

Atrial Fibrillation and Obstructive Sleep Apnea, understanding the link

***Mohammad Shafiq, MD
Cardiology lecturer
Beni Suef University***

Outline of the Talk

- **What is sleep apnea?**
- **What is the link between atrial fibrillation (AF) and sleep apnea?**
- **Does treatment of obstructive sleep apnea (OSA) improve outcomes in patients with AF?**

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What is Sleep Apnea?

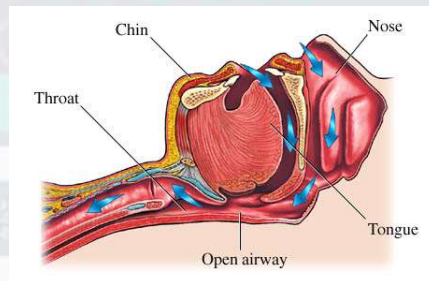
- **Sleep apnea is a condition that affects your ability to have a restful sleep**
 - Pauses in breathing 10-20 seconds or longer
- **Obstructive sleep apnea (OSA)**
 - Collapse of the pharyngeal airway leading to repetitive interruption of ventilation during sleep
- **Central sleep apnea (CSA)**
 - The brain fails to signal muscles that control breathing
 - Less common
- **Mixed sleep apnea**

Causes or conditions that can lead to CSA

- **Parkinson's disease**
- **Medical conditions that affect the brain stem including brain infection and stroke**
- **Obesity**
- **Certain medications like narcotic painkillers**

Conditions associated with OSA

1. *Obesity*
2. *Alcohol*
3. *Sedatives*
4. *Neuromuscular disorders*
5. *Craniofacial abnormalities*
6. *Endocrine disorder*



•Young, T., P.E. Peppard, and S. Taheri, *Excess weight and sleep-disordered breathing*. J Appl Physiol, 2005. **99**(4): p. 1592-9.
 •Nieto, F.J., P.E. Peppard, and T.B. Young, *Sleep disordered breathing and metabolic syndrome*. WMJ, 2009. **108**(5): p. 263-5.

What Causes OSA?



If you have obstructive sleep apnea, excess soft tissue can obstruct your airway.

Epidemiology

- 1 in 5 adults has at least mild sleep apnea (20%)
- 1 in 15 has at least moderate sleep apnea (7%)
- Sleep apnea is increasing in frequency due to increasing **obesity**

Young, T., P.E. Peppard, and D.J. Gottlieb, *Epidemiology of obstructive sleep apnea: a population health perspective*. Am J Respir Crit Care Med, 2002. 165(9): p. 1217-39

Signs and Symptoms

- Loud snoring
- Pauses in breathing while sleeping
- Restless sleep
- Waking up frequently at night
- Being very tired or falling asleep during the day

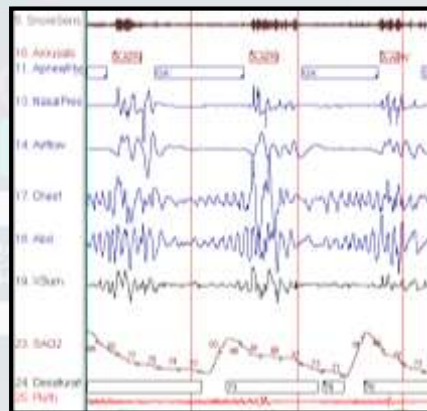
Differential diagnosis

- Chronic sleep deprivation disorder (shift-work disorder)
- Depression and anxiety
- Hypothyroidism
- Obesity hypoventilation syndrome
- Central sleep apnea syndrome

Diagnosis

- **Clinical:**
 - Typical patient is male, 30-60y, snores, has daytime sleepiness, moderate obesity and large neck circumference ± uncontrolled hypertension.
 - Women with OSA are postmenopausal, snoring is less frequent and daytime fatigue is more common than outright sleepiness.

Diagnostic testing



What is Sleep Study?

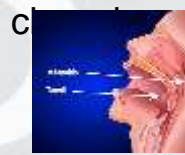
- **Polysomnography** = a detailed overnight sleep study with recordings of:
 - **ECG** (arrhythmias), **EEG** (brain waves – level of sleep), EOG (eye movements – REM sleep) and submental EMG (muscle twitches - REM sleep) to evaluate sleep
 - **Ventilatory variables**: movement of chest wall and airflow at the mouth and nose
 - **Arterial O₂ saturation** (finger/ear oximetry)
 - **Heart rate**

What variables are reported on a sleep study report, and what do they mean?

