

Vibroassisted Liposuction and Endermologie for LipoLymphedema

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INTRODUCTION

The dream of the aesthetic surgeon has always been the body improvement, since he is not able to act against the aging. But each of his efforts has to deal with the scars, the unavoidable traces of the knife.

Adipose tissue, as well as from its various composition as from its distribution, represents the main structure for the silhouette definition and the body harmony. But the attempt to reduce or to remove fat in excess or badly located, has always been limited by scars.

On September 1976 has been published the first and revolutionnary operation allowing removal of fat tissue while limiting trauma and scars^{1,2}: liposuction was born.

This methodology had various evolutions^{3,4,5,6} since getting the possibility to use it either in different pathologies^{7,8,9} or in unaesthetic affections as lymphedema, lipoedema or lipolymphedema^{10,11}.

CELLULITE

The silhouette is characterized by the particular localization of the subcutaneous adipose tissue over the osteomuscular structure. We know that human body is characterized by the presence of rigid fasciae, and especially deep muscular fasciae which, starting from the cranium base and without any solution of continuity, to the ankles and metatarsus promoting various physiological functions: vascular, neurophysiological and orthopedic.

Cellulite is a classically degenerative and evolutive affection of the subcutaneous tissue which grows on a constitutional substrate itself linked to a whole series of predisposed and releasing factors. According to the authors who have described cellulite from an histomorphologically point of view, defining it as a P.E.F.S.: "oedematofibrosclerotic dermo-ipodermical pathology"^{12,13}.

Cellulite is considered as a series of events characterized by interstitial edema, secondary connective fibrosis and consequent sclerotic evolution. Recent clinical observations demonstrated that if P.E.F.S. is a true part of cellulite it does not represent all the various clinical aspects of cellulite.

In fact there are often particular forms of connective and interstitial damage or diffuse syndroms characterized by a lipoedema associated with a lymphedema and/or lipodistrophy. Such pathologies are mainly observed on gluteal muscle and on lower limbs of female gender.

LIPOEDEMA AND LIPOLYMPHEDEMA

Lymphedema is described¹⁴ as a pathology characterized by a tumescent state of soft tissues, -usually superficially-, and related to the accumulation of lymph highly containing proteins by stasis in the interstitial space. It is determined by primary and/or secondary damage of the transport vessels.

On the contrary, lipoedema is a particular syndrom, which etiology is not well known nowadays, and characterized by fat and water deposition in the subcutaneous tissue (particularly in lower limbs and gluteal muscle) associated to lymphedema and/or lipodistrophy.

Lipoedema was described for the first time as an accumulation of subcutaneous fat with hard leg edema avoiding the feet. In the various next descriptions¹⁵ the following observation has always been underlined, that is to say a foot hypothermy with a localized gradient of temperature. During the last years, this syndrome has been well described with 4 major criteria mandatory for its diagnostic.

Such a pathology, often superficially defined as a lymphedema, a venous insufficiency or cellulite, is observed in more than 65% of female gender between the age of 14 and 35 years, becoming a lipodistrophic lipolymphedema after the age of 40.

The common characteristics of a lipolymphedema are the

incisions. Cannula are not connected to a suction device, it is only the movement of the cannula which induces the cellular disruption and channel formation.

The adipocyte disruption is not induced by suction but essentially by the backward-forward motion of the cannula. The created channels will help, in the healing phase, the adhesion of subcutaneous tissue to skin and also the angiogenesis.

The adipocyte contains collagen. Then, its disruption leads to a collagen exposure into the extracellular matrix, very useful in the post operative healing phase.

With the introduction of ultrasound assisted liposculpture and so, with the patented vibroassisted method Microaire, the possibilities have been multiplied^{17,18,19}.

The benefits obtained from the reduction of the interstitial pressure due to the adipocyte decrease are characterized by the microcirculation (arterial and lymphovenular) and tissue metabolism improvement.

The reduction in adipocytes number and size prevents the hormone action and thus the evolution of the adipose and lipodystrophic pathology.

A consequence in the adipocytes reduction is the systemic slimming and the improvement of systemic metabolism related to improvement of insulin peripheral metabolism.

All this is now intensified by the use of Endermologie in the rehabilitation post surgery phase.

An important application for liposuction is also the treatment of lymphedema and particularly, lipolymphedema.

Lipolymphosuction allows the reduction of all the previous selected lymphedema, which can be treated as ankle, knee, calf.

