

Sudden Asthma during Extubation in a Patient without Asthma History: A Case Report

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Abstract

Acute asthma is very dangerous and frequently presents with sudden narrowing of the airways especially during perioperative period. Asthma poses many challenges to the perioperative anesthesia management. This article describes a refractory acute asthma during extubation period in a 35 year old man without any history of asthma. There may be a number of factors that trigger asthma, so we reviewed some of the present literature to analyze the relationship between them and asthma in order to better guide the clinical practices.

Keywords Asthma; Allergic rhinitis; Airway hyper-responsiveness

Introduction

Asthma is a form of bronchial disorder with three distinct components: Airway hyper-responsiveness (respiratory hypersensitivity), airway inflammation and intermittent airway obstruction [1]. It is one of the most common chronic diseases in the world. The statistics in 2017 show that asthma affects about 300 million people globally and accounts for 1 in every 250 deaths in the world [2]. Patients often suffer from the dual effects of surgery and anesthesia perioperative which increased the risk of asthma attacks. This article describes a case of an unexpected acute severe asthma attack in patients with allergic rhinitis after surgery.

Case Report

A 35 years old male with a weight of 102 kg and a height of 176 cm was admitted to the hospital because of the turbinate hypertrophy and hyposmia which caused by a long-term allergic rhinitis. Due to frequent bleeding and turbinate hypertrophy, he was planned to perform an operation of sinus lesions removed under general anesthesia. Moreover, he has a history of smoking for more than 10 years until the day in hospital and no symptoms or history of asthma. Before the surgery, the lung function test showed mild mixed ventilation dysfunction (FEV₁%72.4%, FEV₁/FVC%74.62%). The test result showed normal chest radiography, normal ECG, normal laboratory examination. The patient was received budesonide nasal spray in the surgery day morning.

For general anesthesia induction, 2 mg Midazolam, 20 µg Sufentanil, 100 mg Propofol and 50 mg Rocuronium for the endotracheal intubation were intravenously injected. Before the intubation methylprednisolone 40 mg was administered to prevent anaphylaxis. Tracheal intubation was successfully conducted with a single lumen tube of ID.6.5# for depth 22 cm. With mechanical ventilation started, airway pressure was 30 cmH₂O. In consideration of patient's BMI and a long history of smoking, suctioning, tube depth change and decreasing tidal volume (VT) was performed. But no

satisfying recovery was achieved, the airway pressure was still high (23-30 cmH₂O). Operation was beginning after these treatments anesthesia was administered via sevoflurane, propofol and remifentanyl. Surgery took an hour, when the operation was over; 1 mg neostigmine and 0.5 mg atropine were given as the antagonist of muscle relaxant. As patient's awareness resumed, the airway pressure rises again and the PetCO₂ increased to 61 mmHg, the SO₂ decreased to 96%. Capnography showed a severe obstructive pattern. Auscultation also revealed a severe wheeze compatible with an asthma attack. In that case, a possibility of acute asthma attack was considered, the patient received salbutamol through the endotracheal tube, mucosolvan and aminophylline intravenous injection immediately. The arterial blood gas (ABG) sampling showed a respiratory acidosis (pH 7.16, pCO₂ 74.4 mmHg, pO₂ 108 mmHg, HCO₃⁻ -25.5, BE -2.2). After careful consideration the patient was anesthetized again via Sevoflurane and Propofol to carry out adequate mechanical ventilation and received adrenergic 10 µg intravenously. Ongoing deterioration with decreasing pCO₂-levels and airway pressure. With the consent of the otolaryngologist and his family, the patient was admitted to the ICU for further treatment. The patient received glucocorticoid, theophylline, ambroxol and antibiotic treatment at the ICU. He was extubated at 9 am the second day with full muscle recovery and proper calming and returned to the general ward in the afternoon for a further examination and treatment for the asthma.

