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Vocal Cord Dysfunction in the Pediatric Population, presented in partnership with Cincinnati Children's

Presenter: Jan Middendorf, M.A.,CCC

Moderated by:

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Vocal Cord Dysfunction in the Pediatric Population, presented in partnership with Cincinnati Children's

Jan Middendorf, M.A.,CCC

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Learning Objectives for Seminar

- Describe vocal cord dysfunction and its symptoms
- Describe critical history taking as part of the evaluation
- Describe treatment processes for vocal cord dysfunction

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Vocal Cord Dysfunction

- AKA or associated conditions Patel et al., 2015
  - Paradoxical Vocal Fold movement (PVFM)
  - Irritable larynx syndrome
  - Laryngospasm
  - Pseudo or factitious asthma
  - Munchausen's stridor
  - Psychogenic stridor
  - Chronic "habit" cough

What is Vocal Cord Dysfunction?

- Abnormal adduction of the vocal cords
  - Primarily during inhalation, but can also be on exhalation
    - Usually a chink open in posterior
- AKA Paradoxical Vocal Cord Motion
  - Cords should be open on inhalation and exhalation

Symptoms of Vocal Cord Dysfunction

- Creates restricted airway, resulting in air hunger
- Tightness in throat, upper chest
- More difficulty on inhalation than exhalation
- May create audible sound (stridor)
- Person may react with panic
- Resolves quickly, usually 15 minutes or less
- Future episodes MAY result with minimal stimulation
  - Even without exercise

The Irritable Larynx Theory

- Irritation is a multifactorial concept
  - Post nasal drip
  - Occasional reflux
  - Cough
  - External irritant
  - Post viral
- Difficulty occurs when a threshold is passed

Morrison & Rammage 2010
Sandage 2006
Morrison et al., 1999

The Irritable Larynx Theory

- Central Sensitivity Syndrome Morrison & Rammage 2010
- Co-morbidity data recorded
  - Post viral
  - Reflux
  - Anxiety
- Ages 20-77

Evidence Based Research

- Evidence-Based Systematic Review: Effects of Speech-Language Pathology Treatment for Individuals With Paradoxical Vocal Fold Motion, (2015) Patel, Venediktov, Schooling, Wang
  - 3000 articles on VCD
  - 345 relevant
  - All but 65 rejected
  - Only 2 studies contained evidence to evaluate the effect of SLP treatment
- Really in its infancy

VCD in the Pediatric Population

- Age 21 and younger
- Most common age range 14-17
- Some as young as age 6
- Some in college

Types

- In Pediatrics, most frequently seen in
  - Adolescents
    - Middle and elementary school also
  - High achieving athletes
  - High academic achievers
  - Competitive
  - Perfectionist
  - More females than males

Exercise Activities

- Soccer **
- Basketball **
- Cross Country
- Track
- Swimming
- Conditioning for any sport
- Football
- Hockey
- Volleyball
- Dancing
- Gymnastics
- Marching Band

Non-Exercise

- Anxiety
- Reaction to smells, fumes
  - Chemicals
  - Odors
  - Candles

Morrison & Rammage 2010

Sandage 2006

Morrison et al, 1999

Combination Exercise and Odors

- Swimming
  - Exercises
  - Chlorine
  - Indoor vs. outdoor swimming
    - Differences may be suggestive if one or both are the issue

Morrison & Rammage 2010

Sandage 2006

Morrison et al, 1999

History of Management in the Past

- Child begins to have breathing difficulties
  - Often during athletic event
- Evaluated by family physician
- Assumed to have exercise induced asthma
- Placed on asthma medications
- Medications did not work
  - Often left sport

More Current

- Child begins to have breathing difficulties
  - Often during athletic event
- Is evaluated by family physician
- May be presumed to have exercise induced asthma
- May be placed on asthma medications
- Medications do not work

More Current Patel et al., 2015

- Child is referred on to one or more specialists
  - Pulmonologist/Allergist
    - Spirometry
    - Pulmonary function tests – Spirometry done after exercise
- Otolaryngologist
  - Laryngoscopy with our without
    - Exercise
    - Noxious stimuli
- Co-morbid
    - 56% asthma and VCD

Value of Scope

- Scope during/after exercise to capture VCD
  - Trigger VCD with extreme exhalation ★
  - On treadmill
  - Biofeedback ★
  - Practice exercises

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Diagnosis

- Diagnosis still difficult to confirm
- Laryngoscopy with exercise
  - VCD episodic and many not be triggered/captured at time of study
- Differential diagnosis
  - Symptoms and elimination of other diagnoses

Patel et al., 2015

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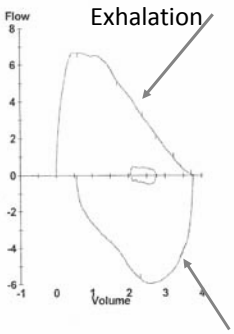
Indications for Bronchoscopy

