The term “lipedema” was first used in 1974 by Allen and Hines. Their publication is regarded as "the classical description" of the syndrome.  

“We wish to describe a clinical syndrome, lipedema of the legs, which is frequently very distressing. In our experience it affects solely women. The chief complaint is of swelling of the legs and feet...On questioning, the physician may elicit that enlargement of the limbs has always been generalised and symmetrical. The swelling below the knees is accentuated when patients are on their feet much and in warm weather. Aching distress in the legs is common... Occasionally, a patient feels, that her large legs have ‘ruined her life.’ Many are ‘ashamed’ of their legs.”

This describes the patient’s problems very well, but it is difficult to define lipedema precisely because the definition depends mainly on subjective findings. There are no medical or laboratory tests to distinguish local lipohypertrophy (local fat tissue increase) of the legs or hips from lipedema or general obesity. Consequently, lipedema is not generally accepted as a real disease. We will attempt to describe the current knowledge on the pathophysiology and treatment of lipedema.

Lipedema is a metabolic disorder of the adipose (fat) tissue with unknown etiology, affecting almost exclusively females. The following clinical and pathophysiological findings are of importance for differential diagnosis.

The term “lipedema” was chosen by Allen and Hines to describe a symmetrical swelling of both legs, extending from the hips to the ankles and excluding the feet, caused by an abnormal amount of subcutaneous adipose tissue. Typically, bulging masses can be found in the proximal thigh region and at the medial aspect of the knees. Occasionally, large, overhanging and hypersensitive fat-lobes develop in these areas. In others, contours of the legs are more funnel-shaped, with a decrease of the adipose tissue noted below the knees. Some individuals present with similar changes in the arms especially when patient is also obese.  

Most patients report slow onset of symptoms, often in connection with beginning of puberty; in other cases, there is no specific time of onset. Some patients report that other females in the family also suffer from lipedema. Allen and Hines found a positive family history in 20% (n=119), but epidemiologic studies concerning lipedema do not yet exist. There is no evidence of a specific genetic disorder or incidence related to race.

Numerous impairments result from the abnormal pathophysiology of the tissues. The epidermis and subcutaneous tissues of the lipedematous legs show a decreased elasticity and progression of the condition. Aging causes further loss of skin elasticity and increase of fluid load. Problems with normal ambulation (walking) lead to secondary orthopaedic deformities of the knees and feet. The tissue resistance to the contracting calf muscles (calf muscle pump) is too low and results in passive haemorhage and an increase in fluid load, resulting in increased lymphatic water load. Swelling occurs when this fluid load exceeds the transport capacity of the lymphatic system. Blood capillaries are fragile and even insignificant trauma (e.g., hitting the leg on a table corner) can cause the development of small haematomas and a further increase in lymphatic load. Blood coagulation tests for this condition are typically normal. It is not surprising that many patients develop an emotional disorder considering the physical appearance of the legs.

"Patients with lipedema ordinarily are very sensitive about the appearance of their legs; they wear long skirts, avoid appearance in swimming suits and stand behind chairs at parties...They are likely to be mirror peelers, searching repeatedly in mirrors for evidence that the appearance of their legs is not actually as bad as it seems to be. Evidence of neurosis is likely to be found. Occasionally, a patient feels that her large legs have ‘ruined her life.’ Many are ‘ashamed’ of their legs."

One patient described her situation: "When you become older, you also become a little more overweight and your legs ‘go through the roof.’ You develop constant rubbing between your thighs; in summer it is itching and becomes sore. With age you also become more lazy—and, because of this constant itching and pain, you don’t see any possibility for doing exercises. As the obesity worsens, lower back pain develops, the joints begin to hurt and your friends make silly jokes about your shape—"
and finally you rest at home, your only consolation is the chocolate in your nightstand and you will be unable to get out of this vicious circle!" After some years, in cases of coexisting general obesity, lipedema can transform into lipo-lymphedema (Stremme’s sign is now positive) in which fatty tissues begin to hold fluid. Furthermore, there is a correlation between obesity and disturbances of vascular edema protective reflexes3,24,26,51,52,53,64,60,65,79,85,100,101,111,112, which leads to additional lymphatic water load.

Edema is always the result of lymphatic insufficiency and, indeed, the lymphatic system shows typical pathological changes. The pre-lymphatic channels are widened; lymphatic capillaries have aneurysm-like changes and we find an irregular vessels-like course of the lymphatic vessels41,107,117. The increased adipose tissue and the enlarged adipo- dytes most likely deform these thin lymphatic structures.

