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Complications of Anorexia Nervosa – Literature Review

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ABSTRACT:

Introduction

Anorexia nervosa is a serious mental disorder characterised by a strong fear of gaining weight, impaired self-perception and weight loss activities. It mainly affects young females and has the highest mortality rate of mental disorders. The aetiology is multifactorial, and treatment most often consists of psychotherapy and pharmacotherapy. The sooner it is started, the better the effect it brings.

Aim of the Study

The aim of this publication is to present possible complications in the course of anorexia nervosa. This is to emphasise that anorexic patients require multidisciplinary care.

Materials and Methods

An analysis of papers available in PubMed was performed. The following keywords were used: anorexia nervosa, anorexia nervosa complications.

Description of the state of knowledge

Anorexia nervosa is classified as a mental disorder, but it nevertheless has many physical consequences. Patients hospitalised for AN often present multiple somatic symptoms. It affects, among others, the cardiovascular, endocrine, respiratory, pulmonary and digestive systems. Malnutrition triggers many mechanisms that manifest themselves in different ways and sometimes lead to irreversible changes.

Conclusions

Malnutrition has consequences in almost every system and organ. They range from mild to life-threatening. Some of them can even contribute to or trigger sudden death. It is worth emphasising that most complications disappear after returning to normal body weight and proper nutrition. The recovery process is also fraught with risk, as complications can also occur in its course.

Keywords: Anorexia nervosa, anorexia nervosa complications

INTRODUCTION

- Definition and classification of anorexia nervosa

Anorexia nervosa is a mental disorder characterised by very low body weight, a strong fear of gaining weight and a distorted way of perceiving one's own body. The severity of the disorder can be classified based on BMI values as follows:

- extreme - BMI is below 15 kg/m²
- severe - BMI is between 15 and 15,99 kg/m²
- moderate - BMI is between 16 and 16,99 kg/m²
- mild - BMI is above 17 kg/m² [1]

It is also possible to distinguish between two subtypes of anorexia nervosa:

- Restricting type - it is characterised by limiting food intake to as much as 300 - 700 calories a day, which is often accompanied by excessive physical exercise
- Binge-eating / purging type - patients use methods such as provoking vomiting and abuse of laxatives and diuretics. [2]

- Epidemiology

Anorexia nervosa can appear at any age, but it most commonly affects adolescents. Many times more often the patients are females. Recent decades have shown an upward trend in the incidence of AN. [1] Mortality in the course of anorexia nervosa is the highest of all mental disorders. [3] Most deaths are due to malnutrition, especially cardiac complications of malnutrition and infections. Another common cause is suicide. [1]

- Pathogenesis

Anorexia nervosa does not have a single cause, but results from the interaction of many factors, including genetic, neurobiological, developmental and environmental components. [1]

- Treatment

Early diagnosis and treatment improve the prognosis. Psychotherapy is used, in which the patient's family should often be involved. [4] In terms of pharmacological treatment, olanzapine supports the return to normal body weight [4] reduces illness preoccupations and anxiety. [1]

COMPLICATIONS OF ANOREXIA NERVOSA

Cardiac complications

Patients with anorexia nervosa struggle with cardiac problems which may impair both the function and structure of the heart. [5] One of the commonly observed consequences is sinus bradycardia. It is interpreted as an adaptation to elevated vagus nerve tone along with lowered

metabolism caused by chronic malnutrition. Bradycardia can also result from reduced muscle mass in the left ventricle of the heart. In atrophic myocardium, bradycardia may act as a defence mechanism against heart failure. The implication is reversible as the body weight restores. [6] Patients with AN may also present a prolonged QT interval which is mainly observed in correlation with water-electrolyte imbalances. When the ions concentration in serum normalises, the QT prolongation becomes mild. [5, 7] Classes of drugs that are known to prolong the QT interval should be prescribed with caution. [5] When the cardiac structure is taken into consideration the following abnormalities can be listed: left ventricular atrophy, annular changes including mitral valve prolapse and pericardial effusions. These are reversible changes. [8] Moreover, anorectic patients present a lower ejection fraction, stroke volume and cardiac output. These parameters are considered to be the cause of reduced left ventricular mass. [9] Rare cases of ventricular arrhythmia, acute heart failure and acute myocardial infarction have also been reported. [5] Moreover, cardiac complications appear to be the most common causes of sudden death in anorexia nervosa. Of particular importance is the extended QT, which presents a predictive value. [10]

Pulmonary complications

The lungs seem to be less affected, but still there are some impairments. Anorectic patients may experience considerably lower diffusing capacity for CO (carbon monoxide). Progression of changes over time is observed. In addition to that respiratory muscles lose their maximal isometric strength. No further impairment is observed with time. [11] Changes similar to those in emphysema are another consequence of malnutrition. The walls of the alveoli become weakened and eventually rupture, leading to larger, less efficient air spaces. This reduces the surface area available for the exchange of oxygen carbon dioxide. [12]

