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Vocal Cord Dysfunction (VCD): Evidence-Based Treatment

Bridget A. Russell, PhD, CCC-SLP

Moderated by:
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Vocal Cord Dysfunction (VCD): Evidenced-Based Treatment

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Learning Objectives

After this course, participants will be able to
- Define the population most often diagnosed with VCD.
- Identify symptoms and etiologic factors of VCD
- Describe effective strategies used to treat VCD.
Vocal Cord Dysfunction - Other Names

- Paradoxical Vocal Fold Motion
- Paradoxical vocal cord motion
- Episodic paroxysmal laryngospasm
- Factitious asthma
- Munchausen’s stridor
- Psychogenic stridor
- Episodic laryngeal dyskinesia
- Adductor laryngeal breathing dystonia

Vocal Cord Dysfunction - Defined

- Inappropriate adduction or closure of the true vocal folds during inspiration and/or expiration.
- May result in upper airway obstruction and laryngeal stridor.
- Often misdiagnosed as asthma

Video: Videostroboscopy of VCD Episode

https://vimeo.com/84887182
### Differential Diagnosis - Symptoms

<table>
<thead>
<tr>
<th>Asthma</th>
<th>VCD</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Multiple triggers</td>
<td>• Typically one trigger</td>
</tr>
<tr>
<td>• Chest tightness</td>
<td>• Throat tightness</td>
</tr>
<tr>
<td>• Wheezing with expiration</td>
<td>• Stridor with inhalation</td>
</tr>
<tr>
<td>• Response to bronchodilators</td>
<td>• No response to bronchodilators</td>
</tr>
<tr>
<td>• Nocturnal awakening common</td>
<td>• Rare nocturnal events</td>
</tr>
<tr>
<td>• Unlikely to return after resuming to activity</td>
<td>• Pediatric exceptions</td>
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</tbody>
</table>

**Asthma**
- Throat tightness
- Stridor with inhalation
- No response to bronchodilators
- Rare nocturnal events
- Pediatric exceptions
- Likely to return after resuming activity

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Video with permission from Dr. Christopher Chang
Demographics

- Documented in males and females of all ages
- More frequently female
- Most patients fall between 10-40 years of age
- Documented in infants as young as four months
- Affects athletes
  - 5% prevalence of inspiratory stridor in elite Olympic athletes (Rundell & Spiering, 2003)
- Average of 4 years from onset to point of accurate diagnosis

Spirometry use in Treatment

- https://youtu.be/K7bFxHJwCwxM
- https://youtu.be/CLj_SZF8xnw
Spirometer: Vital Capacity (VC)

- Maximum amount of air that can be expired after a maximal inspiration - represents the total amount of air that is available for use.

- Not used for treatment (only baseline and post treatment)

- Procedure
  - Max. inhalation at REL, then max exhalation
  - 3 trials
  - Determine patient’s expected VC
    - Female= 2.5-4.0 Liters
    - Male= 3.0-5.0 Liters
    - Children= vary with height and age

- Plot of inspiratory and expiratory flow (on the Y-axis) against volume (on the X-axis) during maximally forced inspiratory and expiratory maneuvers.

- Used for baseline measures, but also to determine if treatment methods are relieving VCD symptoms.
Flow Volume Loop: VCD

Flow-volume loop demonstrates flattened inspiratory loop when symptomatic.

- Trunkated inspiratory loop suggesting extrathoracic obstruction

What do you see? Symptoms

- Change in vocal quality
- Wheezing
- Stridor
- Dyspnea, or shortness of breath, on exertion
- Coughing
- Choking sensation
- Throat tightness
- Chest tightness
- Respiratory distress
- Clavicular breathing pattern

- Fast breathing rate
- Visible tension in:
  - Face
  - Neck
  - Chest

- Videos:
  - https://youtu.be/JoAYCEyGeV
  - https://youtu.be/zI7SfC61wFw
  - https://youtu.be/Qpz8ffyQCY

Video permission from: Speech and Voice Therapy Center, LLC, 40 Mechanic St, Suite 301, Foxboro, MA 02035
Precipitating Factors

- Exercise-
- Medication Use-
  - Neuroleptic drugs, specifically phenothiazines
- Irritants-
  - ammonia, dust, smoke, soldering fumes, and cleaning chemicals
- Psychological Conditions-
  - posttraumatic stress disorder, anxiety, depression, and panic attack
- Rhinosinusitis-
  - Postnasal drip has been linked to airway hyperresponsiveness

