Applied Clay Science 80–81 (2013) 140–146

Contents lists available at ScienceDirect

Applied Clay Science

journal homepage: www.elsevier.com/locate/clay

Research paper

Clay body wrap with microcurrent: Effects in central adiposity

A.S.C. Melo [a,*], J.S. Moreira [b], A. Noites [c], M.F. Couto [c], C. Argel Melo [c]

[a] School of Allied Health Sciences (SAHS), Oporto Polytechnic Institute, Rua Valente Perfeito, nº 322, 4400-330 Vila Nova de Gaia, Portugal
[b] SAHS, Portugal
[c] Department of Physiotherapy, SAHS, Portugal

ARTICLE INFO

Article history:
Received 9 March 2012
Received in revised form 2 May 2013
Accepted 17 June 2013
Available online 25 July 2013

Keywords:
Central adiposity
Body wrap
Microcurrent
Green clay
Physical exercise

ABSTRACT

Introduction: Increased fat mass is becoming more prevalent in women and its accumulation in the abdominal region can lead to numerous health risks such as diabetes *mellitus*. The clay body wrap using compounds such as green clay, green tea and magnesium sulfate, in addition to microcurrent, may reduce abdominal fat mass and minimize or prevent numerous health problems.
Objective: This study aims at measuring the influence of the clay body wrap with microcurrent and aerobic exercise on abdominal fat.
Methods: Nineteen female patients, randomized into intervention (n = 10) and control (n = 9) groups, were evaluated using ultrasound for visceral and subcutaneous abdominal fat, calipers and abdominal region perimeter for subcutaneous fat and bioimpedance for weight, fat mass percentage and muscular mass. During 10 sessions (5 weeks, twice a week) both groups performed aerobic exercise in a cycloergometer and a clay body wrap with microcurrent was applied to the intervention group.
Results: When comparing both groups after 5 weeks of protocol, there was a significant decrease in the subcutaneous fat around left anterior superior iliac spine in the intervention group ($\rho = 0.026$ for a confidence interval 95%). When comparing initial and final abdominal fat in the intervention group, measured by ultrasound (subcutaneous and visceral fat) and by skinfold (subcutaneous fat), we detected a significant abdominal fat reduction.
Conclusion: This study demonstrated that the clay body wrap used with microcurrent and aerobic exercise can have a positive effect on central fat reduction.

1. Introduction

Evidence shows that nutritional modifications combined with sedentary lifestyle have contributed to the accumulation of body fat (McMichael et al., 2007). Adipocyte metabolism is regulated by sympathetic nervous system and hormones such as catecholamines, leading to lipolysis which consists on triglyceride breakdown (Pénicaud et al., 2000).

According to Westphal (2008) fat location is more related with side effects than its quantity. Even though the gynoid pattern is the most common in women, genetic and hormonal disorders may be associated with the accumulation of abdominal fat (Freedland, 2004; Ibrahim, 2009). Increased central adiposity, particularly deep subcutaneous and visceral, increases the risk and has a role on multiple diseases such as diabetes *mellitus*, dyslipidemia and hypertension (Freedland, 2004; Goodpaster et al., 2005; Ibrahim, 2009).

One of the physical therapy procedures used in clinical practice to reduce abdominal fat is the clay body wrap with microcurrent. It is composed by green clay (with calcium and aluminum as components), green tea and magnesium sulfate, impregnated in a bandage whose compressive effect enhances fluid drainage from the abdominal region through the superficial lymphatic system (Standring, 2008).

Green tea has beneficial effects in reducing fat and body weight, given its ability to increase fat oxidation, leading to mature fat cells' apoptosis, inhibition of adipogenesis and inhibition of differentiation of preadipocytes. Its action occurs by the mechanism shown in Fig. 1.

Green tea topical application enables the retention of some compounds in the adipose tissue without easily reaching the systemic route (Belo et al., 2009; Heinrich et al., 2004).

Another body wrap component is magnesium sulfate, which can positively influence lipolysis once the magnesium absorbed by adipocytes allows hormone-sensitive lipase's activity facilitating triglyceride breakdown (Rayssiguier et al., 1990).

Green clay is composed of several elements capable of inducing lipolysis and it is also a low cost, easily accessible material. In addition to magnesium, calcium is another green clay component. An increase in extracellular calcium concentration leads to an augmented enzymatic activity and promotes a reduction of calcitriol, leading to lipolysis (Soma et al., 2003; Zemel et al., 2005). In fact, for Laudánska et al. (2002) human skin appears to be permeable to Ca^{2+} and Mg^{2+} ions, suggesting the possibility of skin penetration by these two components. Moreover, the aluminum present in clay exerts its action only in the presence of certain

* Corresponding author. Fax: +351 222061001.
E-mail address: ana.scmelo@gmail.com (A.S.C. Melo).