- **Apnea-hypopnea index (AHI)**
 - Apnea: airflow cessation ≥ 10 sec
 - Hypopnea: airflow reduction $\geq 70\%$ plus $< 90\%$ OxyHb saturation or arousal from sleep.
 - Episodes of apnea and hypopnea per hour of sleep
 - Mild OSA: AHI ≥ 5 and $< 15/h$
 - Moderate OSA: AHI ≥ 15 and < 30
 - Severe OSA: AHI ≥ 30

How is OSA Treated?

1. **Weight loss**
2. Avoidance of alcohol and sedatives
3. Address underlying cause
4. **Continuous Positive Pressure Ventilation**
5. Surgery
6. Dental appliances

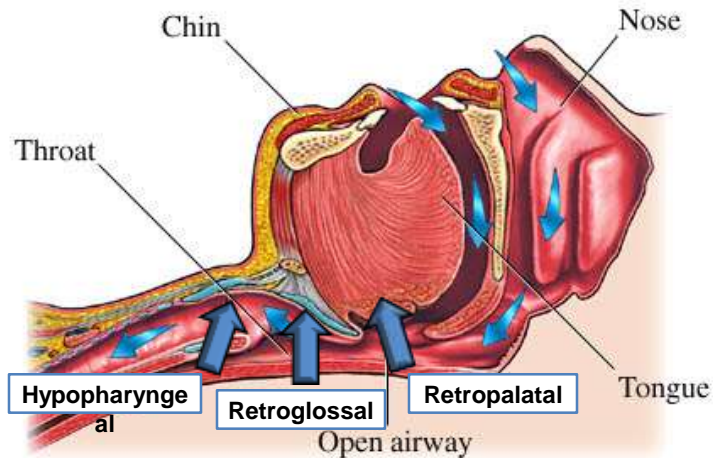


sleep



Treatment (CPAP)

Continuous Positive Airway Pressure (CPAP) therapy



Pictures of a CPAP



Three modes for the CPAP

- A constant stream of compressed air with fixed pressure (6 to 14 cm water).
- Automated pressure needed to open the airway (Dynamic CPAP).
- Bi-level CPAP

Disadvantages to the CPAP

- Inconvenience of the mask, machine **noise**.
- The air pressure also causes some patients to experience **nasal congestion** or a runny nose, and it may take a few weeks to adjust to the machine

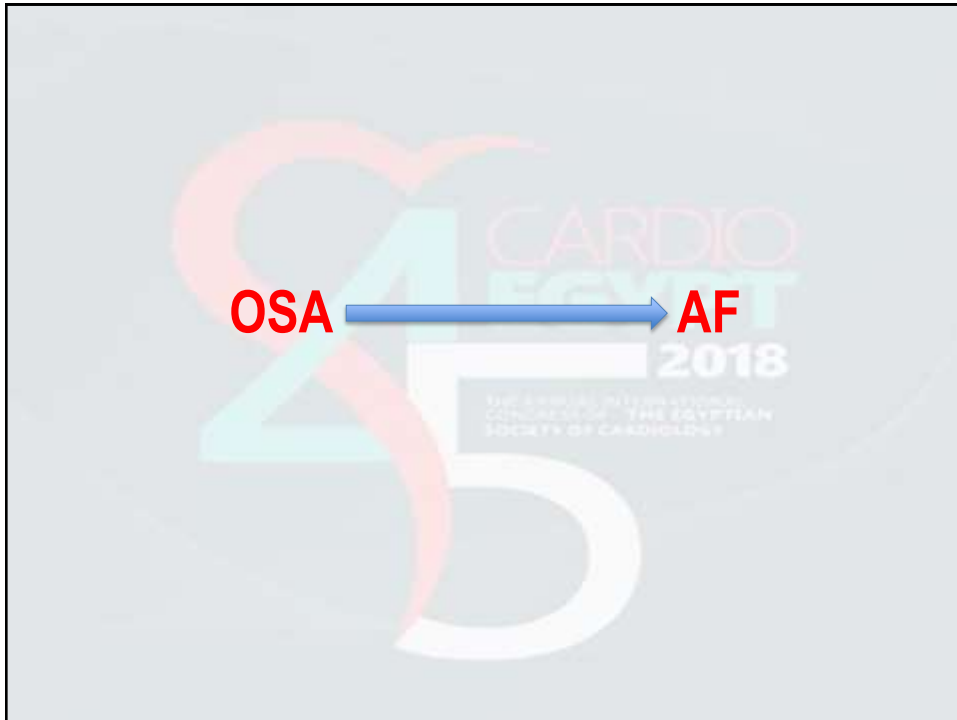
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Why is Sleep Apnea a Concern?

