Vocal Cord Dysfunction

Unmasking the Asthma Pretender

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The symptoms of vocal cord dysfunction (VCD) can be mistaken for those of asthma or other respiratory illnesses. As a result, VCD is often misdiagnosed, leading to unnecessary, ineffective, costly, or even dangerous treatment. Here are the facts that will enable you to avoid making an erroneous diagnosis, choosing potentially harmful treatment, and delaying effective treatment.

A 33-year-old oncology nurse, JD, had moved from Seattle to Phoenix about six months earlier for a job opportunity. Shortly after starting her new job, she had developed intermittent dyspnea on exertion, with a cough lasting several minutes at a time, along with a sensation of heaviness over the larynx and a choking sensation. These symptoms were precipitated by gastroesophageal reflux disease (GERD), postnasal drainage, stress, and significant environmental change (ie, Seattle to Phoenix). She noticed that, since moving to Phoenix, she frequently cleared her throat but denied any hoarseness, dysphagia, chest tightness, chest pain, or wheezing. She noted nasal congestion and clear nasal discharge on exposure to inhaled irritants (eg, woodstove smoke) and strong fragrances (eg, perfume or cologne).
On physical examination, the patient was alert, oriented, and in no acute distress. She was coughing intermittently but was able to speak in complete sentences. No stridor or dyspnea was noted, either on exertion (jogging in place) or at rest.

HEENT examination was normal, with no scalp lesions or tenderness; face, symmetric; light reflex, symmetric; conjunctivae, clear; sclera white, without lesions or redness; pupils, equal, reactive to light and accommodation; tympanic mem-
branes and canals, clear with intact landmarks; no nasal deformities; nasal mucosa, mildly erythematous with mild engorge-
ment of the turbinates; no nasal polyps seen; nasal septum midline without perforation; no sinus tenderness on percussion;
pharynx, clear without exudate; uvula rises on phonation; and oral mucosa and gingiva, pink without lesions. Neck was supple
without masses or thyromegaly, and trachea was midline. Lungs were clear to auscultation with normal respiratory movement and
no accessory muscle use, with normal anteroposterior diameter. Heart examination revealed regular rate and rhythm, without
murmur, clicks, or gallops.
Examination of the skin was normal, without rashes, hives, swelling, petechiae, or significant ecchymosis. There was no palpable cervical, supraclavicular, or axillary adenopathy.

Results of laboratory studies included a normal complete blood count with differential and a normal IgE level of 46.3 IU/mL. Spirometry testing revealed normal values without obstruction; however, there was a flattening of the inspiratory flow loop, with no reversibility after bronchodilator, which was highly suggestive of vocal cord dysfunction (VCD). Perennial nonallergic rhinitis (formerly called vasomotor rhinitis) was confirmed because the patient experienced fewer symptoms to perfume after nasal corticosteroid use. The patient’s GERD was generally well controlled with esomeprazole but was likely a contributing factor to her vocal cord symptoms.
On laryngoscopy, abnormal vocal cord movement toward the midline during both inspiration and expiration was visualized, confirming the diagnosis of VCD.

**VOCAL CORD PHYSIOLOGY AND FUNCTIONS**

The vocal cords are located within the larynx. **Abduction**, or opening, of the cords is controlled by the posterior cricoarytenoid muscle; **adduction**, or closing, occurs via contraction of the lateral cricoarytenoid muscle. These muscles are innervated by the recurrent laryngeal nerve to control the width of the space—the rima glottidis—between the cords. During inspiration, the glottis opens; during expiration, it narrows but remains open.12

The vocal cords are involved in three main functions: protection of the airway, respiration, and phonation (vocal production). These functions are at least partially controlled involuntarily by brain stem reflexes; however, only airway protection—the most important of these functions—is reflexive and involuntary.12 Respiration may be controlled voluntarily, and phonation is primarily voluntary. Closure of the vocal cords is under the control of the laryngeal nerve branches of the vagal nerve.12,13

