The Great Imitator
Vocal Cord Dysfunction

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Learner Outcomes

• Explain the diagnosis of VCD
• Discuss the assessment process for VCD for adequate care plan development
• Describe specific intervention techniques and strategies for maximizing patient outcome
Introduction

• Vocal Cord Dysfunction
  • A phenomenon only recently understood
  • AKA:
    • Paradoxical Vocal Cord Movement
    • Laryngeal Dysfunction
    • Factitious Asthma
    • Irritable Larynx
  • Cause is debated
    • Frequent psychological overtones
    • Organic factors are present
  • Rare: Estimated less than 1:100,000
  • Diagnosis and treatment depends on practitioner’s awareness of condition
Historical Perspective
Historical Perspective – 19th C.

- **Laryngismus Stridulus**
  - “Short or prolonged accessions of suffocation, depending on tonic spasm of the adductor muscles of the larynx... causing closure of the glottis and a sudden arrest of inspiration”
  - “It is purely a nervous disease; it is unaccompanied by any inflammatory affection of the larynx or air passages”

- **A Dictionary of Medicine**
  - Roberts, Bruce, and Armstrong
  - Longmans, Green and Co., 1894
Historical Perspective – 19th C.

- Paresthesia Laryngis
  - “the larynx is the seat of various perverted and unaccountable sensations”
  - “not uncommon in anaemic, hysterical, and hypochondriacal patients”

- A Dictionary of Medicine
  - Roberts, Bruce, and Armstrong
  - Longmans, Green and Co., 1894
Historical Perspective – 20th C.

• Munchausen’s Stridor
  
  • Intermittent inspiratory stridor caused by somatic manifestations of psychological factors
    
    • Asher, R. Munchausen Syndrome. Lancet, 1951
    • Patterson et al. Munchausen Stridor: Non-organic Laryngeal Obstruction. Clin Allergy, 1974
Historical Perspective – 20th C.

• Why would a psychogenic cause be suspected?
  • Typical personality traits (anxious or “type A”)
  • Emotional or physical stresses seem to cause symptoms to flare
  • Although some cases cause true airway distress, most do not
  • Symptoms do not occur during sleep
  • Oxygen saturation is usually maintained

• There is not usually another apparent cause
Historical Perspective – 20th C.

• Vocal Cord Dysfunction
  • Patients with apparent intractable asthma were found to have a distinct laryngeal disorder affecting the inspiratory cycle, causing intermittent stridor


• This is the first “Aha!” moment
Vocal Cord Dysfunction - 1983

• Christopher et al, 1983:
  
  • What causes it?
    • “Possible form of conversion disorder”
    • Still assumed to be psychogenic
  
  • What do we do about it?
    • Effective management using a combination of Speech Therapy and psychotherapy
Concurrent Advances

• **1980s – 1990s**
  
  • Emerging science of Neurolaryngology
  
  • Developing an understanding of the treatment of Spasmodic Dysphonia as a **Focal Dystonia**
    • Andrew Blitzer, MD and Michael Brin, MD
  
  • Neuroscience of the vocal tract
    • Christy Ludlow, PhD
VCD – The Aha! Moments

⭐ VCD is a distinct disorder affecting the larynx during respiration

⭐ VCD has features to suggest a focal dystonia of the larynx

⭐ Laryngeal neurologic control can be affected by manipulating inflammation and muscle tone in the larynx itself
VCD Revisited

- **Prospective study, 2012**
  - 47 VCD patients identified by history, laryngoscopy, and airflow testing

- Psychological profile given

- Data support conversion disorder component
  - Primary cause in 20% of subjects
  - Present as a factor in 70% of subjects

- Medical cofactors are important to control, and were present in 75% of subjects (esp. asthma)

- Forrest et al. in Laryngoscope, 2012
VCD Revisited

• 2012 study raises the next questions to be answered:

  • If VCD is a conversion disorder in some patients, how do patients without psychological issues develop the same symptoms?

