



Effective Health Care Program

Effectiveness and Safety of Bronchial Thermoplasty in Management of Asthma

Evidence Summary

Objectives and Rationale for Review

This report summarizes a systematic review, “Effectiveness and Safety of Bronchial Thermoplasty in Management of Asthma,” and identifies needs for future research. This was one of the six high-priority topics within asthma identified by an National Heart, Lung, and Blood Institute Advisory Council Asthma Expert Working Group.¹

The objective of the systematic review is to assess the effectiveness and safety of bronchial thermoplasty (BT) in adults with asthma.

Background

Patients with severe, persistent asthma are managed with multiple medications that may include inhaled, orally administered, and biologic therapeutics. Some of these patients might be eligible for BT, an interventional treatment option that involves the delivery of controlled radiofrequency thermal energy to the walls of accessible proximal airways with the intent of reducing excess airway smooth muscle tissue in the airways and reducing the frequency of severe asthma exacerbations on a long-term basis. In April 2010, the U.S. Food and Drug Administration approved the Alair BT system for use in patients 18 years of age or older with severe, persistent asthma.

Purpose of Review

To evaluate the effectiveness and safety of bronchial thermoplasty (BT), a procedure that uses heat to remove muscle tissue from the airways of adults with moderate to severe asthma. BT is usually given as three treatments 3 weeks apart.

Key Messages

- BT along with standard medical management, compared to medical management alone, may improve asthma control and quality of life, but evidence is insufficient to determine impact on asthma exacerbations.
- BT along with standard medical management, compared to a similar procedure without the heat (sham procedure), does not improve asthma control or hospitalizations but may reduce severe exacerbations and emergency room visits.
- BT causes more adverse events (such as worsening of asthma symptoms, respiratory infections, and coughing up blood) during the treatment period than standard treatment. Based on the available literature, there is still uncertainty about the balance of benefits and harms, and about which patients are most likely to benefit from the procedure.

