



Letter

Effect of a nasal clip on inhaling a sufficient cortico steroid powder dose

We previously described a patient in whom it was difficult to control asthma symptoms because of velopharyngeal dysfunction due to submucous cleft palate.¹ In patients with velopharyngeal dysfunction, inhalation is released through the nasal passage and air is also inhaled via the nose. Therefore, our patient was receiving an insufficient dose of steroid through the prescribed inhaler because the steroid became diluted with air. However, we instructed her to hold her nose when using the inhaler use trainer. She was then able to inhale a sufficient steroid dose and control her asthma symptoms even when using a nongas-type inhaler.

The most common cause of velopharyngeal dysfunction is cleft palate.^{1–4} The symptoms of cleft palate usually affect speech, such as hypernasality,^{2–4} nasal emissions,^{2–4} and poor articulation.^{3,4} In general, physicians and speech therapists evaluate velopharyngeal function by objective analysis based on experience, for example, by performing nasopharyngeal fiberoscopy and/or videofluoroscopy. The subjective methods for diagnosing velopharyngeal dysfunction are listening to patients while analyzing perceptual speech and holding a mirror below the nose while a patient pronounces vowels or syllables such as /sa, shi, su, se, so/. If air escapes from the nasal passage, the mirror fogs up, indicating velopharyngeal insufficiency.

Because velopharyngeal insufficiency is a potential complication occurring after surgery and in the setting of stroke, neurologic disease, and neuromuscular disease, it is necessary to instruct patients on the possibility of its development and monitor them for its signs.¹ It may also be important to evaluate velopharyngeal function not only in patients with cleft palate but also in those with asthma. For these reasons, we compared the actual inspiratory and expiratory flow in healthy volunteers (without velopharyngeal insufficiency) while the nose was held with a nasal clip and without the clip both as an initial approach to assessing velopharyngeal function and to test the hypothesis that inspiratory flow is improved when holding the nose, as suggested by our experience with the previous patient.¹

The study was performed at the National Hospital Organization Tokyo Medical Center and the Department of Speech Therapy of Rinshofukushi College, after approval by the National Hospital Organization Tokyo Medical Center Ethics Committee. Before participating in the study, all volunteers signed written informed consent forms.

Ninety-two adult volunteers (41 men with a mean [SD] age of 32.9 [10.6] years and 51 women with a mean [SD] age of 34.2 [11.2] years) who had never been diagnosed as having a respiratory disease, such as asthma or chronic obstructive pulmonary disease,

velopharyngeal dysfunction (cleft palate, neurologic movement impairment, and so on), or obstructive nasal disease (sinusitis, nasal allergy, and so on) participated in this study.

We measured inspiratory (In-Check Dial, Turbohaler model; Clement Clarke Intl Ltd, Harlow, United Kingdom) (Fig) and expiratory (Mini-Wright Peak Flow Meter ATS Scale; Clement Clarke) flow with and without a nasal clip to allow comparisons of the differences. Measurements of flow using each of the following procedures were obtained for each volunteer in random order: (1) use the inspiratory flow meter without a nasal clip, (2) use the inspiratory flow meter device with a nasal clip, (3) use the peak flow meter without a nasal clip, and (4) use the peak flow meter with a nasal clip. Three measurements were obtained for each of the 4 procedures in each individual, and the



Figure. The inspiratory flow meter device (In-Check Dial, Turbohaler model).

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highest flow results for each procedure were used in the final analyses.

The results were analyzed statistically with the paired *t* test, followed by the normality test and F test, using Microsoft Excel 2007 (Microsoft, Redmond, Washington). In the 92 volunteers, the mean (SD) inspiratory flow rate was 72.1 (13.5) L/min without the nasal clip and 75.0 (13.3) L/min with the nasal clip. A significant increase ($P < .001$) was therefore seen with the nasal clip. Meanwhile, the mean (SD) expiratory flow rate was 440.3 (143.7) L/min without and 439.7 (142.0) L/min with the nasal clip, which did not represent a significant difference ($P = .86$).

Our results supported the use of the traditional spirometry procedure to determine respiratory function.⁵ According to another report that compared results in the presence or absence of a nasal clip during spirometry, the clip does not systematically affect the results obtained or within-subject repeatability, and marked individual differences highlight the importance of maintaining consistency in the method adopted for a specific patient.⁶ Vaswani et al⁷ reported that a nasal clip had no significant impact on peak flow measurement, as in our results.

On the other hand, in this study in healthy volunteers without velopharyngeal insufficiency, the inspiratory flow rate increased significantly when they wore the nasal clip. This result supported our previous finding that it is preferable to hold the nose when inhaling steroids orally¹ to ensure stable inhalation of a sufficient dose. Therefore, particularly in patients with asthma and abnormal velopharyngeal function, holding the nose might allow more effective delivery of medication to the lower airway, thereby requiring a lower inhaled steroid dose and decreasing the risk of steroid adverse effects even if the clinical response is the same.

The present study was limited because it did not include physiologic data from healthy children and velopharyngeally impaired patients. We are now planning to measure inspiratory and expiratory flow rates in healthy children without velopharyngeal insufficiency and patients with velopharyngeal insufficiency caused by cleft palate or cerebrovascular accident in the same manner.

The results suggest that it is more effective to hold the nose when patients inhale nongas steroids orally, even in those without velopharyngeal dysfunction. On the other hand, it is not necessary

for those without velopharyngeal dysfunction to hold the nose during oral exhalation.

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References

- [1] Tsunoda K, Sasaki T, Tsunoda A, Kobayashi R, Ueha R, Shoji S. Undiagnosed submucous cleft palate interfering with inhalation therapy and a solution. *J Allergy Clin Immunol*. 2013;131:619–621.
- [2] McWilliams BJ. Submucous clefts of the palate: how likely are they to be symptomatic? *Cleft Palate Craniofac J*. 1991;28:247–279.
- [3] DeWeese DD, Saunders WH, Schuller DE, et al. *Otolaryngology—Head and Neck Surgery*. 7th ed. St Louis, MO: Mosby; 1988.
- [4] Lass NJ, McReynolds LV, Northern JL, Yoder DE. *Handbook of Speech—Language Pathology and Audiology*. Hamilton, Ontario, Canada: BC Decker Inc; 1988.
- [5] Miller MR, Hankinson J, Brusasco V, et al; ATS/ERS Task Force. Standardisation of spirometry. *Eur Respir J*. 2005;26:319–338.
- [6] Newall C, McCauley TM, Shakespeare J, Cooper BG. Is it necessary to use a noseclip in the performance of spirometry using a wedge bellows device? *Chron Respir Dis*. 2007;4:53–57.
- [7] Vaswani R, Moy R, Vaswani SK. Evaluation of factors affecting peak expiratory flow in healthy adults: is it necessary to stand up? *J Asthma*. 2005;42:793–794.