

Jaime Schwartz, MD
240 S. LA Cienega BL # 200
Beverly Hills CA 90211

September 19, 2023

Re: Patient: Sandra Amaral
ID #: W278375968
DOB: 02/23/1972

To Whom It May Concern,

We are requesting a **prior authorization and a GAP EXCEPTION review** for surgery to treat the diagnosed disease Lipedema. We are requesting a 6-month Authorization as the procedures are staged.

I have also attached for your review:

1. Letters and notes from non -surgeons documenting this patients Lipedema diagnosis.
2. Proofs of attempts to manage condition with conservative treatment
3. Letter of medical necessity, exam notes and surgical plan from Dr Schwartz
4. Patient letters describing how Lipedema is affecting her life
5. Photos
6. articles and documentation on the treatment of Liposuction for the treatment of Lipedema.

Patients with Lipedema have been misdiagnosed despite this disease identified by the Mayo clinic in the 1940s. Thank you for your attention to this important matter and ensuring a high-quality review of this request.

Please feel free to contact me if you require any additional information.

Best regards,

Noel Salapang
Total Lipedema Care
Jaime S. Schwartz, MD, FACS
Board Certified Plastic Surgeon
Associate Clinical Professor of Surgery- USC Keck School of Medicine
Division of Plastic and Reconstructive Surgery
frontdesk@drjaimeschwartz.com
T: (310)882-5454 F: (310)747-5908

SALINAS VALLEY HEALTH LIFESTYLE AND METABOLIC PROGRAM
1260 S. MAIN ST. SUITE 101
SALINAS CA 93901-2292
Phone: 831-208-6226

September 5, 2023

Patient: **Sandra A Amaral**
Date of Birth: **2/23/1972**
Date of Visit: **9/15/2023**

To whom this may concern,

Sandra is an established patient at lifestyle and metabolic program, she has a history of Lipedema (E88.28). The condition has progressed and caused significant chronic pain/cramping, associated symptoms include pain and tenderness or pressure from calves down to ankles. She also reports having easy bruising.

Symptoms consist of dense fibrotic tissue that has resulted in functional impairment, including gait imbalance, difficulty with ambulation due to the overhanging tissue and weight., inability to exercise and ability to perform ADLs.

Sincerely,

Robert Fernandez, MD

Sandra Amaral
6 Catalina Avenue
Salinas, CA 93901
831-320-3550
justsan@pacbell.net

September 1, 2023

To Whom It May Concern:

Before I was diagnosed, I thought for sure I had lipedema. So while I wasn't sure what needed to happen, I tried to do things on my own to decrease the leg size.

I had tried to do compression therapy myself. I purchased compression leggings, socks, arm bands and unfortunately nothing worked to decrease the size of my legs or pain.

I tried to go to a lymphatic drainage massage therapist, but it was painful I only went once or twice. There, I learned how to do the massage myself. It is a painful massage that created a lot of bruising and soreness.

I've hired various personal trainers to force me to exercise even harder to lose the weight. Nothing worked. So I gave up and figured this was how my body was supposed to be, until a new doctor I went to immediately recognized that I was dealing with lipedema.

Since this was over the last 20 years, I do not have copies of receipts, much less even remember some of the therapists names. Most of the treatments were things I did at home after doing a lot of research on sites like youtube, or reading what I could find on the internet. Once something failed, I moved on and tried the next thing to try and reduce the size of my legs and pain. I have not tried to do any of the things listed in a couple of years, so I do not have anything more current.

Total Lipedema Care
Dr. Jaime Schwartz
240 S. La Cienega Blvd.
Suite 200
Beverly Hills, CA 90211

August 25, 2023

RE: Sandra Amaral

DOB: 02/23/1972

To Whom It May Concern:

I am writing on behalf of Sandra Amaral for coverage of medically necessary lipedema surgery. Miss Amaral has a chronic progressive debilitating disorder called **Lipedema**. This condition is transmitted genetically as an autosomal dominant pattern disease.

The patient has diseased lipedema tissue accumulation in their arms, thighs, legs, and ankles. My approach is to manually extract as much of the diseased tissue as is safely possible per the attached **Surgical Plan** using a staged process involving 4 surgeries. In early stages, lipedema can be present on the legs, hips, and buttocks and 80% of women have it on their arms. Lipedema, in later stages, can also be present in the lower abdomen or other parts of the body and can negatively interact with obesity. Lipedema surgery includes liposuction of the diseased tissue, manual removal of nodules, and excision of excess skin.

There are published guidelines for diagnosing lipedema and an International Consensus Agreement on diagnosis in 2019. Diagnosis is by physical exam. S1 Guidelines J Dtsch Dermatol Ges 2017 Jul;15(7):758-767; International Consensus on the Prevention of Progression of Lipedema. <https://www.ncbi.nlm.nih.gov/pubmed/3135643> 3

Although there is variability among patients, clinicians look for the following:

- Onset at puberty, pregnancy, and menopause-progressive with age
- The affected limbs feel tight and heavy (especially at end of day even with elevation)
- Increase in adipose tissue usually starting in legs
- Reduced ambulation, decreased social activity
- Pain to the touch or pressure
- Easy bruising
- Hands and feet not affected
- Cuffs or bulges around joints (not in Type 1 or Type II Lipedema)
- Negative Stemmer sign (not in late-stage lipedema)
- Palpable spheroids in lipedema fat

As documented in my attached notes, the patient demonstrates most, if not all, of lipedema diagnostic signs. Note, per the International Consensus, a waist-height and waist-hip ratio

are not criteria for diagnosis since, as it progresses, lipedema can occur in other areas like the trunk and arms. Non-pitting edema also is present in early stages of lipedema but can be unreliable because secondary lymphedema is common as the disease progresses.

The patient has tried to manage this condition through conservative measures such as diet, exercise, compression garments and manual lymphatic drainage. The patient's functioning in their everyday life is impacted by lipedema.

Reduced caloric intake, physical activity, and even bariatric surgery do not reduce the abnormal subcutaneous lipedema tissue which likely results from the growth of a brown stem cell population with lymphatic dysfunction in lipedema. *Lipedema, a Frequently Unrecognized Problem*, Fonder & Loveless et al., Journal of the American Academy of Dermatology, 2007, 57(2), S1-S3. Thus, lipedema tissue must be surgically removed.

Lipedema is a chronic, progressive disease, which if left untreated, can lead to multiple secondary and life-threatening health problems. These include circulatory problems (due to pressure on lymph vessels); a disruption of the lymphatic system causing dangerous lymphedema; joint problems in the spine and lower extremities; and a reduction in mobility leading to impaired quality of living. *Lipedema: An Overview of its Clinical Manifestations, Diagnosis and Treatment of the Disproportional Fatty Deposition Syndrome*, Forner-Cordero & Szolnoky, Clin Obes 2012 Jun;2(3-4): 86-95.

The only successful treatment for Lipedema is lipedema surgery. This is not a cosmetic procedure but a medically necessary surgery. Following liposuction surgery, patients can resume activities, return to work, and avoid the cascade of medical and surgical issues that result from Lipedema. Ms. Amaral will be prescribed compression following surgery to assist in her healing. Multiple studies demonstrate the long-term effectiveness of lipedema surgery to relieve the pain, swelling, and immobility caused by lipedema. Also, see links to Aetna, Anthem and Premiera Blue Cross plans coverage policy on lipedema surgery that describes the diagnoses and treatment in additional detail. Highmark, Excellus, Care1st, and other smaller plans also cover lipedema.

http://www.aetna.com/cpb/medical/data/1_99/0031.html

https://www.anthem.com/dam/medpolicies/abc/active/policies/mp_pw_a050277.html

<https://www.premiera.com/medicalpolicies/7.01.567.pdf>

Please contact me if you require further information.

Thank you,

Total Lipedema Care
Tax ID: 85-2749142
NPI # 1003417833

TLC Surgical Center
TAX ID # 83-3724406
NPI: 1104469105

SURGICAL PLAN

Sandra Amaral

DOB: 02/23/1972

Diagnosis Code R60.9, M79.604, M79.605, M79.601, M79.602

Stage 1:

Lipedema reduction surgery bi-lateral lower extremity anterior

CPT Code 15879 Modifiers -50

Lipedema reduction surgery bi-lateral lower extremity anterior

CPT Code 15879 Modifiers -50

Stage 2:

Lipedema reduction surgery bi-lateral upper extremity

CPT Code 15878 Modifiers -50

Lipedema reduction surgery bi-lateral upper extremity (forearm)

CPT Code 15878 Modifiers -50

Lipedema reduction surgery trunk (buttocks) RT

CPT Code 15877

Lipedema reduction surgery trunk (buttocks) LT

CPT Code 15877

Lipedema reduction surgery trunk (hip shelf) RT

CPT Code 15877

Lipedema reduction surgery trunk (hip shelf) LT

CPT Code 15877

Lipedema reduction surgery bi-lateral lower extremity posterior

CPT Code 15879 Modifiers -50

Lipedema reduction surgery bi-lateral lower extremity posterior

CPT Code 15879 Modifiers -50

Stage 3:

Lipedema reduction surgery trunk (abdomen)

CPT Code 15877

Excision excessive skin and tissue (Paniculectomy)

CPT Code 15839

Excision excessive skin and tissue (Abdominoplasty)

CPT Code 15839

Stage 4:

Bi-lateral excision skin. / Subcutaneous tissue upper extremity

CPT code 15836-50 RT/LT

Bi-lateral excision skin. / Subcutaneous tissue lower extremity

CPT code 15832-50 RT/LT

Note that the surgical plan can change depending on how the patient responds to surgery. It will take approximately 12 months to complete this plan, so we ask for approval to reflect that time period.

Total Lipedema Care
Tax ID: 85-2749142
NPI # 1003417833
Address: 240 S. La Cienega Bl # 200
Beverly Hills CA 90211

TLC Surgical Center
NPI: 1104469105
FED TAX ID: 83-3724406
Address: 240 S. La Cienega Bl # 210
Beverly Hills CA 90211

EFFECTIVENESS OF LIPEDEMA SURGERY

There are approximately 1,000 lipedema surgeries performed every year in the United States. They are essential to improving function and reducing pain for patients suffering from this disease.

An August 2014 review of the forty-seven publications from 1982 to 2014, found agreement of the forty-seven publications from 1982 to 2014, found agreement that lipectomy is an applicable and effective treatment for chronic medical conditions such as lipedema. *Liposuction: A Surgical Tool to Improve the Quality of Life after Morbid Medical Conditions: Review of Literature*, Elkhatib HA 2014 *Anaplastology* 3:133. Lipectomy for lipedema has a definite positive and long-lasting effect. *Liposuction is an Effective Treatment for Lipedema-Results of a Study with 25 Patients*, Rapprich. Stefan, MD et al, *Journal of the German Soc of Derm*: Vol 9, (2012); p 33-40. (the majority of patients no longer require prolonged further therapy. Reduction of pain and drastic improvement in the patient's quality of life is noted in all patients.)

Liposuction has ceased to define a specific procedure and became synonymous with a surgical technique or tool the same as the surgical knife, laser, electrocautery, suture material, or even wound-dressing products. *Functional and Therapeutic Indications of Liposuction: Personal Experience and Review of the Literature*, Bishara Atiyeh 2015 *Annals of Plastic Surgery* 75(2). Liposuction results in fewer complications such as hematoma formation, skin necrosis, wound infection, and dehiscence with delayed healing and prolonged hospital stay. *Aesthetic or Functional Indications for Liposuction*, Michel Costagliola, MD et al, *Aesthetic Surgery Journal*, Volume 33, Issue 8, November 2013, Pages 1212–1213. In other words, liposuction is to surgical lipectomy what endoscopic cholecystectomy is to open surgical cholecystectomy.

Lipedema surgery decreases the mechanical stress on lymphatic vessels sufficiently to allow for the cessation of compression garment use beyond the initial postoperative period. *Long-term Outcome After Surgical Treatment of Lipedema*, Anne Warren Peled, MD, et al, *Annals of Plastic Surgery* Volume 68, Number 3, March 2012.

The international expert in lipedema, Dr. Josef Stutz, has studied the effects on the health of his patients for many years. The effects in a patient's body from the unusual gait from lipedema fat storage around the knees causes multiple joint complications. Stutz concluded that lipectomy is the only treatment that can remove the mechanical impediment to normal gait and prevent joint deterioration. *Liposuction of Lipedema for Prevention of Later Joint Complications*; Stutz, Josef MD, *Vasomed*, Vol 23 (2011).

