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Speech pathology for chronic cough: A new approach

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ABSTRACT

Chronic cough may persist despite systematic evaluation and medical treatment of known associated diseases such as asthma, rhinitis, and gastro-esophageal reflux. These patients have refractory chronic cough and many exhibit laryngeal hypersensitivity that is manifest at both a sensory and motor level. Examples of this are heightened sensitivity of the cough reflex to capsaicin, and laryngeal motor dysfunction with hoarse vocal quality and paradoxical vocal cord movement. Chronic cough that persists despite medical treatment may respond to speech pathology intervention. A multidimensional speech pathology treatment programme was designed based upon methods used to treat hyperfunctional voice disorders and paradoxical vocal fold movement. This included education, vocal hygiene training, cough suppression strategies and psychoeducational counseling. When tested in a single-blind, randomized, placebo-controlled trial involving 87 patients, participants in the treatment group demonstrated a significant reduction in cough, breathing, voice and upper airway symptoms following intervention, as well as improvements in auditory perceptual ratings of voice quality (breathy, rough, strain and glottal fry) and significant improvement in voice acoustic parameters (maximum phonation time, jitter and harmonic-to-noise ratio). Speech pathology intervention can be an effective way to treat refractory chronic cough.

1. Refractory chronic cough

Chronic cough is generally assessed and managed using a systematic assessment based on knowledge of specific disease associations and trials of therapy. This approach is generally successful in most people with chronic cough. However, it is now increasingly recognized that cough may persist despite medical treatment based on the anatomic diagnostic protocol in between 12 and 42% of cases [1–6]. When cough persists because a specific cause has not been identified after extensive clinical assessment, then a label of non-specific or idiopathic chronic cough is appropriate. When the cough persists despite appropriate treatment of specific causes, then a label of refractory chronic cough is an accurate description of the problem.

Clinical assessment of patients with refractory or non-specific chronic cough identifies a number of common clinical features that suggest relevant mechanisms in the pathogenesis of this condition [5]. There is significantly heightened cough reflex sensitivity, which manifests as enhanced sensitivity to trigger factors that are known to activate sensory receptors. Patients with refractory cough often describe symptoms triggered by these exposures. Particulate matter such as dry crumbly foods (bread and biscuits) may provide a mechanical stimulus. Volatile compounds, cleaning agents and cooking may trigger irritant receptors (cough sensors), and temperature changes such as air-conditioning may also trigger cough. Many patients report that their cough began after an upper respiratory tract infection, and that the cough persisted after the infection had abated. Respiratory tract infection has been shown to trigger transient vocal cord dysfunction [7] and extrathoracic airway hyper-responsiveness [8], which are abnormalities of laryngeal motor function that may be relevant in refractory chronic cough [9,10].

2. Cough and laryngeal dysfunction

Cough is a motor act involving forced expiration against an initially closed glottis, with subsequent opening of the glottis and generation of an expulsive sound. The larynx is involved in several aspects of the cough reflex, and it is not surprising that there is a close association between laryngeal dysfunction and chronic cough. In addition to cough, other laryngeal functions include phonation, participation in respiration as part of the conducting airway and swallowing. Chronic cough can be associated with dysfunction in each of these areas. Specifically, abnormal vocal function in chronic cough is associated with dysphonia, and altered respiratory function occurs when there is paradoxical inspiratory vocal fold closure, as in vocal cord dysfunction (VCD) [11]. These types of laryngeal motor dysfunction respond well to speech

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pathology, and this raises the possibility that speech pathology may be beneficial in chronic cough.

Coexisting voice problems are common in people with chronic cough. Clinically significant impairment of vocal quality was observed in up to 40% of adults with chronic persistent cough [12–14]. Talking is one of the most frequently identified triggers of cough in people with chronic cough [12]. Typically this occurs when the vocal processes are extended, either by the task (such as singing, shouting, or speaking above a background noise), or by increased laryngeal tension from laryngeal dysfunction. In most cases voice problems are thought to be a result of the chronic cough as the voice improves following behavioral management of the cough [15]. Several mechanisms for the link between voice changes and chronic cough have been proposed. Morice et al. [16] suggested that talking and laughing might decrease lower esophageal sphincter tone and subsequently lead to coughing. It has been hypothesized that vocal fold adduction during phonation stimulates pressure receptors in the larynx and results in coughing [12].

