

Heart Disease and Sleep Apnea: Common Companions

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Wisconsin Sleep Cohort 1993

- The prevalence of OSA, as defined by an Apnea Hypopnea index (AHI) $\geq 5/\text{hr}$, is 24% of men and 9% of women
- When the presence of daytime sleepiness was included in the definition, the prevalence of OSA was 4% of men and 2% of women

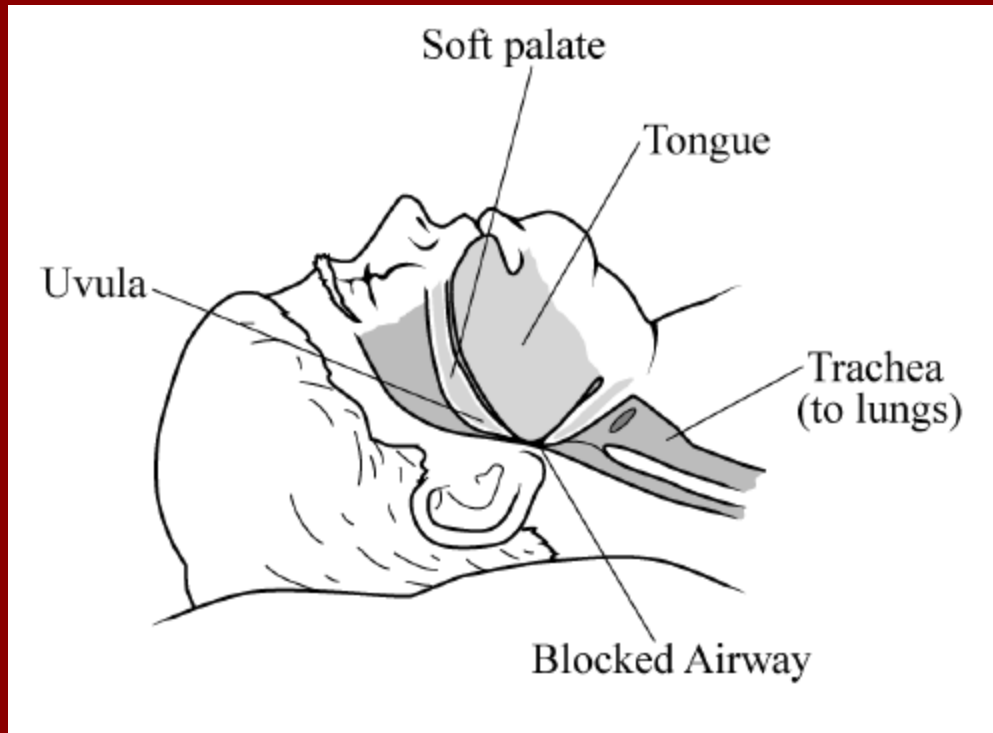
- Incidence is about 2% per year for
AHI \geq 15
- Approximately the same
prevalence as asthma in the
general population

What exactly is obstructive sleep apnea?



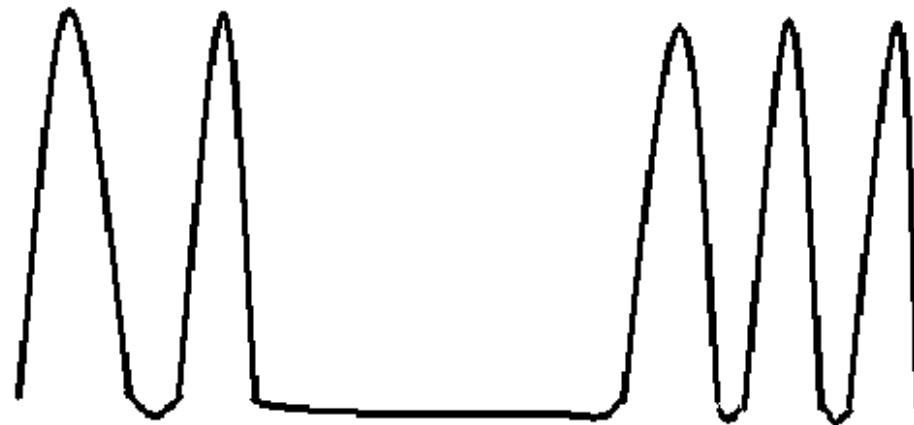
- Repeated episodes of upper airway obstruction during sleep
- Episodes of airway obstruction are associated with:
 - transient increases in blood pressure
 - hypoxemia
 - hypercapnia
 - arousals from sleep

Obstructive sleep apnea syndrome



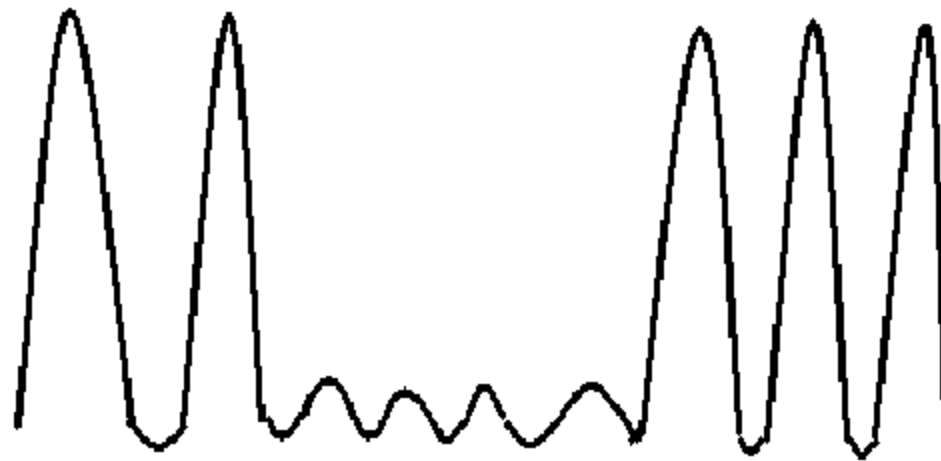
How do we make the diagnosis?





Apnea

Absence of breathing for at least 10 seconds



Hypopnea

Significant decrease in breathing for at least 10 seconds that is associated with a 4% drop in oxygen saturation

Apnea Hypopnea Index

$$\frac{\text{Total Apneas} + \text{Total Hypopneas}}{\text{Total Sleep Time}}$$

AHI \geq 5 events/hr mild

AHI \geq 15 events/hr moderate

AHI \geq 30 events/hr severe

Sleep Disordered Breathing

Risk Factors

- Excess body weight
- Male gender/peri-menopausal
- Large neck circumference
- Cardiovascular disease (including HTN)
- Age
- Airway crowding
- Daytime Sleepiness

Epworth Sleepiness Scale

0 = would never doze
1 = Slight chance of dozing
2 = Moderate chance of dozing
3 = High chance of dozing

