



Correspondence

Exercise-induced dyspnea: more than vocal cord dysfunction or laryngomalacia

The report by Tiles et al¹ describes identification of 83 children and adolescents with exercise-induced vocal cord dysfunction (EIVCD) and 60 with exercise-induced laryngomalacia (EIL). Unfortunately, the authors do not indicate how many children were examined using the free-running protocol described to find 143 children with those disorders. However, the number of patients they describe with those disorders is inconsistent with physiologic abnormalities associated with exercise-induced dyspnea that we previously reported.²

With the use of exercise on a treadmill sufficient to reproduce their symptoms while monitoring cardiac and respiratory physiology and measuring blood pH and Pco₂ at the end of exercise, the physiologic findings identified among 117 sequentially examined patients with the same mean age as those in the report by Tiles et al included several different diagnoses. These diagnoses included exercise-induced bronchospasm (forced expiratory volume in 1 second decreased by $\geq 15\%$) in 11 patients, EIVCD in 13 patients, EIL in 2 patients, restrictive physiology demonstrated during exercise (maximal minute ventilation reached by submaximal tidal volume during high respiratory rate, ie, $>50/\text{min}$) in 15 patients, exercise-induced supraventricular tachycardia in 1 patient, and primary hyperventilation occurring early in exercise in 1 patient. The most common diagnosis, present in 74 patients, was severe exertional dyspnea and chest discomfort from lactic acidosis, a normal cause of physiologic limitation. Most of those conditions had been misdiagnosed as exercise-induced asthma or vocal cord dysfunction.

Visualization of flow-volume loops during the actual exercise enabled us to see direct evidence of upper airway obstruction rather than depending only on increased inspiratory noise, which we found to be frequently deceiving. Demonstration of the flow-volume loop and a video of EIVCD can be seen in figure 5 of our article describing the various causes of dyspnea.³ Another source to view flow-volume loops of upper airway obstruction and videos of vocal cord dysfunction is in slides 28 to 39 of an online presentation.⁴

Visualizing the larynx as done by Tiles and colleagues without demonstrating that the observations were actually causing upper airway obstruction may be misleading. Because exercise-induced

dyspnea from EIL causing upper airway obstruction can be effectively cured by laser laryngoplasty, demonstration of actual upper airway obstruction is essential before subjecting the patient to a surgical procedure. "Paradoxical inward motion of the ... arytenoids" may be present without the actual invagination of the arytenoids into the airway with associated obstruction in inspiratory air flow. Similarly, a degree of paradoxical vocal cord movement without demonstrable decrease in inspiratory flow may not be the explanation for exercise-induced dyspnea.

Because effective treatment of EIVCD and EIL is different, patients are not well served by implying they are "the same syndrome" when in fact they are different anatomically and physiologically.^{5,6} Reproducing the symptoms of the patient's exercise-induced dyspnea while monitoring cardiac and respiratory physiology effectively identifies the various causes of exercise-induced dyspnea and thereby provides the best information for precise diagnosis, treatment, and patient counseling.

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