CASE REPORT

Bronchial Thermoplasty for Severe Asthma with Mucus Hypersecretion

Naoko Nagano, Motoyasu Iikura, Ayaka Ito, Eriko Miyawaki, Masao Hashimoto and Haruhito Sugiyama

Abstract:
Bronchial thermoplasty (BT), which delivers thermal radiofrequency to the bronchial wall, is an effective therapy for patients with severe persistent uncontrolled asthma. We herein report the case of a 47-year-old man who underwent BT for uncontrolled severe asthma. After BT, his asthma control, asthma-related quality of life, and pulmonary function improved. Furthermore, a histologic examination of transbronchial biopsy specimens revealed a decrease in goblet cell hyperplasia and the smooth muscle mass as well as in the subepithelial basement membrane thickness. BT can be effective for patients with severe uncontrolled asthma and mucus hypersecretion.

Key words: bronchial thermoplasty, severe asthma, hypersecretion

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Introduction

Bronchial thermoplasty (BT) involves the delivery of thermal radiofrequency to the bronchial wall. It is an effective non-pharmacologic therapy for patients with severe persistent uncontrolled asthma (1). BT has been known to inhibit bronchoconstriction by reducing the airway smooth muscle mass (2, 3), subepithelial bronchial thickness, and number of bronchial nerve cells (4). However, the effect of BT on the bronchial epithelium has been unclear.

We herein report a patient whose asthma control, asthma-related quality of life, and pulmonary function improved along with the histologic confirmation of a decrease in goblet cell hyperplasia after BT.

Case Report

A 47-year-old non-smoking man was referred for severe persistent asthma. He had been diagnosed with asthma at 16 years of age. Since then, his symptoms had been poorly controlled, and he frequently experienced severe exacerbations that required unscheduled systemic steroid administration. One year prior to this consult, he suffered two instances of severe exacerbation that were treated by intravenous corticosteroids. His asthma remained poorly controlled despite maximal medical therapy with the subcutaneous injection of omalizumab 600 mg every 2 weeks; inhaled fluticasone furoate 100 μg/vilanterol 25 μg and tiotropium 5 μg; and oral theophylline 400 mg and montelukast 10 mg. Therefore, he was referred to our hospital to undergo BT.

He was allergic to house dust mites and moths. His concomitant conditions were atrial fibrillation and hyperuricemia. He had no remarkable family history. His occupation was a clerk in a lawyer’s office. His physical findings were significant for wheezing in the bilateral lung fields.

Spirometry performed before BT showed a forced expiratory volume in 1 second (FEV1) of 1.92 L (52.2% predicted) and a forced vital capacity (FVC) of 4.78 L (111.4% predicted). The FEV1/FVC ratio was 40.2%, and the shape of the flow-volume curve suggested obstructive airway disease. Computed tomography (CT) of the chest showed bronchial wall thickness and air trapping in the expiratory phase.

Three BT procedures were completed without major adverse events. During the first BT procedure, an endobronchial inspection revealed significant findings of a large amount of yellow-white secretion that grew Hemophilus influenzae on culture. Cytology of the sputum revealed neutro-
In this patient with severe persistent asthma, BT improved his symptoms, quality of life (QOL) score, respiratory function, chest imaging findings, and histologic components. Previous studies have reported that BT reduced the number of exacerbations and improved the QOL of patients with severe refractory asthma (1). The major mechanism of action of BT is the reduction of the airway smooth muscle mass (2, 3).

This patient showed a decrease in goblet cell hyperplasia at the site of BT (i.e., B8) and its adjacent bronchus B9. Goblet cell hyperplasia was present in almost the entire epithelial area, but the area that received BT showed a decrease in hyperplasia. Because we performed only one biopsy sampling from B4, further pathologic investigation could not be performed. Nevertheless, after BT, there was obvious residual goblet cell hyperplasia in B4 compared with B8 and B9.

Pretolani et al. analyzed the histopathologic changes in patients who underwent BT (4) and showed that 6 of 15 patients exhibited a decrease in goblet cell hypertrophy/hyperplasia. In the middle lobe, there may be transient ground glass opacities after BT (3), but in general, there was no pathologic confirmation of a decrease in goblet cell hyperplasia. Although the present case was similar to other cases previously reported to have a decrease in goblet cell hyperplasia, this mechanism needs to be further studied.
In conclusion, we pathologically proved the effect of BT on the airway mucosa in a patient with severe uncontrolled asthma with mucus hypersecretion. Further studies will be required to confirm the mechanism underlying the effects of BT treatment on the airway epithelium.

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References

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