- Sleep apnea is linked to many cardiac conditions including:
 - A Fib
 - HTN & pulmonary HTN
 - ACS
 - Strokes
- Sleepiness during the day, increasing chance of accidents, poor performance or judgment.

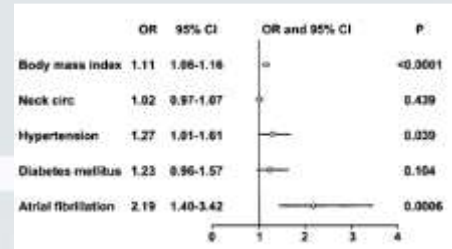
AF \rightleftharpoons OSA



An analysis from the Sleep Heart Study

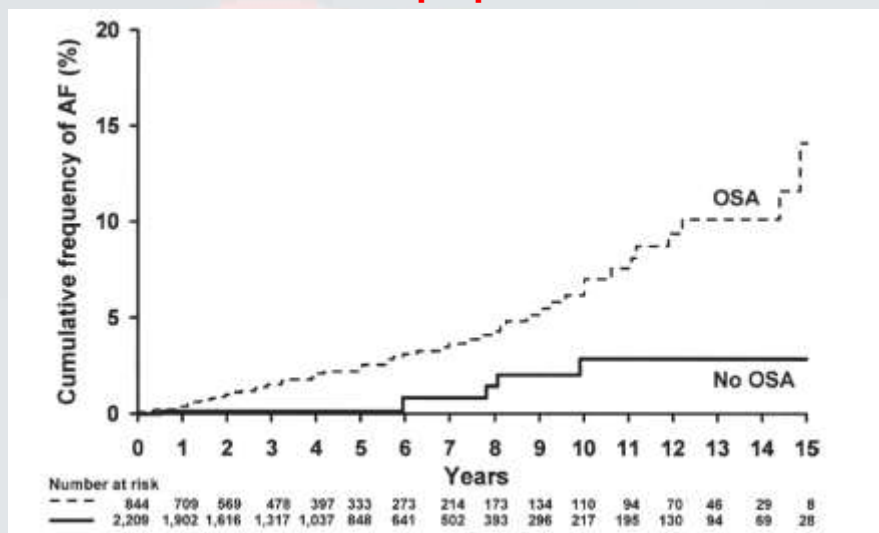
- Those with SDB had 4-fold increased likelihood of AF
- There was a **17-fold** risk of arrhythmia occurrence in the **90 s** following a respiratory disturbance compared with normal breathing

Obstructive sleep apnea is an independent risk factor for AF even after adjusting for obesity, diabetes and hypertension

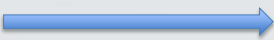


Gami AS, Pressman G, Caples SM, et al. Association of atrial fibrillation and obstructive sleep apnea. *Circulation* 2004;110:364-7.

AF in obese patients < 65 with and without sleep apnea



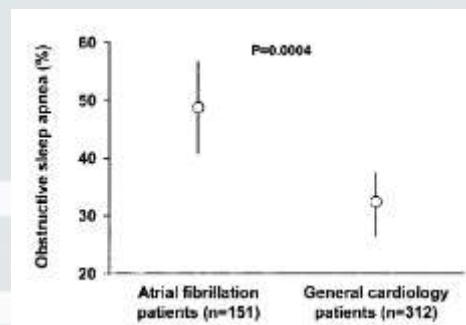
Gami AS et al. Obstructive Sleep Apnea, Obesity, and the Risk of Incident Atrial Fibrillation. *J Am Coll Cardiol* 2007;49:565-71.

AF  **OSA**

Sleep heart study

- Proportion of patients with **OSA** was significantly higher in the group with **AF** than in the non-AF group (49 Vs 32%, $p = 0.0004$) (After adjustment for risk factors, including age, BMI, hypertension, and CHF)

- Half of the patients with AF also have obstructive sleep apnea



Gami AS, Pressman G, Caples SM, et al. Association of atrial fibrillation and obstructive sleep apnea. *Circulation* 2004;110:364–7.

How are AF and Sleep Apnea Linked?

