Obstructive Sleep Apnea: The Under Recognized Killer
Sleep Apnea: A Common Mechanism for the Deadly Triad---Cardiovascular Disease, Diabetes, and Cancer?
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Learning Objectives
At the end of this session, the learner should be able to:
• Describe and distinguish the physiologic characteristics of an apnea and hypopnea.
• List the major risk factors for sleep apnea in adults.
• Recognize the evidence-based link between sleep apnea, hypertension, cardiovascular disease, and mortality.
• Understand the treatment options available for OSA

Airway Collapse: Repeated Asphyxia

State Shift to Sleep ➔ Upper Airway Collapse

Respiratory Effort Related Arousal ➔ Hypoxia + Obstruction

Visual Representation of an Apnea: Cessation of Airflow

Visual Representation of Hypopneas: Reduction of Airflow

Physiologic Consequences of OSA

- Repetitive Arousal
- Sleep Disruption
- Daytime Sleepiness

Physiologic Consequences of OSA

- Hypoxia
- Hypercapnia
- Arousal

Sympathetic Nervous System Activation

Common Terms

- **AHI = Apnea hypopnea index**
  - Number of apneas and hypopneas per hour of sleep

- **RDI = Respiratory disturbance index**
  - Number of apneas, hypopneas and respiratory effort-related arousals (RERAs) per hour of sleep

- **SDB = Sleep-disordered breathing**
  - May include these terms: sleep apnea, upper airway resistance syndrome, sleep-related hypoventilation, and sleep-related hypoxemia

- **UARS = Upper airway resistance syndrome**
  - ≥ 5 RERAs per hour of sleep without significant apnea/hypopnea

Severity of Sleep Apnea

- Severity criteria (adults)
  - Mild: 5-14
  - Moderate: 15-30
  - Severe: > 30
- Judging severity also depends on:
  - Degree of sleep disturbance
  - Degree of hypoxemia
  - Associated arrhythmias
  - Duration of respiratory events

UARS

- “Sleep apnea without the apnea”
- Hypersomnia due to arousals and sleep disruption caused by attempts to breathe through narrowed airway
- No measurable apnea, hypopnea, or hypoxemia, but frequent RERAs (Respiratory Effort Related Arousals)
- Younger, healthier patients
- Mildest form of sleep-disordered breathing

UARS

- Symptoms out of proportion to polysomnogram (PSG) findings
- May be as pathologically sleepy as OSA or narcolepsy patients with same consequences:
  - Falling asleep driving
  - Poor school performance
  - Poor judgment
- Management options same as that for mild OSA

Epidemiology and Risk Factors: Characteristics

- The most serious common sleep disorder
- More recent estimates:
  - 5% to 9% of adults in Western countries
  - Incidence is about 2% per year for AHI ≥ 15
- Approximately the same prevalence as asthma in the general population
- 26% to 32% of patients in primary care medical offices have sleep apnea

Major Risk Factors

Major factors include:

- Obesity associated with adult OSA
- Snoring
- Male gender (until about age 50)
- Postmenopausal state
- Upper airway anatomic obstruction (including nose)
- Ethnicity: black, Asian, or Hispanic


Obesity and OSA

Pre-Weight Loss

Post-Weight Loss

Gender, Age, and Body Mass Index (BMI)

- The effects of gender and BMI change with age.
- After the age of 50, gender becomes an unimportant variable.
- After the age of 60, BMI becomes an unimportant variable.

Signs and Symptoms of OSA: History

- Snoring
- Unrefreshing sleep/daytime sleepiness
- Witnessed apneas
- Insomnia
- Restless sleep
- Nocturnal heartburn
- Morning headache
- Nocturia
- Dry mouth, sore throat, sinus and nasal congestion
- Mood, memory, and learning problems
- Parasomnias
  - Impotence
  - Enuresis
- Many with almost no symptoms

STOP BANG
Screening Tool for Obstructive Sleep Apnea

- Do you Snore loudly (louder than talking or loud enough to be heard through the closed door)?
- Do you often feel Tired, fatigued or sleepy during daytime?
- Has anyone Observed you stop breathing during your sleep?
- Do you have or are you being treated for high blood Pressure?
- BMI: Is your body mass index greater than 35
- Age: Are you 50 years old or older
- Neck: Is your neck circumference >17” (male) or > 16”(female)
- Gender: Are you a male
- STOP: 2/4 significant chance of OSA
- STOP +BANG: Very likely moderate to severe OSA

Sequelae in OSA

The effects of sleep-disordered breathing include:

- Neurocognitive impairment (memory loss)
- Daytime sleepiness
- Impaired quality of life
- Metabolic effects
- Cardiovascular effects
- Cancer

OSA and Metabolic Dysfunction

- OSA is associated with glucose intolerance and insulin resistance, independent of potential confounders.
- OSA is an independent risk factor for the metabolic syndrome.
  - Hypoxemia may be the predisposing factor to the metabolic alterations associated with OSA.
- CPAP improves insulin sensitivity in some patients with OSA.