The vocal cords normally abduct during inspiration to allow air to pass through them into the trachea and the lungs. Sniffing, puffing, snuffling, and panting also cause the vocal cords to abduct. The vocal cords adduct with phonation (talking, singing), coughing, clearing the throat, performing the Valsalva maneuver, and swallowing. During expiration, 10% to 40% adduction is considered normal.14
• Once laryngoscopy become more widely available (1970’s), diagnosis of VCD increased

• Laryngoscopy is the gold standard for the identification of VCD

The condition is confirmed by flexible laryngoscopy with visualization of abnormal adduction of the vocal chords and exclusion of other causes of glottic and subglottic obstruction.
Background

- VCD is a partial upper airway obstruction caused by paradoxical adduction of the vocal cords—a description term rather than a specific diagnosis!
- Primarily associated with inspiration—sometimes can manifest with expiration
- True incidence is uncertain—Precise cause is unknown
- Etiology is often multifactorial
- 20% of patients evaluated for asthma (unresponsive to aggressive treatment) were found to have VCD alone
Historically, VCD has been known by a variety of names:

- Laryngeal Dyskinesia
- Hysteric Croup (Dunglison)
- Munchausen’s Stridor (Patterson)
- Vocal Chord Dysfunction (VCD)
- Paradoxical Vocal Chord Motion (PVCM)
- Factitious Asthma
Background

- VCD is more common in women
  - Reported female-to-male ration varied from 2:1 to 4:1
  - Some reports say more frequently in younger women
<table>
<thead>
<tr>
<th>Common Symptoms of Vocal Cord Dysfunction</th>
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<tbody>
<tr>
<td>Cough</td>
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<tr>
<td>Hoarseness</td>
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<tr>
<td>Throat/neck tightness*</td>
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<tr>
<td>Anxiety</td>
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<td>Choking</td>
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<td>Dizziness</td>
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<td>Sighing</td>
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<td>Noisy breathing, stridor</td>
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<tr>
<td>Frequent clearing of throat</td>
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<td>Sensation of not being able to get a breath in</td>
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* It is important to differentiate between vocal cord dysfunction (VCD) and exercise-induced asthma (EIA). Patients with VCD typically identify the neck, throat, or upper sternum as the source of the airway restriction, while patients with EIA usually describe generalized chest tightness.

Source: Used with permission from the Arizona Asthma & Allergy Institute.
Triggers
Physiologic, psychologic, and neurologic factors may all contribute to VCD.\textsuperscript{1,15} Conditions that can trigger VCD include

- Asthma
- Postnasal drip
- Recent upper respiratory illness (URI)
- Talking, singing
- Exercise
- Cough
- Voice strain
- Stress, anxiety, tension, elevated emotions
- Common irritants (eg, strong smells)
- Airborne irritants
- Rhinosinusitis
- GERD
- Use of certain medications

Identification of a particular patient’s triggers is key to successful management of VCD.
PFT & imaging may be performed prior to laryngoscopy depending on the clinical presentation and degree of clinical suspicion.

The flattened inspiratory limb of the flow-volume loop recorded during spirometry is typical of vocal cord dysfunction. Abbreviations: RV, residual volume; TLC, total lung capacity.

Figure 2 - A normal flow-volume loop is shown in Figure 2a. Figure 2b shows an obstructive defect, with marked scooping. X-axis is volume, Y-axis is flow.
TREATMENT

Acute episode

During an acute VCD episode, offering the patient calm reassurance can be effective in resolving the episode. Simple breathing guidance may also be beneficial; instructing the patient to breathe rapidly and shallowly (i.e., pant) can result in immediate resolution of symptoms.\(^\text{24}\) The patient can be advised to utilize other techniques, such as diaphragmatic breathing, breathing through the nose, breathing through a straw, pursed-lip breathing, and exhaling with a hissing sound.\(^\text{25}\)
Clues that suggest VCD over Asthma

- Subjectively more difficulty on inspiration than expiration
- Minimal response to aggressive asthma treatment
- A flattened inspiratory flow-volume loop on PFT
- Normal expiratory spirometry, lung volumes, and arterial blood gas measurement*

