



## Trabajo Original

### Nutritional approach of inpatients with anorexia nervosa

#### *Abordaje nutricional de pacientes ingresados con anorexia nerviosa*

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### Abstract

Anorexia nervosa (AN) is the most prevalent of eating disorders in children and adolescents, and its treatment is long and complex, involving a multidisciplinary team. Nutritional rehabilitation and restoration of a healthy body weight is one of the central goals in the initial stages of inpatient treatment. However, current recommendations on initial energy requirements for these patients are inconsistent, with a clear lack of controlled studies, available scientific evidence and global consensus on the most effective and safe refeeding practices in hospitalized adolescents with anorexia nervosa (AN). Conservative refeeding recommendations have been classically established in order to prevent the refeeding syndrome. Nevertheless, various works have recently appeared advocating a higher initial caloric intake, without observing more complications or refeeding syndrome, and allowing a shorter average stay. We present our experience in the treatment of restricting AN with a conservative progressive treatment. We have obtained good results with this approach, which was well tolerated by patients, with no observing complications. As a consequence, the medical team could establish a pact about the therapeutic goals with the patients in an easier way.

#### Key words:

Anorexia nervosa.  
Adolescent.  
Nutritional treatment.

### Resumen

La anorexia nerviosa (AN) es el trastorno del comportamiento alimentario más prevalente en niños y adolescentes; su tratamiento es largo y complejo, e involucra a múltiples profesionales. La rehabilitación nutricional y la recuperación de un peso corporal normal es uno de los objetivos centrales en las fases iniciales del tratamiento del paciente ingresado. Sin embargo, las recomendaciones actuales sobre los requerimientos energéticos iniciales para estos pacientes son inconsistentes, con una clara ausencia de estudios controlados, evidencia científica disponible y consenso global sobre la forma de realimentación más efectiva y segura en adolescentes ingresados con anorexia nerviosa (AN). Clásicamente se han recomendado una realimentación conservadora para prevenir el síndrome de realimentación. No obstante, han aparecido recientemente varios trabajos recomendando una ingesta calórica inicial más elevada, sin observar más complicaciones ni síndrome de realimentación, y asociadas a estancias medias más cortas. Presentamos aquí nuestra experiencia en el tratamiento de la AN restrictiva con un tratamiento progresivo conservador. Hemos obtenido buenos resultados con este abordaje, bien tolerando por los pacientes, y sin observar complicaciones. Gracias a él, el equipo médico pudo establecer más fácilmente un acuerdo sobre los objetivos terapéuticos con el paciente.

#### Palabras clave:

Anorexia nerviosa.  
Adolescente.  
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## INTRODUCTION

Anorexia nervosa (AN) is a common, serious and potentially life-threatening mental disorder, with a 10:1 female-male ratio, and it is the most prevalent of eating disorders in children and adolescents. It has a typical onset in adolescence and high rates of medical complications, as well as psychosocial and psychiatric comorbidity, with a remarkable impairment of the health-related quality of life (1,2). Nearly half of adolescent girls with AN will develop at least one additional psychiatric disorder in their lifetime, most commonly major depressive and anxiety disorders (1), and AN has the highest mortality rate among psychiatric diseases (3).

In the last edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) (4), AN fell into the category of disordered eating, where there is an irrational fear of normal body weight, a desire for thinness and avoiding weight gain, leading to body image distortion (5-7). It is characterized by a severe restriction in energy intake that leads to low body weight. The principal diagnostic changes from DSM-IV-TR are the removal of the amenorrhea criterion due to a lack of clinical utility and the recognition that a large percentage of individuals with AN do not report a fear of fatness or weight gain. Thus, to meet criteria for AN, individuals can either report a fear of weight gain or the presence of persistent behavior that interferes with weight gain (1).

The rate of adolescents presenting anorexia nervosa is increasing, perhaps due to the change in the diagnostic criteria (8), and patients are presenting it at an earlier age. Approximately 40% of all new cases appear in 15-19 year-old-females (5).

Many adolescents with AN practice vegetarianism with high fiber, low fat, normal protein levels, and low or normal carbohydrate intakes, which often do not meet basal nutritional requirements (5).

The treatment for AN is long and complex, involving a multidisciplinary team. In addition to nutritional rehabilitation, cognitive-behavioral psychotherapy and family therapy have all shown to be effective in treating patients with anorexia nervosa (7,9). Nutritional rehabilitation and restoration of a healthy body weight is one of the central goals in the initial stages of inpatient treatment for children and adolescents with AN, manifesting underweight or medically compromised, and it is an essential step for overall rehabilitation and recovery (5,10,11).

