Innovation in Subcutaneous Fat Treatment: a Study on the Effectiveness of the Lysiwave on fat tissue.

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Abstract

The treatment of subcutaneous fat presents a significant challenge in both aesthetic and medical fields. This study examines the effectiveness of Lysiwave technology in transforming solid fat into a liquid state within two days post-treatment. Observations suggest that a low-intensity protocol, applying power levels between 120-140 watts for longer durations, optimizes the results.

Introduction

LYSIWAVE is an innovative system that uses microwaves to alter the consistency of subcutaneous fat, making it easier to eliminate.

LYSIWAVE device has an oxygenated air blow that generates a pleasant cooling sensation during treatment. This function can be activated or deactivated directly by pressing the corresponding display button on the diplay. The air cooling is emitted by creating a cushion on the handpiece's emission window, thus preserving the surface skin layers from unwanted overheating. The air allows the delivery of oxygen at a high concentration, up to 90%, thanks to a nitrogen filter that helps oxygenate the tissues by promoting microcirculation and cellular metabolism, guaranteeing total patient comfort and minimising side effects.

The LYSIWAVE device is supplied with two handpieces. Treatments are effective with both handpieces.

The HANDPIECE HD has a larger microwave transmission area than the HANDPIECE LD. Depending on the treatment to be performed, the recommended handpieces are listed below:

- PEFS treatment - select CELLULITE/PEFS programme - It is recommended the use of HANDPIECE HD(the big handpiece)
- Treatment of skin laxity - select the TIGHTENING programme - It is recommended the use of HANDPIECE LD (the small handpiece)
- Body contouring treatment - select LIPOLYSIS programme – It is recommended the use of HANDPIECE HD(the big handpiece).

The device is abbreviated. This article reports a case study, analyzing the effectiveness and outcomes achieved.

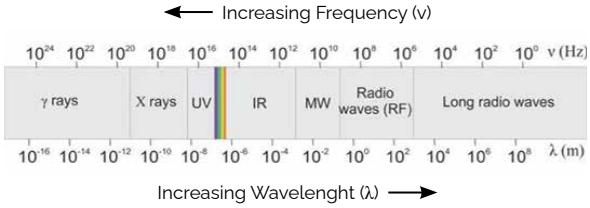
Mechanism of Action of Microwave Technology

Microwave technology is very popular in the modern society and it is not a new comer in medical applications either. It has been widely used in many branches of medicine up to now including Oncology. It has been proven to be highly safe for use on humans too.

The selective microwave frequency LYSIWAVE works at, is 2.45GHz. Such a frequency it has been discovery to make skin tissue to be almost "transparent" to the passage of the energy so to make it free to work almost totally over the subdermal fat layer specifically. This makes the superficial layers of the dermis to be preserved from unwanted heating and to stay cool.

The reason why Microwaves target fat cells in a safe, effective and non-invasive way depends on the frequency Microwaves works at.

In fact microwaves, radiofrequencies, lasers owns their own frequencies as per the following scheme:

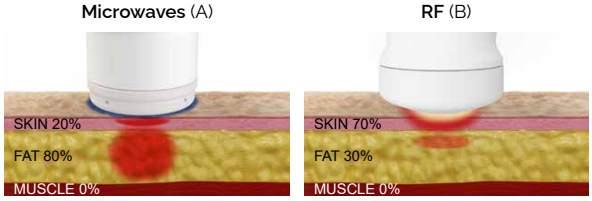


- *Radiofrequencies range from 30 kHz to 1 GHz, i.e. between 10^4 and 10^9 Hz*
- *Microwaves range from 1 GHz to 100 GHz, i.e. between 10^9 and 10^{11} Hz*
- *Lasers range from 10^{11} Hz and 10^{15} Hz*

