

EDITORIAL

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Dysfunctional breathing in children and adolescents

Niggemann et al. (1) have addressed an important issue, dysfunctional breathing as a cause of respiratory discomfort. They give as examples vocal cord dysfunction (VCD), hyperventilation syndrome, habit cough and sighing dyspnoea. These disorders must be considered in the differential diagnoses of respiratory symptoms in children and adolescents. While there are no controlled clinical trials evaluating treatment for these disorders, there is considerable observational experience to provide guidance for clinicians encountering one of these.

VOCAL CORD DYSFUNCTION

Vocal cords that do not abduct during inspiration result in stridorous breathing and dyspnoea (2). The most commonly observed physiologic malfunction of the vocal cords during symptomatic VCD is paradoxical movement with active adduction on inspiration and relaxation during expiration. Stridor is then present on inspiration when the adducted vocal cords are causing obstruction to airflow. A video clip with audio of paradoxical movement of the vocal cords is at EDU-0193-2016_video_1. <http://breathe.ersjournals.com/content/breathe/13/1/15/DC1/embed/inline-supplementary-material-1.mov?download=true>.

More alarming symptoms occur when the vocal cords remain adducted during both inspiration and expiration. This causes more severe respiratory distress with stridorous sounds during both inspiration and expiration. A video clip of the vocal cords with audio of this VCD can be seen at EDU-0193-2016_video_2. <http://breathe.ersjournals.com/content/breathe/13/1/15/DC1/embed/inline-supplementary-material-2.mov?download=true>.

Vocal cord dysfunction occurs most frequently in association with vigorous exercise (3). The differential diagnosis of exercise-induced VCD includes other causes of exertional dyspnoea. The multiple etiologies are best identified by exercise testing with cardiopulmonary monitoring (4). While exercise-induced asthma is common, VCD must be considered as one of the causes of exertional dyspnoea when pre-exercise administration of an inhaled adrenergic bronchodilator, such as salbutamol or terbutaline, does not reliably prevent exertional dyspnoea. Pre-exercise ipratropium, an anticholinergic aerosol, has been observed to prevent exercise-induced VCD (3).

Exercise-induced laryngomalacia (EIL), although much less common than exercise-induced VCD, also causes obstruction of airflow on inspiration and can be distinguished only by direct visualisation with a flexible laryngoscope when symptoms are present. The treatment of EIL may require laryngoplasty (5).



Less common but a more troublesome clinical pattern of VCD is that which occurs spontaneously and unexpectedly (3). The absence of identifiable inciting factors causes episodic and unpredictable respiratory distress that is disruptive for the individual experiencing these. Instructions from a speech pathologist to learn voluntary control of the vocal cords are the standard treatment for spontaneously occurring VCD. Hypnosis has been effectively used to both induce VCD and then enable a patient to cease active VCD (6).

HYPERVENTILATION

Hyperventilation as a functional disorder results in greater ventilation than is needed for normal gas exchange resulting in increased expiration of carbon dioxide with resultant hypocapnea. The result is respiratory alkalosis with an increase in arterial pH. This frequently causes chest discomfort in addition to other symptoms. The medical confusion that can occur from a hyperventilation episode is demonstrated by the published description of a young physician with a prior history of asthma (7). Seen in the emergency room when severely dyspnoeic, she was promptly admitted to the intensive care unit with a diagnosis of severe acute asthma. An arterial blood gas there demonstrated hypocapnia, a pH over 7.5 and a high-normal pO_2 , diagnostic of hyperventilation. This physician-patient commented that her perception of dyspnoea from this episode was indistinguishable from her previous episodes of asthma.

Functional dyspnoea rather than asthma should be suspected when severe respiratory distress occurs in the absence of wheezing with pulse oximetry in the high-normal range. A blood gas showing hypocapnia and an elevated pH is then confirmatory for hyperventilation. Rebreathing into a bag increases alveolar pCO_2 and lowers arterial pH, thereby minimising the discomfort from respiratory alkalosis that occurs from hyperventilation. Providing the patient with an understanding of the cause of the symptoms is essential and generally helpful.

An important component of treating hyperventilation attacks in a patient who also has asthma is enabling the patient to distinguish the dysfunctional breathing disorder from a physical cause such as asthma. This can be performed by providing the patient with a means of assessing airway function when experiencing symptoms such as a peak flow device or hand-held portable spirometer.

HABIT COUGH

Habit cough most commonly presents with a characteristic loud, harsh, barking cough, but some have only a softer throat clearing version of the cough. Diagnosis is based on the presence of a repetitive cough that is completely absent once the patient is asleep (*regarded as the sine qua non*) (8). Suggestion therapy has been highly effective in a large number of children (9). In the absence of treatment with suggestion therapy or hypnosis (10), the habit cough can persist for months or years (8).

SIGHING DYSPNOEA

This disorder mentioned by Niggemann et al.(1) is the most benign of all dysfunctional breathing. It involves intermittent sighing breaths by the child who, when asked, usually explains that he or she just feels the need for more air. Exertion is not involved; symptoms usually occur when at rest. While the cause is unknown, it is associated with no apparent physiologic abnormality and generally disturbs the parents much more than the child. Sighing disorder appears to be self-limited and not disruptive for the patient. Other than reassurance and benign neglect, no other measures are needed for this disorder.

SUMMARY

The differing clinical patterns for dysfunctional breathing need to be distinguished from asthma and other organic respiratory diseases. Correct diagnosis permits specific

treatment. Treatment includes inhaled ipratropium to prevent exercise-induced VCD, speech therapy or hypnosis for spontaneously occurring VCD and suggestion therapy or hypnosis for the habit cough disorder. Provision of a device to monitor pulmonary function at home can enable a patient to distinguish symptoms of hyperventilation from asthma. The physician seeing a patient with cough or dyspnoea needs to be cognizant of these functional disorders and their treatment.

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