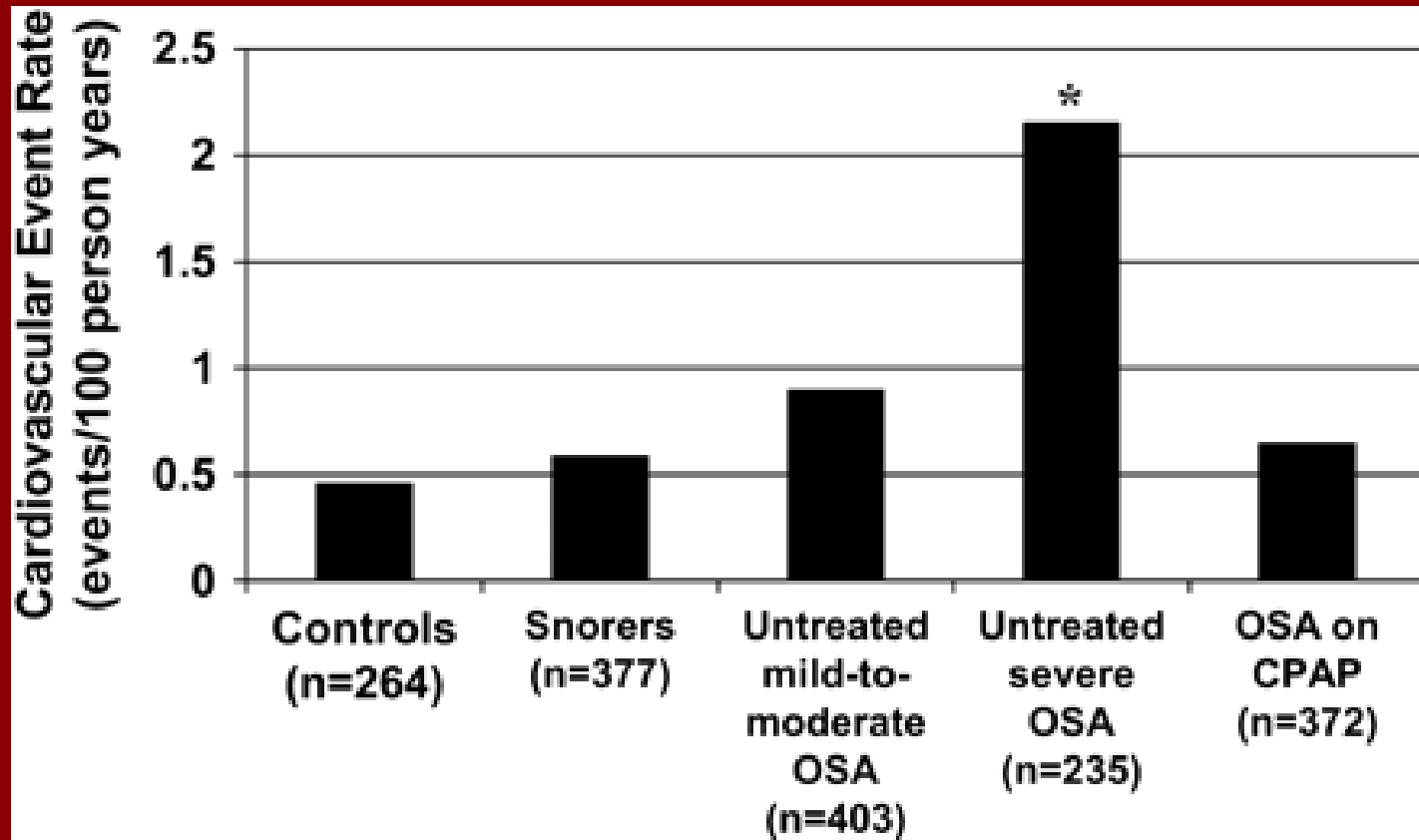
Situation	Chance of dozing
Sitting and reading	<input type="text"/>
Watching TV	<input type="text"/>
Sitting, inactive in a public place (e.g. a theatre or a meeting)	<input type="text"/>
As a passenger in a car for an hour without a break	<input type="text"/>
Lying down to rest in the afternoon when circumstances permit	<input type="text"/>
Sitting and talking to someone	<input type="text"/>
Sitting quietly after a lunch without alcohol	<input type="text"/>
In a car, while stopped for a few minutes in the traffic	<input type="text"/>
Total	<input type="text"/>

- Obesity is one of the best predictors of OSA
 - 40% of those with BMI > 40
 - 50% of those with BMI > 50
- Neck circumference is a surrogate for central obesity
 - > 17 inches for men; > 16 inches for women

- After the age of 60, BODY MASS INDEX becomes less important
- After the age of 50, GENDER becomes less important

Increasing Evidence of Causative Role of Severe Untreated OSA in Cardiovascular Events

(Marin et al, Lancet 365:1046, 2005)



Cardiovascular Effects of OSA

These include:

- Systemic hypertension
- Pulmonary hypertension
- Atrial Fibrillation
- Coronary artery disease
- Congestive heart failure
- TIA/stroke
- Death

Wisconsin Sleep Cohort Study

Odds Ratios* for Incident Hypertension at 4-Year F-U with Baseline AHI >0 Wisconsin Sleep Cohort Study