Wollina and colleagues reported on 111 patients mostly with advanced lipedema treated by this technique in our center between 2007 and 2018. The median pain level before treatment was 7.8 and 2.2 at the end of the treatment. An improvement of mobility could be achieved in all patients. Bruising was also reduced. Serious adverse events were observed in 1.2% of procedures, the infection rate was 0% and the bleeding rate was 0.3%. Liposuction is an effective treatment for painful lipedema. *Dermatol Ther.* 2019 Mar; 32(2) In another study of 209 patients, quality of life increased significantly after surgery with a reduction of pain and swelling and decreased tendency to easy bruising. Bauer and colleagues, *New Insights on Lipedema: The Enigmatic Disease of the Peripheral Fat.* *Plast. Reconstr Surg.* 2019 Dec. 144(6)

Thus, lipedema surgery is safe, effective, and the standard of care for many, many years. Indeed, the International Consensus Conference on Lipedema issued conclusions that although lipedema has been underdiagnosed in places like the United States, multiple studies from Germany have reported long-term benefits for as long as eight years after lipedema surgery. <https://www.ncbi.nlm.nih.gov/pubmed/3135643> 3

Visit Note - August 25, 2023

PMS ID: Sex: DOB: Phone: MRN:
 115636PAT000000870 Female 02/23/1972 (831) 320-3550 MM0000000861

Medical History

Arthritis: Osteoarthritis -
 Diagnosed about 17 years ago
 Fibromyalgia: Diagnosed about
 17 years ago
 H/O: obesity: Since about 14 or
 15 years old, weight started to
 increase in thighs, calves,
 around knees and ankles
 History of anemia: Diagnosed
 about 10 years ago -
 occasionally need iron infusion
 treatments
 Lipedema: Just diagnosed a few
 months ago, but have inquired
 many times over the years, but
 my Dr's wouldn't check if I had it.
 Rheumatoid arthritis: Diagnosed
 about 17 years ago
 Sleep apnea: Diagnosed
 5/1/2023
 Forceps delivery: No

Surgical History

Hernia repair: During volvulus
 surgery - June 2022
 Roux-en-Y gastrojejunostomy:
 Sept 2000 - starting weight 265.
 Got to 180.
 Other: Volvulus (emergency
 surgery June 2022) and two
 thumb fusion surgeries (2008
 and 2010)

**Plastic Surgery
History****Plastic Surgery History**

None

**Family History of Breast
Cancer**

Do you have a family history of
 breast cancer?: No

**Family History of Malignant
Hyperthermia and Anesthesia
Sensitivity**

Do you have a family history of
 malignant hyperthermia or
 severe reactions to anesthesia?:
 No

**Herbal Medications and
Supplements**

Do you take any herbal
 medications or supplements?:
 Yes
 Vitamin D: Dr prescribed D3
 Vitamin E: Every other day for
 hot flashes
 Other: Dr prescribed Vitamin B-
 12 as well.

Chief Complaint: Lipedema Consultation

HPI: This is a 51 year old female who is being seen for a lipedema consultation for lipedema affecting the legs, thighs, arms, abdomen, pubic area, knees, and ankles.

Legs:

- Location: Anterior and Posterior
- Tenderness: Yes
- Lipomas: not sure
- Bruising: Yes
- Pain: Yes
- Cuffing: Yes
- Dimpling: Yes

Thighs:

- Location: Anterior and Posterior
- Tenderness: Yes
- Lipomas: not sure
- Bruising: Yes
- Pain: Yes
- Dimpling: Yes

Arms:

- Tenderness: Yes
- Lipomas: not sure
- Thickened Tender Subcutaneous Fat: Yes
- Spongy Adipose Tissue: not sure

Abdomen:

- Tenderness: sometimes not all the time
- Lipomas: not sure
- Thickened Tender Subcutaneous Fat: Yes
- Spongy Adipose Tissue: not sure

Pubic Area:

- Tenderness: Yes
- Lipomas: not sure
- Thickened Tender Subcutaneous Fat: Yes
- Spongy Adipose Tissue: Yes

Knees:

- Tenderness: Yes
- Lipomas: No
- Thickened Tender Subcutaneous Fat: No
- Spongy Adipose Tissue: No

Ankles:

- Tenderness: Yes
- Lipomas: could be
- Thickened Tender Subcutaneous Fat: Yes
- Spongy Adipose Tissue: Yes

Duration: 20 years

Associated Diagnoses: Varicose veins

Similarly Affected Family Members: sister

Pedicures: Yes (patient is not able to tolerate pedicure massages)

Do You Wear Boots: short ankle boots only

Lipedema Worsened By: puberty

Skin Protection

Do you wear sunscreen?: Yes
If Yes, what SPF?: 30
Do you tan in a tanning salon?: No

Family History of Melanoma

Do you have a family history of Melanoma?: No

Social History

Sexually active with one partner

Patient feels safe at home

EtOH less than 1 drink per day

Single Question Alcohol Screening: 0 days
Caffeine Use: Once a day
Exercise: A few times a week
Occupation: Manage a seed lab for an agricultural technology company
Place of Residence: Own our own home
Smoking status - Never smoker
Driving status: Drives in the Daytime
Drives at Night

Medications

Saxenda 3 mg/0.5 mL (18 mg/3 mL) Subcutaneous - pen injector
estradiol 0.1 mg/24 hr Transdermal - patch semiweekly
progesterone 100 mg/24 hr pill

Allergies

No known drug allergies

ROS

Provider reviewed on Aug 25, 2023.

A complete review of systems was performed.

No Problems With Bleeding, No Problems With Healing, No Problems With Scarring (hypertrophic Or Keloid), No Rash, No Immunosuppression, No Hay Fever, No Chest Pain, No Leg Pain With Walking, No Fever Or Chills, No Night Sweats, No Unintentional Weight Loss, No Thyroid Problems, No Sore Throat, No

Swelling Occurs With: standing, sitting, end of day, and summer
Previous Treatments: Elevation (no change) and Diet (Calorie Restriction (no change), Keto (no change), Small meals after bariatric surgery (no change), Low Carb (no change), Anti-inflammatory (no change), Mediterranean (no change), Intermittent fasting (no change), and Gastric Bypass (no change))
Difficulty Walking: Yes (trips easily and cramps, tired, heavy)
Flexibility: Very Flexible
Cooler Areas: upper arms
Easy Bruising: legs, thighs, calves, and arms
Pain: all the time (Average Pain Score: 7 out of 10), with movement (Worst Pain: 7 out of 10), when touched (Lowest Pain: 5 out of 10), and when sleeping
Ability to move a chair from one room to another: With some difficulty
Ability to bend down and pick up clothing from the floor: Without any difficulty
Ability to stand for one hour: With some difficulty
Ability to do chores such as vacuuming or yard work: With some difficulty
Ability to push open a heavy door: Without any difficulty
Ability to exercise for an hour: With much difficulty
Ability to carry a heavy object (over 10 pounds /5 kg): With a little difficulty
Ability to stand up from an armless straight chair: With a little difficulty
Ability to dress yourself, including tying shoelaces and buttoning your clothes: With a little difficulty
Ability to able to dry your back with a towel: With some difficulty
The patient understands and agrees that they must continue wearing compression garments after their surgery.

Vitals:

Date	Taken By	B.P.	Pulse	Resp.	O2 Sat.	Temp.	Ht.	Wt.	BMI	BSA
08/28/23 16:31	Skriver, Nicole						65.0 in	198.0 lbs	32.9	2
	FiO2									

* Patient Reported

Exam:

An examination was performed.

Base

Appearance: well developed and nourished
Memory: Appropriate recent and remote memory with appropriate history provision
Judgment and Insight: Appropriate judgment, insight, interpersonal dynamics and expectations of encounter and goals of treatment
Orientation: Alert and oriented to person, place, time.
Mood: Mood and affect well-adjusted, pleasant and cooperative, appropriate for clinical and encounter circumstances
Skin Inspection: Normal skin inspection without rashes or concerning lesions
Skin Palpation: Normal skin palpation without rashes or concerning lesions

Comprehensive Upper Extremity

LN Exam: Normal lymphatic exam without lymphadenopathy in cranial, cervical, axillary and inguinal regions
Right Upper arm Inspection: Vascular manifestation Left Upper arm Inspection: Vascular

Malocclusion, No Nasal Obstruction, No Blurry Vision, No Abdominal Pain, No Bloody Stool, No Constipation, No Diarrhea, No Difficulty Swallowing, No Bloody Urine, No Genital Discharge, No Joint Aches, No Muscle Weakness, No Neck Stiffness, No Headaches, No Seizures, No Facial Weakness, No Facial Numbness, No Shortness Of Breath, No Wheezing, No Bloody Sputum, No Problems With Snoring, No Anxiety, No Depression, No History Of Abuse, No Suicidality, No Difficulty With Body Image, No Anorexia, And No Bulimia.

Family History

Family history of cancer (situation)
- Mother
- Father

Other: Both Mom and Dad had lung cancer from years of smoking

such as cherry angiomas, telangiectasia, venous disease

Lipedema Nodules, Pain, Tenderness, Skin Hypothermia, Easy Bruising, No Pitting Edema Persistent Enlargement of after elevation of extremity or weight loss.

Right Forearm Inspection: forearm tenderness. Vascular manifestation such as cherry angiomas, telangiectasia, venous disease

Lipedema Nodules, Pain, Tenderness, Skin Hypothermia, Easy Bruising, No Pitting Edema Persistent Enlargement of after elevation of extremity or weight loss.

Right Hand Inspection: Normal alignment, no deformity, no tenderness, no warmth

Right Hand Stability: Stable

Right Hand Special: Normal

Digit Inspection: Negative Stemmer Sign Fingers/Toes

Right UE Peripheral Pulses: normal radial and ulnar pulses, without thrill, good capillary refill

Right UE Peripheral Sensation intact to light touch throughout peripheral nerve distributions

Coordination: Coordination normal.

Cosmetic Abdominoplasty

Appearance: overweight.

Abdominal Survey: mass, right lower quadrant, mass, left lower quadrant, tenderness, right lower quadrant, and tenderness, left lower quadrant Superficial masses and tenderness c/w Lipedema Nodules, Pain, Tenderness, Skin Hypothermia, Easy Bruising, No Pitting Edema

Hernia Exam: Normal abdominal wall without hernias or bulges

Respiratory Effort: Normal respiratory effort without labored breathing or accessory muscle use

Right LE Peripheral Pulses: normal femoral, posterior tibialis and dorsal pedis pulses, brisk capillary refill

Comprehensive Lower Extremity

manifestation such as cherry angiomas, telangiectasia, venous disease Lipedema Nodules, Pain, Tenderness, Skin Hypothermia, Easy Bruising, No Pitting Edema Persistent Enlargement of after elevation of extremity or weight loss.

Left Forearm Inspection: forearm tenderness. Vascular manifestation such as cherry angiomas, telangiectasia, venous disease Lipedema Nodules, Pain, Tenderness, Skin Hypothermia, Easy Bruising, No Pitting Edema Persistent Enlargement of after elevation of extremity or weight loss.

Left Hand Inspection: Normal alignment, no deformity, no tenderness, no warmth

Left Hand Stability: Stable

Left Hand Special: Normal

Left UE Peripheral Pulses: normal radial and ulnar pulses, without thrill, good capillary refill

Left UE Peripheral Sensation intact to light touch throughout peripheral nerve distributions

Left LE Peripheral Pulses: normal posterior tibialis and dorsal pedis pulses, brisk capillary refill

Visit Note - August 25, 2023

PMS ID: Sex: DOB: Phone: MRN:
 115636PAT000000870 Female 02/23/1972 (831) 320-3550 MM0000000861

Gait: **scissor.**

Right Thigh Inspection: **Vascular manifestation such as cherry angiomas, telangiectasia, venous disease Lipedema Nodules, Pain, Tenderness, Skin Hypothermia, Easy Bruising, No Pitting Edema, Persistent Enlargement of after elevation of extremity or weight loss Persistent Enlargement of after elevation of extremity or weight loss.**

Right Knee Inspection: **valgus alignment. Medial Lobules, Tissue Overhanging or Covering Knee.**

Right Leg Inspection: **Vascular manifestation such as cherry angiomas, telangiectasia, venous disease Lipedema Nodules, Pain, Tenderness, Skin Hypothermia, Easy Bruising, No Pitting Edema Persistent Enlargement of after elevation of extremity or weight loss.**

Right Ankle Inspection: **varus hindfoot. Ankle Cuff.**

Right LE Sensation intact to light touch throughout peripheral nerve distributions

Left Thigh Inspection: **Vascular manifestation such as cherry angiomas, telangiectasia, venous disease Lipedema Nodules, Pain, Tenderness, Skin Hypothermia, Easy Bruising, No Pitting Edema, Persistent Enlargement of after elevation of extremity or weight loss Persistent Enlargement of after elevation of extremity or weight loss.**

Left Knee Inspection: **valgus alignment. Medial Lobules, Tissue Overhanging or Covering Knee.**

Left Leg Inspection: **Vascular manifestation such as cherry angiomas, telangiectasia, venous disease Lipedema Nodules, Pain, Tenderness, Skin Hypothermia, Easy Bruising, No Pitting Edema Persistent Enlargement of after elevation of extremity or weight loss.**

Left Ankle Inspection: **varus hindfoot. Ankle Cuff.**

Left LE Sensation intact to light touch throughout peripheral nerve distributions

Peripheral Vascular

Lower Extremity Venous:

Right Lower Extremity Venous: **edema, severe**

Left Lower Extremity Venous: **edema, severe**

Impression/Plan:

1. Lipedema: Associated diagnoses: Localized Adiposity, Obesity, Subcutaneous Fat, Varicose veins of bilateral lower extremities with pain, Lymphedema, not elsewhere classified, and Edema, unspecified

Plan: Counseling - Lipedema

I counseled the patient regarding the following:

Skin care: Treatments include diet, exercise, and compression. If there is associated lymphedema, patients can benefit from manual lymphatic drainage. Liposuction has also been used to treat this condition.

