



# Atemlos durch die Nacht

pneumologie  
nordwest

Dr. med. P. Fachinger

  
LUNGENLIGA AARGAU

# Fahrplan

Geschichte der Schlafapnoe

Definition / Diagnostik / Epidemiologie

Pathophysiologie

Auswirkungen Kardiovaskuläres Risiko, Müdigkeit / Schläfrigkeit, Strassenverkehr

Überblick über Therapieoptionen

Zusammenfassung

# 400 Jahre Schlafapnoe?

Felix Platter (1536-1614)

Der basler Arzt berichtete von einem sehr dicken Mann, der beim Sprechen, Essen und Trinken unvermittelt einzuschlafen pflegte und während eines Festgelages im Jahr 1560 plötzlich verstarb.



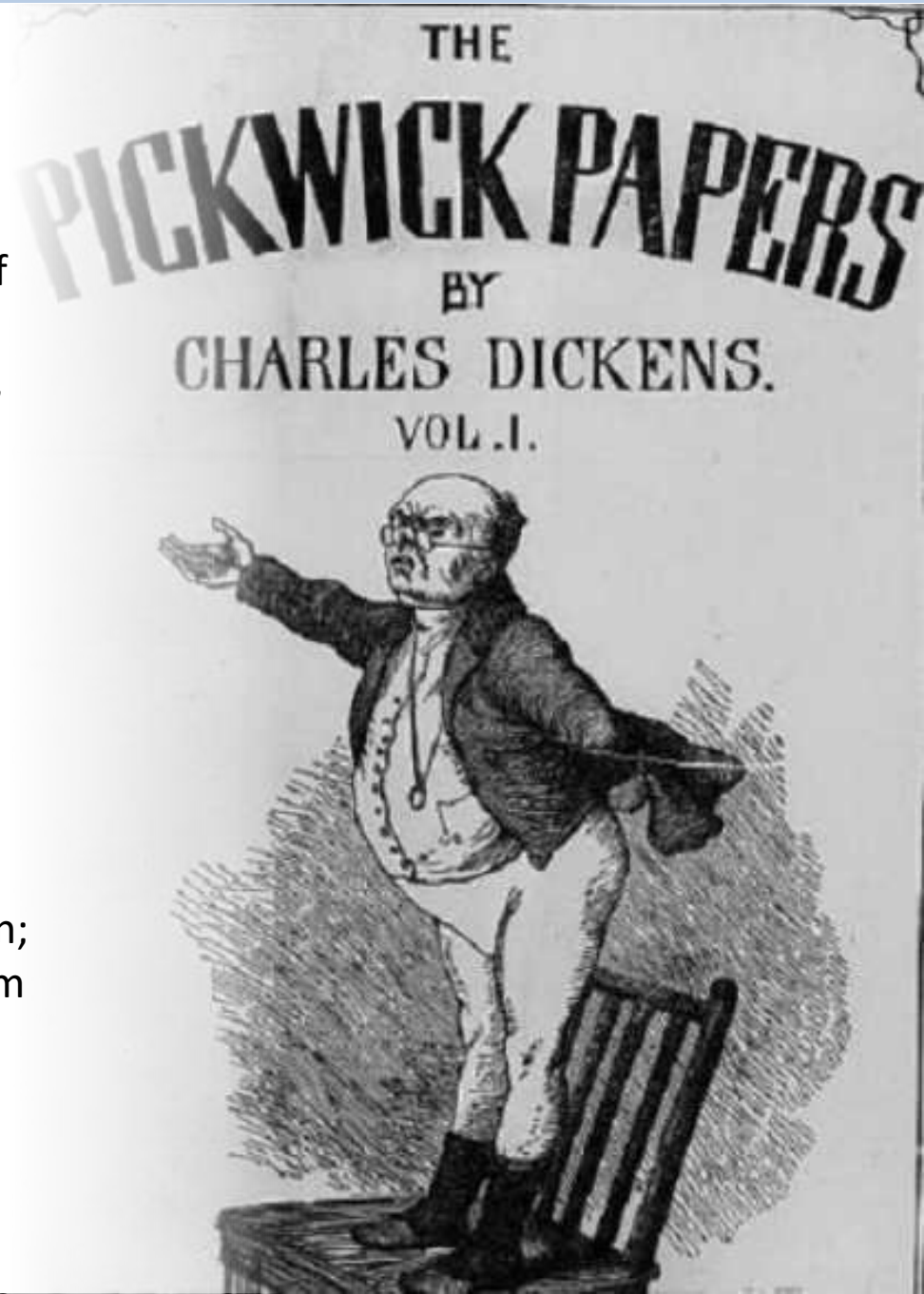
## The Pickwick Papers

The object that presented itself to the eyes of the astonished clerk, was a boy – a wonderfully fat boy– habited as a serving lad, standing upright on the mat, with his eyes closed as if in sleep.

“**Sleep!**” said the old gentleman, ‘**he’s always asleep.** Goes on errands fast asleep, and snores as he waits at table.”

“How very odd!” said Mr. Pickwick.

“Ah! odd indeed,” returned the old gentleman; “I’m proud of that boy–wouldn’t part with him on any account – he’s a natural curiosity!”



1956

## Extreme Obesity Associated with Alveolar Hypoventilation – A Pickwickian Syndrome\*

C. Sidney Burwell, Eugene D. Robin, Robert D. Whaley, †Albert G. Bickelmann

The purpose of this article is to consider the association of obesity, somnolence, polycythemia and excessive appetite. A careful study of one patient will be used to illustrate the discussion.

### REVIEW OF LITERATURE

The association of these characteristics has long been recognized. Medical texts of the early nineteenth century accept the association of these signs and symptoms as well established. The following quotation from Wadd (1) is an example. "A country tradesman aged about thirty, of a short stature and naturally of a fresh, sanguine complexion and very fat applied to me for assistance. He complained of perpetual drowsiness and inactivity. His countenance was almost livid and such a degree of somnolency attended him that he could scarce keep awake whilst he described his situation. In other respects he was well."