THE VIBRO-ASSISTED METHOD

The Vibratory Pneumoassisted Liposculpture by Bacci (1997) or the Reciprocal Automatic Liposculpture by Scuderi, (1999), according to the US patented Microaire method, is a methodology which consists in a 300g device linked in a part to the compressed air from the surgery room or to a nitrogen bottle, and in another part to a 2-3 mm, little and light cannula connected to a little vacuum device.

The system, defined in this version PAD100-MicroAire, allows vibrations of the cannula top, 2mm transversely and 4 mm vertically, inducing the rupture and homogenization of the fat tissue, simultaneously aspirated (Tab. 4)

Heat production and venolymphatic tissue trauma are avoided because the important backward - forward motions are not necessary, as in traditional liposuction; a little movement is sufficient as a violin bow does. Such a methodology, with 1,8 - 2,4 mm cannula, is now well used in the treatment of lymphedema and lipolymphedema, particularly at level of the ankle, calf or arm.

Such a methodology due to its easy use and its rare side effects, even for not skilled users, is an extremely useful remedy²⁰.

ENDERMOLOGIE AND TECHNIQUE LPG

Endermologie^{21, 22, 23, 24, 25} designs a non invasive technique for the mechanical treatment of skin, subcutaneous and connective tissues. This technique is realized by the way of the medical device "Cellu-M6" conceived and produced by the French company LPG Systems. This mechanical device is constituted of two motorized rollers included in a treatment room, which

mobilize the skin by folding and unfolding it, previously grasped by the vacuum power generated between the rollers. The technique LPG, born in France and developed both in Europe and USA, has initially been used to soften burn and traumatic scars (Tab. 5).

Numerous studies have been performed in order to explore the mechanism of action of Endermologie and its effects on tissues, showing a dramatic increase of skin blood perfusion, venous return and lymphatic flow, the creation of thick, longitudinal bands of collagen in the deep subdermal layer, moreover both changes in interstitial structure and tissue vascularization.

Then the results have become exponential with the use of this technique in a protocol validated and improved by us from 1997 to 2000. (BIM.ED protocol)^{25, 26, 27}.

CLINICAL STUDY

Despite of the clinical results confirming the usefulness of the methodology in the conservative treatment of lipolymphedema and lymphedema of the lower limbs, but also the quick recovery or the rare occurrence of complications, we underwent a clinical trial in order to underline the side effects and to evaluate the benefits in an experimental way.

MATERIALS AND METHODS

Objective evaluations have been carried out by videocapillaroscopy with optical probe (VCOP), laser Doppler flowmetry (LDF), transcutaneous oxymetry (tcpO2), lymphoscintigraphy^{28, 29, 30, 31} and measurement of body perimeters.

The subjects were 7 female patients, 18 -28 years old (mean 20.7), who underwent surgery for malleolar and calf lipolymphedema.

The patients were enrolled after signing a consent form. All the subjects have been studied clinically for excluding vascular and/or systemical pathologies which could have an incidence on the objective evaluations (macro and/or micro vascular troubles, renal/hepatic pathologies). All the subjects were non smokers and did not take estroprogestogens.

The protocol included:

- a) experimental evaluations before and 30 days after surgery: VCOP, LDF, tcpO2.
- 8 Endermologie Sessions (LPG Systems), twice a week in the postoperative period when the patient wear elastic garment during the day (Solidea 14mmHg).
- Lymphoscintigraphy 30 days after surgery.

The followed design was:

- Day 0 = VCOP, LDF, tcpO2, body perimeter Surgery
- Day 30 = VCOP, LDF, tcpO2, body perimeter Lymphoscintigraphy

VCOP was performed at magnification 100x and 200x.

VCOP parameters were:

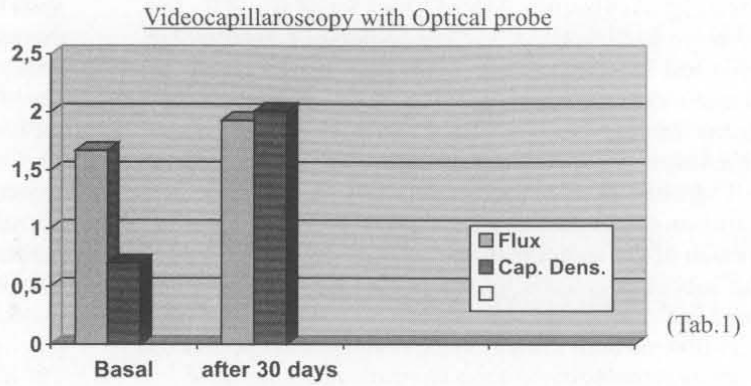
- a) Red blood cell velocity (chosen in the most significative field)
- b) Capillar density changes

