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Apneic Oxygenation with a Nasal Cannula in the Morbidly Obese Patient: A Randomized, Double-Blinded, Placebo-Controlled Trial

Introduction

Morbid obesity (BMI ≥ 40 kg/m²) increases the rate of oxygen desaturation during periods of apnea. Apneic oxygenation may be helpful in increasing the duration of time that SpO₂ $\geq 95\%$. This study seeks to determine whether apneic oxygenation via nasal cannula results in a longer period of apnea.

Methods:

Patients were randomized into 5 groups:

1. Group 1- 6 L/min O₂ and a nasopharyngeal airway
2. Group 2- 6 L/min O₂
3. Group 3- 6 L/min air and a nasopharyngeal airway
4. Group 4- 6 L/min air
5. Group 5- Control

Results

We enrolled a total of 50 patients with a BMI ≥ 40 kg/m². Patient demographics were comparable among all five groups (Table 1). Group 1 had a safe apneic period that was about one minute longer than the other groups.

Conclusions:

The insertion of a nasopharyngeal catheter and oxygen insufflation at 6 L/min prolongs the safe apnea duration in morbidly obese patients by one minute. This is a 47% longer time compared to the control group and provides an increased margin of safety in this subset of patients.

Future Directions:

We plan to increase the flow rate to 15 L/min and continue enrollment. We also plan to add another cohort of obese patients (BMI 30-40 kg/m²).

Table 1. Patient demographic data for all treatment groups.

Variable	Control (n = 13)	O ₂ + NT (n = 20)	O ₂ (n = 21)	Air + NT (n = 17)	Air (n = 18)	P-value
Age [†]	46.9 (12.6)	45.7 (8.0)	43.8 (15.9)	38.8 (11.2)	45.7 (13.6)	0.368
Female Gender	69.2%	90.0%	85.7%	88.2%	88.9%	0.577
Race						
Non-Hispanic	53.9%	45.0%	33.3%	41.2%	38.9%	0.494
Hispanic	46.1%	55.0%	66.7%	58.8%	61.1%	
BMI (kg/m ²) [†]	47.1 (5.4)	47.1 (10.5)	47.0 (7.5)	46.2 (6.0)	43.9 (3.2)	0.634
TBW (kg) [†]	124.3 (17.3)	123.2 (32.1)	121.2 (25.1)	129.1 (25.4)	112.7 (18.5)	0.400
ASA 3	84.6%	75.0%	81.0%	70.6%	50.0%	0.219
Diagnosed OSA	38.5%	20.0%	4.8%	0.0%	16.7%	0.021*
STOP-BANG Score [†]	4.3 (1.7)	4.0 (1.6)	4.1 (1.6)	3.7 (1.8)	4.2 (2.2)	0.944
Hgb [†]	13.9 (1.4)	12.0 (1.6)	12.8 (1.5)	12.2 (2.1)	12.6 (1.5)	0.025*

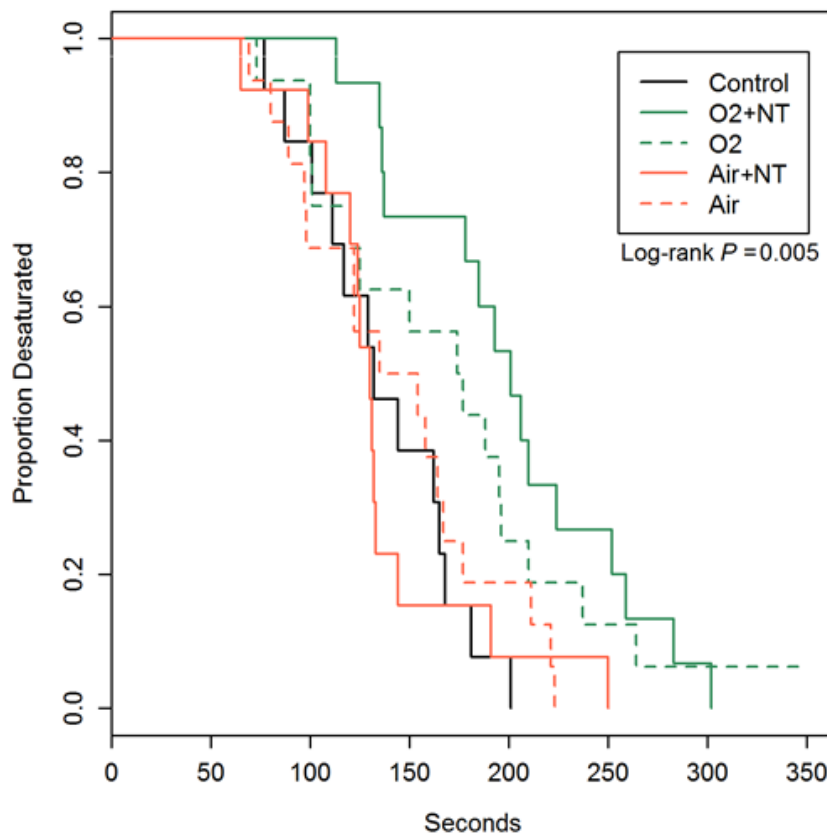
[†]Mean (SD). NT=nasal trumpet, BMI=body mass index, TBW=total body weight, ASA=American Society of Anesthesia status, OSA=obstructive sleep apnea, Hgb=hemoglobin. *P-value < 0.05.

Table 2. Apneic oxygenation desaturation results. Data are presented as mean and standard deviation.

Variable	Control (n = 13)	O ₂ + NT (n = 20)	O ₂ (n = 21)	Air + NT (n = 17)	Air (n = 18)	P-value
SpO ₂ at Mask Off [†]	98.5% (1.8)	99.1% (1.4)	99.1% (1.3)	99.0% (0.9)	98.6% (1.3)	0.598
ETO ₂ at Mask Off [†]	93.0% (2.9)	92.9% (2.8)	91.6% (2.9)	91.0% (2.6)	92.3% (2.6)	0.272
Lowest SPO ₂	88.0% (3.9)	89.2% (5.0)	91.1% (4.2)	87.6% (4.6)	88.4% (4.0)	0.210
Mask Off to 95% Duration (seconds) [†]	136.5 (10.4)	200.9 (14.6)	167.1 (15.1)	134.8 (12.4)	142.9 (12.4)	0.005*
ETCO ₂ after intubation	48.0 (3.3)	47.8 (3.5)	47.4 (5.3)	46.5 (2.9)	47.4 (3.4)	0.887

[†]"Mask Off" marks the beginning of the apneic oxygenation period. The period of desaturation was defined as the time from mask off to the time to reach SpO₂ of 95%. NT, nasal trumpet. *P-value < 0.05.

Figure 1. Kaplan Meier plot showing the time to desaturation to SpO₂ of 95% for all groups.



NT=nasal trumpet