Expectations: Lipedema is a chronic condition characterized by excessive fat deposits on the legs, thighs, and buttocks. It can also affect the upper arms. The condition can be painful and can cause easy bruising. The cause is unknown. It may be genetic and because the condition affects almost exclusively women, it has been postulated that hormones may play a role in development of the condition.

Visit Note - August 25, 2023

PMS ID: Sex: DOB: Phone: MRN:
115636PAT000000870 Female 02/23/1972 (831) 320-3550 MM0000000861

Contact office if: Lipedema causes pain or discomfort.

Lipedema is a chronic disease presenting in women during puberty or other times of hormonal, weight and/or shape change such as pregnancy or menopause, characterized by symmetric enlargement of nodular, painful deposition of inflamed and fibrotic subcutaneous adipose tissue. Lipedema was first named as a medical condition in 1940 at the Mayo Clinic¹ and in Germany.² The diagnosis of lipedema is largely clinical and based on criteria initially established in 1951 by Drs. Wold, Allen and Hines.³ Lipedema starts in the lower extremities leading to circumferential bilateral lower extremity enlargement typically seen extending from the below the umbilicus to the ankles resulting in edema, pain and bruising; with secondary lymphedema, fibrosis and spreading of abnormal tissues to the trunk and arms occurs during later stages. Unfortunately as the lipedema tissue grows, the deep fascia and muscle are also affected reducing the function of the lymphatic pump.

Lipedema is a hereditary disease and recently the first mutated gene AKR1C1 was discovered resulting in a slower and less efficient reduction of progesterone to hydroxyprogesterone and increased subcutaneous fat deposition in variant carriers, confirming hormones as important in lipedema.⁴ Lipedema also clearly manifests as a connective tissue disorder characterized by loss of elasticity in the skin⁵ and the aorta,⁶ hypertrophic adipocytes, inflammatory cells, and dilated leaky blood and lymphatic vessels.^{7, 8}

She has lipedema in her legs, arms and trunk that includes nodules and pain in these areas. Her hands, feet, and upper trunk have been spared. She has other signs of lipedema including a negative Stemmer's sign and abnormal fat pad development, disproportion, pain and dysmobility.

She also might be developing early stages of lipo-lymphedema and thus her lipedema needs to be treated.] She has tried conservative measures for many months and while conservative therapies can reduce swelling and pain for a short time, removing the diseased tissue with surgery is necessary to reduce symptoms and progression long-term.

Lipedema is distinct from non-lipedema obesity, although some, not all, patients can be obese. The adipose tissue accumulation is bilateral and symmetrical in the extremities, with the feet and hands spared from lipedema fat accumulation unless there is loss of elasticity as in hypermobile Ehlers Danlos where the skin has lost elasticity and fat can grow on the hand (with or without obesity). A hallmark of earlier stages of lipedema is the discrepancy in fatty tissue of the extremities compared to the trunk. This is in contrast to the fat associated with lifestyle-induced obesity, which is usually global and proportionate, affecting the abdomen equal or greater than the hips.

Women with lipedema find it difficult to lose weight before a needed surgery or other procedures. There is a significant number of women with lipedema who have failed bariatric surgery because they were already controlling their diet but just not losing weight.⁹⁻¹¹

Besides the many painful nodules that women with lipedema have, studies indicate that women with lipedema do not have the muscle strength like people who have non-lipedema obesity, are subject to more injuries and have poorer functional capacity.¹² Thus, to improve function and reduce pain, lipedema surgery is recommended.¹³

I counseled the patient regarding the following:

Lipodystrophy Care: Cosmetic body contour dissatisfaction may be due to excess skin, stretch marks, bulging, fat excess, muscle weakness, and other complaints. Abdominoplasty, liposuction and other body contouring techniques are performed to help correct these issues. Surgery is commonly performed on an outpatient basis, although overnight hospitalization may be indicated in some patients, particularly those undergoing large body contouring operations. Aesthetic body contouring deformities may improve somewhat with diet control, exercise, rest, and proper skin care, including avoidance of excess sun and abstinence from nicotine. Specific preoperative and postoperative instructions will be provided for surgery.

Expectations: Body contour aesthetic concerns may be the result of obesity or overweight, pregnancy, genetic factors, sun damage, prior surgery, hernias, and other factors. Aesthetic surgery for these concerns is generally not performed for the purposes of weight loss. Rather, overweight patients are advised to lose weight in a controlled, supervised manner until a maintainable plateau weight is achieved before undergoing body contouring operations, in order to optimize results and reduce surgical risks. Liposuction often does not correct wrinkling, roundness, or laxity or fullness on the abdomen or other body locations. Liposuction is also performed for contouring purposes, rather than weight loss intent. Skin retraction may not be complete with liposuction, and excess skin may require surgical removal for full correction. Use of garments after surgery is advised and instructions will be provided. Risks, benefits, expectations and alternatives to liposuction have been explained in detail, including, but not limited to, the risks of infection, bleeding, injury to nerves or abdominal organs, bulging, contour irregularities, inadequate skin retraction, persistent deformity, seromas, deep venous thrombosis, pulmonary embolism, fat embolism, scarring, delayed healing, and other risks. Aftercare and possible use of drains have been explained. No guarantee or warranty regarding cosmetic outcome or longevity of results was given or implied.

Contact office if: the patient develops concerning symptoms such as severe abdominal pain, nausea, vomiting, diarrhea, fever, excessive or unusual drainage, swelling, redness, difficulty breathing, bleeding, or other concerning symptoms. Please contact the office if additional procedures or a change to the recommended treatment plan are desired. Fees for cosmetic procedures are valid for a limited time, as specified on the fee schedule, and are subject to change at the practice's discretion. Please contact the office with any questions regarding fee schedule, payment policy, product concerns, or preoperative and postoperative questions. The risks, benefits, expectations and alternatives of liposuction were discussed and include but are not limited to: infection, bruising, lumpiness, pain, anesthesia reaction, dysesthesia, scarring in treatment area or puncture point, vasovagal reactions,

tachycardia, nausea, necrosis, ulceration, color change and asymmetry.

I discussed the following surgical options with the patient:

Abdominoplasty: Abdominoplasty is the medical term for what is commonly referred to as a tummy tuck. It is a procedure performed to remove excess skin and draping fat from the lower abdomen. It is performed for the purpose of body contouring, not for the purpose of helping patients lose weight. While tissue removed during the procedure has some weight, the procedure is strictly not a procedure for weight loss. Patients seeking to lose weight are best suited by losing the weight through supervised diet and exercise until a stable, more desirable weight is achieved and maintained prior to the surgery. Abdominoplasty is performed through an incision low in the abdomen, usually in the same crease as a C-section would be performed in the suprapubic crease. The skin and fat are undermined off the muscle layer and the muscle layer is typically tightened with a plication procedure. An incision is also performed around the belly button (umbilicus) to allow it to be repositioned when the skin is redraped. After release, the excess tissues are removed and the belly button is delivered through a hole in the tightened skin. Typically, the hole created for release of the umbilicus is within the skin that is ultimately removed. However, in some cases, the hole must be closed and results in a small scar in the lower abdomen below the new hole created for delivery of the belly button. Drains may be used to evacuate fluid from under the fat layer to permit healing. They are usually removed within the first 10-14 days. A postoperative garment and/or binder will be required for several weeks to 2 months to aid in shaping. The scar will usually go through changes over the course of 6-12 months before final maturity. Scar revisions are occasionally required. Placement of the surgical incisions may be aided by the patient bringing typical swimwear, which can help to optimize concealment of the scar. Early ambulation after surgery is important to reduce risks of blood clot formation.

Back Lift: A Back Lift involves removal of adipose tissue and skin. Significant incisions may be required to remove redundant skin. The risks, benefits, expectations and alternatives (including incisional approaches and minimally invasive or noninvasive techniques) have been discussed and include, but are not limited to, the risks of infection, bleeding, injury to nerves/vessels/other structures, contour irregularities, asymmetry, fat necrosis, delayed healing, visible scarring, dissatisfaction with cosmetic outcome and possibility of unplanned return to the operating room. All questions were answered to the patient's satisfaction. No guarantee or warranty was given or implied regarding cosmetic outcome, longevity of results, or satisfaction therewith.

Brachioplasty: Brachioplasty involves removal of the redundant skin, and some excess fat, on the upper arm. The incision is either fashioned along the inner arm seam, or along the back of the arm, and it may be extended into the axilla (armpit) area. It may traverse the length of the upper arm all the way to (and even beyond) the elbow crease. The excess skin is removed and the remaining skin is closed together to improve the cylindrical shape of the arm. Care is paid to avoid overresection of skin in order to reduce the risk of inability to close the incision completely at the time of surgery, which is a possibility with significant skin removal when the skin swells. The incision may be numb and may take 3-5 weeks to heal to closure. Scar maturation may take 6-12 months. Drains may be used for up to 10-14 days in many patients.

Breast Reduction: Breast reduction involves removal of breast tissue and skin. Significant incisions may be required to remove redundant skin. The risks, benefits, expectations and alternatives to breast reduction (including incisional approaches and pedicle selection) have been discussed and include, but are not limited to, the risks of infection, bleeding, injury to nerves/vessels/other structures, contour irregularities, asymmetry, fat necrosis, nipple loss, loss of nipple sensation, delayed healing, visible scarring, dissatisfaction with cosmetic outcome and possibility of unplanned return to the operating room. All questions were answered to the patient's satisfaction. No guarantee or warranty was given or implied regarding cosmetic outcome, longevity of results, or satisfaction therewith.

Fleur-de-Lis Technique: The fleur-de-lis technique involves both horizontal and vertical incisions resulting in an inverted-T shaped scar. This variant of abdominoplasty design is appropriate for many patients with massive weight loss, who have excess skin and fat in both horizontal and vertical directions. The vertical scar is not easily concealable in two-piece bathing garments but may be a reasonable trade-off for many patients in order to secure a better overall contour and correction of skin redundancy. Healing may take 1-2 weeks longer than what would otherwise be required for standard abdominoplasty incisions.

Liposuction: Liposuction may improve contour irregularities and volume excesses. Tumescence fluid with local anesthetics and other medications is used to reduce postoperative bleeding and pain. Fat removal may be enhanced by ultrasound, Vaser, power or other assisted techniques. Repeated sessions of liposuction may be required. Liposuction is a procedure to contour the body's shape, not to help the patient lose weight. A very small amount of weight may be lost as a result of the suctioning of fat, but sustained weight improvement requires attention to diet and exercise. Under no circumstances should the patient expect liposuction to create significant weight loss through the surgery itself. The risks, benefits, expectations and alternatives to liposuction have been discussed and include, but are not limited to, the risks of infection, bleeding, injury to nerves/vessels/other structures, contour irregularities, asymmetry, fat necrosis, nipple loss, loss of nipple sensation, delayed healing, visible scarring, dissatisfaction with cosmetic outcome and possibility of unplanned return to the operating room. All questions were answered to the

patient's satisfaction.

Lower Body Lift: A lower body lift is an extensive technique that includes abdominoplasty, often combined with circumferential correction of excess skin on the back (belt lipectomy or circumferential torsoplasty), as well as bilateral medial and lateral thigh lifting. Incisions include the standard abdominoplasty incision as well as scars on the inner thighs, and a possible extension of the abdominal scar all the way around the back. This procedure is often performed on a hospital setting where overnight hospitalization can be offered, due to the typical length of surgery and extent of incisions. Delayed healing, seromas and scars are common issues with this operation, but the resultant improvement in body contour is often rather dramatic. Early ambulation after surgery is important to reduce risks of blood clot formation. Multiple drains are usually required.