  • What is the relative importance of neural control of the larynx, sensorimotor changes in the larynx, and psychological state?
What we know now
VCD-now

• Distinct condition (features of focal dystonia) that affects vocal cord function during respiration

• Typical features
  • Intermittent stridor
  • Cough
  • Normal voice
VCD-now

• Intermittent hyper-adduction of the true vocal cords during inspiration
  • Reversal of normal physiology

• Dynamic obstruction of the glottic airway, producing inspiratory stridor
VCD-now

• The problem is over-contraction of the vocal cords during inhalation in the apparent absence of other pathology...

• Psychogenic overtones and other conditions contribute
Pre-assessment Thoughts
The Art of Medicine

• With observation comes understanding

• Sometimes patients are more complex than they seem...

• Differential diagnosis is critical to accurate identification of disease and proper treatment
Misdiagnosis

• Results in unnecessary treatments such as use of corticosteroids and other asthma medications
• Possible intubation and tracheostomy
• Delayed diagnosis and treatment
  • Prolongs anxiety
  • Excludes participation (athlete)
Common Denominators

• Wide age range (teens – 50’s)
  • Majority between ages of 10 and 40
• Generally healthy people
• Female predominance (~ 3:1)
• Features include:
  • Intermittent stridor
  • Cough
  • Usually normal voice
• Failure to respond to asthma medications
• High level of frustration, some anxiety
• Delay in diagnosis and effective therapy
Assessment
Components

• History and Examination/Observation
• Acoustical Perception
• Laryngoscopy
• Respiration
• Laryngeal Function
• Tension and Oral Motor Function
PATIENT INTERVIEW
VCD - History

• Medical cofactors
  • Allergy
  • Reflux
  • Sinusitis/Postnasal drip
  • Asthma

• Triggers
  • Upper respiratory infection
  • Exercise
  • Chemical exposures (chlorine, glutaraldehyde, etc.)
  • Emotional stress or anxiety
  • Smoke
  • Others (singing, laughing, coughing)
  • None identifiable
<table>
<thead>
<tr>
<th>Describe your symptoms</th>
<th>When did your symptoms begin?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Are your symptoms the same, better or progressively worse?</td>
<td>Show me or tell me where you feel the tightness.</td>
</tr>
<tr>
<td>While breathing do you make a sound?</td>
<td>Do you feel tightness when you breath in or out or both?</td>
</tr>
<tr>
<td>What makes you have an attack (exercise, environment, stress/anxiety, or other)?</td>
<td>How long do your attacks last? What has been your shortest/longest attack?</td>
</tr>
<tr>
<td>What do you do when your throat gets tight? Did it work?</td>
<td>How long does it take you to recover from an attack?</td>
</tr>
<tr>
<td>Do your symptoms occur at a specific time of the day or night?</td>
<td>Are there others where you work/live that have these attacks?</td>
</tr>
<tr>
<td>Question</td>
<td>Follow-Up</td>
</tr>
<tr>
<td>-------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------</td>
</tr>
<tr>
<td>In general how is your health?</td>
<td>Are your currently under medical care for other conditions?</td>
</tr>
<tr>
<td>Do you have Asthma? Do you use inhalers for your Asthma?</td>
<td>Do you have any allergies? How to you treat your allergies?</td>
</tr>
<tr>
<td>Are you ever awakened by your symptoms?</td>
<td>Do you have reflux? How long? How do you treat your reflux?</td>
</tr>
<tr>
<td>How often do you work out or exercise?</td>
<td>Have you ever been treated in the ER for your symptoms? How were you treated and did it help?</td>
</tr>
<tr>
<td>Have you ever used inhalers for your symptoms and did it help?</td>
<td>Tell me about your current diet.</td>
</tr>
<tr>
<td>Has your voice quality changed? Describe those changes.</td>
<td></td>
</tr>
<tr>
<td>Do you have any history of anxiety and/or depression?</td>
<td>Do you have any history of emotional and/or physical abuse?</td>
</tr>
<tr>
<td>-------------------------------------------------------</td>
<td>----------------------------------------------------------</td>
</tr>
<tr>
<td>Have you ever had an eating disorder?</td>
<td>Have you had any recent and significant life changing events?</td>
</tr>
<tr>
<td>Describe any recent increases in stress.</td>
<td>Are you currently a student? How are your grades? What are your extracurricular activities?</td>
</tr>
<tr>
<td>What is your current occupation? Describe your position. Describe your work environment?</td>
<td>Tell me about your personality. Are you shy, outgoing, driven, etc.?</td>
</tr>
<tr>
<td>Typically how do you handle stressful situations?</td>
<td>Do you have siblings? How old are they?</td>
</tr>
<tr>
<td>Tell me about your home life?</td>
<td>What do you do outside of work/school?</td>
</tr>
<tr>
<td>Do your symptoms stop you from participating in certain activities?</td>
<td>How do others perceive your problem?</td>
</tr>
</tbody>
</table>
Assessment
Acoustical Perception
The Noise

