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THE ROLE OF FRACTIONAL EXHALED NITRIC OXIDE IN THE ASSESSMENT OF ATHLETES REPORTING EXERTIONAL DYSPNOEA

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Background: Exercise-induced bronchoconstriction (EIB) is a common cause of breathing difficulty in athletes. Fractional exhaled nitric oxide (FeNO) is an indirect marker of airway inflammation, recommended for the assessment and management of asthma; however, the role of FeNO in detecting and monitoring EIB has yet to be fully established. The aim of this study was therefore to evaluate the predictive value of FeNO to confirm or refute EIB in athletes presenting with exertional dyspnoea.

Method: Seventy athletes (male: $n = 45$) (age: 35 ± 11 years) reporting respiratory symptoms (i.e. wheeze, cough and dyspnoea) during exercise attended the laboratory on a single occasion. All athletes performed resting FeNO and spirometry pre-and-post a eucapnic voluntary hyperpnoea challenge (EVH) in accordance with international guidelines. Sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV) were calculated for established FeNO thresholds: (intermediate [≥ 25 ppb] and high [> 50 ppb]) and evaluated against objective evidence of EIB: (EVH diagnostic cut-off [$-10\% \Delta FEV_1$ at two consecutive time-points] and [$-15\% \Delta FEV_1$ at one time-point]). The diagnostic accuracy of FeNO was calculated using receiver operating characteristics area under the curve (ROC-AUC).

Results: All had normal resting lung function ($> 80\% FEV_1$ pred). The prevalence of EIB was 33% ($-10\% \Delta FEV_1$) and 23% ($-15\% \Delta FEV_1$) (median (IQR) $\Delta FEV_1 = -7\%$ (10.02)). FeNO values ≥ 25 ppb and > 50 ppb were observed in 49% and 23% of the cohort, respectively. ROC-AUC for FeNO was 75% ($-10\% \Delta FEV_1$) and 86% ($-15\% \Delta FEV_1$). Sensitivity, specificity, PPV and NPV are presented in Table 1.

Conclusion: Our findings indicate that FeNO > 50 ppb provides good specificity for a positive EVH test; however, should not replace indirect bronchoprovocation for diagnostic purposes. The high proportion of athletes reporting breathing difficulty in the absence of EIB highlights the requirement to consider alternative causes of exertional dyspnoea during clinical work-up.

Table 1. FeNO sensitivity, specificity, PPV and NPV for the detection of EIB.

		-10% Δ FEV ₁		-15% Δ FEV ₁		
		+	-	+	-	
FeNO (25ppb)	+	16	18	+	13	21
	-	7	29	-	3	33
FeNO (50ppb)	+	11	5	+	11	5
	-	12	42	-	5	49

FeNO					
		-10% Δ FEV ₁		-15% Δ FEV ₁	
		25ppb	50ppb	25ppb	50ppb
Sensitivity (%)		70	48	81	69
Specificity (%)		62	89	61	91
PPV (%)		47	69	38	69
NPV (%)		81	78	92	91

EVH	-10% Δ FEV ₁		-15% Δ FEV ₁	
FeNO	25ppb	50ppb	25ppb	50ppb
Sensitivity (%)	70	48	81	69
Specificity (%)	62	89	61	91
PPV (%)	47	69	38	69
NPV (%)	81	78	92	91