Eating Disorders in Adolescence and Their Implications

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Abstract: Eating disorders including anorexia nervosa (AN) and bulimia nervosa (BN) have increased lately, and they are increasingly seen in routine clinical settings. Eating disorders are associated with abnormalities in eating behaviors such as fear of obesity, apocleisis, binge-eating, and self-vomiting. These abnormalities result in complications such as malnutrition. The physical effects of these disorders include extended periods of chronic hypotension, bradycardia, hypothermia, swelling of the salivary gland, caries, anemia, dehydration, hypokalemia, hypochloremia, and prolonged metabolic alkalosis. Therefore, renal failure or heart failure tends to occur due to these abnormalities. In addition, the possibility of sudden death due to arrhythmia is not uncommon. Gastric rupture may also occur due to binging or fierce vomiting. Secondary amenorrhea occurs in more than 90% of AN patients because of chronic malnutrition. Reduction of bone mass leads to an increased risk of bone fractures later in life. In addition, psychological complications such as mood disorders, anxiety disorders, obsessive-compulsive disorders, and personality disorders are common, and it is important to note that domestic conflicts are manifested when patients develop eating disorders. Therefore, a multifaceted therapeutic approach, focused on the mental and physical aspects, is necessary in the treatment of eating disorders.

Key words: Eating disorders; Anorexia nervosa; Bulimia nervosa; Physiological complications; Psychological comorbidity

Introduction

Eating disorders are diseases that cause severe malnutrition, including extreme thinness, as a result of abnormal eating behaviors such as intentional apocleisis, binge-eating, and self-vomiting and they stem from an intense fear of obesity.

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It is a known fact that the number of patients with eating disorders has increased globally over the past 50 years. In the United States, it is reported that one to two million women meet the diagnostic criteria for bulimia nervosa (BN), and 500,000 women meet the diagnostic criteria for anorexia nervosa (AN). One of the reasons for the rise in eating disorders appears to be related to a high degree of interest in health in recent years and to extreme sensitivity about body weight and physical appearance mainly among the younger generation.

Eating disorders often occur in the growing years of puberty, and its effect tends to last throughout life since its progress is chronic. Behaviors including apocleisis, binge-eating, self-vomiting, and a desire to be slim become psychologically threatening for family members and other people around these patients. They find themselves at a loss as to how to cope with their behavior. Moreover, since it is difficult to treat these disorders, malnutrition will occasionally lead to a fatal outcome or to suicidal behavior. In some cases, the family is destroyed. As mentioned above, eating disorders are not only diseases about eating behavior such as simply eating or not eating, but they are diseases that affect the physical and psychological conditions of the patient, and the social environment as well.

In this paper, eating disorders are discussed, and the physical, psychological, and social factors and the effect of the disease on these factors are described.

**Definition and Classification**

The characteristics of eating disorders, which stem from the desire to be slim and a fear of obesity, are marked body weight loss due to apocleisis, and binge-eating and purging behaviors such as self-vomiting and the abuse of purgative agents. Eating disorders can be classified roughly as anorexia nervosa and bulimia nervosa.

1. **Anorexia nervosa**: This is an eating disorder characterized by marked intentional body weight loss. There are two types: a restrictive type with only apocleisis, and a binge-eating type with marked purging behavior including self-vomiting or abuse of purgative agents (Table 1).

2. **Bulimia nervosa**: This is an eating disorder that is not characterized by extreme body weight loss seen in AN. It is classified into two types: a purging type with purging behavior such as self-vomiting and the abuse of purgative agents, and a nonpurging type.
type without the regular purging behavior, but with repeated fasting and excessive exercise (Table 2).

(3) Eating disorders not otherwise specified (ED-NOS): Although this type of disorder does not satisfy the diagnostic criteria for AN or BN, there is clearly seen abnormal eating behavior or other behaviors aimed at maintaining low body weight.

Physical Effects

When examining patients with AN, it is important to obtain information about vital signs including heart rate in supine and standing positions, blood pressure and body temperature, to examine for dryness of the skin and extremities, vomiting, calluses, bruises, circulatory information including bradycardia, arrhythmia, and mitral valve prolapse (MVP), digestive information, and information about the central nervous system such as brain tumors that cause body weight loss and vomiting.

The physical examination of patients with BN is similar to that of patients with AN. However, close attention should be paid to any swelling of the salivary glands caused by vomiting and enamel erosion (caries) due to regurgitation of gastric acid.

When dehydration or purging is suspected, serum biochemical examinations should be performed including Na, K, Cl, Ca, Mg, phosphorous, blood urea nitrogen (BUN), creatinine, and amylase. In addition, when amenorrhea continues, the measurement of \( \beta \)-human chorionic gonadotropin (\( \beta \)-hCG) is needed in order to eliminate the possibility of a pregnancy.

