



## CORRESPONDENCE

# Cough in patients after stroke

To the Editors:

WARD *et al.* [1] are to be congratulated on their new and important findings concerning cough in patients after stroke. They measured a large number of ventilatory parameters during voluntary and reflex cough, and compared the values in stroke patients and healthy controls.

Although the relationship of voluntary cough after stroke with the risk of aspiration has been analysed extensively, this seems to be the first detailed study of reflex cough, induced in these experiments by tartaric acid aerosol. This is important because, should material be aspirated into the lower airways, it is reflex cough that will remove the aspirate and lessen the chance of pneumonia.

However, by definition, both voluntary and reflex cough start with an inspiration [2], which would tend to cause rather than prevent aspiration; of course, the subsequent expirations should remove any foreign material from the lungs. The reflex that prevents aspiration is the expiration reflex from the larynx; this, with initial glottal closure, has no preceding inspiration [3]. Several studies have shown that stroke patients may lose their voluntary cough but retain their expiration reflex and, if this is the case, the risk of aspiration is considerably smaller [4, 5].

The authors made an unexpected and important observation that, in stroke patients, the force of expiratory efforts (as assessed by gastric pressure) was considerably reduced with voluntary cough, but not with reflex cough. However, the expiratory flow parameters were reduced in both. Thus, reflex cough, as assessed by the force of expiratory efforts, is not greatly reduced after stroke, but it may be less effective. They suggest that the imbalance between expiratory pressures and flows with reflex cough may be due to ineffective coordination of different muscle groups following cerebral injury. Another possibility is that the tartaric acid aerosol is stimulating not only reflex cough from the lower airways, but also glottal constrictor reflexes from the larynx. These are well established with tartaric acid aerosol [4, 5] and might decrease expiratory flow rates during the expulsive phase of cough.

It is a pity that, in general, only mean values are given. It would be interesting to know if some individual patients lost voluntary cough but maintained reflex cough (although the observations mentioned above make this likely). The opposite, loss of reflex and maintenance of voluntary cough, seems unlikely on theoretical grounds, but would be an important observation. Perhaps individual results could have been made available online.

Like all good papers, this one describes significant new observations and points to future research. We are sure it will be done.

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**Statement of Interest:** Statements of interest for both authors can be found at [www.erj.ersjournals.com/site/misc/statements.xhtml](http://www.erj.ersjournals.com/site/misc/statements.xhtml)

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From the authors:

We thank J.G. Widdicombe and W.R. Addington for their interest in our work on cough impairment in acute hemispheric stroke patients. In our paper, we proposed that the high reflex cough pressures but impaired cough flow rates demonstrated by the stroke patients could be due to poor coordination between the upper airway, chest and abdominal muscle groups [1]. However, we acknowledge that the reflex cough flows could also be reduced by laryngeal constriction secondary to tartaric acid aerosol inhalation. The ideal way to test this hypothesis would be to image the larynx during the tests, but we have not yet developed a method for doing this.

J.G. Widdicombe and W.R. Addington were also interested to know whether some patients had lost voluntary cough but maintained reflex cough, or *vice versa*. These data are given in figure 1. Of 18 stroke patients tested, two could produce neither voluntary cough nor reflex cough in response to 20% tartaric acid. One patient was able to produce voluntary cough but had no reflex cough response. One more patient with no reflex cough response was able to produce voluntary cough. Although, in general, there is a good relationship between