Discussion

Chronic airway inflammation such as T-helper (Th) immune, eosinophilic and neutrophilic responses is recognized as cardinal elements in the development of asthma [3]. Although the patient has no history of asthma, his symptoms could be explained by a single or several factors occurring simultaneously. The asthma may be associated with allergic rhinitis (AR, which the epidemiological evidence suggests a strong relationship between AR and asthma. AR can occur in >75% of patients with asthma, whereas asthma can affect up to 40% of patients with AR. Both diseases are mediated by IgE and can be triggered by similar allergens [4]. The asthma may also be related to smoking and obesity. The mechanism of asthma is airway hyper-

responsiveness caused by chronic inflammation. Smoking can cause airway mucosal injury, edema, increasing in the submucosal stimulation of receptor sensitivity, eventually leading to increasing airway responsiveness. Our patient had no definite history of asthma preoperatively and lack of bronchodilator tests. But the long history of allergic rhinitis and smoking are thought to be crucial mediators in expanded inflammation and airway hyper-responsiveness. On the other hand, obesity is considered to be a chronic low-grade inflammatory state. Obesity-mediated systemic inflammation has been shown to have effects on pulmonary functions and is associated with asthma [5]. A study of 3264 obese asthma patients shows that the obese group exhibited a poor control of asthma and a decreased response to inhaled corticosteroids, which resulted in a greater need of beta-stimulants and corticosteroids during acute exacerbation [6]. This is consistent with the poor effect of methylprednisolone that used in this patient before surgery. Even though the pulmonary function test shows a mild mixed ventilation dysfunction before the surgery. But he has no significant asthma symptoms, this leads to easy to overlook some high-risk index. Furthermore, due to the factors of obesity and smoking, the result is still lack of specificity in this patient.

Tracheal tube can cause distinct stimulation of the airways and oropharynx especially with an inadequate anesthesia. Simultaneously, in order to ensure the full recovery of muscle strength, anticholinergic drugs are often used during recovery. But anticholinesterase drugs (neostigmine or physostigmine) will increase airway secretions and induce bronchospasm, so some experts recommend avoiding these agents in patients with obstructive respiratory disease after the surgery [7]. A previous case report presented a patient who has a known asthma history with asthma attack after receiving neostigmine and atropine [8].

Whilst each factor is nonlethal on its own, the combination delivers a fatal outcome in this case. Our patient had a suddenly increase in airway pressure and carbon dioxide accumulation accompanied by wheezing in both lungs, which promptly reminds us of the possibility of severe acute asthma. Most likely as a result of stimulation of tube and neostigmine. Patients with severe asthma exacerbations often respond to first- and second-line therapies, such as β_2 -adrenergic agonist use, corticosteroids, magnesium, aminophylline and systemic catecholamines [8]. We tried some of them but did not work well. In that moment, mechanical ventilation of this kind of patient is still considered a challenging issue, mainly because of positive pressure mechanical ventilation promotes life-threatening complications of status asthmaticus including pneumothorax, pneumomediastinum, giant subcutaneous emphysema and circulatory shock [9]. In that moment, we finally used epinephrine to relieve bronchospasm and deepen anesthesia to reduce mechanical ventilation damage.

Ipratropium Bromide and magnesium is also a treatment for severe acute asthma, but was not thought in that emergency condition.

The limits of this case report were short of the tests of bronchial provocation test or dilation test before the surgery. Furthermore, we did not pay enough attention to the situation of increasing airway pressure at the beginning of mechanical ventilation. Volatile anesthetics and albuterol have been used for refractory status asthmaticus in pediatric patients who do not respond to conventional therapy. In conclusion, we should be alert to patients with allergic rhinitis who have no definite asthma symptoms, stimulation of operation and endotracheal tube may be are high risk factors for asthma. Adequate preoperative assessment (bronchodilator test, lung function) is necessary.

Disclosure

Written informed consent was obtained from the patient upon discharge for publication of this manuscript. The authors report no conflict of interest in this work.

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