

What to Do When the Inhaler Fails: Revisiting the Diagnosis

2LT Alexandra A. Shams, MSC USA*; COL Jeffrey C. Leggit, MD, MC USA†

ABSTRACT Paradoxical vocal fold movement is important to consider in the differential for dyspnea on exertion or shortness of breath. It is often confused with asthma and remains undiagnosed because of a paucity of pathognomonic examination and imaging findings. This case serves as a reminder of the specific clinical picture, diagnosis, and treatment of paradoxical vocal fold movement. It also highlights the broader importance of continuity of care and the clinician's ability to revisit the differential diagnosis if an initial workup is unrevealing or the patient is not responding to treatment.

CASE

A 24-year-old Caucasian male Army 2nd Lieutenant presented to his primary care manager after experiencing shortness of breath during a timed run for an Army Physical Fitness Test, which prevented him from passing the test. The patient by his own admission was not physically fit and never ran regularly before entering the military. His limited previous aerobic activity had never resulted in dyspnea on exertion or shortness of breath and he had never suffered from any known respiratory disease. He was able to pass all components of his Army Physical Fitness Test during his Officer Basic Course.

The patient's medical history was significant for depression, generalized anxiety disorder, and seasonal allergic rhinitis. His current medications included sertraline and loratadine. The patient had no surgical history and did not use tobacco. The physical examination was unremarkable with a body mass index of 26. A trial of albuterol inhaler before aerobic activity failed to relieve his symptoms. Another provider had given him a 1-month trial of omeprazole which also failed to relieve his exertional symptoms. Subsequent workup included normal pulmonary function tests (PFTs) with a negative methacholine challenge followed by a normal chest X-ray and echocardiogram. After the patient's negative initial workup, he underwent direct laryngoscopy. Laryngoscopy showed no signs of edema, irritation, or inflammation, but did reveal bilateral vocal cord adduction during inspiration while undergoing an exercise challenge. This established the diagnosis of paradoxical vocal fold movement (PVFM). He was referred to speech therapy for treatment. Using the techniques taught in speech therapy, the patient has since been able to control his symptoms enough to pass all components of his physical fitness test.

DISCUSSION

PVFM is known by many names including vocal cord dysfunction, Munchausen's stridor, episodic paroxysmal laryngospasm,

and psychogenic stridor.^{1,2} It occurs most commonly in young women and is characterized by episodic, paradoxical adduction of the bilateral true vocal cords during inspiration.¹ This is distinct from normal physiology, in which true vocal cords are fully abducted during midinspiration to allow air to flow through the larynx and into the lung. Intermittent inspiratory vocal cord adduction can cause a variety of upper respiratory symptoms including shortness of breath, wheezing, stridor, and cough. Patients can present with any combination of these symptoms triggered by a variety of stimuli.³ These are nonspecific symptoms, so PVFM can easily be mistaken for asthma and many patients are diagnosed with PVFM only after failure of an asthma treatment regimen.⁴

The cause of PVFM remains unknown but is associated with behavioral health disorders and medical conditions such as asthma, gastroesophageal reflux, and allergic rhinitis and can be triggered by exercise and airborne irritants.^{3,4} All of these conditions can coexist with PVFM, especially asthma. A recent referral center case series identified PVFM via video laryngoscopy in 117 of 170 (68.8%) patients consulted specifically to evaluate for PVFM. The referral population was 77.6% female. A total of 51 of the 117 (43.6%) found to have PVFM also had confirmed asthma.⁴ The authors also noted that there is a large subset of PVFM patients for whom conversion disorder is either the cause or a contributing factor to their PVFM. This study suggests categorizing PVFM by primary and secondary causes, in which primary PVFM results from a behavioral health disorder and secondary PVFM results from laryngeal hyperreactivity disorders (e.g., asthma, gastroesophageal reflux disease) or neurologic disorders (e.g., autonomic dysfunction, multiple sclerosis).⁴ Thus, the etiology of PVFM must be considered multifactorial and the management plan must address all comorbid conditions and contributing factors. The patient in this case highlights this fact. He had a history of both a psychological diagnosis and allergic rhinitis and his symptoms were consistent with PVFM induced by exercise.³