*Adjusted for age, sex, smoking, ALC, BMI, neck girth
Peppard et al: NEJM 2000

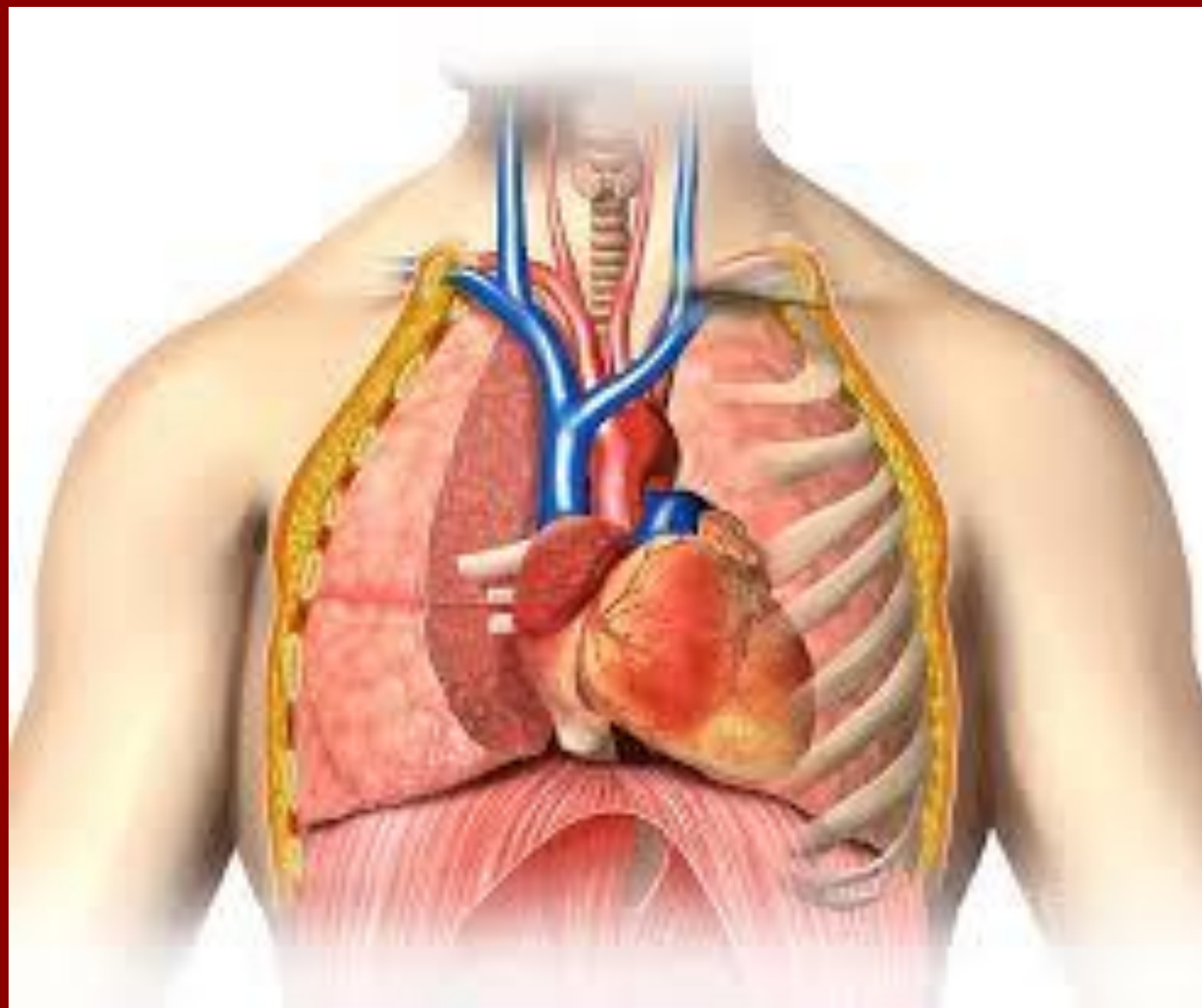


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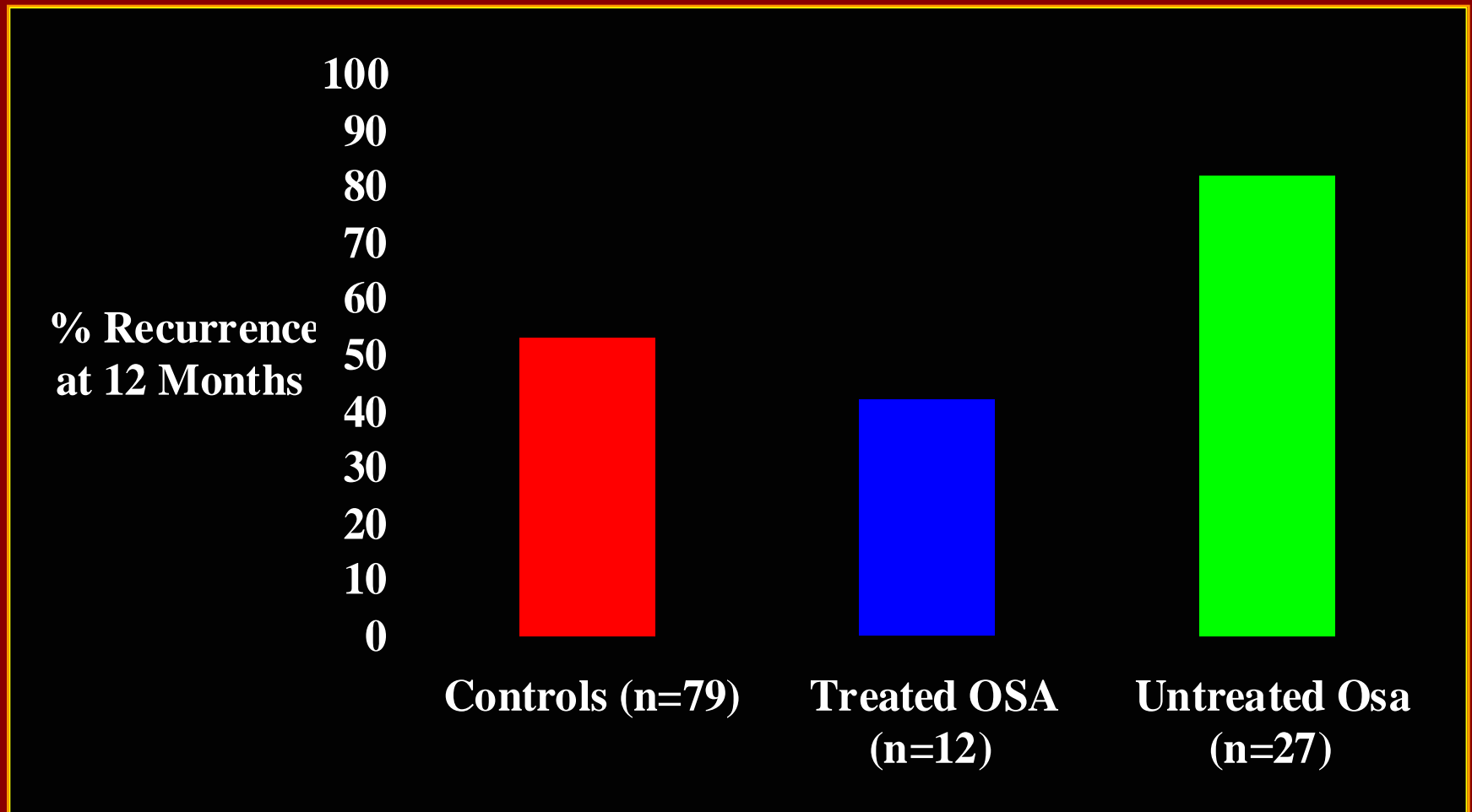


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- In general treating OSA with CPAP can reduce blood pressure to a similar amount that adding a new blood pressure medicine
- However the effect is variable



Recurrence of Atrial Fibrillation after Cardioversion is higher in patients with untreated OSA



