

Sleep Apnea and Cardiac Implications

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Disclosures

- Dr. Tallent has no financial associations with industry and has nothing to disclose

Obstructive Sleep Apnea

- Definition – repetitive upper airway obstruction resulting in oxygen desaturations and arousals from sleep
- Prevalence: 3-7% men and 2-5% women
- Found in 41% patients with BMI>28₍₂₄₎
- Menopause increases female risk (progesterone)
- An estimated 90% or more undiagnosed

OSA Predisposing Factors

- Obesity, large neck circumference
- Male gender
- Aging
- Smoking
- Alcohol
- Family history
- African American race
- Hypothyroidism
- Tonsillar hypertrophy
- Retrognathia
- Macroglossia
- Hi arched palate
- Muscular dystrophy
- Nasal deformities/
septal deviation

Signs and Symptoms of OSA

- Snoring
- Nighttime choking/ gasping
- Witnessed apneas
- Excessive daytime sleepiness
- Frequent awakenings
- “Restless sleeper”
- Fatigue
- Hypertension
- Difficulty concentrating
- Frequent nocturia
- Sleep initiation or maintenance insomnia
- Morning headaches
- Xerostomia
- Decreased libido
- Non-restorative sleep
- Mood effects/ irritability

Sleep Apnea Severity

- Apnea-Hypopnea Index – number of disordered breathing events per hour
- AHI
 - <5 - normal
 - 5-14 - mild
 - 15-29 - moderate
 - 30 or higher - severe
- RDI (respiratory disturbance index)
 - 10 or higher – elevated (UARS)