• Dysphonia
• Wheeze (NOT present)
  • Expiratory, due to collapse of small bronchioles

• Stridor
  • Inspiratory Above the clavicles (PRESENT)
  • Expiratory Below the clavicles
  • Biphasic Above or below
Assessment

Laryngoscopy
Laryngoscopy Findings

- Normal anatomy

- Apparently normal cord movement in absence of symptoms

- With symptoms, cords adduct during inhalation
  - May require provocation (exercise, hyperventilation)

- Sometimes there is evidence of inflammation, but it is not always present
Laryngoscopy Findings, cont.

- "Classic" finding
  - Inspiratory phase anterior cord adduction with posterior chink

- Careful observation is important
  - May have subtle increased muscle tone
  - Slightly delayed abduction with inspiration
  - Slight adduction at transition to exhalation, with increased muscle tone during exhale
Assessment

Respiration
Spirometry and Flow-Volume Loop

- Cornerstone of diagnosis
  - Flattening of the inspiratory loop with essentially normal lung volumes
  - No response to bronchodilators
The Flow-Volume Loop
Glottic Efficiency

• Measure of Respiration
  • Sustained /a/
  • Sustained /s/
  • Sustained /z/

• Visual observation while resting and phonating
  • Identify breathing pattern
    • Abdominal/Diaphragmatic
    • Clavicular
    • Thoracic
    • Combination
Assessment

Laryngeal Function Testing
• Connected Speech
  • Mean Fo
  • Semitones
• Sustained /a/
  • Mean Fo
  • Standard Deviation of frequency
  • vFo
  • RAP (jitter)
  • Mean energy
  • Mean Shimmer
  • Noise-to-Harmonic Ratio (NHR)
  • Voice Turbulence Index (VTI)
• Pitch Range
  • Range
  • Semitones
Assessment

Tension and Oral Motor Function
• Laryngeal Musculoskeletal tension
  • Laryngeal Palpation
  • During speech and while at rest

• Oral Motor
  • Rate during speech and nonspeech
  • Size
  • Shape
  • Symmetry
  • Function (movement, range, speed, coordination)
Video Sample
VCD and Reflux
Treatment of Vocal Cord Dysfunction
Types of Treatment

• Medical Intervention

• Psychotherapy

• Speech-Language Pathology
Treatment
Medical
Patient Education
- Physician review and discussion of findings
- Review of laryngeal examination

Terminate/Taper Nonessential Medications
- Misdiagnosis (asthma)

Additional Medications for the Treatment of Contributory Conditions
- GERD, Rhinosinusitis and Allergies
• Less Common Short Term Medical Treatments:
  • Heliox
    • 70% Helium and 30% Oxygen
    • Low density, easy to inhale
  • Continuous Positive Airway Pressure (CPAP)
    • Relieves Dyspnea
    • Slows the expiratory flow, increases lung volume, opens glottis
  • Sedative or antianxiety drugs
    • Not usually indicated
    • Discontinued with use of strategies
  • Tracheotomy
    • In severe cases only
Treatment
Psychotherapy
• **Purpose:**
  • Provides a support system
  • Allows patient to express fears
  • Allows patient to discuss their care
  • Provides support to patient for the positive changes they make

• **Types of Treatment:**
  • Reduce exposure to triggers
  • Recognize emotional stresses that elicit VCD
  • Express corresponding emotions from least to most difficult
  • Relaxation Therapy
  • Develop new coping strategies
  • Hypnotherapy
  • Goal is to gain control of situations that trigger VCD
Treatment
Speech-Language Pathology
• Speech Therapy is considered the first line of treatment for VCD and is often sufficient to change this disorder

• Success of treatment is dependent on several factors
  • Understanding of the complexity of the disorder
  • Ability to readily identify symptoms characteristic of VCD
  • Expert intervention skills to create a unique plan of care tailored specifically to meet the needs of our patient
• Typically NOT long-term treatment

• Patient should respond to treatment within the first three sessions
  • Beyond three session consider:
    • Psychosocial issues
    • Undiagnosed underlying pulmonary problems
    • Impact of medications
    • Patient’s home practice/implementation
Primary role of the Speech-Language Pathologist is to teach the patient how to control the larynx using various techniques and lifestyle changes to maintain a relaxed and open airway during inhalation and exhalation.