A classic description of the association of signs and symptoms under discussion was written by Charles Dickens (2). The author refers to "a fat and red-faced boy in a state of somnolency." This boy was subsequently addressed as "Young Dropsy," "Young Opium-Eater" and "Young Boa-Constrictor" – no doubt in reference to his obesity, his somnolence and his excessive appetite, respectively. A characteristic of these patients is an extraordinary degree of somnolence in which sleep may overcome the patient while he is sitting up or even while he is engaged in conversation of other muscular activity. The somnolence of his character was described by Mr. Dickens in the following words:

\*From the Department of Medicine, Harvard Medical School and the Medical Clinics, Peter Bent Brigham Hospital; supported in part by a research grant (H-2243) from the National Heart Institute of the National Institutes of Health, Public Health Service and in part by a grant from the Massachusetts Heart Association; presented in part before the Opening General Assembly of the Boston Clinical Meeting of the American Medical Association on November 29, 1955. †Present address, Buffalo, New York.  
Burwell CS, Robin ED, Whaley RD, Bickelmann AG. Extreme obesity associated with alveolar hypoventilation—a Pickwickian Syndrome. *Am J Med.* 1956;21:811-818.

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Special thanks to Judy Roberts and Sandra Graves of the Pennington Information Center for help in acquiring this document.

"A most violent and startling knocking was heard at the door; it was not an ordinary double knock, but a constant and uninterrupted succession of the loudest single raps, as if the knocker were endowed with the perpetual motion, or the person outside had forgotten to leave off.

"Mr. Lowton hurried to the door...The object that presented itself to the eyes of the astonished clerk was a boy – a wonderfully fat boy –...standing upright on the mat, with his eyes closed as if in sleep. He had never seen such a fat boy, in or out of a traveling caravan; and this, coupled with the utter calmness and repose of his appearance, so very different from what was reasonably to have been expected of the inflicter of such knocks, smote him with wonder.

