The International Palestinian Congress in Sleep Medicine

“Temporomandibular Disorders and Sleep Apnea”

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Notre Dame Hotel, Jerusalem
Identifying & Diagnosing Sleep Apnea

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Objectives

• Define obstructive, central and complex sleep apnea syndromes

• Discuss appropriate methods for diagnosing these syndromes (PSG vs HSAT)
What is Obstructive Sleep Apnea?

Obstructive sleep apnea (OSA)

- Repetitive episodes of complete (apnea) or partial (hypopnea) upper airway obstruction occurring during sleep
  - minimum of 10 seconds
- Events often result in reductions in blood oxygen saturation
- Are usually terminated by brief arousals from sleep

OSA in NREM Sleep
Symptoms

- Witnessed apneas
- Snoring
- Gasping/choking at night
- Excessive sleepiness not explained by other factors
- Non-refreshing sleep

- Sleep fragmentation or maintenance insomnia
- Nocturia
- Morning headaches
- Decreased concentration
- Memory loss
- Irritability

Epstein LJ; Kristo D; Strollo PJ; Friedman N; Malhotra A; Patil SP; Ramar K; Rogers R; Schwab RJ; Weaver EM; Weinstein MD. Clinical guideline for the evaluation, management and long-term care of obstructive sleep apnea in adults. J Clin Sleep Med 2009;5(3):263-276.
OSA

• Defined by a combination of symptoms and episodes of not breathing during sleep
Obstructive Breathing Events

- **Obstructive apneas** - a physical blockage of the airway that prevents airflow despite efforts to breathe (OSA)

- **Obstructive hypopneas** - a partial obstruction to airflow (OH)

- **Respiratory event related arousals** - an airflow limitation with increasing or continued respiratory effort followed by an arousal (RERA)
Obstructive Events

Obstructive Apnea

Hypopnea

RERA

*Airflow
*Effort
Apnea Rule

• Score a respiratory event as an apnea when BOTH of the following criteria are met:
  • There is a drop in the peak signal excursion by $\geq 90\%$ of pre-event baseline using an oronasal thermal sensor (diagnostic study), PAP device flow (titration study) or an alternative apnea sensor (diagnostic study).
  • The duration of the $\geq 90\%$ drop in sensor signal is $\geq 10$ seconds.

Obstructive Apnea

- Score an apnea as **obstructive** if it meets apnea criteria and is associated with continued or increased respiratory effort throughout the entire period of absent airflow.
Hypopnea Rule (1A)

• Score a respiratory event as a hypopnea if ALL of the following criteria are met:
  • The peak signal excursions drop by ≥30% of pre-event baseline using nasal pressure (diagnostic study), PAP device flow (titration study), or an alternative hypopnea sensor (diagnostic study).
  • The duration of the ≥30% drop in signal excursion is ≥10 seconds.
  • There is a ≥3% oxygen desaturation from pre-event baseline or the event is associated with an arousal.

Hypopnea Rule (1B)

• Score a respiratory event as a hypopnea if ALL of the following criteria are met:
  • The peak signal excursions drop by ≥30% of pre-event baseline using nasal pressure (diagnostic study), PAP device flow (titration study), or an alternative hypopnea sensor (diagnostic study).
  • The duration of the ≥30% drop in signal excursion is ≥10 seconds.
  • There is a ≥4% oxygen desaturation from pre-event baseline.

Note 2

• If a portion of a respiratory event that would otherwise meet criteria for a hypopnea meets criteria for apnea, the entire event should be scored as an apnea.

Hypopnea with Desaturation
Hypopnea with Arousal
RERA
Diagnostic Criteria for OSA

(A and B) or C satisfy the criteria

A. The presence of one or more of the following:
   - The patient complains of sleepiness, nonrestorative sleep, fatigue, or insomnia symptoms.
   - The patient wakes with breath holding, gasping, or choking.
   - The bed partner or other observer reports habitual snoring, breathing interruptions, or both during the patient’s sleep.
   - The patient has been diagnosed with hypertension, a mood disorder, cognitive dysfunction, coronary artery disease, stroke, congestive heart failure, atrial fibrillation, or type 2 diabetes mellitus.

B. Polysomnography (PSG) or OCST demonstrates:
   1. Five or more predominantly obstructive respiratory events (obstructive and mixed apneas, hypopneas, or respiratory effort related arousals [RERAs]) per hour of sleep during a PSG or per hour of monitoring (OCST).

   OR

C. PSG or OCST demonstrates:
   1. Fifteen or more predominantly obstructive respiratory events (apneas, hypopneas, or RERAs) per hour of sleep during a PSG or per hour of monitoring (OCST).

OSA Diagnosed by Respiratory Scoring Alone

C. PSG or OCST* demonstrates:

1. Fifteen or more predominantly obstructive respiratory events (apneas, hypopneas, or RERAs) per hour of sleep during a PSG or per hour of monitoring (OCST).

*OCST = HSAT (newer terminology)

Central Sleep Apnea (CSA)

Caused by a malfunction in the respiratory control system leading the person to not take a breath

Central apnea:
• Absence of nasal/oral airflow AND absence of thoracoabdominal excursion (no breathing effort)
• Duration of event: ≥ 10 sec

• Central apnea index (CAI) ≥ 5 is considered abnormal
• CSA diagnosed if CAI ≥ 50% of total AHI
• CAI does not include central hypopneas
CSA

- Idiopathic
- Opioid induced
- Heart failure (CSA/CSR)
- Post Arousal
- Treatment-emergent (Complex)
- High altitude
Central Apneas

Cheyne Stokes Respiration
Two Types of CSA

Hypocapneic (↓CO₂)
- Sleep transition (normal)
- Heart failure (CSR)
- Treatment emergent (complex)
- High altitude
- Renal failure (periodic breathing)
- Post stroke

Hypercapneic (↑CO₂)
- Narcotics (opioids)
- Neuromuscular disorders
- Neurodegenerative disorders
- Restrictive thoracic disorders
- Brainstem dysfunction
- Central hypoventilation syndrome
Why is this important?

