

Asthma and obesity in childhood- do they correlate?

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I. INTRODUCTION

Respiratory diseases are the most common acute diseases in children. Bronchial asthma is the most common chronic respiratory disease. Over the past 20 years, there has been an epidemic of bronchial asthma, as well as the increase in incidence of another disease - obesity in and overweight children. The combination of the two conditions is a challenge for the clinical approach and the therapeutic strategy for treatment. In the United States, 65% of adults over 20 years of age are overweight (BMI > 30kg / m) and 16% of children (BMI > 95 percentile). Excessive weight leads to a significant health risks, such as cardiovascular disease, type 2 diabetes, orthopedic problems, skin diseases, psychological trauma, and reduced life expectancy. Childhood obesity is closely related to adulthood obesity and the associated health-risk consequences.

Upper and lower airways undergo significant changes in obese patients [1]. Increased body weight leads to upper airway obstruction during sleep and reduced pulmonary function, resulting in a negative change in FEV1 (forced expiratory volume in 1 second) in both adults and children. In addition, obese children also show a decrease in static pulmonary volumes and capacities as well as diffusion disturbances. In overweight individuals "wheezing" and shortness of breath are the most common respiratory symptoms. There are many factors contributing to this, including impaired chest mechanics and systemic inflammation. Regular physical exercise increases both aerobic and anaerobic exchange, which is expressed in increased oxygen consumption per unit of work. In obese children, physical effort is experienced, there is a high oxygen "price" of respiratory movements, which leads to dyspnea and early cessation of effort.

Purely mechanically, excess weight compresses the chest wall and abdomen and leads to ineffective ventilation due to reduced respiratory compliances. This is associated with reduced pulmonary volumes resulting from inadequate movements of the sternum and the diaphragm, infiltration of the chest with fat and an increased blood volume. The work of the respiratory muscles is ineffective with increased oxygen consumption. Systemic inflammation leads to bronchial hyper reactivity (BHD), which is a cause of narrowing of the bronchial lumen.

Obesity, "wheezing" and asthma

In this respect, the current data is richer regarding adults with obesity and asthma, but studies in children suggests do not necessarily such a comparable link between childhood obesity and asthma. For example, several large longitudinal studies show dissimilar results with increasing risk of asthma only in obese boys or only in obese girls. Whether the increase in BMI in early childhood predicts asthma at a later age is still not fully understood. The Tucson Children's Respiratory Study finds a lack of association between BMI at age 6 and "wheezing" in early childhood, but shows that girls who are overweight at 11 years of age have an increased risk of BHD during puberty. Contrary to these findings, a meta-analysis of 12 studies on early childhood obesity and the subsequent risk for asthma indicate a 50% increase in risk for subsequently developing asthma for overweight infants. Most of these studies do not focus on other factors such as physical activity and functional capacity, and so the relationship between physical hypokinesia, "wheezing" and asthma remains unclear. Whether asthma is over diagnosed in overweight children is also not entirely clear.

Clinical characteristics of asthma in children with obesity: asthma is defined as BHD or an excessive response to stimuli (asthma triggers) associated with chronic bronchial inflammation, bronchoconstriction and reversible bronchial obstruction. The degree of bronchial obstruction is measured by spirometry and static pulmonary volumes, and BHD by spirometry after bronchial provocation by methacholine, histamine, hypertonic sodium chloride solution, cold air inhalation, and so on. Studies on the relationship between BHD and BMI are insufficient [2]. In a large study of 5,984 children, obesity was associated with a more frequent use of inhalers due to subjective symptoms associated with asthma but not with BHD [4]. Other studies show an identical correlation between obesity with BHDs as in children with normal weight. If the frequency of BHD is the same as in children with normal weight, what causes the more severe asthma symptoms, dyspnea and "wheezing" in overweight children? Several mechanisms are likely and include the following:

- Reduced pulmonary volumes, fat infiltration of the abdominal and chest wall. Obese children breathe with a smaller breathing volume and a higher respiratory rate to provide adequate minute ventilation [3]

- In the case of obesity, a systemic inflammatory response is observed, from which secondary respiratory tract irritation may also occur. The increase in circulation of inflammatory mediators has been demonstrated in studies in obese adults and in a small number of studies in children. Increased visceral fat is associated with high circulating levels of TNFalpha, IL-6, CRP. Leptin, an appetite suppressant hormone released from adipose tissue, is increased in inflammation, whereas adiponectin, which is involved in preventing insulin resistance and is an anti-inflammatory protein, decreases in obesity. The role of circulating proinflammatory molecules in asthma, "wheezing" and obesity is unclear, but with decreased weight and improvement in lung function, serum concentration decreases [6].
- Evidence shows that the response to treatment is unsatisfactory in obese children with asthma. Asthma control with inhaled corticosteroids with or without long acting beta – agonists (LABA) is difficult to achieve. The mechanism of suboptimal response to treatment is unclear.

Treatment of asthmatic obese patients: according to GINA recommendations, after assessment of the level of control and risk of exacerbations: ICS (inhaled corticosteroids) or LTA (leukotriene antagonists), ICS + LABA (long acting beta-agonists) and SABA (Short-acting beta-agonists). Due to excess weight the reversibility of bronchial obstruction is usually incomplete, and occasionally unnecessary corticosteroid courses are obtained. It is a great opportunity to increase physical activity and weight loss, which are interrelated and improve the quality of life [5].

II. MAIN CONCLUSIONS:

- Respiratory tract and cardio-respiratory physiology undergo significant changes in most obese children. Losing weight is an essential therapeutic strategy. This is difficult to achieve without a proper program of exercise and physical activity, control of depressive behavior, family support and diet.
- Bronchial asthma in overweight children is characterized by difficult symptom control and corticosteroid overdose in an attack. Even after treatment, the symptoms of dyspnea and wheezing may persist for a long time. The dynamic tracking of pulmonary function by spirometry and BHD tests are most important in order to adapt the treatment.

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