"What's the matter?" inquired the clerk.

"The extraordinary boy replied not a word; but he nodded once, and seemed, to the clerk's imagination, to snore feebly.

"Where do you come from?" inquired the clerk.

"The boy made no sign. He breathed heavily, but in all other respects was motionless.

"The clerk repeated the question thrice, and receiving no answer, prepared to shut the door, when the boy suddenly opened his eyes, winked several times, sneezed once, and raised his hand as if to repeat the knocking. Finding the door open, he stared about him with astonishment, and at length fixed his eyes on Mr. Lowton's face.

"What the devil do you knock in that way for?" inquired the clerk, angrily.

"Which way?" said the boy, in a slow, sleepy voice.

"Why, like forty hackney-coachmen," replied the clerk.

"Because master said I wasn't to leave off knocking till they opened the door, for fear I should go to sleep" said the boy."

Figure 1 represents Thomas Nast's drawing of Mr. Wardle's boy, Joe (3). This masterful description by Charles Dickens of a patient with marked obesity and

1981

## THE LANCET

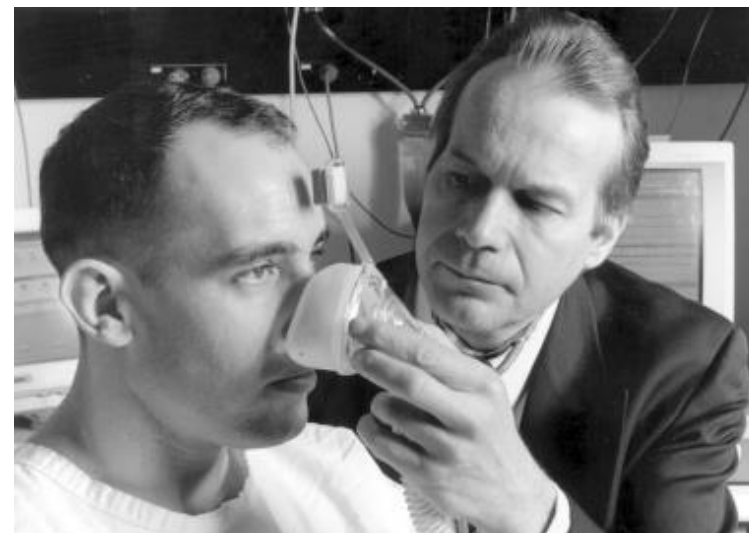
Volume 317, Issue 8225, 18 April 1981, Pages 862–865

