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Anorexia Nervosa

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Key Words

Anorexia nervosa · Weight restoration · Weight maintenance · Macronutrient · Micronutrient · Nutrient restoration

Key Messages

- There are two subtypes of eating behaviors in anorexia nervosa (AN): the restricting type and the binge eating/purging type.
- In addition to effectively treating mood and cognitive disturbances, weight restoration is a central element of AN treatment.
- Weight restoration can be divided into two phases: acute stabilization and weight maintenance.
- During hospitalization, AN patients tend to require escalating caloric intake in order to maintain a 1–1.5 kg/week weight gain. The caloric intake needs to be increased stepwise over time, to around 60–100 kcal/kg/day, to achieve weight gain.
- After returning to a healthy body weight, AN individuals are still energy inefficient and need at least 50–60 kcal/kg/day for weight maintenance (compared to approx. 30 kcal/kg/day for healthy women).
- A major long-term goal is to increase the variety of foods consumed. Daily essential macronutrient requirements to maintain weight are 110–140 g of carbohydrates, 15–20 g of essential fatty acids and 1 g of protein per kilogram of body weight in adults and adolescents.

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Introduction

Anorexia nervosa (AN) is a complex and difficult to treat illness that in a number of cases becomes chronic and disabling. It is a disorder of unknown etiology that most commonly occurs in adolescent girls. AN individuals exhibit an egosyntonic resistance to eating leading to a significantly low body weight, intense fear of gaining weight, body image distortions, and severe weight loss due to a relentless pursuit of thinness and restrictive eating.

Improvements in the understanding and treatment of AN are of particular importance given its chronic and relapsing course, often entailing costly and severe medical morbidity. Importantly, AN has the highest death rate of any psychiatric illness [1], also because there are no proven effective treatments to reverse the symptoms [2].

Individuals with AN, particularly those with the restricting type (R-AN), show altered neural mechanisms and avoid eating because its results are anxiogenic and not rewarding [3, 4]. From a clinical standpoint, individuals with AN appear to become hypermetabolic during weight restoration [5], and they need an increased caloric intake to maintain a safe weight after recovery.

The continuous restrictive eating and malnutrition results in pervasive disturbances of most organ systems. Nutrition restoration is a core element in treatment since weight restoration is fundamental to avoid severe physical complications and to improve cognitive function in order to render therapeutic interventions effective [6].

Etiology

The exact AN etiology is unknown, but it is influenced by biological, developmental, and social processes with cultural attitudes toward physical attractiveness being relevant though not preeminent. AN stereotypic clinical presentation, genetics, sex distribution, and age of onset support the role of intrinsic biological vulnerabilities.

Epidemiology

The onset of AN is common in adolescent females, and up to 0.7% of this age group may be affected [7], while the current lifetime prevalence estimate of this illness is 0.9% in women and 0.3% in men [8]. AN is usually a protracted illness; approximately 50–70% of affected individuals improve or recover, around 20% become chronically ill, and 5–10% die [8].

Clinical Presentation

Two subtypes of eating-related behaviors in AN are typically described. First, R-AN lose weight purely by dieting and exercising without binge eating or purging. Second, binge eating/purging type anorexics (BP-AN) also restrict their food intake and exercise to lose weight, but periodically engage in binge eating and/or purging.

The egosyntonic nature of this syndrome often prevents the evaluation of AN before the ill-

ness becomes severe, also promoting dropout from treatments [9]. An accurate differential diagnosis with medical conditions (i.e. endocrine and gastrointestinal disorders) should be carefully performed.

AN Eating Behavior

AN individuals tend to eat significantly fewer calories by restricting caloric intake and avoiding calorie-dense foods. AN patients show unusual eating behaviors like slow and irregular eating, vegetarianism, and choosing a narrow range of foods.

Both adolescents and adults with AN, when compared with healthy individuals, tend to show macronutrient and micronutrient deficiencies with lower intake of all types of fat, higher fiber intake, and usually normal protein and carbohydrate consumption.

Interestingly, these eating behaviors persist during short-term recovery and are related to outcome; in fact, low-energy foods and limited variety are associated with poor outcome [10].

In terms of caloric intake, it should be noted that healthy young adult women tend to eat about 30 kcal/kg/day (range: 20–40) [11]. For a 50-kg woman, this means eating 1,500 kcal/day, with the normal range falling between 1,000 and 2,000 kcal/day. In our experience, individuals with AN tend to find it difficult to eat more than 10–20 kcal/kg/day (30 kg = 300–600 kcal/day).

Treatment

The treatment of AN presents unique challenges; there are currently no FDA-approved medications, and few psychotherapies are evidence based [for review, see 12]. In addition to effectively treating mood and cognitive disturbances, it is critical to provide weight restoration.

Weight Restoration

Given the high caloric needs during the process of weight restoration, many AN individuals are treated in specialized inpatient, residential or day treatment programs. NICE [2] and APA [6] guidelines specify clearly that the first goal of treatment is weight restoration, but both guidelines lack specificity regarding this topic.