0169-1317/$ – see front matter © 2013 Elsevier B.V. All rights reserved.
http://dx.doi.org/10.1016/j.clay.2013.06.017

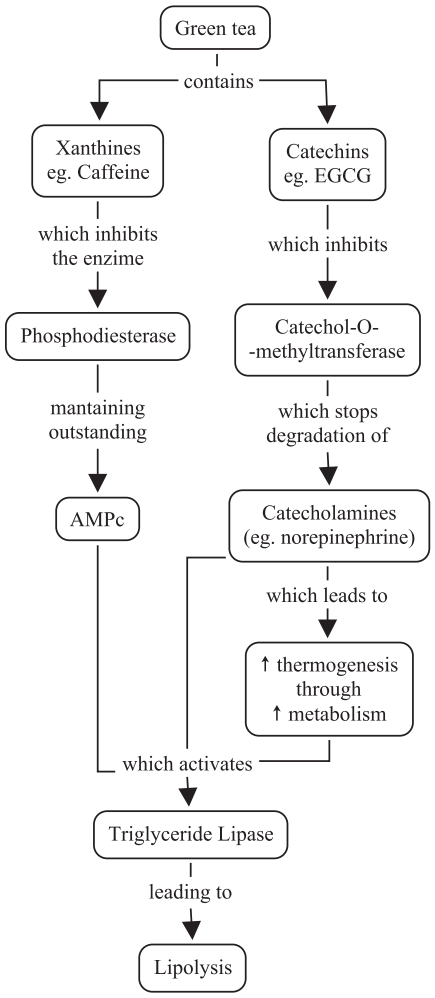

Fig. 1. Green tea's physiological action mechanism on lipolysis.
Adapted from Lin et al. (2005), Maki et al. (2009), and Rains et al. (2011).

lipolysis enzymes, modifying them and promoting the enzyme-substrate recognition (Corvis et al., 2007; Rumberger et al., 2004).

Microcurrent (electrolipophoresis) helps triglyceride degradation by increasing blood flow and metabolism, provoking changes in cell membrane polarity and activating triglyceride lipase and hormone-sensitive lipase enzymes (Curtis et al., 2010; Kirsch, 2002; Puhar et al., 2011). Therefore, this study aims at measuring the influence of the clay body wrap with microcurrent and aerobic exercise on central adiposity reduction.

2. Methods

2.1. Sample

The sample of this controlled trial was composed by 20 volunteers selected by inclusion criteria such as being a faculty female student, with a body mass index ranging from normal (18.5–24,99) to pre-obese (25–29.9) (WHO, 2006) and taking oral contraceptives. Those who practiced regular physical activity or had it as a contraindication were diagnosed with a pathology that could influence lipid metabolism, smoked or consumed alcohol regularly, and those who presented any contra indications to microcurrent (Kirsch, 2002) were excluded. Volunteers were divided randomly into the intervention group (IG) and the control group (CG).

2.2. Instruments

Before measurements, a pilot study was conducted in order to analyze intra-rater reliability, using intraclass correlation (ICC 3.1) and standard error of measurement (SEM). A rigid tape in centimeters was used to measure abdominal perimeter (SEM = 0.1 cm; ICC = 0.99). Skinfold measurements were performed using Harpenden® analog calipers (SEM = 0.2 mm; ICC = 0.96). Bioimpedance Tanita BC-545 InnerScan™ was used to calculate the percentage of total and trunk fat, weight and muscle mass. Echograph Toshiba Medical Systems, with a 7.5 MHz frequency probe was chosen to measure subcutaneous and visceral abdominal fat (SEM = 0.3 mm; ICC = 0.97). Food frequency questionnaire (FFQ) was implemented in order to see whether the participants maintained their eating habits throughout the protocol (Cronbach's α[1] = 0.70). This questionnaire assesses eating habits based on the diet over a specified period of time (1 week in this study). It has 9 sections (related with different kinds of food and drink) classified by the portion size, which allows for an estimate of the total calories ingested per day. During sessions, beyond monitoring heart rate (Polar® heart monitors), the intensity of aerobic exercise was controlled using Borg Scale.[2] A cycloergometer was used for aerobic exercise and the Enraf Nonius® model 692 Sonopuls® device was used to deliver microcurrent.

2.3. Materials

The materials used for the clay body wrap were as follows: green clay; green tea *ElivaPura* lot 01MAT 177103S (xanthines and catechins); magnesium sulfate; distilled water; ethanol and bandages. The green clay, from *Seara* lot 69 0013 and collected in Portugal, presented the following 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); and loss on ignition (26.0). Clay is ground and sieved and used without any further purification. It belongs to the smectite group, commercialized for external therapeutic use.

2.4. Procedures

Both groups were assessed initially and after 5 weeks of intervention. Intervention was performed twice a week, with a total of 10 sessions.

Ultrasound was used to measure subcutaneous and visceral abdominal fat. The former was calculated using 4 areas: between xiphoid apophysis and navel, below navel and above left and right anterior superior iliac spine (ASIS). The latter was measured only in one area, between xiphoid apophysis and navel. Waist perimeter measurements were done in four areas: the narrowest perimeter between the last rib and the iliac crests, the point immediately above the iliac crests, the most prominent abdominal point and at trochanter level. A waist–hip ratio was calculated by dividing the narrowest perimeter between the last rib and the iliac crests by the trochanter level perimeter. Skinfold measurements with a caliper, to analyze superficial fat, were performed using triceps, suprailiac, thigh and abdominal skinfolds. Some of these were also used to estimate body fat percentage [body fat's % = $1.1470292 - 0.0009376 * (X3) + 0.0000030 * (X3) * 2 - 0.0001156 * (X4) - 0.0005839 * (X5)$][3] (Eston and Reilly, 2009).

[1] Cronbach's alpha is a coefficient of internal consistency that shows how closely related a set of items are as a group. For comparing groups, α values of 0.7 to 0.8 are regarded as satisfactory (Bland and Altman, 1997).

[2] The Borg Scale is a subjective index that is used to assess a patient's degree of exhaustion or reaction to activities. In practice, the patient indicates the level of exhaustion and the extent of any dyspnea or chest pain experienced during activity on a scale from 6 to 20 (Vogels et al., 2003).

[3] Jackson and Pollock's formula, where X3 = sum of triceps, suprailiac and thigh skinfolds in millimeters, X4 = age in years, X5 = circumference at trochanter level in centimeters (Eston and Reilly, 2009).