EUROPEAN RESPIRATORY JOURNAL
ORIGINAL RESEARCH ARTICLE
N. JENDZJOWSKY ET AL.

Long-term modulation of airway remodelling in severe asthma following bronchial thermoplasty

Nicholas Jendzjowsky[1,2,6], Austin Laing[1,3,6], Michelle Malig[1,3], John Matyas[4], Elaine de Heuvel[1], Curtis Dumonceaux[1], Elaine Dumoulin[5], Alain Tremblay[5], Richard Leigh[1,5], Alex Chee[5,7] and Margaret M. Kelly[1,3,7]

[1]Dept of Physiology and Pharmacology, Cumming School of Medicine, University of Calgary, Calgary, AB, Canada. [2]Division of Respiratory and Critical Care Physiology and Medicine, The Lundquist Institute for Biomedical Innovation at Harbor-UCLA Medical Center, Torrance, CA, USA. [3]Dept of Pathology and Laboratory Medicine, Cumming School of Medicine, University of Calgary, Calgary, AB, Canada. [4]Dept of Comparative Biology and Experimental Medicine, Faculty of Veterinary Medicine, University of Calgary, Calgary, AB, Canada. [5]Dept of Medicine, Cumming School of Medicine, University of Calgary, Calgary, AB, Canada. [6]Authors contributed equally. [7]Authors contributed equally.

Corresponding author: Margaret M. Kelly (mmkelly@ucalgary.ca)

Shareable abstract (@ERSpublications)
This study demonstrates that bronchial thermoplasty reduces smooth muscle and neural innervation of the airway up to 12 months post-therapy, whereas the airway epithelium is relatively resistant to thermal damage https://bit.ly/3wlQOJX

Cite this article as: Jendzjowsky N, Laing A, Malig M, *et al*. Long-term modulation of airway remodelling in severe asthma following bronchial thermoplasty. *Eur Respir J* 2022; 59: 2100622 [DOI: 10.1183/13993003.00622-2021].

This article has supplementary material available from erj.ersjournals.com

This article has an editorial commentary: https://doi.org/10.1183/13993003.02018-2021

Received: 3 March 2021
Accepted: 16 May 2021

Abstract

Rationale Bronchial thermoplasty is a mechanical therapeutic intervention that has been advocated as an effective treatment option for severe asthma. The mechanism is promoted as being related to the attenuation of airway smooth muscle which has been shown to occur in the short-term. However, long-term studies of the effects of bronchial thermoplasty on airway remodelling are few, with only limited assessment of airway remodelling indices.

Objectives To evaluate the effect of bronchial thermoplasty on 1) airway epithelial and smooth muscle cells in culture and 2) airway remodelling in patients with severe asthma who have been prescribed bronchial thermoplasty up to 12 months post-treatment.

Methods The distribution of heat within the airway by bronchial thermoplasty was assessed in a porcine model. Culture of human airway smooth muscle cells and bronchial epithelial cells evaluated the impact of thermal injury. Histological evaluation and morphometric assessment were performed on bronchial biopsies obtained from severe asthma patients at baseline, 6 weeks and 12 months following bronchial thermoplasty.

Results Bronchial thermoplasty resulted in heterogeneous heating of the airway wall. Airway smooth muscle cell cultures sustained thermal injury, whilst bronchial epithelial cells were relatively resistant to heat. Airway smooth muscle and neural bundles were significantly reduced at 6 weeks and 12 months post-treatment. At 6 weeks post-treatment, submucosal collagen was reduced and vessel density increased, with both indices returning to baseline at 12 months. Goblet cell numbers, submucosal gland area and sub-basement membrane thickness were not significantly altered at any time point examined.

Conclusions Bronchial thermoplasty primarily affects airway smooth muscle and nerves with the effects still present at 12 months post-treatment.