Endocrine complications

Anorectic patients may experience both primary and secondary amenorrhea. The first variant takes place before puberty. The suggested mechanism is as follows. Interrupted secretion of gonadotropin-releasing hormone (GnRH) causes incorrect pulsatile secretion of gonadotropin. This results in insufficient stimulation of ovaries therefore the ovulation does not take place and oestrogen production lowers. It is a protective mechanism against pregnancy in adverse conditions. [13] Thyroid hormone levels can also be altered with decreased T_3 (triiodothyronine), decreased or normal T_4 (thyroxine) and TSH (thyroid-stimulating hormone). [13, 14] Low T_3 level manifests as slow heart rate, low body temperature and blood pressure

among many other symptoms. [13] Hypercortisolemia is another deviation. It is a response to the stress resulting from chronic malnutrition. Hypoglycemia is another contributing factor to hypercortisolemia. However, this does not translate into features of Cushing's syndrome due to cortisol resistance and low body fat. [13] Hypoglycemia is common and patients tolerate it well when it does not reach high severity. [15]

Dermatological abnormalities

Skin lesions can be classified according to their cause as:

- the result of malnutrition
- provoked vomiting
- laxatives, diuretics and emetics abuse
- concomitant mental disorders [16]

The consequences are in the skin, mucous membranes and appendages. They include - from the most common - xerosis, hypertrichosis lanuginosa, alopecia, acne, caries and many others. [17] Particularly noteworthy is the Russell's sign, which is most characteristic of patients with the purging type. It occurs as a result of repeatedly putting the hand in the mouth to provoke vomiting, which leads to the formation of calluses on the back of the hand. [16]

Haematological complications

- Red blood cells

In terms of erythropoiesis, anaemia can be observed, which affects about a third of patients. MCV (Mean Corpuscular Volume) and MCH (Mean Corpuscular Haemoglobin) are within the normal range. Anaemia may be related to the changes seen in the bone marrow, since about half of the patients present with bone marrow atrophy. [18]

- White blood cells

Leukocytopenia occurs in about one-third of patients, but is most often mild. A significant decrease in the number of white blood cells combined with a low BMI can result in a greater susceptibility to infections. [18]

- Platelets

Thrombocytopenia is rare, but patients with anorexia may have a higher frequency of bleeding than patients with thrombocytopenia caused by other diseases. Still, bleeding due to low platelets in patients with AN is very rare. [18]

- Bone marrow

Bone marrow atrophy is common and appears to be correlated with the amount of body fat. Normal peripheral blood test results are not a good indicator of bone marrow health, as about half of patients with normal peripheral blood results have bone marrow impairment. The above changes correlate with total body fat and are reversible once body weight is within normal limits. [18, 19]

Gastrointestinal complications

Complications resulting from anorexia nervosa affect almost every part of the gastrointestinal tract:

- Oral cavity

Patients are more likely to experience gingivitis and gingival recession. This is most often explained by the increased frequency of brushing teeth, which is designed to distract from eating. [20] Abnormalities also affect the salivary glands and concern the amount and quality of saliva. Hyposalivation is probably due to a malfunction of the autonomic system. Disorders in the secretion of enzymes are most prevalent in lysozyme and AST (aspartate aminotransferase) which are reduced. [21]

- Oesophagus

The mobility and pressure of the oesophagus are altered. Possible consequences include achalasia, prolonged contractions (longer than 7.5 seconds) and increased amplitude (greater than 160 mmHg). [22] Chest pain (typically non-cardiac), dysphagia and heartburn are also mentioned. [22, 23] Patients diagnosed with AN are also at risk of developing esophageal squamous cell carcinoma later in life. [24]

- Stomach

Gastric motility is slowed down, so delayed emptying can be observed. This causes early feelings of satiety, bloating, and nausea. A rare complication is acute gastric dilation. It is potentially fatal and occurs in the process of refeeding or bingeing. [22, 23]

- Intestines

Slowed intestinal peristalsis and constipation are a common consequence. Chronic constipation may occur, but the above symptoms disappear when normal body weight is restored. [23] The gut microbiome of patients with AN is different from that of healthy individuals. The changes concern a much smaller amount of the total bacteria and their individual groups. What's more, the level of acids - acetic and propionic - is also lower. [25]

- Liver

Elevated levels of aminotransferases are common, with ALT deviating more than AST. There is a relationship between the degree of malnutrition and transaminase levels - the more malnourished the patient, the higher the levels of liver enzymes. Possible explanations include ischaemic hepatitis, hepatic steatosis and autophagy. [23] Initially, autophagy is beneficial and is designed to deal with nutrient deficiencies. This has a protective function and prevents cell death. However, once the BMI threshold of 13 kg/m2 is exceeded, autophagy leads to hepatocyte death and liver failure. [26] As liver damage progresses, hypoglycemia worsens because glycogen stores decrease. [23]

