

THE EUGANEAN MUD AND CELLULITE: OUR EXPERIENCE AND PERSPECTIVES

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INTRODUCTION: CELLULITE

Cellulite is one of the most common lipodystrophy syndromes, which affect millions of post-adolescent women.

Cellulite is manifested by topographic disorders of subcutaneous tissue such as:

- nodules
- oedema
- abnormal fibrosis.

INTRODUCTION: CELLULITE ETIOLOGY

The tissues undergoing lipodystrophy present histopathological changes. In patients with cellulite, microscope observation reveals:

- swelling of the subcutaneous tissue;
- decay and change of the adipocyte structure;
- enlargement and thickening of the vascular endothelium;
- hyperplasia and hypertrophy of the reticular fibers;
- subcutaneous microangiopathy;
- extensive vascular disorders
- atrophic-dystrophic skin

INTRODUCTION: CELLULITE ETIOLOGY

The etiopathogenesis of cellulite is multifactorial and unclear, but it is known to incorporate environmental, hormonal and genetic factors.

The severity of cellulite is known to be similar in related women.

In addition, incidence and severity are influenced by sex, race, and biological type.

There is no doubt that improper lifestyle is an important accelerator of the syndrome. (Excessive intake of food products rich in fats with a high salt and preservative content; a sedentary lifestyle, lack of physical activity; alcohol consumption, smoking) Tokarska et al., 2018

INTRODUCTION: CELLULITE ETIOLOGY

role of adipocyte

The adipocyte, with the secretion of fatty acids, cytokines, and various hormones with profound paracrine and endocrine effects influences metabolism, endothelial function, inflammation, and extracellular matrix deposition.

Emanuele et al. (2011) revealed the reduced expression of adiponectin mRNA in areas with cellulite compared with those without. However, plasma adiponectin levels did not differ between women with and without cellulite, what suggests that this molecule may act as a local paracrine factor that influences the appearance of the skin.

INTRODUCTION: CELLULITE ETIOLOGY

role of adiponectin

Adiponectin is known to not only have strong antiatherogenic properties, but also to act as a vasodilatory and anti-inflammatory factor. Low levels of this protein correlate with impaired vasodilation, thus impeding microcirculation (Ewart et al 2004).

These findings imply a probable link between local low concentrations of adiponectin and the development of cellulite.

Low levels of adiponectin and high levels of leptin have been implicated in the development of cellulite. (Tokarska et al, 2018)

INTRODUCTION: CELLULITE ETIOLOGY

role of GAGs and hypoxia (Gulhima et al 2022)

According to the vascular hypothesis, the precapillary arteriolar sphincter in the affected areas is altered. Moreover, deposition of altered, hyperpolymerized glycosaminoglycans (GAGs) causes pressure on the capillary walls with exudation of fluid in the spaces between the fat lobules and inter-lobular septae. Hypoxia and intercellular edema set the stage for fibrogenesis with increase in the number and thickness of the inter-lobular septae.

Hypoxia also leads to resistance to lipolytic mechanisms and a low estrogenic state and high carbohydrate intake cause the fat globules to become more hypertrophied and nodular.

Hypoxia inducible factor 1 (HIF-1) protein is increased in cellulite.

INTRODUCTION: CELLULITE ETIOLOGY

role hypoxia, free radicals and inflammation

Endothelial damage is associated with presence of reactive oxygen species and the release of proinflammatory cytokines. Inflammation itself could be the cause of endothelial damage. When associated with obesity and insulin resistance, the presence of macrophages, Th1 cells, and mast cells can contribute to the blood vessel damage occurring in cellulite. Inflammation was proposed as a contributor to the development of cellulite due to presence of tenderness on pinching the affected skin. According to Kligman, a low-grade septal inflammation is responsible for dermal atrophy. (Gulhima et al. 2022)

INTRODUCTION: the Euganean Mud



Euganean Thermal Mud properties depend on the heat and electrolytes of the thermal water, as well as on the bioactive molecules produced by its microbiota, mainly represented by cyanobacteria.

