Nasale Highflow (NHF) – Quantitation of CO2-wash-out in a lung model

Bräunlich, J; Goldner, F; Wirtz, H
Department of Respiratory Medicine; University of Leipzig

Aims: Nasal Highflow has a growing importance in clinical practice. Unfortunately there exist only few studies about effectiveness and mode of action of this new non-invasive ventilatory support device. Some authors prefer pressure increase as the mean mechanism. But there is evidence about wash-out of upper airways and resolved dead space ventilation. This results in a decrease in hypercapnia. We want to prove the hypothesis that Nasal Highflow works through a wash-out effect in small airways.

Methods: We used a sheep lung model in a self-constructed vacuum box. NHF was applied through a nasopharynx-model. CO2 (4%) was introduced into small airways via a BAL catheter. After achievement of stable CO2 values we added NHF with 10-40 l/min. CO2 and pressure were measured with Ganshorn Power Cube via another BAL catheter in trachea and small airways.

Results: NHF led to a flow-dependent decrease in CO2 and increase in mean airway pressure in small airways.

Conclusions: Cause of experimental setting and absence of atelectasis or obstructive airways an influence of increased airway pressure could be closed out. NHF works through a CO2 wash-out of small airways and resolved dead space ventilation. Thereby alveolar ventilation improves. For this reason NHF could be an interesting device in hypercapnic respiratory failure.

Literature: Frat et al. 2015; Maggiore et al. 2015; Stephan et al. 2015; Möller et al. 2015; Bräunlich et al. 2013; Bräunlich et al. 2015