Treatment

- Gastroenterology Management
- Otolaryngology (ENT) Management
- Pulmonary Management
- Allergy and Immunology Management
- Psychological Management
- SLP Management
Short Term Treatment:
- Reassure patient during episode
- Immediately instruct patient in breathing behaviors:
  - Panting, diaphragmatic breathing, breathing through nose or straw, pursed-lip breathing, exhaling with a hissing noise
- Possible trial of heliox (mixture of helium and oxygen)


Long Term Treatment
- Avoid known triggers such as smoke, airborne irritants, or certain medications
- Treat underlying conditions including anxiety, depression, GER, and rhinosinusitis
- Consider a trial of inhaled ipratropium (Atrovent) in patients with exercise-induced symptoms
- Referral for speech therapy is indicated in patients with unresolved symptoms
Gastroenterology Management

- Significant findings of laryngeal changes consistent with GERD were present in 95% of juveniles with confirmed VCD (Wilson & Wilson)
- Diagnosis and treat underlying GERD which could contribute to laryngeal inflammation

Otolaryngology (ENT) Management

- Gold standard for diagnosis: Visualization of vocal fold adduction during a VCD event
- Challenging to stimulate the physical and/or psychologic stresses of competition or practice in an artificial setting
- Exclude other causes of extrathoracic airway obstruction
Pulmonary Management

- To rule out or identify existing asthma/EIB

- Pulmonary Function Testing Flow Volume Loop
  - Baseline
  - Treatment progress

Allergy and Immunology Management

- Untreated allergic rhinitis may result in chronic postnasal drainage that could also act as a laryngeal irritant
Psychological Management

- Sports psychologist-address issue of anxiety and stress related to performance
- Use of biofeedback and hypnosis

Speech Therapy

- SLP management-behavioral therapy by a medical SLP is critical.
- Goal: enable the patient to recognize an impending VCD event
- Implement techniques to avert or control an attack
Speech Therapy Protocol

- 6 sessions:
  - Session 1:
    - Assessment and initial education
  - Sessions 2-6:
    - Diaphragmatic breathing
    - Negative practice
    - Tightening/Relaxing exercises
    - Breathing Recovery
    - Biofeedback

Speech Therapy Assessment

Session 1:
- Gather case history Participation in athletics
  - Description of onset
  - Description of symptoms
  - Co-diagnoses including current medications
- Examination:
  - Respiration
  - Observation of muscle tension
  - Overall posture
- Observation during exercise
- Educate patient regarding vocal cord dysfunction
- Introduce diaphragmatic breathing/"tummy" breathing Laying down
  - Sitting
  - Standing in front of mirror
- Home program
Patient Handouts

- You Tube: “3D view of diaphragm”
  - https://youtu.be/hp-gCvW8PRY
- iPhone Apps for download to help practice diaphragmatic breathing & slower breath rate: My Calm Beat-
  - https://youtu.be/YCickT8ILHE
- Belly Bio Interactive Breathing
  - https://youtu.be/0DsviJEx73I

Treatment: Change Current Response

- **Teach** ➔ **Trigger** ➔ **Apply**
- **Teach: Rescue Strategies**
  - Release and control methods that generate a mechanical response
    - Nasal Inspiration with pursed lip expiration
    - Panting
    - Lip Trills – steady tone, glides

https://youtu.be/p4qy_CXxfKY
Treatment: Change Current Response

- **Teach: Rescue Strategies**
  - **Recognize:** “Just noticeable onset”- This is a period of time when the patient tries to identify the very first respiratory symptoms before the VCD episode begins.
  - **Strategies:**
    - Lingual extension/stretches
      - To release tension
      - Forward carriage facilitates airflow over the base of tongue
    - Say “Duh” to drop jaw and tongue
    - Monitor Posture/Tension
      - Jaw/Tongue/Neck/Shoulders/Arms/Base of Support
    - [Youtube Video](https://youtu.be/oQN7fCla5Uc)

- **Trigger the symptoms**
  - Stationary bike, run track, arm bike

- **Apply the strategies**
  - Will need to cue to apply and continue to use rescue strategies as needed
  - Maneuver patient through tasks стратеgies based on symptoms noted during the triggering of the VCD
### Triggering VCD Episode

- [Video](https://youtu.be/w9IVg0bHPCA)

### Treatment: Triggering

**Protocol:**
- Facemask fitted over subject’s mouth and nose
- Subject instructed to pedal on stationary bicycle at regulated rate while ventilatory measures were collected

