

## Cough and Fear of Sleep: Early Clinical Signs of *Bordetella pertussis* in an Adult

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Pertussis is increasing in frequency among adults, but early diagnosis requires special attention to details in the medical history. We describe a 64 year-old male with classic signs and symptoms of pertussis and documented *Bordetella pertussis* infection that were overlooked because he presented with a chief complaint of cough and fear of falling asleep. Coughing paroxysms and a feeling of suffocation (30-60 seconds) only occurred at night after short periods of deep sleep (30-45 minutes). The physicians did not observe these episodes during daytime examinations, and the basis of the patient's fear of sleep was not explored. We recommend reassessment of how adults describe symptoms of pertussis, including fear of sleep, and we suggest the use of PCR technology to allow early diagnosis and prompt treatment.

**Key Words:** Pertussis, cough, whooping cough, PCR technology.

*Bordetella pertussis* (whooping cough) has increased dramatically in frequency among adults in North America and Europe during the past two decades [1,2]. It remains under-diagnosed because testing for this infection is not routinely done in patients presenting with an upper respiratory illness. Classic symptoms of the infection include paroxysmal violent cough, "whooping" respiratory sound, and short periods of inability to breathe [3,4]. We present a case of an adult with the above symptoms and documented *B. pertussis* infection. These classic symptoms were present by the third day of the illness, but they were overshadowed by the additional, more intense symptom of fear of sleep. Because of the method of describing the illness by the patient, and descriptions of the classic illness in the medical literature, the diagnosis was not properly considered.

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### Case Report

A 64 year-old male was well until September 2001, when he experienced cough, malaise, slight hoarseness and a low-grade fever. There was no sinusitis, conjunctivitis or pharyngitis. The patient did not smoke, he had no underlying pulmonary disease, and he was in good health. His wife had had a similar, but milder illness, beginning one week prior to onset of his symptoms. Neither had known illness exposure.

His cough increased in intensity over the next few days, characterized by production of white sputum every 3-5 minutes. If he fell asleep for a period of 30-45 minutes, the collected secretions, laryngeal and epiglottis inflammation, and uncontrolled spasmodic diaphragmatic movement made breathing impossible for 30-60 seconds. On one occasion this led to an episode of fainting lasting 15-30 seconds, and was associated with mild injuries (bruises on the leg, arm and head) from a fall. On another occasion, during the period of transient suffocation, the patient slid to the floor because of vertigo. He developed a marked fear of falling asleep because he was afraid of suffocating

on awakening. He initiated various methods to remain awake during the night to avoid these episodes, including sitting in a chair all night, reading, sipping cool drinks, snacking, and continuously clearing secretions from the upper airways.

When the patient was seen in the emergency room of the local hospital on the 10<sup>th</sup> day of the illness, his chief complaints were cough and fear of sleep. Physical exam revealed slight pharyngeal hyperemia, and lungs were clear except for intermittent rhonchi. Vital signs were normal; oral temperature was 37.6°C. There were no infiltrates on chest X-ray, the WBC was 7,500 cells per mL with a normal differential, and deep cough sputum was gray in color. Sputum smear showed gram negative bacilli, but culture was reported as normal flora. Oral amoxicillin/clavulanic acid was prescribed for the possibility of bacterial super-infection of a viral respiratory illness.

After an additional week without improvement, antibiotic therapy was changed to clarithromycin, 250 mg bid (twice a day), for presumed mycoplasma infection. Viral, mycoplasma and chlamydia serologic tests were negative, except the test for *Chlamydia pneumoniae* was positive for IgG, but negative for IgM antibodies (qualitative test, no titer). PCR of the sputum was reported as positive for *Bordetella pertussis*; PCR for *Bordetella parapertussis* and *Chlamydia pneumoniae* were negative (Performed at the Institut für medizinische & molekulare Diagnostik AG, Zurich, Switzerland, using published PCR techniques [5,6]). The patient was also given a depot injection of betamethasone (7mg) (Diprophos<sup>R</sup>). Ten days after initiation of clarithromycin and 5 days after steroids, the degree of mucous secretion and spasms decreased. Clarithromycin was continued for 3 weeks. During the subsequent 6 weeks the paroxysmal cough subsided, but intermittent cough continued for 8 months, associated with an increased sensitivity to any air pollutants.

