Etiology of Chronic Cough in a Population of Children Referred to a Pediatric Pulmonologist

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Background: **Chronic cough is a common complaint encountered by physicians who care for children. It is also a common reason for referral to a pulmonologist. Determining the cause of chronic cough, however, rarely requires specialized diagnostic procedures that are unavailable to the primary care physician.**

Methods: **A computerized listing of new patients referred to a pediatric pulmonologist between July 1993 and June 1995 was reviewed. Of 299 patients examined as outpatients during this period, 95 were referred for chronic cough. The diagnosis and diagnostic procedures were examined to determine how frequently procedures available exclusively to subspecialists were necessary to determine the cause of chronic cough.**

Results: **Of the 95 patients who were examined for cough during the period studied, the diagnosis was made by history in 5, pulmonary function testing in 11, radiographic tests in 15, and a therapeutic trial in 58. In only 6 cases was the diagnosis made using tests unavailable to the primary care physician (5 bronchoscopy, 1 allergy skin testing).**

Conclusions: **In 89 cases the cause of chronic cough was determined by procedures available to the referring physician. In most cases chronic cough in children can be diagnosed and managed by physicians who are aware of the spectrum of common disorders that lead to cough. (J Am Board Fam Pract 1996;9:324-27.)**

Cough is a common complaint encountered by physicians who care for children. Chronic cough, defined as a daily cough that persists for 3 or more weeks, has been estimated to affect 7 to 10 percent of children.[1] When the diagnosis proves elusive, children with chronic cough are often referred to a pediatric pulmonologist for consultation. Determining the reason for chronic cough in children, however, only rarely requires diagnostic procedures that are unavailable to the primary care provider. A thorough evaluation for familiar common and unusual causes of cough will disclose a cause in most cases.

Methods

Cases of chronic cough were selected from a computerized listing of the new patient visits to the author for the period of July 1993 to June 1995. The records of patients examined for chronic cough (longer than 3 weeks' duration) were reviewed to learn the diagnosis and necessary steps to determine the cause of the cough.

The Department of Pediatrics at Tripler Army Medical Center serves the military community in Hawaii and throughout the Pacific Basin. The hospital supports a pediatric residency, multidisciplinary outpatient pediatric clinic, inpatient ward, nursery, and neonatal and pediatric intensive care units. Primary care physicians who care for military dependents on Oahu and throughout the Pacific may refer patients to the 25 pediatric subspecialists in the department. In addition, children from the former American Trust Territories of the Pacific may be referred for specialist consultation and care that is unavailable to them.

During the period from July 1993 to June 1995, 299 outpatient pediatric pulmonology evaluations were completed including those for 95 infants and children who were referred for chronic cough. Cough resolved after evaluation and treatment in all cases.

Results

The cause of chronic cough in this series encompassed a range of diagnoses including psychosomatic disorders and abnormalities of large and small airways as well as pulmonary parenchymal disease (Table 1). Mild and moderately severe reactive airways disease were the most common

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reasons for chronic cough in this series (59 percent, 56/95).

Overall, the reason for cough was determined by history in 5 evaluations (5 percent): 2 children had psychogenic cough, 2 had postbronchiolitic airway reactivity, and 1 had tracheomalacia and repaired tracheoesophageal fistula. In no case did a finding on physical examination prove diagnostic.

Pulmonary function testing and response to bronchodilators were diagnostic in 11 cases (11 percent). Radiographic tests (9 barium esophagrams, 5 sinus series radiographs, 1 high-resolution, thin-section computerized axial tomography [CT] scan) were diagnostic in 15 cases (16 percent). In 58 cases (61 percent), the diagnosis was based on a positive response to therapy. Forty-eight patients were responsive to an inhaled bronchodilator–anti-inflammatory regimen, 7 to antibiotics for sinusitis or chronic bronchitis, and 3 to a trial of topical decongestants for allergic rhinitis.

In only six cases (6 percent) was a test necessary for the diagnosis unavailable to the primary care physician. The cause of cough in 5 patients was diagnosed with flexible bronchoscopy: 2 had chronic bronchitis, 1 had tracheomalacia, 1 had vascular ring, and 1 had gastroesophageal reflux with lipid-laden macrophages on bronchoalveolar lavage. A single patient had an atypical history for rhinitis and probable soy allergy confirmed by skin testing. Thus 89 patients (93 percent) had their condition diagnosed with a therapeutic trial or diagnostic study available to the primary care physician (Table 2).

Table 1. Causes of Chronic Cough in a Referral Population (n = 95)

Category	Specific Disorder	Number
Large airway, upper	Allergic rhinitis	4
	Chronic sinusitis	9
Large airway, lower	Chronic bronchitis	6
	Gastroesophageal reflux	9
	Tracheomalacia	3
	Vascular ring	1
Small airway	Mild asthma	30
	Moderate asthma	26
	Postbronchiolitic airway reactivity	4
Parenchymal	Hypersensitivity pneumonitis	1
Psychosomatic	Psychogenic cough	2

Discussion

Most patients referred for evaluation of chronic cough in this series had their conditions diagnosed using an approach available to the primary care physician. The addition of several questions to the history, the application of selected specific diagnostic studies, and the efficacy of a therapeutic trial will often make the reason for the cough apparent.

There are specific questions the primary care physician can ask during history taking to facilitate diagnosis of chronic cough. Knowing the conditions surrounding the onset of cough is vital in determining the duration of symptoms as well as establishing the diagnosis. For example, cough that began as a severe episode of choking suggests the aspiration of a foreign body. Knowing when the cough occurs is also crucial. Cough that occurs primarily at night or when the child is supine usually results from one of five conditions: allergic or infectious rhinitis with postnasal drip, chronic sinusitis, unrecognized reactive airways disease, or gastroesophageal reflux. In this series, history suggested the diagnosis in 5 patients.

