

Obstructive Sleep Apnea in Adults

Biomedical Engineering - URJC

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20 de marzo de 2025



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Understanding Obstructive Sleep Apnea: A Comprehensive Overview

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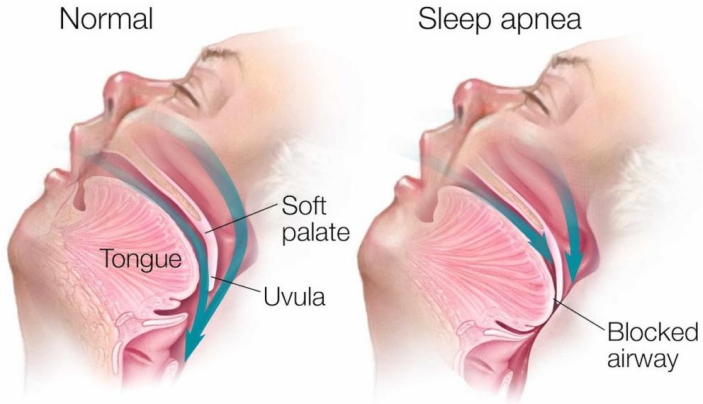
Introduction

- **Sleep apnea syndrome (SAS)** or **obstructive sleep apnea (OSA)** is characterized by **upper airway obstruction during sleep**.
- Leads to episodes of apnea and hypopnea, causing daytime symptoms and cardiovascular issues.

Characteristics

- Dynamic collapse of upper airway tissues during sleep.
- Increased collapsibility leads to reduced (hypopnea) or absent airflow (apnea), causing oxygen desaturation and sleep fragmentation.
- Symptoms: chronic snoring, insomnia, gasping, breath-holding, unrefreshing sleep, daytime sleepiness.

Characteristics



Terms

- **Apnea** is defined as the cessation of airflow for ten or more seconds.
- **Hypopnea** is defined as a recognizable, transient reduction of 30 percent or more (not a complete cessation) of breathing for ten or more seconds.
- **Apnea–hypopnea index (AHI)** is the most commonly reported polysomnographic parameter describing the syndrome severity.

- Prevalence: 15-30 % in North America, 3-6 % in Spain.
- Major predisposing factor: excess body weight (58 % of moderate to severe OSA).
- Other factors: anatomy-related (adenotonsillar hypertrophy), neurological, pharmacologic, muscular.

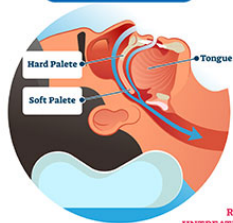
Pathophysiology

- Muscle tone decrease during sleep causes relative narrowing of the air passage.
- Upper airway obstruction due to negative collapsing pressure during inspiration.
- Obstruction sites: nasal cavity, nasopharynx, oropharynx, base of the tongue, laryngeal complex.
- Hypoxemia and arousals linked to cardiovascular, metabolic, and neurocognitive dysfunction.

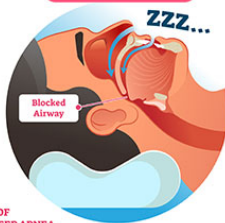
SLEEP APNEA

SLEEP APNEA is a potentially serious sleep disorder in which breathing repeatedly stops and starts.

NORMAL BREATHING ✓



SLEEP APNEA ✗



RISKS OF
UNTREATED SLEEP APNEA



Clinical Presentation

- Symptoms: loud snoring, witnessed apneas, restless sleep, mouth breathing.
- Nonrestorative sleep, morning headache, excessive daytime sleepiness, cognitive deficits, mood changes.

Clinical Presentation

Sleep Apnea

Daytime Symptoms



Early morning headaches.



Daytime sleepiness.



Poor concentration.



Irritability.



Falling asleep during routine activities.

Sleep Apnea

Night-time Symptoms



Loud persistent snoring.



Witnessed pauses in breathing.



Frequent visits to the bathroom.



Choking or gasping for air.



Restless sleep.

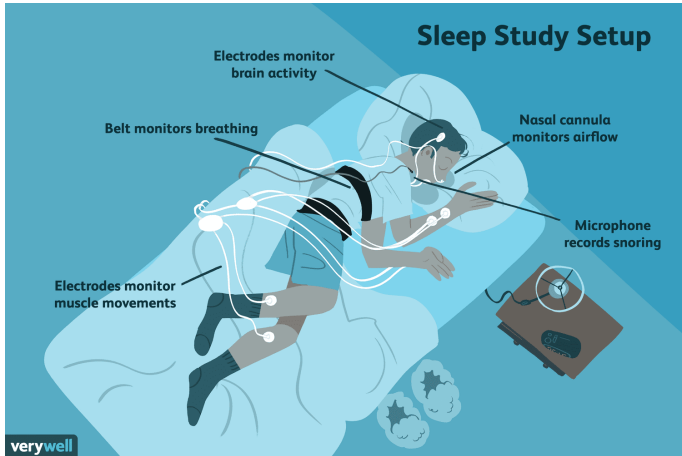
Diagnosis

- Apnea–hypopnea index (AHI) is crucial for diagnosis.
- Questionnaires: Berlin, Epworth Sleepiness Scale, STOP-Bang.
- **Polysomnography** (gold standard) involves various recordings during sleep.

Polysomnography involves simultaneous recording of physiologic variables during sleep:

- Electroencephalogram
- Electrooculogram
- Electromyogram
- Electrocardiogram
- Respiratory effort
- Others: airflow, oxygenation, ventilation, snoring.

Diagnosis



Treatment

- Education and Behavior: Weight loss, avoiding alcohol, proper sleep hygiene.
- Positive Airway Pressure Therapy (CPAP) as the mainstay of treatment.
- Surgery considered when other therapies are ineffective, addressing specific obstruction sites.

Sleep Apnea Treatments



Therapy Treatments

The first line of treatment for sleep apnea usually includes positive airway pressure (PAP) devices and oral appliances.



Surgical Treatments

Depending on the cause of breathing issues, a sleep specialist may recommend surgery when non-invasive devices fail to prevent lapses in breathing.



Lifestyle Changes

It may be beneficial to make lifestyle changes alongside any doctor-prescribed therapy to reduce the severity of sleep apnea symptoms.