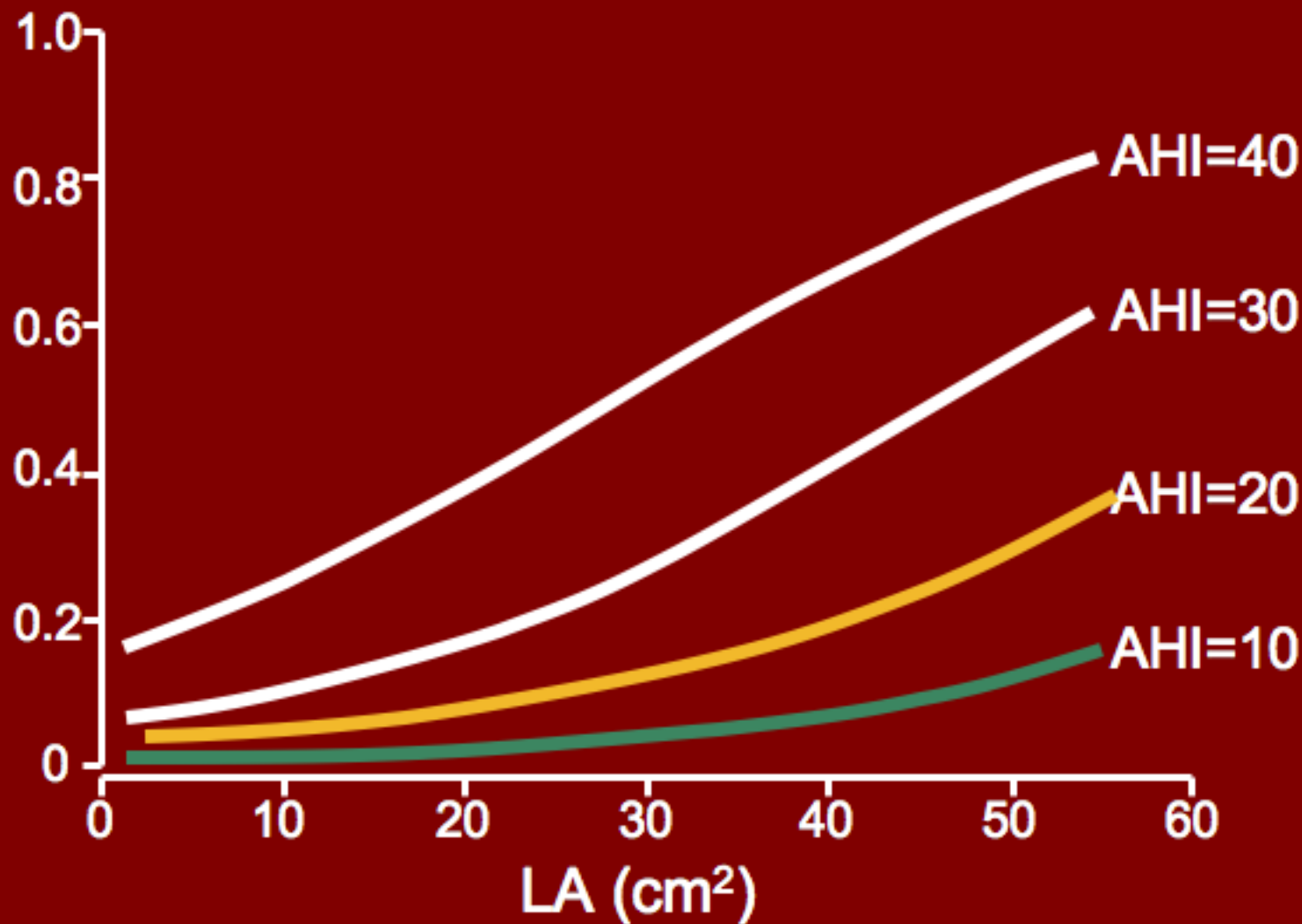
*p < 0.009 compared to controls

**p < 0.013 compared to treated OSA

OSA in Patients with NYHA 3-4 CHF

Author	n	Patients with SDB	Patients with OSA	Patients with CSA
Naughton (AJRCCM, 1995)	74	41 (56%)	5 (7%)	36 (49%)
Javahari (Circ, 1998)	81	41 (51%)	9 (11%)	32 (40%)
Lanfranchi (Circ, 1999)	66	46 (69%)	4 (6%)	42 (63%)

Mortality Occurrence According to AHI and LA area

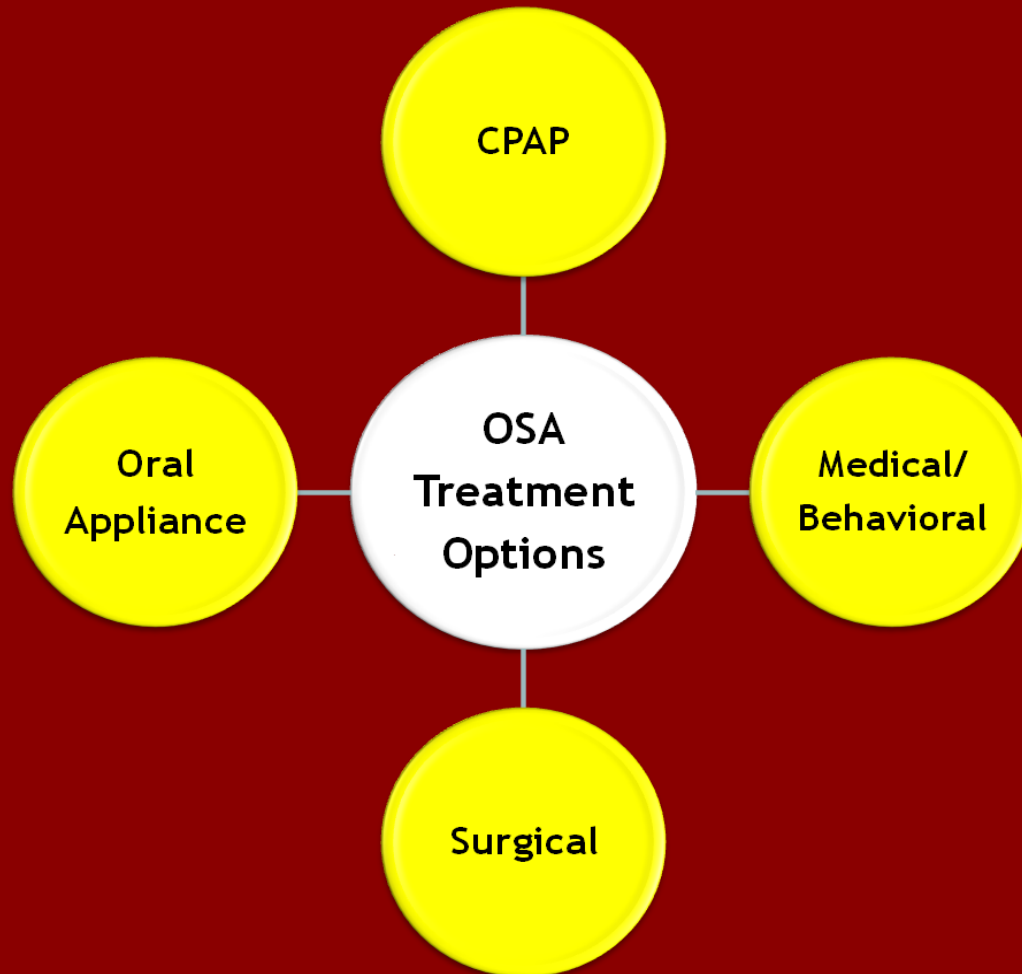


OSA and Heart Failure-

Benefits of CPAP

- Improved daytime LVEF
 - (left ventricular ejection fraction)
- Decreased systolic blood pressure
- Decreased heart rate
- Improved quality of life

Treatment for OSA



Medical Treatments for OSA

These include:

- Weight loss
- Therapy for nasal congestion (allergic rhinitis)
- Positional therapy
- Avoidance of alcohol
- Smoking cessation
- Avoidance of muscle relaxants
- Avoidance of sleep deprivation

