

Vocal Cord Dysfunction:  
Assessment and Management  
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What is Vocal Cord Dysfunction?

- **Inappropriate adduction of the vocal folds during inhalation, resulting in intermittent respiratory obstruction and stridor. (Many authors)**
- **Upper airway stridor characterized by involuntary, paradoxical adduction of the vocal folds and ventricular folds during inspiration, with closure of the vocal folds being present during the entire respiratory cycle, in some cases. (Christopher et al, 1983)**

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Brief review of laryngeal A and P

- **True vocal folds**
  - body is TA muscle
- **Abduction via PCA**
- **Adduction via LCA**
- **Neural control via Vagus**
  - PCA and LCA through recurrent laryngeal nerve

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Also Known As....

- **Paradoxical vocal fold motion/movement**
- **Paradoxical vocal fold dysfunction**
- **Paradoxical vocal fold behavior**
- **Episodic paroxysmal laryngospasm**
- **Factitious asthma**
- **Munchausen's stridor**
- **Functional airway obstruction**
- **Functional laryngeal stridor**

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Different from...

- **Irritable larynx syndrome (ILS) (Morrison et al, 1999)**
  - **Hyperkinetic laryngeal dysfunction resulting from an assorted collection of causes in response to a definitive triggering stimulus.**
  - **Several forms**
    - **Muscular tension dysphonia**
    - **Episodic laryngospasm**
    - **Chronic cough/throat clearing**
    - **Globus pharyngeus**
- **VCD one subset of ILS**

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Also, as discussed here ...

- **Excludes cases of adduction of the true vocal folds during inspiration due to neurologic causes.**
  - **Brainstem compression**
  - **Cortical or upper motor neuron injury**
  - **Nuclear or lower motor neuron injury**
  - **Movement disorder (i.e., respiratory dystonia)**

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Two Phenotypes of VCD

- **Spontaneous VCD**
  - episodes various and unpredictable
- **Exercise-induced VCD**
  - common in adolescent athletes
  - transient episodes relieved with a period of rest
- **Some exhibit both patterns**

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Co-morbidities

- **Data based on retrospective chart review of 10 years of records. n=27**
  - Asthma symptoms (66%)
  - URI/viral condition (66%)
  - GERD (37%)
  - Gastrointestinal problems (33%)
  - Allergies (30%)
  - Acute respiratory distress (26%)
  - Confirmed psych problems (22%)

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Typical VCD Patient

- **Female**
- **Tend to be high achievers and competitive**
- **History of asthma and allergies**
- **Episodes associated with a trigger**
- **Episodes usually sudden in onset and of short duration**
- **No stridor when sleeping**

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## Differential Diagnosis

- **Two papers in AJSLP**
  - Mathers-Schmidt (2001)
  - Koufman and Block (2008)
- Both have very useful appendices for clinicians.

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## Comparison of VCD and Asthma

TABLE 1. Some differential diagnostic features of PVFM and asthma

Diagnostic Features	PVFM	Asthma
Precipitators (triggers)	Exercise, extreme temperatures, airway irritants, emotional stressors	Exercise, extreme temperatures, airway irritants, allergens, viral/bacterial infections
Number of triggers	Usually one (e.g., exercise)	Usually multiple triggers
Breathing obstruction location	Laryngeal area	Distal area
Timing of breathing noises	Stifles on inspiration	Wheezing on exhalation
Pattern of dyspneic event	Sudden onset and relatively rapid cessation	More gradual onset and longer recovery period
Nocturnal awakening with symptoms	Rarely	Abundant always
Response to bronchodilators and/or systemic corticosteroids	No response	Good response
Flow-volume loop	Inspiratory cut-off; perhaps some expiratory limb reduction*	Reduced expiratory limb only
MEF50/MIF50	Abnormal on 50%	Abnormally small ratio
Arterial blood-gas analyses	O <sub>2</sub> : normal to slightly hypoxicemic CO <sub>2</sub> : normal to slightly reduced	O <sub>2</sub> : arterial hypoxemia
Bronchial provocation test	Negative	Positive
Laryngoscopic observations	Inspiratory abduction of anterior 2/3 of vocal folds; posterior diamond-shaped chord; perhaps a reddening of ventricular folds; inspiratory abduction may carry over to expiration	Vocal folds may adduct during exhalation

Note. See text for detailed discussion and exceptions to these distinguishing features.  
\*When patient is symptomatic.

116 American Journal of Speech-Language Pathology • Vol. 10 • 111-125 • May 2001

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## Notable Test Results

- **With pulmonary function testing:**
  - See **inspiratory cut-off on the flow-volume loop (associated with an extrathoracic upper airway obstruction); may also see a reduction in the expiratory limb.**
  - **MEF50/MIF50 > 1.5 (an increased ratio)**
  - **Normal values for airway resistance**

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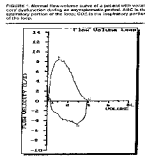
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### Truncated Inspiratory Flow Volume Loop



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### Notable Test Results

- **On laryngoscopy:**
  - See adduction of anterior two thirds of vocal folds, with a diamond-shaped posterior glottic chink; often with medialization of the ventricular folds.
  - This finding is considered the “gold standard” diagnostic test.

