

## Transient Bronchial Wall Thickening After Bronchial Thermoplasty for Asthma

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**FIGURE 1.** Axial computed tomography of the chest showing bronchial wall thickening in the left and right upper lobes after bronchial thermoplasty.

**B**ronchial thermoplasty (BT) is a relatively new bronchoscopic intervention FDA approved in 2010 for the treatment of severe, persistent asthma not well controlled despite maximal medical therapy.<sup>1</sup> Bronchoconstriction occurs in asthmatics and results in airflow obstruction and hence the symptoms of asthma such as shortness of breath, wheezing, and chest tightness.<sup>2</sup> BT decreases

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bronchoconstriction by reducing the amount of smooth muscle mass through the delivery of thermal energy directly to the airways 3 to 10 mm in size.<sup>3</sup> The commercially available Alair System provides radiofrequency energy in 10-second pulses with resulting temperatures of 65°C to the segmental and subsegmental airways using a special treatment catheter.<sup>4</sup> This is postulated to decrease airway smooth muscle and thus airway hyperresponsiveness, but no unique mechanism has been formally identified.<sup>5</sup> Clinically, BT has shown to reduce the rate of severe exacerbations, emergency department visits, and days missed from school or work versus a control group 1 year after initial treatment.<sup>6</sup> Additional data have shown safety in patient populations with reduced severe asthma exacerbations at 2 years versus patients treated with high-dose inhaled corticosteroids and a long-acting bronchodilator.<sup>7</sup>

Our case demonstrates a patient with severe, persistent asthma who developed transient bronchial wall thickening on computed tomography (CT) in her bilateral upper lobes immediately after treatment with BT in that region.

### CASE REPORT

A 77-year-old woman presented with severe, persistent asthma despite budesonide-formoterol fumarate 160-4.5 two puffs twice daily and tiotropium 18 mcg one puff daily. On this treatment she required multiple daily inhalations of albuterol in addition to approximately 6 bursts of prednisone annually. Given her frequent prednisone requirement, plus her intolerance of higher dose inhaled corticosteroids, she was considered to be a candidate for BT. Typically BT is reserved for patients 18 to 65 years of age. However, given the patient's life long history of asthma and her otherwise excellent health status, she was offered the procedure.

The patient tolerated each of her 3 separate BT procedures without difficulty. She did receive 50 mg/d of prednisone beginning 3 days before each procedure and ending the day after each procedure. Specifically, we treated her right lower lobe in the first session, her bilateral upper lobes in the second session, and her left lower lobe in the third session. Typically, the left lower lobe is treated during the second session. However, a small diverticulum, adjacent to the superior segment takeoff, was identified during the airway examination. This prompted the treatment of the bilateral upper lobes during the second session.

A CT scan of her chest was obtained 7 days after the treatment of her upper lobes to further evaluate the left lower lobe diverticulum. Interestingly, this scan revealed prominent bilateral upper lobe bronchial wall thickening (Fig. 1). There was no bronchial

wall thickening in the periphery or in the lower or middle lobes including the right lower lobe that had been treated 24 days before the CT. Given the distribution of the changes, in addition to the temporal relationship, it was reasoned that these radiographic changes were due to the recent BT. The CT also confirmed the small diverticulum.

A phone interview and follow-up clinic evaluation revealed the patient to be stable. A subsequent CT scan of the chest 40 days after the procedure revealed complete resolution of the bronchial wall thickening (Fig. 2). The upper lobe airways were carefully inspected during the third session. Visually, the airways appeared normal.

The patient felt well 6 months after completion of BT. Subjectively, her asthma was less severe. She continued to take budesonide-formoterol fumarate 160-4.5 two puffs twice daily and tiotropium 18 mcg one puff daily. She now rarely required albuterol and has only had 1 minor flare since the procedure. Her Asthma Therapy Assessment Questionnaire decreased from 4 points before her first procedure to 0 to 1 point 6 months after BT was completed.

### DISCUSSION

Studies have demonstrated safety with BT radiographically as long as 5 years after treatment.<sup>8</sup> An incidence of bronchiectasis in BT at a rate of 0.2% per year has paralleled what is seen in severe asthmatics on medical therapy alone.<sup>9,10</sup> In addition, there has been no evidence of bronchiolitis obliterans, pulmonary emphysema, scarring, or stricture.<sup>6,7</sup>

The most common side effect of BT is temporary worsening of respiratory-related symptoms, including wheezing, chest discomfort, chest pain, cough, and upper respiratory tract infections. Side effects generally occur within 1 day of the procedure and resolve within 7 days with standard care. Severe complications are infrequent with 3.4% of individuals requiring hospitalization in 1 study.<sup>7</sup>

To our knowledge, this is the first case report demonstrating the postprocedure finding of bronchial wall thickening on CT scan in a patient receiving BT. Imaging in our patient demonstrates bronchial wall thickening in the upper lobes bilaterally 7 days after receiving BT in the same region. Bronchial wall thickening is a radiographic descriptor for increased diameter of the bronchial wall generally seen on plain film and CT scan. Thickening occurs as the result of mucus gland hypertrophy within the airways resulting in increased interstitial liquid, cells, or collagen.<sup>11</sup> We speculate that the delivery of



**FIGURE 2.** Imaging of the chest in the same patient 6 weeks after the initial computed tomographic scan. There is complete resolution of bronchial wall thickening in the left and right upper lobes.

thermal energy may have resulted in airway edema and hence the radiographic correlate of bronchial wall thickening.

Given the distribution and temporal relation of her new CT findings, it is believed her bronchial wall thickening is the result of BT. A subsequent phone interview and clinical evaluation revealed the patient to be clinically stable. Therefore, we conclude that radiographic change does not correlate with worsening clinical status and hence probably does not indicate an asthma flare. A follow-up CT scan performed 40 days after BT showed complete resolution of bronchial wall thickening. Transient findings suggest relative safety of BT. In summary, bronchial

wall thickening may be seen on a CT scan after BT and to date has proven to be transient and harmless.

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