When lipo-lymphedema is present, pitting (indentable) edema in the lower legs can be noted when the person is upright or walking. This edema causes an uncomfortable feeling of tension. A reversal of the edema is possible after elevation of the legs for a longer period or overnight41,42,86,127.

Scintigraphy of the lymphatic system3 shows contradictory results. Sometimes, a reduced outflow in comparison to normal persons is described117,123, and other times, normal results were found21,124. The increased transport capacity of the lymphatics due to aging develops faster than in healthy legs.

Unfortunately, there are no universally accepted guidelines for diagnosis of lipedema and, in some cases, the differentiation between lipedema and lipo-lymphedema is difficult. The typical progression of lipedema is as follows:

- In the first stage of the disease, the skin of the legs appears soft, smooth and regular. But palpation reveals large deforming fatty lobes, especially at the inner side of the thighs, the knees and above the ankles.

DIFFERENTIAL DIAGNOSIS

The diagnosis of lipedema can be difficult in the early stage or if a combination form exists. Differential diagnosis of LE and lipedema is, in most cases, possible by taking the medical history and evaluation of the Stremme’s sign. Distinction between primary bilateral lower extremity LE and lipedema can be difficult, although bilateral LE usually presents asymptomatically in contrast to symmetrical presentation of lipedema41,42,89,113,119. The typical shape of uni- and bilateral lipedema and lipoedema is now shown.

TREATMENT OF LIPEDEMA

While some of the pathophysiological tissue changes contributing to lipedema are identified, the real cause of the disease remains unknown. Therefore, therapy is predominantly symptom oriented. The goal must be to improve the disturbed lymph transport, pathophysiological changes in microcirculation in the enlarged adipose tissue and a reduction of pain and the fat masses.

The most common therapeutic intervention for lipedema is Complete Decongestive Therapy (CDT)54,57,60,105,127. The main constituents of this therapy concept are Manual Lymph Drainage (MLD)14,43 and compression therapy5,15,42,90,104,128. Diet, skin care and remedial exercises are also very important.

At the Lymphologica 1999 in Marburg/Germany, Wiese reported, a volume reduction of 3.2 liters after a 3-week intensive therapy (mean initial volume of 23.3 liters; the average volume reduction at the thighs was 2.85 liters). In our Department of Lymphology (Freiburg/Germany), the mean volume reduction after 2 weeks of CDT is 14% on average.

After initial decongestion through MLD and compression bandages, the patients are fitted with custom-made compression stockings. Permanent compression therapy causes significant reduction of adipose tissue15,39, has a positive influence on the disturbed veno-arterial response and improves relative insufficiency of the venous pump of the lower legs.

Exercise and sport activities are recommended, but the effect on adipolysis or the loss of leg and hip fat is often disappointing. Nevertheless, some younger patients report an improvement when working out 4-5 times a week, a minimum of 45 minutes and with an exertion rate of 75% (related to the maximum heart frequency). This recommendation may be unrealistic for some women. Some patients feel a positive effect after hydrotherapy applications; currently there is no research available concerning this therapy method.
Weight reduction is absolutely essential if patients are overweight because lipodermia may develop particularly in patients who are also obese. There are, however, no specific dietary recommendations for lipedema. Additional therapy with external pneumatic compression is sometimes recommended. Some patients report positive results with pneumatic compression, but controlled studies do not exist. Allen und Hines\(^5\) and others consider the use of diuretics a mistake.

In some select cases, liposuction has been recommended for the treatment of lipedema. Surgeons have shown good results, but problems also exist. After liposuction, some patients develop chronic lipedema\(^{10,12,17}\), lymphatic cysts or large haematomas\(^{10}\) and have problems with wound healing. Moreover, the cosmetic results are not always satisfactory\(^6\). In recent years, the technique of liposuction has improved, and complications are fewer. Experience with a small number of patients indicates that the combination of surgical techniques with CDT may help to improve the results of liposuction. (Schmeller et al: Dtsch Arztebl 2005; 102:A 1061–1067 [Heft 15]). No definitive studies are available to confirm this finding.

**CONCLUSION**

Lipedema must be differentiated from local lipohypertrophy, primary LE of both legs and general obesity. Until the real cause of lipedema is known, treatment is symptomatic. With adequate treatment and optimal patient adherence, good results can be achieved, progression of lipedema can be halted and additional health problems prevented.