Medial Thigh Lift: A medial thigh lift is a procedure done to remove excess skin on the thighs, and may be combined with abdominoplasty or body lifting (belt lipectomy or circumferential torsoplasty). Incisions are made on the inner thighs, and may be confined to the groin creases in some cases, though many patients require extensions of the incisions down the thigh to remove the excess properly. When combined with body lifting, incisions also include a lower abdominal incision and a possible extension of the abdominal scar all the way around the back. Standard medial thigh lifting may be performed on an outpatient basis, usually under general anesthesia. Delayed healing, seromas, numbness in the thighs and scars are common issues with this operation, but the resultant improvement in body contour is often rather dramatic. Concealment of scars may be difficult in shorts, skirts or bathing suits. Early ambulation after surgery is important to reduce risks of blood clot formation. Drains are often in place for 10-14 days, although some patients require longer periods of drainage due to proximity of the thigh lymphatic vessels to the treatment area. The postoperative garments can also help significantly reduce the fluid accumulation.

Panniculectomy: Panniculectomy is a procedure involving removal of the excess apron of skin and fat below the belly button. In contrast to abdominoplasty, it usually does not involve undermining of the skin well above the belly button. In addition, muscle plication of the abdominal wall may not be performed in panniculectomy. Panniculectomy may be required medically in patients with severe recurrent infections or rashes in the crease below the pannus. Delayed healing and fluid collections are not uncommon. Risks also include, but are not limited to, infection, bleeding, deep venous thrombosis (blood clots), scarring, persistent excess tissue, cosmetic dissatisfaction, and other risks.

Power-Assisted Liposuction: Power-assistance involves the use of a power source to oscillate the suction cannula device to reduce manual effort for the surgeon. In other respects, it is similar to standard liposuction.

Lipodystrophy Option Other: Lipedema Reduction Surgery with Lymphatic Sparing Liposuction (LSL) and Manual Lipedema Extraction (MLE)

LRS surgical stage options:

Anterior thighs - 15879-50-22

Anterior legs - 15879-50-22

Abdomen - 15877-22

Arms - 15878-50-22

Buttock Shelf/Hips 15877-22

Posterior Thighs - 15879-50-22

Posterior Legs - 15879-50-22

Paniculectomy - 15839

Arm lift - 15836-50-22

Thigh lift - 15832-50-22

After counseling, we decided on the following plan: Power-Assisted Liposuction and Lipodystrophy Option Other and LRS surgical stages:

1. Anterior thighs - 15879-50-22
1. Anterior legs - 15879-50-22

2. Arms - 15878-50-22
2. Buttock Shelf/Hips 15877-22
2. Posterior Thighs - 15879-50-22
2. Posterior Legs - 15879-50-22

3. Abdomen - 15877-22
3. Paniculectomy - 15839
3. Abdominoplasty

Visit Note - August 25, 2023

PMS ID: Sex: DOB: Phone: MRN:
115636PAT000000870 Female 02/23/1972 (831) 320-3550 MM0000000861

- 4. Arm lift - 15836-50-22
- 4. Thigh lift - 15832-50-22

I discussed the following miscellaneous information with the patient:

Nicotine Abstinence: I counseled regarding the risks of nicotine exposure, including delayed healing, infection, perioperative cardiovascular events and possible need for extended wound care or return to surgery.

Imaging Studies: Imaging studies including CT scans or MRI's may be appropriate to help determine the extent of deformity or to rule out hernias, and to help guide treatment.

Follow up PRN for: Preoperative Appointment, Discussion of Procedure, Additional Consultation, Preoperative Marking

Staff:

Jaime Schwartz (Primary Provider) (Bill Under)

Electronically Signed By: Jaime Schwartz, 09/19/2023 12:18 PM PDT

Sandra Amaral
6 Catalina Avenue
Salinas, CA 93901
831-320-3550
justsan@pacbell.net

September 1, 2023

To Whom It May Concern:

I was recently diagnosed with Lipedema by Dr. Robert Fernandez in early 2023. My legs were normal size when I was a kid. Once puberty arrived, I slowly started to get bigger thighs, calves and ankles. Over the years, my legs got increasingly heavier feeling and I started to feel intense pain and lots of unexplained bruising would occur. I just thought it was normal for being overweight.

My self confidence was next to nothing, I was always afraid to say or do anything due to my size, I was completely embarrassed and would ask why my diets wouldn't work to decrease the fat in my legs. I could lose weight with no real issue in my upper body, but never in my lower body. Walking around is painful, I love to hike, but after about half a mile, my legs feel like I'm dragging them I'm so tired trying to continue to walk up hills.

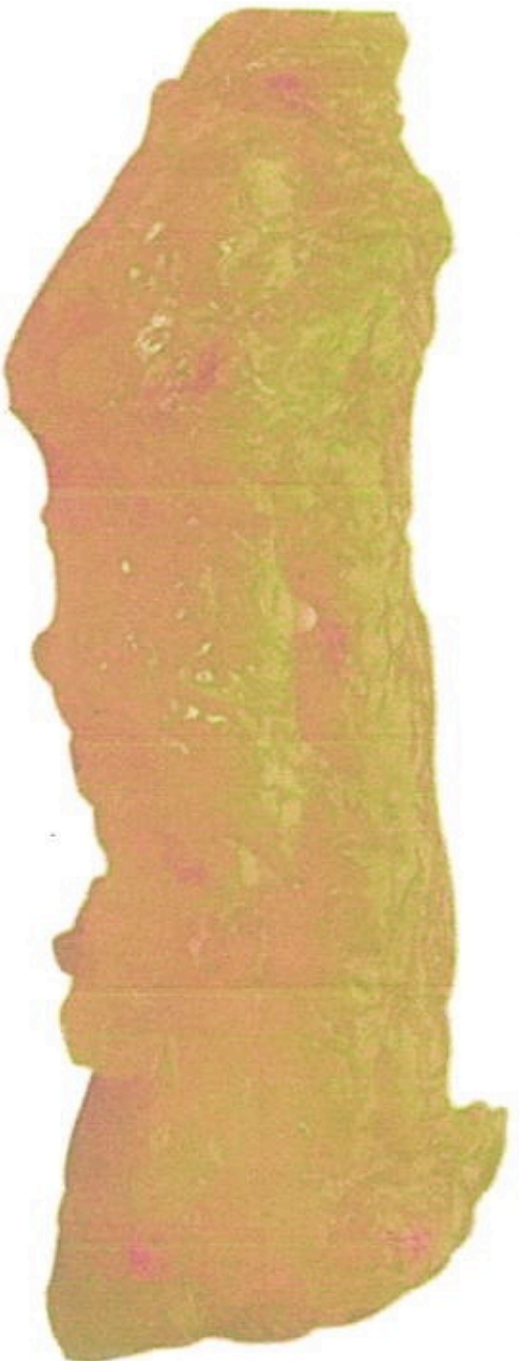
I have gone on some pretty extreme diets to try and lose the weight, from fad diet pills to starving myself. I've drank an enormous amount of water to detoxify my body of the toxins that prevent me from losing the weight. Fad soup diets, smoothies, signed up with personal trainers, would exercise 7 days a week. I went to a Dr that specialized in weight loss using low carb. I lost 65 pounds and my legs never changed, but I looked almost anorexic on my upper body. It can be disheartening when you can't do what everyone else is doing, or always being the biggest person that can't fit into a seat very comfortably. To be able to get the necessary surgeries in order to feel better and start living a better life, its what I can only hope for.

Dr. Robert Fernandez referred me to a surgeon at Stanford, from which I started the process of getting a pre-authorization for surgery. Aetna did approve me for surgery, and it is preapproved for 2024. After the approval process, due to not feeling comfortable with the way surgery happens at Stanford, and not feeling comfortable with the staff, I chose to look at other surgeons in California, in which I found Dr. Schwartz, so we are starting the pre-authorization process over again.

Thank you for your consideration,

Sandra Amaral

Normal fat



Lipedema fat



Liposuction in the Treatment of Lipedema: A Longitudinal Study

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Background Lipedema is a condition consisting of painful bilateral increases in subcutaneous fat and interstitial fluid in the limbs with secondary lymphedema and fibrosis during later stages. Combined decongestive therapy (CDT) is the standard of care in most countries. Since the introduction of tumescent technique, liposuction has been used as a surgical treatment option. The aim of this study was to determine the outcome of liposuction used as treatment for lipedema.

Methods Twenty-five patients who received 72 liposuction procedures for the treatment of lipedema completed a standardized questionnaire. Lipedema-associated complaints and the need for CDT were assessed for the preoperative period and during 2 separate postoperative follow-ups using a visual analog scale and a composite CDT score. The mean follow-up times for the first postoperative follow-up and the second postoperative follow-up were 16 months and 37 months, respectively.

Results Patients showed significant reductions in spontaneous pain, sensitivity to pressure, feeling of tension, bruising, cosmetic impairment, and general impairment to quality of life from the preoperative period to the first postoperative follow-up, and these results remained consistent until the second postoperative follow-up. A comparison of the preoperative period to the last postoperative follow-up, after 4 patients without full preoperative CDT were excluded from the analysis, indicated that the need for CDT was reduced significantly. An analysis of the different stages of the disease also indicated that better and more sustainable results could be achieved if patients were treated in earlier stages.

Conclusions Liposuction is effective in the treatment of lipedema and leads to an improvement in quality of life and a decrease in the need for conservative therapy.

Keywords Lipedema; Lipoedema; Lipectomy

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This article was presented the annual meeting of the German Society of Plastic, Reconstructive and Aesthetic Surgeons (DGPRAC) that was held from October 1, 2015 to October 3, 2015 in Berlin, Germany.

No potential conflict of interest relevant to this article was reported.

Received: 24 Jan 2017 • Revised: 27 Apr 2017 • Accepted: 10 May 2017

pISSN: 2234-6163 • eISSN: 2234-6171 • <https://doi.org/10.5999/aps.2017.44.4.324> • Arch Plast Surg 2017;44:324-331

INTRODUCTION

Lipedema was first described by Allen and Hines as a condition

consisting of a pathological increase in subcutaneous fat and edema in the lower limb [1]. It almost exclusively affects women, and there are very few published case reports of men with li-

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pedema [2]. Lipedema shows familial clustering; one study proposed an autosomal dominant inheritance with sex limitation [3].

Clinically, lipedema can be characterized in most cases as a chronic disease that begins in puberty and takes a progressive course. Typically, there is a symmetric increase in subcutaneous fat in the upper and lower legs due to both hyperplasia and hypertrophy [4], which can be seen through magnetic resonance imaging or computed tomography [5,6]. The feet are spared, so there is an excess of fat at the ankle, also known as the "inverse shouldering effect." The upper limb is affected in up to 30% of cases, however it is rarely affected in isolation [7].

In addition to the increase in subcutaneous fat, there is an increase in capillary permeability and fragility, resulting in both extravasation of fluid and easy bruising [8]. Evidence has also been found of morphologic changes in the lymphatic system, such as microaneurysms; however, the pathophysiological significance remains unclear [9].

In contrast to primary lymphedema, the lymphatic system remains unimpaired in the initial stages of lipedema and can keep up with the increased amount of interstitial fluid [4]. Accordingly, lymphoscintigraphy has shown increased lymphatic transport in some patients [10]. During the later stages of lipedema, the amount of fluid produced exceeds the transport capacity of the lymphatic system, and the pressure of the fat tissue itself causes obstruction of the lymphatic vessels, resulting in secondary lymphedema [10,11]. Additionally, the deposition of protein-rich edema causes fibrosis of the tissue, further impairing lymphatic drainage. The term "lipolymphedema" is used to describe the combined pathology during these stages.

It is known that deposition of fat is positively correlated with stasis of blood and lymphatic fluid [12]. Therefore, a mutual interaction between adipose tissue and the lymphatic system exists.

Lipedema is diagnosed based on a clinical examination and anamnesis. Patients typically show disproportionality between a normal upper body and symmetrically enlarged lower limbs, and this is often accompanied by elevated body mass index (BMI) levels. Furthermore, the amount of fat in the affected areas is almost entirely unaffected by physical activity or dietary measures.

Typical clinical complaints include feeling of tension, pain upon pressure, and easy bruising. These symptoms are important in the differential diagnosis of lipedema, particularly in the common case where lipedema and obesity are present at the same time.

Lipedema can be classified into 3 clinical stages based on morphological appearance [13]: Stage I, a smooth skin surface with

homogenous thickening of the subcutis; Stage II, a bumpy, wave-like skin surface with nodular structures in the thickened subcutis; Stage III, an increase in nodular changes and overhanging masses of tissue.

The condition is a major psychosocial burden for most patients, causing pain that often limits their capacity for exercise. In addition, standing for long periods of time and high temperatures are not tolerated well by those with lipedema, and in severe cases, the condition may cause absence from work or lead to occupational disability.

The most widely applied therapy for lipedema is combined decongestive therapy (CDT), which consists mainly of manual lymphatic drainage and wearing compression garments. It aims to reduce orthostatic edema and limit recurrence.

