

This podcast can be accessed at [www.pedscases.com](http://www.pedscases.com), Apple Podcasts, Spotify, or your favourite podcasting app.

## **Vocal Cord Dysfunction**

Developed by Aleena Amjad Hafeez, Caseng Zhang, and Dr. Elizabeth Anne Hicks for PedsCases.com.  
May 31<sup>st</sup>, 2023

### **Introduction:**

Hello. My name is Aleena Amjad Hafeez. I am a fourth year medical student at the University of Alberta. I am joined by Dr. Anne Hicks, a pediatric pulmonologist at the Stollery Children's Hospital, and Caseng Zhang, a third year undergraduate student at McMaster University. In this PedsCases podcast, we will be discussing paradoxical vocal cord motion disorder, more commonly known as vocal cord dysfunction.

By the end of this podcast learners should be able to tackle to following objectives:

- (1) Define VCD
- (2) Recognize typical presentations of VCD based on history and on physical examination
- (3) Discuss the diagnostic approach for presentations suspicious of VCD
- (4) List the differential diagnosis of VCD
- (5) Review the treatment of VCD

To start, let's establish a definition of VCD. VCD or Paradoxical Vocal Fold Motion refers to involuntary inspiratory adduction of the vocal cords, which leads to inspiratory air flow obstruction and a sense of dyspnea. Triggers include anxiety, asthma, exercise, strong scents, and gastroesophageal reflux disease (GERD).<sup>1</sup> VCD is underdiagnosed and can be misdiagnosed as asthma. Of note, up to 63% of VCD patients may have been diagnosed or misdiagnosed with asthma.<sup>2</sup> Therefore, in a patient with an atypical asthma presentation, including poor response to guideline-based therapy with good adherence or an unexpected increase in frequency of asthma exacerbations without adequate relief from a bronchodilator, considering VCD as a differential or comorbid diagnosis is essential for symptom control. This also results in decreasing healthcare costs and minimizing the potential for adverse effects of asthma treatment, such as, inhaled corticosteroids.<sup>2,3</sup>

Now, we will discuss a typical VCD presentation. You encounter a 15-year old female presenting to your pediatric respiratory clinic with complaints of worsening shortness of breath and chest tightness, particularly, while playing soccer with her team.

Developed by Aleena Amjad Hafeez, Caseng Zhang, and Dr. Elizabeth Anne Hicks for PedsCases.com.  
May 31<sup>st</sup>, 2023

Past medical history reveals that your patient is previously healthy with no underlying respiratory conditions, including asthma. She was born at 39 weeks, weighing 7 lbs 2 oz. She did not require respiratory support after birth and was discharged home after a 24-hour hospital stay. She has been medically well with no significant infections, emergency room visits, surgeries, or hospitalizations. Her family doctor recently prescribed an inhaled short-acting bronchodilator (salbutamol) to use as-needed for shortness of breath and chest tightness. Her family doctor also ordered an electrocardiogram (ECG), a pulmonary function test (PFT), and a chest x-ray, which were all reported as being within normal limits.

She is currently in grade 9 and lives at home with her 3 siblings, mother, and father. She does exceptionally well at school and is involved in several school clubs and extracurricular sports activities. She describes herself as a worrier and her mother reports a recent increase in her level of stress due to her impending transition to high school next year.

Now, Caseng will speak to Dr. Anne Hicks and ask her about the important features we should elicit on history, physical exam, investigations, and management for a possible diagnosis of VCD.

**Dr. Hicks, what are some important questions to ask a patient presenting with features consistent with VCD?**

You should start by asking about features of dyspnea, including when it occurs, triggers and alleviating measures, and location, such as, chest or throat? Is exercise a trigger? If exercise is reported as a trigger, you should ask if dyspnea presents immediately or takes a little while. You should also elicit whether dyspnea is improved with inhaler use and how long it takes for symptoms to improve. Don't forget to ask about nighttime symptoms, including whether dyspnea ever causes the patient to wake up!

Other things to ask about are cough, whether it is wet or dry, or both. Is the cough accompanied with dyspnea or not? Do they notice any throat tightness or vocal symptoms, such as, dysphonia, hoarse voice, or voice changes? Do they wheeze or have stridor?<sup>4</sup>

**Dr. Hicks, would you be able to discuss some alternate diagnoses that should be considered in a patient presenting with features suggestive of VCD?**

VCD is often comorbid with other conditions including asthma, reflux and eosinophilic esophagitis. VCD can trigger panic attacks and asthma exacerbation or be mistaken for them. Furthermore, reflux can be triggered by or trigger VCD.<sup>1</sup>

Other diagnoses to consider in someone presenting with shortness of breath or chest tightness include several cardiovascular and pulmonary conditions. Some important considerations are:

## ENT

- (1) Intrinsic or extrinsic upper airway compression
- (2) Severe nasal congestion or blockage +/- postnasal drip