During weight restoration, R-AN need more calories than BP-AN to gain the same weight [5]. In our experience, during hospitalization, AN patients tend to require escalating caloric intake in order to maintain a 1–1.5 kg/week weight gain. Healthy women usually require about 30 kcal/kg/day to maintain their weight (range: 20–40). If we start a patient with AN on that amount of calories, however, the patient tends not to gain weight. Rather, we have to increase their caloric intake stepwise over time, usually to somewhere between 60–100 kcal/kg/day to achieve weight gain.

Role of Exercise and Metabolism

People with AN tend to become hypermetabolic. That is, they easily lose weight, and need to eat large amounts of food to gain weight [5], also because in these patients caloric intake shows less efficiency in terms of being converted into tissue.

In AN, excessive exercise (pacing, jogging, making restless motions) is a common symptom even in the face of severe emaciation, contributing to increased caloric requirements [5]. AN people who exercise need almost a 3-fold higher range of calories to gain 1 kg [13]; people who do little exercise only need an excess of 4,000 calories to gain 1 kg of weight, whilst those who engage in extreme exercise need up to 12,000 additional calories to gain 1 kg of weight.

Another issue in AN is that energy intake may be converted into heat, rather than used to

build tissue. AN people often complain of becoming hot and sweaty during nutritional restoration. In fact, individuals become hyperthermic since the thermic effect of food in AN patients during renutrition is high, representing up to the 30% of energy expenditure instead of the 14–16% in healthy controls, mostly at the beginning of refeeding [14]. This can be explained by the higher energy intake during refeeding and the low efficiency in the initial phases of renutrition due to changes in hormones or autonomic functions.

Medical Consequences

Emaciation in AN is commonly associated with medical complications (compromised cardiovascular status, hypoalbuminemia, anemia). At high risk are those with body mass index <12, BP-AN individuals, and those with physical comorbidity [2].

Refeeding syndrome is a rare but crucial side effect to be considered at the beginning of renutrition. It is caused by rapid refeeding of someone in a state of starvation, mainly if the patient is chronically ill. Refeeding syndrome is characterized by hypophosphatemia, hypomagnesemia, hypokalemia, glucose intolerance, fluid overload, and thiamine deficiency. This syndrome can lead to cardiac arrhythmias, congestive heart failure, hypotension, encephalopathy, respiratory failure, metabolic acidosis, rhabdomyolysis, coma, seizures, and skeletal-muscle weakness. To avoid refeeding syndrome, electrolyte levels should be determined for the first 5 days and every other day for several weeks, in addition to performing EKG assessments [6]. If indicated, during the first days of refeeding, multivitamins and minerals should be provided under strict monitoring to prevent toxicity in case of excessive supplementation [2].

Phases of Weight Restoration

Treatment approaches can be subdivided into two phases based on the patient's therapeutic needs: acute stabilization and weight maintenance.

Acute Stabilization

At the start of weight gain, the caloric intake should be of 30–40 kcal/kg/day for inpatients to achieve a safe clinical stabilization before beginning weight gain and 20 kcal/kg/day for outpatients [6].

AN patients need 5,000–10,000 excess calories to gain a kg of weight, so a 35-kg patient needs about a 1,000 kcal/day (30 kcal/kg) to maintain her weight and a minimum of 2,000 kcal/day to gain weight.

Later in refeeding, it is possible to gain about 1–1.5 kg/week for inpatients and 0.5 kg/week for outpatients [6]. Studies suggest that AN patients need a higher amount of calories – about 3,400 kcal – to gain 0.5 kg/week above the calories needed just to maintain weight. Over the course of 7 days, this amounts to approximately an extra 500 kcal/day in addition to the calories required for weight maintenance. For example, in the case of a 40-kg woman, if weight maintenance requires 30 kcal/kg/day = 1,200 kcal/day to gain weight, an extra 500 kcal/kg/day should be added (total caloric intake = 1,700 kcal/day).

The maintenance amount of calories needs to be increased at intervals to continue weight gain. According to our experience, if there are plateaus in weight gain, a progressive increase of 10 kcal/kg/day every 5–7 days may be necessary to maintain the rate of weight gain at 0.5 kg/week.

Weight Maintenance

Immediately after getting back to a healthy body weight, AN individuals are still energy inefficient [5]. In fact, they need at least 50–60 kcal/kg/day for weight maintenance, whilst healthy women need 30 kcal/kg/day (range: 20–40). Without this substantial amount of food, rapid weight loss and high rates of relapse occur [5]. Eating attitudes at

hospital discharge represent a reliable predictor of outcome, with the presence of psychological and organic causes being a hindrance to long-term recovery. These increased caloric needs tend to normalize with time since over 3–6 months AN people show a normalization of their metabolism needing between 20 and 40 kcal/kg/day to maintain weight as healthy women [5].

Nutrients

From a nutrition standpoint, increasing the variety of foods consumed is a major goal, although this represents a great difficulty for patients [10]. Importantly, no specific recommendations for macronutrient distribution have been developed in AN. According to the Institute of Medicine, daily essential macronutrient requirements (in adolescents and adults) to maintain weight are 110–140 g of carbohydrates, 15–20 g of essential fatty acids and 1 g of protein per kilogram of body weight [15].

