedema with weight gain, where the authors describe the lipoedema to be stable in two-thirds of their patients, and progression in the remaining one-third was related to weight gain.[118] Therefore, it remains questionable whether the leg circumference increases because patients experience an overall weight gain or in isolation, as is supposed. In the former case, it would be the body weight increase that is progressive, and not the lipoedema. An increase in leg circumference would then be expected as part of the weight gain. Pathophysiological findings clearly support this view. A glance at the patient population attending the Földi Clinic highlights the close association that exists between excess weight and/or obesity and the clinical picture of lipoedema, and as mentioned above, patients with lipoedema and normal weight are very rare.

From this, it is clear that there is no evidence that lipoedema is progressive. It is, in fact, often the body weight that is progressive. The reason that it is vital to reconsider the use of the term 'progressive' to describe lipoedema is that, in addition to their symptoms, many patients with lipoedema have one feature in particular: they are afraid that their lipoedema is progressive. The vast majority of patients have already looked up their condition on the internet, which often shows images of severely obese patients with an extreme (but, in reality, very rare) fatty tissue increase in the legs or arms. Consequently, most patients express great concern that their lipoedema could also reach such proportions.

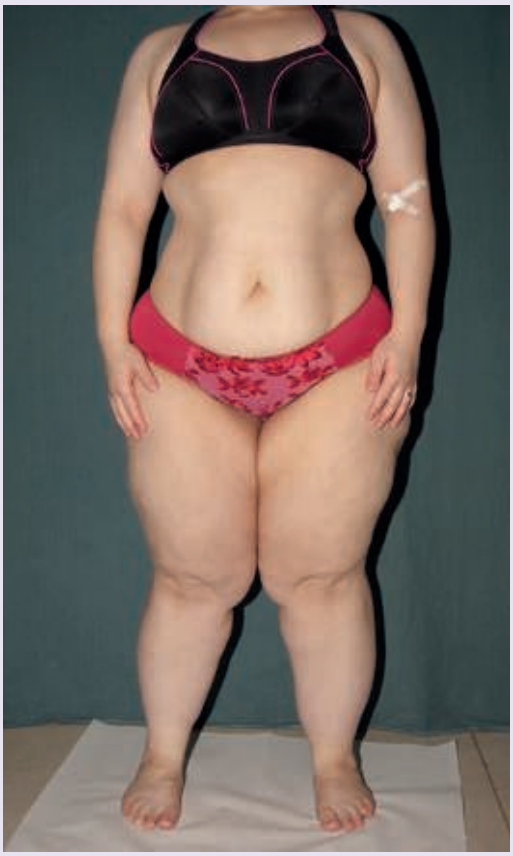
In the authors' daily clinical experience, extreme cases of lipoedema (in patients who are of normal weight or have only mild obesity with extremely disproportionate accumulation of fat in the affected limbs) are quite rare. They regularly see lipoedema patients, both as inpatients and outpatients, who present with stable lipoedema over many years, provided, however, that their weight has remained stable. They are now seeing disease courses extending over 20 years, where patients have stable—non-progressive—lipoedema; the lipoedema is stable because these patients have stabilised their weight (at varying initial weights). Consider the following case as an example. One patient has been receiving treatment as an outpatient for lipoedema for approximately 10 years. This patient's BMI, although high, has been stable at 30 kg/m^2 during this time, and her WHtR has been around 0.45. In this patient, leg volumes (thighs and lower legs measured

separately) have remained virtually unchanged during these 10 years. By wearing flat-knit compression hosiery every day and undertaking regular exercise 2–3 times every week, the patient has remained largely asymptomatic (**Figure 5.1**).

If lipoedema is not progressive, then the term 'lipolymphoedema' also seems inappropriate. 'Lipolymphoedema' suggests progressive lipoedema leading to lymphoedema; it suggests that the lipoedema causes the lymphoedema. In some classifications, the lipolymphoedema is also classed as stage IV lipoedema. Lipoedema is believed to be a pre-lymphoedema condition.[50] However, it must be emphasised that there is no scientific evidence for this viewpoint. There are neither histological investigations supporting the construct of lipolymphoedema nor medical imaging procedures that have provided any confirmation. When discussing lipolymphoedema, the vast majority of studies refer to the work of Amann-Vesti from 2001 and Bilancini et al from 1995,[119, 120] both of which only investigated 12 patients each. While Bilancini et al[120] used dynamic lymphoscintigraphy and found slowed lymph flow in patients with lipoedema, Amann-Vesti et al[119] used fluorescence microlymphography and found the now frequently cited microaneurysms of the lymph capillaries. However, the transport capacity of the lymphatic system was not found to be impaired in Amann-Vesti et al's study.[119] Further clinical studies using indirect lymphography and lymphoscintigraphy also showed that lymph transport from the subepidermal compartment functions in lipoedema, but does not in lymphoedema.[24, 121, 122] A weakness of the data of both Bilancini et al[120] and Amann-Vesti et al's[119] studies is the lack of any description of the patients' weight; neither publication provides the patients' BMI. However, knowledge of the BMI is essential in order to determine whether the irregularities in the lymphatic system are in fact due to the lipoedema, as postulated and often cited, or whether they are more likely to be obesity induced. Amann-Vesti et al's study even states that 'lipoedema is a special form of obesity.'[119] It can, therefore, be assumed that the patients with lipoedema who were investigated were obese and that some were, perhaps, severely obese. Consequently, the changes observed in the lymph capillaries were probably obesity induced. The pathophysiology of obesity related lymphoedema is known and well established.[123]

The authors' experience with thousands of patients with lipoedema in recent years also lends clinical support to this assumption. If a patient with lipoedema

Fig 5.1. Patient with lipoedema whose symptoms were managed using daily flat-knit compression hosiery and regular exercise 2-3 times a week



who is 165 cm tall and weighs 90 kg gains a further 20 or 40 kg, lymphoedema can develop in addition to the lipoedema. This lymphoedema is then not lipoedema-induced lymphoedema, but rather obesity-associated lymphoedema. The term 'lipolymphoedema' should, therefore, be eliminated from lymphology.

Conclusion

There is no scientific evidence that lipoedema takes a progressive course. Rather, it is weight gain and obesity that are very often progressive. An exacerbation of the lipoedema can first occur as part of the progressive weight gain. The term 'lipolymphoedema' is also incorrect from a medical viewpoint. It is important to share this perspective of lipoedema with patients, who will find it reassuring. Patients can be informed that their condition may neither progress nor deteriorate and can be stabilised provided that their weight remains stable.

6. Myth: Lipoedema causes mental health disorders

Women affected by lipoedema can experience a variety of problems. In particular, they experience lipoedema-related pain, which leads to a reduction in quality of life.[124, 125] Many women with lipoedema are dissatisfied with the disproportionality of their bodies and the associated stigma. They have problems in accepting their own bodies, and the consequences of this lack of self-acceptance are severe.[124, 125] Even physicians who treat women with lipoedema may display an initial lack of understanding of their problems;[59] it often takes several years before a diagnosis of lipoedema is made and appropriate therapy provided.

It has often been reported that patients with lipoedema have mental health disorders.[59, 126-129] Overall, however, data on the relationship between lipoedema and mental health are limited. A study in 100 women with lipoedema conducted in the Stutz Liposuction Clinic concluded that 74% had chronic eating disorders,[128] and 8% attempted suicide at least once.[129] In a 2015 worldwide, internet-supported survey initiated by Smidt with 1416 participants, 39.7% women with lipoedema self-reported as having depression (compared with a prevalence of 3–17% in the general population) and 16.5% cited eating disorders (compared with a prevalence of 1–5% in the general population).[127] In another internet-based investigation by Dudek et al in 2016[126] with 328 participants, 31.8% cited eating disorders in the self-assessment. Depression and anxiety were diagnosed in these participants by using the Patient Health Questionnaire (PHQ-9), and 56.8% of them showed high to very high scores for depression.

The role of psychological factors in the origin of other somatic disorders, such as cancers, has been considered for years.[130] For example, in rheumatoid arthritis,[131] psychological factors such as stress are known to play an important role. To date, with regard to lipoedema, the implicit impression has been that mental disorders, such as depression or eating disorders, are the result of lipoedema. However, it remains to be determined whether this is true.

In general, there are two main problems related to researching a condition: first, there is a risk of important aspects being overlooked when complexity is reduced. Second, statistical associations in the sense of a correlation are often incorrectly interpreted as a causality.

With regard to lipoedema, then, the following questions arise: in how many women with lipoedema does their condition cause a mental disorder, in how many is the mental disorder a comorbidity and in how many does the mental disorder possibly have an important involvement in the development of the pain symptoms of lipoedema?

In order to help clarify these open questions, the authors conducted a pilot study at their clinic. The research question was 'Does lipoedema lead to mental disorders?' Some 150 patients during their inpatient stay in the Földi Clinic in the study period from April 2017 to September 2019 were included in the study.[30] The requirement was a diagnosis of lipoedema of the legs, which had been reconfirmed medically in the specialist lymphology clinic, with the typical symptoms of disproportional fat tissue of the legs (sometimes also in the arms) and pain of the soft tissue in these regions. A psychological psychotherapist who had specific experience with this patient population conducted semi-structured interviews with the patients. These were usually divided into two sessions and included: (1) ascertaining the patient's mental disorders according to ICD criteria[132] and all mental disorders in the patient's medical history; (2) the symptoms associated with the lipoedema;[133] and (3) the temporal overlap between these parameters. Questionnaires proved ill-suited to the explorative nature of the study, as they reveal a limited range of symptoms[134-137] or overestimate psychological symptoms in somatic disorders, for example, depression,[138, 139] and they cannot reveal the temporal course of the condition.

