Endocrinol Nutr. 2016;63(9):458–465

Endocrinología y Nutrición

www.elsevier.es/endo

ORIGINAL ARTICLE

Bone mineral density in anorexia nervosa: Only weight and menses recovery?

Ignacio Jáuregui-Lobera[a,b,*], **Patricia Bolaños-Ríos**[b], **Juan Sabaté**[c,d]

[a] *Area of Nutrition and Food Sciences, Department of Molecular Biology and Biochemical Engineering, Universidad Pablo de Olavide, Seville, Spain*
[b] *Behavioural Sciences Institute, Seville, Spain*
[c] *Centro Ecotest, Seville, Spain*
[d] *Universidad de Sevilla, Seville, Spain*

Received 18 May 2016; accepted 24 June 2016

KEYWORDS
Anorexia nervosa;
Bone mineral density;
Quantitative computed tomography;
Amenorrhea;
Osteopenia;
Osteoporosis

Abstract
Introduction: The study objectives were to analyze the presence of reduced bone mass in a sample of patients with anorexia nervosa (AN) and amenorrhea, to assess Bone Mineral Density (BMD) recovery after having a normal weight is reached and regular menses are resumed, and to predict BMD after a treatment period considering different variables (baseline BMD, baseline and final body mass index (BMI), treatment duration).
Material & Methods: 35 patients with AN (mean age 20.57 ± 5.77) were studied at treatment start (T_0) and after they had recovered their normal weight and regular menses (T_1) in order to measure their BMD using quantitative computed tomography (QCT) of the lumbar spine (L2–L4).
Results: At T_0, 2.86% of patients had normal BMD, while a reduced bone mass consistent with osteopenia or with osteoporosis was found in 22.86% and 74.28% of patients respectively. At T_1, the percentages were 20%, 20%, and 60% respectively. No significant differences were seen in L2–L3 and mean BMD (L2–L4). A significant difference was however found for L4 ($p < 0.05$). A positive relationship was seen between final body mass index (BMI) and final BMD in patients with T_0–$T_1 > 11$ months, but not when the time period was ≤ 11 months.
Conclusions: This follow-up study of changes not only in BMD but also in BMI and recovery of menses has clinical relevance from the viewpoint of the day-by-day treatment process. Use of QCT makes the study more relevant because this is a more advanced technique that allows for differentiating trabecular and cortical bone.

* Corresponding author at: Behavioural Sciences Institute, C/Fernando IV, 24-26, 41011 Seville, Spain.
E-mail address: ignacio-ja@telefonica.net (I. Jáuregui-Lobera).

PALABRAS CLAVE
Anorexia nerviosa;
Densidad mineral ósea;
Tomografía computarizada cuantitativa;
Amenorrea;
Osteopenia;
Osteoporosis

Densidad mineral ósea en anorexia nerviosa: ¿solo recuperación de peso y función menstrual?

Resumen
Introducción: El objetivo de este estudio fue analizar la presencia de reducción de masa ósea en una muestra de pacientes con anorexia nerviosa y amenorrea, evaluar la recuperación de dicha masa ósea tras alcanzar un peso normal y reanudar la función menstrual y predecir la densidad mineral ósea tras un periodo de tratamiento considerando diversas variables (densidad mineral ósea inicial, Índice de Masa Corporal (IMC) inicial y final y duración del tratamiento).
Material y Métodos: Treinta y cinco pacientes con anorexia nerviosa (edad media 20,57 ± 5,77) fueron estudiados al iniciar tratamiento —T_0 — y tras recuperar un peso normal y tener reglas regulares — T_1 — con el fin de medir su densidad mineral ósea (DMO) mediante tomografía computarizada cuantitativa (QCT) de columna lumbar (L2-L4).
Resultados: En el momento T_0 el 2,86% tenía una DMO normal, el 22,86% presentaba menor masa ósea compatible con osteopenia y el resto compatible con osteoporosis (74,28%). En T_1 los porcentajes fueron 20, 20 y 60 respectivamente. Con respecto a L2-L3 y la DMO media (L2-L4) no se encontraron diferencias significativas, mientras que en L4 sí se encontraron diferencias significativas ($p < 0,05$). Se halló un correlación positiva entre el IMC final y la DMO final en aquellos pacientes con una diferencia T_0-$T_1 > 11$ meses, relación no observada cuando dicho periodo fue inferior.
Conclusiones: Este estudio de seguimiento considerando no solo cambios en la DMO, sino también en el IMC y la recuperación menstrual, tiene relevancia clínica desde el punto de vista del día a día del proceso terapéutico. Además, el hecho de haber usado la tomografía computarizada cuantitativa añade mayor importancia la trabajo, ya que se trata de un método superior a otros en tanto que permite distinguir entre hueso trabecular y cortical.

Introduction

Anorexia nervosa (AN) is a mental disorder, which is characterized by patient-induced and -maintained weight loss that leads to progressive malnutrition and specific pathophysiological signs (body image disturbances and fear of gaining weight).[1] Complications in many organ systems are common, including the cardiovascular, gastrointestinal, hematological, renal, skeletal, endocrine and metabolic systems, amongst others. These alterations are not only related to the state of malnutrition, but also to the altered behaviors used by these patients to control their weight. The endocrine and metabolic disturbances include menstrual disturbances, delayed puberty, hypothyroidism, hypercortisolism, insulin-like growth factor (IGF)-I deficiency, electrolyte abnormalities, hypoglycaemia and hypophosphatemia, etc., with numerous studies of AN patients indicating a hypothalamic dysfunction as a possible pathophysiological base.[1,2]

Low bone mineral density (BMD) is an established risk in AN, with 50% of patients with AN demonstrating osteopenia within 20 months of amenorrhea and 38% developing osteoporosis with amenorrhea of less than 24 months duration.[3–5] Thus osteopenia and osteoporosis are often chronic complications of AN, leading to clinical fractures and increased fracture risk throughout life.[6,7] It must be noted that more than 50% of AN patients present with osteopenia and/or osteoporosis at the time of diagnosis and with an average illness duration of 5–6 years the annual fracture rate is about seven times greater than that of healthy women of the same age.[8] Among AN patients with a poor outcome at long-term follow-up, bone fracturing occurs in more than 40%.[9] Oestrogens deficiency is a risk factor for bone loss and osteoporosis, whereas malnutrition and low body weight may also increase the risk of osteoporosis by estrogen-dependent and non-oestrogens-dependent mechanisms.[10] Bone density and bone metabolism change dramatically during adolescence, and the onset of AN during this critical time may interfere with the achievement of peak bone mass. In addition, significant changes in body weight and composition, pubertal development and pubertal hormones presented in these patients usually affect the bone metabolism. However, the effect of AN on bone turnover in adolescent girls remains poorly understood, several factors being possible involved mechanisms.[6,11–13] Along with oestrogens deficiency and low body weight, other factors, such as insulin-like growth factor-I (IGF-I) deficiency, growth hormone (GH) resistance, ghrelin resistance, reduced leptin, exercise, etc., have been reported to be involved as causes of low bone mass in AN.[14]

With respect to the influence of the treatment on the recovery of a normal bone metabolism, it must be noted that illness recovery is usually associated with near normal BMD.[15] Long-term studies show that patients at many years of recovery while showing reduced BMD at the femoral neck, the BMD of the lumbar spine is not significantly different from that of controls.[16] The use of oestrogens and gestagens in adolescents with reduced BMD and amenorrhea for at least 1 year has shown that the osteopenia cannot be reversed.[17] The reason why oestrogens are incapable