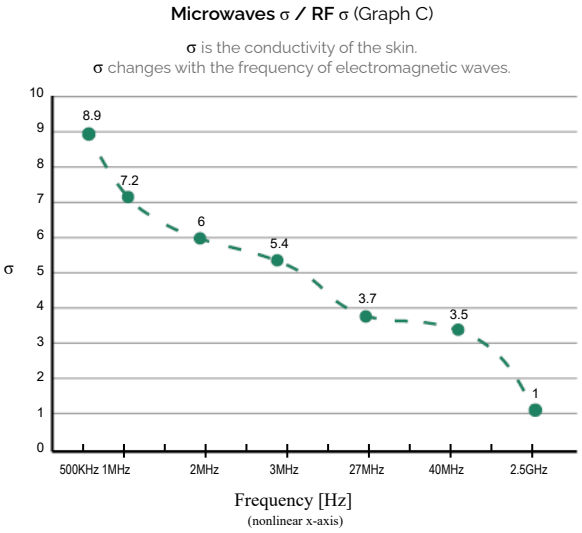
In simple terms, skin behaves differently when submitted to different frequencies (technically: dielectric behaviour). For instance, the skin is either more available to let some energy with certain frequencies to pass through it or it is less available to let the same energy, with a different frequency, to pass through it again. In other words, frequency discriminates the passage properties.

Technically speaking, "Skin Conductivity" is a physic characteristic that identifies the property of a biological tissue to transfer the energy received from an outer source (microwave handpiece) to surroundings tissues.

Conductivity is a function of the applied frequency of energy. Simply speaking skin offers more resistance to low frequency energies (less conductivity) instead skin offers less resistance (more conductivity) to higher frequency energies.



(A)Lysiwave are designed so that only 20% of the energy goes to the dermis, and this is in any case counterbalanced by the integrated cooling system that annuls the effects of such heat on the epidermis. The remaining 80% of the energy penetrates into the fat, acting effectively on the lipocytes.
(B): the situation is quite different with RF handpieces. For Lysiwave , the conductivity of the outermost layers of skin is at least 3.5 times higher than that of the commonly-used RF irradiation systems in aesthetic medicine (Graph C). That means that most of the RF energy gets stuck in the epidermis and dermis, heating them up to such an extent that there is a risk of tissue damage. Moreover, as the RF energy remains close to the surface, it fails to reach the hypodermis where the fat cells are located, and whose membranes must be broken in order for the treatment to be effective.



Mechanism of Action Adipocyte Cells

Lysiwave targeted action on adipose tissue, it produces the following effects:

1. Remodeling of the connective tissue matrix with consequent modification of the microenvironment that regulates the Adypocites metabolism. The homeostatic balance between the adipocytes and the connective interstitium that defines the vital conditions of the adipose tissue is therefore altered.
2. Adypocite metabolic changes by induced thermal stress. Adypocites are therefore stimulated to release a quantity of lipids much higher than their physiological capacity in the outer environment.

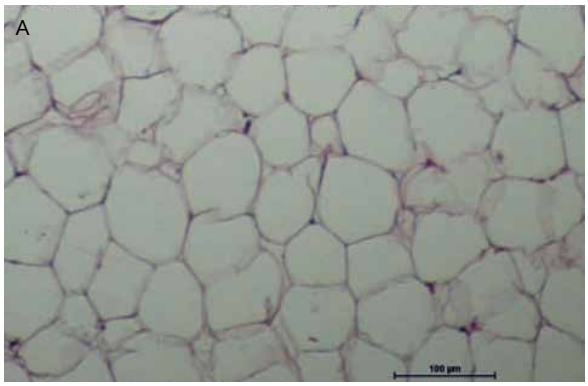
Action on the fat

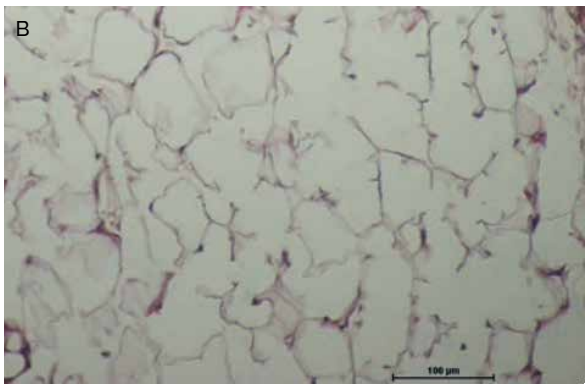
Lysiwave intense stimulation, put adipocytes under a strong stress condition so to induces metabolic changes. These modifications lead the adipocytes to release part of their lipid content outside, in the cellular interstitium, through a mechanism called "blebbing": the droplets of fat reach the plasma membrane where they are surrounded by evaginations of the membrane which give the cell a bubble-like appearance.