Examples of Common CPAP Devices



Respironics
PR System One



Resmed S9



Fisher and Paykel
Icon



Puritan Bennett
Goodnight 420 G

Common CPAP Interfaces: Masks



Nasal



Nasal Pillows



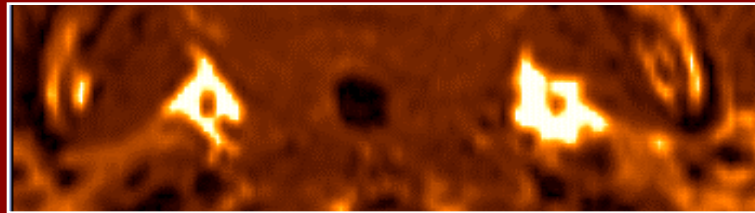
Hybrid



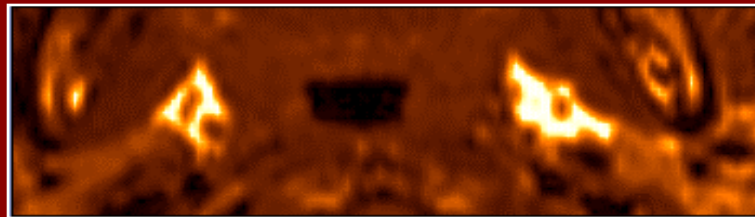
Full Face

CPAP Acts as an Airway Stent

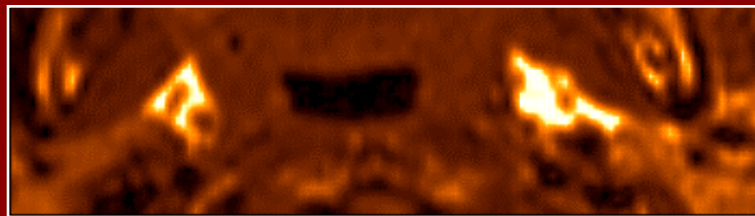
0 cm H₂O



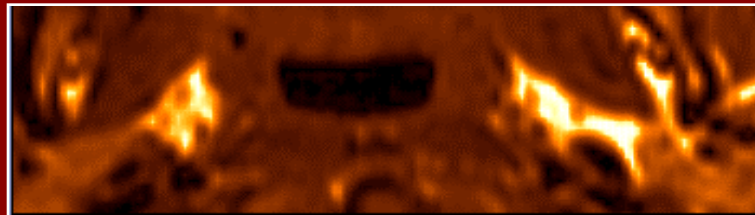
5 cm H₂O



10 cm H₂O



15 cm H₂O



CPAP Outcomes

CPAP clearly improves:

- Obstructive events
- Daytime sleepiness
- Driving risk
- Mortality
- Hypertension

CPAP probably improves:

- Other CV outcomes
 - MI
 - Stroke
 - CHF
- Neurocognitive dysfunction
- Quality of life
- Mood/Depression

Compliance With CPAP

- > 4 hours/night on 70% of nights
- Required by many insurances to reimburse equipment

Compliance With CPAP

- Compliance may be as low as 50 - 60%
 - Patients overestimate nightly use
- Compliance patterns are determined early
- Few clear predictors of compliance:
 - Daytime sleepiness
 - More severe disease

CPAP: Complications

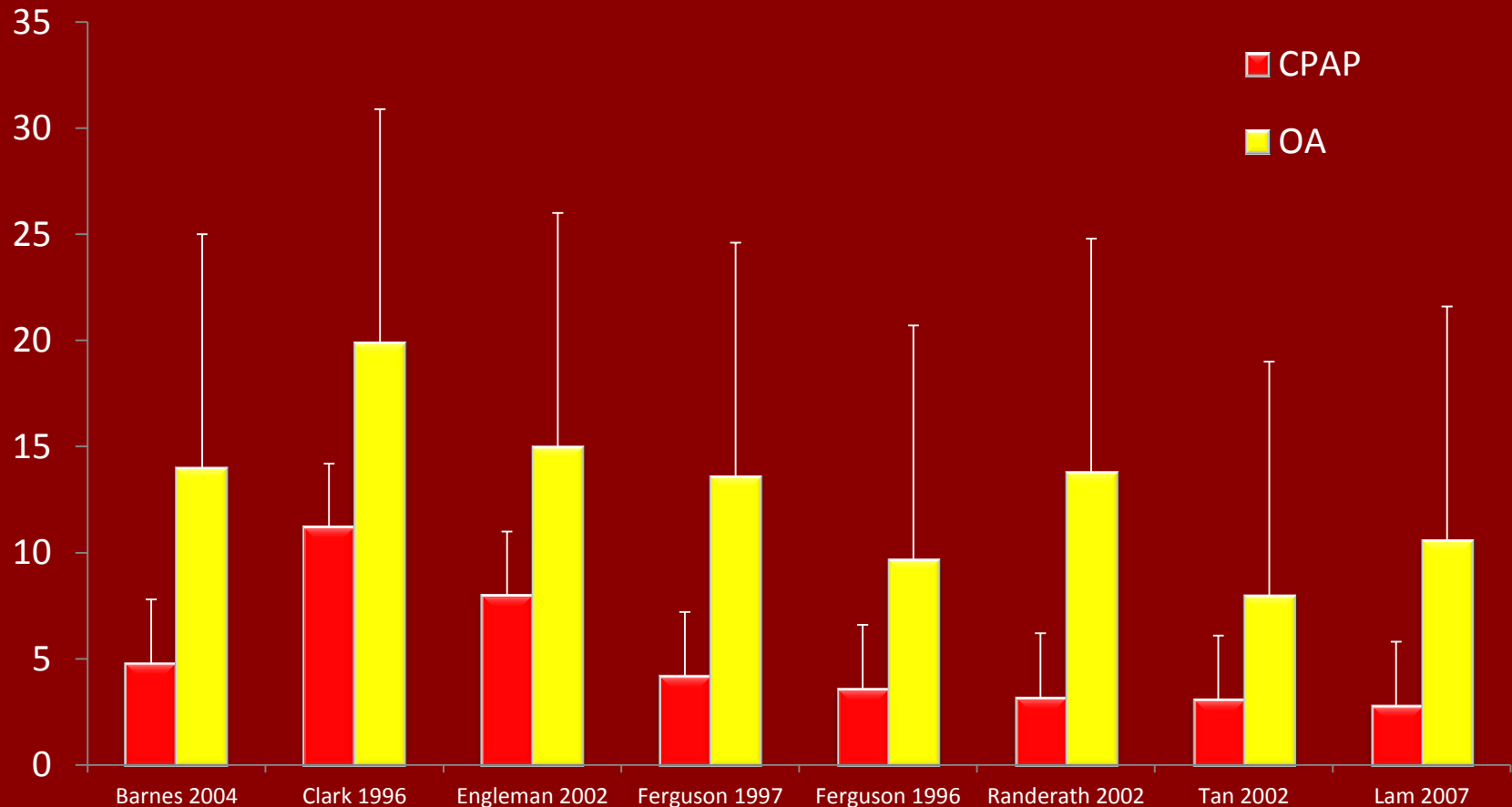
- Rhinorrhea
- Nasal congestion or dryness
- Epistaxis
- Skin abrasions/rashes
- Chest discomfort
- Claustrophobia
- Air swallowing
- Inconvenient
- “Not sexy”