Among the 150 patients included in the study, a distinction was made between subgroup n1 with BMI<40 kg/m^2 and subgroup n2 with a BMI≥40 kg/m^2. Of the total sample, 80% participants showed pronounced psychological symptoms, which preceded the development of lipoedema-related pain. These

included mental health disorders, for example, a depressive episode or symptoms only slightly less severe than those of a mental health disorder such as stress eating, a high level of chronic stress and burnout syndrome.[140] The latter is not considered a mental disorder in diagnostic terms of the International Classification of Diseases (ICD-10) but rather a performance-related disturbance in work and motivation. At the time of the investigation, 50.1% of the total sample (n1: 43.2%, n2: 59.4%) had at least one mental health disorder. Depressive disorders were the most common, although only symptoms corresponding at least to a mild depressive episode were included. Dysthymia was classified under 'other'. In terms of clinical diagnostics, 14.7% fulfilled the criteria of having an eating disorder and 12.7% showed an abnormality in their eating behaviour that does not yet fulfill the criterion of an eating disorder according to the ICD.

It should be noted that 5.3% of the participants had developed posttraumatic stress disorder before developing lipoedema. Some 22.7% of the women in the total sample reported having had suicidal thoughts in the past, but they denied any association between these thoughts and the lipoedema. The main triggers were stressful life events, such as the death of a loved one, loss of a job, a life-threatening disorder in a child or serious conflicts at the workplace. One patient had previously attempted suicide due to family problems. Additionally, 56% of the women with lipoedema (n1: 51.9%, n2: 60.9%) showed mental health disorders that definitely manifested in the 12 months prior to the presentation of lipoedema-related pain. Thus, their mental health disorders could not have been a result of the lipoedema. Both current and previous mental health disorders were considered in this study. The 12-month period before the development of lipoedema-related pain was found to be of particular significance in this pilot study.

Conclusion

The vast majority of women with lipoedema (80%) experience severe psychological symptoms **BEFORE** the onset of lipoedema-related pain. Thus, it is apparent that what temporally precedes the development of lipoedema cannot be its cause. There is no evidence for the popular statement that lipoedema causes mental health disorders. In fact, the opposite seems to be true, that is, psychological issues contribute substantially to the development of lipoedema. Further, depression and posttraumatic stress disorders are significantly related to the pain intensities (on the VAS) reported by patients in everyday life.

7. Myth: Liposuction is effective for lipoedema, producing long-lasting results

For many years, health practitioners who perform liposuction have promoted this procedure as an effective and permanent treatment option for patients with lipoedema.[141] One report stated that liposuction can cause 'a significant, sometimes even spectacular improvement in body shape with a marked reduction or removal of the symptoms typical of the disease',[142] and another described liposuction as providing long-lasting improvements in findings and symptoms of lipoedema.[143] There are three aspects to consider when evaluating these statements for their veracity. (1) Is the effectiveness of liposuction for lipoedema supported by robust data? (2) How permanent are these positive effects of liposuction? (3) The secondary disease in lipoedema—namely, obesity—needs to be taken into consideration.

Studies regarding the efficacy of liposuction for lipoedema

With regard to the efficacy of liposuction for lipoedema, the studies that the German lipoedema guidelines cite and are based on have considerable differences in how they assess of the success of liposuction. For example, Cornely (2011) considered lipoedema to be curable through liposuction,[10] stating that 'It is clear that even with large numbers of cases of our own patients, as was already published in 2004, the postoperative need for further lymphatic drainage and compression is zero'.[144] However, this claim in not validated in the article itself or in the wider literature. Further, the other claims, specifically, that once liposuction is performed, conservative therapy to treat the disease is no longer required and the 97% success rate on long-term monitoring of patients for 15 years,[144] were debunked by another research in 2015.[145] It was found that the results of liposuction curing lipoedema could not be reproduced. Finally, the study proclaiming the cure was found not to have been conducted based on scientific criteria, but was merely a survey.[145] In light of these debates, the authors of this supplement are convinced that the surgical perspective does not do justice to the complexity of the disease of lipoedema, and it tends to oversimplify the treatment of the condition.

Rapprich found that only 16% of patients still required compression therapy after liposuction,[146] which reduced postoperative pain, oedema and haematoma, and in a more recent study, the author noted that most patients no longer required conservative treatment after liposuction,[141] although no actual figures are mentioned. Despite the relative volume reduction seen in this study (range: 0.9%–19.8%), the main limitation, which the author acknowledges, is that the time of follow-up was 6 months postoperatively. This is undoubtedly too short a follow-up time for a study investigating the effectiveness of an operation in improving preoperative symptoms and permanently reducing pathological adipose tissue.

In 2010, Schmeller published the results of a single-centre retrospective study in which 112 patients who had undergone liposuction for lipoedema were examined over an average follow-up period of 3 years and 8 months postoperatively.[147] This study reported that liposuction was successful not only in removing the circumscribed and often disfiguring increase in adipose tissue, but also in reducing the spontaneous pain, tenderness and the tendency to bruise. This led to an improvement in mobility, aesthetics aspects and quality of life. In 2014, Baumgartner et al[148] published the results of a second single-centre retrospective study that were meant to confirm the results of the 2010 study[147] over a longer time period. This study also aimed to determine the need for conservative treatment (manual lymphatic drainage and compression therapy) postoperatively over time. The authors stated that liposuction led to complete eradication of symptoms in only about one-third of the patients, whereas two-thirds of the patients still needed conservative treatment, including compression. In the 2010 study, 77% of the patients still required complex decongestion after liposuction[147] and, in the study published in 2014, 70% were still receiving this treatment (although this

number was fewer than those requiring complex decongestion before liposuction). Of all the published studies that investigated the efficacy of liposuction in the treatment of lipoedema, these are of the highest quality. Despite this, these studies have similar limiting factors: both were retrospective and single-centre.[149] In these studies, the success rate of liposuction treatment (defined by Cornely as no further need for complex physical decongestion postoperatively) ranges widely over an equally widely ranging follow-up period (6 months to 15 years):

- 97% with a reported 15 years of follow-up[144]
- 84%, but with continuation of any psychological support and dietary advice, with only 6 months of follow-up[146]
- 23% after 4 years of follow-up[147]
- 30% after 8 years of follow-up[148]

Further, the definition of the success rate itself is seriously questionable, as it is the authors' contention that lipoedema patients do not require manual lymphatic drainage (even without liposuction).[150] Since compression has positive effects on postoperative pain, oedema and haematoma, patients have to wear compression stockings even after undergoing liposuction, and they appear to experience improved mobility. In the authors' opinion, improved mobility and a reduction in pain would be more suitable criteria to gauge the success of any intervention.

Certain questions must be considered when determining the success of liposuction. First, is the success of treatment measured attributable to the liposuction or are there other factors at work that have contributed to this measured success? It should be recognised that many lipoedema patients have experienced a long and painful journey until their condition was recognised and eventually treated by liposuction. For instance, in the UK, some women have applied for and been rejected through the NHS individual funding request for specialised services, and others have saved extensively to pay for it themselves. The expectations they have from this treatment have a strong bearing on how these questions are answered, as it is possible that patients perceive the treatment as successful because of what they have gone through for their condition to finally be addressed. Placebo research provides an indication of whether high expectations from treatment affect perceived improvements in symptoms.[151] Additionally, the effects of communication between the patient and health practitioner also need to be considered. The physician could lead the patient to have high expectations from the treatment. The effect of surgical procedures compared to sham operations was investigated in another placebo study. Shivonen et al[152] compared arthroscopic partial meniscectomy with sham surgery in a multicentre, blinded and randomised controlled study. Remarkably, both groups of patients reported a marked reduction in knee pain even after 1 year postoperatively. Louw's review of randomised controlled studies with placebo operations in the field of orthopaedics concluded that sham surgery was as effective as actual surgery in reducing pain and improving disability.[153] With regard to liposuction for lipoedema then, the true effects of liposuction can only be recognised if a second control group is included, in addition to an untreated control group. However, unlike the orthopaedic procedures described above a sham liposuction operation cannot be performed, because the visible difference in body shape is a significant partial aim of the liposuction; additionally, ethical aspects also need to be considered. Instead of a placebo design that differentiates between the effects of patient expectations and the actual effects of liposuction, a study comparing the effects of liposuction with those of another therapeutic approach might be useful. Different treatments could be compared among themselves and with no treatment. For instance, a comparison between physiotherapy combined with psychotherapy[154] focusing on improvements in fitness levels and self-esteem and liposuction in a study lasting several years seems appropriate. Another potential methodological design would be to compare three groups: one group of lipoedema patients without liposuction (baseline),

one group that has undergone liposuction and another that has undergone conservative treatment.

The second question to address is: Do the questionnaires used measure the success of liposuction treatment?[145] The questionnaires used in studies on liposuction for lipoedema conducted so far do not meet the quality criteria for questionnaires.[155] For example, the questions are not adequately specific, leading to distorted answers. Further, responses to earlier questions generally have an effect on the responses to subsequent questions.[156] Women who first estimate the spontaneous pain in their legs, the tenderness in their legs, the feeling of heaviness in their legs and their problems walking, may report dissatisfaction with their legs rather than impairment of their quality of life. A good-quality study is required to determine the success of liposuction perceived by patients. Somatic comorbidities and their development also need to be recorded so that improvements or deteriorations can be interpreted. Importantly, psychological symptoms such as depression or anxiety that can intensify pain must be recorded.[157] Lastly, self-assessments (e.g. patient questionnaires) must be supplemented by assessments by diagnosticians who are independent of the treatment providers or by objectively measured data.

Conclusions from studies on liposuction for lipoedema

From summarising the studies on the effects of liposuction on lipoedema, it is clear that evidence for the success of liposuction in curing lipoedema is lacking. This view was mirrored by the Federal Joint Committee (G-BA) in Germany, which decided that outpatient liposuction is not a standard benefit of German statutory insurance schemes (GKV) in November 2017.[158] This assessment was further confirmed by the German Federal Social Court (BSG) in April 2018, in a case brought by a woman with lipoedema who had undergone several liposuctions as an inpatient. The judges ruled that liposuction did not meet the requirements of quality and cost-effectiveness for insurance to be paid out, and that the long-term effectiveness of the method had also not been adequately confirmed.[159] A recently published review of clinical effectiveness of liposuction concluded that the quality of the evidence was limited, and studies had systematic biases due to lack of randomisation; further, they used instruments that have not been validated for data collection and assessment in lipoedema-related complaints.[160]

Does liposuction have a permanent effect?