Classic dry liposuction cannot be applied to lipedema patients due to the potential injury to lymphatic vessels. However, the introduction of the tumescent technique in the 1980s has made the application of liposuction possible. Cadaver studies have shown markedly reduced injury to lymphatic structures when the tumescent technique was used [14].

In 1994, Rudkin and Miller [15] described liposuction in combination with skin and subcutaneous fat excisions as a treatment option for lipedema, in contrast to lymphedema. In 2002, liposuction alone was presented as a method to surgically reduce the pathological increase in subcutaneous fat [15-17].

The literature on lipedema, in general, is limited. Most articles are in German and fall under the disciplines of dermatology or phlebology. The present study aimed to examine the long-term results of liposuction in patients with lipedema who were treated in our plastic surgery clinic.

METHODS

From July 2010 to July 2013, 33 female patients received a total of 104 liposuction procedures in our clinic as treatment for lipedema. Patients were classified preoperatively into the 3 clinical stages described above.

At the end of 2013, these patients received a standardized questionnaire composed of 18 items. Visual analog scales (VAS) from 0 to 10 in increments of 0.5 were used to assess the severity of spontaneous pain, pain upon pressure, feeling of tension, bruising, cosmetic impairment, and general impairment of quality of life before and after liposuction treatment. Questions were also asked regarding weight, the frequency of manual lymphatic drainage per month, and the number of hours per day the patient wore compression garments. These last two values were added together to give a CDT score. In 2015, the assessment was repeated using the same questions but assessed only the

current state of the patients' symptoms.

Twenty-five patients responded in 2013 and were included in this study, and all 25 patients were available for follow-up in 2015.

The first postoperative follow-up was performed between 4 and 34 months after patients received their last liposuction procedure, with a mean follow-up time of 16 months. The second postoperative follow-up was performed between 25 and 56 months after the last liposuction procedure, with a mean follow-up time of 37 months.

For each patient, lipedema diagnosis had been clinically confirmed by a lymphologist, ruling out other lymphatic diseases. Each procedure was covered by health insurance after a medical proposal was accepted, and the patient had typically already received at least 6 months of CDT without improvement of symptoms.

Tumescent liposuction was performed using saline with epinephrine (1:1,000,000) after obtaining informed consent. All liposuctions were performed as inpatient procedures, and general anesthesia was used during the multi-hour procedures to increase patient comfort and reduce operation time. Antibiotics were administered as a single shot for perioperative prophylaxis

only.

Patients were told to bring their compression garments, which were put on immediately after liposuction. New garments were measured 3 weeks after liposuction and after swelling had decreased, and manual lymphatic drainage was allowed after postoperative day 2.

Statistical analyses of complaint severity and the CDT score were performed in SPSS ver. 21.0 for Mac (IBM Corp., Armonk, NY, USA) using repeated-measures analysis of variance (ANOVA) with the Bonferroni correction after meeting the criteria of the Mauchly test of sphericity. All the tests were 2-sided, with $\alpha = 0.05$ and $P < 0.05$ considered statistically significant.

RESULTS

The age at the first performed liposuction ranged from 23 to 64 years, with a median of 45 years. BMI upon presentation ranged from 24.5 to 50.6 kg/m², with a mean of 35.3 kg/m². After treatment, BMI ranged from 22.7 to 47.2 kg/m², with a mean of 33.9 kg/m².

All patients had lipedema of the lower limb. Additional upper limb involvement was present in 9 patients (36%). One patient

Table 1: Results from the analysis of the questionnaires (n=25)

Measured variable	Preoperative		Postoperative 1		Postoperative 2	
	Mean	SD	Mean	SD	Mean	SD
Complaints ^a						
Spontaneous pain	7.20	1.46	3.70	1.79	4.28	2.10
Stage II (n = 11)	7.00	1.40	3.36	2.01	4.00	2.18
Stage III (n = 13)	7.54	1.44	4.12	1.58	4.61	2.13
Sensitivity to pressure	7.38	1.79	3.98	1.83	4.42	2.08
Stage II (n = 11)	7.05	1.29	3.50	1.97	3.82	2.27
Stage III (n = 13)	7.77	1.56	4.46	1.71	4.81	1.90
Feeling of tension	7.52	1.36	3.26	2.28	4.06	2.18
Stage II (n = 11)	7.09	1.00	3.14	2.47	4.00	2.35
Stage III (n = 13)	8.08	1.35	3.62	2.07	4.35	2.01
Bruising	6.96	1.58	4.36	1.91	4.64	1.83
Stage II (n = 11)	6.82	1.54	3.86	1.78	4.46	1.89
Stage III (n = 13)	7.15	1.70	4.65	2.03	4.66	1.85
Cosmetic impairment	8.98	0.81	5.10	1.93	7.36	1.66
Stage II (n = 11)	8.68	0.72	4.55	1.97	6.96	1.52
Stage III (n = 13)	9.31	0.78	5.58	1.91	7.85	1.69
Impairment to quality of life	8.38	1.06	4.30	1.80	5.16	1.60
Stage II (n = 11)	8.22	1.35	4.09	2.12	4.64	1.89
Stage III (n = 13)	8.62	0.71	4.42	1.63	5.46	1.23
CDT score ^b	20.48	4.13	16.38	6.97	13.90	7.32
Stage II (n = 9)	21.22	4.58	13.33	9.15	12.00	9.89
Stage III (n = 11)	19.91	4.06	18.55	3.93	14.90	4.57

SD, standard deviation; CDT, combined decongestive therapy.

^aVisual analog scale of symptom severity ranging from 0 to 10 in increments of 0.5, with 10 being the most severe; ^bThe CDT score was calculated as the sum of the number of manual lymphatic drainage sessions per month and the number of hours spent wearing compression garments per day. Four patients were excluded who did not receive full CDT preoperatively.

had stage I lipedema, 11 patients had stage II lipedema, and 13 patients had stage III lipedema.

On average, patients received 3 procedures, with a range of 1 to 7 procedures. A total of 72 liposuctions were performed on the 25 patients. In 41 liposuctions, a vibration-assisted device was used, and in 31 liposuctions, a water jet-assisted device was used.

The operation time, which included infiltration, was 116 minutes on average and ranged from 58 to 251 minutes.

The mean volume of removed fat per liposuction was 3,106 mL (range, 1,450–6,600 mL) and the mean volume of total removed fat per patient was 9,914 mL (range, 4,000–19,850 mL).

One patient developed erysipelas after liposuction, which required antibiotic treatment. However, there were no other complications during the study period. Therefore, the complication rate was 1.39%.

Complaints

Table 1 shows that patients reported substantial lipedema-associated complaints preoperatively. Spontaneous pain was reported with a mean VAS score of 7.2 (standard deviation [SD], 1.46); the equivalent of “severe” to “very severe” spontaneous pain. Sensitivity to pressure and feeling of tension were reported with mean VAS scores of 7.38 (SD, 1.79) and 7.52 (SD, 1.36), respectively, falling within the “very severe” range. The reported cosmetic impairment ranged from “severe” to “unbearable,” resulting in a mean VAS score of 8.98 (SD, 0.81). General impairment to quality of life was also reported as “very severe,” with a mean VAS score of 8.38 (SD, 1.06).

Fig. 1 shows that the severity of all analyzed complaints was significantly reduced over the course of liposuction treatment by the time of the first postoperative follow-up. All but 1 of the patients reported a reduction in spontaneous pain (the chief complaint in lipedema), with a mean difference in VAS score of 3.5 (95% confidence interval [CI], 2.83–4.17). Furthermore, all but 1 of the patients reported a reduction in impairment of quality of life, with a mean difference in VAS score of 4.08 (95% CI, 3.12–5.04).

The Bonferroni-corrected P-value was <0.001 for all 6 complaints. At the second postoperative follow-up, only the severity of cosmetic impairment significantly increased since the first postoperative follow-up, and there was significant improvement in all symptoms between the preoperative period and the second postoperative follow-up. Fig. 2 shows a comparative subgroup analysis of general impairment to quality of life for patients with stage II lipedema and stage III lipedema. This symptom was chosen for analysis because it was the most important complaint. While a significant reduction in the severity of the

complaint from the preoperative period to the first postoperative follow-up was observed for both stage II and stage III patients, only stage III patients experienced a significant increase in the severity of the complaint from the first postoperative follow-up to the second postoperative follow-up.

Conservative therapy

Three patients did not wear compression garments preoperatively and only started wearing them after liposuction in order to retain the results of the treatment. One patient who did not receive manual lymphatic drainage preoperatively received it postoperatively. Twenty-one patients regularly received manual lymphatic drainage and wore compression garments preoperatively. For these patients, CDT scores were calculated as the sum of manual lymphatic drainage sessions per month and hours spent wearing compression garments per day.

At the second postoperative follow-up, the CDT scores of 14 patients had decreased after liposuction treatment, with 3 patients no longer in need of further conservative therapy. Three patients showed no change in their CDT scores, while 4 patients showed an increase in their CDT scores.

For all patients who received full CDT preoperatively, the mean CDT score had decreased from 20.48 (SD, 4.13) during the preoperative period to 16.38 (SD, 6.97) during the first postoperative follow-up, and then decreased further to 13.9 (SD, 7.32) during the second postoperative follow-up. Fig. 2 shows that in the repeated-measures ANOVA, only the reduction in CDT score from the preoperative period to the second postoperative follow-up was found to be significant ($P = 0.011$).

A comparative subgroup analysis of patients with stage II lipedema and stage III lipedema showed a significant decrease in the CDT score from the preoperative period to the second postoperative follow-up for stage II patients only. The reduction in CDT score from the preoperative period to the second postoperative follow-up for stage III patients was barely non-significant ($P = 0.051$).

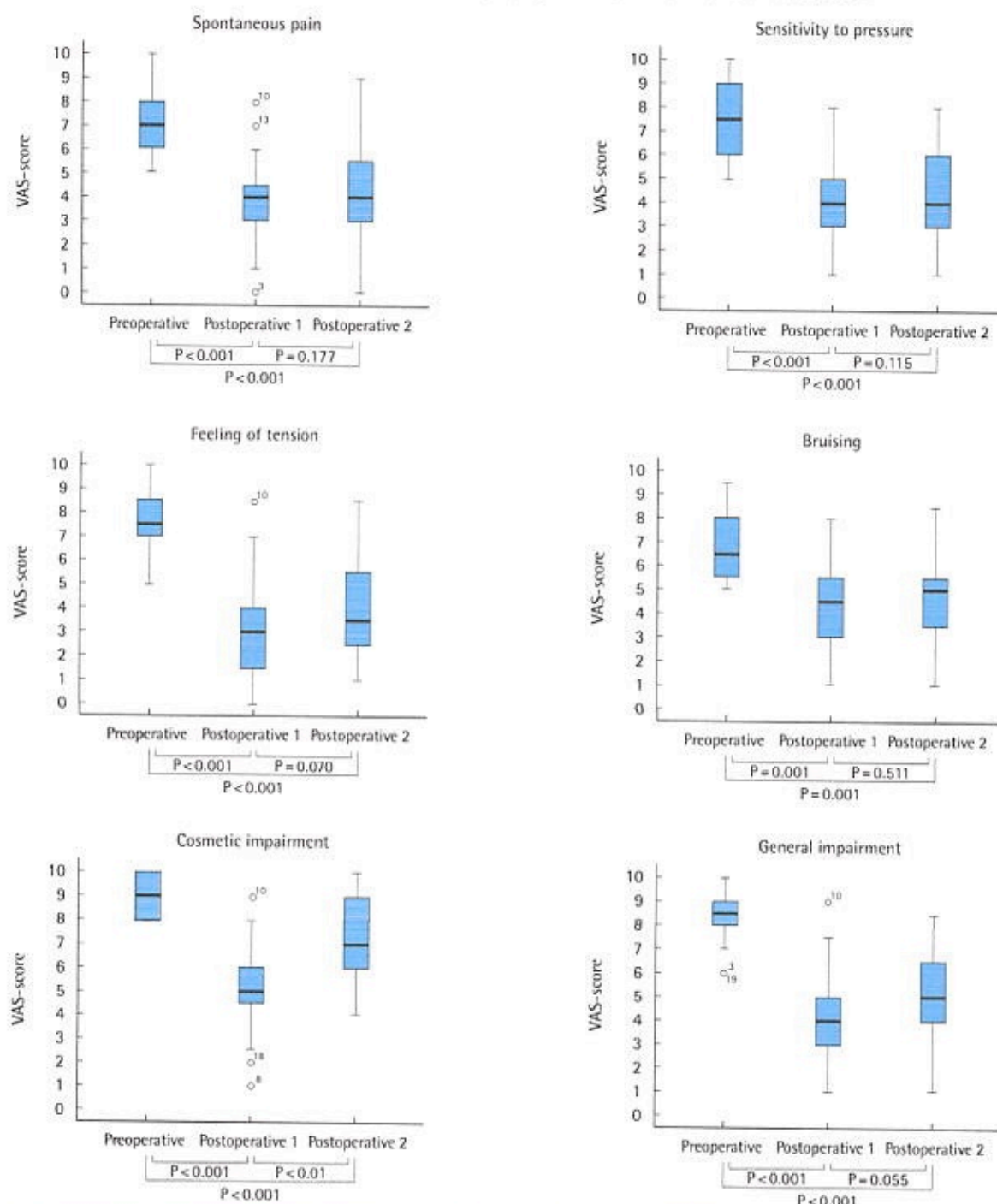
DISCUSSION

In most countries, CDT is the first line of therapy for lipedema. Though this treatment aims to stop the progression of the disease and reduce edema, many patients still see an increase in subcutaneous fat and aggravation of symptoms.