AF & OSA have nearly the same incidence:

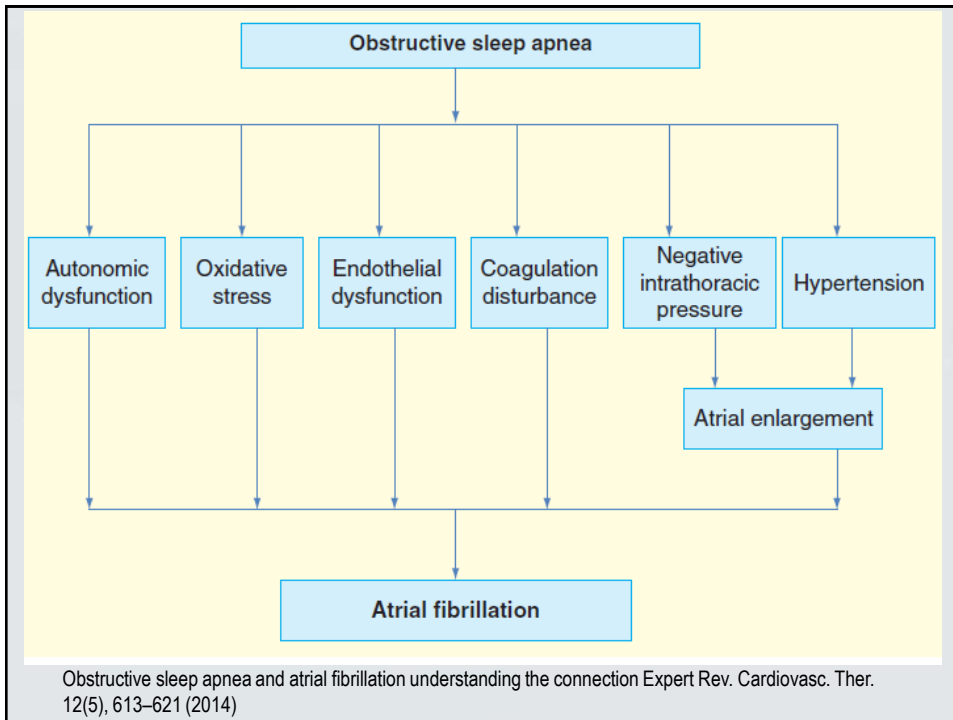
- It is estimated that one in four will develop AF over the age of 40 years [*]
- Obstructive sleep apnea (OSA) affects up to 25% of middle-aged adults [•]

*Lloyd-Jones DM, Wang TJ, Leip EP, et al. Lifetime risk for development of atrial fibrillation: the Framingham Heart Study. *Circulation* 2004;110(9):1042-6
 •Young T, Palta M, Dempsey J, et al. The occurrence of sleep-disordered breathing among middle-aged adults. *N Engl J Med* 1993

Obstructive sleep apnea and AF share many common risk factors and associations:

- Age
- Obesity *
- Diabetes
- Hypertension
- Heart failure
- Coronary artery disease

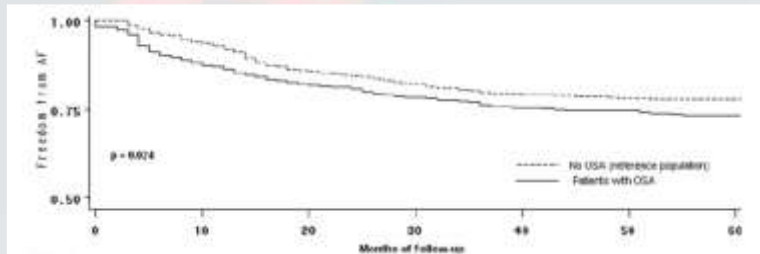
* Kirchhof P, Benussi S, Kotecha D, Ahlsson A, Atar D, Casadei B, et al. 2016 ESC guidelines for the management of atrial fibrillation developed in collaboration with EACTS. *Eur Heart J* (2016) 37(38):2893–962. doi:10.1093/eurheartj/ehw210



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Sleep Apnea Affects AF Treatment



- OSA is independently associated with AF ablation failure.
- All patients treated with CPAP had higher ablation success rates than patients not on CPAP.

Patel D, et al. Safety and efficacy of pulmonary vein antral isolation in patients with obstructive sleep apnea: the impact of continuous positive airway pressure. *Circ Arrhythm Electrophysiol* 2010;3:445–51.

CPAP and AF treatment

- Patients with obstructive sleep apnea can have 25% to 31% increased risk for AF recurrence after catheter ablation compared with patients who did not have OSA (70% Vs 50% success)
- Use of CPAP is associated with a significant reduction in AF recurrence
- CPAP use reduces AF recurrence across patient groups; it does not matter whether they are managed medically or with ablation

Shukla A, et al. Effect of Obstructive Sleep Apnea Treatment on Atrial Fibrillation Recurrence A Meta-Analysis. *J Am Coll Cardiol EP* 2015;1-2:41–51.

Conclusions

- Obstructive sleep apnea is a common, underdiagnosed condition, independently linked to multiple health problems including AF
- Half the patients with AF have obstructive sleep apnea
- Treatment with CPAP use reduces AF recurrence across patient groups

Thank you