The second aspect that needs to be addressed here is the permanence of the effects of liposuction for lipoedema. Most studies on liposuction for lipoedema claim that, once the adipose tissue is removed, it does not accumulate again.[161-163] In their 2018 article, Heck and Witte, who describe their liposuction method as lipo-decompression because of its decongestive effects, stated that the lipoedema did not generally recur after this surgery.[161] A previous study proposed a similar concept, where liposuction is described to reverse the cause of lipoedema, which in turn is described as the overproduction of lymph in the arms and legs, leading to congested adipose tissue.[10] However, scientific evidence for this pathophysiological construct is virtually non-existent,[15, 150, 164] and there seems to be no scientific basis for terms such as 'lymphological liposculpture' and 'lipo-decompression'. Additionally, Baumgartner reported that liposuction had a much more long-lasting effect over complex physical decongestion.[147]

A vital factor that does not seem to be considered in any of these previous studies, however, is obesity as a comorbidity in those with lipoedema. A large proportion of patients with lipoedema are also obese:[41-43] 88% of the lipoedema patients seen in the lead authors' institution in 2015 were obese (detailed data are provided in Chapter 3). In a Dresden-based study, despite having undergone liposuction for lipoedema, 65% of the patients were obese, and 35% were morbidly obese, that is, they had a BMI of >40 kg/m^2.[165] It is not clear why most of these studies on

liposuction do not acknowledge the common coexistence of lipoedema and obesity. When listing concomitant conditions, the Dresden study listed arterial hypertension as the most common one (n = 13/26), followed by chronic venous insufficiency (n = 9/26). Central body obesity was found in four patients. However, if the BMI of patients who underwent liposuction in this study is considered, then it is evident that 17 of the 26 patients were obese (BMI of 30 kg/m^2 or more), with 9 being morbidly obese (BMI of >40 kg/m^2).[145] Even if the WHtR is considered a better marker of obesity than BMI in patients with lipoedema, it can safely be assumed that lipoedema patients with a BMI of 35 kg/m^2 or higher will have abdominal obesity. In the Dresden study, this would be the case in 12 of the 26 patients.[165] Thus, it appears that obesity was not recorded appropriately as a comorbidity.

In the authors' experience, this 'obesity blindness' is shared by many self-proclaimed lipoedema experts. To the authors' knowledge, only one study by Frambach considers that obesity in lipoedema patients is a significant aggravating factor in the pathogenesis of lipoedema. This study found that obesity is the most common comorbidity in lipoedema, indicating that increased body weight not only worsens the appearance of the extremities but also lipoedema symptoms.[125] These findings are mirrored by the authors' own experiences in clinical practice with lipoedema patients. The acknowledgement that obesity is an aggravating factor in lipoedema is vital, but unfortunately seems to be unrecognised by many colleagues who perform liposuction. The course of body weight after liposuction deserves special attention and leads to the following questions: How does the weight of patients diagnosed with lipoedema who have undergone liposuction change with time? Could the patients investigated in the previous studies mentioned above maintain their weight for the duration of follow-up after liposuction? And did the patients who underwent liposuction not experience any increase in weight in the subsequent years? None of the studies mentioned here provide any information about the course of body weight.

Nonetheless, these figures are essential because the permanence of the effects of liposuction could only be expected if the patients' weight remained largely stable after liposuction. Overall, the authors' experience indicates that a weight increase would lead to an increase in symptoms, and the long-term stability of body weight in most lipoedema patients would contradict the authors' many years of experience with this group of patients. Many patients with a diagnosis of lipoedema experience a constant increase in weight with time. All health practitioners who treat lipoedema patients know their difficult history regarding body weight and have heard the tales of weight gain merely interrupted by diets and the subsequent yo-yo effect. Obesity experts have spoken for years of an obesity epidemic, but weight increase among people with an initially normal weight is now being observed.[166-170] Why should this individual weight gain in lipoedema patients, whose weight has often varied considerably over many years, stop after liposuction? And what happens in the case of patients who have undergone liposuction and then regained weight subsequently? It stands to reason that there would be a renewed increase in adipose tissue in the legs and a consequent increase in symptoms typical of lipoedema. During the course of their clinical work, the authors regularly see patients diagnosed with lipoedema who have undergone liposuction and yet continue to experience symptoms of lipoedema. Almost all women report a transient improvement in symptoms after liposuction. However, most of these individuals gain weight and, therefore, also experience worsening of soft tissue pain in the legs. This increase in adipose tissue after liposuction was also observed in another prospective randomised, controlled study conducted in the US.[171] Patients with normal weight who had undergone liposuction for lipoedema showed an increase in the adipose tissue removed by liposuction within 1 year postoperatively.[171] The fat accumulated in both visceral as well as subcutaneous depots.[171] The authors of this study also provided information about which regions of the body were particularly affected by the increase in adipose tissue, namely, the abdominal

region. Fat accumulated more slowly in the hip and thigh regions.[171]

Conclusions regarding liposuction having permanent effects on lipoedema symptoms

In summary, the prospective, randomised, controlled study by Hernandez and Eckel[171] suggests that:

1. Within a year, the weight of suctioned adipose tissue (body fat) will increase
2. The cosmetic effect on the thigh after 1 year (in a study population of normal weight) will persist, but here too, the adipose tissue in the operated legs will increase
3. There will be an increase in predominantly visceral fat in the abdominal region that is known to be associated with an increased cardiovascular risk.

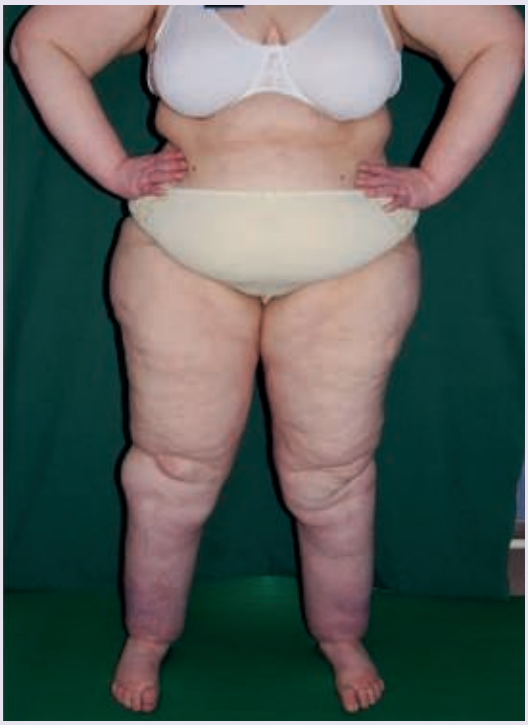
Based on the findings of this study, one American expert—Anne Peled—stated that avoiding postoperative weight gain is essential for the results of the study to be maintained.[11]

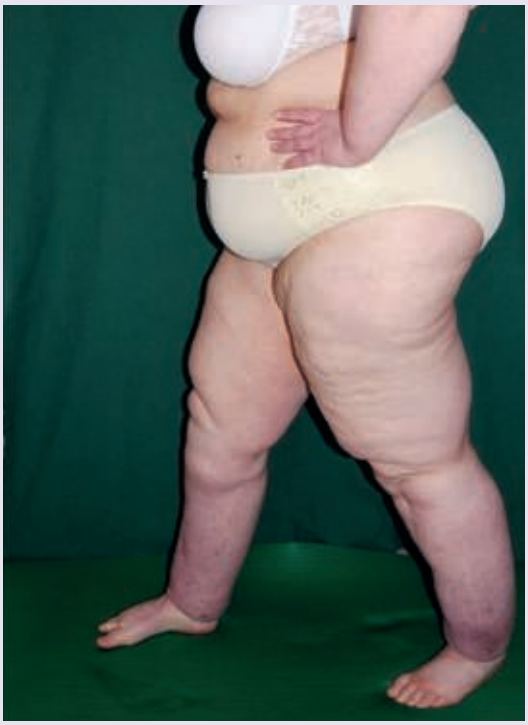
Obesity coexisting with lipoedema

The authors regularly see liposuction recommended and performed for morbidly obese patients, with BMIs of 40, 50 or even 60 kg/m^2. This weight is often closely associated with metabolic, cardiovascular and orthopaedic concomitant diseases. In the authors' view, the indication for bariatric surgery should be examined instead of liposuction.

Let us consider a case. **Figures 7.1 and 7.2** show a patient who presented to a large German dermatology

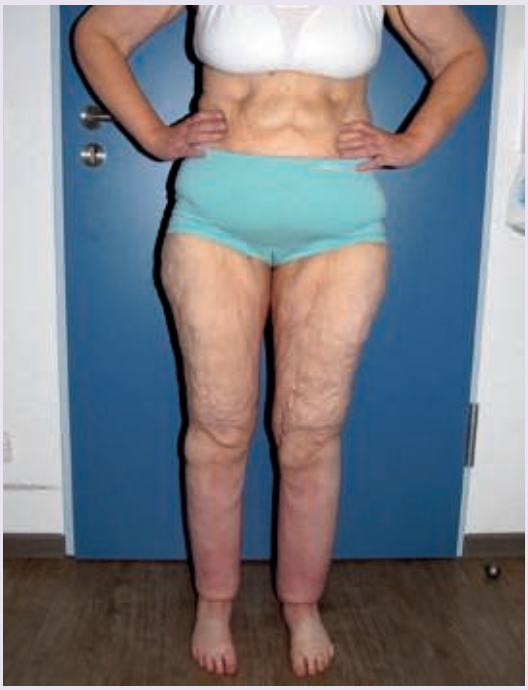
Fig 7.1 and 7.2. Patient with morbid obesity, lipoedema and obesity-related lymphoedema

