Correlations of forced oscillometric bronchodilator response with airway inflammation and disease duration in asthma

Naoko Higaki [1], Hiroshi Iwamoto [1]*, Kakuhiro Yamaguchi [1], Shinjiro Sakamoto [1], Yasushi Horimasu [1], Takeshi Masuda [1], Shintaro Miyamoto [1], Taku Nakashima [1], Shinichiro Ohshimo [2], Kazunori Fujitaka [1], Hironobu Hamada [3], Noboru Hattori [1]

[1] Department of Molecular and Internal Medicine, Graduate School of Biomedical and Health Sciences, Hiroshima University, Hiroshima, Japan

[2] Department of Emergency and Critical Care Medicine, Graduate School of Biomedical and Health Sciences, Hiroshima University, Hiroshima, Japan

[3] Department of Physical Analysis and Therapeutic Sciences, Graduate School of Biomedical and Health Sciences, Hiroshima University, Hiroshima, Japan

***Corresponding author**:

Hiroshi Iwamoto, Department of Molecular and Internal Medicine, Graduate School of Biomedical and Health Sciences, Hiroshima University

1-2-3 Kasumi, Minami-ku, Hiroshima, 734-8551, Japan

E-mail address: iwamotohiroshig@gmail.com

Phone: +81-82-257-5196 Fax: +81-82-255-7360

Abstract

Introduction: Airway resistance and reactance, measured by forced oscillometry, are used to measure airway obstruction in patients with asthma.

Objectives: This study aimed to investigate oscillometric bronchodilator responses in treated and untreated asthma and evaluate its association with airway inflammation and disease duration.

Methods: This study included 30 non-smoking patients with mild to moderate treated asthma, 25 patients with newly diagnosed untreated asthma, and 29 control subjects. Spirometric and oscillometric measurements were performed before and after inhalation of 400 µg salbutamol. Disease duration was defined as the number of years since asthma diagnosis.

Results: At airway resistance of 5 Hz (R5) and 20 Hz (R20), bronchodilator responses in patients with untreated and treated asthma were greater than those in control subjects. In patients with untreated asthma, higher fractional exhaled nitric oxide concentration (FeNO) levels were strongly correlated with greater reversibility of R20 (r_s=-0.621, $p<0.001$). In patients with treated asthma, there was no significant association between FeNO and oscillometric reversibility, whereas longer disease duration was significantly associated with lesser bronchodilator response at R20 (r_s=0.441, $p<0.05$). Treated asthma patients with longer disease duration (≥10 years) showed significantly higher post-bronchodilator R5 and R20 than treated asthma patients with shorter disease duration (<10 years).

Conclusion: The present study provides further evidence of an association between airway inflammation and variable airway obstruction in asthma patients and indicates that long-term disease duration could be related to poorly reversible airway resistance in patients with mild to moderate asthma.