Original Article

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Assessment of Effect of Nasal Oxygen Supplementation During Apnoea of Intubation on Arterial Oxygen Levels

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Abstract

Background: The aim is to evaluate the effect of nasal oxygen supplementation during apnoea of intubation on arterial oxygen levels. **Subjects and Methods :** A sum total of seventy patients with American Society of Anesthesiologists physical status Grade I or II in age range of 18- 40 years of either gender scheduled for surgery requiring general anaesthesia were divided into group of 2 each containing 35 patients. In group I patients, nasal oxygen supplementation was administered at 10 L/min during apnoea of laryngoscopy and in group II, no oxygen supplementation was done. **Results:** The mean age was 32.5 years in group I and 31.4 years in group II, height was 164.2 cm in group I and 162.5 cm in group II, weight was 58.4 kgs in group I and 57.5 kgs in group II and BMI was 22.3 Kg/m^2 in group I and 25.1 Kg/m^2 in group II. pH at baseline was 7.42 and 7.40, after pre- oxygenation was 7.39 and 7.37 and after intubation was 7.30 and 7.29. PaO_2 at baseline was 105.6 and 100.2, after pre- oxygenation was 342.8 and 328.4 and after intubation was 240.6 and 238.2. $PaCO_2$ at baseline was 32.5 and 33.5, after pre-oxygenation was 35.4 and 37.2 and after intubation was 43.2 and 46.1. HCO_3 at baseline was 20.4 and 21.3, after pre- oxygenation was 21.3 and 21.8 and after intubation was 22.9 and 23.7 in group I and II respectively. Desaturation safety time was 420.5 seconds in group I and 380.2 seconds in group II, resaturation time was 32.4 seconds in group I and 42.8 seconds in group II, PaO2 after intubation was 243.2 in group I and 241.9 in group II and PaCO2 after intubation was 42.7 in group I and 45.3 in group II. A non- significant difference was observed (P> 0.05). **Conclusion:** Apnoeic oxygen supplementation at 10 L/min flow by nasal prong did not prolong the apnoea desaturation safety periods or the PaO2.

Keywords: Apnoeic, Oxygen, Laryngoscopy.

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Introduction

Airway management needs administration of supplemental oxygenation in most of cases including laryngoscopy.[1,2] For the reversal of non-hypoxaemic apnoea, sufficient oxygenation of lung is important is essential. Transnasal Humidified Rapid-Insufflation Ventilatory Exchange (THRIVE) deliver oxygen at rate of >60 L/minute.[3] This much high flow even cannot be delivered by Anaesthesia machines. It is seen that oxygen insufflated into the upper airway diffuses down to the trachea.[4] At the alveolar level, oxygen is being absorbed at 250 ml/min and the resultant negative pressure gradient creates a subatmospheric pressure in the alveolus. Oxygen from the oxygen-rich air is thus absorbed across the alveolar capillary membrane.[5,6]

Holmdahl (1956),[7] introduced the idea of Apnoeic oxygenation (AO). One of indication of it is to inhibit desaturation in bronchoscopy procedure, thus ensuring continuous oxygen and there is no further requirement for mechanical ventilation. Later on its effect found to be beneficial in cases of laryngoscopy to prolong the apnoea desaturation safety time.[8,9] All India Difficult Airway Association guidelines have augmented a need for supplemental oxygenation during airway manoeuvres. Similarly, the updated recommendations of the Canadian Airway Focus Group too authorized the utilization of continuous oxygen administration during the apnoeic period.[10] Considering this, we selected present study to evaluate the effect of nasal oxygen supplementation during apnoea of intubation on arterial oxygen levels.

Subjects and Methods

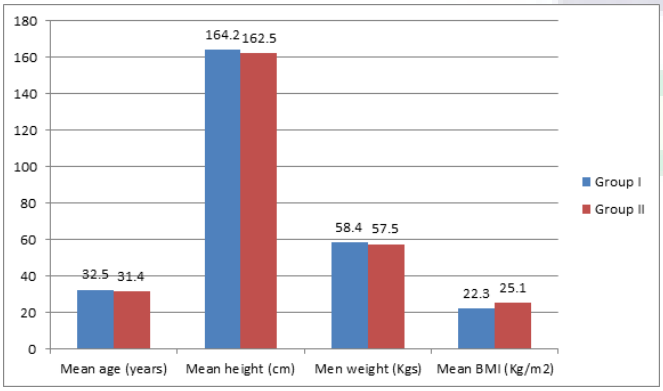
A sum total of seventy patients with American Society of Anesthesiologists physical status Grade I or II in age range of 18- 40 years of either gender scheduled for surgery requiring general anaesthesia were enrolled in this prospective,

observational study. Patients with cerebrovascular disease (CVS), not indicated for nasal prong use and pregnancy were excluded from the study.

