Impaired cough reflex in patients with recurrent pneumonia

A Niimi, H Matsumoto, T Ueda, M Takemura, K Suzuki, E Tanaka, K Chin, M Mishima, R Ami
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Background: A substantial proportion of patients with recurrent pneumonia do not have an apparent underlying condition, but they may have unknown defects in host defence mechanisms such as cough reflex. Methods: Capsaicin cough sensitivity was measured in seven patients with recurrent pneumonia but no underlying condition. Recurrent pneumonia was defined as at least two episodes of pneumonia in 1 year, or three or more episodes at any time. After remission of pneumonia, 10 doubling concentrations of capsaicin (1.22–625 μM) were inhaled until five or more coughs were induced (cough threshold). Mucociliary clearance was assessed on the basis of nasal ciliary beat frequency and nasal clearance time. Twenty four and sex matched healthy subjects were studied as controls. Results: Each patient had 2–6 episodes of pneumonia. Most episodes developed in dependent lung segments, suggesting the involvement of silent aspiration. Log transformed cough threshold was significantly higher in patients than in controls (mean 2.37 (95% CI 1.84 to 2.90) v 1.29 (95% CI 1.11 to 1.47); p<0.0001). The effect of pneumonia per se on cough reflex seemed unlikely since the cough threshold showed little change when re-examined after 3 months. The patients and controls did not differ with respect to the indices of mucociliary clearance. Conclusions: Impaired cough reflex may be involved in the pathogenesis of recurrent pneumonia.
ciliary beat frequency (12.0 (0.6) (n=2), or increased (n=1) by only 1 doubling concentration of re-examined in six patients, did not change (n=3), decreased CI 1.11 to 1.47); p<0.0001, fig 1). Cough sensitivity, pneumonia in the lung was determined on the basis of chest examination of a sweet taste was measured in minutes. Location of the inferior turbinate until the subjects reported the first sensation of a sweet taste was measured in minutes. Location of pneumonia in the lung was determined on the basis of chest radiographic or computed tomographic findings.

The study protocol was approved by the ethics committee of our institution and written informed consent was obtained from all subjects.

Data are expressed as mean (SD) except where specified otherwise. The unpaired t test was used to compare patients with controls. A p value of <0.05 was considered significant.

RESULTS
Each patient had 2–6 episodes of pneumonia (total 22 episodes). Of 20 episodes with identifiable locations, 19 developed in dependent lung segments. Log C5 was significantly higher in patients than in control subjects (mean 2.37 µM (95% CI 1.84 to 2.90) v 1.29 µM (95% CI 1.11 to 1.47); p<0.0001, fig 1). Cough sensitivity, re-examined in six patients, did not change (n=3), decreased (n=2), or increased (n=1) by only 1 doubling concentration of capsaicin. The patients and controls did not differ with respect to ciliary beat frequency (12.0 (0.6) v 12.3 (1.1) Hz) or nasal clearance time (7.3 (2.4) min v 7.2 (2.2) min) (p>0.1 for both).

DISCUSSION
This study shows, for the first time to our knowledge, that cough sensitivity is significantly attenuated in patients with recurrent pneumonia who lack apparent underlying illnesses or a predisposition to aspiration. Mucociliary function did not differ between the patients and controls. Immunoglobulin deficiencies, a potential cause of recurrent pneumonia, were not found in the patients. Almost all episodes of pneumonia developed in dependent lung segments, suggesting the involvement of silent aspiration. These findings suggest that a lowered cough reflex in patients impairs defence mechanisms against aspiration, leading to the development of recurrent pneumonia.

The cough reflex is reportedly less sensitive in men than in women. In addition, aging may or may not attenuate cough reflex and mucociliary function. We believe these effects were negligible in our study because the patients and controls were matched for sex and age. The effect of pneumonia per se on cough reflex also seems unlikely, since the cough threshold showed little change in patients re-examined after 3 months.

In conclusion, impaired cough reflex may be involved in the pathogenesis of recurrent pneumonia. Prophylactic protussive treatment might be indicated in patients with recurrent pneumonia who have lowered cough sensitivity. The effectiveness of such treatment, however, must be confirmed by future studies in larger numbers of patients. Mechanisms involved in the impairment of cough reflex, including genetic factors, should also be investigated.

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Authors’ affiliations
A Niimi, H Matsumoto, T Ueda, M Takemura, M Mishima, Department of Respiratory Medicine, Graduate School of Medicine, Kyoto University, Kyoto, Japan
K Chin, Department of Physical Therapy, Graduate School of Medicine, Kyoto University
K Suzuki, Department of Medicine, National Kinki-Central Hospital, Osaka, Japan
E Tanaka, Department of Respiratory Medicine, Tenri Hospital, Nara, Japan
R Amitani, Department of Respiratory Medicine, Osaka Red Cross Hospital, Osaka, Japan

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