Originally published as Volume 1, Issue 8225

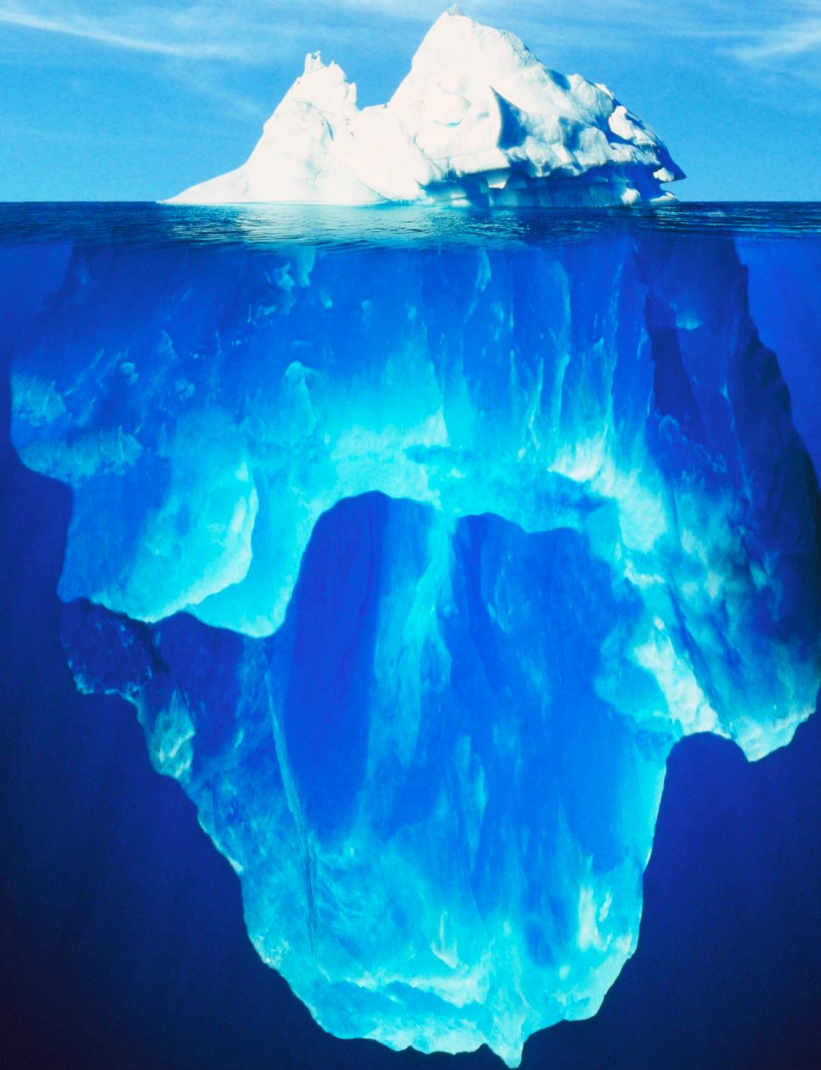


### REVERSAL OF OBSTRUCTIVE SLEEP APNOEA BY CONTINUOUS POSITIVE AIRWAY PRESSURE APPLIED THROUGH THE NARES

Colin E. Sullivan, Michael Berthon-Jones, Faiq G. Issa, Lorraine Eves



**Und trotzdem: Wir kennen nur die Spitze des Eisbergs**



**Ca. 85% aller behandlungswürdigen OSAS-Patienten sind nicht bekannt.**

*Kapur et al. Sleep Breath 2002; 6:49-54 - Young et al. SLEEP 1997; 20:705-706.*

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## Klinische Präsentation

### Leitsymptome:

Schnarchen  
beobachtete Atempausen  
Tagesmüdigkeit /-schläfrigkeit

### Symptome nachts:

Durchschlafstörungen  
nächtliche Luftnotattacken  
Herzrasen  
vermehrtes Schwitzen  
Nykturie (nächtliches Wasserlösen)

### Symptome am Tag:

Verminderte Leistungsfähigkeit  
Depression  
Potenzstörungen  
reduziertes sexuelles Verlangen (Libidoverlust)  
morgendliche Kopfschmerzen  
morgendliche Mundtrockenheit





# Definition

American Academy of Sleep Medicine (AASM), 1999

OSAHS is characterized by **recurrent episodes of partial or complete upper airway obstruction during sleep**. This manifests as a reduction in (hypopnea) or complete cessation

**SLEEP-RELATED BREATHING DISORDERS IN ADULTS**

Sleep-Related Breathing Disorders in Adults: Recommendations for Syndrome Definition and Measurement Techniques in Clinical Research  
*The Report of an American Academy of Sleep Medicine Task Force*

**Obstruktive Schlafapnoe:**  
**AHI > 5 aber KEINE Symptome**

**Obstruktives Schlafapnoe-Syndrom:**  
**AHI > 5 UND Symptome**

apnea syndrome hyperbstructive k, et al. as aturation.<sup>6</sup> neas were SAS, and sequently tive sleep In 1992 ad typical I not have raphy. It y increasation and r airways tral sleep in the lit-r patients h altitude rubric. leminault 0 seconds althy sub-neas per later stan- number of t for OSAS