Mandibular Repositioning Appliance



CPAP Better than Oral Appliances at Reducing AHI



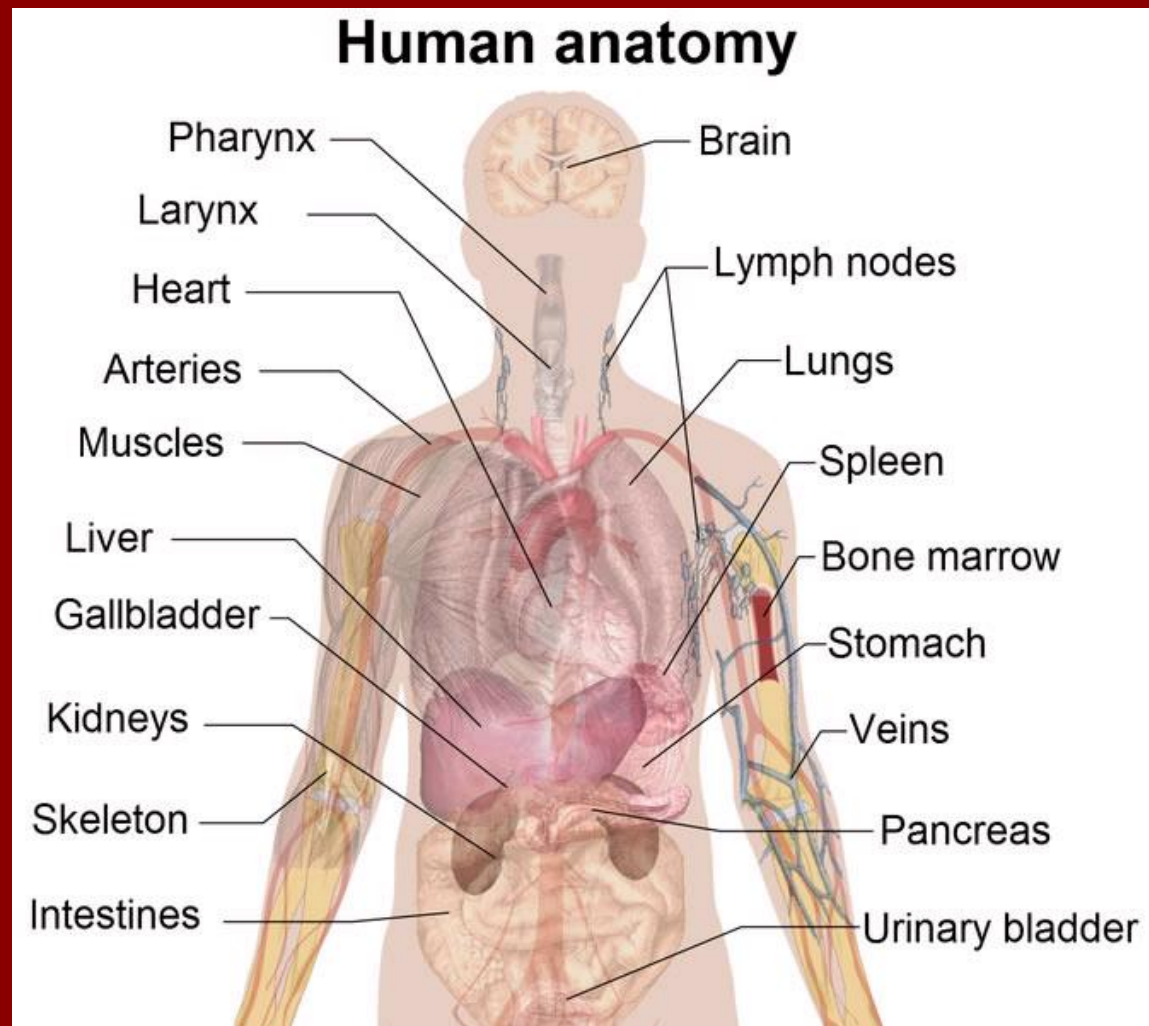
Oral Appliances

- Mild to moderate sleep apnea
- Compared to CPAP:
 - Equal reductions in sleepiness despite less reduction in AHI
- *No* predictors of efficacy
 - Post-fit PSG needed to prove efficacy

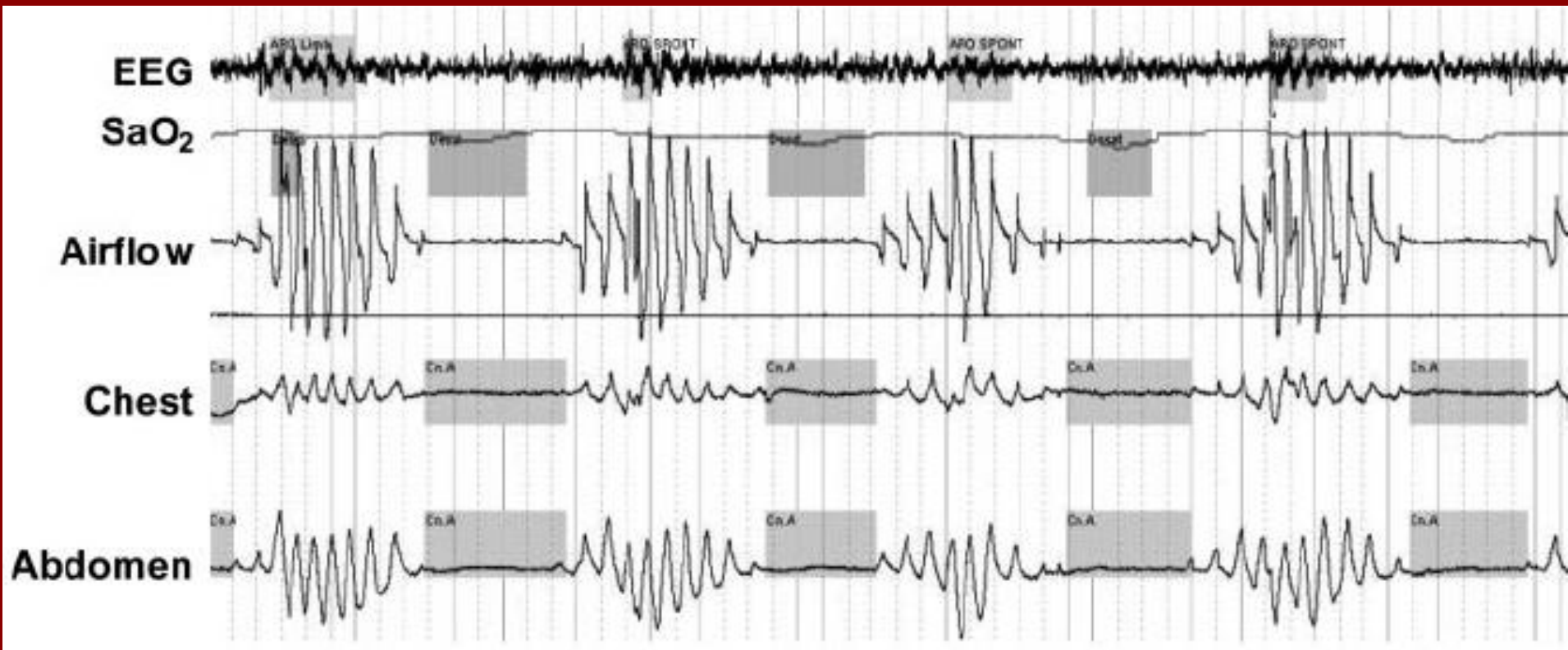
Surgery.....

