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No difference between measured and calculated $F_ENO_{0.05}$ with a clinical software for extended NO analysis

Researchers

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Conclusion

The clinical software with the HMA to calculate NO parameters could accurately generate $F_ENO_{0.05}$. The flow rates to use for the non-linear model for the NO parameters are 20, 100 and 350 mL/s. Therefore patients need only to perform at three flow rates which make the extended NO analysis less burdensome.

Background

The extended NO analysis, with the calculations of alveolar NO (C_ANO), airway wall NO ($C_{aw}NO$), diffusion rate of NO ($D_{aw}NO$), gives more information of the respiratory system than a single value. It requires one exhalation at low flow which is difficult in children.

The aim was to identify the lowest flow to be used for the extended NO analysis, non-linear method (Högman & Meriläinen algorithm, HMA)[1]. In addition, a clinical software using the HMA having been incorporated in the CLD 88sp NO analyser (ECO Medics AG, Switzerland) was tested with this lowest optimal flow rate.

Material & Methods

Healthy subjects, smokers and atopic subjects with an age of 18-65 years participated. Their NO measurements and NO parameters are shown in Table 1.

Project 1.The lower flow rates of 10, 20 and 30 mL/s in addition to 100 and 350 mL/s were tested in 20 subjects. The research mode of the NO analyser was used. The HMA was applied to calculate the NO parameters and separate calculations were done for 10, 20 and 30 mL/s . $F_ENO_{0.05}$ was calculated from the NO parameters.

Project 2. Subjects (n=32) volunteered to exhaled at 20, 100 and 350 mL/s in addition to 50 mL/s with the use of the clinical software in the NO analyser. $F_ENO_{0.05}$ was calculated from the NO parameters.

Table 1. Measured $F_ENO_{0.05}$ and calculated NO parameters in the two projects.

	$F_ENO_{0.05}$ ppb	C_ANO ppb	$C_{aw}NO$ ppb	$D_{aw}NO$ nL/s	$J_{aw}NO$ nL/min
Project 1 (n=20)	13.6 (10.1-18.3)	0.8 (0.5-1.1)	49 (34-71)	16 (13-21)	797 (561-1132)
Project 2 (n=32)	11.7 (9.6-14.3)	0.8 (0.6-1.0)	45 (33-62)	14 (10-19)	674 (527-864)

Geometrical mean ($CI_{95\%}$), C_ANO in mean ($CI_{95\%}$)

Abbreviations as agreed on in *George et al. JAP 2004*[2]:
$F_ENO_{0.05}$ = NO at the flow rate of 50 mL/s
C_ANO = NO in the alveolar gas (ppb)
$C_{aw}NO$ = NO in the airway tissue (ppb)
$D_{aw}NO$ = diffusion rate of NO (mL/s)

Results

Project 1. A significant difference was found when applying different flow rates in the calculations of $D_{aw}NO$ and $J_{aw}NO$ (p=0.01 resp. 0.02). Bland-Altman analysis comparing measured vs. calculated $F_ENO_{0.05}$ showed a standard deviation of 2.7 ppb for 30 mL/s compared to 1.9 ppb for 10 and 20 mL/s. It was concluded that 20 mL/s could be used instead of 10 mL/s in the calculations of the NO parameters.

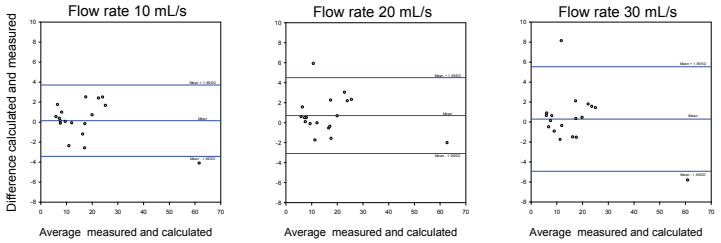

Figure 1. Bland-Altman analysis of the measured $F_ENO_{0.05}$ and the calculated $F_ENO_{0.05}$ values retrieved from the NO parameters calculated with different lower flow rates.

Project 2. With the use of the clinical software, there was no statistical difference between the measured and calculated $F_ENO_{0.05}$.

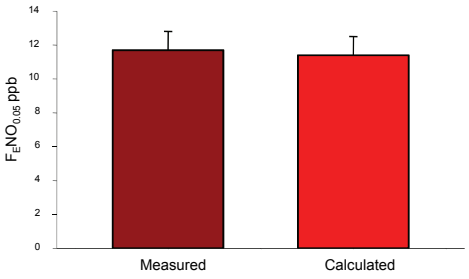

Figure 2. Measured $F_ENO_{0.05}$ and the calculated $F_ENO_{0.05}$ values retrieved from the NO parameters calculated with flow rates of 20, 100 and 350 mL/s.

References

1. Högman *et al*. Respiratory Medicine 2002; 96: 24-30
2. George *et al*. Journal of Applied Physiology 2004; 96: 831-839

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