Breathing Attacks!
Differential Diagnosis & Speech Treatment of Vocal Cord Dysfunction

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Disclosure

- I have no relevant financial or nonfinancial relationship(s) within the products or services described, reviewed, evaluated or compared in this presentation.
Objectives

- To define the population most often diagnosed with VCD
- To identify symptoms of VCD
- To understand the differential diagnosis between asthma and VCD
- To recognize the effectiveness of strategies used to treat VCD
- To make appropriate referrals if VCD is suspected
Definitions

- Condition characterized by adduction of vocal cords during inspiration
- Syndrome which inappropriate vocal cord motion produces partial airway obstruction, leading to subjective respiratory distress
Definitions

- Normal: Cords abduct during inspiration and adduct slightly, if at all, during expiration

- Typical VCD: anterior 2/3 adduct during inspiration forming a small diamond-shaped or triangular aperture posteriorly
Normal Larynx
Larynx:

VCD patient during inhalation

- Normal Cords during inhalation
- Vocal cord dysfunction
Larynx: VCD patient during inhalation

- Illustration of vocal cords during inspiration in the normal patient (figure A) and the patient with VCD (figure B). Illustration taken from Patterson et al.
Larynx: VCD patient during inhalation

- a) early paradoxical adduction of the vocal folds with formation of a “posterior chink” by b) complete closure of the vocal folds.
VCD population
Population

- Over-achieving personality
- Perceive psychosocial stresses
- Anxiety, depression, perfectionism
- Participation in organized sports and exercise inducible symptoms
- Studies have identified VCD in as young as 8
Population: Case Study

- Landwehr et al.
  - 7 patients with diagnosed VCD (6 girls, 1 boy)
  - Mean age: 14.7 years
  - All in at least one sports activity
  - Symptoms: shortness of breath, chest and throat tightness, wheezing
  - Did not respond to bronchodilators and inhaled and systemic corticosteroids
Population: Case Study

- Landwehr et al.
  - 6/7 patients underwent psychological evaluation
  - 5 had at least one Axis II diagnosis from DSM:
    - 2 with anxiety
    - 2 with depressive disorder
    - 1 with both anxiety/depressive disorder
  - ALL students were “straight A” or “4.0” students
Symptoms

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

- Clavicular breathing pattern
- Fast breathing rate
- Visible tension in:
  - Face
  - Neck
  - Chest
Subtypes of VCD

- **Laryngospasm** - brief involuntary spasm of vocal cords that often produces aphonia and acute respiratory distress. Common complication of anesthesia.

- **Spasmodic dysphonia** - causes hoarseness and strained vocalization with abnormal vocal cord motion during speech.
Differential Diagnosis

Asthma/ Exercise-induced bronchospasm (EIB)

- Occurs after intense activity peaking 5 to 10 minutes after cessation of exercise
- Stops spontaneously within 30 to 60 minutes
- Predominately a nocturnal disease

VCD

- Episodes most often begin and resolve abruptly
- Occur during the day
### Differential Diagnosis

**Asthma/ Exercise-induced bronchospasm (EIB)**
- More likely to respond to B2-adrenergic agonists
- Complaints of chest tightness

**VCD**
- Symptoms do not improve and/or may be aggravated by asthma medications
- Patients will localize their symptoms to their throat
- More difficulty with inspiration than expirations
- Throat tightness or choking
Misdiagnosis

- Exercise-induced asthma
- Exercise-induced bronchospasm (EIB)
- Upper airway obstruction
Misdiagnosis

- May result in unnecessary treatments including the use of corticosteroids and other asthma medications
- Has led to intubation and tracheostomy
- Delay in diagnosis and management may impede or exclude athletic participation and can amplify or prolong patient anxiety
Co-existing diagnosis

- Coexistent asthma with VCD in about 40-60% of patients

- Rundell & Spiering:
  - Study of 370 elite athletes
  - 5.1% (18 female, 1 male) had inspiratory stridor highly suggestive of VCD
  - 53% of these patients had related exercise-induced bronchospasm (EIB)
Precipitating Factors

- Exercise
- Psychological Conditions
- Irritants
- Rhinosinusitis
- Medication Use
GERD

- Significant findings of laryngeal changes consistent with GERD were present in 95% of juveniles with confirmed VCD (Wilson & Wilson)
GERD

A: Laryngoscopic view of normal larynx.

B: Laryngeal inflammation consistent with gastroesophageal reflux.

Treatment

- Gastroenterology Management
- Otolaryngology (ENT) Management
- Pulmonary Management
- Allergy and Immunology Management
- Psychological Management
- SLP Management
Gastroenterology Management

- Diagnosis and treat underlying GERD which could contribute to laryngeal inflammation
Otolaryngology (ENT) Management

- **Gold** standard for diagnosis: Visualization of vocal fold adduction via laryngoscopy 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
Pulmonary Function Testing

Flow-volume loop.

(Left) Normal expiratory and inspiratory loop.