However, current recommendations on initial energy requirements for these patients are inconsistent, with a clear lack of controlled studies, available scientific evidence and global consensus on the most effective and safe refeeding practices in hospitalized adolescents with AN (6,8,12). The most common inpatient practice, based on international guidelines such as those of the American Dietetic Association (13), is conservative and begins the refeeding process cautiously. Inpatient programs often start weight rehabilitation on low-calorie diets of 1,000-1,200 kcal/day, typically 30-40 kcal/kg body weight/day or even less (until 10-20 kcal/kg/day) in severely-emaciated patients, with a progressive increase during the time of hospitalization, because of concerns about refeeding syndrome (5,6). The goal is to achieve an average weekly weight gain of 0.5 to 1 kg in inpatient setting (14,15), but for others it would be 1-2 kg/week during hospitalization (5).

Since refeeding syndrome was first described in the 1950s (16,17), it has been documented in patients with AN (18-20), and conservative refeeding recommendations have been established (21). Refeeding syndrome is primarily developed during the first fortnight after starting refeeding. Later in the refeeding process, most guidelines recommend a stepwise increase of daily intake such as 100-200 kcal/day (5).

However, various works have recently appeared advocating a higher initial caloric intake, without observing more complications or refeeding syndrome, and allowing a shorter average stay. Moreover, some authors argue that initiating very low energy intakes can have deleterious effects on weight gain (8). Refeeding syndrome is caused by a correction of malnutrition which is too fast, but on the other hand, we also need to avoid underfeeding caused by a rate of refeeding which is too cautious (22,23).

We describe in this study our experience about the nutritional therapy in adolescent patients with anorexia nervosa, according to an established method of refeeding.

## METHODS

This observational study was carried out in a group of AN inpatients admitted in a regional specific adolescent psychiatric unit, initially diagnosed by the DSM-IV-R criteria, and subsequently by the DSM-V criteria when they were published (4). This service is the only inpatient unit of child and adolescent psychiatry in our region.

The aim of this study was to examine weight gain, adverse events, prevalence of refeeding syndrome, and average length of stay, by reviewing retrospectively the charts data of a consecutive unselected AN sample during 7 years, from May 2007 to July 2014. Moreover, clinical, biochemical, and nutritional data were collected up during this review. The admission in the unit was decided by the Department of Psychiatry, and there was no serious nutritional commitment in all the cases. There may have been different psychiatric reasons than the nutritional ones causing this hospital admission. We have only included the cases of restricting AN which had been made an indirect calorimetry. We have discarded the cases of bulimia nervosa and binge eating/purging subtypes of AN.

All patients underwent a protocol of refeeding starting with a 1,000 calories diet, and with a progressive increase as tolerated of 200 kcal every 3-4 days until 2,000 kcal were reached before discharge.

No systematic additional mineral and vitamin supplementation was provided to patients.

On admission, a complete analytical study was conducted in all cases, including hemogram parameters and biochemistry, thyroid hormones, and serologic testing for celiac disease. The clinical analysis was repeated if needed by evolution, or in the presence of symptoms of refeeding syndrome.

The body composition (fat mass [FM], and fat-free mass [FFM]) was calculated by anthropometric methods (skinfold thickness). In most cases we evaluated the resting energy expenditure (REE) by fasting indirect calorimetry in the first days (Deltatrac). Data were collected in the morning, after 12 h of fasting.

We define a theoretical “healthy body weight” or “expected weight” as a goal of nutritional therapy before discharge, indicative goal for psychiatrists, the cut-off point to grade 1 thinness of Cole et al. (24), adjusted for age and sex.

In case of readmission, only the first entry in the unit was analyzed.

## RESULTS

This study included 50 adolescents under 18 years of age (average age  $14.51 \pm 1.55$  years, with an age range of 11.3-17.5 years). This age was significantly higher in males than females ( $15.38$  vs.  $14.23$  y) ( $p < 0.05$ ).

Among our patients, 76% were women, keeping a male/female ratio of 3.1/1. In this series an unusual high percentage of males is observed.

