

Sleep apnea syndrome and arrhythmias



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Definitions

OSAS repetitive interruption of ventilation during sleep caused by collapse of the pharyngeal airway

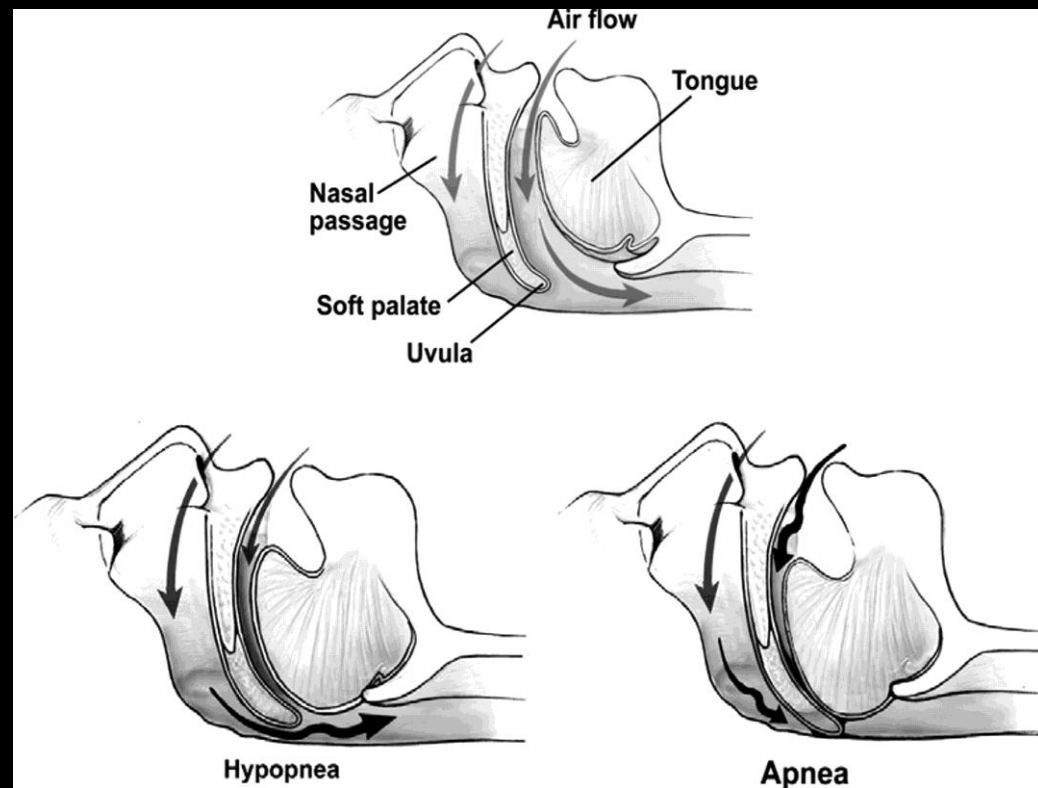
Apnea is $>90\%$ decrease in airflow for > 10 seconds

Hypopnea (recommended AASM definition) :
decrease in airflow to $>30\%$ for 10 seconds
with $> 4\%$ desaturation

Pathogenesis of OSA

OSA patients usually have a narrow pharynx

*At sleep onset there is **loss of pharyngeal dilator muscle tone** which causes complete or partial pharyngeal collapse causing obstructive apneas and hypopneas.*



A photograph of a man and a woman lying in bed. The man, on the left, is wearing a white t-shirt and has his mouth open as if snoring. His right arm is raised above his head. The woman, on the right, is wearing a white tank top and has a frustrated or annoyed expression on her face. She is holding a white pillow over her ears. The background is a plain white pillow and headboard.

Diagnosis of OSA

≥ 5 episodes of apnea or hypopnea per hour of sleep

Hypersomnolence

Episodes of choking or gasping during sleep

Unrefreshing sleep

Recurrent awakenings

Daytime fatigue

A man and a woman are lying in bed together. The man, on the left, is wearing a white t-shirt and has his mouth open as if snoring. His right arm is raised above his head. The woman, on the right, is wearing a white tank top and has a frustrated or annoyed expression on her face. She is holding a white pillow over her ears. The background is a plain white pillow and headboard.

Mild OSAS: AHI > 5/hour

Moderate OSAS: AHI > 15/hour

Severe OSAS: AHI > 30/hours

OSAS and Cardiovascular diseases

OSAS affects approximately 15 million adult Americans.

Caples Sm et al, Obstructive sleep apnea Ann Intern Med 2005; 142: 187-197

OSAS is seen in a large proportion of pts who have hypertension, CAD, stroke and atrial fibrillation.

Lattimore JD et al, Obstructive sleep apnea and cardiovascular disease J Am Coll Cardiol 2003; 41: 1429-1437

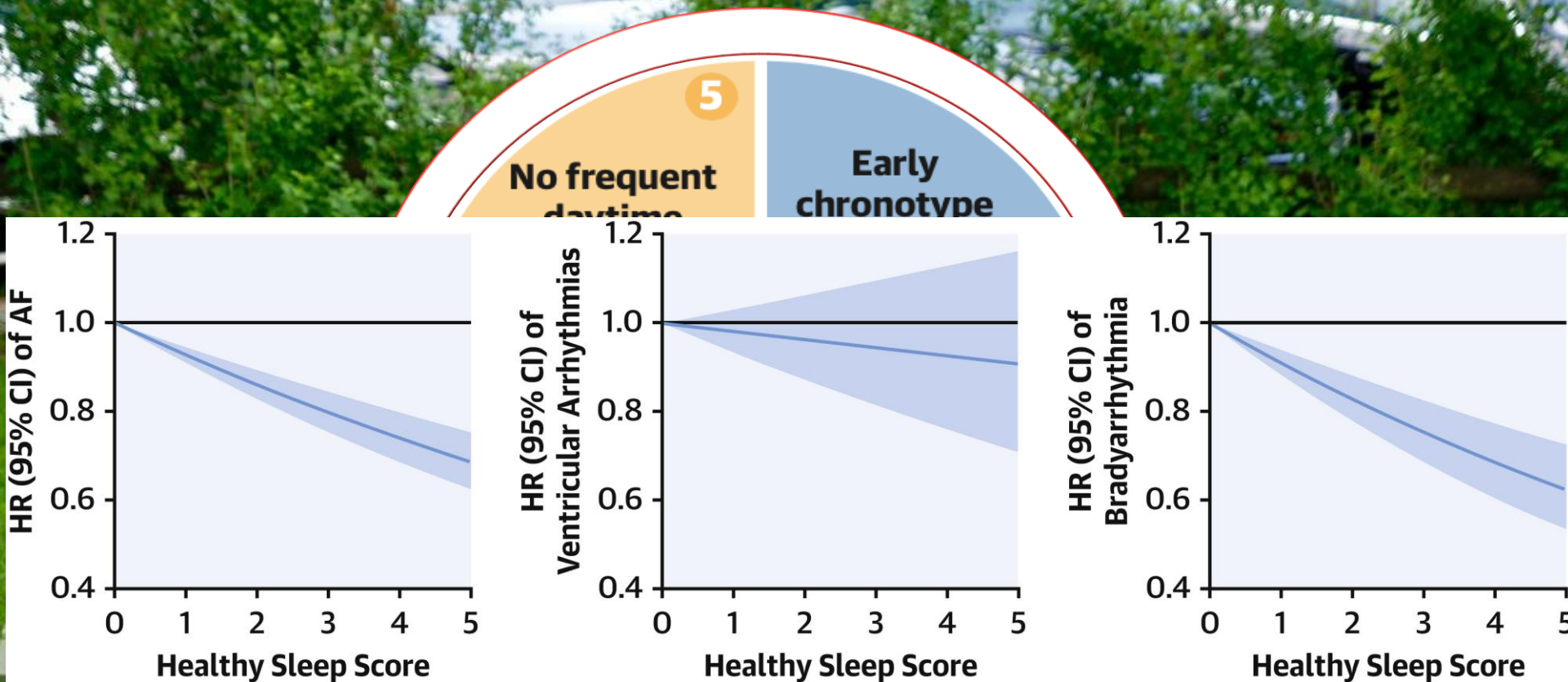
Prevalence of OSAS is 2% in women and 4% in men in the 30-60 year age group.