**REFERENCES**

6. BALLETT, G., L’adipose douloureux. Presse Méd. 28 (1903) 285-288
venoarteriolar response in essential hypertension.

Pamnneva Med. 35 (1993) 5-8

COSBOLD, A., FOLKOW, B., KEELER, I., MOLLANDER, S., Nervous and local chemical control of precapillary sphincters in skeletal muscle as measured by changes in filtration coefficient.

Acta Physiol. Scand. 57 (1963) 180-192

CARR, S.B., Ödem, Lymphödem und perivasculäre Grundsubstanz

Haug-Verlag, Heidelberg, 1988

CARR, S.B., FERNANDEZ, G.

Venous stasis and panniculopathy: a semilogic study.

Angiologia 42 (1990) 127-132

CARR, S.B., MIRONEN, J.P., SARTHEL, A.M.

Cellulitis, a conjunctive microvascular disease.

Phlebol. 32 (1979) 279-282

CARR, S.B., MIRONEN, J.P.

Anatomico-pathological causes of cellulite.


DJEWEIL, S., HASSELI, K.D., ZUBER, J., VON SCHUTTHEIS, G.K., BOLLINGER, A., FUCHS, W.A.

Swollen lower extremity: role of MR imaging.

Radiology 184 (1992) 227-331

EISEMANN, J.M., SWIZZEY, R.L.


FÖLDI, E.

Das Lipödem des Mannes und das Launobis-Bendaue-Syndrom.


Bonn, 1997, 167-169

FÖLDI, E., FÖLDI, M.

Die anatomischen Grundlagen der Lymphödembefunderung.


FÖLDI, E., FÖLDI, M.

Die Therapieglichkeiten des Lipödems, dessen mit verschiedenen Erkrankungen kombinierten Formen sowie der „benignen sym-metrischen Lipodermatose” (Modadung-Krankheit).


FÖLDI, E., FÖLDI, M., TSCHEID, F.


FÖLDI, M., Lymphödem, Lipödem, chronische venöse Insuffizienz und Kombinationsformen.

Therapiewoche 38 (1988) 3295-3305

FÖLDI, M.


FÖLDI, M., Das Lymphödem - Stand und Unsinn in der Therapie und Diagnostik.

Vasomed Aktuell 3 (1989) 27-29

FÖLDI, M., Lymphödem, Lipödem, chronische venöse Insuffizienz und Kombinationsformen.

Phlebol. u. Protopl. 19 (1990) 6-16

FÖLDI, M., KLEIN, S.

„Lehrbuch der Lymphologie“


FÖLDI, M., ŠTRÅBNIEK, R.H.K.

„Grundlagen der manuellen Lymphdrainage“

G. Fischer, Stuttgart-Jena-Ulm, 1996

FÖLDI, M., TSCHENDORF, F.

„Lipödern und »Zellulitiss«“

Erdmann-Brenger, München, 1983

FOLKOW, B., MOLLANDER, S.

Aspects of the nervous control of the precapillary sphincters with regard to the capillary exchange.

Acta Physiol. Scand. 50, Suppl. 175 (1960) 52-54

G. Fischer, A. Das Lipödem.

Z. Lymphol. XI (1987) 41-43

HADDOCK, T.J, GILBERT, R.P.

The relation of a venous-arteriolar reflex to transmural pressure and resistance in small and large systemic vessels.

Circ. Res. 4 (1956) 25-32

HARAUS, A.A.K., TOCHIE, J.E.

The relationship between foot swelling rate and postural vasoconstriction in man.

J. Physiol. 76P (1987) 387

HEINIKSEN, O.

Orthostatic changes of blood flow in subcutaneous tissue in patients with arterial insufficiency of the legs.


HEINIKSEN, O.

Effect of chronic sympathetic denervation upon local regulation of blood flow in human subcutaneous tissue.


HEINIKSEN, O.

Local reflex in microcirculation in human subcutaneous tissue.


HEINIKSEN, O.

Circulatory studies: Local sympathetic veno-arteriolar axon „reflex“.

In: „The Sympathoadrenal System - Alfred Benson Symposium 33“

CHRISTENSEN, N.J., HEINIKSEN, O., LASSSEN, N.A. (Eds).

Munksgaard, Copenhagen, 1986, 67-80

MUNKSGAARD, O., CHRISTENSEN, J.K., WACZKO, S.

Local regulation of blood flow in subcutaneous tissue in generalized solerdermia.


HEINIKSEN, O., LASSSEN, P., PAASKE, W.P., EIKOFF, J.H.
factors.