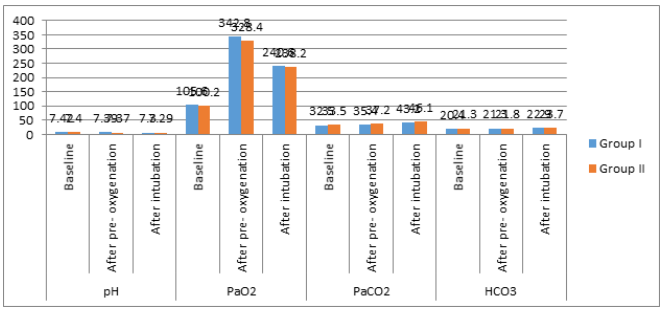
We divided 70 patients into group of 2 each containing 35 patients. In group I patients, nasal oxygen supplementation was administered at 10 L/min during apnoea of laryngoscopy and in group II, no oxygen supplementation was done. Desaturation safety period and the PaO2 just after intubation were compared. Time for SpO2 to increase to 100% after initiation of ventilation was also assessed. Results thus found were compared for dependent and independent variables in both groups. The level of significance was considered at the value of o below 0.05.

Results

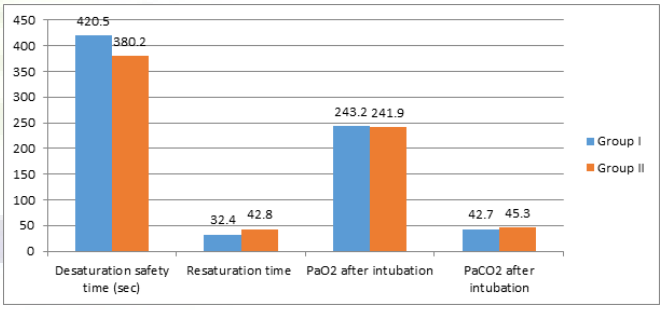
The mean age was 32.5 years in group I and 31.4 years in group II, height was 164.2 cm in group I and 162.5 cm in group II, weight was 58.4 kgs in group I and 57.5 kgs in group II and BMI was 22.3 Kg/m^2 in group I and 25.1 Kg/m^2 in group II. The difference was non- significant (P> 0.05) [Table 1, Figure 1].



[Table 2, Figure 2] shows that pH at baseline was 7.42 and 7.40, after pre- oxygenation was 7.39 and 7.37 and after intubation was 7.30 and 7.29. PaO_2 at baseline was 105.6 and 100.2, after pre- oxygenation was 342.8 and 328.4 and after intubation was 240.6 and 238.2. $PaCO_2$ at baseline was 32.5 and 33.5, after pre- oxygenation was 35.4 and 37.2 and after intubation was 43.2 and 46.1. HCO_3 at baseline was 20.4 and 21.3, after pre- oxygenation was 21.3 and 21.8 and after intubation was 22.9 and 23.7 in group I and II respectively. A non- significant difference was observed (P> 0.05).



[Table 3, Figure 3] shows that desaturation safety time was 420.5 seconds in group I and 380.2 seconds in group II, resaturation time was 32.4 seconds in group I and 42.8 seconds in group II, PaO2 after intubation was 243.2 in group I and 241.9 in group II and PaCO2 after intubation was 42.7 in group I and 45.3 in group II. A non- significant difference was observed (P> 0.05).



Discussion

Supplemental oxygenation is required in most of the surgical procedures. It is evident that warm humidified oxygen at the level ~60 L/minute have additional benefit for prolonging apnoea desaturation time as in the THRIVE. The only drawback of this technique is high cost.[11–13] The use of nasal prongs in order to insufflate oxygen at flows of 5 L/minute- 15 L/minutes during the apnoeic period has been suggested by The Difficult Airway Society and the Obstetric Anaesthetists' Association.[14] Nasal prongs administer nasal oxygen adequately.[15,16] The present study evaluated the effect of nasal oxygen supplementation during apnoea of intubation on arterial oxygen levels.