RESULTS

VIDEOCAPILLAROSCOPY WITH OPTICAL PROBE (TAB.1)

Average values in basal conditions
 basal flux = 1.67
 capillar density= 0.70

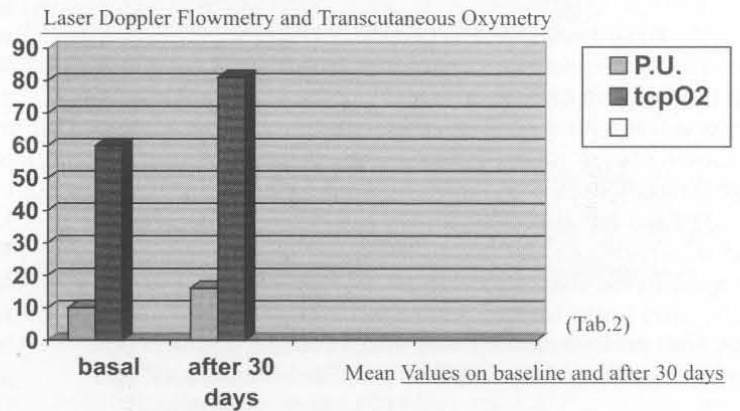
Average values after 30 days
 flux = 1,93 (+0.26)
 capillar density= 2,01 (+1.31)



LASER DOPPLER FLUXIMETRY AND TRANSCUTANEOUS OXYMETRY (TAB.2)

Perfusion and tcpO2 basal values
 PU= 10,04
 TCPo2 = 60.02

Values after 30 days
 PU = 16,12 (+6,08)
 TcpO2 = 81,09 (+21,07)



CIRCUMFERENCES (TAB.3)

Circonfereces have been measured with a tape misure before surgery and 60 days after at the malleolar level, superior area of the thigh, Boyd's and solear perforating.

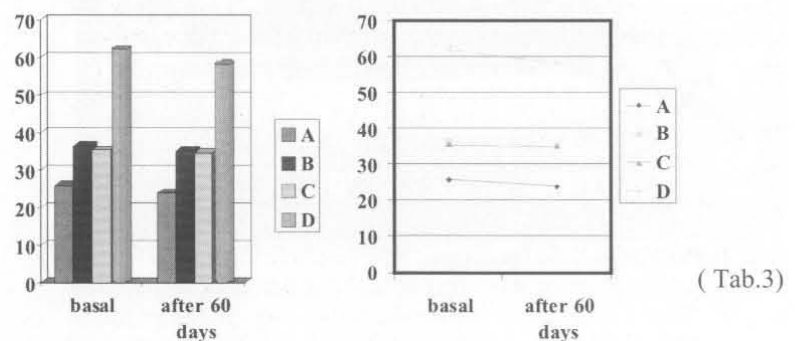
Average basal values

- Malleolar level: 25,8 cm
- Solear perforating: 36,4 cm
- Boyd's perforating: 35,3
- Thigh: 62,1 cm

Average values at 60 days

- A) Malleolar level: 23,9 cm
- Solear perforating: 35,1 cm
- Boyd's perforating: 34,9
- Thigh: 58,1 cm

Circumference values (after 60 days)



All the values made at the end of this study show a sensitive decrease of the circumferences showing the decreased thickness of the lymphoadipose tissue and the improved lymphovenous deflux. Infact, in case of the lymphatic vessel lesions, we'd had a progressive increase of the circumferences and, at the end, we could have a worst situation.

Certainly, the lipolymphedema is a cronical pathology, so, it requires an integrated medical and physiotherapeutical treatment, in association to elastic stocking therapy, to mantein long time this results.

LYMPHOSCINTIGRAPHY

The lymphoscintigraphy has been made before and after the treatment in 8 cases of leg's lipolymphedema treated by vibroassisted liposculpture MicroAire System. All the examinations has been made in Nuclear Medecine Center by the radioisotopic test Tc-99m with quantity less 0,5 cc using the traditional methodology. Each study has been repeated after 60 days from the surgery and we never notice lymphatic vessel lesions in the surgical treated areas. More over, a reduction of the time Foot- Thigh has been shown.

This examination shows that the vibroassisted surgery provides us a real reduction of the complications about the lymphatic vessel system and subcutaneous tissue. We can notice, sometime, an improvement of the lymphatic stasis, a reduction of the ipodermocal fibrosis and, finally, a real reduction of the speed's evolution of this pathology.

The evolution until the ipodermocal fibrosis and hard lipolymphedema is a common complication of the lymphatic stasis.