(Right) Normal expiratory loop with flattening of the inspiratory loop, consistent with vocal cord dysfunction.
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
Long-Term Management

- Avoid known triggers—smoke, airborne irritant, certain medications
- Treat underlying conditions—anxiety, depression, GERD, rhinosinusitis
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

- 6 session protocol:
  - 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
Speech Therapy Assessment

Session 1:

Examination:
- Respiration
- Observation of muscle tension
- Overall posture
Speech Therapy Assessment

- Session 1:
  - 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”
- iPhone Apps for download to help practice diaphragmatic breathing & slower breath rate:
  - My Calm Beat
  - Belly Bio Interactive Breathing
- Diaphragmatic breathing handout
- Relaxation techniques
Additional Referrals

- ENT referral to assess vocal fold function via laryngoscopy during exercise
- Gastroenterology, Allergy, Psychology, Pulmonary, etc to treat underlying diagnosis
Speech Therapy Goals

- Demonstrate knowledge of VCD
- Use of diaphragmatic breathing strategies
- Slow breath rate
- Use relaxation strategies
VCD exercises

- Diaphragmatic breathing
- Negative practice
- Tightening/Relaxing exercises
- Breathing Recovery
- Biofeedback
Diaphragmatic Breathing

• The way babies breathe naturally

• Our breathing pattern changes as we get old for a number of reasons:
  • pressure on women to have a flat stomach
  • certain fashions
  • poor posture
  • anxiety
Diaphragmatic Breathing

- 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

- breathe in through the nose and push the belly out.
- push in on the belly and push air out through the mouth
Diaphragmatic Breathing Practice
Use of Diaphragmatic Breathing

- Emphasis placed on abdominal contribution to respiration during exercise
  - Laying down
  - Sitting
  - Standing
  - Walking
  - Slow running
  - Running fast
Breathing Styles

- Abdominal
- Thoracic
- Clavicular
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
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
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
Typical Session Layout

1. Review homework, past week, strategies
2. Diaphragmatic breathing practice-at rest
3. Diaphragmatic breathing practice-slow walk
4. Walk/Run-practice recovery breath
5. Relaxation
Research case study

- **Sullivan et al.**
  - 20 adolescent female athletes
  - ages 12-17 years
  - One treatment session consisted of: pt/family identifying symptoms, pt/family learning they can voluntarily control behaviors, assessing breathing patterns and training pt/family to breath correctly, prescribe treatment program of practice
Research case study- Speech treatment

- Sullivan et al.
  - Followed for 6 months post treatment via phone call
  - 19/20 reported ability to control symptoms of VCD during exercise for up to 6 months after treatment
  - Asthma medications no longer used in 16/20
  - All continued participation in athletics
Research case study: Speech treatment

• Sullivan et al.

• Conclusion: speech pathology intervention focusing on respiratory control of VCD in adolescent female athletes is an effective treatment resulting in the athletes’ ability to control symptoms of VCD
Biofeedback

• Application of operant conditioning to gain control of visceral, somatomotor, or central nervous system activities

• Offers a direct impact and differential control of excessive involuntary muscle activity

• A training technique in which people are taught to improve their health and performance by using signals from their own body
Types of Biofeedback

- **EEG**: records electrical activity in the brain
- **Respiration**: breath rate, rhythm, volume, location
- **EDA (electrodermal activity)**: records electrodermal response, sweat gland activity
- **EMG (electromyography)**: records muscle activity
- **Heart Rate**: records blood volume pulse and heart rate variability
- **Skin Temperature (thermal biofeedback)**: records blood flow changes
Biofeedback
Biofeedback

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
Case studies
CHOC Children’s Hospital
Orange, CA

• ALL patients:
  1. demonstrated signs of tension
  2. used a clavicular breathing pattern
  3. reported their medications did not improve their symptoms enough to return to their sport
  4. received 6 weeks of speech therapy targeting: tightening/relaxing exercises, diaphragmatic breathing, breathing recovery
Case Studies

- **B. F.-Male, 15 years**
  - **Sports:** basketball, track
  - **Co-diagnoses:** asthma, reflux
  - **Medications:** Prilosec, Nasonex, Advair, and Xoponex
  - **Prior to therapy:** Stopped track, significantly decreased time playing basketball
  - **Results of 6 weeks of speech therapy:** able to return to basketball full time
Case Studies

- **D.J.-Male, 12 years**
  - **Sport**: club soccer
  - **Co-diagnoses**: asthma, allergies
  - **Medications**: Albuterol, Singulair, Veramist, and Claritin D
  - **Prior to therapy**: Significantly decreased time playing soccer
  - **End of 6 weeks of speech therapy**: able to return to soccer full time
Case Studies

- **N.P.-Male, 18 years**
  - **Sports**: football, wrestling
  - **Co-diagnoses**: asthma and allergies
  - **Medications**: Advair, Singulair, Zyrtec D, Maxair, and Protonix
  - **Prior to therapy**: Stopped wrestling, significantly decreased time playing football
  - **End of 6 weeks of speech therapy**: able to return to both wrestling and football
Case Studies

- **J. S.** - Male, 13 years
  - **Sports:** track, cross country
  - **Co-diagnosis:** Pectus excavatum
  - No medications
  - **Prior to therapy:** Stopped track and cross country
  - **End of 6 weeks of speech therapy:** able to return to both track and cross country
References


References


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