Ways we accomplish this include:

- Education
- Supportive counseling
- Exercises
Patient Education

• Discuss assessment results

• Discuss vocal subsystems

• Discuss vocal cord dysfunction
Education

Speech-Language Pathology
Patient Education: Assessment Results

• Review medical findings
  • Respond to patient questions
  • Educate further as needed

• Show support of recommendations - Divide and conquer
  • Continue or discontinue medications such as for asthma
  • Manage allergies or sinusitis
  • Manage reflux
Patient Education: The Vocal Subsystems

Discuss normal physiological processing between vocal subsystems simultaneously with assessment results

• Respiration
  • System that supports vocal fold movement
  • Discuss glottic efficiency such as the /s/:/z/ ratio
  • Discuss the mechanics of breathing

• Phonation
  • Laryngeal Function
  • Discuss the element of muscle tension

• Resonance
  • Shaping of the sound waves to formulate speech
  • Typically preserved
Patient Education: Vocal Cord Dysfunction

Discuss the key features of VCD

• Associated medical diagnoses-Drive it home
  • GERD
  • Post Nasal Drip
  • Allergies

• What happens with VCD?
• How is VCD diagnosed?
• What can trigger VCD symptoms?
• How is VCD treated?
• Why Speech Therapy?
Support
Speech-Language Pathology
Supportive Counseling

• Acknowledge the patient’s fears

• Support their feelings that this is a real disorder and not “all in their mind”

• Provide the patient with encouragement

• Discuss evidence and clinical based findings that speech therapy is proven successful

• Provide reputable resources (i.e. websites)
Exercises
Speech-Language Pathology
Exercises: Tension Reduction

Relaxation Exercises

• Yawn/Sigh
  • Oropharyngeal
  • Tongue
  • Jaw

• Lip and Tongue Trills
  • Vocal Folds

• Progressive Relaxation
  • Entire body
Exercises: Relaxed Throat Breathing

• Behavioral approach

• Assumptions:
  • Coordination of the laryngeal apparatus during inspiration is considered an unconscious, reflexive function of the brainstem
  • This unconscious function can be moved to a conscious cortical level

• Goals:
  • Increased use of abdominal breathing
  • Open throat breathing
  • Focuses on exhalation
  • Increase self-awareness and self-control of breathing sequence
Exercises: Relaxed Throat Breathing

• Prepare patient for relaxed inhalation
  • Tongue of floor of mouth
  • Lips gently closed
  • Jaw gently released

• Encourage general relaxation throughout
  • Release shoulders, chest, and neck
  • Focus on “letting” the air in and out

• Remind the patient that the tightness/stridor can be resolved using breathing exercises
Exercises: Relaxed Throat Breathing

• Inhalation Methods

  • Gentle shortened /h/

  • Gentle shortened sniff in through nose

  • Gentle shortened sip with pursed lips
Exercises: Relaxed Throat Breathing

• Exhalation Methods
  • Controlled
  • Slow
  • Adjusted with physical level
• Sounds “h”, “s”, “sh” or “f”
• Explore apps for visual feedback
  • Android-Paced Breathing (free)
  • IOS-still looking for a good one
Exercises: Relaxed Throat Breathing

• Practice Schedule
  • Begin with daily practice 3-5 repetitions each
  • Increase to a criteria focused on time

• Spread out throughout the day
  • Morning
  • Noon
  • Before bedtime
  • Before medications
  • Simply as it fits into patient’s schedule
Trigger Management
Chronic Cough and Throat Clearing

• Determine whether the trigger has become a habit
  • If a habit apply behavior modification in combination with vocal hygiene