**Respiratory Retraining Protocol:**
- Regulated closed mouth/nasal inspiration
- Regulated pursed lip expiration
- Continued retraining until resolution of VCD episode

Equipment array (Vista Mini-CPA System - Viasense Inc./Vasa-Med Division, model number TV1600/Spence, Hans Rüdelh mouth/nasal breathing facemask, model number KM201; elastic head strap, patient positioning during baseline and treatment sessions).
Treatment: Environmental Considerations

- Need space to tax the patient
- Helpful to have access to exercise equipment, treadmill, arm bike, bike
- Used pool for swimmers, exposure to “smells” also helpful for those who trigger because of odors
- Appropriate tools and space to simulate/re-create as best as possible

Treatment: Relaxation

Use these techniques prior to activity during the “red flag moments” and or when triggered

- Laryngeal Massage (Aronson, 1990)
- Hyoid Release (Roy, 1993)
  - https://youtu.be/zEZ8igCcEGc
- Lingual Stretch/Massage
- Attention to Oral Posture
Laryngeal Massage

- Exhalation than inhalation
- Cyclical breathing
  - https://youtu.be/qcyY0tsGm6A
- Timing, pacing, rhythm
- Ability to change rhythm with activity
  (ie. Walk vs. jog vs. sprint)
- General awareness of abdominal support, helpful to work supine
Treatment: Respiratory Control

- Increase level of difficulty incrementally
- Provide distraction training
- Provide home exercise program
- Use of gate belt or abdominal binder helpful to feel exhalation
- Identify breath holding
- Teach cyclical breathing
- Increase awareness of airflow over base of tongue ("h" words may help)
- Amount of direct instruction is case dependent: age, self-awareness, level athletic ability, willingness

Treatment: Increase Task Intensity with use of Strategies

- Increase:
  - Rate of activity
  - Length of activity
  - Complexity of activity
- Vary the time of day
- Simulate suboptimal conditions
  - Heat, cold, fatigue, odors
Diaphragmatic Breathing

- The way babies breathe naturally
- Our breathing pattern changes as we get old certain
- Diaphragm is most efficient muscle of breathing
- Abdominal muscles help move diaphragm
- If diaphragm isn’t working effectively, neck and chest muscles must assume an increased share of the work of breathing

Benefits of Diaphragmatic Breathing

- Strengthen the diaphragm
- Decrease the work of breathing by slowing your breathing rate
- Decrease oxygen demand
- Use less effort and energy to breathe
Diaphragmatic Breathing Practice

- Take in a very deep breath-relax the pressure on your belly wall and let it swell out
- Push in with your hands on your abdomen and blow out air through the mouth. This makes the diaphragm force air up and out of the lungs
Diaphragmatic Breathing Practice

Breathing Rhythms

- Even Breathing

- Extended Breathing

- 4x4x4x4 Breathing
Breathing Rate

- Slow breathing rate
- Breathe out making /s/ sound
- Pursed lips
- Goal: 6.0 bpm at rest
- Use of weights to slow breathing

Normal

14 - 20 respirations in 1 minute
7 respirations in 30 seconds

Pursed Lips

- Breathing exercise that helps learn how to master extended exhalation
- Breathe in through your nose with mouth closed…
- Then breathe out through pursed lips like you were going to whistle
- https://vimeo.com/78772085
Negative Practice

- Tightening and Relaxing Muscles
  - To show the patient the difference between tight and loose muscles
- Laying down
- Sitting/ Standing while looking in a mirror
  - Watching for clavicular breathing
  - Watching for visible tightening in face, neck, and chest

Relaxation Techniques

- Practice at the end of every session
  - Progressive Muscle Relaxation Technique
  - Quieting the Body and Mind
  - Focusing
  - Meditation
Types of Biofeedback

- **Respiration:** breath rate, rhythm, volume
- **EMG (electromyography):** records muscle activity

Study by Warnes & Allen: 16 year old with 2 year history of VCD

- EMG electrodes placed along thyrohyoid membrane
- Patient seen for biofeedback 1 time/week for 10 weeks
- Baseline tension levels reduced by 60%
- Reductions in episodes of respiratory distress and chest pain
- Elimination of disorder-related school absences & reduction in interference of daily functioning

Typical Session Layout

1. Review homework, past week, strategies
2. Breathing practice—at rest
3. Walk/Run—practice recovery breath
5. Relaxation/ Discussion
References