When the tumescent technique for liposuction was introduced in the late 1980s [18], the safety of liposuction improved and injury to lymphatic vessels was reduced [14,19]. Subsequently, liposuction became an option in treating lipedema and reducing the amount of fat tissue.

Fig. 1. Complaints

Box plots of the complaints before and after liposuction with accompanying P-values (n = 25). VAS, visual analog scales.



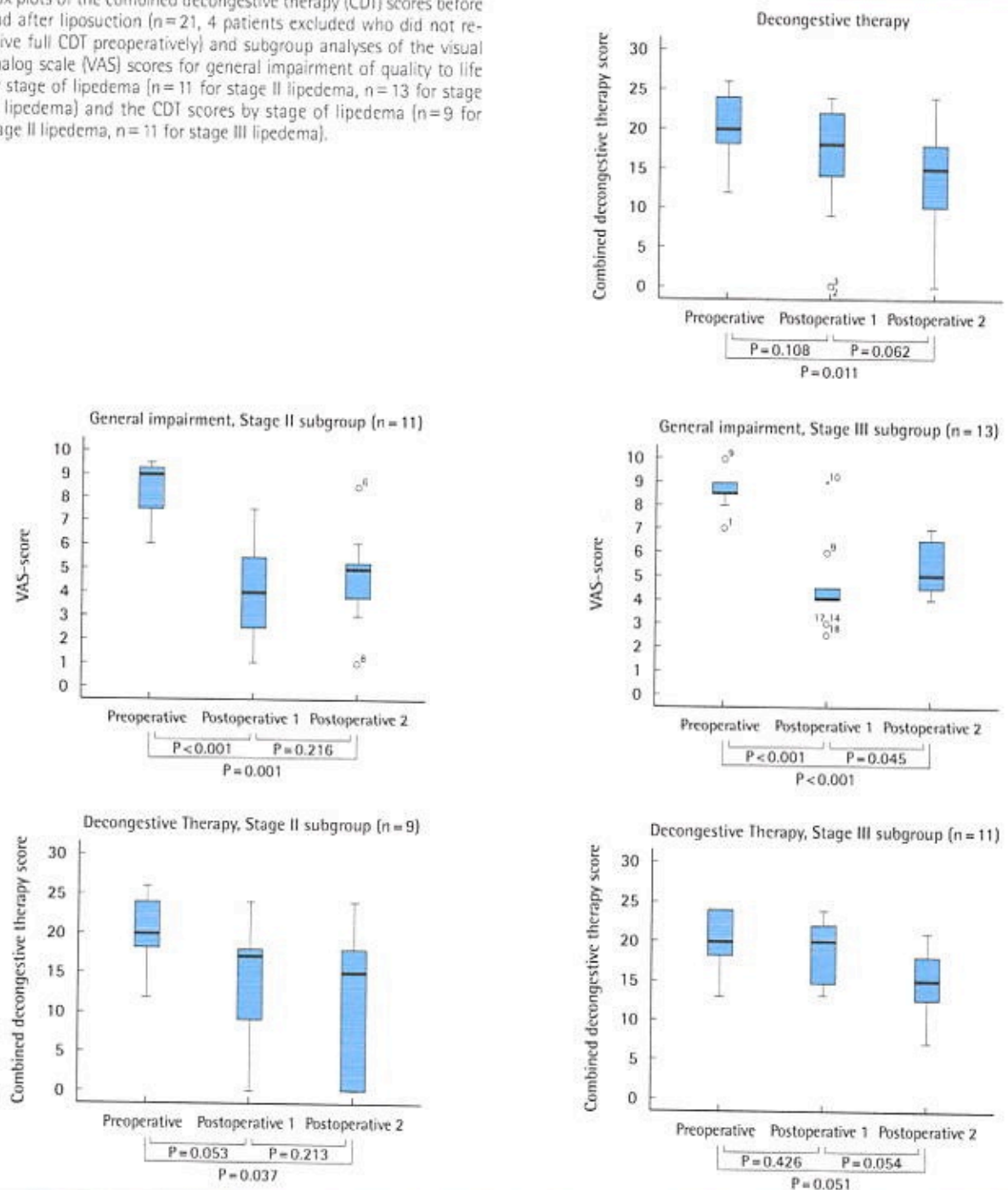
Our study showed that liposuction was an effective treatment for lipedema with good long-term outcomes. Our findings support the results of previous studies, such as Schmeller et al. [20], Rapprich et al. [21], and the recent long-term study by Baumgartner et al. [22].

However, unlike the aforementioned studies, the data for the preoperative period were collected retrospectively, representing a possible bias.

An average operation time for liposuction under tumescent anesthesia that includes infiltration has been reported as 5.5

Fig. 2. Combined decongestive therapy scores and subgroup analyses

Box plots of the combined decongestive therapy (CDT) scores before and after liposuction ($n = 21$, 4 patients excluded who did not receive full CDT preoperatively) and subgroup analyses of the visual analog scale (VAS) scores for general impairment of quality to life by stage of lipedema ($n = 11$ for stage II lipedema, $n = 13$ for stage III lipedema) and the CDT scores by stage of lipedema ($n = 9$ for stage II lipedema, $n = 11$ for stage III lipedema).



hours. In our study, the average operation time under general anesthesia that included infiltration was roughly 2 hours, yielding comparable amounts of removed fat [22].

In accordance with the Practice Advisory on Liposuction published by the American Society of Plastic Surgeons, we believe that general anesthesia has advantages over tumescent anesthe-

sia for long and complex liposuctions, such as those used to treat lipedema [23].

General anesthesia has been shown to be a safe procedure and has a decreased risk of aspiration and airway complications when compared to sedation [24]. This may be needed when operating under tumescent anesthesia to alleviate patient dis-

Fig. 3. Case example 1

A 24-year-old patient with stage II lipedema preoperatively (A) and 10 months after 2 liposuctions (B). A total of 8,800 mL of fatty tissue was removed from her legs.

**Fig. 4. Case example 2**

A 65-year-old patient with stage III lipedema preoperatively (A) and 6 months after 3 liposuctions (B). A total of 11,600 mL of fatty tissue was removed from her legs.



comfort.

During our study, there was only 1 minor infectious complication from the 72 liposuctions, resulting in a complication rate of 1.4%. Schmeller et al. [20] saw the same rate of infection in 349 liposuctions used to treat lipedema, and Rapprich et al. [21] reported just 1 case of deep vein thrombosis during 15 years of surgical treatment for lipedema. In general, liposuction using the tumescent technique carries a low surgical risk and has been shown to be a safe and appropriate procedure [25].

The patient examples in Figs. 3 and 4 show that liposuction led to a marked reduction in the volume of fatty tissue in the affected limbs and the disproportionality of these limbs to the rest of the body. Although this was not measured quantitatively in our study, Rapprich et al. [21] were able to show volume reduction in lipedema patients treated with liposuction using 3-dimensional volumetry.

The severity of all major symptoms of lipedema was significantly reduced, and there was a significant reduction in the severity of impairment of quality of life, as reported by the patients.

This corresponds with our clinical experiences, where we have found that lipedema patients benefit greatly from liposuction treatment and display a very high level of gratitude.

After extensive liposuction, the resulting excess skin tissue may harm the long-term aesthetic outcome. This may be a possible explanation for the increase in the VAS score for cosmetic impairment that was measured during the second postoperative follow-up and was perceived to be caused by the disease. Lifting operations should be considered for these patients, taking all necessary precautions to preserve lymphatic vessels.

We propose a simple score to quantify the need for CDT. From our clinical experience and that of our cooperating lymphologists, we have found that lipedema patients wear compression garments for roughly 8 to 10 hours per day on average, and patients will typically receive 2 manual lymphatic drainage sessions per week. Deviations from these patterns depend on symptom severity and distribution. Thus, summing the number of hours spent wearing compression garments per day and the number of manual lymphatic drainage sessions per month is an easy way to quantify CDT in a single score. Using this score, we were able to show for the first time that liposuction for patients with lipedema led to a significant decrease in the need for conservative lipedema treatment and also improved the quality of life for these patients. Previous studies that had already shown that liposuction may result in a decreased need for conservative lipedema treatment did not quantify this need or test for signifi-

cance [20,21].

Our data suggest that liposuction treatment for stage II lipedema provides a more sustainable reduction in the impairment of quality of life and a larger decrease in the need for conservative therapy than liposuction treatment for stage III lipedema.

Due to the development of secondary lymphedema and the irreversible damage to the lymphatic system that occurs in later stages of the disease, liposuction should be implemented as part of the standard therapy for lipedema at early stages. This will prevent disease progression, improve quality of life, and reduce the need for decongestive therapy.

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Tumescent liposuction in lipoedema yields good long-term results

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Accepted for publication

29 July 2011

Funding sources

None.

Conflicts of interest

None declared.

DOI 10.1111/j.1365-2133.2011.10566.x

Background Lipoedema is a painful disease in women with circumscribed increased subcutaneous fatty tissue, oedema, pain and bruising. Whereas conservative methods with combined decongestive therapy (manual lymphatic drainage, compression garments) have been well established over the past 50 years, surgical therapy with tumescent liposuction has only been used for about 10 years and long-term results are unknown.

Objectives To determine the efficacy of liposuction concerning appearance (body shape) and associated complaints after a long-term period.

Methods A total of 164 patients who had undergone conservative therapy over a period of years, were treated by liposuction under tumescent local anaesthesia with vibrating microcannulas. In a monocentric study, 112 could be re-evaluated with a standardized questionnaire after a mean of 3 years and 8 months (range 1 year and 1 month to 7 years and 4 months) following the initial surgery and a mean of 2 years and 11 months (8 months to 6 years and 10 months) following the last surgery.

Results All patients showed a distinct reduction of subcutaneous fatty tissue (average 9846 mL per person) with improvement of shape and normalization of body proportions. Additionally, they reported either a marked improvement or a complete disappearance of spontaneous pain, sensitivity to pressure, oedema, bruising, restriction of movement and cosmetic impairment, resulting in a tremendous increase in quality of life; all these complaints were reduced significantly ($P < 0.001$). Patients with lipoedema stage II and III showed better improvement compared with patients with stage I. Physical decongestive therapy could be either omitted (22.4% of cases) or continued to a much lower degree. No serious complications (wound infection rate 1.4%, bleeding rate 0.3%) were observed following surgery.

Conclusions Tumescent liposuction is a highly effective treatment for lipoedema with good morphological and functional long-term results.

Lipoedema, first described in the 1940s in the U.S.A.,^{1,2} is characterized by bilateral symmetric enlargement mainly of the legs as a result of abnormal deposition of subcutaneous fatty tissue in combination with oedema. Despite being a specified clinical entity, epidemiological data are still unknown.

The disease occurs exclusively in women; it is probably attributable to an autosomal dominant inheritance with sex limitation.³ In most cases, hips, thighs ('jodhpur-like riding breeches'), knees and lower legs, sometimes with a fatty cuff at the ankles (Turkish-pants phenomenon, inverse shouldering effect) are affected; arms are rarely affected and hands and feet

are never involved. The accumulation of fluid in the form of orthostatic oedema results in pain, tenderness and sensitivity to pressure; this is expressed in synonyms such as lipalgia, adiposalgia, adipoalgia, adiposis dolorosa, lipomatosis dolorosa or painful column leg. Together with easy bruising, it causes significant physical morbidity.

Whereas lipoedema may appear in women with generalized obesity, body weight is normal in many patients. The obvious disproportion between a slim upper half of the body and large lower extremities cannot be eliminated by weight loss brought about by diet or physical exercise; this often results in considerable frustration and psychological problems.^{2,4}

In the majority of patients, the disease starts almost imperceptibly after puberty but may also develop at other periods of hormonal change, such as pregnancy or menopause; it persists lifelong and progresses gradually. At the beginning, the skin is smooth and the subcutaneous layer is thickened, soft and with an even structure (stage I); the skin might be cool in certain areas as a result of functional vascular dysbalance. Over time, subcutaneous nodules develop and the skin surface becomes uneven (stage II). After several decades, patients may present with huge amounts of tender subcutaneous tissue and bulging protrusions of fat, mainly at the inner side of the thighs or knees (stage III), which lead to an impairment of gait.

