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Paradoxical Vocal Fold Motion

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Paradoxical Vocal Fold Motion

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Presentation of Pathophysiological Process

What is it?

Laryngoscopy figures

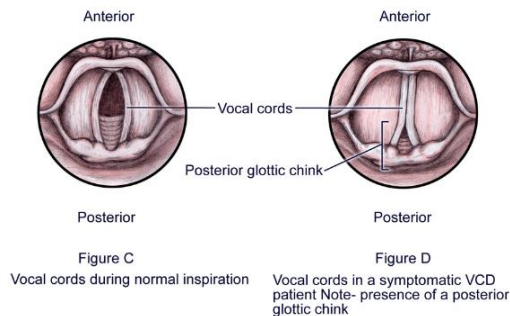


Table 1. Normal inspiration vs. VCD inspiration

Paradoxical vocal fold motion (PVFM), otherwise known as vocal cord dysfunction (VCD) is an abnormal degree the vocal folds adduct upon inspiration causing airflow narrowing. This restriction can cause severe dyspnea and can be misdiagnosed as asthma. The cause of the abnormality related to PVFM has not been directly recognized, but multiple factors or triggers are associated. It is this lack of clarity and association with asthma, exercise, extubation, stress, and gastric reflux that I take interest in this pathology. I have a personal connection with exercise induced asthma. In addition, my sister in-law was recently diagnosed with VCD who had previously been diagnosed solely with exercise induced asthma. The new diagnosis was reached after inhalers were proving ineffective. My lack of knowledge on the treatment of paradoxical vocal fold motion is another source of curiosity and cause for choosing this topic. The normal physiology of the vocal folds are to abduct (opening the airway) upon inspiration and slightly adduct (close the airway) upon expiration (Cohen, 2010). The normal abduction during inspiration to decrease airway resistance and slightly adducted with expiration to prevent alveolar collapse (Cline and Davis, 2006). With vocal cord dysfunction the vocal folds paradoxically adduct upon inspiration and or expiration (with expiration adduction is a higher degree than normal) (Mansur, 2013).

Signs and Symptoms

The presentation of vocal cord dysfunction is dependent on the individual. Common symptoms include: cough, hoarseness, throat and neck tightness, anxiety, choking, dizziness, sighing, noisy breathing (stridor), frequent clearing of throat, and dyspnea (MacConnell and Danielsen, 2014). Symptoms of VCD and asthma can be similar and often misdiagnosed. In VCD the patient will often report the source of airway tightness in the neck or upper sternum, where as in asthma the tightness reported is often in the chest (MacConnell and Danielsen, 2014). It is important to note that VCD is an upper airway obstruction mostly upon inspiration, while asthma is more associated with difficulty upon expiration (Deckert and Deckert, 2010). The sound of vocal cord dysfunction will present as an inspiratory monophonic wheeze, where as asthma will cause a polyphonic wheeze (Morris, 2015).

Underlying Pathophysiology

The underlying pathophysiology of vocal cord dysfunction is not well defined as causes are multifactorial. There are many associated causative factors to VCD, but there is no clear unifying pathophysiology (Deckert & Deckert, 2010). Inferred from the research, it seems that all of the causative factors are related to some sort of stress including mechanical, chemical, and psychological components. These associated factors include: exercise, psychological conditions, irritants, rhinosinusitis, gastroesophageal reflux disease, endotracheal intubation, and medications (Deckert & Deckert, 2010). A common causative factor is exercise, often misdiagnosed as exercise induced asthma, exercise can precipitate VCD (Deckert & Deckert, 2010). Success or failure of bronchodilators can help diagnose exercise induced asthma from VCD (Deckert & Deckert, 2010). Psychological conditions like posttraumatic stress disorder, anxiety, depression, and panic attacks can incite VCD as well (Deckert & Deckert, 2010). Anxiety being of high prevalence in teenage patients with vocal cord dysfunction (Deckert & Deckert, 2010). Environmental and chemical irritants are known to cause symptoms of VCD as well. Studies have shown an associated onset of symptoms with time of exposure to irritants like ammonia, moist buildings, dust, smoke, soldering fumes, and cleaning chemicals (Deckert & Deckert, 2010). There is a high prevalence of rhinosinusitis and patients that present with vocal cord dysfunction (Deckert & Deckert, 2010). Postnasal drip associated with rhinosinusitis is linked to airway hyperresponsiveness and another possible contributor to VCD (Deckert & Deckert, 2010). Endotracheal intubation has been directly associated with the pathogenesis of vocal cord dysfunction. In one study an endotracheal tube caused neurologic injury to the recurrent laryngeal nerve and resulted in dysphonia and VCD (Kupfer, Callaghan, and Hogikyan, 2014). Gastroesophageal reflux disease has been associated with high prevalence in vocal cord dysfunction (Deckert & Deckert, 2010). Neuroleptic drugs such as phenothiazines (Compazine, Phenergen) may cause transient VCD as well (Deckert & Deckert, 2010).

