

CLUSTER ANALYSIS OF THE PHENOTYPE OF ASTHMA AND OBESITY

ANALIZA SKUPIEN (KLASTERYZACJA) FENOTYPU ASTMY I OTYŁOŚCI

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ABSTRACT

Introduction: The combination of asthma and obesity can affect the mutual encumbrance to which other pathogenetic mechanisms join, which worsen the course of both diseases. **The aim of the work is to analyze the features of the genotype and phenotype in patients with a combined course of asthma and obesity.** **Materials and methods:** In order to detect the features of obesity asthma, 108 patients were examined. Patients were divided into two groups: the first included 50 patients with normal body weight, the second - 58 patients with obesity. **Results:** The analysis of the history of the disease revealed that 98% of women with obesity with asthma started the illness at the mature age (50.9 years) against the background of age-related hormonal dysfunctions. Relatively rarely in the obesity group, allergic rhinitis and eosinophilia in the peripheral blood were diagnosed. In analyzing the indicators of the function of external respiration, it has been established that in obese patients, restrictive bronchoconstriction disturbances and more significant distal bronchial obstruction are more pronounced than in patients with normal body mass. In the group of obese patients, the majority were women, the disease was more often complicated by pulmonary insufficiency, emphysema of lungs, and co morbid condition - hypertension. In this group, the symptoms of asthma were constantly persistent, but worse controls. **Conclusions:** The obtained data allow to distinguish the phenotype of patients with asthma with adjunctive obesity.

KEY WORDS: asthma, obesity, body mass index.

INTRODUCTION

Asthma is one of the most common diseases (5-25% of the general population) with a clear upward trend in 2011 [1]. About 300 million people suffer from asthma, and in most patients it is poorly controlled or not at all, which requires the search for new approaches to treatment. One of the reasons for poor control is the heterogeneity of asthma in terms of mechanisms, manifestations and flow [1, 2]. The reflection of heterogeneity of inflammation in asthma in the scientific literature is the selection of different phenotypes and endotheilium of the disease [3, 4]. The genotyping and phenotype of asthma are based on clinical characteristics and genetic markers and understanding of the pathophysiological basis of the disease and the optimization of therapeutic measures [5, 6]. The phenotype of asthma occurs according to clinical characteristics (age, sex, duration, co morbid states) and pathomorphological signs of inflammation (eosinophilic, neutrophilic, pauci-granulocytic) [7, 8, 9, 10]. Thus, today there is a parallel increase in the spread of asthma and obesity throughout the world [11, 12, 13]. Modern studies have found among asthma patients 28-44% of patients with obesity of varying degrees [14]. Obesity not only increases the risk of asthma, but also worsens the course of the disease. In patients with co morbidity of asthma and obesity, sufficiently low asthma control indicators are found. The combination of asthma and obesity can affect the mutual encumbrance to which other pathogenetic mechanisms join, which worsen the course of both diseases [15, 16].

THE AIM

The aim of the work is to analyze the features of the genotype and phenotype in patients with a combined course of asthma and obesity.

MATERIALS AND METHODS

On the basis of the SDC «Rehabilitation» of the Ministry of Health of Ukraine, a comprehensive survey of 108 patients with asthma was conducted. All patients had a thorough allergy history, anamnesis of life and disease. The study includes assessment of resting anthropometric data, physical activity habits, blood pressure, structure and quality of nutrition,

family and socioeconomic data. The function of external respiration (FER) was studied using the computer spiograph Pulmovent-2, parameters were compared by age, sex and body weight. Body mass index (BMI) was determined by Kettle. To determine the characteristics of the course of AD with obesity, all patients were divided into two groups. The first group included 50 patients with asthma with normal body mass ($BMI \leq 25 \text{ kg / m}^2$), to the arc - 58 patients with obesity asthma ($BMI \geq 30 \text{ kg / m}^2$). Data were expressed as mean \pm standard error for quantitative variables.

RESULTS

The average age in the group of patients with isolated asthma was 34.9 ± 0.77 years, and in the group of patients with asthma with obesity - 53.7 ± 0.95 years. By gender, both groups were dominated by women, but the percentage varied and was 86.2% in the second group, compared with 68% in the first. In the analysis of anamnesis data, it was found that in 98% of obese women, the onset of illness was at the mature age (50.9 years), the prescription of the disease was 3.8 ± 0.22 years. In 18 (36%) of women with obesity asthma manifested itself against the background of climax, in 12 (24%) - after surgical interventions for gynecological diseases. While in 32 (64%) patients with asthma with normal body mass, the debut of the disease was noted in childhood and adolescence. In patients with obesity asthma, pulmonary insufficiency was more frequent than the second to third degree (24.1%) and emphysema of the lungs (17.2%) versus 10% and 4% respectively in patients with normal body mass.