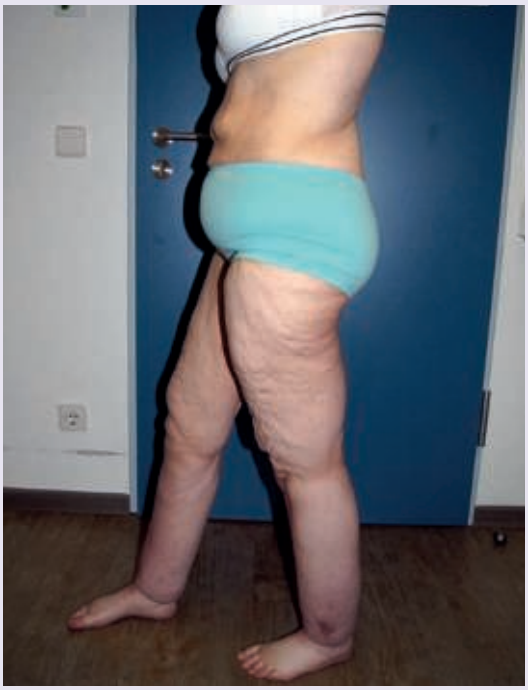




clinic specialising in the treatment of lipoedema, where she was diagnosed with 'lipolymphedema' of the legs and arms, which, as mentioned above, is not a correct diagnosis. Although she weighed 147 kg and was 1.65 m tall, obesity was not a diagnosis listed in her report; she had a BMI of 54 kg/m^2.[11] The patient also had several concomitant conditions that are closely linked to morbid obesity: obesity-associated lymphoedema in the legs, arterial hypertension, reflux disease, chronic venous insufficiency with a history of venous leg ulcer on the left leg, as well as lipoedema.The clinician proposed 7 sessions of liposuction at a total price of 18228 euros. In the authors' opinion, this assessment makes little sense either from a medical or an economic viewpoint. At their clinic, where the patient sought a second opinion, the authors were able to convince the patient that the proposed liposuction would not yield any significant benefits and certainly not permanent resolve her condition. They proposed bariatric surgery as a better alternative treatment. The patient agreed and was prepared for a gastric bypass operation within the clinic's multimodal obesity programme. Surgery was performed a few months after discharge from the clinic. **Figures 7.3 and 7.4** show the same patient 14 months after the gastric bypass. The patient's weight almost halved to 76 kg. The leg volumes, which were originally 21 L per leg more than halved to 10 L per leg. This has led to improvements in obesity-associated lymphoedema as well as the other comorbidities. She stopped using the antihypertensives and has no symptoms of reflux. With compression treatment using flat-knit compression stockings for the lymphoedema, the patient is also free of the preoperative soft tissue leg pain typical of lipoedema. The long-term effect of bariatric surgery has been

Fig 7.3 and 7.4. The same patient 14 months after gastric bypass





demonstrated previously.[96, 100-102] After weight stabilisation over more than 1 year, the plastic surgeon could remove the excess skin over the legs as well as the abdomen.

Conclusions about obesity coexisting with lipoedema

In summary, liposuction is not a therapeutic option for treating obesity, and disregarding the diagnosis of obesity in obese lipoedema patients is unhelpful. It is essential to take obesity, the most common comorbidity in lipoedema, into account in order to offer the best treatment to patients with lipoedema.

Conclusion

The current data for liposuction are quantitatively and qualitatively inadequate. If liposuction is performed, the selection of suitable patients and the incorporation of liposuction into a multimodal treatment plan are essential. The consensus of the European Lipoedema Forum describes the conditions and limitations of this surgery (please see page **41** of this supplement).

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,

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 discussion 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 lipohypertrophy, 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.

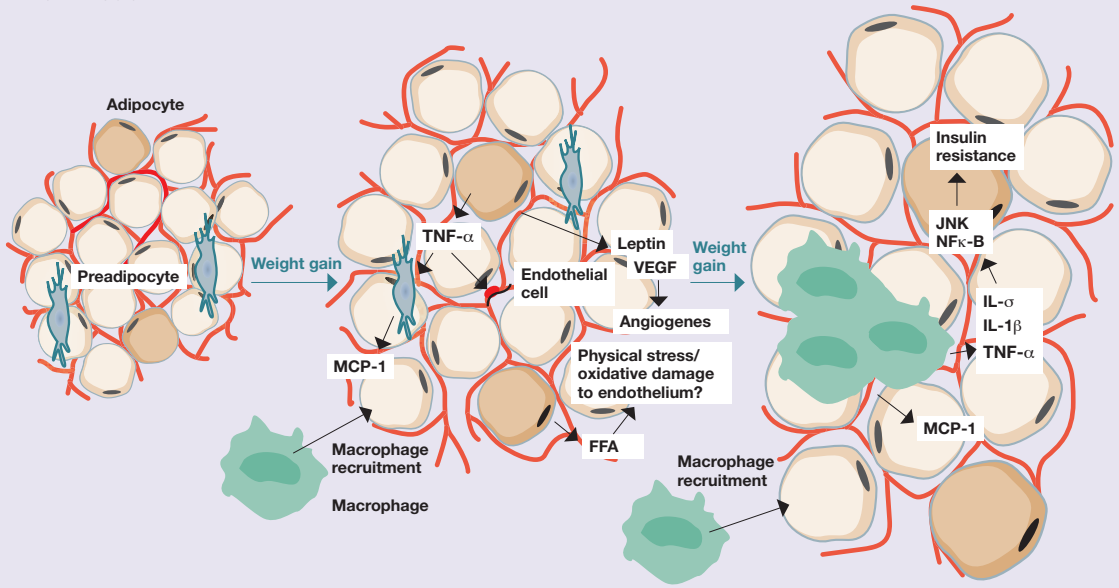
5. The consensus statement regarding overweight and obesity is that these conditions are an aggravating factor of lipoedema. The majority of lipoedema patients are obese (80–88%). Most patients try diet and exercise to lose weight and experience yo-yo effect. Weight gain can impair lipoedema, and obese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

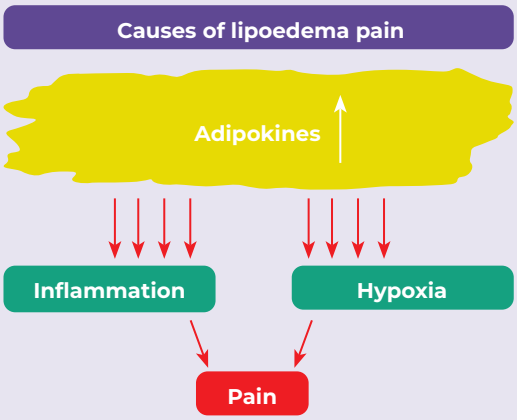
Figure 8.2 shows the somatic aspects of the model that the lead authors use to explain to patients how the pain develops. This somatic view of lipoedema is just one side of the coin. In the past, the medical profession has viewed pain exclusively as a warning signal for tissue or nerve damage, but more 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 authors[30] (including 150 cases) showed that patients who had

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 stress[187] or posttraumatic stress disorder[188] also show

Fig 8.2. Somatic causes of lipoedema pain



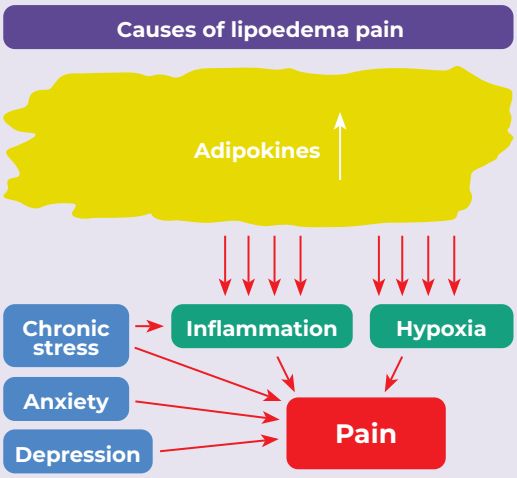
an increase in inflammatory markers that is unrelated to any underlying somatic disease. Given the psychological vulnerability of most patients with lipoedema, a vicious circle may ensue, where chronic stress and psychological symptoms intensify the pain

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?

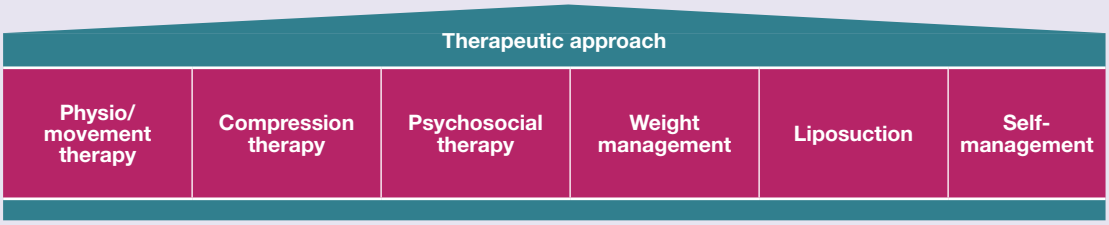
Fig 8.3. Psychological causes of lipoedema pain



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.

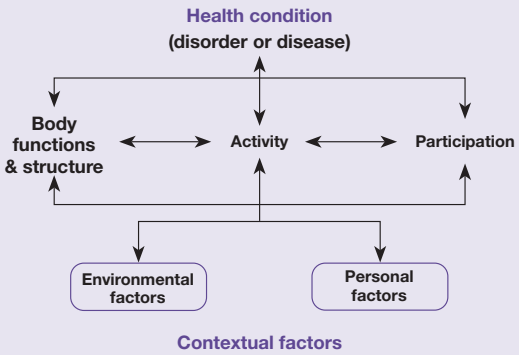
Part 2 is concerned with specific contextual factors and has two components:

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



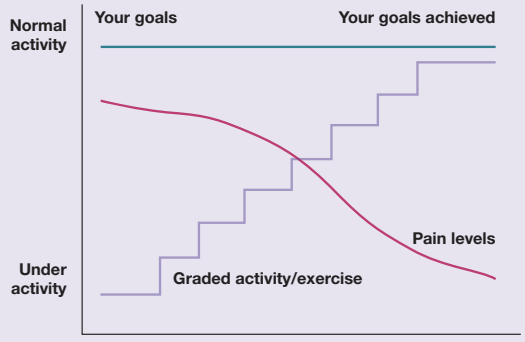
tools offers the possibility of establishing an individual health profile and drawing up an optimally personalised treatment plan. This should lead to an improvement in function and quality of life.[189, 190, 194, 195] Monitoring the measurements at regular intervals allows us to analyse treatment progress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

Fig 8.6. How graded activity reduces pain over time



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 run[202] (**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

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.