Young T et al, The occurrence of sleep-disordered breathing among middle-aged adults, NEJM 1993 Apr 29; 328 (17): 1230-5

Sleep patterns and arrhythmias



Sleep patterns and arrhythmias



The Sleep Heart Health Study (SHHS)

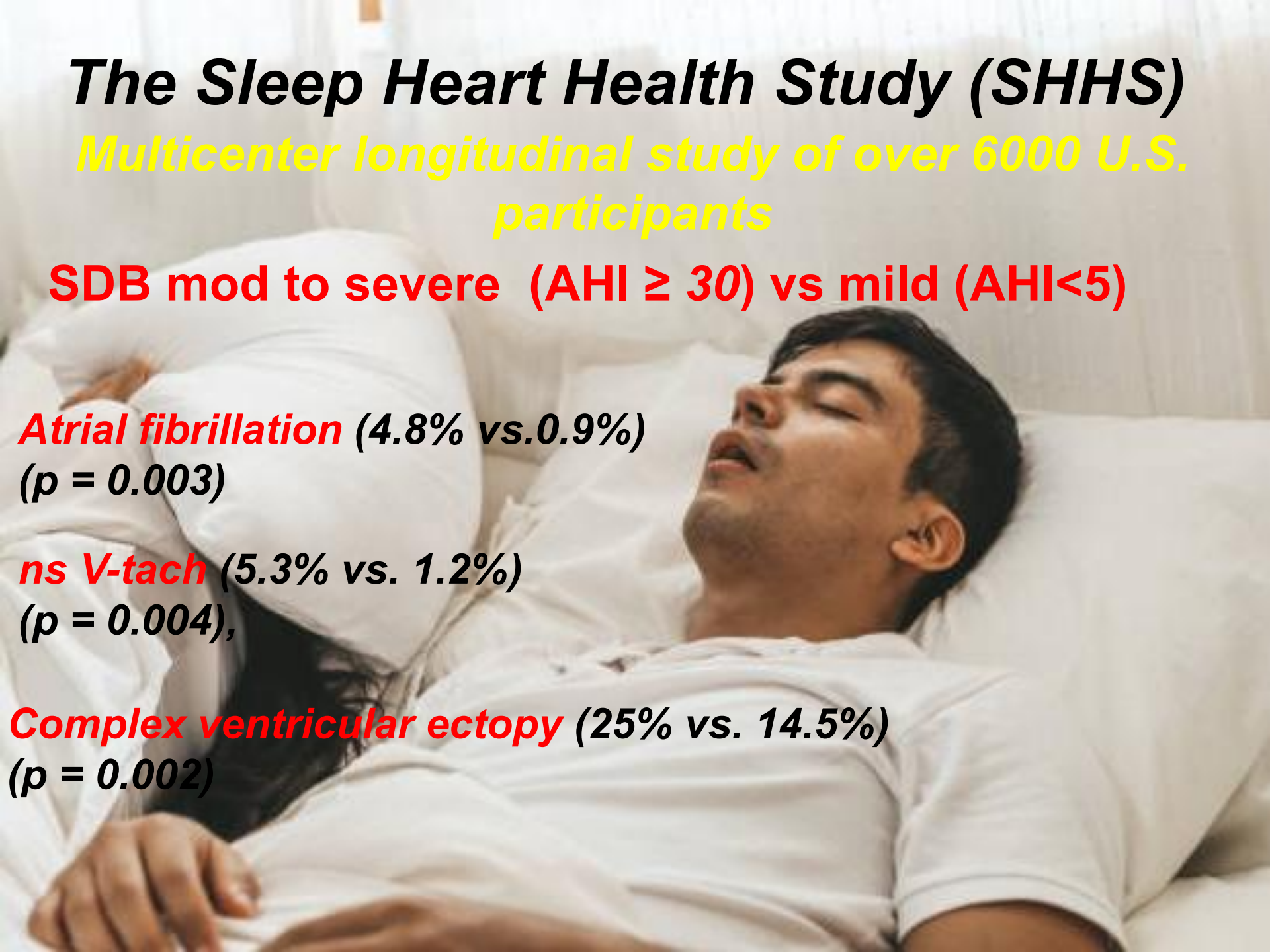
Multicenter longitudinal study of over 6000 U.S. participants

SDB mod to severe ($AHI \geq 30$) vs mild ($AHI < 5$)

Atrial fibrillation (4.8% vs. 0.9%)
($p = 0.003$)

ns V-tach (5.3% vs. 1.2%)
($p = 0.004$),

Complex ventricular ectopy (25% vs. 14.5%)
($p = 0.002$)