• Identify the irritants
  • Strategies to reduce effects of irritants
    • Increase water intake (at room temperature)
    • Fight the sensation
    • Consistently take medications
    • Use an agent to increase secretions such as a lemon drop
SPEICH-C

- Educate
  - No physiological benefit from cough
  - Develop voluntary control over coughing

- Strategies to control
  - Identify warning signs
  - Replace cough: modified swallow, pursed lip breathing, relaxed throat breathing

- Psycho-educational counseling
  - Set realistic goals
  - Acceptance that treatment is hard
  - Internalizing ability to control

- Vocal hygiene education
  - Increase Hydration
  - Decrease exposure to source of irritation

Asthma

Co-exists in about 40-60% of patients

- 370 athletes
- 5.1% with inspiratory VCD
- 53% with related exercise-induced bronchospasm (EIB)

- Attempt Relaxed Throat Breathing for five minutes
- Use mouthpiece of inhaler **without** medication
- Repeat breathing using inhaler mouthpiece
- After 15 minutes if breathing not restored use inhaler **with** medication

Allergies

- Immediately treat with medications
  - Oral and nasal
- Begin Relaxed Throat Breathing exercises
- Incorporate Lip and Tongue Trills for additional relaxation and voice restoration
Environmental Irritants

• Begin relaxed throat breathing
• Focus on audible and tactile feedback
• Intermittently attempt to resume normal breathing patterns
• Consider training desensitization techniques
Environmental Irritants

Desensitization

• Identify the Irritant
• Begin Relaxed Throat Breathing
• Locate the irritant
• Expose self quickly while maintaining Relaxed Throat Breathing
• Recover if needed
• Repeat procedure with a gradual increase in exposure
Exercise Induced

• Goal: Train patient to let ribcage breathing support the pace and not force the breathing to match the pace.

• Rationale: This pattern of breathing responds quicker than lower abdominal breathing when rapid breathing is required in such cases as with athletes.
Exercise Induced: Relaxed Throat Breathing

• Ribcage movement procedures:
  • Instruct patient to place their hands on their ribcage
  • While inhaling cue patient to notice expansion of the ribcage and while exhaling the contraction of the ribcage
Exercise Induced: Hierarchy

Train patient to become aware of breathing from behind their nose with lips gently closed or in front of mouth using pursed lips to inhale and exhale feeling the air release over their lips as they blow out

- Practice several times while standing and convert to sitting if applicable
- Discuss with the patient to prepare for the change in breathing as the intensity of the activity increases
- Begin slowly and gradually allowing patient to integrate new breathing into activity/sport
- Maintain breathing and gradually increase the pace
- Keep hands on ribcage for tactile feedback and remove once breathing pattern has been established and consistently maintained
Exercise Induced: Track Athlete

- Walk while maintaining ribcage breathing
- Increase pace of walking with continued focus on ribcage breathing
- Once pattern is maintained, increase the pace of walking
- Move into a slow, brief jog and return to a rapid walk
- Increase intervals of slow jog always returning to a rapid walk
- Goal: Maximum performance with new focus of breathing
Scaffolding

• In cases where athlete cannot increase pace while maintaining breathing or there is an onset of constriction:
  • Slow down the pace immediately
  • Bring back to baseline where the patient is able to maintain ribcage breathing
  • Start hierarchy over again
Exercise Induced: Swimmers

• Anaerobic
  • Breathing cycle is altered
  • 3 out of 4 strokes (freestyle, butterfly and breast stroke) swimmer’s face is in the water
  • At least 50% of the time
  • In fourth stroke (backstroke) bombarded with water splashing in face
    • Rapid rotation of arms/shoulders
Exercise Induced: Swimmers, cont.