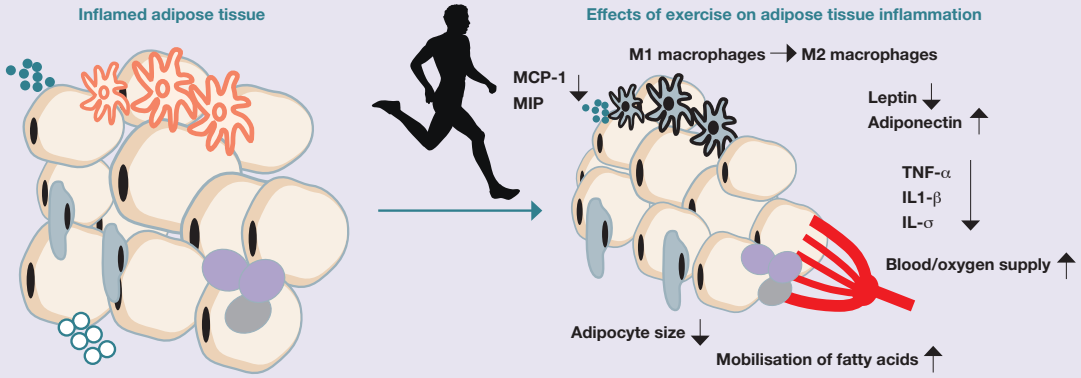
Self-management

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



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

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 groups[221] 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

(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/m^2.

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

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 European[245] 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/m^2, 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/m^2.

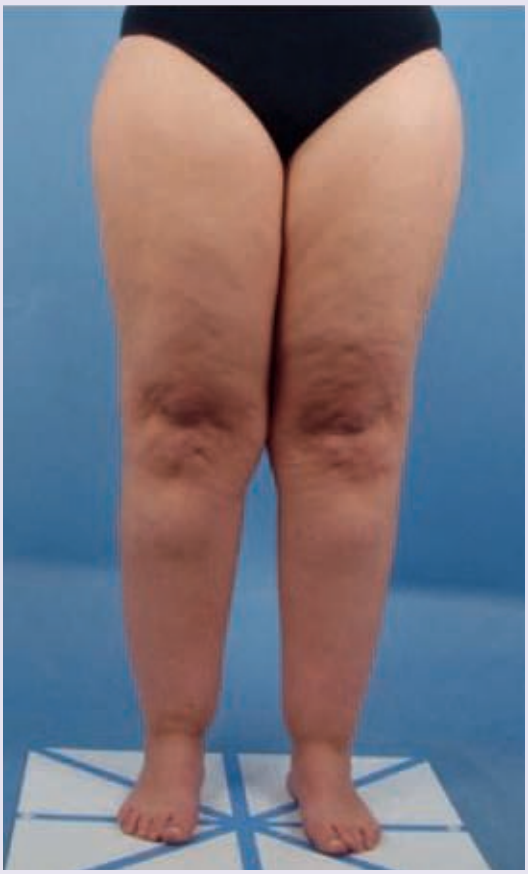
Liposuction is not a treatment option for patients with a BMI > 35 kg/m^2 and central obesity (WHtR > 0.5). In the absence of the latter, liposuction can be carried out in patients with a higher BMI, although this is extremely rare. A lipoedema/liposuction task force comprising members of the executive 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.

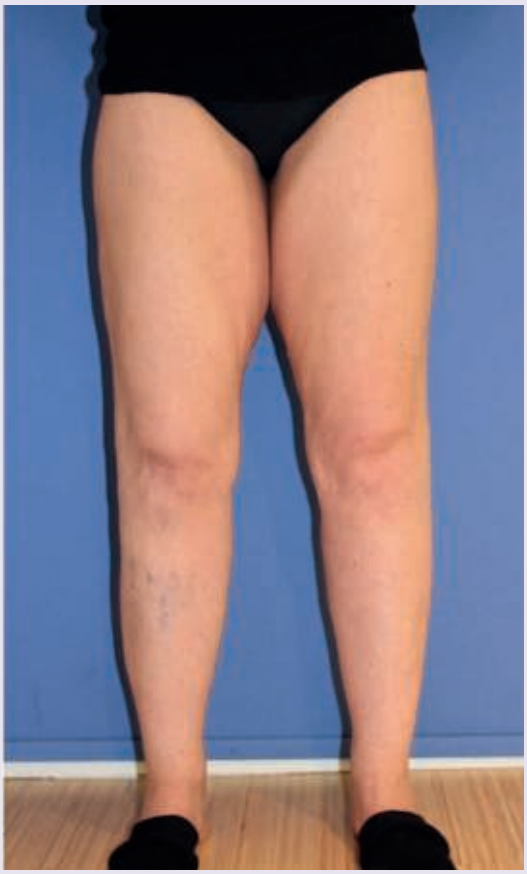
Figure 8.8 shows a patient who fulfills all the mentioned criteria. **Figure 8.9** shows the same patient 3 years after liposuction. She was happy with the results and experienced good pain relief, although she still has to wear compression garments.

Self-management

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

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 Torio 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

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 hypertrophy[257] 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. Lipoedema [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 unenhanced 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, Reisshauer 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 lipedema. 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, Białaszek 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/y538sxq2 (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/y5euxvxo (accessed 17 September 2020)
48. NDR.de. Lipedema: health insurance does not pay for the treatment. [in German] 2018. https://tinyurl.com/yylpakwr (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)

References

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, Lindgrena 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. Gudzune 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-Westhpal 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://diseasetheycallfat.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/y3s5tukl (accessed 17 September 2020)
88. Kaniuth M. Fat legs despite a diet: my life with lipedema [in German]. Munich (Germany): MGV-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, Sigrist 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, Fahrbach K et al. Weight and type 2 diabetes after bariatric surgery: systematic review and meta-analysis. Am J Med. 2009;