- Considered 3rd line option
- Effective slightly over 50% of the time
 - Varies with patient anatomy and surgical type
- Can be permanent solution for some
- Others can have recurrence within 5 years
- Sometimes done to help improve CPAP tolerance

Cheyne Stokes Respiration



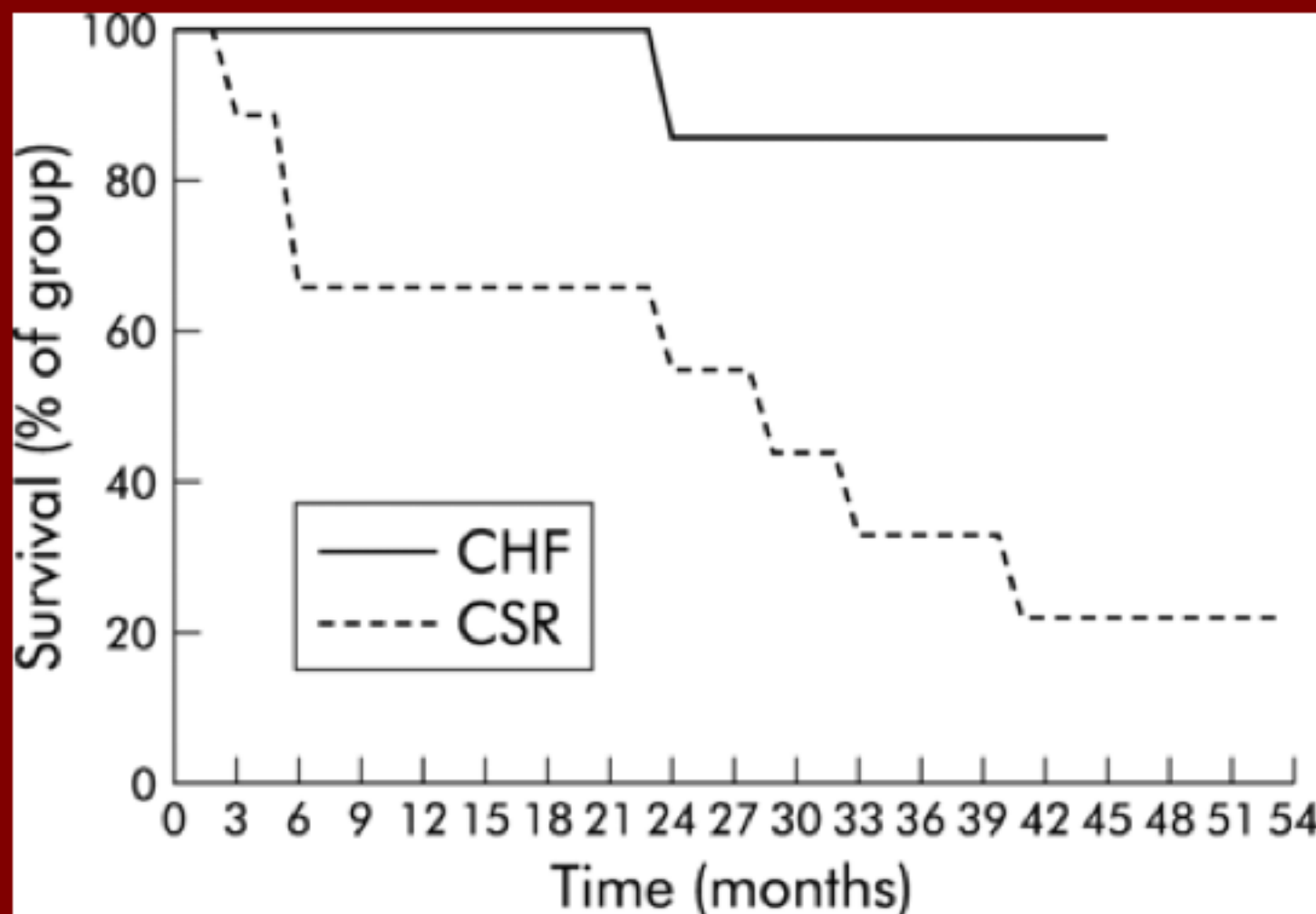
Cheyne Stokes Respiration



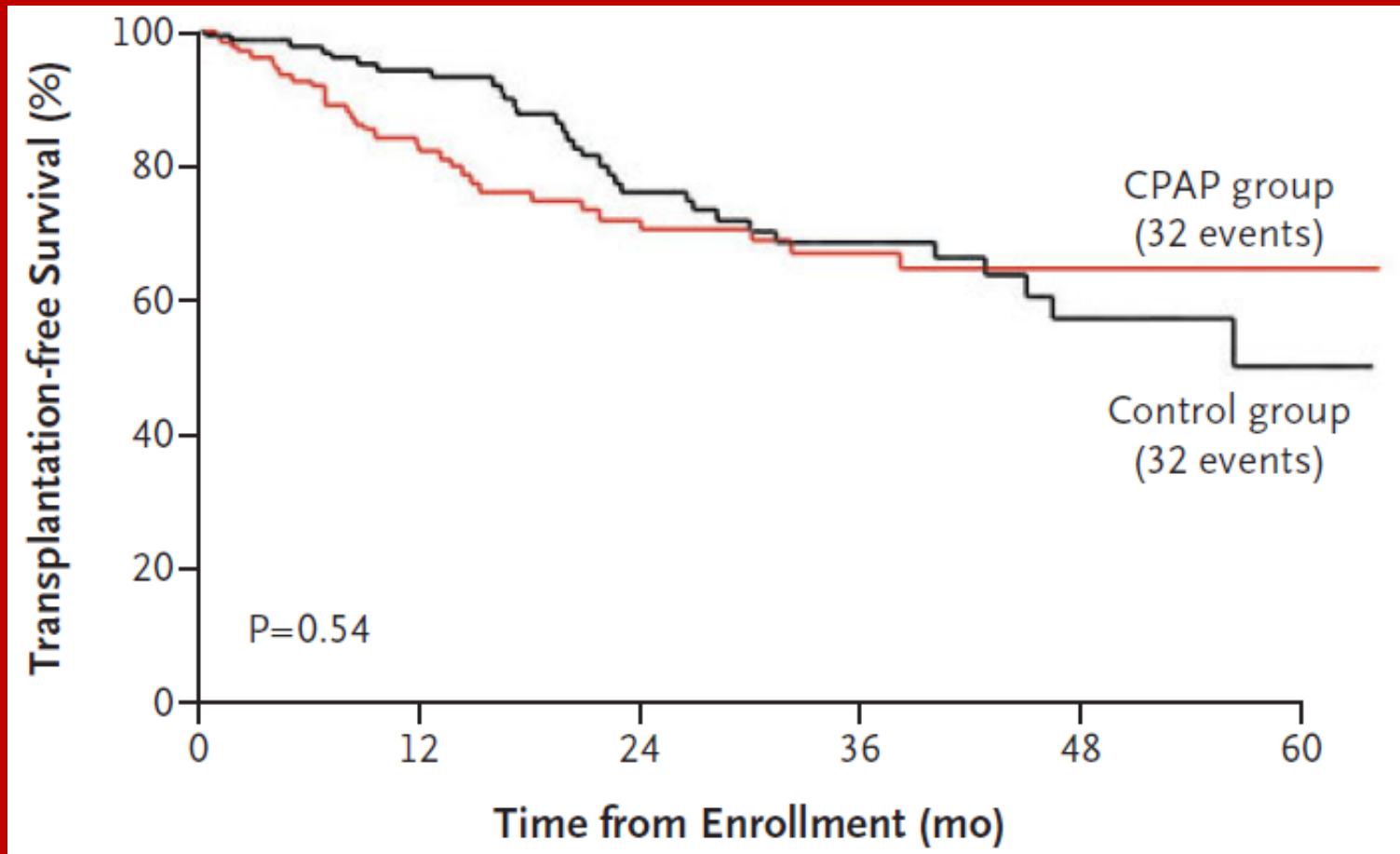
Clinical Presentation of CSA/CSR

- Hypersomnolence
- Fatigue
- Insomnia (both sleep onset and sleep maintenance)
- Snoring NOT defining
- Complaints of nocturnal breathlessness
- Witnessed apneas (more than OSA)

