Chronic Cough Caused by Arnold's Nerve Ear-Cough Reflex

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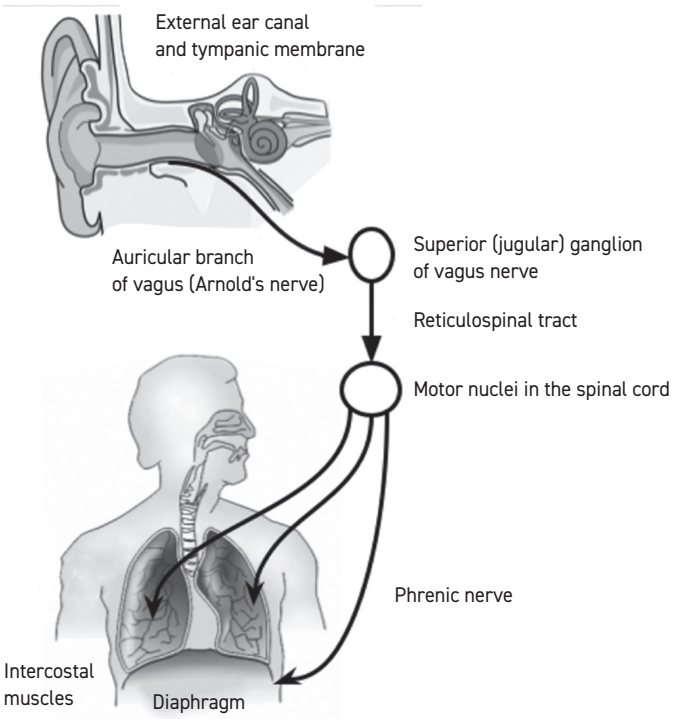
Chronic cough is a common clinical symptom with a broad differential diagnosis, including respiratory, gastrointestinal, and neurological causes. A rare yet important cause is Arnold's nerve reflex (ear-cough reflex) and triggered by stimulation of the auricular branch of the vagus nerve. We present the case of a 77-year-old man with a persistent dry cough and no significant medical history other than mild hypertension. The patient reported paresthesia in his left ear and noted that his cough was often triggered by touching the ear. A comprehensive physical and neurological examination, including otoscopy, was performed. Examination revealed cerumen impaction covering the posterior wall of the left external ear canal. Removal of the cerumen immediately triggered a cough but resulted in complete resolution of symptoms within one day. This case emphasizes the importance of considering Arnold's nerve reflex as an underlying cause of chronic cough. A thorough physical examination, particularly otoscopy, is essential for accurate diagnosis. Understanding the neuropathic basis of the ear-cough reflex provides insights into targeted management including neuromodulator therapy.

PATIENT DESCRIPTION

A 77-year-old patient with no significant medical history, except for mild hypertension treated with angiotensin-converting enzyme inhibitors, presented with a persistent, dry cough. The patient reported no history of respiratory infections, asthma, or chronic obstructive pulmonary disease. He is a nonsmoker and has no known allergies. The cough began insidiously and was not associated with typical respiratory symptoms such as wheezing, shortness of breath, or fever. The patient noted that the cough was consistently triggered by touching the left ear. He also complained of a tingling sensation in that ear, which coincided with the onset of the cough.

The patient appeared healthy on physical examination, with clear lung fields, no additional sounds,

Figure 1. Arnold's nerve pathway



and normal heart sounds. Neurological examination revealed no motor or sensory deficits, and cranial nerve function was intact. The otoscopic examination was unremarkable apart from the cerumen layer covering the posterior wall of the left external ear canal. Cerumen removal triggered a cough, but within one day after the procedure the cough stopped.

COMMENT

Chronic cough is a common symptom encountered in the clinical setting, with a wide range of differential diagnoses, including respiratory, gastrointestinal, and neurological causes. Arnold's nerve has been referred to as an obscure cause of chronic cough. The cough is triggered by mechanical stimulation of the external auditory meatus through the auricular branch of vagus nerve (Arnold's nerve). This nerve originates from the superior ganglion of the vagus nerve and is joined by a filament from the inferior ganglion of the glossopharyngeal nerve. It travels posterior to the internal jugular vein, enters the mastoid canaliculus, and passes through the temporal bone, crossing the facial canal approximately 4 mm above the stylomastoid foramen. It then divides into two branches: one joins the posterior auricular branch of the facial nerve, and the other supplies the posterior and inferior meatal skin and a portion of the tympanic membrane. The auricular branch of the vagus contains somatic afferent fibers that terminate in the spinal nucleus of the trigeminal nerve, suggesting a secondary association of trigeminal fibers with the vagus.

Stimulation begins in the external ear, usually on the posterior wall of the external auditory canal or the external surface of the tympanic membrane. Sensory impulses travel via Arnold's nerve and are transmitted to the spinal nucleus of the trigeminal nerve in the brainstem. The spinal nucleus connects with the thalamic nuclei, sensory cortex, and medullary, and spinal nuclei. Signals are sent in various directions, some terminating in the motor nucleus of the trigeminal, lacrimal nucleus, inferior salivatory nucleus, nucleus ambiguous, and dorsal nucleus of the vagus. These nuclei interact with other centers in the reticular formation, such as the respiratory, vasomotor, cardiac, vomiting, and swallowing centers. Efferent signals travel via the reticulospinal tract to the phrenic nerve and motor neurons in the spinal cord, which control the diaphragm and intercostal muscles, leading to coughing (ear-cough reflex) [Figure 1] [1]. Arnold's nerve encompasses various physio-anatomical reflexes beyond the ear-cough reflex, including the auriculo-palatal reflex (gag reflex), auriculo-lacrimal reflex, auriculo-cardiac reflex (auricular syncope), and ear-vomiting reflex.

The incidence of ear-cough reflex is estimated to be 4.2% in the healthy population and is bilateral in 2.8% of cases [1]. Dicpinigaitis and colleagues [2] demonstrated that the prevalence of ear-cough reflex in patients with chronic cough was 25.5%. They suggested that cough hypersensitivity syndrome may be responsible for these results. Cough hypersensitivity syndrome is a clinical condition marked by an abnormally heightened cough reflex sensitivity. It often manifests as persistent and bothersome coughing triggered by mild thermal, mechanical, or chemical stimuli [3]. Cough hypersensitivity syndrome is proposed as a neuropathic disorder driven by peripheral and central sensitization of the vagal sensory nerve pathways, often triggered by infections, irritants, or inflammation [4].

This case highlights the significance of considering Arnold's reflex as an underlying cause of chronic cough, particularly in the absence of respiratory or systemic abnormalities, and emphasizes the significance of complete physical exam including otoscopy and ear cleaning as needed. Understanding the neural mechanisms of this reflex and its association with cough hypersensitivity syndrome provides a basis for accurate diagnosis and targeted management. Further research is needed to elucidate the exact mechanisms involved and to optimize treatment strategies. Evidence for the neuropathic basis of chronic cough includes success in treating patients with neuromodulators like gabapentin [5].

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