
Thermal In-Vivo Experiment using (MP)²® energy – A synergy between Multi polar RF and Pulsed Magnetic Field using Venus Freeze® a new system developed by Venus Concept.

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INTRODUCTION

In recent years, several new radiofrequency (RF) devices have been introduced for the treatment of various skin conditions, particularly, skin wrinkling and laxity. These non-surgical systems induce tissue tightening and contour changes through dermal collagen remodeling, by skin heating without disruption of the overlying epidermis, obviating a significant recovery period or risk of serious adverse consequences¹. By sending high frequency alternating electrical currents through the skin, the penetrated electrical energy to the skin causes collisions between charged molecules and ions with the transformation of mechanical energy to heat and produce supra-physiological temperatures.

Stimulation of dermal ECM induces an immediate shrinkage of collagen fibers^{2,3,4}. Stimulation of dermal fibroblasts by mild thermally mediated wounding induces a synthesis of new collagen fibers^{4,5} (neocollagenesis) and elastic fibers (neoeLASTogenesis) after several weeks⁵.

Stimulation of skin fat cells induce an immediate increase rate of enzyme (lipase) mediated breakdown of TGs (Lipolysis) to glycerol and free fatty acids⁶ (FFAs). However RF does not increase oxidation of FFAs and weight loss.

The Multi Polar Magnetic Field named (MP)² supplies high-frequency alternating electrical currents, penetrating the skin through an hand held applicators of either 4 or 8 syntesizers (DiamondPolar™ or OctiPolar™ - See Figure 8 below) which are placed on the skin to generate appropriate energy primarily to be focused in the dermis and hypodermis with heat production. Any 2 electrodes in the hand piece emits (MP)² energy in varying phases which was designed to raise the temperature over the entire treated area and create a highly efficient woven dense energy matrix that deeply penetrates the skin's layers simultaneously for maximum efficacy.

METHODS

To evaluate important parameters concerning the heated tissue, we examined the heating effects of the Venus Freeze device on a section of static pork meat and on a human abdomen. We were aware to the limitations of the results obtained from the experiment on the section of static pork meat which do not represent the conditions of a living human body in terms of hydration, ability to respond to high temperature and the lack of blood circulation which helps to control tissue temperature. The experiments were conducted at the local standard Institute.

In vitro experiment: the study was performed on a section of static pork meat (4 cm. thick, 16cm width and 20cm length) which included skin, meat and fat layers. We used the OctiPolar™ hand piece which consists of 8 electrodes supplied with the Venus Freeze device. The experiment was conducted on "Design your own program" on 70% power. Temperatures were measured periodically and both still and video images were taken with the use of a thermal camera on the surface of the meat and laterally.

The room temperature was 23.4°C. The Initial temperature of the static meat both on the surface and laterally before treatment ranged between 18.0° - 18.3°C.

RESULT

Following several minutes of massaging the raw meat with the Octipolar™, the temperature on the surface rose to 41.2°C (Fig. 1), and at the same time the lateral view indicated 40.8°C at 20mm depth (Fig. 2). 22 minutes post treatment, despite the above mentioned limitations of the experiment (rwa meat), the temperature on the surface dropped by only 7.1°C and still was 33.1°C which is 15°C more compared with the base temperature.

Lateral pictures with the thermal camera showed that the heat penetration was still homogenous (Fig.3) and reached a depth of 20-25 mm.

IN-VIVO EXPERIMENT

Temperatures were measured and pictures were taken with a thermal camera on the surface of the abdomen before and after treatment.

The initial measured temperature on the abdomen's surface was 33.3°C (Fig 4). Several minutes after treating the right side of the abdomen with the Octipolar hand piece, the temperature rose to 41.3°C.

Subsequently, following several minutes of treating the left side the temperature rose to 40.4°C (Fig 5). Then the right and the left side of the abdomen were treated together in order to create a merge of temperatures and it reached 42.5°C (Fig 6).

10 minutes post treatment the measured temperature dropped to 39.0°C, 10 minutes later (20 minutes post treatment) it dropped to 37.0°C (Fig 7), a drop of 5.5°C after 20 min.

SUMMARY

The results obtained from these experiments demonstrated that:

The distribution of the heat was homogeneous all over the treated surface.

The heat penetrated up to 25mm.

The distribution of the heat was homogeneous all over the different layers inside.

The elevated temperature inside the skin remained at least 20 minutes post treatment.

These results indicate that the heating effects of Venus Freeze (MP)² has the ability to raise the body temperature fairly quick and maintain the heat inside various depth of skin layers for a while. Additional study is been conducted to verify that the thermal characters observed in this trial will be translated into effective clinical results using this new synergetic technology.

FIGURES 1-8

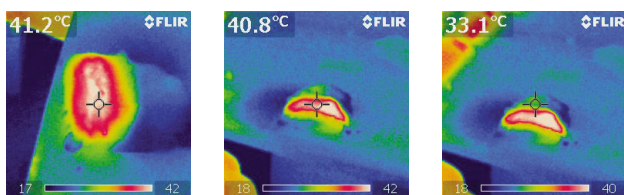


Figure 1

Figure 2

Figure 3

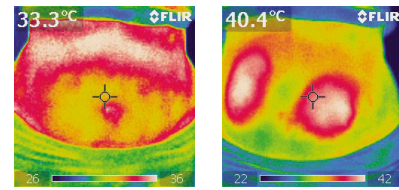


Figure 4

Figure 5

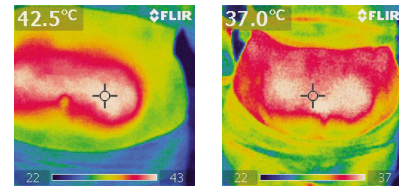


Figure 6

Figure 7

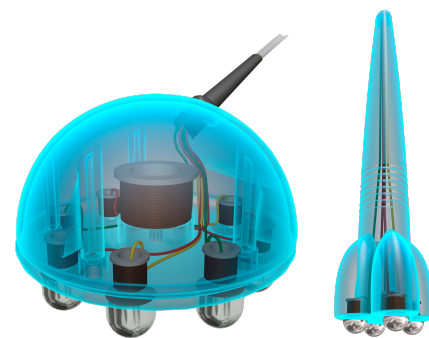


Figure 8

REFERENCES

1. T. Alster, J. Lupton (2007). Nonablative cutaneous remodeling using radiofrequency devices. *Clin Dermatol.*;25(5):487-91.
2. Arnoczky S.P, Aksan A. (2000). Thermal modification of connective tissues: basic science considerations and clinical implications. *J Am Acad Orthop Surg.*; 8(5):305-13.
3. Zelickson B, Ross V, Kist D, Counters J, Davenport S, Spooner G. (July 2006). Ultrastructural effects of an infrared handpiece on forehead and abdominal Skin *Dermatol Surg.*;32(7):897-901.
4. Hantash BM, Ubeid AA, Chang H, Kafi R, Renton B. (2009). Bipolar fractional radiofrequency treatment induces ne elastogenesis and neocollagenesis. *Lasers Surg Med.*;41(1):1-9.
5. Brian D. Zelickson, MD; David Kist, BA; Eric Bernstein, MD et al. (2004) Histological and Ultrastructural Evaluation of the Effects of a Radiofrequency- Based Nonablative Dermal Remodeling Device. *A Pilot Study/ Arch Dermatol.*;140:204-209.
6. Emilia del Pino M, Rosado RH, Azuela A, et al. (2006). Effect of controlled volumetric tissue heating with radiofrequency on cellulite and the subcutaneous tissue of the buttocks and thighs. *J Drugs Dermatol.*;5(8):714-22.