Obstructive sleep apnea: An overview

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Main goal for this presentation

- Give an overview of OSA - diagnosis and treatment
- Review epidemiology, pathophysiology, and relationship to comorbidities
- Help you understand where sleep apnea fits into the overall health of your patients
Why is OSA important?

- Top 3 disorders pulmonary docs actually see in office practice
- Significant morbidity, some mortality
- Easily treatable
- Make a meaningful impact on patient lives
- 10% of pulmonary boards
Patient Presentation

- 55 year old woman
- Loud snoring, choking/gasping
- Witnessed apnea by spouse
- Htn x 5 year
- Borderline T2DM
- 30# weight inc x 5 yrs
- BMI 32kg/m2
- ESS 12

- Diagnosis?
- Causation?
- Would you do next?
- Treatment?
- Prognosis?
Sleep Apnea
Pathophysiology
Pathophysiology Key Points

- UA is collapsible
  - Genetics
  - Weight
  - Intrinsic property

- Collapse occurs at all segments
  - Naso, velo, hypo
  - Nose, mouth, lower

- Promote collapse
  - Weight of neck
  - Small anatomy (oroP)
  - ?NM tone

- Promote patency
  - GG tone
  - Larger anatomy
  - Less soft tissue

Effect of State, medications, internal obstruction, ctrl of breathing
Upper Airway Sites Contributing to OSA
Pathogenesis of OSA

Genetic factors

Obesity influence

Small pharyngeal airway

Ventilatory control factors

Sleep effect

Airway Closure
Balance of Pressures in Upper Airway Function

- Small airway size
- Upper airway resistance
- Neg inspiratory pressure
- Extra lumenal tissue pressure
- Greater collapsibility
- Smaller mandible

- Pharyngeal dilator muscles
- Larger airway size
- Larger mandible
- Less collapsibility
- Higher lung volume

Favors collapse

Favors patency
Sleep Apnea

Definitions and Examples
What is sleep apnea?

• **Apnea** is complete absence of airflow for ≥10 seconds.

• **Hypopnea** is a partial (50-70%) reduction in airflow and with ≥3% O2 desaturation and/or arousal.

• **Obstructive sleep apnea**: complete collapse of the pharynx during sleep despite efforts to breathe.

• **Central sleep apnea**: complete withdrawal of central respiratory drive to the muscles of respiration during sleep.
Obstructive Apnea

A complete blockage of the airway despite efforts to breath.
Obstructive apnea

No airflow

Continued breathing effort
Obstructive sleep apnea

Resp effort

Apnea

Resp effort
Obstructive apnea with arousal

Apnea

Breathing resumes

EEG Arousal from sleep
Hypopneas

- >70% airflow reduction
- >4% decrease in saturation
- At least 10 sec

- >50% airflow reduction
- >3% decrease in saturation OR EEG arousal
- At least 10 sec
Sleep Apnea Epidemiology
Epidemiology

• 1990s
  • Men 25% at risk; 4% affected
  • Women 9% at risk; 2% affected

• 2010s
  • Men 35% at risk; 15% affected
  • Women 15% at risk; 8% affected

Obesity

AGING
Epidemiology of OSA

• 2 major US prevalence studies
  – Wisconsin sleep cohort study
  – Penn State study
• Both have found similar results
  – About 15% of men have clinical OSA
  – About 7% of women have clinical OSA
Prevalence of Sleep Apnea

Increases with age
What Has Epidemiology Taught Us About Clinical Presentation?

• Large difference between OSA and OSA Syndrome
  – Men: 25% vs. 4%
  – Women: 9% vs. 2%

• Implications/Questions:
  – Large number of people without symptoms vs. subclinical disease- may develop symptoms later?
  – Are we asking the right questions about clinical presentation?

• Relationship between clinical presentation and objective testing?
Clinical Presentation
Clinical Presentation: Most Common Features

• Loud snoring
  – Very common complaint
  – 40% of men, 20% of women report habitual snoring
  – Minimal to no health hazard known
  – Associated with considerable social and marital hazard
  – 70-90% of OSA patients snore; in one study only 6% of OSA did not snore*

Clinical Presentation: Most Common Features

- Excessive Daytime sleepiness (EDS)
  - Extremely common complaint
  - Neither specific nor sensitive in OSA
  - Sleepiness does not distinguish OSA from non-OSA
  - Cause of EDS is not completely known
    - Arousals?
    - Hypoxia?
    - Primary brain injury?
Clinical Presentation: Most Common Features

- Nocturnal choking/gasping
  - Bed partners may recognize this more commonly than the patient
  - Differential diagnosis includes:
    - Nocturnal panic disorder
    - Paroxysmal nocturnal dyspnea
    - GERD/Reflux
Other Presenting Symptoms

• Restless sleep
  – Multiple causes of this; many not apnea related

• Headache
  – Common side-effect of OSA; mechanism unknown

• Dry mouth
  – Related to mouth breathing

• Nocturia
  – Think OSA when seen in younger men or pre-menopausal women
How OSA May “Present” to Other Physicians

- Cardiologist
  - Hypertension, CHF, Arrhythmias, Nocturnal angina
- Psychiatrist
  - Depression
- Neurologist
  - Stroke, refractory epilepsy, headache in AM
- Urologist
  - Nocturia, erectile dysfunction
Notable physical exam features