The average body mass index at admission and discharge were respectively  $15.45 \pm 1.14$ , and  $17.58 \pm 0.77$  kg/m<sup>2</sup>, and the average Z-scores, taking Spanish graphics (Carrascosa, 2010) into consideration, were  $-1.54 \pm 0.33$  and  $-0.93 \pm 0.26$ , with no differences between sexes. At admission, 48% of them showed grade 1 thinness, 32% presented grade 2, and 18% had grade 3 of Cole.

No serious electrolyte disturbance was observed in any of the patients on admission, although some of them needed initial intravenous fluids due to mild hypoglycemia and no recent intake. They did not show any symptoms suggesting refeeding syndrome in evolution, and none received vitamin and mineral oral supplements. Nevertheless, the patients may have received psychiatric drug treatment during their stay. However, almost all cases had abdominal pain at baseline, and occasionally diarrhea.

The average resting energy expenditure (REE) in these patients on admission was  $827.11$  kcal  $\pm$  178.65 Kcal. When adjusted for FFM, the REE kcal/kg FMM ratio was  $24.55 \pm 4.75$ . There were no gender differences in these parameters. In a previous research, we studied a control group of healthy children between 8-17 years, who presented a significantly lower REE of  $1,353 \pm 270$  kcal, and the REE/FFM ratio was  $37.37 \pm 3$  ( $p < 0.05$ ) (25). Only 4 cases (8%) needed enteral feeding by nasogastric tube temporarily as they did not achieve the oral intake goal, with a polymeric standard formulae; and 8 cases (16%) needed energy supplements for a while to help managing the nutritional objective. The average length of stay was  $44.54 \pm 17.75$  days.

Patient cooperation was always adequate, and it was easy to establish therapeutic agreements about nutritional goals between the patient and the medical team. This was likely due to our slow and progressive dietary pattern.

After hospital discharge, patients were followed for some time in the day hospital or in their home-provinces.

## DISCUSSION

Regaining weight during hospitalization and the maintenance of this weight gain after discharge have been shown to be one

of the major prognostic factors and predict favorable short and long-term outcomes, and these have been associated with an improvement in a number of psychological and medical complications (5,11). Restoring weight in young patients can also reverse growth retardation, developmental delay, and compromised bone density (6).

Apart from other options, such as day hospital treatment or outpatient therapy, inpatient is the treatment of choice in moderately to severely ill adolescents. We must take into account that adolescents with AN often do not want to be hospitalized and tend to experience hospitalization as more coercive than adults patients do (5).

One of the medical complications that can occur by treating severely malnourished patients is a refeeding syndrome, which is a potentially fatal disease. The adverse effects of rapid acute refeeding have been known since the experience with rehabilitation of concentration camp survivors. This syndrome is caused by a shift in fluid and electrolytes (particularly phosphate) from the extracellular to intracellular spaces upon refeeding, when insulin is released in response to an influx of nutrients (particularly carbohydrate). This results in electrolyte abnormalities, in particular hypophosphatemia, hypokalemia, and hypomagnesemia, glucose intolerance and thiamine deficiency, and can cause muscle weakness, delirium, coma, ataxia, arrhythmias and congestive heart failure or arrest (11). A review of the literature has revealed an average incidence rate of refeeding hypophosphatemia of 14% (8).

In order to prevent this syndrome, current recommendations for refeeding in anorexia nervosa (AN) are conservative, beginning around 1,000-1,200 calories (26). Nevertheless, some authors have denounced an “underfeeding syndrome” (22,23). Due to the lack of scientific evidence and risks of under and overfeeding, researchers have started to investigate feeding regimes in hospitalized adolescents with AN.

In 2010, Whitelaw et al. published the first report of higher calorie meal-based refeeding showing good outcomes, beginning around 1,900 calories and increasing by 500 calories in the first 5 days, but 37% of patients required phosphate supplementation for hypophosphatemia (27).

After this, Garber et al. compared moderately malnourished adolescents with AN during refeeding on higher calorie diets starting around 1,800 calories (1,400-2,400) and advancing by about 120 calories per day in the first week, *versus* lower calorie diets starting around 1,100 calories (800-1,200) and advancing by approximately 100 calories per day (21,26). Higher calorie diets increased the rate of weight gain and shortened the stay for hospitalized adolescents with AN, although they had a greater tendency to receive phosphate supplementation to avoid refeeding syndrome, and 45% of participants had a low serum phosphorus level.

Furthermore, similar experiences have been recently published (28,29), showing no increase in the refeeding syndrome incidence. However, in order to reach that effect, they have more often resorted to nasogastric feeding, which can damage the psychological engagement with the patients (30,31).