Cardiovascular Effects of OSA

These include:

- Systemic hypertension
- Pulmonary hypertension (with sustained hypoxemia)
- Arrhythmias, especially atrial fibrillation
- Coronary artery disease
- Congestive heart failure
- Stroke and transient ischemic attacks (TIA)
- Mortality

Mortality in OSA

- 1,522 sample cohort with standard PSG
  - Ages 30 to 60 years at recruitment
- OSA severity by AHI (a priori)
  - $\geq 5 =$ mild
  - $\geq 15 =$ moderate
  - $\geq 30 =$ severe
  - Three-fold all cause mortality (HR = 3.8)
  - > Five-fold risk cardiovascular mortality (HR = 5.2)

Mortality in OSA

All-Cause Survival in Untreated SDB

(p < 0.00001, diff by AHI)


Recurrence of Atrial Fibrillation After Cardioversion Is Higher in Patients With Untreated OSA.

- % Recurrence at 12 Months
  - Controls (n=70)
  - Untreated OSA (n=27)
  - Treated OSA (n=12)


OSA in Patients With New York Heart Association Classification III to IV Congestive Heart Failure (CHF)

<table>
<thead>
<tr>
<th>Author</th>
<th>n</th>
<th>Patients with SDB</th>
<th>Patients with OSA</th>
<th>Patients with CSA</th>
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<tbody>
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<td>Naughton</td>
<td>74</td>
<td>41 (55%)</td>
<td>5 (7%)</td>
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<tr>
<td>Javaheri</td>
<td>81</td>
<td>41 (51%)</td>
<td>9 (11%)</td>
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<td>(Circ, 1998)</td>
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<td>Lanfranchi</td>
<td>66</td>
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Sleep Apnea in Newly Diagnosed Heart Failure

• AmJRespCritCareMed: vol 183 July 2010
• Retrospective study 31,000 patients with newly diagnosed heart failure
• 4% suspected of having sleep apnea while data supports incidence of over 50%
• 2% actually evaluated and treated
• Treated group had 10% mortality at 2 years
• Untreated group had 30% mortality at 2 years

Stroke and Mortality With OSA


International Diabetes Federation Taskforce on Epidemiology and Prevention

Recommendations

• All health professionals caring for patients with diabetes or OSA should be educated about links between the two conditions
• Health professionals caring for patients with type 2 diabetes or OSA should adopt clinical practices to ensure that a patient presenting with one condition is considered for the other.
### Home Sleep Testing

<table>
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<tr>
<th>Pros</th>
<th>Cons</th>
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<tbody>
<tr>
<td>More like “usual” night’s sleep</td>
<td>Quality of data/need to repeat studies</td>
</tr>
<tr>
<td>More convenient for patient</td>
<td>A test for sleep apnea only</td>
</tr>
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<td>Less expensive?</td>
<td>No trained technologist present to:</td>
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<tr>
<td></td>
<td>• Correct equipment problems</td>
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<tr>
<td></td>
<td>• Directly observe any abnormalities during sleep</td>
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<tr>
<td></td>
<td>• Start treatment if necessary</td>
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<td></td>
<td>• Provide patient education</td>
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### Bottom Line for Objective Testing for OSA

- Full attended nocturnal polysomnography for diagnosis and management of sleep apnea in sleep laboratory when possible
- A second night may be required for titration of CPAP.
  - CPAP may be applied after 2 hours of sleep if severe OSA is present on first night (split-night study). This should be done routinely.
- Unattended home sleep testing has a role in selected, uncomplicated patients. These are now accepted by CMS for the diagnosis of OSA.
Management of OSA

Medical Therapies for OSA

• There are no medical therapies that are indicated as primary management options for OSA.

• Overweight and obese patients should be counseled on weight loss, in addition to a primary therapy.

• Nasal steroids and nonsedating antihistamines may be useful adjuncts.
  - Avoid respiratory depressant drugs, benzodiazepines, and opioids.

