



Introduction

Study of guinea pig airways has shown that vagal stimulation alters airway calibre and bronchial responsiveness, in response to a given dose of methacholine. We hypothesised that spinal neural outflow influences the sensitivity of airways to methacholine in humans. Patients with spinal neuromodulators, for various indications, offered the opportunity to explore this physiological response.

Methods

Patients with spinal cord stimulators for chronic pain were recruited into the study; therapeutic stimulation is approximately 60Hz. One patient had high frequency stimulation. Testing was conducted on two separate occasions, at the same time of day, within five days. Methacholine challenge testing was carried out as per standard protocol and oscillometric testing was conducted at baseline and after each incremental dose. Spirometry was also performed, pre- and post- testing. Testing was terminated either once threshold changes in resistance had been reached, by patient choice, or if maximum dose was reached. Ethics was obtained for this study.

Lower, and total, airways resistance for each dose was compared for each subject when on and off stimulation, using paired t-tests. In addition, comparison was made between spinal level of stimulation, and response to methacholine. Patients were grouped into cervical, thoracic and lumbar stimulation depending on vertebral level of electrode, on XRay

Results

Stimulation led to an alteration in the responsiveness of the airways to methacholine when stimulation was on and off. This did not correlate with clinical symptoms. In addition stimulation at different spinal levels had differing degree of effects on the change in airways resistance detected in response to methacholine challenge.

Conclusions

We conclude that reactivity of the airways is changed when the spinal cord is stimulated. This is a novel and unexpected finding and suggests there is active modulation of the airways by the spinal neuronal outflow.

In addition the effects differed by level of stimulation suggesting a localised differentiation of modulation.

Learning Objectives

Stimulation of the spinal cord changes airway responsiveness to methacholine challenge, suggesting there is modulatory outflow.

There is variation by spinal level

References

Zhuang J, Bailet D, Curtis R, Xu F. High-Frequency stimulation of cervical vagi reduces airway response to methacholine. World J Respirol 2013; 3(2): 11-19