- Identifies the underlying mechanism of CSA
- Determines appropriate therapy
  - Treat underlying problem if indicated
  - Hypocapnic CSA
    - servoventilation (ASV)
  - Hypercapnic CSA
    - noninvasive positive pressure ventilatory support (NPPV)
Complex Sleep Apnea (CompSA)

- Also called treatment-emergent CSA
- Central apnea emerges during initial PAP titration
- Thought to be due to a reduction in CO$_2$ caused by PAP
- Prevalence estimated to be 7-20%
- Generally resolves with ongoing PAP therapy (within 1 - 3 months)
Complex Sleep Apnea (CompSA)

Too Much Pressure?

• Frequent arousals
• Emergence of central apnea
• Patient awakens and complains of excessive pressure

First rule out common issues with PAP treatment - these are often confused with CompSA

- Wrong PAP pressure (under/over titration)
- Mask leak
- Other CSA events (CSR, post-arousal, opioid-induced)
Determine the Appropriate Test

• First – the evaluation
  • The evaluation should occur before any sleep study is performed

• Establish a differential diagnosis to select the appropriate test(s)
 Recommendation 2

• We recommend that **PSG**, or **HSAT** with a technically adequate device, be used for the diagnosis of OSA in uncomplicated adult patients presenting with signs and symptoms that indicate an increased risk of moderate to severe OSA.
High Probability of OSA

- Observed apneas during sleep
- Epworth sleepiness score > 10
- Inappropriate napping
- Sleepiness interfering with daytime activities
- Habitual snoring
- Obesity - BMI >30 in adults
- Craniofacial / upper airway abnormalities
Recommendation 4

• We recommend that PSG, rather than HSAT, be used for the diagnosis of OSA in patients with significant cardiorespiratory disease, potential respiratory muscle weakness due to neuromuscular condition, awake hypoventilation or suspicion of sleep related hypoventilation, chronic opioid medication use, history of stroke or severe insomnia.

IN-Lab vs HSAT

- Failed HSAT
- History of moderate to severe pulmonary disease
- Patient uses oxygen at home
- Neuromuscular disease
- Congestive heart failure
- Hypoventilation syndrome

- Patient is under 18 years of age
- Suspected Central Sleep Apnea
- Narcolepsy, PLMS or Movement disorder
- Parasomnia
- PAP titration
Outcomes are the Same

Recent comparative effectiveness research studies have shown that clinical outcomes of patients with a high pretest probability for obstructive sleep apnea who receive ambulatory management using portable-monitor testing have similar functional outcomes and adherence to continuous positive airway pressure treatment, compared to patients managed with in-laboratory polysomnography.

Kuna ST. Portable-monitor testing: an alternative strategy for managing patients with obstructive sleep apnea. Respir Care. 2010 Sep;55(9):1196-215
HST VS HSAT

Home Sleep Testing

HOME SLEEP APNEA TESTING
Home Testing Modalities

- Cardiorespiratory recordings
  - Expanded montages (EEG or a measure of sleep)
- PAT
- Actigraphy
- Pulse oximetry
- PAP monitoring / Auto PAP
HSAT

• HSAT for evaluation of OSA includes recording and evaluation of
  • Respiration
  • Snoring
  • Oximetry
  • Body position (sometimes)
  • Sleep stages (rarely) or a measure of sleep (sometimes)
Tell the Patient!

- Why diagnosis and treatment of obstructive sleep apnea is important
- How HSAT fits into the clinical evaluation
- What the HSAT device measures
- How to use the HSAT device
- How to return the HSAT device
Demonstrate How to Use the Equipment

DEVICE SPECIFIC – Teach back recommended!

- Sensor application
- Plugging sensors into the device
- Starting the recording
- Ending the recording
- Removing the sensors
What about auto PAP?
Auto PAP (APAP)

- May be used for unattended treatment of patients without significant comorbidities to:
  - Treat moderate to severe OSA
  - Determine a fixed CPAP treatment pressure
  - Address changes in pressure requirements throughout the night
  - Assist with titration difficulties due to pressure intolerance
  - Aid in treatment of OSA when attended CPAP titration cannot be accomplished
  - Improve patient comfort
No Statistical Difference

A clinical pathway utilizing PM (HSAT) and APAP titration resulted in CPAP adherence and clinical outcomes similar to one using PSG and in-lab titration.

Berry RB; Hill G; Thompson L; McLaurin V. Portable monitoring and autotitration versus polysomnography for the diagnosis and treatment of sleep apnea. *SLEEP* 2008;31(10):1423-1431.
Guidelines for OSA Diagnosis

• PSG or HSAT (with a technically adequate device)

• Uncomplicated adult patients with signs and symptoms of moderate to severe OSA

• PSG to follow a negative, inconclusive or technically inadequate HSAT

• Split-night diagnostic PSG protocol may be used for the diagnosis of OSA
Guidelines for OSA Diagnosis

• PSG – **not HSAT** - for the diagnosis of OSA in patients with
  • Significant cardiorespiratory disease
  • Potential respiratory muscle weakness (neuromuscular)
  • Awake hypoventilation or suspicion of sleep related hypoventilation
  • Chronic opioid medication use
  • History of stroke
  • Severe insomnia
Thank you!

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