- Pancreas

Patients may suffer from acute pancreatitis. Possible mechanisms include pancreatic hypoperfusion resulting from dehydration and hypotension. However, caution should be exercised in interpreting elevated amylase levels, as it may result from purging and secretion by the salivary glands. [23]

Metabolic bone disease

Anorexia nervosa leads to osteopenia and osteoporosis. Recovery in this area can take many years, as osteopenia does not go away even more than a decade after the diagnosis of AN. Deviations consist of a reduction in both bone density and bone size. [13] Factors such as malnutrition and hormonal changes, which include decreased oestrogen levels and increased cortisol and ghrelin levels, are responsible for these changes. Resistance to the growth hormone also contributes to this. [27] The cortical bone is regenerated much more slowly than the trabecular bone. [28] As a result, anorectic patients are at increased risk of fractures even years after an AN diagnosis. [27, 28]

Renal complications

Patients may be affected by end-stage renal disease. Volume depletion and low potassium levels are considered to be the mechanism of formation. [29, 30] Estimating GFR is hampered by low muscle mass and reduced meat consumption, leading to significantly reduced plasma creatinine levels. This limits the calculation of GFR from commonly used formulas that inflate the result in this situation. [29] Urolithiasis is more common in AN patients and is associated with chronic dehydration and increased oxalate intake. [15] Changes in the kidneys can be irreversible. This illustrates the importance of early intervention by a nephrologist to preserve kidney function. [31]

Electrolyte disturbances

Electrolyte imbalances in the course of anorexia nervosa affect all major ions.

- Hypokalaemia

Decreased potassium levels may result from provoking vomiting, overuse of diuretics and laxatives. Potassium levels should be carefully interpreted, as it is an ion concentrated mainly in the intracellular space, so its concentration in plasma may not reflect the total stores. [15] In the case of laxative abuse, potassium is lost directly and vomiting leads to an indirect loss of potassium - through the resulting metabolic alkalosis. [15] Refractory hypokalemia should prompt the measurement of magnesium. [15] Some patients are able to adapt to low potassium levels. For others, it can be a lethal threat resulting in cardiac arrhythmias (QT prolongation, torsade de pointes, ventricular fibrillation) or acute kidney failure, among others. [32]

- Hypomagnesemia

Insufficient magnesium intake affects a large proportion of anorexic patients. Additionally, magnesium is lost through urine and faeces. [15, 33] In the case of concomitant hypokalemia and hypomagnesemia, magnesium levels should first be corrected. [2, 15]

- Hypocalcaemia

Hypocalcaemia can be misdiagnosed in a situation of artificially elevated serum albumin levels during dehydration. [15] In the case of refractory hypocalcemia, hypomagnesemia should be taken into account, as it may be the cause. [2, 15]

- Hyponatremia

Hyponatremia is associated with increased water intake, which is practised to lower hunger. Low sodium is also exacerbated by the secretion of vasopressin as a reaction to volume depletion. [2]

- Hypophosphatemia

A negative phosphate balance is due to malnutrition, provoking vomiting, overuse of laxatives and exercise. The consequences of this deficiency affect many systems, including sudden death. [34]

- Metabolic alkalosis

Metabolic alkalosis arises as a result of chronic dehydration, sometimes exacerbated by the abuse of laxatives and diuretics and the induction of vomiting. Dehydration causes increased secretion of aldosterone, renin and angiotensin, and consequently increases the resorption of bicarbonate by the kidneys. [30] Metabolic alkalosis is dangerous due to concomitant low serum potassium levels as a result of exchange for hydrogen ions. [2]

Refeeding syndrome

It is a complication that occurs during treatment with anorexia nervosa. It results from an inadequate way of re-feeding patients - sudden introduction of larger amounts of food after a prolonged period of increased starvation.. This leads to water and electrolyte imbalances, of which hypophosphatemia is the most useful in terms of diagnosis. Other abnormalities include low levels of potassium, sodium, magnesium, and metabolic alkalosis. It is a potentially lethal complication and occurs after both enteral and parenteral feeding. Prevention is particularly important because the mortality rate can reach up to 70% of patients. [35, 36]

Neurological complications

Brain atrophy occurs in patients with AN and affects both white and gray matter. With the improvement of health and the return to normal body weight, atrophy decreases. [37]

CONCLUSIONS

Patients with anorexia nervosa resort to extreme methods of weight loss. This has an impact on their health. The consequences and complications affect almost every organ and system in the body. Some are trivial and disappear shortly after recovery, others take years, and still others turn out to be irreversible. This leads to the conclusion that in the case of anorexic patients, the focus should not be only on their mental health, but on treating them interdisciplinarily.

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