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Plaster body wrap: effects on abdominal fat

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ABSTRACT

Background: Abdominal fat is associated with metabolic disorders, leading to cardiovascular risk factors and numerous diseases. This study aimed to analyze the effect of plaster body wrap in combination with aerobic exercise on abdominal fat.

Methods: Nineteen female volunteers were randomly divided into intervention group (IG; $n = 10$) performing aerobic exercise with plaster body wrap, and control group (CG; $n = 9$) performing only exercise. Subcutaneous and visceral fat were measured using ultrasound; subcutaneous fat was also estimated on analysis of skinfolds and abdominal perimeters.

Results: At the end of the 10-sessions protocol, the IG demonstrated a significant decrease ($p \leq 0.05$) in subcutaneous fat at the left anterior superior iliac spine (ASIS) level and in iliac crest perimeter measurements. A large intervention effect size strength (0.80) was found in subcutaneous fat below the navel and a moderate effect size strength on the vertical abdominal skinfold (0.62) and the perimeter of the most prominent abdominal point (0.57). Comparing the initial and final data of each group, the IG showed a significant decrease in numerous variables including visceral and subcutaneous fat above and below the navel measured by ultrasound ($p \leq 0.05$).

Conclusion: Plaster body wrap in combination with aerobic exercise seems to be effective for abdominal fat reduction.

1. Introduction

Research demonstrates that fat location, namely abdominal fat or central adiposity, is more related to adverse metabolic consequences than fat quantity.[1,2] Abdominal fat (divided into visceral and subcutaneous fat) is associated with metabolic disorders, characterized by insulin resistance, glucose intolerance, and risk factors for type 2 diabetes mellitus, dyslipidemia, hypertension, and atherosclerosis.[2]

In order to metabolize fat, aerobic exercise is recommended, increasing free fatty acid oxidation and muscle

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glycogen preservation.[3,4] To complement exercise, plaster body wrap, a clinically used technique involving a composition of green tea, green clay, magnesium sulfate, and calcium, can be used to maximize abdominal fat loss. Green tea contains catechins, which inhibit the enzyme that degrades norepinephrine and, consequently, leads to an increase in energy expenditure and an increase in fat oxidation. It also has caffeine that affects the sympathetic nervous system by enhancing the action of norepinephrine.[5–7] Both components can be absorbed by the skin.[8–10]

Green clay contains minerals such as iron and magnesium that contribute to lipolysis. Iron increases the lipolysis rate in adipocytes.[11,12] Magnesium, which appears to be absorbed by the skin, is picked up by adipocytes during lipolysis.[13,14] Green clay also contains calcium, and despite the lack of evidence regarding the reduction of intracellular calcium via its action on parathyroid hormone (PTH) and 1,25 dihydroxyvitamin D by the topical absorption of calcium by means of plaster bandage, Laudańska et al[13] found that calcium ions were able to cross the human skin barrier. Moreover, an association was found between increased calcium intake and decreased fat mass.[15–17]

The purpose of this study was to analyze the effect of plaster body wrap in combination with aerobic exercise on abdominal fat.

2. Methods

2.1. Sample

The controlled trial sample was composed of 19 female volunteers, selected through a questionnaire, and divided randomly into intervention (IG, $n = 10$) and control (CG, $n = 9$) groups. Volunteers were selected with body mass index (BMI) within the range 18.5–29.9, corresponding to normal range and preobese.[18] All volunteers were taking oral contraceptives. Those who practiced regular physical activity, who had a disease or risk factor that may influence lipid metabolism, as well as those who regularly smoked or consumed alcohol were excluded.

2.2. Instruments

A pilot study was done to analyze instrument intraobserver reliability by intraclass correlation coefficient (ICC) and standard error of the mean (SEM).

A nonstretchable measuring tape was used to measure height and perimeters (SEM = 0.1 cm; ICC = 0.99). Bioelectrical impedance Tanita BC-545 InnerScan was used to register weight.

Skinfolds, used to measure subcutaneous fat, were calculated using Harpenden analog caliper (SEM = 0.2 mm; ICC = 0.96). For the measurement of abdominal visceral and subcutaneous fat, the Echograph Viamo (Toshiba Medical Systems, Minato-ku, Tokyo, Japan) and a 7.5-Hz transducer (SEM = 0.3 mm; ICC = 0.97) were used.

A food frequency questionnaire (FFQ; Cronbach's $\alpha = 0.70$) was used in order to assess if participants' eating habits remained stable during the study.[19]

A plaster body wrap was prepared using the following components: green tea (Brazilian, ElivaPura, lot 01MAT 177103S), alcohol, magnesium sulfate, distilled water, plaster bandage, and green clay [from 00137 lot, Seara, Portugal – a smectite clay with chemical composition in %: SiO_2 (27.8); CaO (25.5); Al_2O_3 (11.2); MgO (4.6); Fe_2O_3 (2.3); K_2O (1.57); TiO_2 (0.37); Na_2O (0.05); loss on ignition (26.0)].

2.3. Procedures

The study lasted 5 weeks, with two sessions performed per week. Assessments were done prior to (M0) and after (M1) each of the 10 sessions. Ultrasound evaluated the areas between the xiphoid apophysis and above the navel for visceral and subcutaneous fat and below the navel and above the anterior superior iliac spine (ASIS) for subcutaneous fat.[20] Perimeters were measured for the waist (the narrowest point between the last rib and the iliac crests), the area above the iliac crests, the most prominent abdominal point, and the trochanter level; the waist to hip ratio was calculated (waist/trochanter level perimeter).[21]

Skinfolds were measured at the triceps, suprailiac, abdominal (horizontal and vertical), and thigh areas.[21] The percentage of body fat was estimated using skinfold measures according to the following formula:

$$\text{Body fat \%} = 1.1470292 - 0.0009376 \times (X1) + 0.0000030 \times (X1) \times 2 - 0.0001156 \times (X2) - 0.0005839 \times (X3)$$

where X1 is the sum of triceps, suprailiac, and thigh skinfolds in millimeters, X2 is age in years, and X3 is the circumference at the trochanter level in centimeters.[21]

Height and weight were also measured. The FFQ was self-applied and the participants were asked to maintain their eating and exercise habits.

The IG intervention protocol began with dynamic abdominal massage (5 minutes, with circular movements, to promote blood circulation) with an alcoholic extract of green tea (alcohol at 96%). Then, a solution of 33.79 g of green clay combined with 18.56 g of magnesium sulfate in 16.67 mL of distilled water was applied in order to improve clay element mobility.

The plaster bandage was then applied, impregnated with 3.12 g of green tea infusion, 6.94 g of magnesium sulfate in 0.5 L of water, and with more pressure in the center than in the periphery. Finally, cellophane was applied around the plaster bandage to keep it moist and retain body temperature.

While using the plaster body wrap, participants performed 30 minutes of moderate-intensity aerobic exercise on a cycle ergometer, monitored by Polar heart monitors and a Borg scale. The exercise was performed using Karvonen's formula, at 50% of the reserve heart rate (HR):

HR during training = HR in the resting state + (0.50 × HR reserve), where HR reserve = HR maximum – HR resting state.[4]

The CG only performed aerobic exercise following the same criteria as the IG.

2.4. Ethics

Permission to carry out the study was granted by the School of Allied Health Sciences Ethics Committee (approval number 1360/2011) and all volunteers signed informed consent accord-