EMA Emergency Medicine Australasia

Emergency Medicine Australasia (2017)

LETTER TO THE EDITOR

Preoxygenation via a non-rebreather mask comparing a standard oxygen flowmeter rate of 15 Lpm to maximally open

Dear Editor,

Preoxygenation is critical to safe emergency airway management with an end-tidal oxygen (ETO_2) of >90% considered the target prior to induction. Outside of the operating theatre and in prehospital environments, turning open the valve of a standard wall/cylinder outlet past the 15 Lpm graduation ('overflow') has been proposed to greatly enhance preoxygenation via a non-rebreather mask (NRB),[1] achieving an ETO_2 of 86% in a recently published report.[2] However, this study used an American 15 L/min flowmeter that allows oxygen flow of 40–60 Lpm if opened fully, while previous work with NRB masks with standard oxygen flow rates of 15 Lpm produce an ETO_2 of only 50–65%[3,4] and standard Australian oxygen outlets may only increase this flow to 19 Lpm when completely open.[5] Therefore, preoxygenation may not be improved by such a margin for all types of 15 Lpm flowmeters.

Methods

We performed a randomised crossover trial on healthy volunteers using two preoxygenation conditions; 3 min tidal volume breathing via a NRB at 15 Lpm and 3 min tidal volume breathing via a NRB with the 15 Lpm flowmeter with the dial turned all the way open (overflow). ETO_2 as a measure of preoxygenation/denitrogenating efficacy was measured by single exhaled vital capacity breath. The study received ethics approval from the Sydney Local Health District Ethics Review Committee (HREC/15/RPAH/587) and was registered with the Australian clinical trials registry (ACTRN12617000339358). The NRB used was a Mayo adult high-concentration full non-rebreathing mask (http://www.mayohealthcare.com.au/products/Resp_oxygen_variableconcent_mask.htm#oxygenmask).

Results

Forty participants (29 males, 11 females) completed both preoxygenation conditions. The mean age of participants was 41 years (SD = 10), and mean BMI of 26 (SD = 3). The median ETO_2 was greatest for NRB with overflow (median = 55%, IQR = 10, 25–75 percentiles = 51–61%) compared to 15 Lpm (median = 48%, IQR = 7, 25–75 percentiles = 44–51%). The difference in median ETO_2 was 8% (95% CI: 6–10%, $P < 0.001$).

Conclusions

The preoxygenation achieved using our Australian standard 15 Lpm flowmeter at overflow with our NRB mask was only marginally effective in improving preoxygenation in healthy volunteers. This contrasts with a USA study showing a greatly increased ETO_2 that utilised a different 15 Lpm flowmeter, but was marked as having overflow rates of 40–60 L/min[2]. The technique of preoxygenation with a NRB with overflow from a standard 15 Lpm flowmeter lacking markings for higher flow may not be as effective at preventing hypoxia at intubation in Australia as other available methods.

Competing interests

None declared.

References

1. Weingart SD, Levitan RM. Preoxygenation and prevention of desaturation during emergency airway management. *Ann. Emerg. Med.* 2012; **59**: 165–175.e1.
2. Driver BE, Prekker ME, Kornas RL, Cales EK, Reardon RF. Flush rate oxygen for emergency airway preoxygenation. *Ann. Emerg. Med.* 2017; **69**: 1–6.
3. Hayes-Bradley C, Lewis A, Burns B, Miller M. Efficacy of nasal cannula oxygen as a preoxygenation adjunct in emergency airway management. *Ann. Emerg. Med.* 2016; **68**: 174–80.
4. Groombridge C, Chin CW, Hanrahan B, Holdgate A. Assessment of common preoxygenation strategies outside of the operating room environment. *Acad. Emerg. Med.* 2016; **23**: 342–6.
5. Grant S, Khan F, Keijzers G, Shirran M, Marneros L. Ventilator-assisted preoxygenation: protocol for combining non-invasive ventilation and apnoeic oxygenation using a portable ventilator. *Emerg. Med. Australas.* 2016; **28**: 67–72.

Clare HAYES-BRADLEY,[1] David MCQUADE[2] and Matthew MILLER[3]

[1]Ambulance Service of New South Wales, Sydney, New South Wales, Australia, [2]Department of Emergency Medicine, Wellington Hospital, Wellington, New Zealand, and [3]Department of Anaesthesia, Toronto Western Hospital, Toronto, Ontario, Canada

doi: 10.1111/1742-6723.12784