Role of Weight Management in Asthma Symptoms and Control

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KEYWORDS

• Obesity • Asthma • Weight loss • Gastric bypass surgery • Asthma control

KEY POINTS

- Weight loss achieved by both dietary and surgical interventions improves asthma symptoms and control.
- There may a subset of obese patients with asthma who receive added benefits from weight loss. These patients tend to have late-onset asthma that is preceded by obesity and have decreased airway hyperresponsiveness with weight loss.
- More research is needed to determine whether the physiologic changes that occur with obesity are responsible for the improvements in asthma symptoms.
- Weight loss should be recommended to patients with poor asthma control; however, there are insufficient data to support surgical interventions for weight loss solely for the purpose of improving asthma control.

INTRODUCTION

The prevalence of obesity has increased significantly over the past several decades, with more than a third of adults in the United States now considered obese (body mass index [BMI] >30) according to a recent report from the US Centers for Disease Control and Prevention. Obesity has a known association with diabetes mellitus type 2, hypertension, and atherosclerotic heart disease. Over the past decade it has become increasingly recognized that obesity is associated with asthma, with an increased risk of developing asthma with increasing BMI in a dose-response manner.[1] In addition, overweight/obese patients with asthma have more symptoms, poor asthma control, and decreased response to conventional asthma therapies, including inhaled steroids.[2] Patients who are morbidly obese bear the greatest morbidity from asthma and the prevalence of asthma in the bariatric surgery population is as high

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as 10%.[3] Obesity has also been recognized as a risk factor for more severe and difficult-to-treat asthma, and obese patients with asthma have poor response to conventional asthma therapies including inhaled steroids, which is thought to be caused by glucocorticoid resistance.[2,4,5] Animal models and epidemiologic studies have suggested that leptin, a hormone that regulates satiety and is increased in obesity, and adiponectin, an antiinflammatory hormone that is present in decreased levels in obesity, may play a role in allergic airway inflammation and subsequently cause worsening asthma.[6,7] Proposed mechanisms for the increased risk of asthma in obesity include shallow tidal breathing caused by decreased chest wall compliance causing decreased airway smooth muscle stretch and increased hyperresponsiveness, increased incidence of gastroesophageal reflux, sleep-disordered breathing (SDB), misdiagnosis of asthma, genetic polymorphism, and effects of systemic cytokines associated with obesity on inflammation in the lungs.[8–11] There is likely a causal relationship between obesity and asthma and thus targeting weight loss in individuals who are overweight/obese with asthma is likely to lead to improved asthma control and may even cause reversal of inflammation and potentially fully resolve asthma in patients for whom obesity is the primary cause of disease.

This article discusses the effect of weight loss via dietary modifications and surgical interventions on asthma symptoms and control. It is concerned with the effect of weight loss on inflammatory mediators of asthma and the impact of alterations in inflammation on asthma.

DIETARY INTERVENTIONS IN WEIGHT MANAGEMENT

There are several observational studies that have been performed to determine the effect of changes in weight on asthma control and symptoms (**Table 1**). A study from the United Kingdom followed 151 patients with severe asthma (75% with BMI>25 and 44% with BMI>30) over a 1-year period and monitored changes in their weight. There was no correlation with changes in weight and asthma exacerbations or Asthma Control Questionnaire (ACQ) scores. However, there was a correlation between weight change and forced expiratory volume in 1 second (FEV_1) with increased FEV_1 associated with decreases in weight ($r = -0.3$; $P = .03$).[12] In a larger cohort of patients, Haselkorn and colleagues[13] evaluated patients from The Epidemiology and Natural history of Asthma: Outcomes and Treatment Regimens (TENOR) study with severe or difficult-to-treat asthma divided into 3 groups based on changes in weight over a 1-year period. The groups were divided into those patients that had greater than or equal to 2.3-kg (5-lb) weight loss, less than 2.3-kg change in weight, or greater than or equal to 2.3-kg weight gain. Those who gained weight reported poor asthma control and required a greater number of steroid bursts for asthma exacerbations. The patients who lost weight did not experience improvements in asthma control. However, this study is limited by the inclusion of nonobese individuals and the low threshold of weight loss that is likely to result in low power to detect a difference in asthma control associated with weight loss.

These observational studies indicated that obesity is associated with poorer asthma control, quality of life, and increased exposure to oral steroids. In these initial studies the effect of weight loss on lung function measures was unclear because there were contrary findings with regard to FEV_1. Based on these findings, several investigators designed studies that incorporated weight loss interventions to determine the effect of weight loss on markers of asthma control, quality of life, and lung function measures.

Stenius-Aarniala and colleagues[14] completed an unblinded randomized controlled trial of 38 obese patients with asthma assessing the effects of a 14-week weight