A case of obstructive sleep apnea (OSA) / obesity hypoventilation syndrome (OHS) with extreme OSA burden, complicated by acute on chronic hypercapnic respiratory failure

Doo Woong Choi[1], Angila Bag[1], Osman Abdelsadig[1], Shim Roh[1], Srikant Kondapaneni[2], Dipal Patel[1]
1. Englewood Hospital, Englewood, NJ, 07631 2. Englewood Health Physician Network, Englewood, NJ, 07631

Background

- Obstructive sleep apnea (OSA) is underdiagnosed and undertreated despite increasing prevalence
- Estimates of moderate to severe OSA is 10% in patients between the ages of 30 to 70 years.
- Severe OSA can cause significant nocturnal respiratory decompensation and routine approach with supplemental oxygen can cause serious adverse events

Case presentation

- A 31-year-old male with hypertension and body mass index (BMI) of 76 kg/m2 was admitted for abdominal and scrotal cellulitis treated with intravenous antibiotics.
- At 8am, admission day 8, there was a significant clinical deterioration of the patient with hypoxia to 79% on 4L nasal cannula, improving to 96% on non-rebreather mask.
- However, the patient remained lethargic and arterial blood gas (ABG) revealed severe respiratory acidosis. The patient was placed on bilevel positive airway pressure (BiPAP) with inspiratory airway pressure (IPAP) of 22, expiratory positive airway pressure (EPAP) of 10.
- Despite BiPAP, repeat ABG showed worsening CO2 retention and eventually the patient required intubation.

Arterial Blood Gas

Table1: Arterial blood gas result

	8:02	9:22	11:40	14:05
ph	7.14	7.13	7.11	7.35
CO2	130.3	>138.3	>138.3	69.1
PO2	84.4	74.4	277.4	195.9
HCO3	44.8	*	*	38.4
SaO2	90.6	*	*	99.6
Draw site	Arterial	Arterial	Arterial	Arterial
FiO2	0.36	0.5	1	1
Delivery system	cannula	Bipap	Bipap	Vent
Setting	4L	14/6	22/10	22/500/1/8
				*out of technical range

BiPAP setting: IPAP/EPAP

Ventilation setting: respiratory rate/tidal volume/FiO2/Positive end expiratory pressure

(Case Continues)

- Review of previous polysomnography results revealed severe OSA with apnea-hypopnea index (AHI) of 154.9 events/hour, lowest desaturation 20% and 369 minutes of oxygen saturation below 90%, which required BiPAP settings of IPAP of 25, EPAP of 21 with nasal cannula of 3L with residual AHI of 5.5.
- Outpatient BiPAP was recommended prior to admission however it was not affordable for patient due to financial issues. Patient underwent tracheostomy, was weaned off ventilator with improvement in respiratory status.
- The patient was eventually discharged on home oxygen with FiO2 28%, with plan for bariatric surgery.

Conclusion

- This case highlights awareness of risk of hyperoxygenation and high BiPAP requirements in severe OSA/OHS patients.

Discussion

- This case demonstrates acute on chronic hypercapnic respiratory failure due to severe OSA/OHS, triggered by hyperoxygenation.
- Firstly, oxygen supplementation in severe OSA/OHS needs to be used with caution. In our patient, hypercapnic respiratory failure was triggered by initial non-rebreather placement, followed by high FiO2 on BiPAP.
- BiPAP requirements need to be noted in severe OSA cases. Despite the relatively high initial BiPAP settings used, even higher requirements were documented in this case, leading to failure of BiPAP treatment. Intubation could have been avoidable with better education regarding severe OSA for nursing and house staff.

Reference

Peppard PE, Young T, Barnet JH, Palta M, Hagen EW, Hla KM. Increased prevalence of sleep-disordered breathing in adults. Am J Epidemiol. 2013;177(9):1006-1014. doi:10.1093/aje/kws342

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