upon resumption of respiratory effort indicating upper airway obstruction.  
As different types of disordered breathing events during sleep have been described, it has been recognized that signs and symptoms could be used to describe several syndromes. Burwell used the term Pickwickian syndrome to describe patients with obesity, hypercapnia, cor pulmonale, erythrocytosis, and daytime hypersomnolence.<sup>3</sup> Guille-

was set at 5.<sup>7</sup> Since the initial descriptions of these different types of abnormal breathing events and their related syndromes, technology has changed and original definitions have been modified to incorporate methods with uncertain validity and reliability. This has led to variable definitions of events and syndromes that are based on differing methodologies. The lack of uniform definitions as well as the clinical overlap between the Pickwickian syndrome, OSAHS, and CSAS has created confusion in clinical settings and has hindered comparisons of results from research studies. This publication addresses this issue by proposing a set of standard criteria for defining apnea events and syndromes.

Accepted for publication April 1999  
Comments and Reprint Requests to: AASM in conjunction with: The European Respiratory Society, The Australasian Sleep Association, The American Thoracic Society

SLEEP, Vol. 22, No. 5, 1999 667 Sleep-Related Breathing Disorders in Adults—AASM Task Force

(a)  
T  
a  
k

- unrefreshing sleep,
  - daytime fatigue,
  - impaired concentration (and/or)
- c. Overnight monitoring demonstrates **five or more obstructed breathing events per hour during sleep**. These events may include any combination of obstructive apneas/hypopneas or respiratory effort related arousals.

## Hypopnoe (AASM 2.0)

Flusslimitation um  $\geq 30\%$

Dauer mind. 10s

Destauration um  $\geq 3\%$  UND/ODER Arousal

## Apnoe

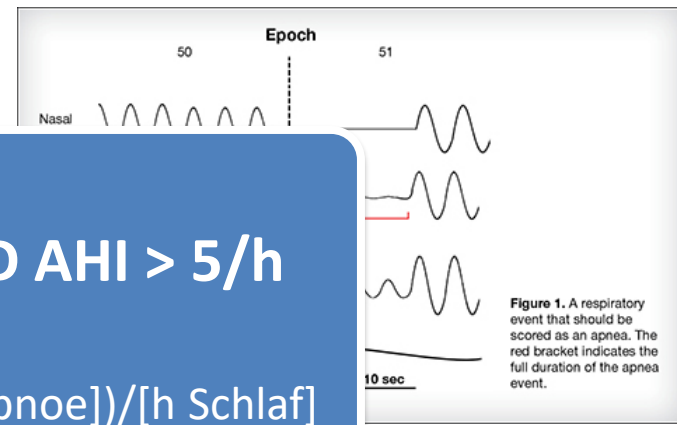
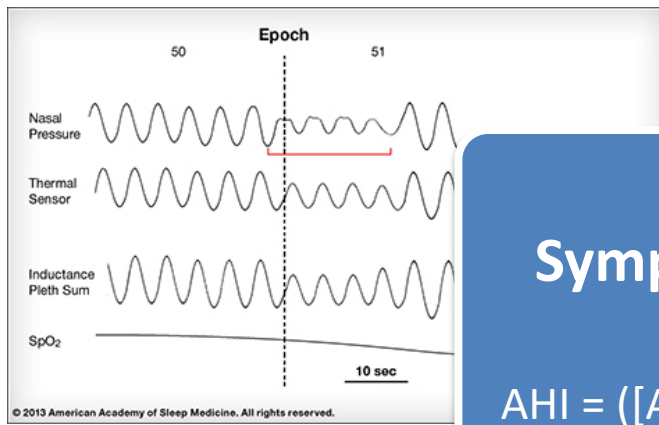
Flusslimitation um  $\geq 90\%$