* ABG are only obtained in patients presenting with severe respiratory distress.
Acute management of VCD

- Reassurance and supportive care
- Use of CPAP
- Heliox SVN—rarely used but has shown some improvement
- Endotracheal intubation or tracheostomy is NOT needed for VCD unless patient is at risk for airway obstruction
Long-term management
Although various strategies are employed in the management of VCD, well-designed studies on which to base treatment decisions have not been performed. Of course, control and management of possible underlying triggers or disorders should be implemented. Because etiology is rarely known, treatment for VCD is generally empiric.

Evidence does exist, however, to suggest that voice therapy, the treatment of choice for muscle tension dysphonia, is also effective for VCD. Speech therapy with specific voice and breathing exercises can enable the patient to manage the condition, thereby reducing ED visits, hospitalizations, and treatment costs.26
Patient education and self-care

Patient education is a critical component of VCD management. The clinician should explain the functions of the larynx to the patient, including the normal functioning of the vocal cords during respiration, speaking, swallowing, coughing, throat clearing, and breath holding. It may also enhance patients’ understanding of VCD to view their diagnostic laryngoscopy or videostroboscopy films.²¹

The patient should be advised to rest the voice, hydrate, utilize sialagogues (lozenges, gum) to stimulate salivation, reduce exposure to triggers when possible, and decrease stress. She should be encouraged to track VCD triggers by documenting what she is doing, where, and when, at the time of a VCD episode.
PATIENT HANDOUT

Paused Breathing
1. Sit in a position that allows your neck and shoulders to relax, but keep your back straight.
2. Breathe in gently through the nose.
3. Stick your tongue out of your mouth, past the teeth and lower lip, in preparation to exhale. This forward stretch of the tongue helps to open the airway at the vocal cords. This may be difficult to do with a severe spasm but will be easier the more you repeat this exercise.
4. With the tongue out, exhale only through the mouth in slow, paused, or spaced breaths. The timing should be like saying ha, ha, ha, ha, very slowly. Don’t use your voice; just breathe out.
5. Repeat 10 times and practice three times a day so you will know how to do this well when vocal cord dysfunction occurs.

Belly Breathing
1. Sit in a position that allows your neck and shoulders to relax, but keep your back straight.
2. Place your hand on your belly. Breathe in gently through the nose with your belly, pushing your hand outward from your body.
3. As you start to exhale, place the tip of your tongue where your upper teeth meet the roof of your mouth. This will allow you to make a hissing or “S” sound as you exhale. This creates a backpressure to help keep the airway open.
4. Slowly exhale, allowing the hand and belly to move inward to a resting position and make the hissing or “S” sound as you push the air between your tongue and teeth.
5. Repeat 10 times and practice three times a day so you will know how to do this well when vocal cord dysfunction occurs.

Source: Used with permission from the Arizona Asthma & Allergy Institute.
CASE PATIENT

After diagnosing VCD, the clinician explained the normal functioning of the vocal cords and how certain factors may cause them to close during inspiration. The patient then understood why bronchodilator therapy had failed to relieve her symptoms. She was counseled to continue her inhaled nasal steroid and proton pump inhibitor for her perennial nonallergic rhinitis and GERD, respectively, because these conditions may trigger her VCD, and to take steps to manage her stress. She learned breathing techniques to alleviate acute episodes of VCD and was informed of the option of voice therapy with a speech therapist if needed.

At six-week follow-up, the patient reported that she was complying with her medication regimen, had made an effort to relax more, and had experienced no acute attacks of VCD since her last visit.
CONCLUSION
Patients with symptoms suggestive of VCD require a thorough evaluation, including laryngoscopic examination, to ensure accurate diagnosis and avoid a too-common misdiagnosis. Primary care clinicians should know about VCD and, if not trained in the performance of flexible laryngoscopy, should refer the symptomatic patient to a specialist for appropriate work-up.