Our results showed that the mean age was 32.5 years in group I and 31.4 years in group II, height was 164.2 cm in group I and 162.5 cm in group II, weight was 58.4 kgs in group I and 57.5 kgs in group II and BMI was 22.3 Kg/m^2 in group I and 25.1 Kg/m^2 in group II. Sahay et al,[17] in their placebo-controlled trial on sixty patients compared parameters such as desaturation safety period and the PaO2 just after intubation

Table 1: Comparison of demographic data

Parameters	Group I	Group II	P value
Mean age (years)	32.5	31.4	>0.05
Mean height (cm)	164.2	162.5	>0.05
Men weight (Kgs)	58.4	57.5	>0.05
Mean BMI (Kg/m^2)	22.3	25.1	>0.05

Table 2: Arterial Blood Gas parameters

Parameters	Variables	Group I	Group II	P value
pH	Baseline	7.42	7.40	>0.05
	After pre- oxygenation	7.39	7.37	
	After intubation	7.30	7.29	
PaO_2	Baseline	105.6	100.2	>0.05
	After pre- oxygenation	342.8	328.4	
	After intubation	240.6	238.2	
$PaCO_2$	Baseline	32.5	33.5	>0.05
	After pre- oxygenation	35.4	37.2	
	After intubation	43.2	46.1	
HCO_3	Baseline	20.4	21.3	>0.05
	After pre- oxygenation	21.3	21.8	
	After intubation	22.9	23.7	

Table 3: Effect of oxygen supplementation at 10 L/min

Parameters	Group I	Group II	P value
Desaturation safety time (sec)	420.5	380.2	>0.05
Resaturation time	32.4	42.8	>0.05
PaO_2 after intubation	243.2	241.9	>0.05
$PaCO_2$ after intubation	42.7	45.3	<0.05

in group O2 and no O2 group. Desaturation safety period at 415.46 ± 97.23 seconds in group O2 versus 378.69 ± 89.31 seconds in group NoO2 (P = 0.213) and PaO2 (P = 0.952) and time to recovery of SpO2 (P = 0.058) were similar in both groups. Rise in arterial carbon dioxide secondary to apnoea was slower in oxygen supplementation group.

We found that pH at baseline was 7.42 and 7.40, after pre-oxygenation was 7.39 and 7.37 and after intubation was 7.30 and 7.29. PaO_2 at baseline was 105.6 and 100.2, after pre-oxygenation was 342.8 and 328.4 and after intubation was 240.6 and 238.2. $PaCO_2$ at baseline was 32.5 and 33.5, after pre- oxygenation was 35.4 and 37.2 and after intubation was 43.2 and 46.1. HCO_3 at baseline was 20.4 and 21.3, after pre-oxygenation was 21.3 and 21.8 and after intubation was 22.9 and 23.7 in group I and II respectively. Ramachandran et al,[18] assessed the influence of nasal oxygen (O2) administration on the duration of arterial oxygen saturation (SpO2) ≥95% during simulated difficult laryngoscopy in 30 obese patients. It was found that nasal O2 administration was associated with significant prolongation of SpO2 ≥95% time (5.29 ± 1.02 vs. 3.49 ± 1.33 min, mean ± SD), a significant increase in patients with SpO2 ≥95% apnea at 6 minutes (8 vs. one pt), and significantly higher minimum SpO2 (94.3 ± 4.4% vs. 87.7 ± 9.3%). Resaturation times were no different between the groups.

It was found that desaturation safety time was 420.5 seconds in group I and 380.2 seconds in group II, resaturation time was 32.4 seconds in group I and 42.8 seconds in group II, PaO2 after intubation was 243.2 in group I and 241.9 in group II and PaCO2 after intubation was 42.7 in group I and 45.3 in group II. Teller et al,[19] showed that direct pharyngeal O2 insufflation during apnea increases the duration of SpO2 ≥95% for between 10 minutes and 6 minutes, respectively, during general anesthesia in non-obese, healthy patients.

Conclusion

Apnoeic oxygen supplementation at 10 L/min flow by nasal prong did not prolong the apnoea desaturation safety periods or the PaO2.

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