Starr, E.H.
On the absorption of fluids from the connective tissue spaces.
J. Physiol. 19 (1896) 312-326

Stemmer, R.
Ein klinisches Zeichen zur Früh- und Differentialdiagnose des Lymphödems.
Vasa 5 (1976) 261-226

Stenger, D., Bahrer, F.A.

Stöberl, C.H., Pansch, H., Urbanek, A.
Indirekte Lympographie beim Lipödem.
In: „Odem“

Stroßbrenleith, R.H.K.

Stroßbrenleith, R.H.K.
Manuelle Lymphdrainage.
In: „Praxist-Ratgeber - So hilft die «Physikalische Therapie»“. VPT (Hrsg.), Gesundheits-Dialog Verlag, Obernaching, 1993, 10-12

Stroßbrenleith, R.H.K.
Praktische Hinweise für Physiotherapeuten.
In: Lehrbuch der Lymphologie.

Stroßbrenleith, R.H.K.
Physikalische Maßnahmen bei Venenerkrankungen - spezielle Aspekte der Prophylaxe und Therapie.
In: „Lymphologica, Jahresband 1996“

Stroßbrenleith, R.H.K.
Die Behandlung des Lipödems.
In: „Lehrbuch der Lymphologie“

Struckmann, J., Strange-Vognsen, H.H., Andersen, J., Hauch, O.
Venous muscle pump functions in patients with primary lymphoedema: Assessment by ambulatory strain gauge plethysmography.

Sjövik, H.
Microangiopathy in subcutaneous fatty tissue.


Szuczi, J.
Antidromic vasodilatation and neurogenic inflammation.
Agents Actions 23 (1988) 4-11

Tiedjen, K.U.
Isotopenlymphographie.

Tiedjen, K.V., Knorz, S.
Different Methods of diagnostic imaging in lymphedema, lipedema and venous disorders: Indirect lymphography, xeroradiography, CT and isotope lymphography.
In: „Progress in lymphology: XIII. Int. Congress of Lymphology“

Tiedjen, K.U., de Manèbes, A.
Isotopenlymphographie: Versuch einer praxisgerechten Messwert-Standardisierung.
In: „Lymphologica - Jahresband 1990“
Baumester, R.G.H. (Hrsg.), Medicin-Verlag, München, 1990, 14-19

Tiedjen, K.U., Schlitz-Ehrenburg, U.
Isotopenlympho-graphische Befunde beim Lipödem.
In: „Dermatologie und Nuklearmedizin“

Toldt, G.
Beiträge zur Histologie und Physiologie des Fettgewebes.

Vollmar, J.
Massenverschiebung der Beine beim sogennanten Säulen- bzw. Fettbein, beim umschriebenen Riesenwuchs und Tumoren.
In: „Das dicke Bein“

Wapler, P., Kasenberg, E., Scheick, R., Werner, G.T.
Darstellung eines künstlichen Lymphödems mit der Kernspintomographie und im pathologisch-anatomischen Bild.
In: „Lymphologica, Jahresband 1996“

Weberleider, H., Schuchhardt, Ch.

Wessbecker, H., Braun, J.W., Schuchhardt, Ch., Heffertz, U.
Aussagewert der Funktions-Lymphszintigraphie beim Lipödem-Syndrom.
Lymphol. 19 (1995) 34-41

Weiß, G.T., Kasenberg, E., Rodiek, S., Scheick, R., Wapler, P.
Stellenwert der Kernspintomographie in der Diagnostik - artifizielles Ödern der unteren Extremitäten im Kernspintomogramm und im histologischen Bild.
In: „Lymphologica, Jahresband 1996“

Weiß, G.T., Stroßbrenleith, R.H.K.
Grundlagen und therapeutische Ideen zur Behandlung von Lymphödemen.

Weinert, V., Liebman, S.
Das Lipödem.
Hautarzt 42 (1991) 484-486

World, L.E., Henne, J.R., Allen, E.V.
Lipedema of the legs: A syndrome characterized by fat legs and edema.

Yamada, S., Burton, A.C.
Effect of reduced tissue pressure on blood flow of the fingers: the veno-vasomotor reflex.
J. Appl. Physiol. 6 (1954) 501-505

Yoshimori, G., Schieder, J., van Dyk, D.J., Chetry, A., Mold, G., Bønner, G.
Impairment of the postural venoarteriolar response in young type 1 diabetic patients.
A study by laser doppler flowmetry.
Angiology 47(1996) 687-691

Young, J.R.
The effect of posture (standing) on the serum protein concentration and colloid osmotic pressure of blood from the foot in relation to the formation of edema.

Young, J.R.
The swollen leg.

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