Obstructive sleep apnea in heart disease
- Consequences and treatment options

Dr. med. Marco Laures
Pneumologie/Schlafmedizin Kantonsspital Münsterlingen
Overview

- Obstructive sleep apnea – General aspects
- Cardiovascular consequences of OSA
- OSA and heart disease
  - Atrial fibrillation
  - Chronic heart failure
- Heart disease and sleep – anything else?
- Summary and implications for patient care
- Discussion
OSA – general aspects

Risk factors

- male sex
- age
- BMI
- neck circumference
- craniofacial abnorm.
- menopause
- alcohol
- sedating drugs, …

AHI = Events/h

1 http://www.entheadandneckspecialist.com/Education-snoring.osa_2.html
Video-Polysomnography
OSA – patients view

- Daytime sleepiness
- Snoring, witnessed apnea
- Choking
- Sweating
- Nycturia
- Dry mouth
- Fragmented sleep

... but often no subjective complaints at all
- poor correlation between AHI and symptoms
### OSA - Prevalence

![Graph showing OSA prevalence]

<table>
<thead>
<tr>
<th>Study</th>
<th>Men (AHI&gt;5/h)</th>
<th>Men (AHI&gt;15/h)</th>
<th>Men (AHI&gt;5/h+EDS)</th>
<th>Women (AHI&gt;5/h)</th>
<th>Women (AHI&gt;15/h)</th>
<th>Women (AHI&gt;5/h+EDS)</th>
<th>n/a</th>
</tr>
</thead>
<tbody>
<tr>
<td>Young T et al. N Engl J Med 1993</td>
<td>24</td>
<td>9</td>
<td>4</td>
<td>9</td>
<td>2</td>
<td>4</td>
<td>9</td>
</tr>
<tr>
<td>Heinzer R et al. Lancet Respir Med. 2015</td>
<td>84</td>
<td>61</td>
<td>50</td>
<td>50</td>
<td>23</td>
<td>23</td>
<td>n/a</td>
</tr>
</tbody>
</table>

Note: AHI stands for Apnea-Hypopnea Index, EDS stands for Epworth Sleepiness Scale.
OSA – doctors view

OSA is associated with …

- Art. Hypertension\textsuperscript{1}
- Diabetes mellitus II\textsuperscript{1}
- Metabolic syndrom\textsuperscript{1}
- Depression\textsuperscript{1}

and

- Death\textsuperscript{2}

\textsuperscript{1} Heinzer R et al. Lancet Respir Med. 2015
\textsuperscript{2} Young T et al. Sleep 2008;31(8):10071-8.
OSA – a cardiovasc. Risk factor

- Intermittent hypoxia/hypercapnia
- Intrathoracic pressure swings
- Sleep fragmentation

20 - 30 years

- Norm
- Endothelial dysfunction
- Stenosis
- Stenosis > 50%
- Atherothrombosis

- Art. hypertension
- Coronary heart disease, cerebrovascular disease
CPAP and endothelial dysfunction

N=64, parallel, 6 months, flow mediated dilation

Kohler et al. Chest 2013
CPAP and c.v. morbidity/mortality

- CPAP → Significant benefit on mortality in severe OSA (AHI > 30/h)

OSA – Therapy

Indication depending on...

• AHI
• Comorbidities
• Symptoms
OSA and atrial fibrillation (1)

- Approx. ½ of patients with atrial fibrillation have OSA¹

1 Gami AS et al. Circulation 2004
2 Gami AS et al. J Am Coll Cardiol. 2007
OSA and atrial fibrillation (2)

- Higher probability of cardioversion failure in untreated OSA

- Obstructive respiratory events induce premature atrial contractions (-negativ intrathoracic pressure)

1 Ravi Kanagala et al. Circulation. 2003
Sleep apnea and **Chronic Heart Failure**

- Mortality in CHF higher than for most carcinomata (50/5yrs, 45%/yr in NYHA IV)
- Sleep apnea is frequent in CHF (50-80%)
- Mortality increases with presence of sleep apnea
- Presence of sleep apnea → Reduced Quality-of-Life (contrasts with daytime sleepiness)
Central sleep apnea (Cheyne-Stokes-Respiration)
Evolution of sleep apnea in CHF

- 2-yr-mortality 86% vs. 56% for CHF with vs. without CSA/CSR
SDB and CHF - Pathophysiology
Fluid-Shift

Potential therapeutic targets

<table>
<thead>
<tr>
<th>Sitting time/inactivity</th>
<th>Fluid-retaining conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exercise</td>
<td>Compression stockings</td>
</tr>
<tr>
<td>Diuretics</td>
<td>Dialysis</td>
</tr>
</tbody>
</table>

DAY

Rostral fluid shift

NIGHT

UA-XSA

UA collapsibility

UA obstruction

OSA

PCWP

PCO$_2$

GSA

CHEST

Pulmonary congestion

Pulmonary irritant receptors

Heart failure

Hyperventilation

Central apnoea

PCO$_2$ increase

PCWP increase

White L H, and Bradley T D J Physiol 2013
CPAP in sleep apnea and CHF…

- reduces AHI (obstructive and central (approx. in 50%)\(^1\)

- improves left ventricular function\(^1\) ….

but

- did not generally improve transplant free-survival\(^2\) only when AHI was reduced to <15/h \(^3\)

\(^1\)Sin DD […] Bradley TD Circulation 2000
\(^3\)Arzt M et al. Circulation 2007
Adaptive Servoventilation (ASV)
ASV for Central sleep apnea in syst. HF

In patients with chronic systolic HF and SDB with dominant CSA…

- …ASV controls AHI
  but
- … does neither significantly improve a combined primary endpoint (hospitalisation, death) nor multiple functional parameter (QoL, 6MWT…)

and

- increases mortality (+28%; especially in very low LVEF and high proportion of CSR)
Recommendations „after Serve-Hf“

- NO ASV in patients with systolic heart failure (LVEF <45%) and central sleep apnea

- It seems reasonable to search and treat obstructive sleep apnea in patients with heart failure (CPAP preferred)

- Treatment of central sleep apnea in CHF by other means than ASV is a matter of debate
Heart disease and sleep – anything else?

- Comorbid Chronic Insomnia is very common in many medical disorders

- 26% in patients with heart disease (OR 1.6)\(^1\)

- Cognitiv behavioral therapy is effective in comorbid insomnia

Budhiraja R et al. SLEEP 2011
Summary

- OSA is frequent especially in heart disease
- OSA increases cardiovascular morbidity and mortality
- OSA patients - even with high cv risk - may be asymptomatic
  - → CPAP in asymptomatic patients needs good patient education/motivation
- Sleep apnea very common in Chronic heart failure
  - No ASV in reduced LVEF and central sleep apnea, treatment of OSA still reasonable
- OSA is not the only cause of poor sleep in heart disease
  - Listen to your patient! Assess comorbid insomnia
Für beide: wie Ferien!
OSA and art. hypertension

- 40% of patients with art. Hypertension have OSA (70% in therapy refractory patients) \(^1\)

- „Nondipper“ in 24h-BP-measurement → poorer prognosis → 84% have mild to severe OSA\(^1\)

- Overall-CPAP effect on blood pressure - significant but mild\(^1\)

---

1\(^1\) Torres G et al. CHEST 2015
2\(^\text{Pépin et al. AJRCCM 2010}\)