

OBESITY HYPOVENTILATION SYNDROME

- David Claman, MD
- UCSF Professor of Medicine
- Director, UCSF Sleep Disorders Center
- Disclosures: None.

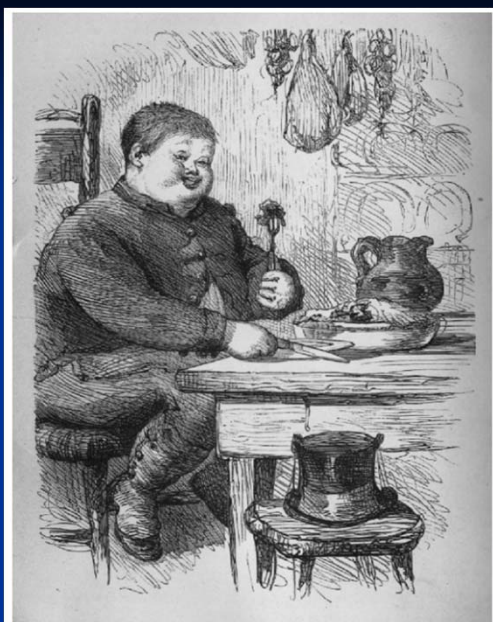


Fig. 1. Joe the "Fat Boy," the character in Dickens's *The Posthumous Papers of the Pickwick Club*, from which the term "Pick-

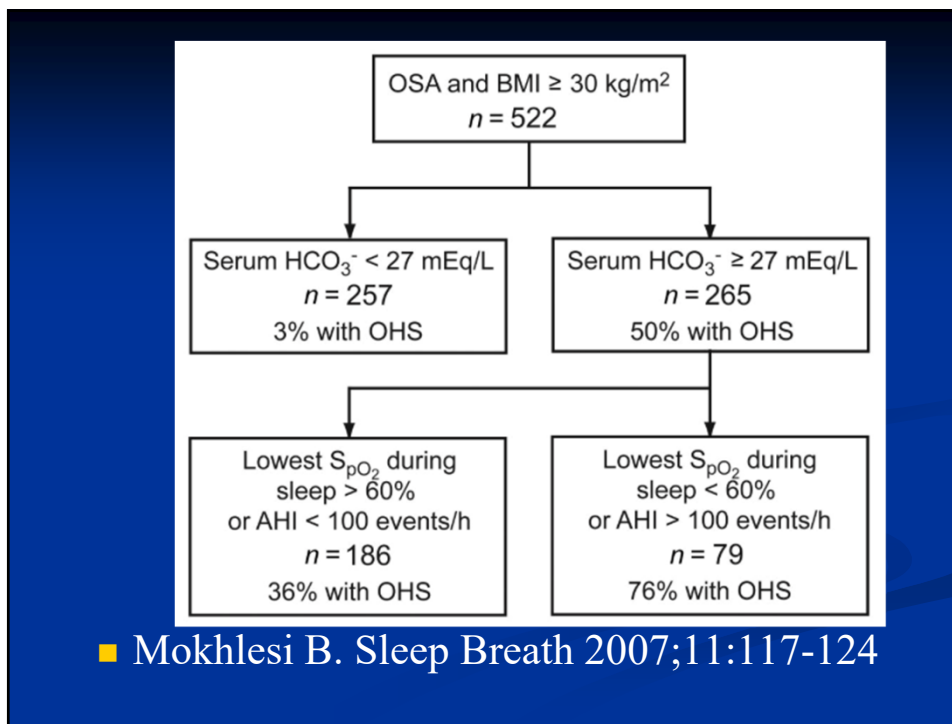
COMPLICATIONS OF OSA

- Cardiovascular
 - HTN, CHF, CVA, arrhythmia, Pulm HTN
- Excessive daytime sleepiness
- Polycythemia
- Obesity hypoventilation syndrome (OHS)
- “Overlap” syndrome – COPD & OSA together

Obesity Hypoventilation (OHS)

Mokhlesi B. OHS State of Art Review. Respir Care 2010;155(10):1347-1362

- Combination of obesity (BMI > 30) and daytime hypercapnia (PaCO₂ > 45)
- Symptoms: EDS, fatigue & morning headaches similar to OSA
- 90% will have sleep-disordered breathing (AHI>5)
- Need to exclude other causes of hypercapnia (PFTs)
- Hypoxemia in office or during PSG
 - ABG most accurate assessment for pCO₂
 - Prolonged hypoxemia during PSG
 - Macavei et al; Predictors of OHS; J Clin Sleep Med 2013;9:879-884
 - Serum bicarbonate >27 is 85% sensitive; 89% specific
 - Bicarb >27: 68% positive predictive value and 95% negative predictive value
 - TRT90 (sleeping sat<90% = 30% v control 11%)

