Supplemental Oxygen Delivery Method Affects Comfort Level in Volunteers

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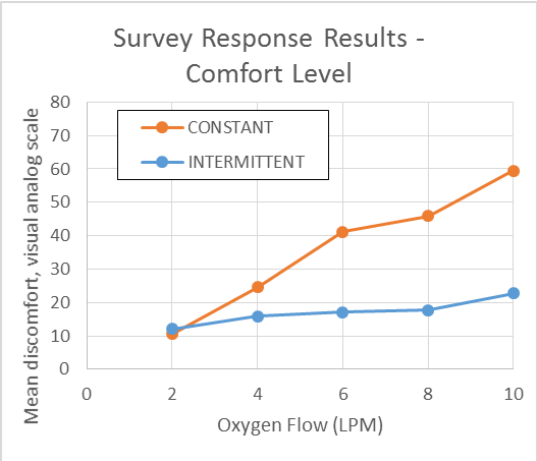
Introduction: Supplemental oxygen is often given to awake, sedated patients in order to decrease the frequency and depth of oxygen desaturation caused by periods of respiratory depression and airway obstruction. When sedation is minimal, patients may complain of discomfort caused by high flow oxygen delivered into the nares by nasal cannula. Discomfort may be more severe when the patients are monitored using cannulas designed to sample CO_2 since the cross-sectional area of the oxygen delivery port is smaller causing oxygen to jet into the nostril(s).

We hypothesized that the majority of discomfort associated with oxygen delivery is experienced when the patient is breathing out against the oxygen flow. During the expiratory phase of respiration, as the patient is breathing out, the supplemental oxygen flowing into the nares raises intra-nasal pressure increasing discomfort. Furthermore, high flow during the expiratory pause adds to the perceived discomfort by drying the nasal mucosa. We have developed an intelligent supplemental oxygen flowmeter that only gives oxygen at during the start of inspiration and at low flows for a brief period during the expiratory pause. The amount of flow given by the system varies according to the respiration rate so that as the respiration rate slows, the amount of inhaled oxygen is increased so that the volume of inhaled O_2 remains constant regardless of breath rate.

We evaluated how well high flow nasal oxygen is tolerated if it is only given during inspiration in volunteers.

Methods: Thirty healthy volunteers (21 Male, 9 female, average age = 34.4) were fitted with a nasal cannula while seated before a laptop computer. A semi-automated system administered nasal oxygen through the cannula at various flow rates using either continuous flow or pulsed inspiratory flow. After breathing under each condition, the volunteers entered their level of discomfort into the computer using a sliding scale between 0 and 100 where 0 indicates no discomfort and 100 indicated pain.

Results: The plot below shows the average relative discomfort for each of the tested flow rates for both conventional (constant flow) and intermittent (inspiratory only) oxygen delivery modes. The average perceived discomfort was similar at 2 L/min. At flow rates of 4 l/min and above, intermittent inspiratory-only flow the average discomfort was significantly less (P = 0.05).



Discussion: At low flow rates, there is no difference between the perceived discomfort of the two modes. When supplemental oxygen flow is constant, discomfort increases with

increasing flow rates. When oxygen flow is turned off during exhalation, the average level of perceived discomfort does not change significantly regardless of the flow rate. Using a time controlled oxygen delivery scheme creates the possibility of giving high flows of oxygen without additional patient discomfort. Using inspiratory only oxygen delivery, it may be possible to “pre-oxygenate” patients prior to administering sedatives and opioids during procedural sedation.