- Anatomic abnormalities
  - Tracheal stenosis
  - Tracheal malacia
  - Endobronchial lesion or mass
  - Bronchomalacia
  - Tracheomalacia

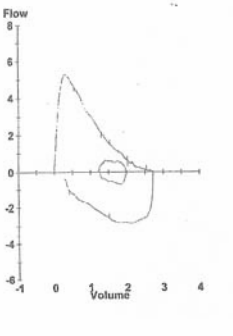
Differential Diagnosis in VCD

- Inappropriate closure of vocal cord on inhalation
  - Less than complete
  - Posterior chink
- Improvement with sniffing (adduction of vocal cords with sniffing)
- Flat, truncated limb of inspiratory flow volume loop of spirometry

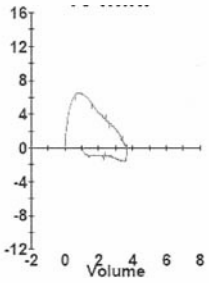
Spirometry Flow Loops



normal inhalation



Asthma scooped out exhalatory



VCD flattened inhalatory

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Differential Diagnosis in VCD

- Tightness in throat/upper chest
  - Stridor (high pitch noisy breathing) ★
- Different from wheezing
  - Exhalation
  - Associated with asthma, bronchitis
    - Lower respiratory

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Differential Diagnosis of VCD

- Laryngopharyngeal Reflux
  - Can trigger VCD
- Asthma
  - Lower respiratory system
- Psychogenic Stridor
  - Sudden onset/offset
- Drug Induced
  - Hours to days

Reported Perceptual Differences

VCD	Asthma
• Inhalation	• Exhalation
• Throat or upper chest	• Chest
• Medications –	• Medications +
• <15 min	• >30-60 min
• One trigger	• Multiple triggers

Observable Differences (Mathers-Schmidt, B. et. al)

VCD
- Stridor inhalation
- Sudden onset
- Rapid recovery
- Negative Methacholine Challenge
- Inspiratory cut off flow loop

Asthma
- Wheezing exhalation
- Gradual onset
- Slow recovery
- Positive Methacholine Challenge
- Expiratory cut off flow loop

Speech Pathology Involvement

- History
- Educate patient and family
- Evaluate-Treat
- Counsel
- Referral to outside sources

History

- Take critical history
  - Tell me how it feels when you have breathing difficulties
    - Difficulty on inhalation
    - Tightness in throat or upper chest
    - Medications do not help
    - Rapid recovery after stopping exercise

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History

- Changes at time of first VCD episode
  - Growth spurt
  - Respiratory infection
    - Pneumonia
    - Flu
    - Whooping cough
  - Change in playing level
    - Jr. High to Sr. High
    - Select level

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History

- Personality traits
  - What kind of grades do you get
    - High achiever (honors student)
  - Competitive
  - Perfectionistic

Hydration

- Water or water based drinks
  - Sports drinks
- ½ of body weight in ounces
- Increase if on asthma, decongestants, antihistamine medications
- Increase on exercise days
- Soft drinks
- “pee pale”
  - Color of lemonade

Evaluation: Reflux

- Typical symptoms reported in addition to cough include:
  - Globus sensation/lump in throat
  - Frequent throat clearing
  - Difficulty swallowing
  - **Sour/acid taste (baby barf)**
  - Throat tickle
- Dysphonia in the morning
- Most children with GERD/LPR do not experience heartburn

Koufman & Block 2008

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Education

- Educate patient and family about VCD
- Anatomy and physiology
- Show video of normal and VCD
- Discuss role of panic and anxiety
  - anxiety anticipating event
  - reaction to event
- Often education is freeing
  - Takes mystery away from event

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WHY?

- Perfect Storm
  - Definition: Combination of forces which aggravate a situation
- Change in sport level + personality type
- Reflux + sport + anxiety

Diaphragmatic Breathing

- Aid patient in identifying
- Teach lying down first
- Work up to mild activity if possible

Emulated Stridor

- Ask patient to produce stridor ★
- Contrast with breathing in through pursed lips
- Try both together

Open/Relaxed Throat Breathing

- Goal: Prevent event or lessen severity
- Inhalation
  - Through small orifice (pursed lips or straw breathing)
  - Through nose
- Exhalation
  - Breath out slowly and controlled on soft “ssss” or /sh/
  - Breath out slowly and controlled through pursed lips (Newsham. et al.) ★

Newsham et al., 1995

In Exercise Activity

- Inhalation
  - Quick sniff through nose
    - Results in vocal fold abduction and is a brainstem reflex.
- Exhalation
  - Exhalation on “sh”
  - Exhalation through pursed lips

Koufman & Block 2008

Practice in Exercise

- Check for cardiac, respiratory issues that would be contraindicated
- Treadmill, stationary bike, run steps, run outside
  - Assure that they can slow down or stop if needed
    - Try to breathe through any event
- Rate breathing on 1-10 scale
  - 1 = no difficulty
  - 10 = maximum difficulty you could imagine (I can’t breathe)
- Re-rate breathing during exercise