Sleep apnea syndrome and Arrhythmias

***Nocturnal arrhythmias occur in 50% of
OSAS patients***

Nonsustained ventricular tachycardia

Sinus arrest

Second degree AV` block

Frequent PVC's

***Franz et al. Circulation 1992
Aviles et al. Circulation 2003***

Triggering of nocturnal arrhythmias by sleep disordered breathing events

Number of
arrhythmias
included in each
analysis

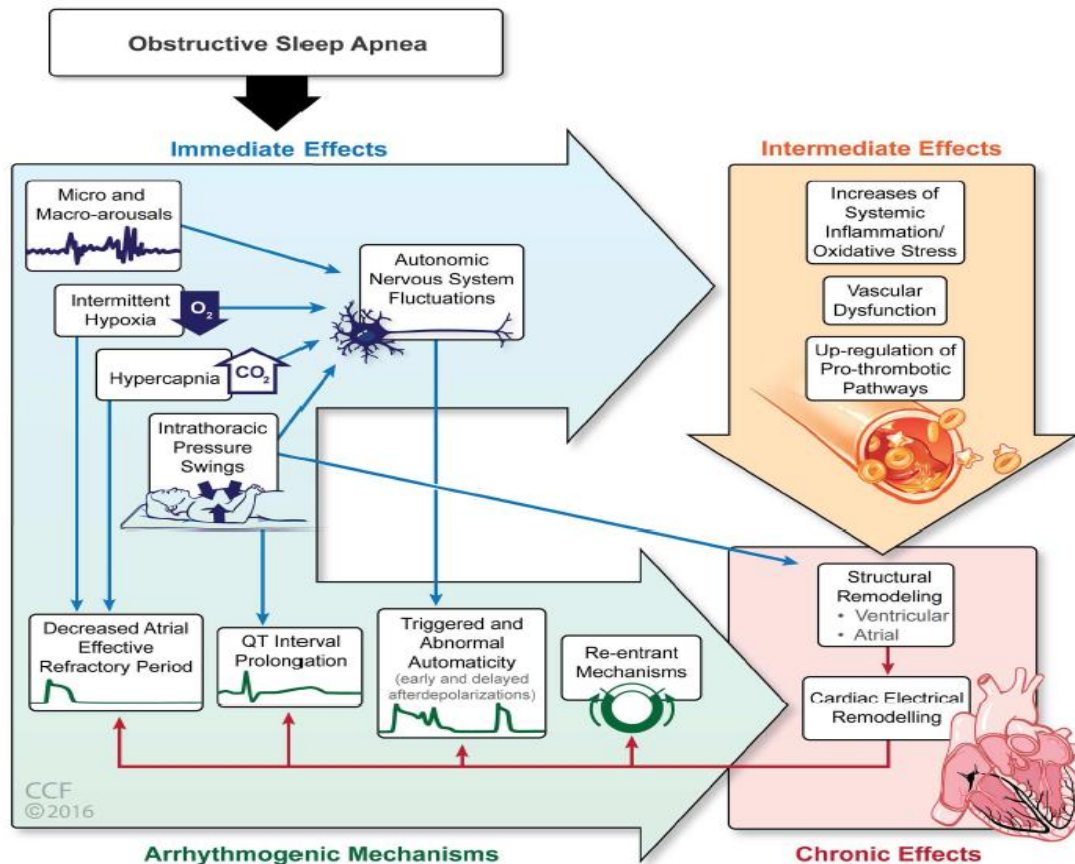
Odds Ratio
(95% CI)

Conclusions

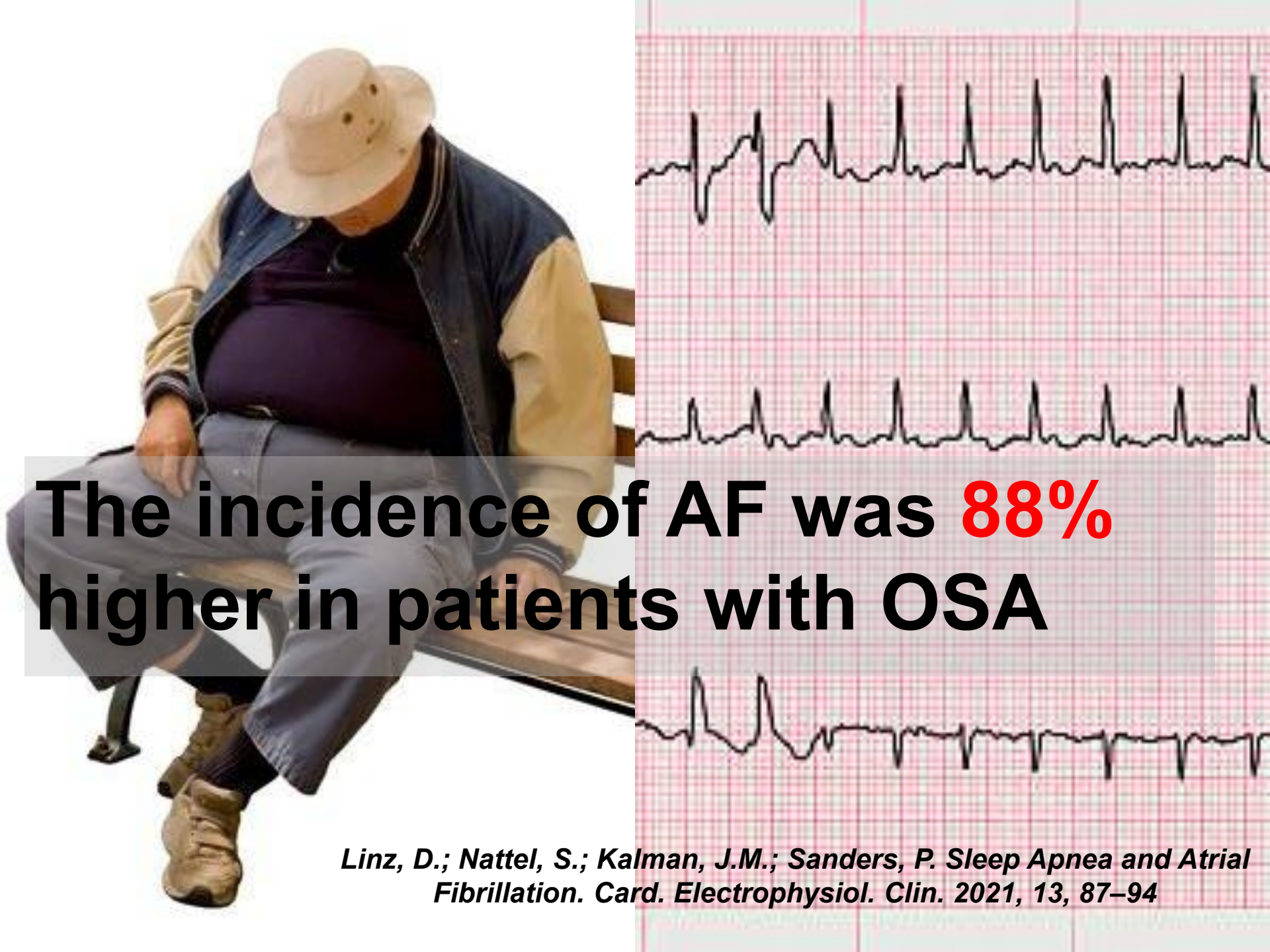
the relative risk of paroxysmal atrial fibrillation and NSVT during sleep is markedly increased shortly after a respiratory disturbance. These results support a direct temporal link between SDB events and the development of these arrhythmias.