Mallampatti Airway Classification

Class I

Class II

Class III

Class IV
Why Sleep Apnea Isn’t Going Away.....
Wide range of disease severity – symptom severity relationships

n = 4653

Apnea – Hypopnea Index

Epworth Sleepiness Scale

Sleepy Sleep Apnea

Non-Sleepy Sleep Apnea
Diagnosing OSA

Lab
• Comprehensive
• Expensive
• Guidelines: comorbidities – CHF, COPD, NMDz

Home
• Simpler
• Less expensive
• Guidelines: high risk patients
• Insurers push for this in most patients
Polysomnogram Interpretation

**Diagnosis**

- AHI < 5: Normal
- AHI 5-15: Mild OSA
- AHI 15-30: Moderate OSA
- AHI > 30: Severe OSA
Home sleep apnea test

- Uses fewer channels of recording
- Focuses on respiratory signals
- Well-validated compared to PSG
- Lower costs, lower reimbursement
- Increased tech failure rate, ~ 10%
- Controversial at present but is the future of sleep apnea diagnosis
Home Sleep Apnea Test

Hypopnea = decr airflow + effort + desat of >3%
Outcomes of home OSA testing

• At least 5 RCT’s in past 7 years
• Have shown equivalent outcomes in terms of CPAP usage and QOL/functional outcomes
Management of OSA
Management of OSA

• Weight loss
• CPAP
• Oral appliance
• Head/neck surgery
• Positional therapy
Effect of weight loss on OSA

• A prospective cohort study (n=690) reported 10% weight loss predicted a 26% decrease in AHI
  (Peppard, JAMA 2000)

• A RCT of 31 pts comparing cognitive behavioral weight reduction with/without CPAP reported improvement in ODI mostly seen in the first 6 months
  (Kajaste 2004)

Potential problems
  ▪ often short term as most patients regain the weight
Continuous Positive Airway Pressure (CPAP) Overview

• First description of CPAP – 1981
• Rapidly became therapy of choice
• Very effective
• Side effects tend to be mild, manageable
• Limited by need for nightly volitional decision to use it
Mechanism of CPAP in OSA

• Pneumatic splinting is the most important
• Reflex dilatation also occurs – as lung volume increases, so does pharyngeal vol.
Effects of CPAP

- On HTN
- On cardiovascular outcomes and mortality
- On sleepiness
Mean net change in systolic BP by trial

Pooled estimate of intervention effect:
- net SBP ↓ 2.46 mmHg
  (95% CI -4.31 to -0.62)
- Arguably clinically significant
- Greater effect in worse studies with worse hypertension

OSA and Risk of CV Complications: A prospective cohort trial

Marin, Lancet, 2005
Long-term cardiovascular outcomes in men with obstructive sleep apnoea-hypopnoea with or without treatment with CPAP

Conclusion:

• In men, severe OSAH significantly increases the risk of fatal and non-fatal cardiovascular events.

• CPAP treatment reduces this risk.
CPAP improves sleepiness

<table>
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<th>Study</th>
<th>CPAP N</th>
<th>CPAP Mean (SD)</th>
<th>Control N</th>
<th>Control Mean (SD)</th>
<th>Weighted Mean Difference (Fixed)</th>
<th>Weight (%)</th>
<th>Weighted Mean Difference (Fixed)</th>
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Total (95% CI): 390
Test for heterogeneity chi-square=27.38 df=9 p=0.001 I²=67.1%
Test for overall effect z=10.12 p<0.00001
Benefits of CPAP

• Immediate impact
  ➢ Reduce hypoxia,
  ➢ improves quality of sleep
  ➢ Improves quality of life

• Long term impact
  ➢ Attenuates sympathetic nerve activity
  ➢ improves LVEF
  ➢ reduces afterload,
  ➢ decreases daytime blood pressure
  ➢ decreases arrhythmia,
  ➢ improves insulin resistance
  ➢ decreases stroke
CPAP: the more you use it, the better you do...

Figure 1—Cumulative proportion of participants obtaining normal threshold values on the Epworth Sleepiness Scale (ESS), Multiple Sleep Latency Test (MSLT), and Functional Outcomes of Sleep Questionnaire (FOSQ). A cumulative proportion function was applied to the data in Table 3. CPAP refers to continuous positive airway pressure.

Weaver et al, Sleep, 2007
Compliance

- Short term compliance is 50-80%
- Ave 3.5-4.5 hr/night
- Tolerability is frequently an issue but can be solved in many patients
Summary

- OSA is common, but under-recognized → under-diagnosed → under-treated.
- Confirmed by overnight sleep study
- Big impact – quality of life, cardiovascular complications, and socio-economical cost
- Readily available treatment – CPAP
- Main obstacle – compliance
Summary

• Sleep apnea is easy to diagnose
  – Sleep labs
  – Home OSA testing
Summary

• Very treatable
  – Adherence is no worse than taking pills
  – Programs to help patients with adherence are available.
  – Expect about 1/3 of your OSA patients will need another therapy
Patient Presentation

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Diagnosis?
Causation?
Would you do next?
Treatment?
Prognosis?
Thanks

Questions?