Protein intake should be highly encouraged. Consuming small amounts of protein of high biological value, in conjunction with the AN patient's preferred protein source foods (mostly vegetable) can provide a faster restoration of nutrient status even if still underweight.

Fat intake is a critical issue since AN patients tend to avoid consuming fats, resulting in severe lipid depletion entailing the risk of impaired neuronal activity. Thus, AN patients particularly need to replenish lipids during treatment, with a focus on essential fatty acids. A variety of carbohydrates can be offered, both complex (bread, rice and potatoes) and simple (fruits, fruit juices and vegetables).

Medical foods are a useful tool to reduce the stomach and gastrointestinal discomfort that refeeding tends to aggravate; they should be considered when patients have difficulties in achieving weight restoration or as a useful addition in case of unstable weight maintenance.

Conclusions

- AN is a puzzling psychiatric illness with unpredictable outcome and high mortality rates. Renourishment and weight restoration play a pivotal role in AN treatment since – in addition to life-threatening risks – a severely emaciated status is likely to frustrate both psychological and pharmacological therapeutic interventions.
- Weight restoration in AN should start slowly, accelerating as tolerated. Nutrient intake should be reinforced, as opposed to caloric intake, coupled with psychotherapy to encourage increasing amount and diversity in food selection and preferences, and eventual further restoration of body weight to the individual's normal range. Dietary diversity should be encouraged since it is predictive of weight maintenance in AN patients.
- Caloric requirements in AN are high and vary between 30 and 40 kcal/kg/day (up to 70–100 kcal/kg/day) for inpatients and 20 kcal/kg/day for outpatients; after the first phase of treatment, it is possible to achieve a weight gain of 1–1.5 kg/week in the inpatient setting and of 0.5 kg/week in the outpatient setting. Compared to the general population, AN patients also need higher caloric amounts – around 50–60 kcal/kg/day – for weight maintenance.
- When severely malnourished, hospitalization may be required; to avoid refeeding syndrome, a strict monitoring of vital functions, electrolyte levels and cardiac functions should be performed.

References

- 1 Sullivan PF: Mortality in anorexia nervosa. *Am J Psychiatry* 1995;152:1073–1074.
- 2 National Institute for Health and Clinical Excellence: Core interventions in the treatment and management of anorexia nervosa, bulimia nervosa and related eating disorders (Clinical Guideline 9). London, National Collaborating Centre for Medical Health, 2004.
- 3 Wagner A, Aizenstein H, Venkatraman VK, et al: Altered reward processing in women recovered from anorexia nervosa. *Am J Psychiatry* 2007;164:1842–1849.
- 4 Kaye WH, Fudge JL, Paulus M: New insights into symptoms and neurocircuit function of anorexia nervosa. *Nat Rev Neurosci* 2009;10:573–584.
- 5 Kaye WH, Gwirtsman HE, Obarzanek E, et al: Caloric intake necessary for weight maintenance in anorexia nervosa: non-bulimics require greater caloric intake than bulimics. *Am J Clin Nutr* 1986;44:435–443.
- 6 American Psychiatric Association: Treatment of patients with eating disorders, third ed. *Am J Psychiatry* 2006;163 (suppl):4–54.
- 7 Fitzpatrick KK, Lock J: Anorexia nervosa. *Clin Evid* 2011;11.
- 8 Hudson JI, Hiripi E, Pope HG Jr, Kessler RC: The prevalence and correlates of eating disorders in the National Comorbidity Survey Replication. *Biol Psychiatry* 2007;61:348–358.
- 9 Fassino S, Pierò A, Tomba E, Abbate-Daga G: Factors associated with dropout from treatment for eating disorders: a comprehensive literature review. *BMC Psychiatry* 2009;9:67.
- 10 Schebendach JE, Mayer LE, Devlin MJ, et al: Dietary energy density and diet variety as predictors of outcome in anorexia nervosa. *Am J Clin Nutr* 2008;87:810–816.
- 11 Petersen R, Kaye W, Gwirtsman H: Comparison of calculated estimates and laboratory analysis of food offered to hospitalized eating disorder patients. *J Am Diet Assoc* 1986;86:490–492.
- 12 Marzola E, Trunko ME, Grenesko-Stevens E, Kaye WH: Anorexia and bulimia nervosa; in Nemeroff CB: *Management of Treatment-Resistant Major Psychiatric Disorders*. New York, Oxford University Press, 2012.
- 13 Kaye WH, Gwirtsman HE, Obarzanek E, George DT: Relative importance of calorie intake needed to gain weight and level of physical activity in anorexia nervosa. *Am J Clin Nutr* 1988;47:989–994.
- 14 Moukaddem M, Boulier A, Apfelbaum M, Rigaud D: Increase in diet-induced thermogenesis at the start of refeeding in severely malnourished anorexia nervosa patients. *Am J Clin Nutr* 1997;66:133–140.
- 15 Otten J, Hellwig JP, Meyers LD (eds): *DRI: Dietary Reference Intakes: The Essential Guide to Nutrient Requirements*. Washington, National Academies Press, 2006.