

Nasal exhalation of inhaled beclomethasone hydrofluoroalkane-134a to treat chronic rhinosinusitis



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Clinical Implications

- Nasal exhalation of inhaled corticosteroid hydrofluoroalkane-134a-beclomethasone dipropionate may be a simultaneous and effective technique for the management of asthma and concomitant eosinophilic chronic rhinosinusitis.

TO THE EDITOR:

Eosinophilic chronic rhinosinusitis (ECRS) is characterized by refractory chronic rhinosinusitis with eosinophil-enriched nasal polyps.¹ As ECRS and asthma often occur concomitantly,² simple and simultaneous treatments are required for their management. Good inhaler technique is essential to maximize the effects of inhaled corticosteroids (ICSs) for the treatment of asthma; however, less attention is given to particle exhalation. Here, we describe a technique for the nasal exhalation of ICS particles and provide results indicating that this exhalation technique is associated with improved outcomes while controlling upper and lower airway diseases.

We report the case of a 59-year-old woman diagnosed with aspirin-exacerbated respiratory disease at the age of 50 years and with ECRS following a sinus surgery at the age of 53 years. Following her surgery, the patient was asymptomatic until several weeks before her referral visit. In December 2014, a family physician referred her to Mitsubishi Kyoto Hospital because of a persistent dry cough and nasal discharge without symptoms of a preceding respiratory viral infection. She was not sensitized to inhaled allergens and had not complained of seasonal rhinitis. The family physician treated her with 2 puffs of 200 µg of inhaled hydrofluoroalkane-134a-ciclesonide (HFA-CIC) once daily, but not with antileukotrienes or nasal steroids. She did not use a spacer but had used HFA-CIC correctly with good adherence. Plain chest radiography revealed no remarkable findings. Sinus computed tomography (CT) revealed mucosal thickening and opacification of the ethmoid sinuses, olfactory clefts, and maxillary sinuses bilaterally (Figure 1, A). Because she was not willing to use nasal steroids or add antileukotrienes, she was treated with 4 puffs of 100 µg of inhaled HFA-beclomethasone dipropionate (BDP) twice daily using a spacer for exacerbations of asthma and ECRS. Besides instructions for effective inhalation technique, the patient was trained to exhale through the nose. In 1 month, symptoms and signs were markedly alleviated. Cough and nasal discharge had resolved, and the FEV₁ (% predicted) increased from 94% to 101%. Over 3 months, peripheral blood eosinophil counts decreased from 8.6% (470/µL) to 4.9% (268/µL), and fractional exhaled nitric

oxide (FENO; NIOX MINO, Aerocrine Solna, Sweden) levels improved from 84 ppb to 52 ppb. Sinus CT demonstrated marked improvement with a decrease in Lund-Mackay score from 11 points to 7 points (Figure 1, B). When rechecked in 9 months, the FENO level was 39 ppb and peripheral blood eosinophil counts were 2.3% (127/µL).

To show evidence that particles of ICS are present in the nasally exhaled breath, we evaluated the technique in a 35-year-old man with mild asthma and no history of chronic rhinosinusitis. Using a PIV Laser (KATO KOKEN, Kanagawa, Japan), able to detect particles of 1 µm or more, inhaled HFA-BDP particles (average diameter, 1.1 µm) that were exhaled through the nose (Figure 2, A) and mouth (Figure 2, B) after breath-holding were clearly visualized, while no particles were detected in nasally exhaled breath without prior inhalation of HFA-BDP (Figure 2, C).

In this report, we demonstrated the presence of inhaled HFA-BDP particles in the nasally exhaled breath (Figure 2, A). We have previously demonstrated macroscopic flow images of stained small particles during oral inhalation and nasal exhalation.³ However, in that study, we used a saline solution created by an ultrasonic nebulizer and did not use an actual ICS.³ In this respect, the present study provides new and clinically relevant information. Our previous³ and present findings contribute to the understanding of the mechanism underlying the marked improvement in the symptoms and signs of asthma and concomitant ECRS with decreases in blood eosinophil counts and FENO levels observed following inhalation of HFA-BDP with breath-holding and nasal exhalation. Nasally exhaled HFA-BDP particles may have deposited on the nasal mucosa and exerted simultaneous anti-inflammatory effects in the upper and lower airways. Further studies are needed to confirm the deposition of exhaled HFA-BDP particles in the paranasal sinuses using single-photon-emission CT with technetium-99m-labeled HFA-BDP.

The patient had used HFA-CIC correctly and adherently, but the possibility that the marked improvement in sinus CT results was related to the systemic absorption due to the increased dose of ICS and inhalation technique using a spacer cannot be excluded. Nonetheless, we believe that the increase in the systemic absorption of corticosteroid alone is insufficient to explain the marked changes in the sinus CT scan, considering that systemic absorption of inhaled BDP would be estimated to be approximately 1/44th of the systemically administered BDP.⁴

Endoscopic sinus surgery and topical nasal steroid treatment are currently standard therapies for the treatment of ECRS.⁵ However, our patient was not willing to use topical steroids or antileukotrienes. Therefore, we introduced the nasal exhalation technique of HFA-BDP for the treatment of ECRS for this patient with asthma. This therapy could be considered in other patients who refuse to use nasal steroids, have poor technique with nasal steroids, or have trouble paying for medications.

The simple use of nasal exhalation of ICS may have substantial utility in simultaneously controlling upper and lower airway inflammation in a cost-effective manner. Future studies using different inhalation devices are needed to further explore the effects of nasal exhalation technique.

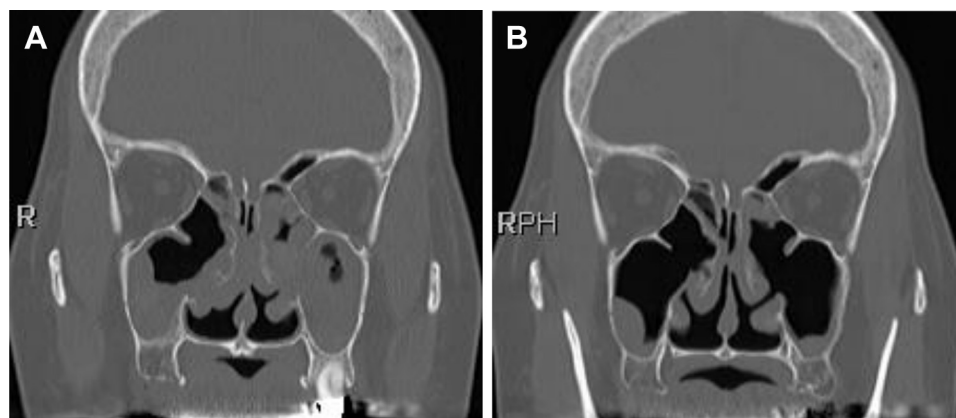


FIGURE 1. Sinus CT images before (A) and after (B) 3-month treatment with inhaled HFA-BDP in a patient instructed to exhale through the nose after inhalation.



FIGURE 2. Visualization of exhaled HFA-BDP particles through the nose (A) and mouth (B) using a PIV Laser. C, Visualization of exhaled particles using a PIV Laser in nasally exhaled breath without prior inhalation of HFA-BDP.

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