RESTING METABOLIC RATE INCREMENTED BY PULSATING ELECTROSTATIC FIELD (PESF) THERAPY

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ABSTRACT. Pulsating electrostatic field (PESF) therapy was investigated to assess the possibility of increasing the resting metabolic rate (RMR) in 14 adult females. The pumping effect of positive calcium and hydrogen ions was obtained by 30 min daily exposure to negative PESF, adjusted individually between 2 and 9 kV. This treatment could result in a buffering effect on blood pH and reduction of the rouleaux formation of erythrocytes, thus ameliorating the oxygen exchange potential and the red cell circulation in the capillary system. After PESF therapy, the average RMR (measured by indirect calorimetry) of 1255 kcal was increased on average by 323 kilocalories, indicating a possible role of PESF in the obesity treatment.

INTRODUCTION

The effect of a negative electrostatic pulsating field (PESF) was investigated to assess the possibility of increasing the resting metabolic rate (RMR) caused by the improved oxygen delivery through an augmentation of the red cell flow in the capillary system. The rationale of using PESF to increase the RMR comes from the concept that even a very slightly acid blood (pH<7.3) in humans can cause erythrocyte rouleaux, which reduces the exposed surface of cell membranes in micro and large vessels. The oval shape of red cells facilitates their penetration and circulation in the capillary system. The erythrocyte aggregation (rouleaux) has a dual negative effect: the oxygen exchanging potential is reduced and the penetration and circulation of erythrocytes in the capillary system is hindered (1-4). Aggregation of red cells is an electrostatic-related phenomenon that can be modulated, enhanced, halted or reversed by
electrostatic charges of appropriate polarization and intensity. PESF is an ion pump that can move the positively charged calcium and hydrogen ions, thus restoring the ideal pH and voiding or reducing the rouleaux of red cells (5-7).

MATERIAL AND METHODS

A PESF generating device (New Health 9000-Akern/Saeik, Florence-Italy) was used to generate a negative pulsating electrostatic field, with extremely low and safe current levels. The pulsatile frequency is 50 Hz and the field intensity can be adjusted from 2,000 to 9,000 volts. The static field is applied to a fully dressed subject, using an ion mat made from a conductive plastic insert (conductivity = 200 Ohm/cm) lined by non-conductive PVC and fabric sheets, over which the subject can either sit or lie, insulated from the ground (insulation =>24,000V). The electrostatic field is confined to the ion mat surface, and it is not harmful for either the central nervous system or the patient’s organs (9). In a preliminary investigation trial on 10 subjects with transcutaneous oxymetry values lower than normal (average <80%), an increased tissue oxygenation (average 23% augmentation) was assessed by checking the peripheral oxygen increment on arms, legs and fingers using a transcutaneous PO2 pulse oxygen meter (Tuff Sat Datex/Ohmeda).

The PESF metabolic rate increment trial protocol was approved by the Board of University Clinic Ethical Committee and conventional informed consent agreement was obtained from each participant. Fourteen adult female subjects were treated for 30 minutes per day for 14 consecutive working days.

Exclusion criteria were: implanted electronic devices (pacemakers), acute diseases, malignant tumors, infection symptoms, pregnancy, heart disorders, feverish state, bleeding and concurrent treatments. Body Composition Analysis was assessed with a BIA phase sensitive system (BIA 101S, Akern/RJL Systems-Florence) with estimates of fat mass (FM), free FM, total body water and body cell mass (BCM) using standard manufacturer’s equations. The BCM Index (BCMI) was calculated for each participant using the following formula: BCMI=Weight/(Height x Height)
The average BCMI was 10.189 (Min.7.407, max 14.696, SD 2.000). The field intensity was set up respectively at 5,000, 7,000 and 9,000 kV level in relation to the individual estimated BCMI. The BCMI/related standard recommended settings provided by the manufacturer are: male <9 level 5,000 V or = >9 level 7,000 V and =<10.5 or >10.5 level 9,000 V; female <8 level 5,000V or = >8 level 7,000 V and =< 9.5 or > 9.5 level 9,000 V. The treatment duration per each session was 30 consecutive minutes.

During the treatment, subjects were laying supine, fully dressed and left free to perform any activity compatible with the position and safety, such as reading, listening to music or even sleeping. The BMR was assessed by means of indirect calorimetry (Sensor Medics) in each participant, prior to the initiation and at end of the 14 days program.

**Statistical analysis**

Descriptive statistics were calculated for all variables. The differences from baseline were used as the outcomes for this analysis, allowing for treatment and visit effects and their interactions. The data were also analysed using ANOVA with repeated measures, which accounted for the correlation over time within a subject.
RESULTS

Rough data for all the treated subjects are shown in Table 1. The mean RMR significantly increased after treatment by 19.1% (min 0%, max 37.8%, SD 11.2%). Four subjects were randomly recalled and the measurements were repeated 30 days after discontinuation of the PESF treatment. The RMR increase was kept at an average of +18.1% (min 10.2, max 23.1%, STD Dev 5.5%) over the baseline RMR assessment. Only one subject did not respond to therapy, showing no increment of her RMR. After examining her blood parameters, no evident reasons were found, as all values were found normal. However, the general results are very encouraging since the average increase of 323 kilocalories is equivalent to an energy burn-out achievable by 45 minutes of daily walking.

Table 2 - Characteristics of the subjects.
**CONCLUSIONS**

These preliminary results showed increments of RMR in the acute post treatment phase that can reach a significant +37,8%, far superior to our expectations. The peak of relative increments of RMR is relevant in subjects with a lower than expected measured RMR (if compared to the standard estimates weight-based formulae such as the Devine or the Harris-Benedict).

Variable ranges of RMR assessment have to be carefully evaluated if total energy expenditure is calculated as a multiple of RMR, especially in subjects that need nutritional interventions (10). Also it is important to take into account body composition while measuring RMR, since it is known that BCM is related to RMR (11).

We conclude that PESF therapy can be a significant aid in the treatment of obesity, due to the marked increase of RMR that can be achieved. As PESF is a painless and non-invasive treatment and does not require taking drugs it can be easily recommended to all subjects with poor compliance with very low calorie diets. Positive side effects such as a reported subjective “feeling better” and less “fatigueability” require further investigation. The lack of any adverse effects leads us to consider extending the study by treating, under strict medical control, also those subjects who had been previously excluded from this trial because of concurrent illness.

**REFERENCES**


