5-1-2017

A Novel Method of Measuring Fractional Exhaled Nitric Oxide in Tracheostomized Ventilator-Dependent Children.

Vydehi R. Murthy
Children's Mercy Hospital

Hugo Escobar
Children's Mercy Hospital

Michael Norberg
Children's Mercy Hospital

Charisse I. Lachica
Children's Mercy Hospital

Linda L. Gratny
Children's Mercy Hospital

See next page for additional authors

Recommended Citation

Murthy VR, Escobar H, Norberg M, et al. A Novel Method of Measuring Fractional Exhaled Nitric Oxide in Tracheostomized Ventilator-Dependent Children. Respir Care. 2017;62(5):595-601. doi:10.4187/respcare.04858

RESPIRATORY CARE

Research Article | Original Research

A Novel Method of Measuring Fractional Exhaled Nitric Oxide in Tracheostomized Ventilator-Dependent Children

Vydehi R Murthy, Hugo Escobar, Mike Norberg, Charisse I Lachica, Linda L Gratny, Ashley K Sherman, William E Truog and Winston M Manimtim

Respiratory Care May 2017, 62 (5) 595-601; DOI: https://doi.org/10.4187/respcare.04858

Article | Figures & Data | References | Info & Metrics

PDF

A Novel Method of Measuring Fractional Exhaled Nitric Oxide in Tracheostomized Ventilator-Dependent Children

Vydehi R Murthy MD, Hugo Escobar MD, Mike Norberg MDiv, Charisse I Lachica MD, Linda L Gratny MD, Ashley K Sherman MA, William E Truog MD, and Winston M Manimtim MD

BACKGROUND: The lower airway concentration of fractional exhaled nitric oxide (F_{ENO}) is unknown in children with chronic lung disease of infancy who have tracheostomy for long-term mechanical ventilation. We aimed to evaluate an online method of measuring F_{ENO} in a cohort of ventilator-dependent children with a tracheostomy and to explore the relationship between the peak F_{ENO} concentration (F_{ENO} peak) and the degree of respiratory support using the respiratory severity score. **METHODS:** We conducted a prospective cross-sectional study in 31 subjects who were receiving long-term respiratory support through a tracheostomy. We measured the F_{ENO} peak and F_{ENO} plateau concentration from the tip of the tracheostomy tube using a nitric oxide analyzer in subjects during a quiet state while being mechanically ventilated. We obtained 2 consecutive 2-min duration measurements from each subject. The F_{ENO} peak, exhaled NO output (equal to the F_{ENO} peak minute ventilation), and pulmonary NO excretion (exhaled NO output/weight) were calculated and correlated with the respiratory severity score. **RESULTS:** The median F_{ENO} peak was 2.69 ppb, and the median F_{ENO} plateau was 1.57 ppb. The coefficients of repeatability between the 2 consecutive measurements for F_{ENO} peak and F_{ENO} plateau were 0.74 and 0.59, respectively. The intraclass coefficient between subjects within the cohort was 0.988 (95% CI 0.975–0.994, $P < .001$) for F_{ENO} peak and 0.991 (95% CI 0.982–0.996, $P < .001$) for F_{ENO} plateau. We found that the F_{ENO} peak was directly correlated with minute ventilation, but we did not find a direct relationship between the F_{ENO} peak concentration, exhaled NO output, or pulmonary NO excretion and respiratory severity score. **CONCLUSIONS:** F_{ENO} peak and plateau concentration can be measured online easily with a high degree of reliability and repeatability in infants and young children with a tracheostomy. F_{ENO} peak concentration from the lower airway is low and influenced by minute ventilation in children receiving mechanical ventilation. *Key words: tracheostomy; fractional exhaled nitric oxide; chronic lung disease of infancy.* [Respir Care 2017;62(5):595–601. © 2017 Daedalus Enterprises]

Introduction

Fractional exhaled nitric oxide (F_{ENO}) has been studied in many pulmonary diseases, including asthma, COPD, cystic fibrosis, primary ciliary dyskinesia, and pulmonary arterial hypertension.[1,2] In patients with asthma, F_{ENO} is now used as a biomarker of eosinophilic airway inflammation to diagnose, to monitor response and adherence to anti-inflammatory medications, and to predict upcoming exacerbations.[3] Studies measuring F_{ENO} in infants with respiratory distress syndrome, bronchopulmonary dysplasia (BPD), and chronic lung disease of infancy have yielded conflicting results.[4-8] The reasons for the variations in F_{ENO} include differences in patient population, timing of measurement in relation to the disease process and inhaled medication administration, use of different interface techniques, and other measuring conditions such as tidal breathing parameters and variable exhalation flow. In 2005, the

The authors are affiliated with the Children's Mercy Hospitals and Clinics, University of Missouri-Kansas City School of Medicine, Kansas City, Missouri.

Supplementary material related to this paper is available at http://www.rcjournal.com.

DOI: 10.4187/respcare.04858

This work was supported by the Children's Mercy Center for Infant Pulmonary Disorders and a Children's Mercy Fellowship Research grant. The authors have disclosed no conflicts of interest.

Correspondence: Winston M Manimtim MD, Children's Mercy Hospitals and Clinics, University of Missouri-Kansas City School of Medicine, 2401 Gillham Road, Kansas City, MO 64108. E-mail: wmanimtim@cmh.edu.

QUICK LOOK

Current knowledge

In patients with asthma, Fractional exhaled nitric oxide (F_{ENO}) is used as a biomarker of eosinophilic airway inflammation to diagnose, to monitor response and ad-

Previous Next

Back to top

In this issue

Respiratory Care

Vol. 62, Issue 5

1 May 2017

Keywords

tracheostomy, fractional exhaled nitric oxide, chronic lung disease of infancy

More

Contact Us

RSS

Print ISSN: 0020-1324 Online ISSN: 1943-3654