Significance of pathophysiology

The significance of paradoxical vocal fold motion or VCD and its pathophysiology can be found in its incidence, misdiagnosis, and emergency response. The incidence of VCD is estimated at 3% of the population with a female to male ratio of approximately 3 to 1 (Cohen, 2010). There is a significantly higher incidence in competitive athletes, high achievers, and healthcare professionals (Cohen, 2010). Another reason PVFM is significant is that it is often misdiagnosed as asthma. PVFM sufferers are often diagnosed with exercise induced asthma and unnecessary treatments like beta adrenergic agonists, corticosteroids, hospitalization, and mechanical ventilation occur (sometimes even tracheostomy placement). The appropriate diagnosis of PVFM is commonly delayed by 5 to 10 years (Marcinow, Thompson, Chiang, Forrest, and deSilva, 2013). If healthcare providers were trained to recognize this diagnosis earlier, many unnecessary treatments could be avoided. Over reactive emergency treatments could be avoided as well. In anesthesia, anesthesiologists are often called to treat emergent airway situations like stridor. It is important to be able to recognize vocal cord dysfunction over other more common diagnoses causing stridor such as laryngospasm, laryngeal edema, and aspiration because treatments can range from anti-biotics to tracheal intubation to opioid administration (Neustein, Taitt-Wynter, and Rosenblatt, 2008).

Flow volume loops

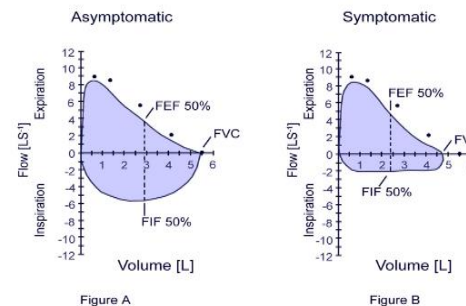


Figure A - Normal inspiratory and expiratory loops
Figure B - Truncated inspiratory loop suggestive of variable extra thoracic large airway obstruction and normal expiratory loop.
This is pathognomonic of paradoxical vocal cord motion.
FVC - Forced vital capacity
FEF 50% - Forced expiratory flow 50%

Table 2. The flattening of forced inspiratory flow is indicative of PVFM

Implications for Nursing Care

The significance of VCD recognition has many implications to nursing care. It is important for nurses to recognize vocal cord dysfunction and control possible precipitating factors (Cohen and Bellucci, 2011). Appropriate recognition and management of VCD has been found to reduce emergency room visits, hospitalizations, acute office visits, job and school absenteeism, medication costs, and increases in patient productivity and quality of life (Cohen and Bellucci, 2011). Nurses can also help misdiagnosed asthma patients understand VCD and help with the psychosocial aspect of weaning off inhalers, reducing exposure to triggers, hydrating, and reducing stress (MacConnell and Danielsen, 2014). Nurses can also comfort patients with education about treatments like speech therapy that allow the patient to achieve significant improvements in symptoms (MacConnell and Danielsen, 2014).

Conclusions

Researching paradoxical vocal fold motion has led me to better understand the pathophysiology, misdiagnosis, and implications of the diagnosis. This understanding will help me communicate with others about VCD and teach about it. Knowing that something can cause such a disruption with breathing, use many healthcare resources, and can be well controlled with proper guidance gives me confidence to continue my research and communicate with others what I have found. It will be interesting to learn more findings of research such as the effects of smoking on VCD.

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