Respiratory disturbance without hypoxia (nadir SpO ₂ ≤ 92%) or arousal	14	24.1 (5.4–106.6)
Respiratory disturbance with hypoxia	20	13.6 (3.7–50.6)
Respiratory disturbance with arousal	10	21.8 (4.5–106.3)

OSA and arrhythmogenesis

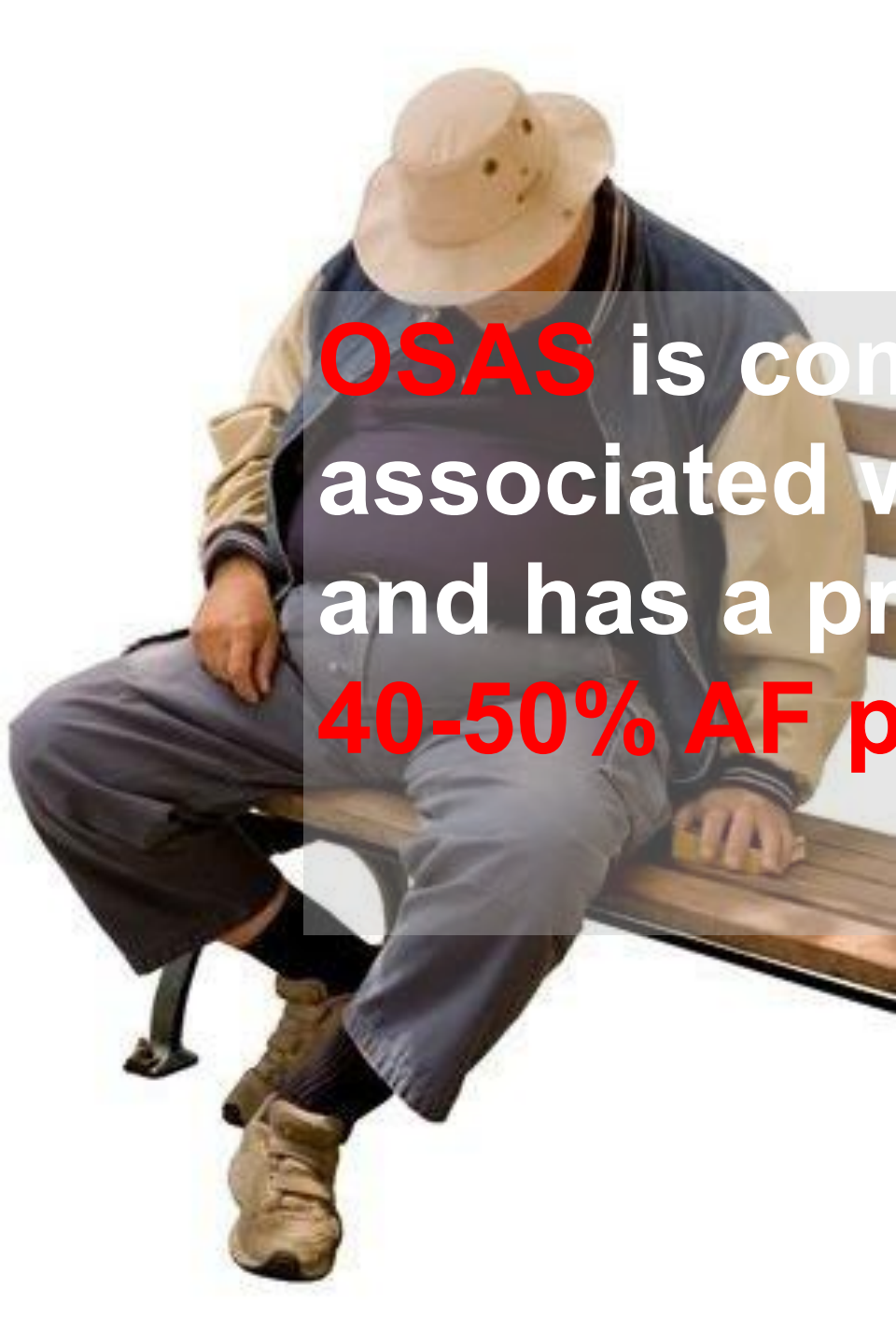


Anna May et al. OSA and arrhythmogenesis mechanistic insights Chest 2016



**The incidence of AF was 88%
higher in patients with OSA**

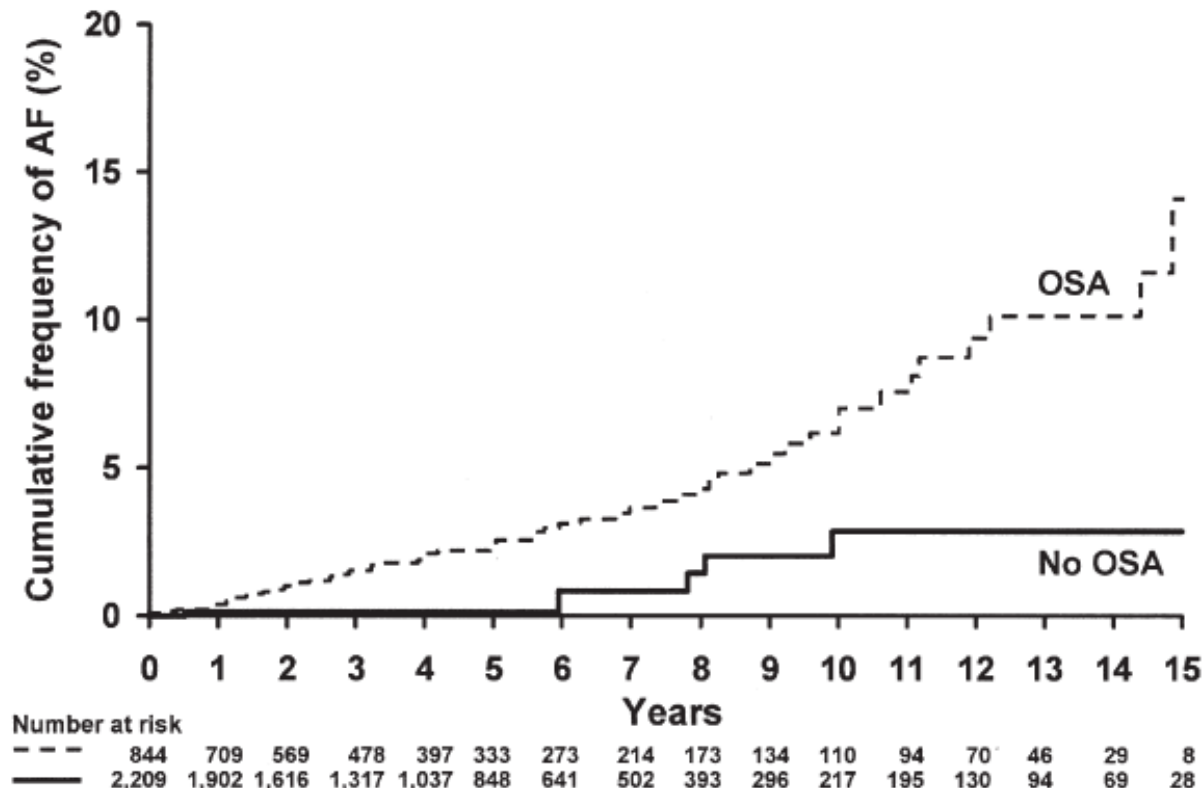
Linz, D.; Nattel, S.; Kalman, J.M.; Sanders, P. Sleep Apnea and Atrial Fibrillation. Card. Electrophysiol. Clin. 2021, 13, 87–94



OSAS is commonly
associated with obesity
and has a prevalence
40-50% AF population