Practice in Exercise

- Start with walking
  - Practice breathing strategies ★
  - Increase speed/incline
  - Practice breathing strategies
  - When first sign of symptoms occur, implement breathing strategies ★

Caveats

- Keep patient under their threshold for full VCD event
  - Goal is to control and reduce symptoms
  - Patient gains confidence with positive results
- Let patient play with patterns of breathing ★
- Swallow
  - Vocal cords close on swallow
  - Swallow can disengage paradoxical position

Cough (Gallena, S. et.al, (2013) Vertigan, A. E. et.al (2007).

- Cough and VCD may be linked, different manifestations of same condition (Vertigan, et al)
- Educate swallow function
- Sufficient hydration
- Awareness of "need" to cough
  - Throat tickle, globus sensation
- Substitute swallow for cough
- VCD breathing techniques
- Engage vocal cords-talk, hum, sing
- Visualize being in library, church, need to delay cough

Post Evaluation Counseling

- Set realistic expectations
  - Answer questions honestly
  - Families may expect immediate change
  - Expect to be able to successfully use strategies in upcoming tournament

Progressive Relaxation Exercises

- Progressing relaxation exercises (Jacobson) progressive relaxation with controlled breathing
  - CD with exercises
- Muscular skeletal tension
- Thoracic breathing pattern

Follow-up

- Need for follow-up varies
- 2-4 sessions
- Call to report success after 2-3 weeks

Referrals

- Counseling
  - Anxiety
- ENT
  - Scope if questions about anatomical issues
- Primary care or referral source
  - Reflux management

Summary

- VCD is a complex set of symptoms, which can be easily misdiagnosed
- SLPs take critical history taking as part of the evaluation
- Evaluation/Treatment includes education, hygiene, breathing exercises, counseling

Case Study #1

- 16 yr old female, referred from Pulmonology
- Symptoms: tightness in neck, noisy breathing, trouble getting air in and out. Meds of no help
- Swimmer – symptoms noted 4 months ago
  - ↑ Symptoms with indoor swimming
- – Methacholine challenge
- + personality traits
- Known reflux, on medication with some improvement
- Good hydration
- Excellent condition
- Thoracic breathing pattern

Case Study #1

- Ran up to 8 MPH
- Symptoms
  - difficulty on inhalation, tightness in upper chest and rapid recovery after cessation of activity
- Benefit with sniff ★

Case Study #1 Recommendations

- Breathing exercises in a practice regime of 5 inhalations/exhalations 7-10 times per day
- Trial out breathing walking by indoor pool
- If additional sessions needed
  - Expose to noxious smells of chlorine

Case # 2

- 13 year old, referred by Allergy
- VCD symptoms trigger coughing, often explosive, often related to stress
- Noted in past 4 months
- Normal spirometry, [redacted] Methacholine
- Triggered by stressed, anxious, engaged in exercise, or in cold weather
- Symptoms increased when more than one trigger
- Personality – stress
- Hydration: 60 oz water. 3 cans of soda per week
- Thoracic breathing

Case # 2

- Very aware of symptoms ★
- Reported “taste of throw up”
- Treadmill, 3 MPH
- Difficulty on inhalation, tightness in throat/upper chest, audible breathing ★
- Breathing in through pursed lips, slow nasal inhalation, slow exhalation and sip of water
- Taught long hard swallow

Case # 2

- 5 weeks
  - “He is markedly improved in his coughing. He is doing his breathing exercises and eliminating the coughing episodes. His stress level has significantly diminished.
  - Child stated “I feel empowered."

Case Study # 3

- 15 yr old – one incident
- Treated for asthma
- Cheerleading
  - Sensation of throat closing
  - Hot, humid day
- High academic achiever, competitive, perfectionistic
- Now well hydrated
  - 60 oz water, but new behavior

Case Study # 3

- Mixed thoracic and diaphragmatic breathing
- Treadmill: 5 MPH with slight incline
- Benefited with deep nasal inhalation, slow exhalation and sip of water. ★
- Perfect storm
  - Asthma+exercise+weather
- Family had ?s about use of inhaler
  - Directed back to allergist

Case Study # 4

- 10 yr old
- Poorly controlled asthma
- VCD symptoms, no particular activity
- Competitive, feels a lot of stress
- Reflux?
  - Clears throat frequently
  - Taste of “throw up”
  - Voice worse in morning
- Poorly hydrated, soft drink every day

Case Study # 4

- Treadmill: walked
- ✚ Sip of water ★
- Eventually did improve using breathing strategies
- Able to identified improvement ★

Case Study # 4

- Referral to assess reflux
- Increase hydration
- Decrease/eliminate soft drinks
- Breathing exercises

Questions?

Thank You

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