Obstructive sleep apnea and its effects on the Heart!

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Outline

- Definitions
- Demographics
- Pathophysiology
- Risk factors
- Symptoms
- Determining Severity
- Systemic effects
- Effects on the Heart
Definitions

- Repetitive cessation (Apnea) or reduction (Hypopnea) of airflow during sleep despite respiratory efforts
- Due to complete (Apnea) or partial (Hypopnea) airway occlusion during sleep

Is this you?
Demographics

- 24% of adult men and 9% of adult women
- Gender: Males > Females
- Prevalence in women increases with menopause
Upper airway is a collapsible cylinder

- Think of your upper airway as a cylinder..
- Determinants of air flow
  - Difference of upstream pressure and downstream pressure
  - Airway resistance
- Upper airway patency determined by balance of
  - Maintain airway opening (dilator muscles)
  - Promote airway closure (decreased intraluminal pressure and Bernoulli Forces)
- Airway size influenced by lung volume that decreases during sleep
While you are asleep...

Mechanism of Obstruction - Upper airway is a collapsable cylinder
What are some factors that worsen collapse of the upper airway

- Alcohol
- Sedatives
- Obesity
- Aging
Repetitive upper airway obstruction is associated with:

- Snoring (alternating with periods of silence)
- Fall in SaO2
- Arrhythmias
  - Decrease HR during obstruction
  - Increase HR during apnea termination
- Arousal at apnea termination
- Increased Blood pressure during post apnea period
Risk Factors for OSA

- Family history of OSA
- Male Gender
- Menopausal state
- Aging
- Race (AA, Mex-A, Asians and Pacific islanders)
- Excess body weight
Common Clinical Features

- Daytime sleepiness (most common)
- Repeated awakenings with gasping or choking
- Snoring, morning headaches
- Witnessed apneas
- Attention deficit
- Changes in mood
- Dry mouth/throat
- Fatigue, Reflux, Insomnia
Is your doctor screening you?

What Do You Do if OSA Is Suspected: STOP-BANG

**STOP Questionnaire**
- Snoring
- Tiredness
- Observed you stop breathing
- Blood Pressure

**BANG**
- BMI > 35
- Age > 50
- Neck circumference > 40 cm (>15.7”)
- Gender male

High risk: Yes to ≥3 items → Refer for sleep testing
OSA: Severity

- APNEA-HYPOPNEA INDEX (AHI)
  - Mild 5-15
  - Moderate 15-30
  - Severe >30
OSA - Severity

- Other factors that influence the clinical severity of OSA
  - Degree of daytime sleepiness
  - Lowest SaO2
  - Severity of sleep fragmentation
  - Nocturnal arrhythmias
  - Co-morbid cardiovascular or neurological disorders
OSA: A Systemic Disorder

- Cardiovascular
- Respiratory
- Renal
- Gastrointestinal
- Endocrine
- Neuro-cognitive
- Immunity
OSA and HTN

- OSA is a risk factor for HTN independent of known confounding factors
  - Increase in SBP and DBP
  - Loss of nocturnal fall in BP ‘dipping’ phenomenon
  - Risk of cardiovascular disease is increased..
Wisconsin Sleep Cohort Study (709 participants followed over 4 years)

The OR for presence of HTN at 4 year follow up

- AHI (0-5) - 1.42
- AHI (5-15) - 2.03
- AHI >15 - 2.89
OSA and HTN

- Improvement in BP during CPAP therapy in persons with OSA and HTN
  - 16 trials; 818 subjects
  - Compared to controls, mean net change with CPAP
    - SBP 2.46mm Hg
    - DBP 1.83mm Hg
    - MAP 2.2mm Hg
1/3rd of patients with heart failure will have OSA

LV systolic dysfunction is an independent risk factor for OSA

OSA may contribute to worsening LV dysfunction

Higher mortality with untreated OSA

24% vs 12% (J Am Coll Card 2007)
Effect of treating OSA in CHF

- CPAP therapy improved Left Ventricular ejection fraction in persons with acute heart failure and OSA
OSA and Arrhythmias

- Ventricular arrhythmias
  - Frequency of PVCs during sleep decreased by 58% with CPAP

- Atrial fibrillation
  - Decreased recurrence after cardioversion with CPAP (82% vs 42%)
OSA and Ischemic Heart Disease

- Increased risk in middle aged adults with OSA
- Independent of age, BMI, BP and smoking
- Reduced by reversal of OSA (J Chest 1996)
- Sleep Heart Health Study
- 16% of patients with OSA reported 1 more major event
  - MI or angina
  - Coronary re-vascularization
  - HF or Stroke

Sleep Apnea and Heart Disease: Inevitable Consequence Which Can Be Prevented

ApneaTreatmentCenter.com
OSA and Heart disease

- Possible mechanisms for greater risk of heart disease in patients with OSA
  - Endothelial dysfunction
  - Hyper coagulable state
    - Increased plasma fibrinogen levels
    - Increased platelet activity
  - Decreased fibrinolytic activity
  - Insulin resistance
  - Increased inflammatory markers
  - Increased sympathetic activity
  - Marked sleep related hypotension (low BP)
At a mean follow of 10.1 years

- Untreated severe OSA significantly increased the risk of fatal and non-fatal cardiac events compared with health controls.
- In treated OSA patients, the incidence of fatal and non-fatal events was decreased by 50%.
OSA and Sudden Cardiac death

- General population
  - Sudden cardiac death peaks from 6am to noon
- Patients with OSA
  - Peaks from midnight to 6am
Avoidance of alcohol, smoking and muscle relaxants

Sleep hygiene

Safety counseling

Optimal Weight management

CPAP therapy, Oxygen therapy, Drugs

Dental devices

Upper airway surgery

Tracheostomy