Besides, most authors state that refeeding syndrome depends more on the degree of malnutrition at admission, than on the

speed of caloric intake (6,21,32). As a matter of fact, even at low caloric intakes, refeeding syndrome has still been documented (8,29).

All these data could support more aggressive approaches to nutritional rehabilitation for hospitalized adolescents with AN compared to current recommendations and practice (10).

Yet, we must also consider other relevant aspects. Providing such big amounts of food to the inpatient could cause an increase in the level of anxiety and, consequently, treatment resistance (11). Furthermore, abdominal discomfort and psychological distress may appear. Moreover, this approach would require monitoring levels of phosphorus, magnesium, potassium, and calcium at least for the first 5 days; and an electrocardiogram (EKG) should be also carried out. What is more, with that more aggressive approach, additional mineral and vitamin systematic supplementation ought to be performed, and the patient's level of satisfaction should also be assessed, as well as the long-term evolution and the number of readmissions. Finally, the results in adolescents and adults must be analyzed separately.

On the contrary, as other authors (33), we have obtained good results with a classic progressive pattern, which was well accepted and tolerated by patients, without observing complications. This approach allowed a kind of pact to be made regarding the therapeutic goals between the patients and the medical team

As it has recently been claimed by a panel of European experts (5), there is an urgent need to improve the available evidence base and resulting clinical guidance to decision-making in the management of the adolescent inpatient management, refeeding and nutritional rehabilitation of AN.