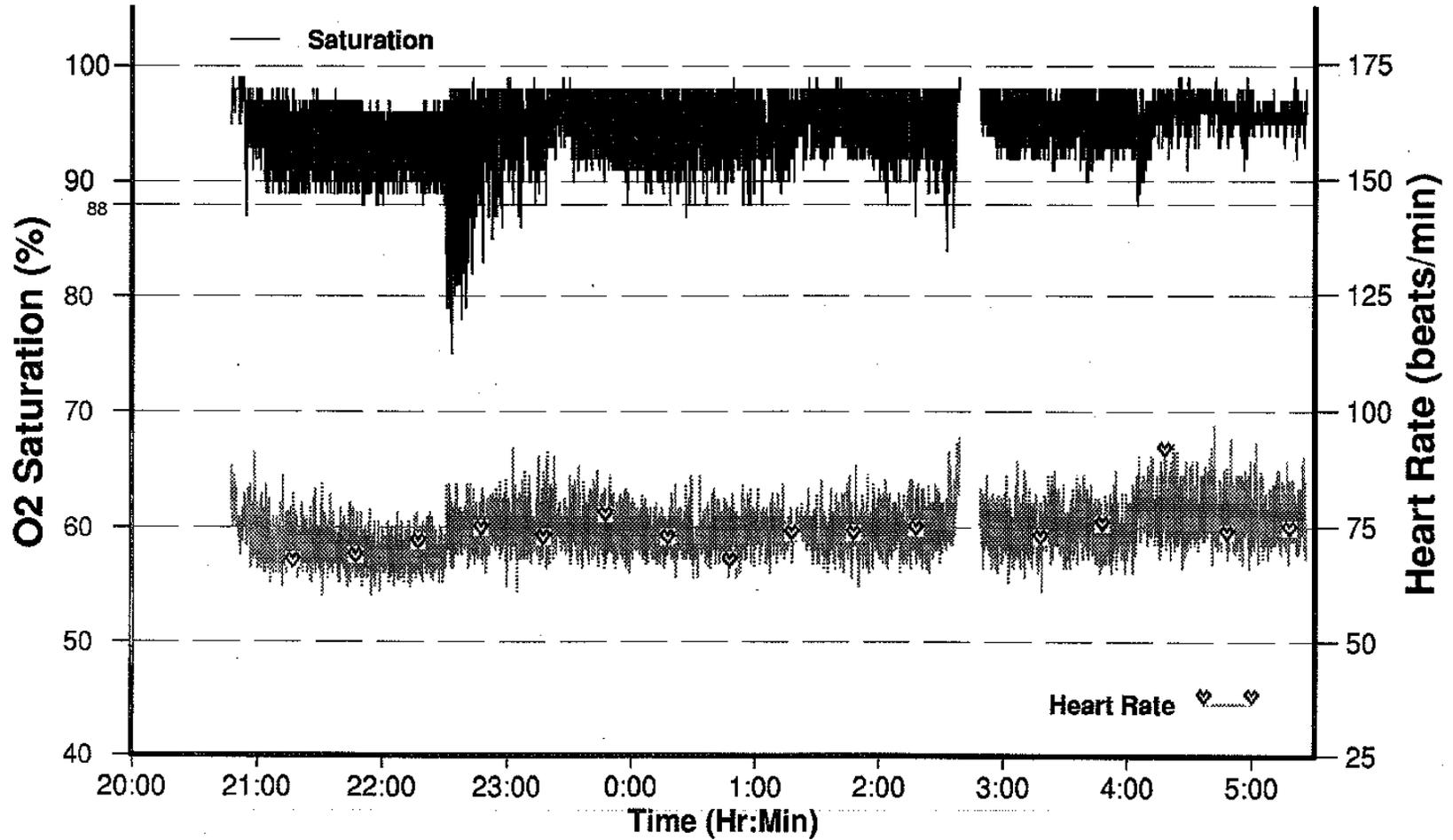
Central Sleep Apnea

- Temporary loss of ventilatory effort
- Absence of obstruction/ patent airway
- Hypersensitive ventilatory chemoreflex (incr. loop gain with over/undershoot ventilatory oscillation)
- Risk factors: male, age >60, A. fib, CVA, CHF (esp. EF<30%), Opioids, daytime hypocapnia
- Minimal signs and symptoms

Forms of CSA

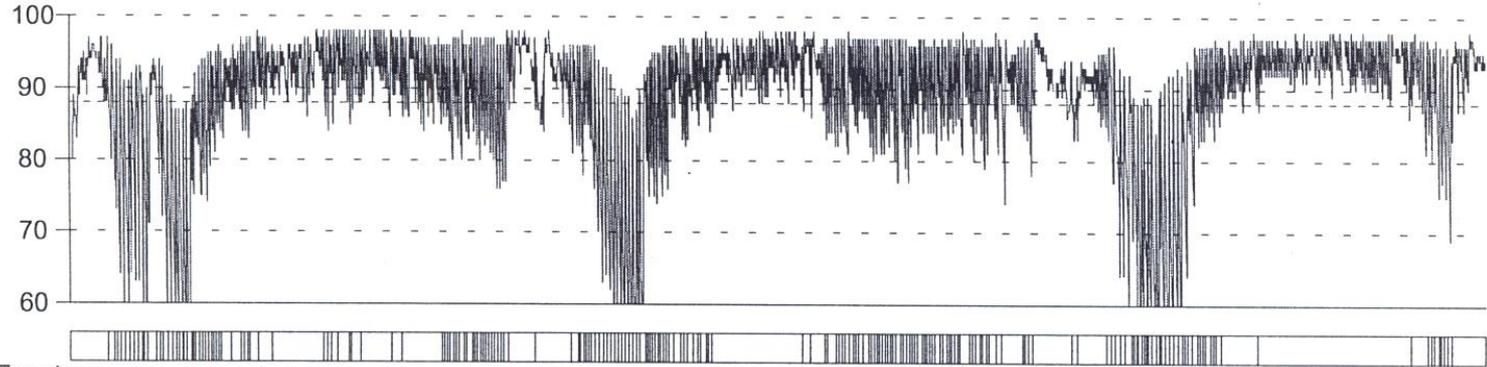
- Primary CSA – unclear etiology
- Medication Induced – Opioids
- Treatment Emergent (Complex) CSA – develops on PAP – tx options: BiPAP, ASV
- Cheyne-Stokes respiratory pattern

Oximetry in CSA



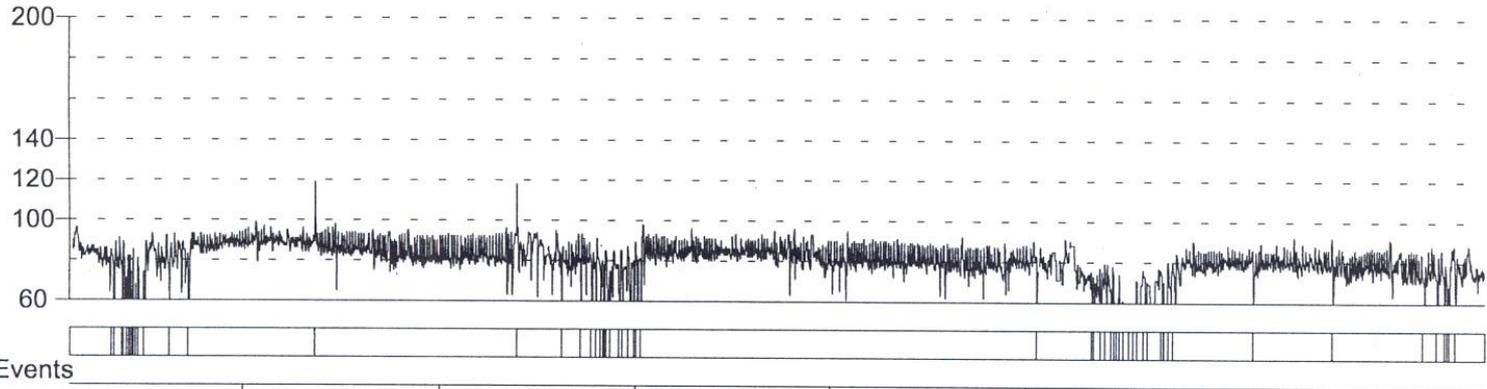
Oximetry with OSA

SpO₂ (10 % per division)