The therapeutic potential of exopolysaccharides (EPS) produced by *Phormidium* sp. ETS05, the most abundant cyanobacterium of the Euganean mud result in exerting anti-inflammatory and pro-resolution activities (in vivo downregulation of NF- κ B signaling, cytokines, and inflammatory markers, the reduction of neutrophils at the damage site, and recovery of detrimental effects . (Zampieri et al. 2020) In vivo the EPS shows also an antioxidant effect (Zampieri et al. 2022)

AIM OF THE STUDY

Many women who attend our spa facilities for years, during the medical examination often reveal to undergo thermal mud therapy, not only for the presence of polyarthralgia, but especially because they observe an improvement in cellulite after 6-12 cures.

We therefore aim to investigate whether there is a real cellulite improvement or not



METHODS: STUDY DESIGN

A bibliographical research on pubmed, looking for 'cellulite' and 'spa therapy', 'balneotherapy', 'mudpack' has retrieved 0 results.

Looking for 'oedema' and 'balneotherapy' we found some paper about the use of some 'mudpack' not well specified for the treatment of the chronic venous insufficiency

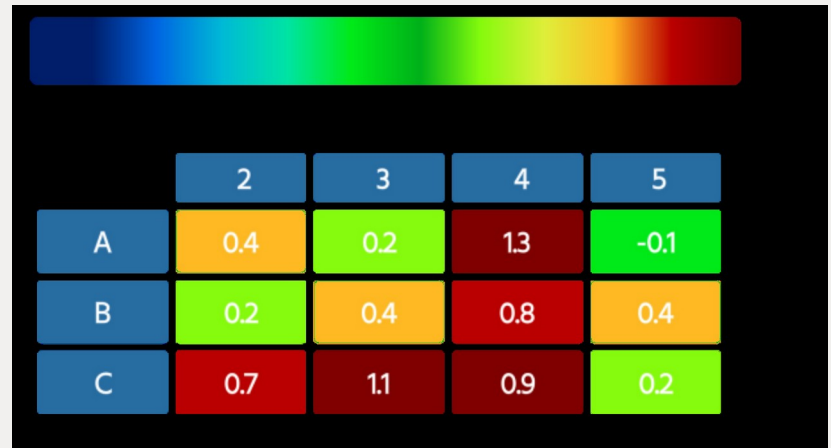
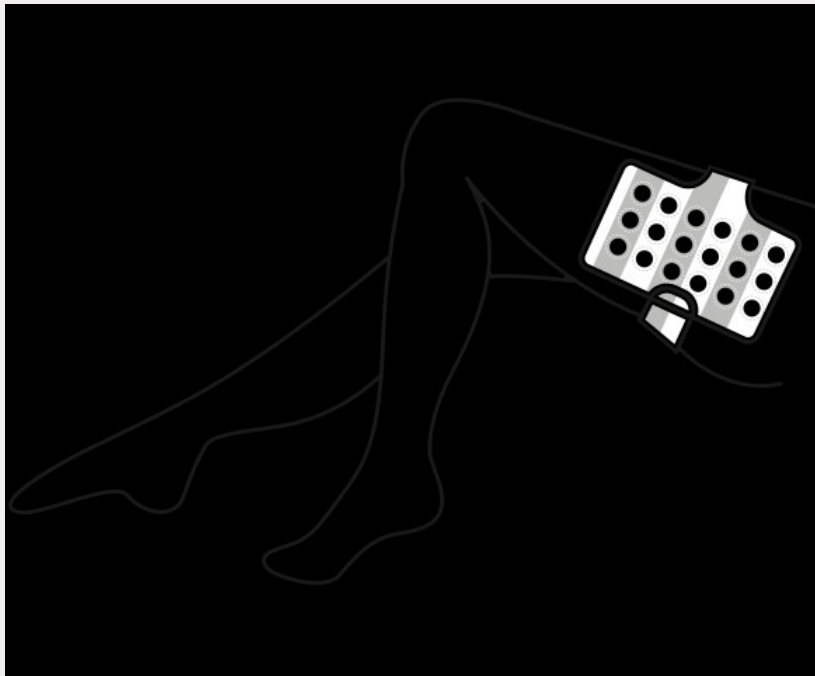
METHODS: STUDY DESIGN

We designed a controlled experimental study, using SOFT FX, a device that allows to carry out a surface thermography and that has a software for the diagnosis of cellulite.