The allergic history indicated a hemorrhagic inheritance in 21 patients (36.2%) and 13 patients (26%) more often in the maternal line in obese patients and with normal BMI, respectively. In asthma patients with obesity, inflammation of the respiratory tract was reported as nonatopic (96.6%), which was confirmed by a low level of eosinophils in the peripheral blood (2 - 3%) versus (5-7%) in patients with asthma with normal body mass. Manifestations of allergic rhinitis were less common in obese patients (6.9%) than in patients with normal BMI (40%).

Among concomitant illnesses in patients with asthma with obesity, arterial hypertension was often diagnosed - 24,1% versus 4% of patients with normal body mass. FER indices in patients of both groups differed. Perforation in the bronchial tree in obese subjects developed predominantly in the restrictive-obstructive (mixed) type and was diagnosed in 89.7%, whereas in patients with normal body weight disorders were more obstructive - 84%. Thus, the vital capacity of the lungs (FVC) was significantly lower in patients with obesity (83.4 ± 1.5)% than in normal weight (91.2 ± 1.7)%. The obstructive changes in FER were also more pronounced in the group of obese asthma patients. The indicators of distal obstruction differed significantly and significantly lower MEF75 was in obese (49.6 ± 1.45)% versus (60.5 ± 1.6)% in subjects with normal body weight. In patients with obesity, the course of asthma was always persistent. Among the complaints in this group of patients, the attacks of odor pre-

vailed - in 86.2%; difficulty in breathing - 84.5%; headache - in 17.2% of patients. In 77.6% of obese patients listened to dry wheezing. In the group of patients with asthma, in the presence of normal BMI, 60% of patients complained of asthma attacks, 78% had difficulty breathing, 54% had a wet cough. When auscultation, 60% of these patients were diagnosed with dry wheezing. In support of glucocorticosteroids therapy, 34 (58.6%) patients were in the group of obese patients, whereas in the group of patients with normal body mass there were 11 (22%) persons. According to the Asthma Control Test (AST), the most percentage was an uncontrolled course of asthma.

DISCUSSION

Combination of all the main factors of phenotype according to clinical features: age of illness, sex, presence or absence of obesity; for pathophysiological - eosinophilic, neutrophilic, pauci - granulocytic, immune inflammation; by the nature of the response to the treatment: the positive or the presence of refractory reactions in one classification has not yet been developed. Some features of the course of asthma with obesity are described [21, 22, 23, 24]. A more detailed description of the cluster analysis of asthma in work [9], which unites mainly women aged 34-68 years (middle age - 50 years) with obesity. Asthma was atopic, late, characterized by a decrease in peak volume velocity and frequent use of glucocorticosteroids (17% of patients received systemic steroids), and only 64% of them had normal respiratory function in the background of treatment. There was a direct correlation between the degree of obesity with the severity of asthma [12].

By cluster analysis, obstructive asthma is characteristic of older women [6, 11], in our case, 50.9 years, against the background of climacteric and gynecological diseases with hormonal dysfunction of the ovaries. The type of inflammation in obstructive asthma was more often non-eosinophilic [3,6,13] and rarely detected concomitant allergic rhinitis. Frequent concomitant disease in patients with asthma and obesity was arterial hypertension [19]. In these patients, asthma often has non-standardized character and the quality of life in them is reduced [25]. The excess of adipose tissue in the mediastinum reduces the mobility of the lungs, and excess of its deposition on the diaphragm - until the development of the diaphragm dysfunction, which leads to a decrease in the diaphragm excursion [13]. Violation of ductance of external respiration at high BMI is marked by a decrease in the volume of forced exhalation (FEV1) in the first second, the forced vital capacity (FVC) and vital capacity of the lungs (VC). The reason for the low rates is a decrease in the function of the respiratory muscles, a decrease in the diameter of the bronchial tree in the distal parts compared with those who have normal body mass [22]. Therefore, the disruption of respiration in patients with asthma with obesity has a mixed character [6], which is confirmed by our data.

Asthma in obesity has a pronounced respiratory symptomatology, although there is a slight obstruction and inflamma-

- tion in the respiratory tract. Some authors [24, 25, 26] cite data that obese patients with asthma have more pronounced disease symptoms and worse control than patients with normal body weight, which is confirmed by our data as well.
- CONCLUSIONS**
- The obtained data allow unambiguously genotype and phenotype patients with asthma with comorbid obesity. In the clinic it is expedient to allocate a cluster of obstructive asthma characterized by neo-eosinophilic genotype of inflammation, more common in women with debut in adulthood, worse parameters of FFR with bronchial tuberculosis in mixed type and need three or more medications for asthma control, one of which is - inhaled glucocorticosteroids.
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