

ORIGINAL ARTICLE

In anorexia nervosa, even a small increase in abdominal fat is responsible for the appearance of insulin resistance

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Summary

Context The aim of treatment in patients affected by anorexia nervosa (AN) is weight recovery. However, during weight gain, anorectic patients' body composition is changed, with an increase in abdominal fat, particularly in the visceral compartment.

Objective We hypothesized that changes in body composition, particularly in abdominal fat, are responsible for the variability in insulin sensitivity (IS) in different stages of AN.

Design and Measurements We compared 20 anorectic patients in the acute stage, 19 in the weight-recovery stage and 21 controls. All subjects underwent an oral glucose tolerance test, hyperinsulinaemic euglycaemic clamp and dual energy X-ray absorptiometry to measure body composition.

Results The percentage of trunk fat was higher in weight recovery than in the acute phase ($47.7 \pm 8.4\%$ vs $34.6 \pm 7.6\%$; $P < 0.01$) and in the control group (33.4 ± 7.6 ; $P < 0.01$ vs weight recovery). Although the recovery group gained weight, their body mass index (BMI) was not statistically different from that of the acute group (14.4 ± 1.1 vs 13.6 ± 1.8 kg/m²). Insulin sensitivity was lower in the weight-recovery group than the acute group (4.7 ± 1.5 vs 7.8 ± 1.6 mg/kg/min; $P < 0.01$) and controls (7.7 ± 1.4 mg/kg/min; $P < 0.01$). A linear negative correlation was found between IS and the percentage of abdominal fat in the weight-recovery and acute groups ($r = -0.51$; $P = 0.04$ and $r = -0.53$; $P = 0.04$ respectively), while IS did not correlate with BMI.

Conclusion Although weight-recovery represents the main aim of treatment in AN, refeeding is associated with an increase in abdominal fat which might be responsible of the onset of insulin resistance. As BMI and weight-recovery were associated with impaired IS, they cannot be considered the only aim of treatment of AN.

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Introduction

Anorexia nervosa (AN) is a psychiatric eating disorder, affecting mostly female adolescents and is characterized by self-induced weight loss, body image distortion and obsessive fear of gaining weight. AN is characterized by two types of eating behaviours: restricting or bingeing–purging. The prevalence ranges from 0.3 to 1%,¹ and the all-cause mortality related to the disease is high.²

In the literature, there is a large amount of data regarding the endocrine and metabolic changes associated with AN, mostly representing physiological adaptation to starvation, and their reversal after refeeding, resulting in many being considered as indices of the acute phase of disease.^{3,4} Nonetheless, weight loss and gain clearly affect fat content, and it is well known that fat content largely influences insulin sensitivity (IS). It is known that prolonged starvation causes changes in body composition with loss of fat and lean masses⁵ while nutritional recovery may result in significant changes in the regional redistribution of fat mass, the abdominal area being the largest site of lipid storage.⁶ As elegantly demonstrated by Mayer *et al.*⁷ by magnetic resonance imaging, weight gain in AN is associated with an increase in visceral and intramuscular fat depots, closely resembling the detrimental fat distribution of patients affected by several metabolic disorders associated with insulin resistance. Nevertheless, previous studies of IS in patients with AN provided contradictory results, finding insulin action to be normal,⁸ increased^{9,10} or decreased¹¹. These controversial results could be related to the different techniques used to evaluate IS, to the evaluation of insulin sensitive tissues on body mass index (BMI) rather than actual body composition and to different clinical conditions (losing or gaining weight) of the studied subjects.^{8,10}

In the present study, we explored the hypothesis that, in anorectic patients, even small differences of abdominal fat, measured as trunk fat by dual energy X-ray absorptiometry (DEXA),¹² might be responsible for dramatic variations in IS.

Subjects and methods

Study subjects

Forty women with a restrictive type of AN, recruited between March 2008 and October 2010 in the Division of Endocrinology, were divided according to the stage of disease as 'weight-recovery

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