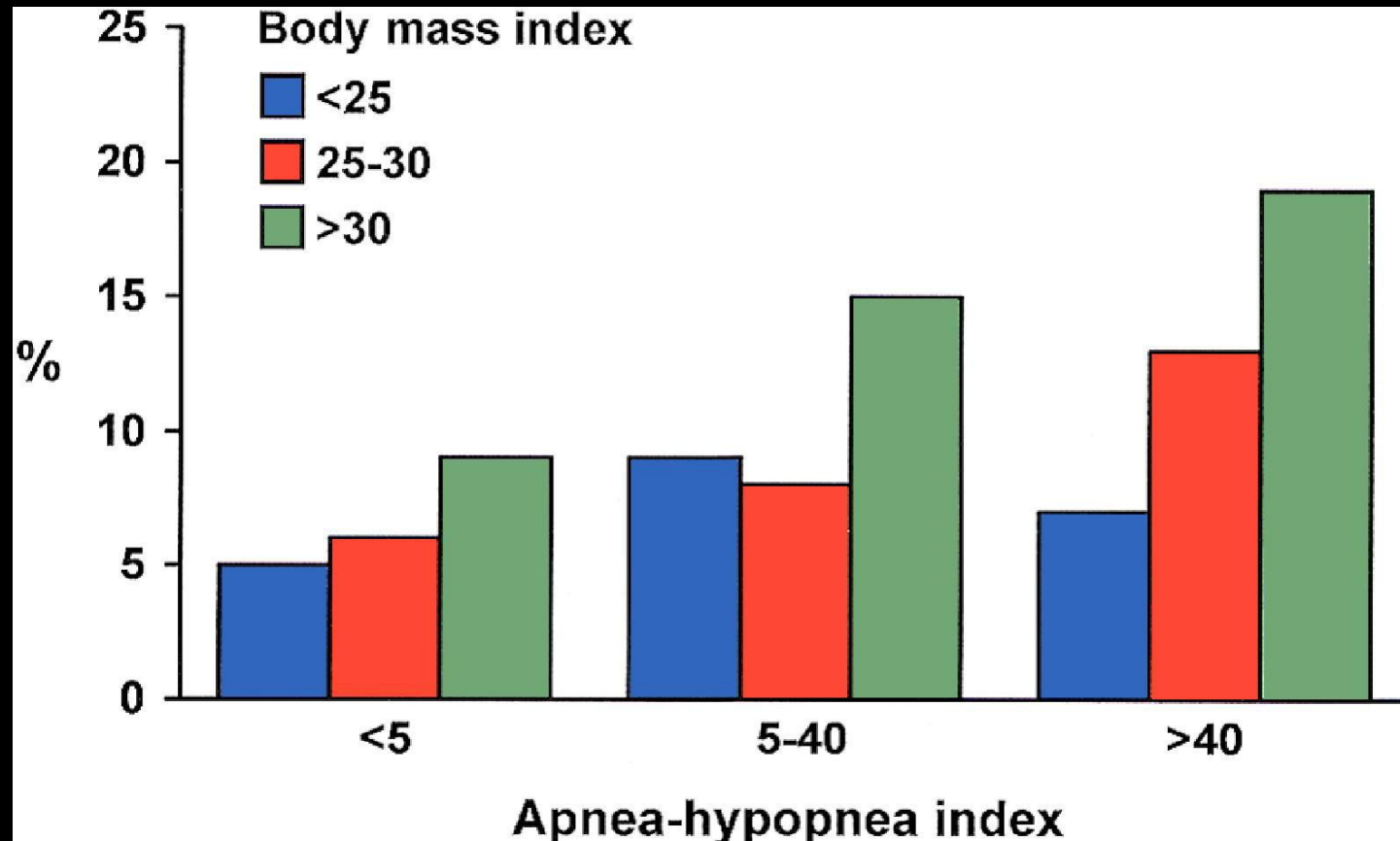
A Fib and sleep disturbance



Gami et al: Obstructive Sleep Apnea, Obesity, and the Risk of Incident Atrial Fibrillation JACC 2007; 49 (5):565-571

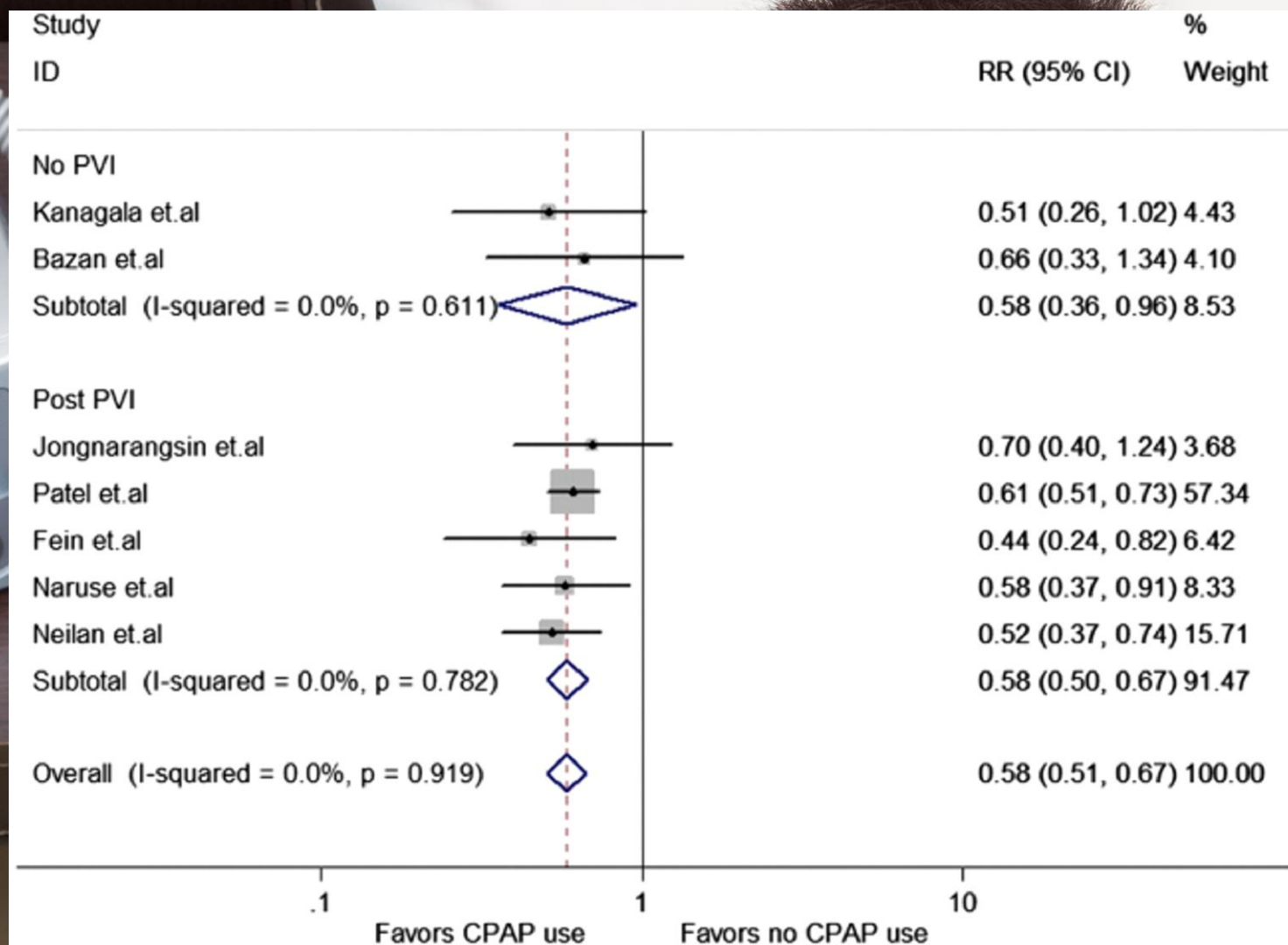
A Fib and sleep disturbance

Incidence of Afib based on the severity of OSA and obesity



Gami et al: Obstructive Sleep Apnea, Obesity, and the Risk of Incident Atrial Fibrillation JACC 2007; 49 (5):565-571