It is necessary to evaluate the thyroid gland function, serum prolactin levels, and follicle-stimulating hormone (FSH) levels to diagnostically distinguish AN and BN from prolactinoma, hyperthyroidism, hypothyroidism, or ovarian dysfunction. With respect to thyroid functions, low levels of tetraiodothyronine (\( T_4 \)) and triiodothyronine (\( T_3 \)) are often seen. However, these abnormalities are not related to thyroid diseases when thyroid-stimulating hormone (TSH) levels are in the normal range or slightly low or when reverse \( T_3 \) levels are shown to be increased.\(^3\)

Hypokalemia or metabolic alkalosis can be considered as evidence of self-vomiting or use of diuretics by the patient.

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Table 2  Diagnostic Criteria for Bulimia Nervosa

| A. Recurrent episodes of binge eating. An episode of binge eating is characterized by both of the following. |
| (1) Eating in a discrete period of time (e.g., within any 2-hour period), an amount of food that is definitely larger than most people would eat during a similar period of time and under similar circumstances. |
| (2) A sense of lack of control over eating during the episode (e.g., a feeling that one cannot stop eating or control what or how much one is eating.) |
| B. Recurrent inappropriate compensatory behavior in order to prevent weight gain, such as self-induced vomiting; misuse of laxatives, diuretics, enemas, or other medications, fasting or excessive exercise |
| C. The binge eating and inappropriate compensatory behaviors both occur, on average, at least twice a week for 3 months. |
| D. Self-evaluation is unduly influenced by body shape and weight. |
| E. The disturbance does not occur exclusively during episodes of anorexia nervosa. |

Specify type:

Purging Type: During the current episode of bulimia nervosa, the person has regularly engaged in self-induced vomiting or the misuse of laxatives, diuretics, or enemas.

Nonpurging Type: During the current episode of bulimia nervosa, the person has used other inappropriate compensatory behaviors such as fasting or excessive exercise, but has not regularly engaged in self-induced vomiting or the misuse of laxatives, diuretics, or enemas.

1. Physical effects of chronic malnutrition and persistent purging

In eating disorders, persistent chronic hypotension, bradycardia, hypothermia, salivary gland swelling, caries, anemia, dehydration, hypokalemia, hypochloremia, and metabolic alkalosis are observed. Thus, renal failure and heart failure also tend to occur. In addition, sudden death due to arrhythmia is not uncommon.

Chronic vomiting causes reflux esophagitis, and binge-eating and severe vomiting can sometimes cause gastric rupture. Metabolic alkalosis due to vomiting, abuse of purging agents, or hypokalemia may cause intestinal obstructions.

More than 90% of AN patients develop secondary amenorrhea due to chronic malnutrition. Amenorrhea results from a decrease in FSH and corpus luteum hormone. Due to low estrogen levels, treatment using progesterone or oral contraceptives will not successfully result in a natural return of menstruation unless body weight is recovered.

Among the complications of AN, the reduction of bone mass is a serious problem as it is difficult to cure. Bone mass is reduced by 40% to 60% of other adolescents.

2. Reduction of bone mass

Bone mass is decreased even after short-term abnormal eating habits, and it is reported that the bone mass is reduced by 1 SD in 92% or 2.5 SD in 38% of patients whose eating patterns have been abnormal for longer than 6 months. Reduced bone mass leads to increased risk of bone fractures later in life. The incidence of bone fractures in patients with AN is reported to be 2.9 times higher than the expected incidence of bone fractures in the general population. Bone fractures occur in patients with AN most frequently at the age of 38 for pelvic fractures, 25 for vertebral fractures, and 24 for brachial fractures.

In eating disorders, the deficiency of estrogen and the decreased intake of vitamin D and calcium are believed to inhibit the neogenesis of bones. Bone disorders in AN are due to decreased bone regeneration and increased bone absorption. The condition is not improved by supplementing estrogen since it differs from increased bone absorption/decreased bone mass caused by decreased estrogen during menopause.

The bone mass index (BMI) and the nutritional index are closely related to decreased bone mass in AN, and the decrease in bone density in AN patients is clearly greater than in patients with pituitary amenorrhea.

The most effective treatment for decreased bone mass is to increase body weight, and it is important to ensure the intake of 1,200–1,500 mg/day of calcium and 400 IU of vitamin D. Some physicians recommend a combined supplementary treatment of estrogen/progesterone.

3. Effect on the cardiovascular system

Anorexia nervosa causes mitral valve prolapse, prolonged QT interval, and heart failure. It is reported that mitral valve prolapse is seen in 32% to 60% of AN patients, in comparison to 6% to 22% of the general population. This is believed to be due to a decrease in the circulating blood volume stemming from starvation. In addition, close attention must be paid to prolonging the QT interval when patients have bradycardia in conjunction with reduced body weight, although it does not directly affect arrhythmia or sudden death.

The highest risk for a patient with an eating disorder is heart failure, which frequently occurs within 2 weeks after nutritional supplementation is started. In addition to a decrease in cardiac contractile force, a sudden increase in the volume of circulating blood caused by nutrient supplements and hydropericardium can also cause heart failure. Heart failure can be prevented by gradual nutritional and phosphorous supplementation or by avoiding a diet with a high salt content. Patients who repeat self-vomiting, use purging agents or have a habit of binge-eating are especially prone to...
heart failure and should be treated with care.