Being aware that certain types of cough are more common among specific age groups is important. For instance, psychogenic cough, which occurs as a frequent, repetitive, honking cough, typically affects adolescents and is one condition in which a disruptive cough will occur throughout the office visit. Because psychogenic cough is the only chronic cough that is completely absent during sleep, the diagnosis is often one of exclusion.[2-4]

Activities that exacerbate cough can provide clues to the cause of the cough. As many as 70 to 90 percent of children with asthma will have symptoms that are exacerbated by exercise or exertion.[5] Cough that occurs after crying spells, roughhousing, or during exercise suggests asthma. Similarly, the cough from asthma is often observed by parents when the child comes in from playing in the late afternoon or early evening. Reactive airways disease, or asthma, was the most common cause of cough in this series. Reactive airways disease also includes postbronchiolitic or postinfectious bronchial hyperreactivity, which can affect 60 percent of patients after an acute viral lower respiratory tract infection.[6] In these children, there might be no family history of

Table 2. Diagnostic Studies That Determined the Cause of Chronic Cough (n = 95).

Diagnostic studies	Total Number
Therapeutic trial	58
Lung function test	11
Barium esophagram	9
History	5
Sinus radiograph	5
Bronchoscopy	5
Computed tomographic scan of chest	1
Allergy skin test	1
Physical examination	0
Chest radiograph	0

asthma. Nevertheless, cough is usually reported after such exertion as running or laughing, a feature that is highly suggestive of reactive airways.

The quality of the cough can also provide information as to its cause. Children with a seal-like or croupy cough, and children who wheeze on forced exhalation often have a lesion of the central airway, such as tracheomalacia.[7] Although tracheomalacia is a common complication after repair of tracheoesophageal fistula, it also occurs as an isolated or primary process.[7] Cough in a child with a vascular ring will often have the same tracheal-like quality. A productive, wet-sounding cough occurring day and night suggests a suppurative process of the lower respiratory tract, such as bronchiectasis or cystic fibrosis. The chronic bronchitis complex is a difficult condition to characterize and is a diagnosis that is not completely accepted by some authors.[8] Chronic bronchitis complex is reported in the literature, however, and diagnosed by finding inflammatory cells and bacteria on quantitative culture of bronchoalveolar lavage. Chronic bronchitis complex will often follow an initial disruption of the respiratory epithelium, such as a viral respiratory infection. In addition to the cough, the parents often complain of the child having noisy breathing. Although the diagnosis is made bronchoscopically, in many cases a trial of β-lactamase-resistant antimicrobial medication (such as amoxicillin-clavulanate) in the correct clinical situation will lead to the gradual resolution of the symptoms within 2 to 3 weeks.[9]

Although physical examination did not reveal a specific diagnosis in any of the patients in this series, several findings on examination should be looked for closely. Finding nasal polyps in a child with chronic cough should prompt an evaluation for cystic fibrosis. The chest should be inspected for subcostal retractions or increased anterior-posterior diameter; both suggest obstructive pulmonary disease and hyperinflation. The absence of wheezing on auscultation does not eliminate the possibility of asthma. Digital clubbing is not a feature of asthma but points instead toward a suppurative pulmonary process in a child with cough.

Children with chronic cough who are older than 6 years should have pulmonary function testing, particularly if the history suggests a possible reactive airways disease. Response to bronchodilators will be indicative in many cases. Exercise or methacholine challenge testing might be necessary, but only in rare circumstances. In infants and children too young for pulmonary function testing, response to a trial of inhaled bronchodilators (albuterol) and anti-inflammatory therapy (cromolyn or beclomethasone) by nebulization or metered-dose inhalers with a spacer device will often be diagnostic.

Chronic bacterial sinusitis accounted for almost 10 percent of children referred for evaluation of chronic cough in this series. In children with sinusitis, cough usually follows a viral upper respiratory tract infection and persists beyond 10 days. The nasal discharge can be absent, clear, or purulent. Cough occurs anytime during the day, but typically it is worse at night. Headache is an infrequent finding.[10] Occasionally there is a history of therapy with antibiotics of insufficient duration. A radiographic sinus series is often helpful, particularly in older children, but a coronal CT scan is the best diagnostic study.[10] A chest radiograph was not diagnostic for any patient in this series because most of the children referred had radiographs, and a new film was not part of their consultation. A chest radiograph is, however, an integral part of the initial evaluation of chronic pulmonary symptoms including cough.

Gastroesophageal reflux can cause a cough that is often productive sounding and typically occurs when the child or infant is supine. A history of regurgitation is helpful but is neither particularly sensitive nor specific. Reflux should be suspected in infants who are overfed.[11] A barium swallow might not reveal reflux but will, as part of the initial evaluation, at least eliminate the possibility of gastric outlet obstruction. A trial of conservative therapy (limiting the volume of food, avoiding a

seated position, and elevating the head when in a prone position for an hour after feeding) will lead to resolution of symptoms in some cases. In others, where the history and examination strongly suggest a diagnosis of gastroesophageal reflux despite a negative barium swallow, a trial of prokinetic agent and a histamine (H_2) receptor antagonist is helpful. In persistent cases, further diagnostic evaluation is warranted.[12,13]

Summary

Chronic cough is a common reason for referral to a pediatric pulmonologist. It represented one third of outpatient referrals during the 2-year study period. In most of the cases, determining the cause of the chronic cough did not require diagnostic procedures uniquely available to the subspecialist. There will be cases when parents seek subspecialty consultation for reassurance or reinforcement; however, the primary care provider who is aware of the spectrum of disorders that lead to chronic cough in children can make the diagnosis and treat the condition in most cases.

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