Events

Pulse Rate (20 BPM per division)



Events

Time

9 10 11 12 13 14 15

PAP – Positive Airway Pressure

- CPAP – effective for OSA, some CSA
- BiPAP – can be effective for OSA, CSA, CSR
- Auto-titrating CPAP – not effective for COPD, CHF, non-snorers
- ASV – for central apnea or Cheyne-Stokes breathing

Most effective and reliable outcomes for treatment of all forms of SDB

Apnea Physiology/ Effects

- During apnea: bradycardia and AV block, increased SVR, CO decreases by 1/3
- BP during apnea: decreased early, increased late and in postapneic period
- After apnea: tachycardia and CO increases by 10-15%
- Decreased: fibrinolysis
- Increased: fibrinogen, platelet aggregation

CHF and Sleep Apnea

- OSA worsens CHF: decreased preload, leftward shift of cardiac septum, increased afterload, decreased cardiac output
- Pts frequently hypocapnic which triggers apnea (oscillate just above and below threshold)
- 40-50% of CHF patients have CSA
- CSR present in 30-40% of CHF pts – often longer apnea-hyperpnea cycles with prolonged circulation time
- Severe OSA – powerful predictor of 2 yr mortality

Congestive Heart Failure and Apnea

- OSA and CSA can cause CHF progression
- Rostral fluid shifts: neck (OSA), alveoli (CSA)
- CSA frequent in CHF: pulmonary congestion, prolonged circulation time, increased chemosensitivity
- Apnea assoc. with post-discharge mortality and readmission in setting of acute CHF ⁽¹⁴⁾

CHF and Apnea

- RCT: CPAP impact on survival in CHF patients with CHF showed increased survival ⁽⁷⁾
- SERVE-HF: n=1300 - CHF and predom. CSA, randomized to ASV vs. medical mgmt.

Results: - no difference: all-cause mortality, admission or hospitalization for heart failure

- negative impact: CV-specific mortality

- ASV contraindicated for LVEF < 45%

- Another possible therapy: transvenous phrenic nerve stimulation

Atrial Fibrillation and Apnea

- OSA prevalence is approx. 50%
- Projected to affect 10 million by 2050 ⁽⁸⁾
- OSA increases AF risk:
 - increases: inflammation, intrathoracic pressure, CO2 levels ⁽¹³⁾
 - structural and electrical remodeling, increased fibrosis ⁽¹⁰⁾
- Sleep Heart Health Study:
 - strong assoc. between atrial and ventricular arrhythmias
 - 2-5x odds of AF if severe OSA ⁽⁹⁾
 - 2-3x odds of AF if CSA ⁽¹³⁾

AF and Apnea

- Increasing degree of hypoxia and SA severity associated with increased prevalence of AF⁽¹²⁾
- Case crossover study: 18x increased risk of nocturnal arrhythmia (AF, NSVT) within 90 sec. of an apnea or hypopnea⁽¹¹⁾
- CPAP Tx can decrease burden or help resolve dysrhythmias⁽¹⁴⁾

AF and CPAP

- Retrospective studies: OSA Tx with CPAP after ablation and cardioversion – decreased AF recurrence ⁽²⁾
- CPAP usage and AF recurrence are inversely correlated ⁽¹⁵⁾

OSA and CV Disease

- SDB prevalence in AMI: up to 60 % ⁽¹⁹⁾
- 2-3x increase in CV outcomes and all-cause mortality ⁽¹⁷⁾
- 2005 Study: n=1500, duration 10 yrs ⁽¹⁶⁾
 - Tx'd OSA had survival approaching that of non-OSA
- OSA – higher risk of sudden nocturnal cardiac death – esp. between 12mn-6am ⁽¹⁸⁾

OSA and CV Disease

- AHI > 15 with impaired outcomes after AMI: less myocardial salvage, less reduction of infarct size, less recovery of LVEF (22,23)
- Debated: acute AMI setting: poor outcomes vs. increased collateral development and ischemic preconditioning from intermittent hypoxia (20,21)

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Thank you