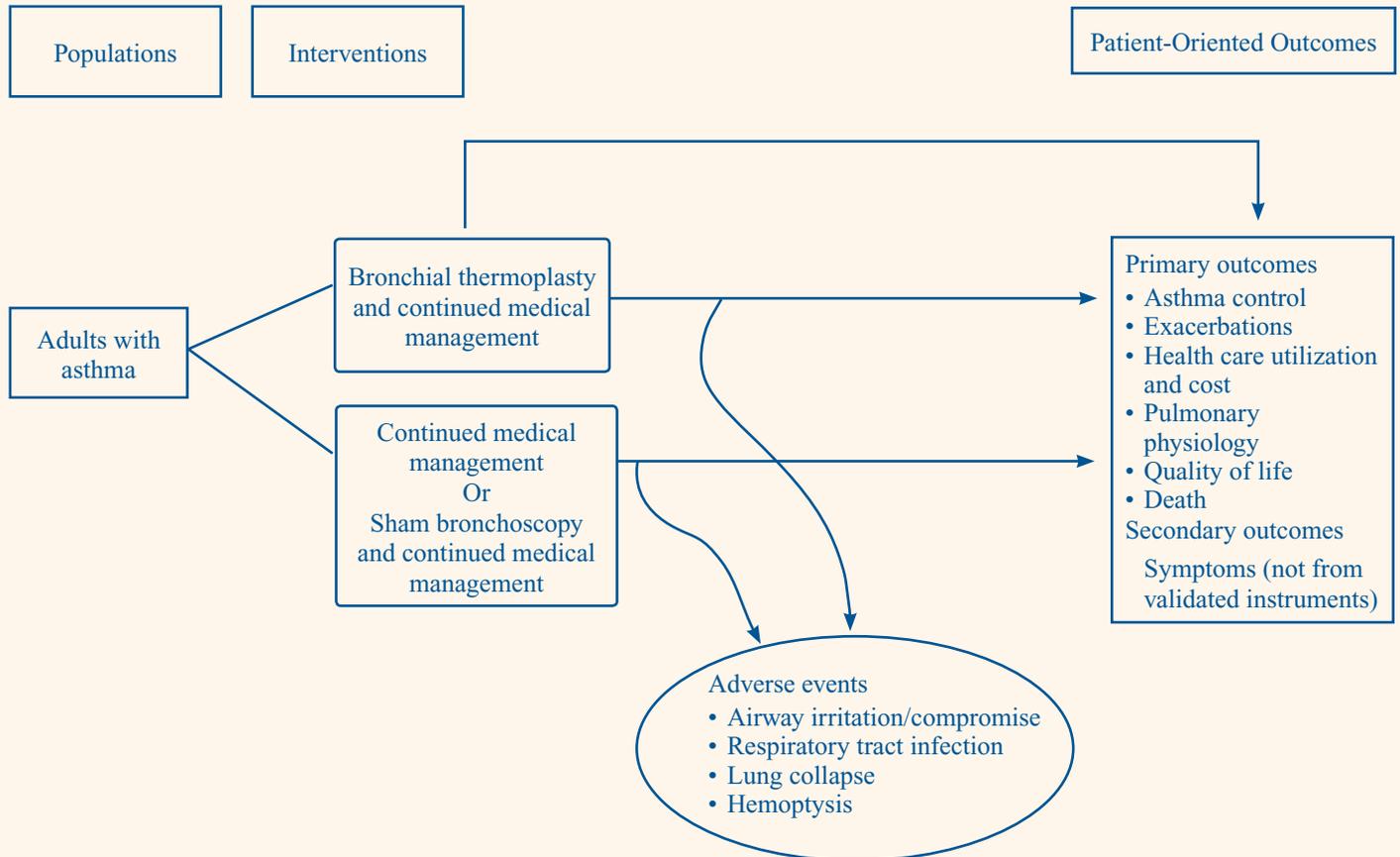


This report’s main objective is to conduct a systematic review of the benefits and harms of BT for the management of asthma in adults. In this review, we address the following Key Question (KQ):

What are the benefits and harms of using BT in addition to standard treatment for the treatment of adult (≥ 18 years) patients with asthma?

Figure A shows the analytic framework for the review.

Figure A. Analytic framework for bronchial thermoplasty in asthma



Data Sources

MEDLINE®, Embase®, PubMed®, CINAHL®, the Cochrane Library, and the gray literature were searched through April 20, 2017. The systematic review protocol is available in the full report.

Results

Fifteen studies, including three randomized controlled trials (RCTs) with 5-year single-arm followup in BT-treated patients (n=432 for the RCTs), examined the impact of BT on patients with severe asthma. The key findings of the review are listed below along with the strength of evidence (SOE).

- Patients treated with BT and standard care (medical management) showed statistically greater improvements in asthma control (as measured by the Asthma Control Questionnaire [ACQ]) and quality of life (as measured by the Asthma Quality of Life Questionnaire [AQLQ]) compared with patients undergoing standard care (medical management) only (SOE: low). However, the clinical importance of the changes is unclear.
- Evidence as to whether patients treated with BT and standard care versus standard care alone experienced different rates of severe exacerbations following treatment was inconclusive (SOE: insufficient). While rates of mild exacerbations improved to a greater

extent in the BT and standard care group than in the standard care only group, the clinical importance of the difference is unclear. (SOE: low).

- Patients treated with BT and standard care used statistically significantly less rescue medication than patients receiving standard care alone, but the clinical importance of the difference is unclear. (SOE: low).
- Patients given BT and standard care compared with patients given the sham bronchoscopic procedure and standard care had no difference in asthma control scores, as measured by ACQ; in hospitalizations for respiratory symptoms; in use of rescue medication; in number of days rescue medications were required; or in pulmonary physiology measures (forced expiratory volume in 1 second [FEV1] and morning peak expiratory flow [PEF]) (SOE for all outcomes: low).
- Patients treated with BT and standard care experienced statistically significantly fewer exacerbations (those requiring systemic corticosteroids or doubling of inhaled corticosteroid dose) compared with those receiving the sham bronchoscopic procedure and standard care after the treatment period was complete (3 procedures over 6 weeks, followed by an additional 6 weeks) through the 12-month followup (post-treatment period), but the clinical importance of this difference was unclear (SOE: low).
- Patients treated with BT and standard care had fewer emergency department (ED) visits compared with those receiving the sham bronchoscopic procedure and standard care during the post-treatment period (SOE: moderate).
- Evidence as to whether patients receiving BT and standard care versus the sham bronchoscopic procedure and standard care had different quality of life (AQLQ) scores was inconclusive (SOE: insufficient). Analysis of results for the intention-to-treat population did not find improvement, but analysis of results for the per-protocol population found a difference that may not be clinically important, as it did not achieve the minimum important difference for this measure. A responder analysis (proportion of patients who achieved the minimum important difference) favored the BT and standard care group, but this outcome was not prespecified.
- Patients treated with BT developed the following common adverse events: bronchial irritation, chest discomfort, cough, discolored sputum, dyspnea, night