## Pulmonary

- (1) Asthma
- (2) Laryngospasm (choking sensation and aphonia) - can wake a patient from sleep
- (3) Laryngeal angioedema
- (4) Other vocal cord motion abnormalities (e.g. vocal cord paresis or paralysis)
- (5) Laryngeal or tracheal stenosis
- (6) Excessive dynamic airway collapse (tracheomalacia or laryngomalacia)
- (7) Cystic fibrosis
- (8) Non-cystic fibrosis bronchiectasis
- (9) Other lung diseases, including interstitial lung disease and pulmonary veno-occlusive disease
- (10) Hyperventilation response to dyspnea

## Cardiac

- (1) Poor cardiac function
- (2) Dysrhythmia
- (3) Vascular ring and other anomalies that compress the trachea or mainstem bronchi leading to dynamic or chronic malacia
- (4) Pulmonary hypertension
- (5) Arteriovenous malformation leading to desaturation during activity

## GI

- (1) GERD
- (2) Eosinophilic esophagitis
- (3) Structural GI problems including abnormal esophageal movement

## Other

- (1) Deconditioning
- (2) Vagal episode
- (3) Anxiety and panic attacks

## Which investigations would be important to obtain in this patient?

### Investigations

- (1) **Nasal endoscopy** to assess vocal cord motion. Full brisk abduction can be induced by sniffing. Adduction of the true vocal folds occurs with phonation, coughing, throat clearing, swallowing, and during a Valsalva maneuver. Partial adduction (approximately 10 to 40 percent) is normal during expiration. It is also normal to see vocal fold adduction for 0.2 seconds following the end of the inspiratory phase just prior to a cough. ***Visualization of the vocal cords is the gold standard for VCD diagnosis.***
- (2) **Spirometry** to assess for other causes of dyspnea. VCD can lead to flattening of the inspiratory arm of the flow volume loop, a sign of dynamic air flow obstruction,. In contrast, scooping of the expiratory arm of the flow volume loop, decreased forced expiratory volume at 1 second (FEV1) and significant bronchodilator response are more in keeping with asthma; abnormal lung volumes, gas trapping and abnormal diffusion are concerning for interstitial lung disease or other pulmonary parenchymal or vascular diagnoses.
- (3) **Methacholine challenge** can help to rule in asthma, although it will not rule out VCD.
- (4) Cardiopulmonary exercise testing can help to identify whether exercise-induced dyspnea is associated with cardiac issues, asthma, respiratory insufficiency, VCD, deconditioning, hyperventilation or other issues.

## Finally, what would be appropriate treatment for VCD?

Acute management of VCD should always start with reassurance and supportive care as the symptoms of VCD are real and the airway is truly obstructed. During an acute episode, patients should be encouraged to try “relaxed throat breathing exercises” to maintain laryngeal control, including pursed-lip breathing. Inhaled ipratropium bromide may be helpful to treat exercise-induced laryngospasm (the mechanism is postulated to be through its anticholinergic action suppressing vagus signaling). Finally, with a prolonged episode which results in measurable respiratory distress, CPAP may be helpful to overcome the obstruction.

Long-term treatment of VCD involves speech-language and behavioral therapy to provide (1) Respiratory retraining and (2) Vocal fold relaxation techniques. Make sure to also treat any comorbidities, including asthma, GERD, and anxiety. Psychotherapy can be helpful in particular with patients with VCD that is triggered or worsened by anxiety.

### **Key Take Away Points From This Podcast**

- (1) VCD is common and often misdiagnosed as asthma
- (2) Consider VCD when patients present with dyspnea and typical triggers such as exercise, strong scents, asthma, or GERD
- (3) Visualization of the vocal cords is the gold standard for VCD diagnosis
- (4) There are many co-morbid and differential diagnoses to consider when a patient presents with dyspnea which may relate to pulmonary, cardiac, upper airway, or GI pathology
- (5) Short term treatment of VCD includes the use of the anticholinergic medication, ipratropium bromide (Atrovent) via MDI. Long term treatment involves speech language and behavioural therapy to incorporate relaxation techniques and respiratory retraining.

Thanks for listening!

## References

1. Boger J, Gurevich-Uvena J, Frizzel E, Norris W, Maydonovitch C, Perry J, et al. The Prevalence of Gastroesophageal Reflux in Patients with Paradoxical Vocal Fold Motion: 64. Official journal of the American College of Gastroenterology | ACG. 2008 Sep;103:S25.
2. Traister RS, Fajt ML, Petrov AA. The morbidity and cost of vocal cord dysfunction misdiagnosed as asthma. allergy asthma proc. 2016 Mar 1;37(2):25–31.
3. Loke YK, Blanco P, Thavarajah M, Wilson AM. Impact of Inhaled Corticosteroids on Growth in Children with Asthma: Systematic Review and Meta-Analysis. PLOS ONE. 2015 Jul 20;10(7):e0133428.
4. Hurvitz M, Weinberger M. Functional Respiratory Disorders in Children. Pediatr Clin North Am. 2021 Feb;68(1):223–37.