HIGH FLOW NASAL VS HIGH FLOW MASK OXYGEN DELIVERY: TRACHEAL GAS CONCENTRATIONS THROUGH A HEAD EXTENSION AIRWAY MODEL.

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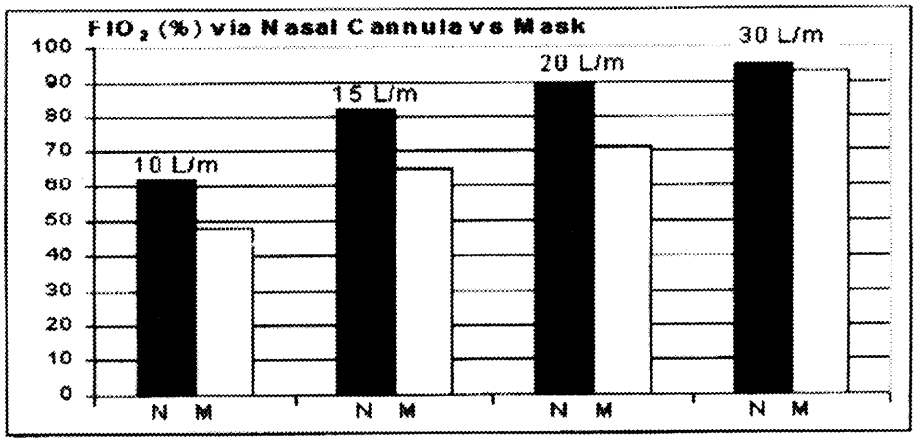
Background: The Non-rebreather mask has been the standard for delivering high flow oxygen. Unfortunately, difficulty in maintaining a facial seal often leads to a lower than expected FIO_2. Some patients find the mask uncomfortable and are unable to eat or communicate while wearing it. Nasal oxygen is not typically regarded to be a high flow option, because of lack of efficacy, mucosal drying and discomfort. Recently, a high flow, warmed and humidified, nasal O_2 delivery system (Vapotherm) was introduced that comfortably delivers nasal O_2 up to 40 L/m. The present study was designed to measure FIO_2 attainable by mask and nasal cannula and to trace the delivery flow through the upper airways. Methods: We constructed an upper airway model to trace flow of ultrasonic fog and measure gas exchange at the model's trachea. A mouthpiece "T" junction at the trachea allowed the subject to breathe into the model using the model's upper airway architecture and dynamics. We measured O_2, CO_2 and respiratory flow in a normal subject breathing in a consistent and controlled flow pattern at a rate of 20 breaths/min with the model wearing the mask (**M**) vs nasal (**N**) cannula. O_2 was delivered at 10, 15, 20, and 30 L/m through each device. Results: Peak FIO_2 as measured at the beginning of inspiration via nasal cannula and mask: 10 L/m: N=62% M=48%; 15 L/m: N=82% M=65%; 20 L/m: N=90% M=71%; 30 L/m: N=95% M=93%. End-exhalation FEO_2 via nasal cannula and mask: 10 L/m: N=38% M=37%; 15 L/m: N=52% M=52%; 20 L/m: N=54% M=50%; 30 L/m: N=72% M=71%. Ultrasonic flow studies recorded on digital video demonstrated that mask O_2 remains outside the nose and mouth until the subject inhales; whereas nasal O_2 is stored in the upper airways during exhalation for additional delivery upon inhalation. Conclusions: High flow nasal cannula delivery is more efficacious than the non-rebreather mask at equivalent flows, due to O_2 storage in the upper airways during exhalation poised for delivery upon the next inhalation in addition to the continuous supply flow. High flow nasal O_2 can be an effective option for patients with high flow requirements. Clinical studies are recommended to evaluate the impact of high flow, warmed and humidified O_2 following extubation, during sleep, and in the management of exacerbations.



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