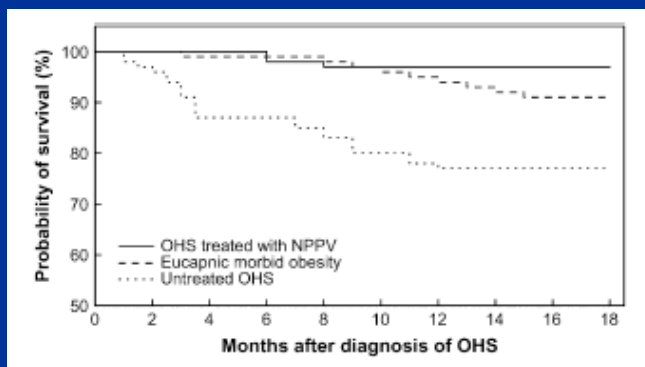


HYPERCAPNIA IN OSA

- French Multicenter Study; n=1141 from database
- Excluded those with FEV1 < 80%
- Overall prevalence of 11% with PaCO₂ > 45
- BMI < 30 – prevalence 7.2%
- BMI 30-40 – prevalence 9.8%
- BMI > 40 – prevalence 23.6%
- Laaban J-P. Chest 2005;127:710-715
- Similar results in Italy and US: Mokhlesi B. Chest 2007;132:1322-1336

INCREASED MORTALITY IN OHS

- If untreated, approx 23% mortality at 1-1.5 yrs
- Treated with NPPV: mortality 3% at 1.5 yrs
- Mokhlesi B et al. Proc Am Thorac Soc 2008(5):218-225



PICKWICK STUDY: NIV v CPAP

Masa JF et al. AARCCM 2015;1:86-95

- 221 subjects with AHI>30; pCO₂ 50, bicarb 30, BMI 44
 - NIV (AVAPS: IPAP 18-22/EPAP 4-8; Rate 12-15; tidal volume 5-6 cc/kg) v CPAP v Lifestyle; oxygen in 20-25% of each group for 88-92% sat
 - Treatment for 2 months; compliance 5.3 hours/night
 - NIV & CPAP improved symptoms and sleep study results
 - NIV showed improved pCO₂ v control, and better pulmonary fxn than CPAP; both NIV and CPAP improved serum bicarb
 - Improvement correlated with compliance
 - **Conclusion:** NIV (AVAPS) & CPAP statistically superior to usual care; NIV yielded better respiratory results

RANDOMIZED TRIAL: BiLevel vs CPAP

Piper AJ. Thorax 2008;63(5): 395-401

- 45 subjects; 9 excluded due to persistent hypoxemia on initial CPAP titration
 - BMI 52-54; pCO₂ 49-52; bicarb 30
- N=36 randomized to CPAP (13-14) vs Spontaneous BiLevel (avg 16/12)
 - 3-4 subjects in each group on oxygen
- After 3 months, same adherence, improved symptoms (less sleep; higher O₂ and lower CO₂)
- Conclusion: in subjects without hypoxemia on CPAP, Spontaneous BiLevel and CPAP were equally effective

AVAPS v BiLevel ST: Randomized Trial

Murphy PB. Thorax 2012;67:727-734

- 50 patients (23 in each group completed study); single blind; BMI 50; pCO₂ 52; Bicarb 31
- AVAPS 657 ml tidal volume (2 on oxygen)
- BiLevel ST 25/10 (4 on oxygen)
- Back-up rate 14 in both groups
- Compliance 5.3 hours; similar changes in both groups
 - pCO₂ reduced to 47; bicarb reduce to 28
- Conclusion: no significant difference in treatment outcomes between AVAPS and BiLevel ST

CPAP & BILEVEL FOR OHS

- Spanish retrospective analysis of 54 patients (18 women) with OHS; mean BMI 44
 - Perez de Llano LA et al. Chest 2005;128:587-594
- Overall, all patients had improved PaCO₂ and PaO₂ on treatment; 5 weaned from treatment after weight loss

<u>Modality</u>	<u>When discharged</u>	<u>Outpt f/u</u>
■ CPAP	3	16
■ Bilevel	49	30
■ Volume ventilator	2	3
■ Oxygen	47	31

TREATMENT SUMMARY

- **Weight loss!**
- **CPAP or Spontaneous BiLevel can be effective for OHS patients with only mildly elevated PaCO₂**
- **Bilevel ST or AVAPS for Severe patients!**
 - Oxygen often necessary in severe cases
 - Physiology can be dynamic:
 - Patients may need NIV + oxygen initially, and then need re-study to adjust therapy and also to see if oxygen can be discontinued
 - Ventilation control improves over 4-6 nights of treatment (Berthon-Jones M et al. Am Rev Respir Dis 1987;135:144-7)

CONCLUSIONS

- OHS complicates 10-15% of OSA patients
- OHS has higher mortality risk if untreated
- Basic treatment should always include weight loss
- For Severe cases: BiLevel ST or AVAPS treatment with oxygen if needed
- Consider CPAP or spontaneous BiLevel for milder cases