Meta-analysis of prospective cohort studies on CPAP use and Afib in 1087 OSA pts



Shukla A et al: Effect of obstructive sleep apnea treatment on atrial fibrillation recurrence: a metanalysis JACC Clin Electrophysiol 2015; 1:41-51

Efficacy of catheter ablation of atrial fibrillation in patients with obstructive sleep apnoea with and without continuous positive airway pressure treatment: A meta-analysis of observational studies

Five observational studies 3743 pts

OSAS patients had a 31% greater risk of AF recurrence post catheter ablation

Pts treated with CPAP had a recurrence rate similar to non OSAS patients

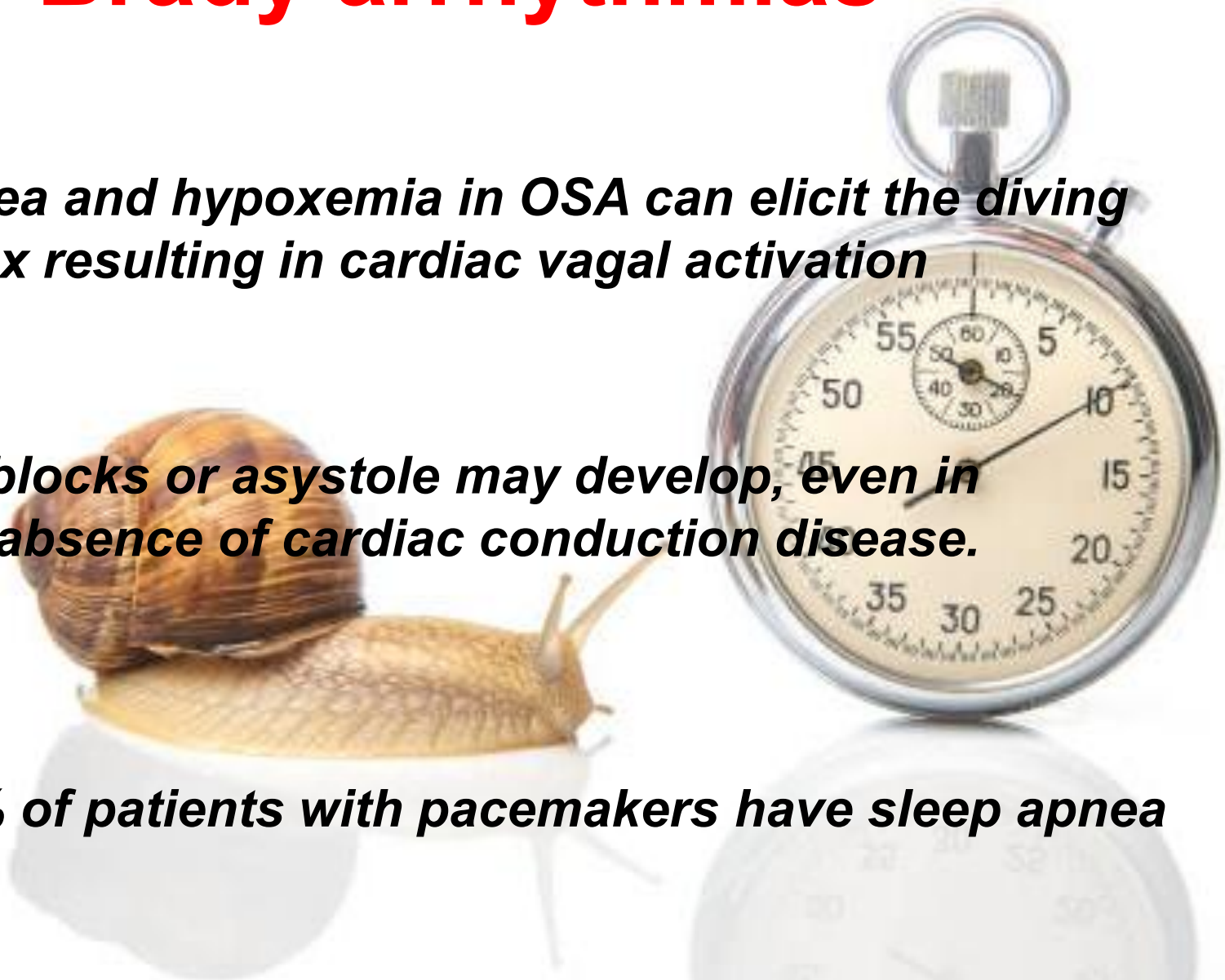
Brady arrhythmias

Apnea and hypoxemia in OSA can elicit the diving reflex resulting in cardiac vagal activation

AV blocks or asystole may develop, even in the absence of cardiac conduction disease.