awakenings, and wheezing. Serious adverse events occurred more frequently in BT-treated patients than in patients receiving sham treatment and/or standard care during the 12-week treatment period. No deaths were attributed to BT.

Discussion

We identified three primary RCTs (n=432) of BT, as well as their associated followup studies (n=245). Nine observational studies (n=55) also reported outcomes associated with BT. Relatively few randomized studies have examined BT in patients with severe asthma and addressed the question in this review, with only two multicenter RCTs comparing BT with standard care (medical management), and one multicenter RCT comparing BT to a sham bronchoscopy intervention with standard care continued in both groups. Compared with standard care, the evidence from two RCTs suggests that BT improved asthma control (defined by the ACQ change from baseline to 12 months), health care utilization (defined by rescue medication use), and quality of life (low strength of evidence [SOE]). However, the minimally important difference (MID) was not met for these measures, and the clinical relevance of these findings is uncertain. Similarly, rates of mild exacerbations were reduced following BT (low SOE), but concerns about the magnitude of the effect and directness of the findings led us to conclude that the clinical relevance of this finding was uncertain. The evidence base was insufficient to draw conclusions about BT's effects on severe exacerbations, FEV1, and airway hyper-responsiveness compared with standard care.

Compared with sham treatment, the intention-to-treat analysis in a single RCT suggests that BT had no effect on asthma control (defined as improvement in ACQ from baseline), hospitalizations for respiratory symptoms, health care utilization (rescue medication usage), pulmonary physiology measures (FEV1 % predicted and morning PEF [L/min]), or other asthma symptoms outcomes (low SOE). However, reduced risk of severe exacerbations was suggested (low SOE), although the clinical importance of this difference was unclear. BT was associated with fewer ED visits than sham treatment during the post-treatment period (moderate SOE). The evidence was inconclusive regarding quality of life scores following BT or sham (insufficient SOE). Serious adverse events attributed to BT were infrequent, and no deaths were reported.

Clinicians whose patients are potential candidates for BT may want to consider the evidence presented in this review, including the highly selected and heterogeneous study populations, limited improvement in outcomes, and rates of adverse events (including asthma worsening and respiratory tract infections during the treatment period) when determining BT's appropriateness for their patients.

Conclusions

Three RCTs and several descriptive studies meeting our inclusion criteria have evaluated BT. Based on the available literature, BT may be modestly beneficial in some patients with asthma, but is not without risks in any population. The risk of adverse events is higher early in treatment, while benefit is typically observed weeks to months after therapy and can last for at least 5 years, after which the effect is unknown

Reference

1. National Heart, Lung, and Blood Advisory Council Asthma Expert Working Group. Needs Assessment Report for Potential Update of the Expert Panel Report-3 (2007): Guidelines for the Diagnosis and Management of Asthma. 2015.

Full Report

This evidence summary is part of the following document: D'Anci KE, Lynch MP, Leas BF, Apter AJ, Bryant-Stephens T, Kaczmarek JL, Umscheid CA, Schoelles K. Effectiveness and Safety of Bronchial Thermoplasty in Management of Asthma. Comparative Effectiveness Review No. 202. (Prepared by the ECRI Institute–Penn Medicine Evidence-based Practice Center under Contract No. 290-2015-00005-I.) AHRQ Publication No. 18-EHC003-EF. Rockville, MD: Agency for Healthcare Research and Quality; December 2017.
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