References

122(3):248–256. https://doi.org/10.1016/j.amjmed.2008.09.041
96. Wittgrove AC, Clark GW. Laparoscopic gastric bypass, Roux en-Y – 500 patients: technique and results, with 3–60 month follow-up. Obes Surg. 2000; 10(3):233–239. https://doi.org/10.1381/096089200321643511
97. Sugerman HJ, Wolfe LG, Sica DA, Clore JN. Diabetes and hypertension in severe obesity and effects of gastric bypass-induced weight loss. Ann Surg. 2003; 237(6):751–756. https://doi.org/10.1097/01.SLA.0000071560.76194.11
98. Rasheid S, Banasiak M, Gallagher SF et al. Bypass is an effective treatment for obstructive sleep apnea in patients with clinically significant obesity. Obes Surg. 2003; 13(1):58–61. https://doi.org/10.1381/096089203321136593
99. Courcoulas AP, Yanovski SZ, Bonds D et al. Long-term outcomes of bariatric surgery: a National Institutes of Health symposium. JAMA Surg. 2014; 149(12):1323–1329. https://doi.org/10.1001/jamasurg.2014.2440
100. Arterburn DE, Olsen MK, Smith VA et al. Association between bariatric surgery and long-term survival. JAMA. 2015; 313(1):62–70. https://doi.org/10.1001/jama.2014.16968
101. Sjöström L, Narbro K, Sjöström CD et al. Effects of bariatric surgery on mortality in Swedish obese subjects. N Engl J Med. 2007; 357(8):741–752. https://doi.org/10.1056/NEJMoa066254
102. Adams TD, Gress RE, Smith SC et al. Long-term mortality after gastric bypass surgery. N Engl J Med. 2007; 357(8):753–761. https://doi.org/10.1056/NEJMoa066603
103. Shubeck S, Dimick JB, Telem D. Long-term outcomes following bariatric surgery. JAMA. 2018; 319(3):302–303. https://doi.org/10.1001/jama.2017.20521
104. Dulloo AG, Jacquet J, Montani J-P, Schutz Y. How dieting makes the lean fatter: from a perspective of body composition autoregulation through adipostats and proteinstats awaiting discovery. Obesity Rev. 2015; 16 (S1):25–35. https://doi.org/10.1111/obr.12253
105. Lowe MR. Dieting: proxy or cause of future weight gain? Obes Rev. 2015; 16 (S1):19–24. https://doi.org/10.1111/obr.12252
106. Faerber G. Obesity and chronic inflammation in phlebological and lymphological diseases [in German]. Phlebologie. 2018; 47:55–65
107. Tindle HA, Omalu B, Courcoulas A, Marcus M, Hammers J, Kuller LH. Risk of suicide after long-term follow-up from bariatric surgery. Am J Med. 2010; 123(11):1036–1042. https://doi.org/10.1016/j.amjmed.2010.06.016
108. Peterhänsel C, Petroff D, Klinitzke G, Kersting A, Wagner B. Risk of completed suicide after bariatric surgery: a systematic review. Obes Rev. 2013; 14(5):369–382. https://doi.org/10.1111/obr.12014
109. Baumeister H, Härter M. Mental disorders in patients with obesity in comparison with healthy probands. Int J Obes. 2007; 31(7):1155–1164. https://doi.org/10.1038/sj.ijo.0803556
110. Müller A, Claes L, Smits D, Schag K, de Zwaan M. Lifetime self-harm behaviors are not more prevalent in bariatric surgery candidates than in community controls with obesity. Obes Facts. 2018; 11:109–115. https://doi.org/10.1159/000486484
111. Verein zur Förderung der Lymphödemtherapie e.V. 2020. https://tinyurl.com/y2e77o8a (accessed 17 September 2020)
112. Meier-Vollrath I, Schneider W, Schmeller W. Lipedema: improved quality of life through combination therapy [in German]. Dtsch Arztebl. 2005; 102(15):A-1061
113. Wagner S. Lymphedema and lipedema – an overview of conservative treatment. Vasa. 2011; 40(4):271–279. https://doi.org/10.1024/0301-1526/a000115
114. Wiedner M et al. Development of lipedema [in German]. Lymph-Selbsthilfe. 2017; (2):15–16
115. Shin BW, Sim YJ, Jeong HJ, Kim GC. Lipedema, a rare disease. Ann Rehabil Med. 2011; 35(6):922–927. https://doi.org/10.5535/arm.2011.35.6.922
116. Dadras M, Mallinger PJ, Corterier CC, Theodosiadi S, Ghods M. Liposuction in the treatment of lipedema: a longitudinal study. Arch Plast Surg. 2017; 44(4):324–331. https://doi.org/10.5999/aps.2017.44.4.324
117. Norddeutscher Rundfunk Gesundheit Ratgeber. What to do with lipedema. 2020. https://tinyurl.com/y6c7v6ll (accessed 17 September 2020)
118. Forner-Codero I, Martínez-Amorós P, Herrero-Manley L, Muñoz-Langa J. Secondary malignant lymphedema: different scenarios. Lecture delivered at the International Society of Lymphology, 3–4 May 2019, Brussels, Belgium
119. Aman-Vesti BT, Franzeck UK, Bollinger A. Microlymphatic aneurysms in patients with lipedema. Lymphology. 2001; 34(4):170–175
120. Bilancini S, Lucchi M, Tucci S, Eleuteri P. Functional lymphatic alterations in patients suffering from lipedema. Angiology. 1995; 46(4):333–339. https://doi.org/10.1177/000331979504600408
121. Bräutigam P, Földi E, Schaiper I, Krause T, Vanscheidt W, Moser E. Analysis of lymphatic drainage in various forms of leg edema using two compartment lymphoscintigraphy. Lymphology. 1998; 31(2):43–55
122. Amann-Vesti BT. Pressure measurement in the initial lymphatic vessels of the skin in patients with lipedema. LymphForsch. 2002; 6 (1):7–9
123. Bertsch T. Obesity related lymphedema - underestimated and undertreated. Phlebologie. 2018; 47(2):75–83
124. Frambach Y, Baumgartner A, Schmeller W. Lipedema and quality of life. Vasomed. 2015; 27(5):248–249
125. Frambach Y, Baumgartner A, Schmeller W. Lipedema - a "serious" diagnosis? Vasomed. 2016; 5:2–3
126. Dudek J. Quality of life and psychological functioning of patients with lipedema and Dercum's disease. 2017. https://youtu.be/xV-IVc0eVQM (accessed 17 September 2020)
127. Smidt T. Lipedema. 2020. www.tillysmidt.nl (accessed 17 September 2020)
128. Kraus RH. All about lipedema. Lymphological information service. 2020. https://tinyurl.com/y6ngcxvg (accessed 17 September 2020)
120. Stutz J. Understanding the physical and emotional effects of lipedema. 2015. https://youtu.be/FI2RIRsZX0M (accessed 17 September 2020)
130. Grossarth-Maticek R. Cancer risks—chances of survival. Heidelberg (Germany): Carl Auer Systeme; 1998
131. Baerwald C. Influence of low and heavy stress on a rheumatic disease [in German]. Deutsche Rheuma Liga. 2020. https://tinyurl.com/yyl-nqpeq (accessed 17 September 2020)
132. Dilling H, Mombour W. International Classification of Mental Disorders: ICD-10 chapter V (F) - clinical diagnostic guidelines [in German]. Boston (MA): Hogrefe; 2015
133. Schmeller W, Meier-Vollrath I. Lipedema pain. An attempt to get closer [in German]. LymphForsch. 2008; 12:7–14
134. Carr T, Moss T, Harris D. The DAS24: A short form of the Derriford Appearance Scale DAS59 to measure individual responses to living with problems of appearance. Br J Health Psychol. 2005; 10(Pt2):285–298. https://doi.org/10.1348/135910705X27613
135. Hilbert A, Tuschen-Caffier B. Eating Disorders Questionnaire [German translation]. Münster (Germany): Verlag für Psychotherapie; 2006
136. Löwe B, Zipfel S, Herzog W. German translation and validation of the Brief Patient Health Questionnaire (Brief PHQ) [in German]. Karlsruhe: Pfizer; 2002
137. Maier W, Philipp M. Reliability and validity of subtyping and measurement of the severity of depressive syndromes [in German]. Berlin Heidelberg: Springer; 2013
138. Beck AT, Brown GK, Steer RA. Beck Depression Inventory FS (BDI-FS). Manual. German adaptation. Frankfurt am Main: Pearson Assessment; 2013
139. Hautzinger M, Keller F, Kühner C. BDI-II. Beck Depression Inventory. Revision. 2nd edn. [in German] Frankfurt: Pearson Assessment; 2009
140. Bauer J. Work: Why our happiness depends on it and how it makes us sick [in German]. Blessing; 2013
141. Rapprich S, Baum S, Kaak I, Kottmann T, Podda M. Treatment of lipoedema using liposuction: results of our own survey. Phlebologie. 2015; 1(3):121–133
142. Schmeller W, Meier-Vollrath I. Successful surgical therapy of lipedema

using liposuction [in German]. Phlebologie. 2004; 1:23–29
143. Baumgartner A. Lipedema: surgical therapy - necessity or luxury? [in German] Vasomed. 2014; 5(26):241
144. Cornely M, Gensior M. Lipedema update 2014. Cologne Lipedema Study [in German]. LymphForsch. 2014; 18(2):66–71
145. Schmeller W. Letter to the editor on the article 'Lipedema update 2014. Cologne Lipedema Study'. LymphForsch. 2015; 19(1):55–57
146. Rapprich S, Dingler A, Podda M. Liposuction is an effective therapy for lipedema - results of a study with 25 patients [in German]. JDDG. 2011; 9:33–41
147. Schmeller W, Hüppe M, Meier-Vollrath I. Long-term changes after liposuction in lipedema. LymphForsch. 2010; 14(2):17–28
148. Baumgartner A, Hüppe M, Schmeller W. How long do lipedema patients benefit from liposuction? LymphForsch. 2015; 19(1):8–14
149. Murad HM, Asi Noor, Alsawas M, Alahdab F. New evidence pyramid. MJ Evidence-Based Medicine 2016;21:125–127. http://dx.doi.org/10.1136/ebmed-2016-110401
150. Bertsch T, Erbacher G. Lipedema—myths and facts. Part 2. Phlebologie. 2018; 47:120–126
151. Bingel U, Wanigasekera V, Wiech K et al. The effect of treatment expectation on drug efficacy: imaging the analgesic benefit of the opioid remifentanil. Sci Transl Med 2011; 3(70): 70ra14. https://doi.org/10.1126/scitranslmed.3001244
152. Sihvonen R, Paavola M, Malmivaara A et al. Arthroscopic partial meniscectomy versus sham surgery for a degenerative meniscal tear. N Engl J Med. 2013; 369: 2515–2524. https://doi.org/10.1056/NEJMoa1305189
153. Louw A, Diener I, Fernández-de-Las-Peñas C, Puentedura EJ. Sham surgery in orthopedics: a systematic review of the literature. Pain Med. 2017; 18(4):736–750. https://doi.org/10.1093/pm/pnw164
154. Howlett N, Trivedi D, Troop NA, Chater AM. What are the most effective behavior change techniques to promote physical activity and / or reduce sedentary behaviour in inactive adults? A systematic review protocol. BMJ Open. 2015: 5(8):e008573. https://doi.org/10.1136/bmjopen-2015-008573
155. Cornely ME. Lymphological liposculpture. My experience after 1600 operations [in German]. 2012. https://tinyurl.com/yx9pp2qh (accessed 17 September 2020)
156. Bogner K, Landrock U. Response biases in standardised surveys. GESIS survey guidelines. 2016. https://doi.org/10.15465/gesis-sg_en_016
157. de Heer EW, Gerrits MMJG, Beekman ATF et al. The association of depression and anxiety with pain: a study from NESDA. PLoS One. 2014: 9(10):e106907. https://doi.org.10.1371/journal.pone.0106907
158. Gemeinsamer Bundesausschuss. Basic reasons for the decision of the Federal Joint Committee on an amendment to the guidelines for hospital treatment methods: liposuction for lipedema [in German]. 2017. https://www.g-ba.de/beschluesse/3961/ (accesed 17 September 2020)
159. Ärzteblatt.de. Liposuction for lipedema: Federal Social Court points Legal action for reimbursement [in German]. 2018. https://tinyurl.com/y3jbsqkt (accessed 17 September 2020)
160. Peprah K, MacDougall D. Liposuction for the treatment of lipedema: a review of clinical effectiveness and guidelines. 2019. https://tinyurl.com/y2somhte (accessed 17 September 2020)
161. Heck FC, Witte T. Standards in lipedema surgery. Chirurgische Allgemeine. 2018; 19(6):320–325
162. Schmeller W, Meier-Vollrath I. Lipedema - diagnosis and therapy [in German]. Gefässchirurgie. 2009; 14:516–522
163. Rosenbergklinik. 2020. https://www.rosenbergklinik.de/index.php?id=28 (accessed 17 September 2020)
164. Hirsch T, Schleinitz J, Marshall M, Faerber G. Is the differential diagnosis of lipoedema by means of high-resolution ultrasonography possible? Phlebologie. 2018; 47(04):182–187
165. Wollina U, Heinig B. Tumescent microcannular (laser-assisted) liposuction in painful lipedema. Eur J Aesth Med Dermatol. 2012; 2;(2):56–69
166. Wang Y, Beydoun MA, Liang L, Caballero B, Kumanyika SK. Will all Americans become overweight or obese? Estimating the progression and cost of the US obesity epidemic. Obesity. 2008; 16(10):2323–2330. https://doi.org/10.1038/oby.2008.351
167. Wang Y, Beydoun MA. The obesity epidemic in the United States –gender, age, socioeconomic, racial/ethnic, and geographic characteristics: a systematic review and meta-regression analysis. Epidemiol Rev. 2007; 29:6–28
168. Ogden CL, Carroll MD, Curtin LR et al. Prevalence of overweight and obesity in the United States, 1999–2004. JAMA. 2006; 295(13):1549–1555. https://doi.org/10.1001/jama.295.13.1549
169. Olshansky SJ, Passaro DJ, Hershow RC et al. A potential decline in life expectancy in the United States in the 21st century. N Engl J Med. 2005; 352(11):1138–1145. https://doi.org/10.1056/NEJMsr043743
170. Stenholm S, Vahtera J, Kawachi I et al. Patterns of weight gain in middle-aged and older US adults, 1992–2010. Epidemiology. 2015; 26(2):165–168. https://doi.org/10.1097/EDE.0000000000000228
171. Hernandez TL, Kittelson JM, Law CK et al. Fat redistribution following suction lipectomy: defense of body fat and patterns of restoration. Obesity. 2011: 19(7):1388–95. https://doi.org/10.1038/oby.2011.64
172. Bertsch T, Erbacher G. Lipedema—myths and facts. Part 1. Phlebologie. 2018; 47:84–92
173. Bertsch T, Erbacher G. Lipedema—myths and facts. Part 3. Phlebologie. 2018; 47:188–197
174. Bertsch T, Erbacher G. Lipedema—myths and facts. Part 4. Phlebologie. 2019; 48:47–56
175. Spahn J. Liposuction should become a health insurance benefit [in German]. 2019. https://tinyurl.com/y4kehdpb (accessed 17 September 2020)
176. Aerzteblatt.de. Letter to Spahn: G-BA offers liposuction for lipedema as a limited health insurance benefit [in German]. 2019. https://tinyurl.com/yack55uf (accessed 17 September 2020)
177. Stulnig T. Obesity and inflammation of the adipose tissue [in German]. Austrian J Clin Endocrinol Metab. 2009; 2 (3):17–21
178. Halberg N, Khan T, Trujillo ME et al. Hypoxia-inducible factor 1alpha induces fibrosis and insulin resistance in white adipose tissue. Mol Cell Biol. 2009; 29(16):4467–4483. https://doi.org/10.1128/MCB.00192-09
179. Fujisaka S, Usui I, Ikutani M et al. Adipose tissue hypoxia induces inflammatory M1 polarity of macrophages in an HIF-1α-dependent and HIF-1α-independent manner in obese mice. Diabetologia. 2013; 56(6):1403–1412. https://doi.org/10.1007/s00125-013-2885-1
180. Al-Ghadban S, Cromer W, Allen M et al. Dilated blood and lymphatic microvessels, angiogenesis, increased macrophages, and adipocyte hypertrophy in lipedema thigh skin and fat tissue. J Obes. 2019; 8747461. https://doi.org/10.1155/2019/8747461
181. Walker AK, Kavelaars A, Hejnen CJ, Dantzer R. Neuroinflammation and comorbidity of pain and depression. Pharmacol Rev. 2014; 66(1):80–101. https://doi.org/10.1124/pr.113.008144
182. Butler DS, Moseley GL. Understanding pain [in German]. 3rd edn. Berlin, Heidelberg: Springer; 2016
183. Hermesdorf M, Berger K, Baune BT, Wellmann J, Ruscheweyh R, Wersching H. Pain sensitivity in patients with major depression: differential effect of pain sensitivity measures, somatic cofactors, and disease characteristics. J Pain. 2016; 17(5):606–616. https://doi.org/10.1016/j.jpain.2016.01.474
184. Klinger R. Psychological pain modulation [in German]. Schmerz 2017; 31:91–92. https://doi.org/10.1007/s00482-017-0213-2
185. Briest J, Bethge M. The influence of catastrophizing on the effect of depression on pain and physical function [in German]. Der Schmerz. 2017; 2:159–166. https://doi.org/10.1007/s00482-016-0172-z
186. Miller AH. Five things to know about inflammation and depression. Psychiatr Times. 2018. https://tinyurl.com/yyh66cux (accessed 17 September 2020)
187. Slavich GM, Way BM, Eisenberger NI, Taylor SE. Neural sensitivity to social rejection is associated with inflammatory responses to social stress. Proc Natl Acad Sci USA. 2010; 107(33):14817–14822. https://soi.org/10.1073/pnas.1009164107
188. Hori H, Kim Y. Inflammation and posttraumatic stress disorder.