THE SOFT FX (CATTELANI GROUP) AND THE DIAGNOSIS OF CELLULITE

- **MEASURING PRINCIPLE:** infrared emission detection for measuring the surface temperature of the skin without contact. The probe is equipped with an optical pointing system that projects on the surface 4 arcs to indicate the correct reading distance of the probe. • **FIELD:** 1.0 - 80 inches C • **RESOLUTION:** 0.1
- The measurement results are shown through a thermal map showing the temperature changes in the analyzed area. Soft Fx uses measured data at the ends of the belt to evaluate temperature ranges.
- The green dots correspond to the ideal value, that indicates a uniform temperature. The points represented with cold colors like blue indicate a temperature lower than ideal and therefore the presence of fat nodules and circulatory problems related to the compression of the vessels. The points represented with warm colors such as yellow, orange, red indicate a temperature higher than ideal that corresponds to the presence of water retention.

THE SOFT FX (CATTELANI GROUP) AND THE DIAGNOSIS OF CELLULITE



THE SOFT FX (CATTELANI GROUP) AND THE DIAGNOSIS OF CELLULITE

Regarding the calculation of the degree of cellulite, this takes into account the level of water retention, discomfort, appearance and touch of the area examined. Possible results are absent cellulite, cellulite stage I, stage II or stage III, according to the Nurnberger and Muller scale.

OUR STUDY

- 38 women, not on holiday
- age 20-63 years old
- Introducing questionnaire (sociodemographic information, health behaviour)
- Anthropometric measurements and BIA at t0
- Cellulite evaluation at t0 with the cellulite program of SOFT FX
- 19 of them underwent a mud treatment and 19 of them no treatment;
- 1 of the treated women did not undergo all the treatment for personal problems and 2 of the non treated women didn't do the final check
- Anthropometric measurements and BIA at t8
- Cellulite evaluation at t8 with the cellulite program SOFT FX
- Satisfaction questionnaire

TREATMENT

The treated group underwent at the thermal establishment 'La Residence Idrokinesis' Group GB Hotels Abano to 6 thermal therapies with Euganean thermal mud, at a temperature of 42 °C, applied on the entire back, buttocks and thighs (front and back) for 15 minutes. Subsequently a bath in salsobromoiodic thermal water was carried out for 15 minutes at a temperature of 36-37 °C.

The treated group did not carry out any other treatment during the observation period, continuing to follow their daily habits.



TREATMENT

The group of controls did not carry out any treatment, even if for all of them the evaluation of cellulite at t_0 was a spur to increase water intake and for those who did not start physical activity.

RESULTS: THE POPULATION

The average age was 38.5 years old, with no differences between treated and non treated groups (t-test, $p=0.1$).

No differences between the two groups in the distribution of risk factors, such as smoking, alcohol consumption, previous pregnancies, use of extropogestines, nutrition.

The t0 assessment of the number of hot spots at the right thigh (hence the degree of oedema) and the degree of cellulite were homogeneous in the two groups.

Also the distribution of the degree of cellulite at t0 and the number of hot spots at t0 were uniform in the two groups.

RESULTS: EVALUATION ON THE EIGHTH DAY

All of the population was evaluated at 8 days.

The group of patients undergoing mud therapy appreciated the treatment, only one patient had as a side effect headache in the first day, and a patient presented on the last day the appearance of a hematoma on the thigh in the posterior region, which resolved spontaneously without therapy, in 6 days.

All patients reported a sense of 'lightness' and noticed an improvement in the appearance of cellulite.

RESULTS: BIA

The BIA at t8 was decreased in the treated group more than in non treated group, with a statistically significance. Thus according to recent studies that shows a positive effect of balneotherapy on the fat mass and oedema (Fioravanti 2015; Koçak 2020; Olah 2011)

Coefficienti del Modello - differenza BIA

Predittore	Stima	SE	t	p
Intercettare ^a	-1.083	0.394	-2.75	0.010
B:				
controlli – casi	0.730	0.565	1.29	0.205