Diagnosing PVFM can be challenging because the symptom of shortness of breath creates a broad differential involving both pulmonary and cardiovascular systems. A clue to the diagnosis on physical examination for the patient with active symptoms is to listen to the trachea as well as the lung fields

*F. Edward Hébert School of Medicine, Uniformed Services University of the Health Sciences, 4301 Jones Bridge Road, Bethesda, MD 20814.

†Department of Family Medicine, Uniformed Services University of the Health Sciences, 4301 Jones Bridge Road, Bethesda, MD 20814.

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to discern the origin of the abnormal sounds. Wheezing from asthma or exercise-induced bronchoconstriction is heard over the lungs preferentially and not in the trachea, while the disruption in air flow from PVFM is heard most prominently over the trachea.⁵ PFTs are usually normal unless the patient is having an episode of PVFM during the visit. If PFTs are performed while the patient is symptomatic, there may be a flattened inspiratory loop, but this finding is not sensitive or specific for diagnosis.² In addition, the patient's PVFM will not respond to β -agonists because the pathophysiology of the disorder does not include airways that dilate under sympathetic activation. Endoscopic visualization of the paradoxical vocal fold motion during the symptomatic period (usually manifested as wheezing, stridor, or shortness of breath) is the only way to definitively diagnose PVFM.⁴ Often times a provocation, such as exertional stress or noxious stimuli, must be employed to induce an episode.³

Unlike other obstructive airway disorders with similar symptoms, the treatment of PVFM is largely nonpharmacologic. The mainstay of treatment involves a referral to speech/language therapy as was pursued in this case.⁴ Through speech therapy, patients can learn methods for both controlling acute attack of PVFM and for chronic management. Treatments learned include breathing/relaxation techniques, behavior therapy that teaches cognitive control over breathing and stress reduction.⁴ Breathing techniques such as sniffing through one's nose, panting, and blowing through pursed lips, can force the vocal cords to abduct during inspiration and may help abate acute episodes. Not all of these breathing techniques may work for each patient, so they must be tried during direct laryngoscopy to confirm which tech-

niques abduct the cords.⁴ Heliox (an inhaled mixture of helium and oxygen) has been used in the acute setting to improve symptoms of PVFM. It increases oxygen delivery through the vocal folds and into the lungs relieving the patient's feeling of dyspnea and allowing the vocal folds to relax and abduct.² Patients with comorbid conditions should have their medication regimens optimized as well when managing PVFM.

CONCLUSION

Paroxysmal vocal fold movement is important to consider in the differential for dyspnea on exertion or shortness of breath. PVFM requires a high clinical suspicion, good continuity of care, and close follow-up to diagnose because of a paucity of pathognomonic examination and imaging findings. Direct visualization of the abnormal inspiration adduction is required for diagnosis. This case illustrates the need for continuity of care and to revisit a patient's differential diagnosis when the initial workup is unrevealing or the patient is not responding to treatment.

REFERENCES

1. Morris MJ, Christopher KL: Diagnostic criteria for the classification of vocal cord dysfunction. *Chest* 2010; 138(5): 1213–23.
2. Kenn K, Balkissoon R: Vocal cord dysfunction: what do we know? *Eur Respir J* 2011; 37(1): 194–200.
3. Olin JT, et al: Glottic configuration in patients with exercise-induced stridor: a new paradigm. *Laryngoscope* 2014; 124(11): 2568–73.
4. Forrest LA, Husein T, Husein O: Paradoxical vocal cord motion: classification and treatment. *Laryngoscope* 2012; 122(4): 844–53.
5. Bohadana A, Izbicki G, Kraman SS: Fundamentals of lung auscultation. *N Engl J Med* 2014; 370(8): 744–51.

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