CROSSSECTION
- Vocal cord dysfunction (VCD) may be misdiagnosed as asthma because its symptoms and triggers are similar. When misdiagnosed VCD fails to respond to standard asthma treatment, it may be further mischaracterized as unresponsive or difficult-to-treat asthma.
- In VCD, the cords adduct abnormally during inspiration and sometimes during expiration, making breathing difficult. This can cause a characteristic upper-airway stridor, as distinct from the lower-airway wheezing sound heard in asthma.
- During an acute VCD episode, laryngoscopic visualization of vocal cord adduction, including the pathognomonic “glottis chink,” is diagnostic for VCD.
Quick Question #1

1. Which of the following is true concerning the evolution of thinking about vocal cord dysfunction (VCD)?
   - a. VCD has been described for several centuries, at least since the 1700s.
   - b. First recognized in the mid-1800s, VCD was considered a completely organic disorder.
   - c. It was originally known by its French name dysfonctionnement des cordes vocales.
   - d. In the mid-19th century, Dunglison observed a condition that he referred to as “hysteric croup.”
2. Which of the following medications may help distinguish between VCD and asthma during an acute episode? 
   - a. Ipratropium bromide
   - b. Albuterol
   - c. Salmeterol
   - d. Formoterol
3. Which of the following IS NOT a typical symptom of VCD?

- a. Cough
- b. Chest tightness
- c. Anxiety
- d. Sighing
- e. Wheezing
Quick Question #4

4. In differentiating VCD and asthma, what clue would point you to VCD?
   a. Patients with VCD do not experience breathlessness that awakens them at night.
   b. In evaluating spirometry flow-volume loops, there is a spike during inspiration in patients with VCD that is not seen in patients with asthma.
   c. VCD is always due to underlying psychopathology.
   d. VCD is rare in women and far more common in males.
5. The most important function of the vocal cords is
   a. Phonation (vocal production)
   b. Respiration (breathing)
   c. Protection of the airway
   d. Assist the epiglottis when swallowing
Quick Question #6

6. What is a characteristic finding during the examination of a patient with VCD?
   ○ a. Inspiratory stridor
   ○ b. Good relief of symptoms with bronchodilator therapy
   ○ c. Good relief with oral corticosteroids
   ○ d. Expiratory stridor
Quick Question #7

7. Stridor is best auscultated over which area of the upper body?
   ○ a. Tracheal area
   ○ b. Anterior chest wall
   ○ c. Posterior chest wall
   ○ d. Xiphoid process
   ○ e. Thyroid cartilage
8. All of the following are known VCD triggers EXCEPT

- Eating
- Irritants like smog and perfume
- Voice straining; yelling and loud singing
- Exercise
- Stress and anxiety
9. The “gold standard” for diagnosis of VCD is
   ○ a. Complete adduction of the vocal cords during inspiration
   ○ b. Complete adduction of the vocal cords during expiration
   ○ c. A larger opening in the anterior vocal cords than posterior vocal cords during respiration
   ○ d. A small gap in the posterior portion of the vocal cords during inspiration
   ○ e. Videostroboscopy
10. All of the following are recommended in the treatment of VCD EXCEPT
   a. Avoidance of triggers
   b. Voice therapy
   c. Behavior therapy and benzodiazepines for anxiety
   d. Breathing exercises
   e. Hydration and sialagogues
REFERENCES
### Additional Resources

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<tr>
<th>Resource</th>
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<tr>
<td>National Jewish Health Vocal Chord Dysfunction</td>
<td><a href="http://www.nationaljewish.org/healthinfo/conditions/vcd/">http://www.nationaljewish.org/healthinfo/conditions/vcd/</a></td>
</tr>
<tr>
<td>Cleveland Clinic Vocal Chord Dysfunction</td>
<td><a href="http://my.clevelandclinic.org/services/head-neck/diseases-conditions/vocal-cord-dysfunction">http://my.clevelandclinic.org/services/head-neck/diseases-conditions/vocal-cord-dysfunction</a></td>
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