CPAP Therapy

• Initially described by Sullivan in 1981
• Currently the mainstay of therapy for OSA

Common CPAP Interfaces: Masks

- Full Face Masks
- Nasal Pillows
- Nasal Masks
CPAP Acts as an Airway Stent

<table>
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Compliance With CPAP

- Definition of compliance
  - > 4 hours/night on 70% of nights
- Compliance probably about 50% to 60%
  - Patients overestimate nightly use.
- Compliance patterns are determined early.
- Few clear predictors of compliance:
  - Daytime sleepiness
  - More severe disease
- CMS requires documentation of compliance and benefit after 90 days to retain CPAP


CPAP: Complications

- Rhinorrhea
- Nasal congestion or dryness
- Epistaxis
- Skin abrasions/rashes
- Chest discomfort
- Claustrophobia
- Air swallowing
- Inconvenient
- “Not sexy”

Strategies to Improve CPAP Compliance

- Education, support, reinforcement
- Heated humidification
- Attention to patient-machine interface (mask)
- Get a good home care/durable medical equipment company
- Follow-up:
  - Early (within first few weeks of treatment)
  - Objective compliance monitoring
Strategies to Improve CPAP Compliance

- Management of nasal congestion
  - Nasal steroids
  - Antihistamines
- Other types of positive airway pressure (PAP):
  - Expiratory pressure relief technologies
  - Bilevel positive airway pressure (BPAP) for pressures ≥ 17 cm H2O
  - Autotitrating positive airway pressure (APAP)
  - Adaptive servo-ventilation (ASV) for complex sleep apnea

Oral Appliances

Adjustable devices

Nonadjustable devices

Images courtesy of Dr. Donald Falace

CPAP Better Than Oral Appliances at Reducing AHI


Practical Considerations for Prescribing Oral Appliances

- Identification of proper candidates
- Finding qualified/reputable oral surgeon or dentist
- Cost
- Insurance
- Adverse events
- Follow-up sleep study is needed
Surgical Management

<table>
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<th>Soft Tissue (Phase 1)</th>
<th>Boney/Reconstructive (Phase 2)</th>
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<tr>
<td>Adenotonsillectomy</td>
<td>Maxillomandibular Advancement</td>
<td>Tracheostomy</td>
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<tr>
<td>Palatal Procedures (UPPP, RFA, Pillar)</td>
<td>Bariatric Surgery?</td>
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<tr>
<td>Genioglossal Advancement</td>
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<td>Nasal Procedures</td>
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<td>Base of the Tongue Procedures</td>
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<tr>
<td>Combinations</td>
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Surgical “Success” Depends on Definition


Surgical Summary

- Data concerning efficacy for many surgical procedures is controversial.
- Role of surgery must be tailored to the individual patient’s needs:
  - Adenotonsillectomy for children and adults with enlarged tonsils
  - Nasal procedures for septal deviation in attempt to improve CPAP compliance
  - Tracheostomy for severe disease intolerant to other treatments
  - Role of bariatric surgery is not well-defined.

Provent nasal valve

- One way valve
- FDA approved but not covered yet
- Effective 30% if able to learn to sleep with it
OSA Management Summary

- Medical therapies are not supported as primary management options for any degree of OSA.
- CPAP is indicated for all adult patients with OSA.
  - Compliance is improved by education and heated humidification.
  - Follow-up:
    - Early with objective compliance monitoring
    - Oral appliances may be indicated for patients with mild-to-moderate OSA as an alternative to CPAP.
    - Provent now another non-CPAP alternative
    - Efficacy and role of surgery for OSA are not well-defined and must be individualized to the patient.

Signs and Symptoms of OSA

Children may show the following signs:

- Snoring, gasping, choking
- Mouth-breathing
- Obesity or failure to thrive
- Behavioral problems
- Adenotonsillar hypertrophy
- Nocturnal enuresis
- Morning headache
- Restless sleep

OSA: Diagnosis and Management

Recommendations from the American Academy of Pediatrics 2002:

- All children should be screened for snoring. Snoring in children is not normal!
- Complex high-risk patients should be referred to a subspecialist.
- Patients with cardiorespiratory failure cannot await elective evaluation.
- Diagnostic evaluation is useful in discriminating between primary snoring and OSA, the gold standard being polysomnography.

OSA: Diagnosis and Management

Recommendations from the American Academy of Pediatrics 2002

- Adenotonsillectomy is the first-line treatment for most children, and CPAP is an option for those who are not candidates for surgery or do not respond to surgery.
- High-risk patients should be monitored as inpatients postoperatively.
- Patients should be re-evaluated postoperatively to determine whether additional treatment is required.
Thank You

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