## REFERENCES

- Kelly NR, Shank LM, Bakalar JL, Tanofsky-Kraff M. Pediatric feeding and eating disorders: Current state of diagnosis and treatment. *Curr Psychiatry Rep* 2014;16:446. DOI: 10.1007/s11920-014-0446-z.
- Naab S, Schlegl S, Korte A, Heuser J, Fumi M, Fichter M, et al. Effectiveness of a multimodal inpatient treatment for adolescents with anorexia nervosa in comparison with adults: An analysis of a specialized inpatient setting. *Treatment of adolescent and adult anorexics. Eat Weight Disord* 2013;18:167-73.
- Brown C, Mehler PS. Medical complications of anorexia nervosa and their treatments: an update on some critical aspects. *Eat Weight Disord* 2015;20(4):419-25. DOI 10.1007/s40519-015-0202-3
- American Psychiatric Association. *Diagnostic and Statistical Manual of Mental Disorders, 5th ed. (DSM-5TM)*. Washington, DC: American Psychiatric Association; 2013.
- Herpertz-Dahlmann B, Van Elburg A, Castro-Fornieles J. ESCAP Expert Paper: New developments in the diagnosis and treatment of adolescent anorexia nervosa - A European perspective. *Eur Child Adolesc Psychiatry* 2015. DOI 10.1007/s00787-015-0748-7.
- Rocks T, Pelly F, Wilkinson P. Nutrition therapy during initiation of refeeding in underweight children and adolescent inpatients with anorexia nervosa: A systematic review of the evidence. *J Acad Nutr Diet* 2014;114:897-907.
- Westmoreland P, Krantz MJ, Mehler PS. Medical complications of anorexia nervosa and bulimia. *Am J Med* 2015 Jul 10. pii: S0002-9343(15)00582-3. DOI: 10.1016/j.amjmed.2015.06.031. E-pub ahead of print.
- O'Connor G, Nicholls D. Refeeding hypophosphatemia in adolescents with anorexia nervosa: A systematic review. *Nutr Clin Pract* 2013;28:358-64.
- Le Grange D. Examining refeeding protocols for adolescents with anorexia nervosa (again): Challenges to current practices. *J Adolesc Health*. 2013;53:555-6.
- Leclerc A, Turrini T, Sherwood K, Katzman DK. Evaluation of a nutrition rehabilitation protocol in hospitalized adolescents with restrictive eating disorders. *J Adolesc Health* 2013;53:585-9.
- Marzola E, Nasser JA, Hashim SA, Shih PA, Kaye WH. Nutritional rehabilitation in anorexia nervosa: Review of the literature and implications for treatment. *BMC Psychiatry* 2013;13:290.
- Suárez-Pinilla P, Peña-Pérez C, Arbaizar-Barrenechea B, Crespo-Facorro B, Del Barrio JA, Treasure J, et al. Inpatient treatment for anorexia nervosa: A systematic review of randomized controlled trials. *J Psychiatr Pract* 2015;21:49-59.
- Position of the American Dietetic Association: Nutrition intervention in the treatment of anorexia nervosa, bulimia nervosa, and other eating disorders. *J Am Diet Assoc* 2006;106:2073-82.
- American Psychiatric Association: *Treatment of patients with eating disorders*. 3rd ed. *Am J Psychiatry* 2006;163(Supl. 7):4-54.
- NICE: *Core interventions in the treatment and management of anorexia nervosa, bulimia nervosa and related eating disorders (Clinical Guideline 9)*. British Psychological Society, London: National Collaborating Centre for Medical Health; 2004.
- Schnitker MA, Mattman PE, Bliss TL. A clinical study of malnutrition in Japanese prisoners of war. *Ann Intern Med* 1951;35:69-96.
- Keys A, Brozek K, Henschel A, et al. *The biology of human starvation*. Minneapolis: University of Minnesota Press; 1950.
- Fisher M, Simpser E, Schneider M. Hypophosphatemia secondary to oral refeeding in anorexia nervosa. *Int J Eat Disord* 2000;28:181-7.
- Kohn MR, Golden NH, Shenker IR. Cardiac arrest and delirium: Presentations of the refeeding syndrome in severely malnourished adolescents with anorexia nervosa. *J Adolesc Health* 1998;22:239-43.
- Boateng AA, Sriram K, Meguid MM, Crook M. Refeeding syndrome: Treatment considerations based on collective analysis of literature case reports. *Nutrition* 2010;26:156-67.
- Garber AK, Mauldin K, Michihata N, Buckelew SM, Shafer MA, Moscicki AB. Higher calorie diets increase rate of weight gain and shorten hospital stay in hospitalized adolescents with anorexia nervosa. *J Adolesc Health* 2013;53:579-84.
- Le Grange D, Lock J, Accurso EC, Agras WS, Darcy A, Forsberg S, et al. Relapse from remission at two- to four-year follow-up in two treatments for adolescent anorexia nervosa. *J Am Acad Child Adolesc Psychiatry* 2014;53:1162-7.
- Katzman DK. Refeeding hospitalized adolescents with anorexia nervosa: Is "start low, advance slow" urban legend or evidence based? *J Adolesc Health* 2012;50:1-2.
- Cole TJ, Flegal KM, Nicholls D, Jackson AA. Body mass index cut-offs to define thinness in children and adolescents: International survey. *BMJ* 2007;335(7612):194.
- Marugán de Miguelsanz JM, Redondo del Río MP, Alonso-Franch M, Calvo Romero C, Torres Hinojal MC. Increase resting energy expenditure by fat-free mass in children and teenagers with constitutional leanness. *Nutr Hosp* 2011;26:589-93.
- Garber AK, Michihata N, Hetnal K, Shafer MA, Moscicki AB. A prospective examination of weight gain in hospitalized adolescents with anorexia nervosa on a recommended refeeding protocol. *J Adolesc Health* 2012;50:24-9.
- Whitelaw M, Gilbertson H, Lam PY, Sawyer SM. Does aggressive refeeding in hospitalized adolescents with anorexia nervosa result in increased hypophosphatemia? *J Adolesc Health* 2010;46:577-82.
- Agostino H, Erdstein J, Di Meglio G. Shifting paradigms: Continuous nasogastric feeding with high caloric intakes in anorexia nervosa. *J Adolesc Health* 2013;53:590-4.
- Golden NH, Keane-Miller C, Sainani KL, Kapphahn CJ. Higher caloric intake in hospitalized adolescents with anorexia nervosa is associated with reduced length of stay and no increased rate of refeeding syndrome. *J Adolesc Health* 2013;53:573-8.
- Hart S, Franklin RC, Russell J, Abraham S. A review of feeding methods used in the treatment of anorexia nervosa. *J Eat Disord* 2013;1:36. DOI: 10.1186/2050-2974-1-36. eCollection 2013.
- Elzakkers IF, Danner UN, Hoek HW, Schmidt U, van Elburg AA. Compulsory treatment in anorexia nervosa: a review. *Int J Eat Disord* 2014;47:845-52.
- Gentile MG. Enteral nutrition for feeding severely underfed patients with anorexia nervosa. *Nutrients* 2012;4:1293-303.
- Hofer M, Pozzi A, Joray M, Ott R, Hähni F, Leuenberger M, et al. Safe refeeding management of anorexia nervosa inpatients: An evidence-based protocol. *Nutrition* 2014;30:524-30.