^a Rappresenta il livello di riferimento

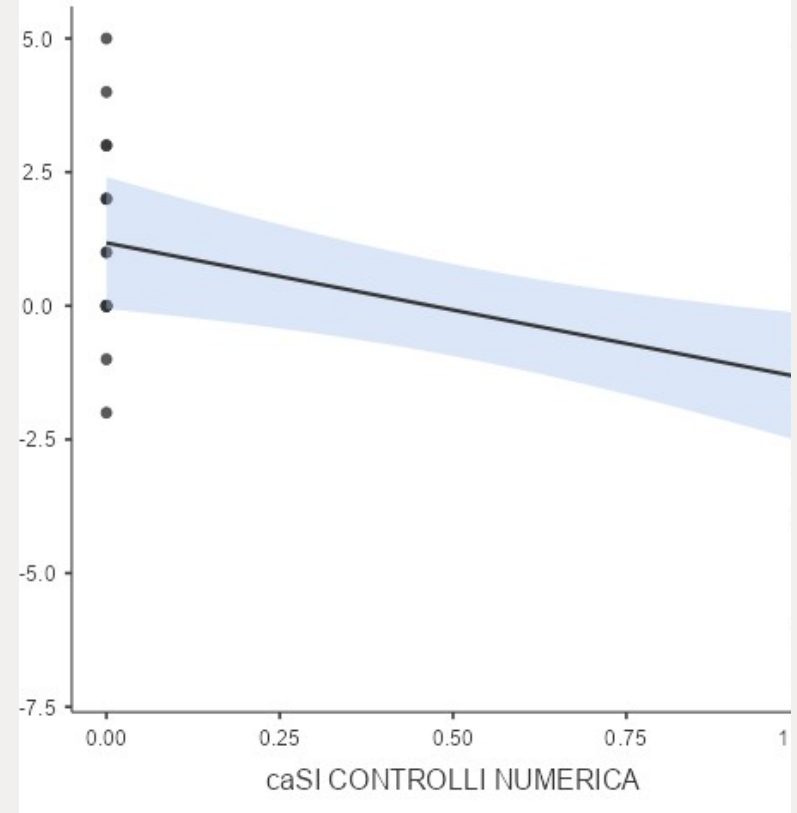
RESULTS: HOT SPOT RESULTS (DEGREE OF EDEMA)

Treated women had a statistically significant decrease in the number of hot spots compared to controls, thus showing an improvement in the degree of edema.

Model coefficients - hot spot difference

Predictor	Estimation	IF	t	p
Intercept ^a	-1.33	0.590	-2.26	0.030
B: controls - cases	2.51	0.846	2.97	0.006

^a Represents the reference level



Results

RESULTS: thigh circumference

Treated women had a statistically significant decrease of the thigh circumference.

Coefficienti del Modello - differenza cfr coscia t0-t8

Predittore	Stima	SE	t	p
Intercettare ^a	1.02	0.288	3.53	0.001
B:				
controlli – casi	-1.46	0.414	-3.52	0.001

^a Rappresenta il livello di riferimento

RESULTS: CELLULITE STAGE

About the classification of cellulite stage at t8 there was an improvement in 10 of the treated women (and no improvement in the controls.

Only in 5 women who then underwent the mudpack, to the thermography to t0 I detected cold points (zones of nodularity), that disappeared at the control thermography, while the cold points in the 4 women of the group of controls have been maintained also to 8 days. This result is not statistically significant due to the low number of population; this would therefore be a data to be further developed.

RESULTS: perspectives

- Some studies to confirm the metabolic effect of the Euganean mud, especially on the adipose tissue, evaluating the microbiota possible action;
- Some studies to evaluate how long is the effect of thermal therapies on cellulite, for introducing new programs that use the natural thermal resources to treat cellulite.
- Some study to evaluate if the mudpack therapy associated with thermal bath and medical gymnastics in thermal water can be a valid approach to lipedema. Lipedema is a pathology misdiagnosed and with a pathogenesis still unclear of which the putative causes that have been proposed include altered adipogenesis, microangiopathy, and disturbed lymphatic microcirculation (Kruppa et al, 2020).

CONCLUSIONS

From our data the thermal mud seems to have an anti-cellulite action.

The Euganean Thermal mud and bath therapy together could act like a metabolic modulator and an antinflammatory local treatment on the cellulite



CONCLUSIONS

Cellulite is a lipodystrophic syndrome that affects women in postpubertal age; it is widespread and there are no validated treatment protocols. Treatment is often expensive.

The thermal environment with its natural resources, can be an ideal place to offer a treatment that improves the cellulite, combining the treatment with mud and therapeutic thermal baths, with perhaps specific physical activity in salsobromoiodic thermal water and adequate nutrition.



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GRAZIE DELL'ATTENZIONE



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