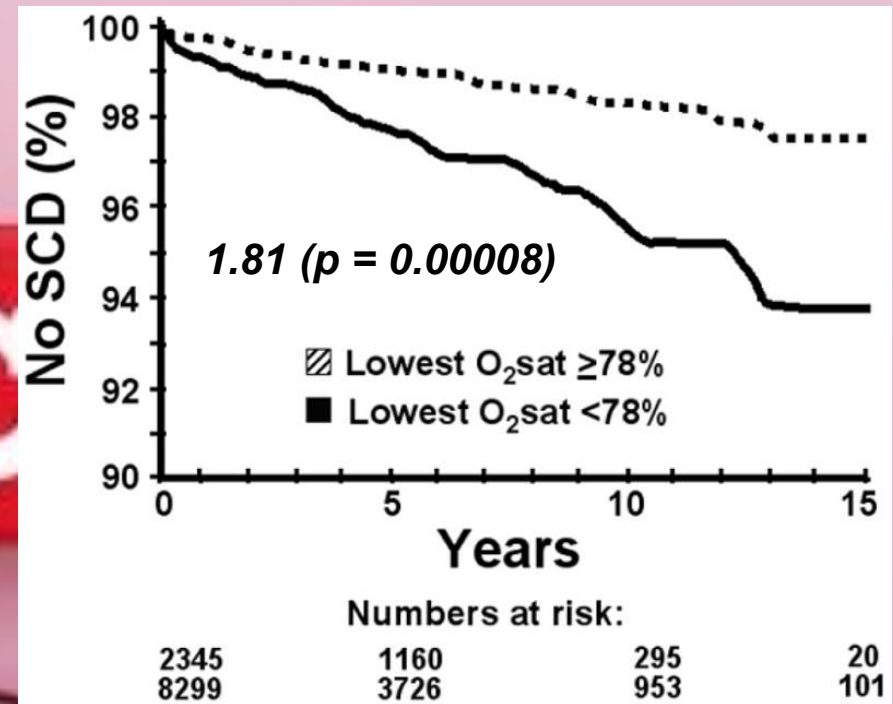
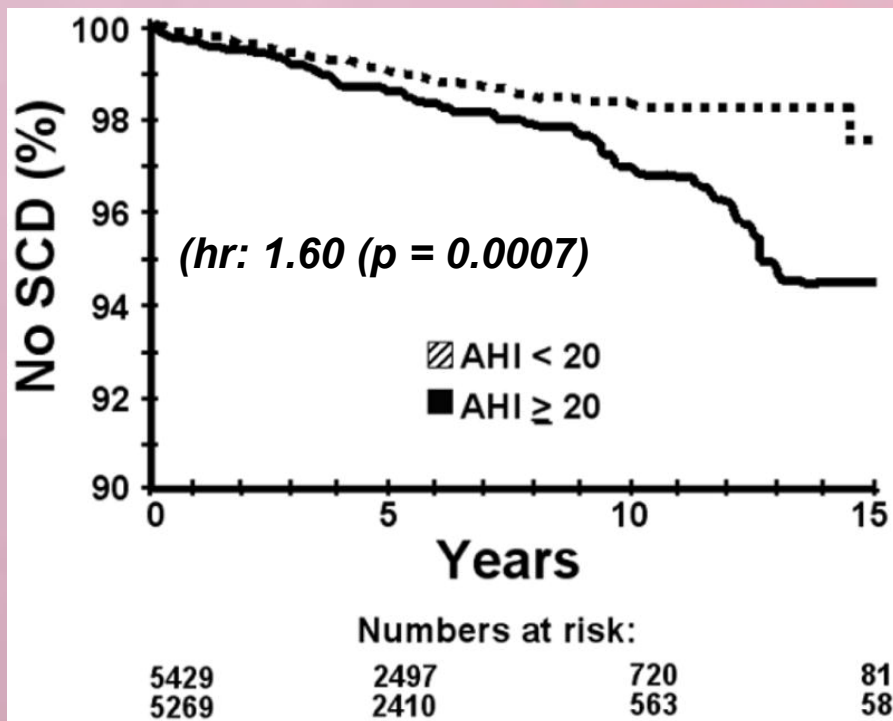
59% of patients with pacemakers have sleep apnea