References

Psychiatry Clin Neurosci. 2019; 73(4):143–153. https://doi.org/10.1111/pcn.12820

189. World Health Organization. International Classification of Functioning, Disability and Health. Geneva (Switzerland): World Health Organization; 2001
190. Stucki G, Grimby G. Applying the ICF inmedicine. J Rehabil Med. 2004; 44(Suppl):5–6. https://doi.org/10.1080/16501960410022300
191. Nederlandse Vereniging voor Dermatologie en Venereologie. Lipedema guidelines for patients. 2014. https://tinyurl.com/y65rpuay (accessed 17 September 2020)
192. Halk AB, Damstra RJ. First Dutch guidelines on lipedema using the international classification of functioning, disability and health. Phlebology. 2017; 32(3):152–159
193. Weggemans RM, Backx FJG, Borghouts K et al. The 2017 Dutch physical activity guidelines. Int J Behav Nutr Phys Act. 2018; 15:58. https://doi.org/10.1186/s12966-018-0661-9
194. Lorig KR, Sobel DS, Stewart AL et al. Evidence suggesting that a chronic disease self-management program can improve health status while reducing hospitalization: a randomized trial. Med Care. 1999; 37(1):5–14. https://doi.org/10.1097/00005650-199901000-00003
195. Jansen D, Spreeuwenberg P, Heijmans M. Developments in care for the chronically ill. A report [in German]. 2012. https://tinyurl.com/yyxv5qlk (accessed 17 September 2020)
196. Ridner SH, Fu MR, Wanchai A et al. Self-management of lymphedema: a systematic review of the literature from 2004 to 2011. Nurs Res. 2012; 61(4):291–299. https://doi.org/10.1097/NNR.0b013e31824f82b2
197. van Esch-Smeenge J, Damstra RJ, Hendrickx AA. Muscle strength and functional exercise capacity in patients with lipedema and obesity: a comparative (obeservational) study. J Lymphoedema. 2017; 12(1):27–31
198. Linton SJ, Hellsing AL, Andersson D. A controlled study of the effects of an early intervention on acute musculoskeletal pain problems. Pain. 1993; 54(3):353–359. https://doi.org/10.1016/0304-3959(93)90037-p
199. Ostelo RW, de Vet HC, Berfelo MW et al. Effectiveness of behavioral graded activity after first-time lumbar disc surgery: short term results of a randomized controlled trial. Eur Spine J. 2003; 12(6):637–644. https://doi.org/10.1007/s00586-003-0560-9
200. Koke A, van Wilgen P. Graded activity. Vol 1. Houten: Bohn Stafleu van Loghum; 2007
201. Noland MP. The effects of self-monitoring and reinforcement on exercise adherence. Res Q Exerc Sport. 1989; 60(3):216–224. https://doi.org/10.1080/02701367.1989.10607443
202. Veenhof C, Köke AJ, Dekker J et al. Effectiveness of behavioral graded activity in patients with osteoarthritis of the hip and/or knee: a randomized clinical trial. Arthritis Rheum. 2006; 55(6):925–934. https://doi.org/10.1002/art.22341
203. Krüger K. Inflammation during obesity – pathophysiological concepts and effects of physical activity. Dtsch Z Sportmed. 2017; 68:163–169. https://doi.org/10.5960/dzsm.2017.285
204. Ringseis R, Eder K, Mooren FC, Krüger K. Metabolic signals and innate immune activation in obesity and exercise. Exerc Immunol Rev. 2015; 21:58–68
205. Wegner M, Helmich I, Machado S et al. Effects of exercise on anxiety and depression disorders: review of meta-analyses and neurobiological mechanisms. CNS Neurol Disord Drug Targets. 2014; 13(6):1002–1014. https://doi.org/10.2174/1871527313666140612102841
206. Rief W, Bleichhardt G, Dannehl K, Euteneuer F, Wambach K. Comparing the efficacy of CBASP with two versions of CBT for depression in a routine care center: a randomized clinical trial. Psychother Psychosom. 2018; 87(3):164–178. https://doi.org/10.1159/000487893
207. Langendoen SI, Habbema L, Nijsten TE, Neumann HAM. Lipoedema: from clinical presentation to therapy. A review of the literature. Br J Dermatol. 2009; 161(5):980–986. https://doi.org/10.1111/j.1365-2133.2009.09413.x
208. Reich-Schupke S, Altmeyer P, Stücker M. Thick legs – not always lipedema. J Dtsch Dermatol Ges. 2013; 11(3):225–233. https://doi.org/10.1111/ddg.12024
209. Wagner EH. Chronic disease management: what will it take to improve care for chronic illness? Eff Clin Pract. 1998; 1(1):2–4
210. Bandura A, Adams NE. Analysis of self-efficacy theory of behavioral change. Cognitive Ther Res. 1977; 1(4):287–310
211. Konschake W, Valesky E, Stege H. Compression therapy evidence [in German]. Der Hautarzt. 2017; 68:625–631
212. Kramer WJ, Volek J, Bush A et al. Influence of compression hosiery on physiological responses to standing fatigue in women. Med Sci Sports Exerc. 2000; 32(11):1849–1858. https://doi.org/10.1097/00005768-200011000-00006
213. Altintas A, Gehl B, Aust M, Meyer-Marcotty M. Impact of compression therapy on local microcirculation and histomorphology in venous leg ulcers. Phlebologie. 2011; 40(1):9–14
214. Ligi D, Croce L, Mannello F. Inflammation and compression: the state of art. Veins Lymphatics. 2016. https://tinyurl.com/yy3kp35f (accessed 17 September 2020)
215. Beidler SK, Douillet CD, Berndt DF, Keagy BA, Rich PB, Marston WA. Inflammatory cytokine levels in chronic venous insufficiency ulcer tissue before and after compression therapy. J Vasc Surg. 2009; 49(4):1013–1020. https://doi.org/10.1016/j.jvs.2008.11.049
216. Grenier E, Gehin C, Mc Adams E. Effect of compression stockings on cutaneous microcirculation: Evaluation based on measurements of the skin thermal conductivity. Phlebology. 2016; 31(2):101–105
217. Mayrovitz HN, Delgado M, Smith J. Compression bandaging effects on lower extremity peripheral and sub-bandage skin blood perfusion. Ostomy Wound Manage. 1998; 44(3):56–60
218. Flore R, Geradino L, Santoliquido A. Reduction of oxidative stress by compression stockings in standing workers. Occupat Med. 2007; 57(5):337–341. https://doi.org/10.1093/occmed/kqm021
219. IsHak WW, Wen RY, Naghdechi L et al. Pain and depression: a systematic review. Harv Rev Psychiatry. 2018; 26(6):352–363. https://doi.org/10.1097/HRP.0000000000000198
220. Swami V, Frederick DA, Aavik T et al. The attractive female body weight and female body dissatisfaction in 26 countries across 10 world regions: results of the international body project I. Pers Soc Psychol Bull. 2010; 36(3):309–325. https://doi.org/10.1177/0146167209359702
221. Schuck K, Munsch S, Schneider S. Body image perceptions and symptoms of disturbed eating behavior among children and adolescents in Germany. Child Adolesc Psychiatry Ment Health. 2018; 12:10. https://doi.org/10.1186/s13034-018-0216-5
222. Häuser W, Schmutzer G, Brähler E et al. Maltreatment in childhood and adolescence—results from a survey of a representative sample of the German population. Dtsch Arztebl Int. 2011; 108(17):287–294. https://doi.org/10.3238/arztebl.2011.0287
223. Egle U, Egloff N, von Känel R. Stress-induced hyperalgesia (SIH) as a result of emotional deprivation and psychological trauma in childhood [in German]. Konsequenzen für die Schmerztherapie. Der Schmerz. 2016; 30:526–536. https://doi.org/10.1007/s00482-016-0107-8
224. Bachem R, Lorenz L, Köllner V. Minor trauma and the new concept of adjustment disorder [in German]. Psychotherapie im Dialog. 2019; 20(2):37–41. https://doi.org/10.1055/a-0771-5094
225. Louw A, Zimney K, Puentedura EJ, Diener I. The efficacy of pain neuroscience education onmusculoskeletal pain: a systematic review of the literature. Physiother Theory Pract. 2016; 32(5):332–355. https://doi.org/10.1080/09593985.2016.1194646
226. Louw A, Zimney K, O'Hotto C, Hilton S. The clinical application of teaching people about pain. Physiother Theory Pract. 2016; 32(5):385–395. https://doi.org/10.1080/09593985.2016.1194652
227. Wijma AJ, van Wilgen CP, Meeus M, Nijs J. Clinical biopsychosocial physiotherapy assessment of patients with chronic pain: the first step in pain neuroscience education. Physiother Theory Pract. 2016; 32(5):368–384. https://doi.org/10.1080/09593985.2016.1194651
228. Zanini S, Voltolini A, Gragnano G, Fumagalli E, Pagnini F. Changes in pain perception following psychotherapy: the mediating role of psycho-