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### Notable Test Results

- **Arterial blood gases**
  - O<sub>2</sub> normal to slightly hypoxemic
  - CO<sub>2</sub> normal to slightly reduced
- **These findings may be the best differentiator from asthma.**

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Notable Test Results: A Caveat

- **Pulmonary function and laryngoscopic test findings are typical of VDC pts when symptomatic, but may not be found when pts are asymptomatic.**

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SLP Assessment

- **Patient History**
  - VCD symptoms and history
  - Medical history
  - Social history

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SLP Assessment

- **Assessment**
  - Laryngeal and respiratory efficiency and control
  - Respiratory driving pressure control
  - Laryngeal musculoskeletal tension
  - Structural/Functional integrity of the speech structures

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Laryngeal Valving Efficiency and Control

- **Note respiratory patterns, ranges of respiratory and phonatory performance, steadiness of sound production during:**
  - Physiological Fo range
  - MPT for /s/, /z/, /a/
  - s/z ratio
  - Loudness variation of /a/
    - Normal, soft, normal, twice as loud
  - Phonatory onset and offset during utterances with many voiced-voiceless changes
  - Vocal quality throughout

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Respiratory Driving Pressure Control

- **Determine if pt can sustain a steady respiratory driving pressure of 5 cm H2O for 5 seconds.**
  - Hixon “around the house” device

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Laryngeal Musculoskeletal Tension

- **Palpate the laryngeal area to assess tension during quiet breathing and phonation samples**
  - Aronson (1990)

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Structural/Functional Integrity of the Speech Structures

- **Assess the size, shape, and symmetry of the structures. During the nonspeech and speech tasks, determine the adequacy of speech structure function (muscular contraction strength, movement speed, range of motion, movement accuracy, motor steadiness, ability to vary muscular tension, coordination, tone)**
  - See Duffy (1995)

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SLP Treatment

- **Medical intervention should first be assessed. Is it appropriate and optimal?**
  - Is asthma under good control?
  - Are allergies under good control?
  - Is GERD/LPR under good control?

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SLP Treatment

- **Patient education**
- **Supportive counseling**
- **Instruction in tension identification and control**
- **Instruction in relaxed-throat breathing**

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Patient Education

- **Review assessment results**
- **Educate pt on structure and function of larynx and respiratory system**
- **Review VCD symptoms and video**

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Supportive Counseling

- **Acknowledge pt's fears and anxiety**
- **Reflect what pt has shared and response to triggers**
- **Discuss tx focusing on learning techniques and working toward situations where VCD most likely to occur**

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Tension Identification and Control

- **Guide through steps of tightening and relaxing**
  - Use different muscle groups, leading to face, jaw, and breathing muscles
  - Start with maximal tension/relaxation then to moderate tension/relaxation
  - Important for pt to learn s/he can “let go” of the tension
  - Emphasis on identifying and reducing excessive tension associated with respiration during a variety of activities and settings.

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SLP Treatment

- **Many pts, through their experiences, already know how to relieve the symptoms.**
- **Relaxed open throat breathing technique not a “quick fix”**
  - need to practice daily
  - several times a day
  - forever (or as long as experiencing episodes)

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Relaxed Throat Breathing:  
Inhalation

- **Place hand on abdomen.**
- **Tongue should rest forward on floor of mouth, lips gently closed, jaw relaxed (slightly open).**
- **Breathe in through nose, feel abdomen expand.**

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Relaxed Throat Breathing:  
Exhalation

- **Let air out through gently pursed lips or on a prolonged /sh/ or /s/.**
- **Feel abdomen go down.**
- **Exhale below resting expiratory level.**
  - If experiencing only expiratory stridor, then exhale to REL

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What about ... ?

- **Heliox: 70/30 or 80/20**
  - Many experience temporary relief
  - Easily inhaled because of low density
  - Doesn't always work

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What about ... ?

- **CPAP**
  - Especially with VF adduction on exhalation
    - Slows expiratory flow, thereby increasing lung volume, resulting in a more open glottis
  - If VCD on inhalation
    - May reduce effort needed for inhalation by establishing a favorable pressure gradient for inhalation

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A Few Thoughts

- **VCD is the response of the vocal folds to a real or perceived threat to the airway.**

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- **Some pts may have been exposed to a laryngeal irritant, resulting in laryngeal hyper-responsiveness**
  - **Due to an altered autonomic balance??**
    - Subsequent stimuli induce local parasympathetic reflexes
    - Driven by area 25 in prefrontal cortex??

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My experience suggests

- **Teaching the relaxed throat breathing results in:**
  - **More pt awareness of relaxation vs. tension in breathing**
  - **A distraction**
    - from area of anxiety (throat)
    - to a behavior pt can master
  - **Once pts have the solution to the problem, and once they have implemented it a few times, the episodes tend to subside.**

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Let's talk about some cases

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## Any Questions?

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