4. Factors and effects on the central nervous system

Brain neurotransmitters are considered to affect the pathogenic conditions of AN. Brain serotonin is related to the appetite center and satiety center, and is thought to play some role in the alteration of the nervous system and the absence of appetite seen in AN. In patients with certain types of AN, a high level of brain serotonin is usually seen, which supports the hypothesis that high levels of brain serotonin may cause compulsive behavior or may inhibit the appetite center.

In addition, it is a well known fact that an MRI scan of AN patients show atrophied gray and white matter, and an increase in the volume of cerebrospinal fluid. These changes remain even after the body weight increases, and a marked increase in cerebrospinal fluid is reported to persist.

Psychological Factors and Effects

Although a clear consensus regarding the cause of eating disorders does not exist, it is believed that a complex combination of psychological, physical, family, environmental, and social factors are involved at the very least in the onset of an eating disorder.

Those who have low self-esteem or suffer from a lack of self-control due to physical trauma or traumatic experiences in their family history tend to resort easily towards dieting and other measures of reducing their body weight in order to gain a sense of self-stability or self-control.

An eating disorder is often accompanied by serious mental disorders. Mood disorders, anxiety disorders, obsessive-compulsive disorders, and personality disorders are commonly seen. Drug dependency is often associated with eating disorders, and alcoholism is a common problem in BN. Among various personality disorders, complications with borderline personality disorder tend to become problematic. This is a type of disorder that is characterized by acute emotional instability and unstable interpersonal relationships. Other people in the patient’s environment become involved and the disorder is characterized by various behaviors.

Family Related Factors and Their Effect

There are various characteristics in the families of patients with eating disorders: (1) Parents have high expectations of the academic performance and the personal appearance of their children. (2) The family has problems handling family conflicts. (3) There is poor interpersonal communication between family members (especially the emotional aspects). (4) There is a tendency to cling to the present family structure (enmeshment). (5) There is an abnormally small number of family quarrels. (6) There is a high value placed on the mother or the mother role. (7) There is little tension between husband and wife.

Various types of domestic stress are involved in the development of eating disorders, but there are many cases where the efforts of the family to cure the eating disorder result in inhibiting the physical and emotional needs specific to development during adolescence. In contrast, various domestic conflicts often surface when the patient develops eating disorders. The conflicts persist indefinitely since the family lacks the ability to resolve the problems, and the patient’s conditions become difficult to improve.

Early Detection and Treatment

1. Early therapeutic intervention

It is important to introduce therapeutic intervention at the early stages of an eating disorder. In either AN or BN, patients with eating disorders show unique clinical characteristics. Using a simple self-evaluation method for eat-
ing disorders such as the questionnaire developed by the Scottish Colloquium on Food and Feeding (SCOFF), it is possible to evaluate the potential development of eating disorders (Table 3).19)

However, the treatment of an eating disorder is sometimes very difficult. Factors that make the treatment difficult are: (1) AN and BN are caused by multiple factors, (2) eating disorders are life-threatening diseases, (3) patients with eating disorders tend to deny their own disease, and (4) various behaviors including wrist-cutting are seen.

2. Team approach

The treatment of eating disorders must be based on a team approach using teams of experts from medicine, nutrition, mental health, and other fields who participate in the treatment.

1) The medical staff strives to stabilize the patient’s vital signs and it is responsible for treating electrolyte abnormalities such as dehydration and function as care coordinators.

2) Nutritionists play a role in educating people about healthy diets and provide a theoretical basis for changing eating behaviors. They have discussions with the patient about available foods and methods of dieting, plan the required caloric and food intake, and help the patient to achieve their appropriate body weight.

3) In the area of mental health, mental health experts play a very important role in the treatment team. Individual psychotherapy and cognitive behavioral therapy are at the center of treatments for eating disorders and they are also a means of obtaining the cooperation of the family. By combining various psychological therapies, it is possible to obtain information about the background and factors that lead to eating disorders. In addition to pursuing a psychological approach, a variety of psychological factors that surround the patient must be considered, and mental health experts provide the other team members with information about background factors, coexisting psychological problems, severity of the disease, the need for psychiatric hospitalization or day care. In addition, it is important to collect information about the risk of self-injurious behavior such as wrist cutting.20)

Conclusion

Eating disorders may result in fatal consequences due to nutritional deficiencies. Patients with eating disorders sometimes exhibit suicidal behavior or hinder their own social functions; and the disorder may occasionally destroy the family. In treating the disease, it is important that family members and the people around the patient take part in the treatment. In addition, it should be stressed that the disease not only causes disorders in eating behaviors, but it also diversely affects the physical, psychological, and social aspects of the patient. Eating disorders should be acknowledged as a serious disease that is difficult to treat.

REFERENCES