- “Sip” breath through slightly parted lips
- Forcefully exhale to empty the lungs of breath
  - Creates a negative pressure in the lungs, needs equalized
  - Physiological response:
    - vocal folds abduct allowing maximum airway size
    - Air pressure will equalize
    - Lungs will inflate for next breath cycle
- Outside of water use exercise ball
  - Mimic strokes with relaxed breathing
Exercise Induced: other sports and physical activity

- Always begin with an evaluation of the patient’s body movement and patterns during their chosen sport/activity
- Always start using a slow pace
- For example:
  - Basketball, hockey, and soccer
    - Movement is constant
    - Inhalation occurs with movement of the ball or puck while in motion
  - Tennis
    - Fast movements
    - Moments of down time while waiting for opponent to return
    - Serving requires inhalation with forceful exhalation
Treatment Outcomes

Case study

- 13 year old female; academically bright student with a supportive home environment
- One year history of vocal-respiratory problems
- Cardiac and pulmonary pathologies were ruled out
- Pharmacological management for exercised-induced asthma negative
- Symptoms included episodic chest tightness with decreased ability to obtain a full inhalation and identified as “vocal attacks”
- Anxiety reported to increase during and after vocal attacks
Assessment Findings

• Predominate clavicular and antero-posterior chest expansion with minimal lateral expansion or abdominal breathing

• Vocal Fold function WNL
  • Mean Fo of 209 Hz for habitual pitch
  • 14.6 average MPT
  • Perceptually voice quality
Treatment Goals

• Education of the patient and parents
  • Respiratory mechanism
  • How respiration impacts laryngeal performance
• Reduction in both the frequency and duration of the vocal attacks
• Duration of treatment
  • One session per week for two months with three bi-monthly sessions
Techniques

• Relaxation exercises including visual imagery ("Floating in Space") for a general relaxation
• Respiration Techniques to facilitate and compensate during vocal attacks
• Exposure to physical activities
  • Simultaneous monitoring of respiratory performance
  • Pulse oximeter
  • Subjective reports
  • A log maintained coding the occurrences and circumstances/triggers for each of the vocal attacks
Objective Findings

- Progressive decline in the first four months
- Decrease from one per week to zero for an entire month
- Duration decreased from a baseline of 15 minutes to an average of 2.22 with intervention
- Six month follow-up reassessment revealed maintenance with no vocal attacks reported by the subject.
Subjective Findings

• Breathing patterns observed to be diaphragmatic/abdominal

Subject statements:
• Ability to self monitor and modify breathing while playing basketball
• Able to remain on her basketball team due to these changes
• Improved performance in basketball
• Increased her confidence to handle vocal attacks
Plan of Care

• Develop 3 case history questions
• Develop 3 intervention goals
• Discuss 3 exercises to be used in therapy and rationale
Typical Case #1

- 17 year old female swimmer
- Previously healthy
- Driven personality (type A)
- Sudden onset “exercise induced asthma”
  - Dyspnea and stridor with exercise
  - Several ER visits
  - Inhalers and steroids of little to no value
- Tests for asthma are negative
- Patient and family are distressed and frustrated
Typical Case #2

- 46 year old female
- Occasional reflux, peri-menopausal
- Recently divorced, but independent
- Progressively worsening chronic cough, recently worse, and now having occasional “breathing attacks”
- Has had ER visits for “asthma”
  - In ER, oxygen levels are always OK
- Now missing work and becoming “stressed” and frustrated
Typical Case #3

- 50 year old male, former respiratory therapist
- High blood pressure, controlled
- Cough started after a “cold” 6 months ago, and now gets “wheezing” after bouts of coughing
- Perfumes and smoke may trigger symptoms
- Asthma medications of little help
- Cough suppressants of little help
- Becoming progressively more incapacitated by breathing symptoms
Typical Case #4

- 55 year old female
- Anxious personality type
- Abrupt onset of “asthma” after laparoscopic surgery 8 months ago
- “Asthma attacks” are severe, prompting 911 calls
  - Intubated in ER three times, admitted to ICU, and discharged home in 3-5 days each time
  - Has been told that her anxiety makes the asthma symptoms worse, and that intubation was a “precaution”
- Becoming very anxious about recurrences and unpredictability of condition
- Feels completely out of control
Take Away Points

• A complex disorder-embrace it
  • The symptoms are not always straightforward so don’t attempt to condense but address ALL possible symptoms

• Diagnosis, assessment, and treatment of VCD involves a variety of medical professionals

• Knowledge of normal function of vocal subsystems is crucial

• Understanding the key function of relaxed throat breathing and other techniques crucial for best practices

• Treat each patient uniquely by designing a treatment plan according to their medical history and reactions to initial intervention
References