DISCUSSION AND CONCLUSION

In this clinical study, an important and significant increase of the measured values has been observed showing the improvement of the microcirculation of the cutaneous oxygenation and of the interstitial metabolism.

This underlined the improvement we can obtain by decreasing the interstitial pressure and tension caused by the presence of fat and lympe in the tissue. This result is always detectable also clinically after lower limbs liposculpture or lipolymphosuction surgery, well performed with very small cannula and in a non traumatic way using MicroAire Method. Such a metabolic and

microcirculatory improvement has already been observed in other clinical trials using the LPG Systems patented device and the Technique LPG specific way.

Off course every liposculpture or lipolymphosuction surgery must be completed by physiotherapeutic sessions making an unique therapeutic period between the surgery act and the sessions of Endermologie.

Conclusion must always been referred to this complete treatment, the both therapeutic sessions could not be separated.

The circumference decrease also showed how the proposed physio- surgery therapeutic protocol gave good results by decreasing edema and adipose tissue, thus leading to a clinical, functional and aesthetic improvement.

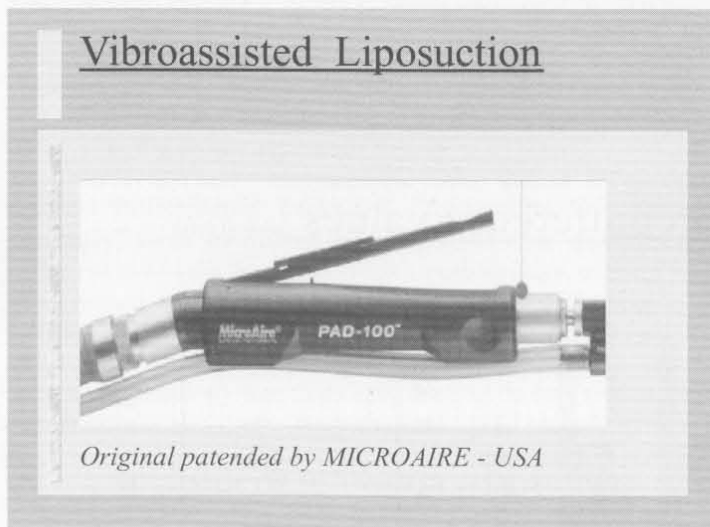
The improvement can also be valuable by the delay of the typical evolution of these pathologies towards fibrosis and phlebolymparthrosis with articular rigidity.

The lymphoscintigraphy, performed after 60 days, demonstrated, beside the MicroAire surgical technique validity, the absence of lymphatic damage.

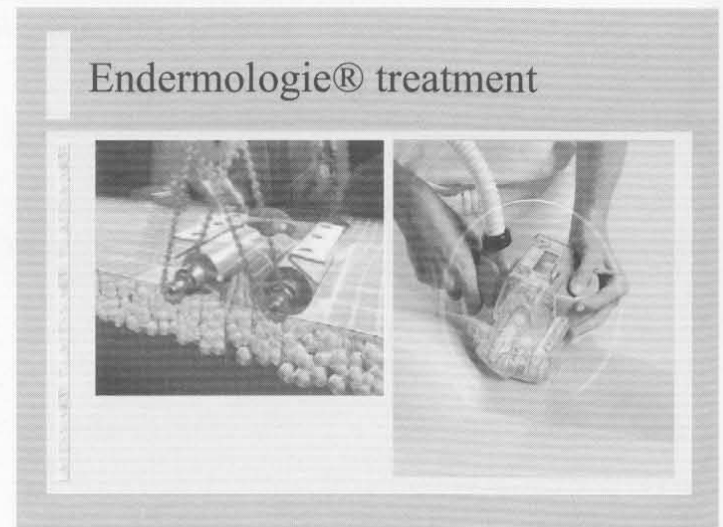
Such observations confirm clinical observations such as the slight surgery traumatism and the synergy with Endermologie achievement in the treatment of lower limbs lipolymphedema and lymphedema.

This treatment is conservative and will be always associated with elastocompressive treatment and physiotherapeutic maintenance. Sometime, a new surgery will be necessary if the pathology is evolutive. Such an evolutivity must always tend to evaluate the eventual indication of other surgical solutions of lymphatic correction.

When clinical evaluations are not able to guarantee a real success and a long-term effect, by the way of the traditional surgical solutions, we believe that such a protocol of conservative surgery by both a vibro-assisted lipolymphosuction and Endermologie is justified.



(Tab. 4) The Vibroassisted liposuction



(Tab. 5) The Endermologie – LPG System

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