logical components. Pain Res Manag. 2018; 2018:8713084. https://doi.org/10.1155/2018/8713084
229. Deutsche Gesellschaft für Psychiatrie und Psychotherapie, Psychosomatik und Nervenheilkunde e. V. 2020. https://tinyurl.com/y4heyl96 (accessed 17 September 2020)
230. Faerber F, Rosendahl J. The association between resilience and mental health in the somatically ill—a systematic review and meta-analysis. Dtsch Arztebl Int. 2018; 115(38):621–627. https://doi.org/10.3238/arztebl.2018.0621
231. Lustig R. Fat chance – beating the odds against sugar, processed food, obesity, and disease. New York (NY): Hudson Street Press; 2012
232. Faerber G. Obesity and chronic inflammation. Phlebologie. 2018; 47:55–65
233. Faerber G. Nutritional therapy for lipedema and obesity - results of a guideline-based therapy concept [in German]. Vasomed. 2017; 29 (4):122–123
234. Cohen PG. Aromatase, adiposity, aging and disease. The hypogonadal metabolic-atherogenic- disease and aging connection. Med Hypotheses. 2001; 56(6):702–708. https://doi.org/10.1054/mehy.2000.1169
235. Mizushima N, Noda T, Yoshimori T et al. A protein conjugation system essential for autophagy. Nature. 1998; 395:395–398. https://doi.org/10.1038/26506
236. Harvie M, Wright C, Pegington M et al. The effect of intermittent energy and carbohydrate restriction vs. daily energy restriction on weight loss and metabolic disease risk markers in overweight women. Br J Nutr. 2013; 110(8):1534–1547. https://doi.org/10.1017/S0007114513000792
237. Klempel MC, Kroeger CM, Bhutani S, Trepanowski JF, Varady KA. Intermittent fasting combined with calorie restriction is effective for weight loss and cardioprotection in obese women. Nutr J. 2012; 11:98. https://doi.org/10.1186/1475-2891-11-98
238. Feinman RD, Pogozelski WK, Astrup A et al. Dietary carbohydrate restriction as the first approach in diabetes management: critical review and evidence base. Nutrition. 2015; 31(1):1–13. https://doi.org/10.1016/j.nut.2014.06.011
239. Westman EC, Feinman RD, Mavropoulos JC et al. Low-carbohydrate nutrition and metabolism. Am J Clin Nutr. 2007; 86(2):276–284. https://doi.org/10.1093/ajcn/86.2.276
240. Noakes T. Low-carbohydrate and high-fat intake can manage obesity and associated conditions: occasional survey. S Afr Med J. 2013; 103(11):826–830. https://doi.org/10.7196/samj.7302
241. Hoenselaar R. Saturated fat and cardiovascular disease: the discrepancy between the scientific literature and dietary advice. Nutrition. 2012; 28(2):118–123. https://doi.org/10.1016/j.nut.2011.08.017
242. Sofi F, Buccioni A, Cesari F et al. Effects of a dairy product (pecorino cheese) naturally rich in cis- 9, trans-11 conjugated linoleic acid on lipid, inflammatory and haemorheological variables: a dietary intervention study. Nutr Metab Cardiovasc Dis. 2010; 20:117–124. https://doi.org/10.1016/j.numecd.2009.03.004
243. Ditschuneit HH, Flechtner-Mors M, Johnson TD et al. Metabolic and weight-loss effects of a long-term dietary intervention in obese patients. Am J Clin Nutr. 1999; 69(2):198–204. https://doi.org/10.1093/ajcn/69.2.198
244. Cheng J, Gao J, Shuai X et al. The comprehensive summary of surgical versus non-surgical treatment for obesity: a systematic review and meta-analysis of randomized controlled trials. Oncotarget. 2016; 7(26):39216–39230. https://doi.org/10.18632/oncotarget.9581
245. Fried M, Yumuk V, Oppert JM et al. Interdisciplinary European guidelines on metabolic and bariatric surgery. Obes Surg. 2014; 24(1):42–55. https://doi.org/10.1007/s11695-013-1079-8
246. American College of Cardiology/American Heart Association Task Force on Practice Guidelines OEP. Executive summary: Guidelines (2013) for the management of overweight and obesity in adults: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines and the Obesity Society published by the Obesity Society and American College of Cardiology/American Heart Association Task Force on Practice Guidelines. Based on a systematic review from the The Obesity Expert Panel, 2013. Obesity 2014; 22(2):5–39. https://doi.org/10.1002/oby.20821
247. Lee CM, Huxley RR, Wildman RP, Woodward M. Indices of abdominal obesity are better discriminators of cardiovascular risk factors than BMI: a meta-analysis. J Clin Epidemiol. 2008; 6(7):646–653. https://doi.org/10.1016/j.jclinepi.2007.08.012
248. Armer JM, Brooks CW, Stewart BR. Limitations of self-care in reducing the risk of lymphedema: supportive-educative systems. Nurs Sci Q. 2011; 24(1):57–63. https://doi.org/10.1177/0894318410389058
249. van der Vlegel-Brouwer W. Integrated healthcare for chronically ill. Reflections on the gap between science and practice and how to bridge the gap. Int J Integr Care. 2013; 13:e019. https://doi.org/10.5334/ijic.1079
250. Barr VJ, Robinson S, Marin-Link B et al. The expanded chronic care model: an integration of concepts and strategies from population health promotion and the chronic care model. Hosp Q. 2003; 7(1):73–82. https://doi.org/10.12927/hcq.2003.16763
251. McEwen BS. Physiology and neurobiology of stress and adaptation: central role of the brain. Physiol Rev. 2007; 87(3):873–904. https://doi.org/10.1152/physrev.00041.2006
252. Miller WR, Rollnick S. Motivational interviewing: helping people change. 3rd edn. New York (NY): Guilford Press; 2012
253. Lundahl B, Burke BL. The effectiveness and applicability of motivational interviewing: a practice-friendly review of four meta-analyses. J Clin Psychol. 2009; 65(11):1232–1245. https://doi.org/10.1002/jclp.20638
254. Larry E, Beutler T, Harwood M. What is and can be attributed to the therapeutic relationship? J Contemp Psychother. 2002; 32(1):25–33
255. Sutin AR, Terracciano A. Perceived weight discrimination and obesity. PLoS One. 2013; 8(7):e70048. https://doi.org/10.1371/journal.pone.0070048
256. Cornely M. Letter to the editor. Phlebologie. 2005
257. Felmerer G, Stylianaki A, Hagerling R et al. Adipose tissue hypertrophy, an aberrant biochemical profile and distinct gene expression in lipedema. J Surg Res. 2020; 253:294–303. https://doi.org/10.1016/j.jss.2020.03.055
258. Task Force for Lipedema/Liposuktion der Deutschen Gesellschaft für Phlebologie gemeinsam mit der Deutschen Gesellschaft für Lymphologie. 2019; noch unveröffentlicht.
259. Földiklinik Hinterzarten. Opinion on lipedema. 2019. https://tinyurl.com/y3tepvld (accessed 17 September 2020)

SUPPORTED BY