The bubbles once detached from the adipocyte, bring the lipid content to the outer interstitial connective tissue.

This mechanism is so intense that it initiates a

process of lysis of fat cells with adipocyte membrane rupture. The large amount of droplets of fat that are poured into the interstitial connective, stimulates the recall of the macrophages from the blood that have the task of "cleaning" the cellular interstitium from the excess of fatty acids, engulf the excess free fat. When the condition of normality is restored, the macrophages migrate into the lymphatic system.





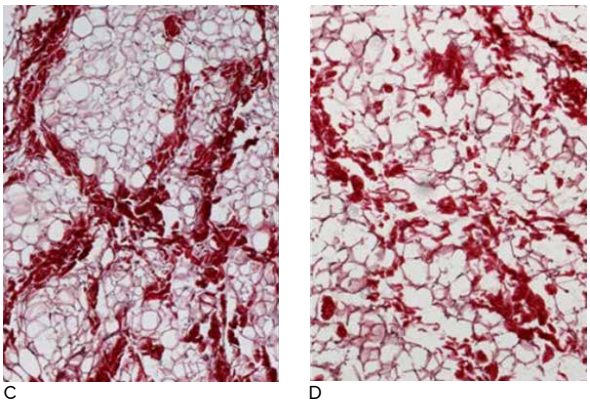
Histological images of tissue with human abdominal fat (magnification x20). (A): Control. (B): Sample from the same patient immediately after treatment with Microwaves. Image (B) clearly shows the ruptured lipocytes and initial hyperaemia with dilatation of the blood vessels. Foto comes from published paper of equivalent technologies.

Action on the cellulite

The typical "orange peel" texture of cellulite is determined by the consistent presence of large fibrous collagen septae that lead to a constriction of the natural lobulation of adipose tissue, as well as adipocyte hypertrophy and water retention.

The energy of the Lysiwave absorbed by fibrous connective branches, causes the solubilization of the collagen to take place, with consequent debridement of the tight non-elastic weft that strangled the lobules.

The solubilization of collagen, in addition to producing the loss of the pitted appearance of the skin, also makes it possible to reactivate the fibroblasts which are stimulated to produce new, more elastic collagen.



Before (C) and after (D) treatment with the Microwaves. In the pre-treatment image is visible the organized structure of the collagen fibers while in the post-treatment picture is possible to observe the collagen fibers solubilization. Foto comes from published paper of equivalent technologies.

Action on the Skin Laxity

The heat produced by the Lysiwave in the dermis it causes either an immediate collagen shrinking and a consequent tightening.

Materials and Methods

Participants: a sample of patients undergoing Lysiwave treatment.

Procedure: the treatment involved applying Lysiwave at controlled intensities (120-140 watts) in 1 session, in 30 minutes.

Analysis: Treated fat was compared to untreated fat to assess its consistency and properties within 48 hours post-application.

Results

Preliminary Observations: two days after treatment, the fat treated with Lysiwave was completely liquefied, whereas untreated fat remained solid.

Composition of subcutaneous fat extracted before being treated with Lysiwave.

Optimized Protocol: the low-intensity, longer-duration method proved more effective in transforming the fat.

Discussion

The success of the Lysiwave protocol is attributed to the combination of controlled intensity and treatment duration, which facilitates fat liquefaction without damaging surrounding tissues.

Conclusions

Lysiwave technology is an effective and safe solution for subcutaneous fat treatment.

Composition of subcutaneous fat extracted after 48 hours of being treated with Lysiwave.
Watch the video by clicking here

Clinicals evidence

Before *After 3 treatments*

Before *After 1 treatment*