

## ASSESSMENT OF AIRWAY REVERSIBILITY IN ASTHMATIC CHILDREN USING FORCED OSCILLATION TECHNIQUE - A SINGLE-CENTER EXPERIENCE FROM NORTH INDIA

Lung India. May-Jun 2021;38(3):229-235.doi: 10.4103/lungindia.lungindia\_354\_20

**Background:** Lung function testing is recommended for the management of asthma. Due to imitations of conventional spirometry in pediatric patients, forced oscillation technique (FOT) has been studied with promising results. In this study, airway reversibility was assessed after inhaled salbutamol in asymptomatic children with suspected asthma using impulse oscillometry (IO) in a pediatric asthma clinic of a tertiary care referral hospital in North India.

**Design:** Prospective interventional study over 1-year period.

**Subjects and methods:** Asymptomatic children between 2 and 18 years of age, with history of episodic cough and/or breathing difficulty with one of the following:  $\geq 3$  episodes in previous 12 months or Symptoms more at night or early morning or Symptomatic relief with bronchodilator use were included. Those who received recent bronchodilators, had uncontrolled symptoms or were not able to perform the FOT were excluded. Baseline and postbronchodilator pulmonary functions were assessed using FOT. Airway resistance and reactance were monitored at various frequencies. R5 and R19 depicted resistance at total and large airways, respectively, whereas smaller airways resistance was calculated by their difference (R5–R19). Reactance was measured at 5 Hz (X5). Fres, point at which X5 value is zero, was monitored for all the attempts.

## ACADEMIC P.E.A.R.L.S

Pediatric Evidence And Research Learning Snippet



*The newer evolution in pediatric lung function measurement: Impulse Oscillometry using Forced Oscillation Technique*

**Results:** Among the 345 enrolled children, baseline mean  $\pm$  standard deviation total airway resistance (R5), central airway resistance (R19), peripheral airway resistance (R5-R19), reactance (X5), and resonant frequency (Fres) were  $6.85 \pm 2.60$ ,  $5.23 \pm 1.93$ ,  $1.6 \pm 1.16$ , and  $-2.54 \pm 1.36$  cmH<sub>2</sub>O/L/s and  $17.28 \pm 3.06$  Hz. The median (interquartile range) percentage change after inhaled salbutamol was 19.9 (11.40, 29.12), 22.86 (6.88, 38.76), 14.08 (3.40, 22.62), 39.20 (8.20, 62.39), and 15.79 (8.33, 27.27) in respective parameters. All changes were statistically significant. The airway resistance at all frequencies was maximum in preschool children. Reactance became less negative with reduction of resonant frequency as the age advanced. The studied respiratory variables were in maximum negative correlation with height, followed by body mass index.

**Conclusions:** FOT is a simple technique for monitoring lung functions in children during asthma management.

**Similar evidence:** Komarov H et al<sup>2</sup> have similarly studied the utility of Impulse Oscillometry against the conventional spirometry and found it to be comparable to spirometry in measurement of lung function in asthmatic children. Zing J<sup>3</sup> in their study on asthma control in preschool children also showed that the asthma control is superior when treatment is monitored and titrated by IOT and FeNO.

### EXPERT COMMENT

**“The newer evolution in pediatric lung function measurement: Impulse Oscillometry using Forced Oscillation Technique has found its utility in the measurement of lung function where spirometry becomes difficult and not feasible. Smaller children especially 2-5 years old, those on ventilators and in the COVID pandemic the impulse oscillometry technique is more convenient, reliable and less aerosol generating. This technique requires lesser time, lesser cooperation and hence the lung functions of asthmatic children which have been hitherto not monitored regularly, now can be monitored and treatment titrated effectively for better outcomes by early and objective recognition of small airway dysfunction.”**

**Dr Soundarya M**

Pediatric Allergist & Associate Professor, Department of Pediatrics  
Kasturba Medical College, Mangalore  
Manipal Academy of Higher Education, Manipal

With warm regards,

**DR MANINDER S  
DHALIWAL**

**DR. PIYUSH GUPTA**  
IAP NATIONAL  
PRESIDENT 2021

**DR REMESH KUMAR R.**  
IAP PRESIDENT  
2022

**DR BAKUL JAYANT  
PAREKH**  
IAP PRESIDENT  
2020

**DR G.V.  
BASAVARAJA**  
HON. SECRETARY  
GEN. 2021 - 22

Editor – Academic Pearls  
pedpearls@gmail.com

### Reference

- Gupta N, Sachdev A, Gupta D, Gupta S. Assessment of airway reversibility in asthmatic children using forced oscillation technique - A single-center experience from North India. Lung India. 2021 May-Jun;38(3):229-235. doi: 10.4103/lungindia.lungindia\_354\_20. PMID: 33942746; PMCID: PMC8194442.
- Komarow HD, Skinner J, Young M, Gaskins D, Nelson C, Gergen PJ, Metcalfe DD. A study of the use of impulse oscillometry in the evaluation of children with asthma: analysis of lung parameters, order effect, and utility compared with spirometry. Pediatr Pulmonol. 2012 Jan;47(1):18-26. doi: 10.1002/ppul.21507. Epub 2011 Aug 24. PMID: 22170806; PMCID: PMC3423092.
- Zeng J, Chen Z, Hu Y, Hu Q, Zhong S, Liao W. Asthma control in preschool children with small airway function as measured by IOS and fractional exhaled nitric oxide. Respir Med. 2018 Dec;145:8-13. doi: 10.1016/j.rmed.2018.10.009. Epub 2018 Oct 16. PMID: 30509720.