## Discussion

A pattern of signs and symptoms has been used by pediatricians to suggest a diagnosis of whooping cough

[3,4]. These have included violent, uncontrolled paroxysmal cough, a “whooping” sound during respiration, gagging or vomiting at the time of the cough, and periods of apnea. These same symptoms have been recorded in most adult patients [1,7-9]. However, historical precision regarding these signs and symptoms may have been lost, resulting in a description shared among many respiratory infections. For example, the word “paroxysmal cough” means sudden occurrence of the cough at periodic intervals, a sign in most respiratory illnesses. What is overlooked are the words “violent” and “uncontrolled”. It is the uncontrolled violence of each paroxysm that prevents breathing during the spasmodic diaphragmatic movement, and leads to the sounds from the larynx of the simultaneous mixture of attempted inspiration and forced expiration. This process also leads to the description of the cough as a “gasping cough”, the English translation of “Keuchhusten”, the name for pertussis in German. The use of the word “whooping” in the English language must have derived from an ornithologist-oriented pediatrician who noted the sound made by an ill child was similar to that made by the whooping crane. Since most of us are not well acquainted with this sound, it is possible that this important sign is also lost in communication from the patient to the modern physician taking a medical history. Children tend to vomit during these episodes, but adults may control this reflex and experience gagging or air swallowing rather than vomiting.

The sign of pertussis described as “apnea”, although accurate, is also misleading because it emphasizes the inability to breathe rather than the gasping attempts at breathing. A better description would be periods of “gasping breath” or of “suffocation”. As recorded by Holt 100 years ago in his description of pertussis [3], the experience of difficult breathing is the main feature of the illness. He wrote, “Those old enough to describe their sensations tell of a sense of impending suffocation, the suffering from which is almost indescribable.” Another problem with the violent paroxysmal cough, gagging, and the whooping sounds, is that in the adult these occur at night, and therefore the physician does not observe them at the time of the examination. Their

absence during daytime is due to continuous clearance of secretions by the upright patient and breathing through the nose, thus avoiding the sudden irritation to the upper airway and the occurrence of these signs. In addition, these symptoms are most dramatic during the first week of the illness because, thereafter, the patient learns various activities to avoid them. Because of this learning process, by the time of the visit by our patient to the emergency room on day 10, the actual “whooping” was confined to 2 to 3 sounds with each paroxysm at night. All of the classic signs and symptoms had been converted to a “fear of falling asleep”.

Once the characteristic of periodic gasping for breath is identified in the adult with suspected pertussis, the differential diagnosis turns away from identification of other causes of suspected bronchitis and/or pneumonia, and towards excluding other causes of paroxysmal dyspnea, such as laryngospasm from reflux, esophagotracheal fistulas, obstructive sleep apnea, panic attacks, congestive heart failure and asthma.

All of the classic signs or symptoms of pertussis were present, but they were not reported by the patient, as he tried to relate to the physician the resulting effect, which was his fear of falling asleep. When this fear was reported to several different physicians, the physicians simply noted that sleep disturbances occur during respiratory infections [9], that cough is often more severe at night [2,8], and that some adults have anxiety reactions to illness [10]. The idea that the patient was communicating the same thing that pediatricians observe, but using a different language, was not considered.

It is our opinion that in the 21<sup>st</sup> century it is time to review how and when we may use new technological developments for early diagnosis of this disease. Diagnosis by PCR, and treatment of pertussis, can and should be initiated within days of the onset of the illness. The recent attention to the prolonged illness due to pertussis [7] should not be used as a differential diagnostic point, primarily because antibiotic therapy is effective only when the diagnosis is made early in the illness. Considering diagnostic testing only in patients with at least 3 weeks of cough is not appropriate medical care. The

main limitation to early diagnosis at present is the cost and lack of availability of the special diagnostic tests in many laboratories.

Present guidelines for managing patients with suspected pneumonia [11], or with acute bronchitis [12] do not encourage specific testing for treatable organisms, nor use of antibiotics, unless the chest X-ray confirms pneumonia [11], hospitalization is considered appropriate [11], or the case appears during “documented outbreaks” of pertussis [12]. Instead of rejecting special testing early in an illness, analysis of each patient’s need for organism-directed treatment should be made and the cost or test availability issues evaluated. This can only be determined by obtaining a careful, detailed medical history. There would have been a strong vote from our patient in favor of early comprehensive diagnostic testing. Many weeks of an illness that caused major sleep disturbance, anxiety regarding an unknown prolonged illness, sequential use of different antibiotics because of uncertain diagnosis, and inability to work, far exceeded the costs of the laboratory tests.

The case is presented to remind physicians of the signs of pertussis, and to call attention to the fact that adults may direct attention away from the classic description of the disease. Symptoms of cough and fear of sleep in an adult should place *Bordetella pertussis* infection high on the list in the differential diagnosis. Early identification of the illness by clinical symptoms should allow rapid confirmation by PCR technology and initiation of proper treatment.

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