Paradoxical vocal fold movement (PVFM), also known as vocal cord dysfunction (VCD), is another example of laryngeal motor dysfunction that is associated with chronic cough [11]. There is an overlap in the medical conditions that are associated with cough and with VCD, namely asthma, rhinitis and gastro-esophageal reflux [11,17,18]. In addition, Milgrom et al. [19] found that approximately 50% of people with chronic cough had an abnormal pattern of vocal fold movement during respiration, that was similar to the characteristic pattern seen with VCD/PVFM. This pattern involves involuntary vocal fold adduction during inspiration [19], attenuation of the inspiratory flow volume curve and a perception of breathing difficulty. Similarly Ryan and Vertigan (published PhD thesis) found that approximately half the participants with chronic cough had evidence of PVFM following hypertonic saline challenge. Blager hypothesized that cough is a protective mechanism that relieves glottal constriction that occurs during PVFM episodes. Speech pathology is highly effective for VCD, and this suggests that a speech pathology approach may be beneficial in refractory cough.

3. Speech pathology treatment for chronic cough

Several studies have evaluated speech pathology treatment for chronic cough [20–22]. The components of successful therapeutic programmes include: education, vocal hygiene, cough suppression strategies and psychoeducational counseling [24] (Table 1).

3.1. Education

Cough is not considered beneficial or physiological in chronic cough patients who have undergone careful medical evaluation and no cause can be identified for the cough. Careful medical evaluation is needed to identify those patients with significant and/or treatable medical conditions. When the results of this assessment are negative, then the persistence of cough is considered to be detrimental. The educational component of speech pathology treatment for chronic cough seeks to reframe the reasons for coughing, describe the unnecessary nature of the cough, and educate the patient as to the possible negative consequences of ongoing chronic cough. These include laryngeal trauma, perpetuation of the cough cycle, and exacerbation of throat or laryngeal irritation. The other purpose of the educational component of therapy is to inform the person of the goals of therapy which are to suppress cough despite awareness of the triggering sensation, and reinforce the concept that the person has the ability to voluntarily control the cough.

3.2. Vocal hygiene training

In some voice disorders, coughing and throat clearing are considered to be phono-traumatic or vocally abusive behaviors that have contributed to, exacerbated or perpetuated the voice disorder. These behaviors may be considered habitual and targeted in treatment programmes for voice disorders. Vocal hygiene education for hyperfunctional voice disorders includes strategies to reduce coughing and throat clearing in individuals with voice disorders and has been found to improve voice quality [23]. Components of vocal hygiene include measures to reduce laryngeal irritation and hydration strategies. Laryngeal irritation can be reduced by avoiding passive smoking, avoiding mouth breathing, minimizing dehydrating substances, and behavioral management of gastro-esophageal reflux. Several studies have found a beneficial effect on the larynx of adequate hydration including attenuating or delaying elevation of phonatory threshold pressure [25].

3.3. Cough suppression strategies

Patients can be taught to voluntarily suppress a cough using a range of strategies. These include identification of precipitating sensations or warning signals and teaching the person to substitute a competing response, such as a distraction technique, cough suppression swallow, or relaxed throat breathing. In addition, exercises are taught to reduce laryngeal constriction. The cough suppression swallow involves an effortful swallowing action, performed with head flexion and isometric pushing of the hands together. Relaxed throat breathing emphasizes an abdominal breathing pattern, with exhalation on a voiceless fricative sound (e.g. /s/) to increase oral pressure and lead to vocal fold abduction.

3.4. Psychoeducational counseling

This component of the programme emphasizes that there is 'no easy cure' for the chronic cough, that the person can internalize responsibility for their cough behaviors (internal locus of control), and encourages the setting of realistic goals for therapy and expected outcomes. This component of the speech pathology programme was designed to facilitate the person's internalization of control over their cough and their belief in the cough as something they do in response to irritating stimuli rather than a phenomenon outside of their control.

4. Efficacy of speech pathology for refractory chronic cough

The speech pathology programme described above was evaluated in a single -blind, randomized placebo-controlled trial conducted in patients with refractory chronic cough [22]. The speech pathology intervention was delivered in four sessions over a 2 month period by a qualified speech pathologist. The control or placebo group received a course of healthy lifestyle education delivered similarly in four sessions over a 2 month period. The four components of the placebo program included relaxation, stress management, exercise and diet. The study participants were adults with chronic cough (>2 months) that had persisted despite medical treatment according to the anatomic diagnostic protocol, including treatment for asthma, postnasal drip syndrome, gastro-esophageal reflux and withdrawal of angiotensin-converting enzyme inhibitors (if used). The severity of the cough was sufficient to seek medical attention from both a general practitioner and respiratory physician. Out of 97 participants who were randomized, 87 completed the study. They had a mean age of 59.4 years (SD = 13.6, range 23– 84 years), and 64 were female. Forty seven participants were randomly allocated to the treatment group and 50 to the placebo group.