Although the number of textbooks and publications dealing with lipoedema is extensive in Germany,⁵ literature is sparse in English.⁶ Many clinicians are still unaware of this disease, with lipoedema being frequently unrecognized or misdiagnosed.^{7,8} Confusion often exists concerning the differential diagnosis of lipohypertrophy (similar disproportion, symmetric, but no oedema and no pain), primary lymphoedema (asymmetric, decreased lymphatic flow, positive Kaposi–Stemmer skin fold sign, no pain, no bruising), phleboedema (pathological vein function tests, typical skin changes), obesity (increased volume on the trunk, increased weight, body mass index $> 30 \text{ kg m}^{-2}$, often no obvious disproportion, no oedema, no pain), Dercum disease (increased volume, pain, but no oedema) and Launois–Bensaude benign symmetric lipomatosis [increased accumulation of fatty tissue with typical disproportion, mostly localized in the neck (type I), shoulders and upper arms (type II) or pelvic region (type III), no pain, no oedema]. The diagnosis of lipoedema can be made only on the basis of the patient's clinical signs and symptoms;⁹ ultrasound or magnetic resonance imaging has been used for the exact localization and quantification of fatty tissue.⁸

Conservative treatment with manual lymphatic drainage and compression hosiery or bandages (combined physical therapy, decongestive physiotherapy, known as CDT) is used as a standard regime worldwide to eliminate oedema.⁴ In 2002, the first results concerning the surgical therapy of lipoedema by tumescant liposuction to reduce the subcutaneous fatty tissue were reported during the 20th World Congress of Dermatology in Paris.^{10,11} Since 2005, liposuction has become an integrated part of therapy in the guidelines of lipoedema of the German Society of Phlebology.⁴

Our aim was to determine the efficacy of liposuction concerning appearance and associated complaints over a long-term period and to clarify whether decongestive conservative therapy (manual lymphatic drainage, compression treatment) can be reduced in the years following surgery.

Patients and methods

From January 2003 to December 2009, a total of 255 female patients with lipoedema were treated with tumescant liposuction in the Hanse-Klinik, a specialized clinic in Lübeck, Germany. One hundred and sixty-five patients who had completed treatment for at least 6 months, received standardized

questionnaires. Of the 114 questionnaires returned, 112 (68%) could be evaluated. In addition, many patients were seen clinically, or photographs could be analysed.

The patients' mean age was 38.8 years (range 20–68); the average weight was 79.3 kg (range 50–123). Thirty-five patients presented with lipoedema stage I, 75 patients with stage II and two patients with stage III. Nearly all had undergone conservative therapy for many years and either had experienced no obvious improvement of complaints or had noticed a progression of subcutaneous fatty volume.

Following informed consent from each patient, liposuction was performed on legs, hips and arms under pure tumescant local anaesthesia (TLA) with blunt vibrating microcannulas of 3 and 4 mm in diameter (power-assisted liposuction).^{5,12}

The average amount of TLA solution infiltrated was 7707 mL (range 2564–13 450), the average time of surgery was 2 h (40 min to 3 h 35 min). Of 112 patients, 12 patients were operated on once, 29 patients twice, 28 patients three times, 23 patients four times, 12 patients five times, four patients six times and four patients seven times. The minimum time between the operations was 1 month, the maximum about 1 year. Because in most cases the German health insurance system refused to pay for this treatment, the financial situation of the patients often determined the intervals between the liposuctions. The average amount of fat removed was 9846 mL per person (range 1000–25 600) or 3077 mL per session (range 450–7000), depending on the size and number of operated areas (hips, outer thighs, inner thighs, front thighs, back thighs, knees, outer lower legs, inner lower legs, upper arms, lower arms, buttocks). The patients could be re-evaluated after a mean of 3 years and 8 months (1 year 1 month to 7 years 4 months) after the first liposuction and a mean of 2 years and 11 months (8 months to 6 years and 10 months) after the last liposuction.

Prior to the first surgery and after the last surgery, physical measurements and patient-reported symptoms/complaints were assessed. Physical measurements were limb circumference and weight; in addition patients reported their clothing size.

Because of a lack of validated questionnaires for the assessment of lipoedema-related complaints we used a new questionnaire including items with high face validity. By means of seven items, patients reported the intensity of spontaneous pain, pain upon pressure, oedema, bruising, restriction of movement, cosmetic impairment and reduction in quality of life. The quantification of these items was performed on five-point-scales: 0, none; 1, minor; 2, medium; 3, strong; 4, very strong. In addition these items were summarized to a total score named 'general impairment'.

For these seven parameters (complaints) and the total score (general impairment) statistical analysis was conducted by using t-tests for dependent samples to compare the intensity of complaints prior to surgery with their intensity after the last operation. Analyses of variances were conducted to determine differential effects of the patient's age, stage and time since last liposuction. Statistics were performed with SPSS 16.0

for Windows (SPSS, Chicago, IL, U.S.A.). The statistical analysis was performed without alpha adjustments; therefore, the results are considered mainly explorative.¹³ According to this, the term 'significant' (used for P -values < 0.05) is given as a description of differences.

Results

Changes of body shape

The reduction of subcutaneous fatty tissue caused a decrease in the circumference of hips, legs and/or arms, resulting in a proportionate body at the end of surgery; mean reductions of 8 cm (range 1–23) in the thighs (inguinal region) and of 4 cm (1–11) in the middle of the lower legs (calves) were achieved.

The average weight before surgery was 79.3 kg (range 50–123) and before the last liposuction 78.9 kg (49.5–118); in the questionnaire, an actual average weight of 75 kg (48.5–113) was mentioned.

With respect to off-the-peg clothing (trousers), 38% of the patients mentioned a reduction of one size, 25% of two sizes and 11% of three sizes; 23% of the patients did not notice any change and 2% experienced an increase of one size.

Improvement of complaints

The score values (minimum: 0; maximum: 4) of spontaneous pain, pain attributable to pressure, amount of oedema, bruising, reduction of movement, cosmetic impairment and reduction in quality of life showed significant differences pre- and postoperatively. Table 1 shows the mean improvement of all these complaints typical for lipoedema. An improvement was also seen in the summary score (overall severity score) (Fig. 1). This summary score, including all seven values in one figure, represented the 'general impairment'; with values from 2.81 preoperative to 0.86 postoperative, its difference was also significant. The clinical effect of all these differences is repre-

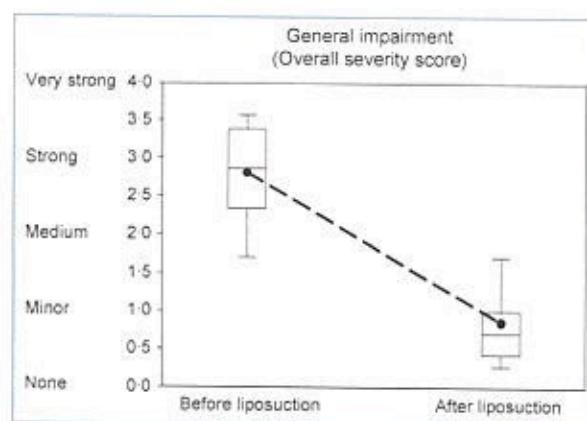


Fig 1. Improvement of general impairment in lipoedema after liposuction (mean values).

sented by the effect size, which describes the magnitude of a change. A value > 0.50 is classified as medium, a value > 0.80 may be classified as a strong effect. The highest scores of the effect size were seen in cosmetic appearance and reduction of quality of life. These two items also had the highest values (3.33 and 3.36) of all parameters before surgery.

In addition, the general impairment was examined by analysis of variances according to age groups, stage of lipoedema and time after the last liposuction. Table 2 demonstrates no difference in the amount of improvement between the various age groups. For severity of lipoedema, stage II (75 patients) and stage III (two patients) were pooled into one group; in comparison with stage I (35 patients), this group showed a higher improvement ($P = 0.02$). No significant differences in improvement could be seen with regard to time after liposuction (1–24, 25–36, 37–48 or 49–82 months).

Reduction of conservative therapy

Of 112 patients, 67 had combined physical therapy (manual lymphatic drainage and compression) before the operation(s).

Table 1 Changes of complaints

Complaint*	Preoperative		Postoperative		P-value (t-test)	Effect-size
	Mean	SD	Mean	SD		
Spontaneous pain	1.88	1.33	0.37	0.60	$< 0.001^*$	1.36
Pain because of pressure	2.91	1.06	0.91	0.92	$< 0.001^*$	2.01
Oedema	3.06	1.02	1.27	0.88	$< 0.001^*$	1.88
Bruising	3.01	1.03	1.26	1.11	$< 0.001^*$	1.63
Restriction of movement	2.03	1.36	0.28	0.68	$< 0.001^*$	1.58
Cosmetic impairment	3.33	0.88	1.08	0.91	$< 0.001^*$	2.52
Reduction in quality of life	3.36	0.86	0.76	0.91	$< 0.001^*$	2.95
General impairment ^b	2.81	0.70	0.86	0.63	$< 0.001^*$	2.93

*Scale: 0, none; 1, minor; 2, medium; 3, strong; 4, very strong. * $P < 0.001$. ^bReliability (internal consistency) of the total score 'general impairment' is 0.77 (preoperative) and 0.76 (postoperative) (= good reliability).

Table 2 Differential analysis of 'general impairment' using age, stage and months following last liposuction as factors in addition to time effects

	Groups	n	Preoperative, mean (SD)	Postoperative, mean (SD)	Source	Analysis of variance P-value
Age (years)	20–29	27	2.7 (0.8)	0.7 (0.5)	Group (g)	0.07
	30–39	41	2.9 (0.7)	1.1 (0.9)	Time (t)	< 0.001**
	40–49	25	2.7 (0.7)	0.7 (0.3)	Interaction g × t	0.85
	50–68	19	2.9 (0.5)	0.8 (0.5)		
			P = 0.46	P = 0.07		
Stage	I	35	2.6 (0.7)	0.9 (0.7)	Group (g)	0.20
	II/III	77	2.9 (0.7)	0.8 (0.6)	Time (t)	< 0.001**
			P = 0.02*	P = 0.66	Interaction g × t	0.02*
Months following last liposuction	1–24	33	2.9 (0.6)	0.8 (0.6)	Group (g)	0.66
	25–36	33	3.0 (0.7)	0.8 (0.7)	Time (t)	< 0.001**
	37–48	19	2.5 (0.9)	0.9 (0.4)	Interaction g × t	0.11
	49–82	27	2.7 (0.6)	1.0 (0.7)		
			P = 0.19	P = 0.69		

P-values in the columns headed preoperative and postoperative are related to a comparison at this point of measurement. **P < 0.001. The results demonstrate a decrease of general impairment without an influence of age and months following last liposuction. The significant interaction between stage and time (*P = 0.02) shows that the decrease of general impairment is greater in patients with higher stages of lipoedema.

Another 18 patients only had compression garments and eight patients exclusively used decongestive physical therapy. In 19 patients, no conservative treatment before surgery was performed.

Table 3 shows the changes in conservative treatment (in percentages) in the 67 patients who had previously undergone combined physical therapy. Of these, 13 patients (19.4%) needed manual lymphatic drainage and compression as often as before; 20 patients (29.9%) also continued with physical decongestive therapy, but less often; 13 patients (19.4%) still used compression garments; six patients (9%) declared that they only needed manual lymphatic drainage from time to time; 15 patients (22.4%) reported that they no longer required conservative therapy.

Side-effects and complications

Out of the 112 patients who had 349 liposuctions in total, postoperative wound infections occurred in five cases, representing an infection rate of 1.4%. All patients had received prophylactic oral antibiotics (cefepodoxime proxetil) for 3 days after surgery. In four women, postoperative erysipelas could be treated at home with further oral antibiotics; one patient with an abscess of the lower leg was treated in hospital in her home town.

In one case (0.3%), postoperative bleeding on one side occurred on the evening of surgery after removal of 5400 mL fatty tissue from hips and outer thighs. The haemoglobin level dropped from 13.2 to 8 g/dL; following oral therapy with iron and folic acid, normal values were reached again within 4 weeks. The following three liposuctions (removal of, in total, 16 700 mL of fatty tissue) in this woman were performed without any problems.