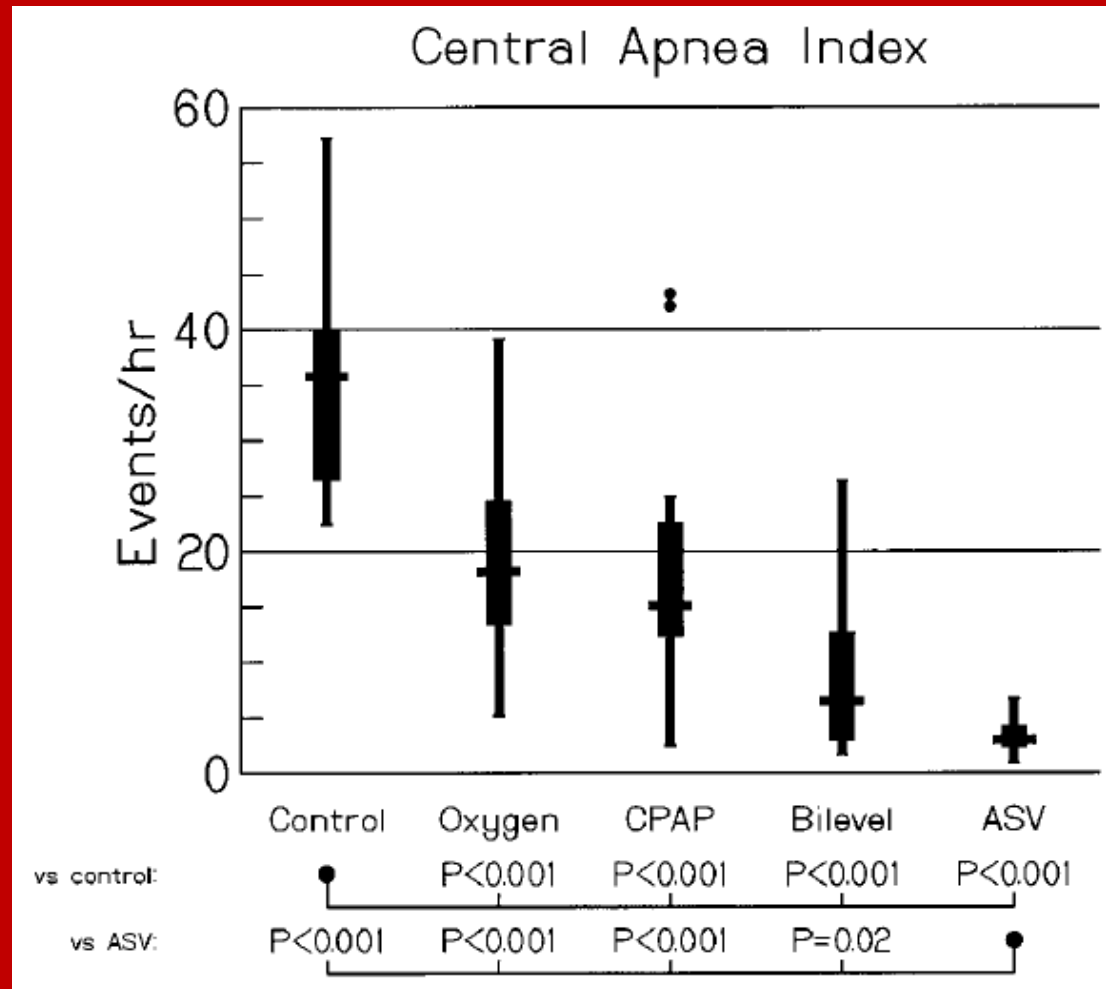
Effect of CSR on Survival in CHF Patients



CPAP for CSA in CHF Has Not Been Proven

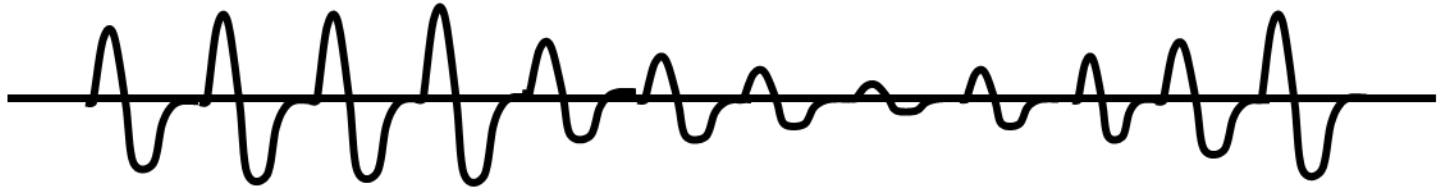


Adaptive Servo Ventilation (ASV) for CSR in Heart Failure



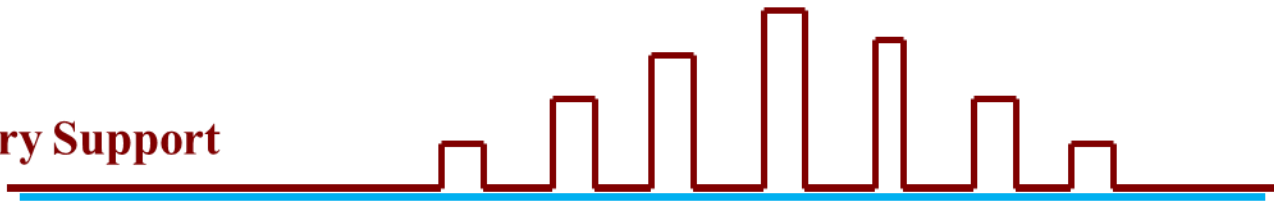
Teschler et al, Am J Respir Crit Care, 2001

Adaptive Servo Ventilation



Inspiratory Support

CPAP



ASV counterbalances the shift between hyperventilation and hypoventilation by applying variable inspiratory support and thus overcomes the ventilatory overshoot.

In Conclusion...

- There is more than one kind of sleep apnea
- Untreated sleep apnea can lead to more complications in heart disease
- CPAP is the gold standard treatment for OSA, but there are alternatives
- More advanced machines may be needed for Cheyne Stokes Respiration

Thank you!