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Preoxygenation using the Optiflow™ system

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Editor—The use of transnasal humidified oxygen delivery system (Optiflow™, Fisher and Paykel Healthcare Limited, Auckland, New Zealand) has been described to provide preoxygenation and to extend the apnoea time of patients with difficult airways in the THRIVE study.[1] The purpose of preoxygenation is to increase alveolar oxygen fraction,[2] which is inferred by the measurement of end tidal oxygen concentration (EtO2). We conducted an observational pilot study to evaluate the performance of the Optiflow™ system in preoxygenating patients.

The study was approved by London–West London Research Ethics Committee (Ref: 15/LO/1895). Healthy volunteers who gave written informed consent were recruited. Volunteers sat semi-recumbent on an operating theatre trolley. Optiflow™ nasal cannulae were fitted and the volunteers were instructed to breathe normally through the nose, with the mouth closed. At time zero, the oxygen supply was turned on at 70 l min^{-1}. After 30 s, oxygen was switched off and the volunteers were asked to breathe out into a mouthpiece connected to a GE Healthcare gas analyser. Once EtO2 returned to baseline, the test was repeated using five further predetermined times: 60, 90, 120, 150 and 180 s. Each volunteer was asked to grade the level of discomfort experienced with the transnasal high flow oxygen using a visual analogue score (VAS).

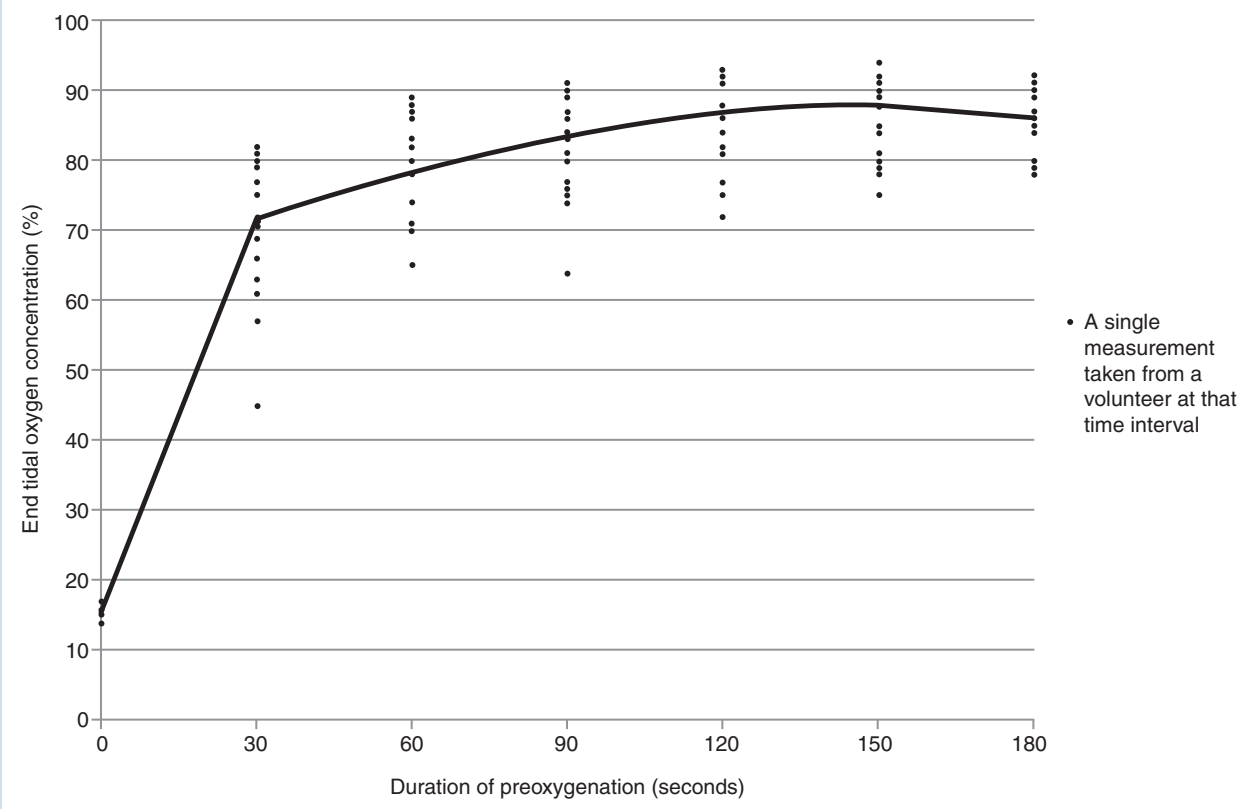

Fig 1 xxx

Twenty-one healthy volunteers aged 23–59 yr were enrolled into the study. One volunteer withdrew midway after experiencing discomfort with the Optiflow™ system, leaving 20 to complete the protocol. Baseline EtO2 was between 14–17%. EtO2 rose quickly, but only 10 out of 20 volunteers achieved an EtO2 of 90% within three min. The median [IQR (range)] EtO2 for each time interval (30, 60 90, 120, 150 and 180 s) was 72% [66–79% (45–82%)], 79% [71–86% (65–89%)], 84% [77–88% (64–91%)], 87% [80–91% (72–93%)], 88% [83–90% (75–94%)] and 86% [84–90% (78–92%)] respectively. Four out of 20 volunteers recorded a VAS for discomfort of five or six.

High flow humidified nasal oxygen has been used in a variety of settings, including anaesthesia,[3] intensive care[4 5] and emergency departments.[6] It flushes the anatomical dead space and provides low-grade positive pressure depending on flow and degree of mouth opening.[4 6] There has been recent focus regarding the role of Optiflow™ in apnoeic oxygenation during intubation, particularly in hypoxaemic patients,[7 8] morbidly obese patients[9] and patients with potentially difficult airways.[1]

Our study demonstrated that the Optiflow™ system increased EtO2 rapidly, however the variability in the extent of denitrogenation suggests that it might not be a reliable alternative to face mask ventilation in preoxygenating patients. Optiflow™ has been described as "well tolerated",[5 6] but four out of 20 volunteers gave a VAS for discomfort of ≥ 5. Delivering nasal oxygen at induction of anaesthesia has been recommended in national guidelines,[10 11] this recommendation remains valid as there are studies demonstrating its role in preventing desaturation and maintaining arterial oxygen content during apnoea.[1 8 9]

We did not investigate other patterns of breathing such as breathing with the mouth open or taking vital capacity breaths. We considered measuring transcutaneous oxygen concentration or arterial oxygen concentration, but these techniques do not measure the size of the alveolar oxygen reservoir. Our findings could inform future studies into transnasal high flow oxygen therapy.

Declaration of interest

Fisher and Paykel Healthcare Limited loaned the Optiflow™ system to Northampton General Hospital but was not involved in any part of study design/planning, or in the preparation of this letter.

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