In some patients, orthostatic reactions occurred on the day of operation; these were resolved without further treatment

Table 3 Changes of conservative therapy postoperatively in four subgroups

	n	%
(a)		
Before		
Lymphatic drainage and compression	67	100
After		
Lymphatic drainage and compression (as before)	13	19.4
Lymphatic drainage and compression (less than before)	20	29.9
Only compression	13	19.4
Only lymphatic drainage	6	9
No lymphatic drainage, no compression	15	22.4
(b)		
Before		
Only compression	18	100
After		
No compression	5	27.8
(c)		
Before		
Only lymphatic drainage	8	100
After		
No lymphatic drainage	4	50
(d)		
Before		
No lymphatic drainage, no compression	19	100
After		
Lymphatic drainage, compression	3	15.8
Only compression	3	15.8
Only lymphatic drainage	2	10.5
No lymphatic drainage, no compression	11	57.9

within the same day. Other than minor haematomas and postoperative swelling for a few days, no other side-effects were seen. Indurations of the subcutaneous fatty tissue as a result of

scar formation during wound healing (mainly at the inner and lower legs) disappeared completely within weeks.

Discussion

To our knowledge, this is the first long-term study concerning surgical therapy (liposuction) of lipoedema to be presented in English. For many decades, only conservative treatment with manual lymphatic drainage and compression hosiery was available. This so-called combined decongestive therapy (CDT) was introduced by the Dane, E. Vodder, in the 1930s and was modified by the German, J. Asdonk, in the 1960s. The reduction of oedema decreases tenderness and aching distress in the affected extremities, but only for a short period. Despite life-long decongestion, the amount of subcutaneous tissue increases and the disease worsens over time. Diet, physical activities such as sport, the restriction of fluid and diuretics are all without benefit.⁴

Until the end of the last century, fat removal by lipectomies or liposuction under general anaesthesia without subcutaneous infiltration ('dry technique') and large sharp cannulas caused considerable tissue damage, often in combination with unacceptable functional and cosmetic results.

The introduction of TLA in the 1990s¹⁴ with the infiltration of large amounts of fluid ('wet technique') has made liposuction a safe and effective procedure.^{15,16} With the use of blunt vibrating microcannulas of 3–4 mm in diameter (power- or water-assisted liposuction), no relevant tissue damage occurs.^{17–20} Since 2005, liposuction has been integrated into the guidelines of care for lipoedema by the German Society of Phlebology and has been further stressed in an update in 2009.⁴

Our figures demonstrate that liposuction of lipoedema under pure TLA is time-consuming. The whole operation including the infiltration of the local anaesthetic takes an average time of about 5.5 h and an average of 7.7 L of tumescent solution is needed per session. The mean duration of the liposuction itself is 2 h, a reasonable work expenditure for the surgeon. During this time, an average of about 3 L of fatty tissue is removed. This is a much larger amount than has been reported in other studies, where amounts between 1.1 and 1.9 L have been removed per session.^{16,18,21,22} Most of our patients, the majority of them with lipoedema stage II, needed two to four liposuctions but some had such extensive fatty volumes that more than five sessions were necessary. This number is much higher than that in 'standard' liposuctions performed for cosmetic reasons only.

If handled well, the results of liposuction are good with regard to morphology. The removal of fatty tissue in our patients causes an obvious reduction of circumferences in hips and extremities with a distinct improvement of body size and a minor reduction of weight. However, the most important point is the disappearance of disproportionality between the upper and lower parts of the body. Figures 2–4 show typical results before and after surgery in various body regions.

Improvements of complaints are also obvious after surgery: spontaneous pain, pain attributable to pressure, amount of oedema, bruising, reduction of movement, cosmetic impairment and reduction in quality of life showed impressive improvements with significant differences pre- and postoperatively; the same was true with the summary score termed 'general impairment'. Similar results have been reported in the literature with a smaller patient group ($n = 25$) after a shorter period (6 months after liposuction).²³

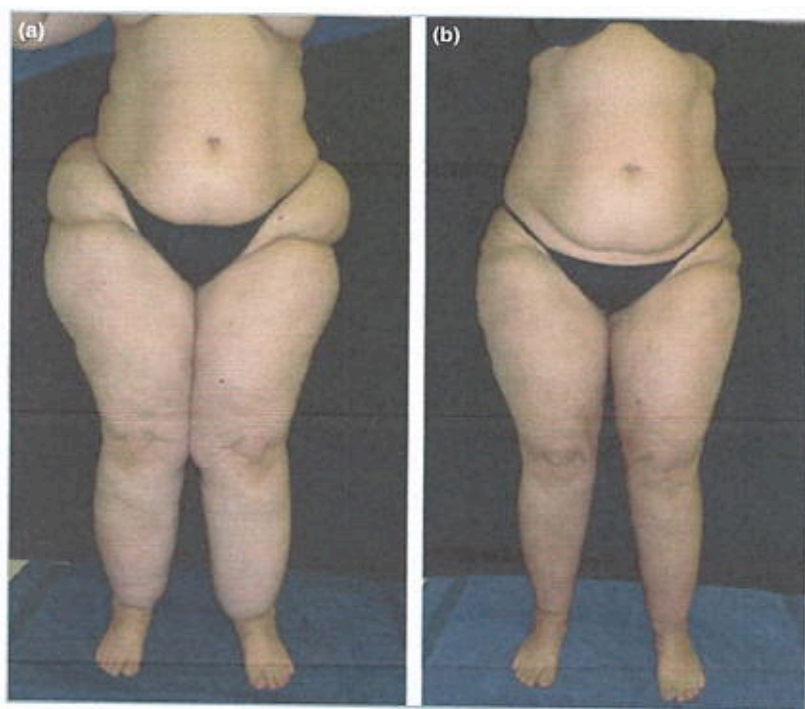


Fig 2. (a) Lipoedema in a 42-year-old woman. (b) Result 1 year and 8 months after four liposuctions (hips, thighs, buttocks, lower legs), removal of 18 300 mL of fatty tissue.

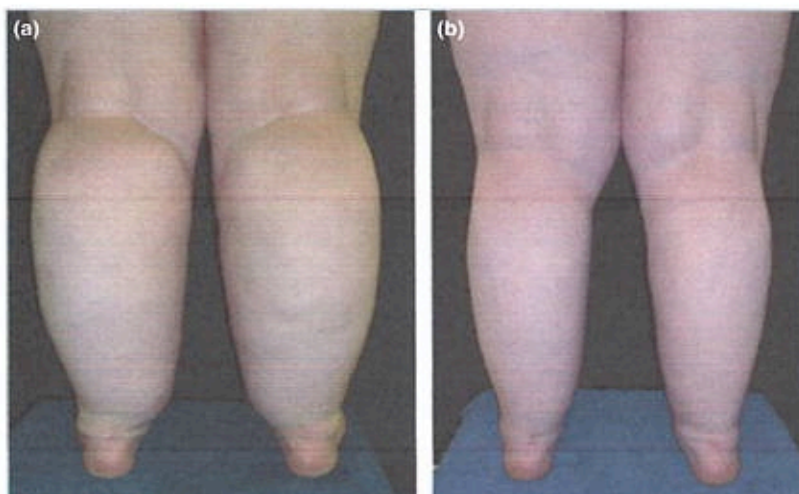


Fig 3. (a) Lipoedema in a 34-year-old woman. (b) Result 3 years and 2 months after removal of 7000 mL of fatty tissue in both lower legs in one session.

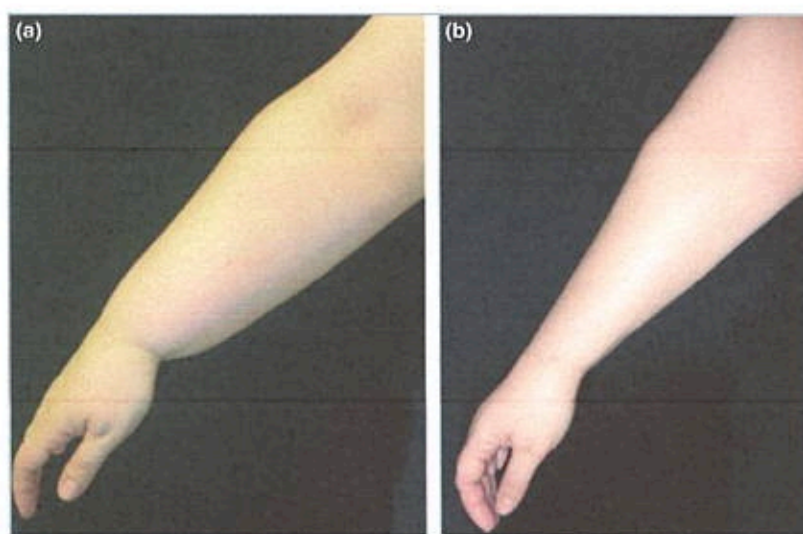


Fig 4. (a) Lipoedema in a 32-year-old woman. (b) Result 2 years and 4 months after removal of 600 mL of fatty tissue from each lower arm.

Spontaneous pain, which has previously been described in an earlier lipoedema study as being pressing and dull, sometimes as heavy, pulling or even torturing,²³ was less pronounced preoperatively (1.88) than pain attributable to pressure (2.91); both items showed a distinct improvement. Most probably, this is a result of oedema reduction (3.06 preoperative, 1.27 postoperative). Improvement of pain is well known following decongestive physical therapy. One can speculate that, following liposuction(s), oedema in the extremities is diminished because of the reduced subcutaneous space available.

The obvious reduction of bruising (3.01 before to 1.26 after surgery) has not been described before and cannot be explained. However, similar results have been published following decongestive physiotherapy of lipoedema; they have been interpreted as an improvement of the altered capillary fragility, resulting in a reduction of petechiae and thereby causing reduced haematoma formation following minor trauma.²⁴

A more physiological movement was noticed after liposuction. This was attributable to reduced skin irritation at the

inner side of the thighs, resulting in a more balanced gait. In addition, several patients have reported a reduction of chronic joint pains in the hips and/or knees, probably as a result of a more physiological strain on these joints; similar observations have just been published in another German study.²⁵

The improvement of cosmetic impairment is a direct result of the new, and now normal, body proportions of the patients. Interestingly, in spite of all the painful symptoms, the outward appearance had an enormous negative influence (3.33 before surgery) on the patients' self-esteem. This demonstrates the marked effect of body shape on the well-being of female patients. The increase in quality of life is probably attributable to the improvement of all complaints taken as a whole; it is also a result of the reduction of conservative therapy, mentioned below.

Although differential analysis showed similar good results in all age groups with every life period being well suited for surgery, differences were seen when looking at the severity of the disease. Patients with lipoedema stage II (and III) showed

a more distinct improvement compared with those at stage I. Hence, the more complaints were present before surgery, the more benefits were gained afterwards. Strikingly, this success prevailed over the following years indicating no or little deterioration of these symptoms with time. This is an obvious difference from the short-term success of oedema reduction by conservative therapy, which usually has to be repeated within days.

Decongestive physical therapy is a basic treatment in orthostatic oedema. Whereas manual lymphatic drainage reduces the actual oedema volume, compression (by stockings or bandages) is used to prevent recurrence. Although 19.4% of our patients needed conservative therapy to the same extent as before, the remainder required less, with 22.4% no longer needing conservative treatment over the following years.

This demonstrates the long-lasting positive 'side-effect' of liposuction on the associated complaints. Despite the treatment having no direct influence on the swelling of legs and arms (oedema itself cannot be removed by liposuction), the indirect benefit by 'space reduction' of the subcutaneous areas is obvious.

Nevertheless, surgery cannot cure lipoedema completely; according to the persisting oedema formation, physiotherapy and compression are still necessary in most patients, although at longer intervals and to a much lower degree. The postoperative infection rate of 1.4% seen here is similar to that of other studies in which rates between 1% and 3% are described.^{26,27}

The application of TLA and the usage of blunt microcannulas avoids damage to important structures, and bleeding is rare;^{16,28} a significant reduction of haemoglobin level (in our study, 0.3% of the patients) has been reported in the literature in 0.2–0.6% of cases.^{21,26} However, we should mention that the patient with postoperative bleeding in our study was the only one that we saw in a total of 1826 liposuctions within the past 10 years, representing a complication rate of 0.05%.

No serious or life-threatening events occurred during our study. In agreement with others,^{16,21} we can confirm that liposuction with exclusively TLA according to the existing guidelines is a safe procedure with no serious and only a few minor side-effects. We should finally mention that, in contrast to conservative therapy, the costs for this surgical treatment are not reimbursed in most cases by the statutory health insurance in Germany.

In conclusion, tumescent liposuction in lipoedema is a highly effective method with long-term benefit concerning body shape, together with a significant improvement of pain, oedema, bruising and restriction of movement. The obvious reduction in the need for further conservative treatment and the remarkable increase in the quality of life are important positive aspects of this therapy. Because often large amounts of TLA solution are needed and extensive volumes of subcutaneous fat have to be removed, a considerable degree of experience is required; therefore, the procedure should be performed in specialized centres only.

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