Garrigue et al. Circulation 2007



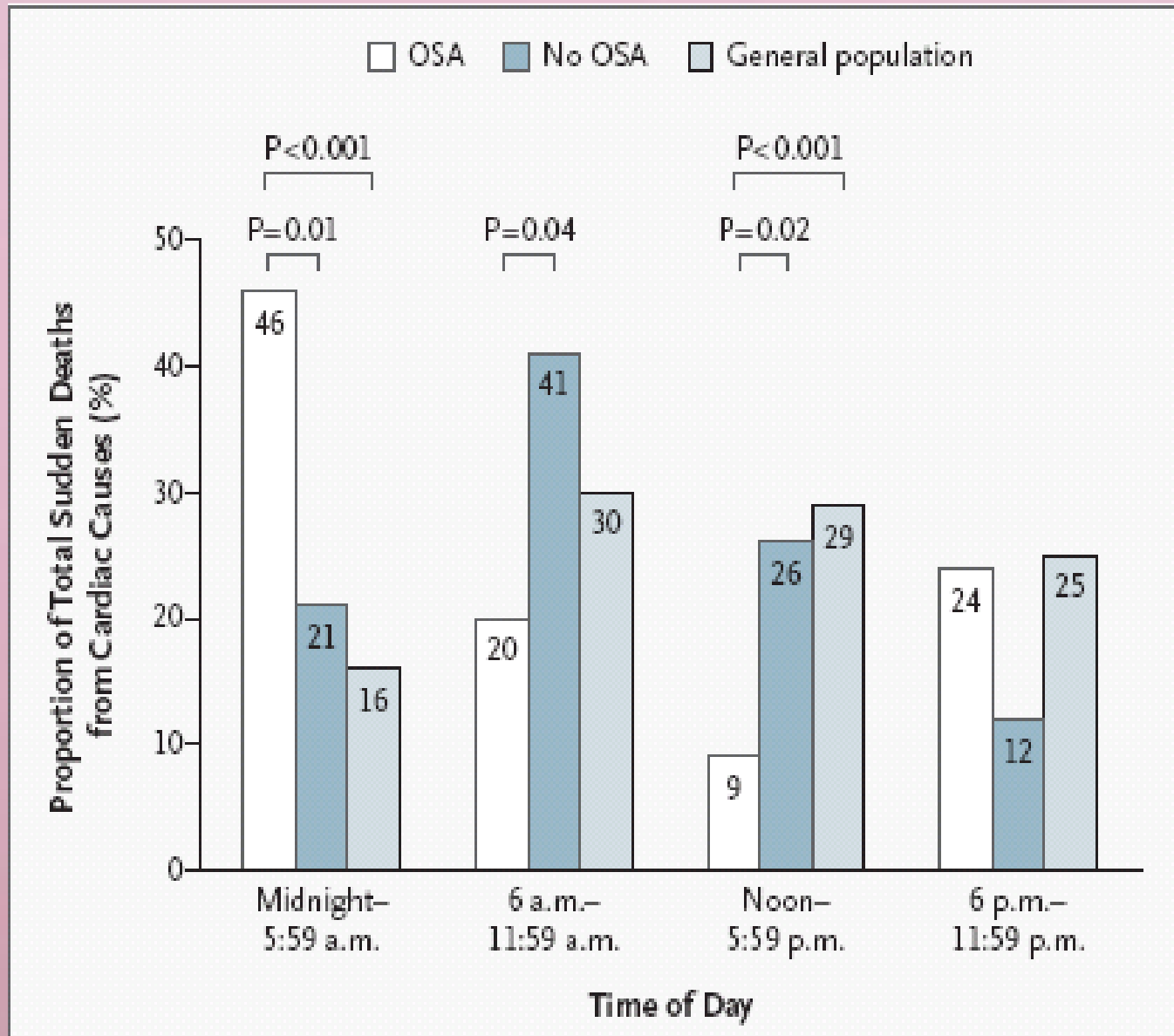
Sudden Cardiac Death in OSA

Longitudinal cohort study involving 10,701 adults

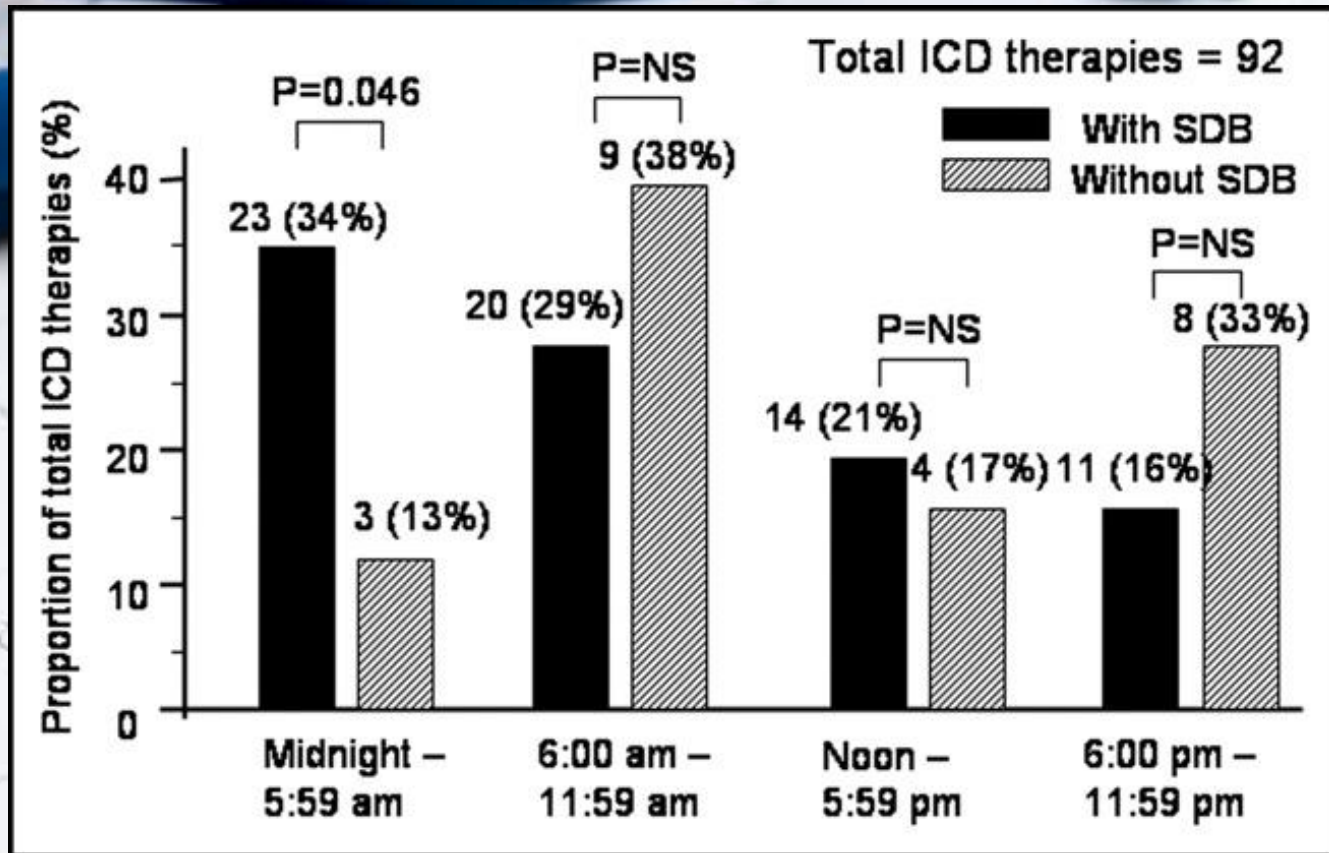


Gami, A.S.; Obstructive Sleep Apnea and the Risk of Sudden Cardiac Death. JACC 2013, 62, 610–616.

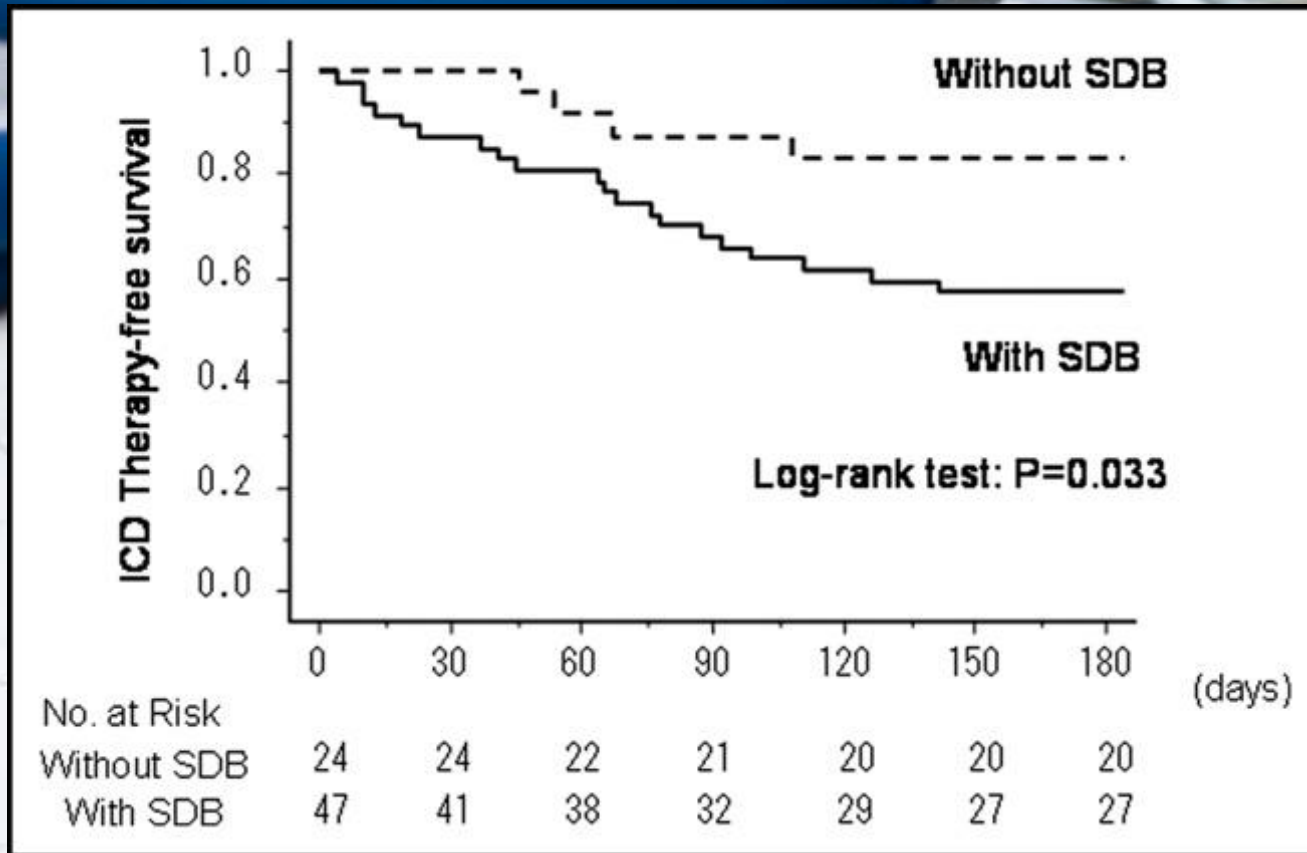
Sudden Cardiac Death in OSA



ICD therapy and SDB



ICD therapy and SDB



Conclusions

Patients with OSA are at higher risk for arrhythmias

In AF patients OSA should be considered among several modifiable risk factors

Strategies to treat OSA may be useful in patients with AF undergoing rhythm control strategies (pharmacological, electrical, ablative)

OSA may be considered risk factor for SD

In patients with a device OSA may be diagnosed for the first time and it helps to define the sleep severity, arrhythmia burden and their relationships