Dauer mind. 10s

Obstruktiv: erhaltene Atemanstrengung

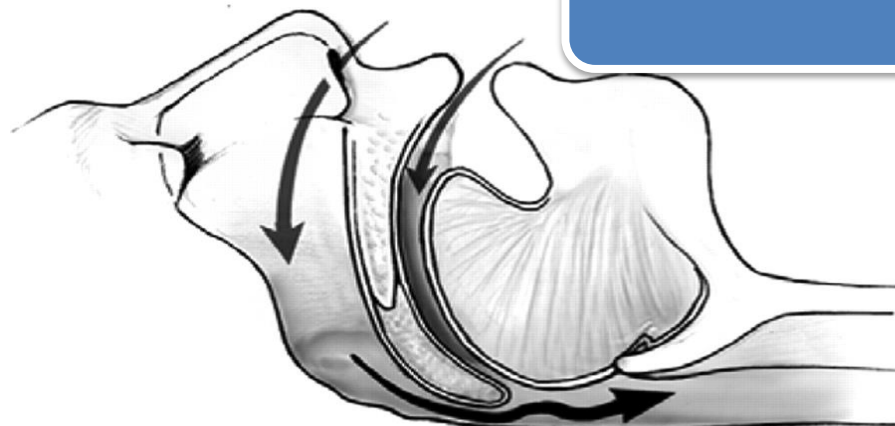
Zentral: fehlende Atemanstrengung

Gemischt: initial zentral, dann obstruktiv

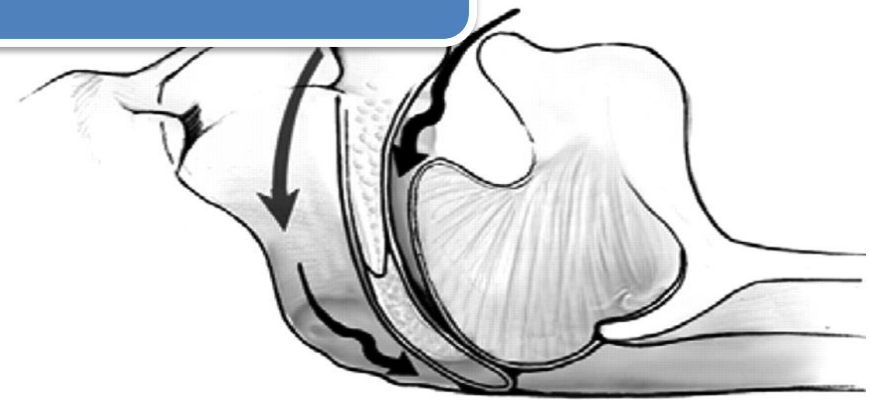


**Symptome UND AHI > 5/h**

$AHI = ([Apnoe] + [Hypopnoe]) / [h \text{ Schlaf}]$

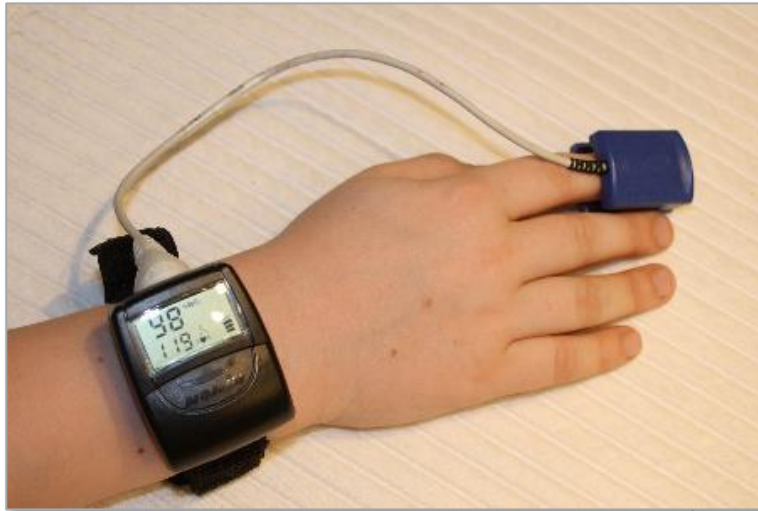


**Hypopnea**

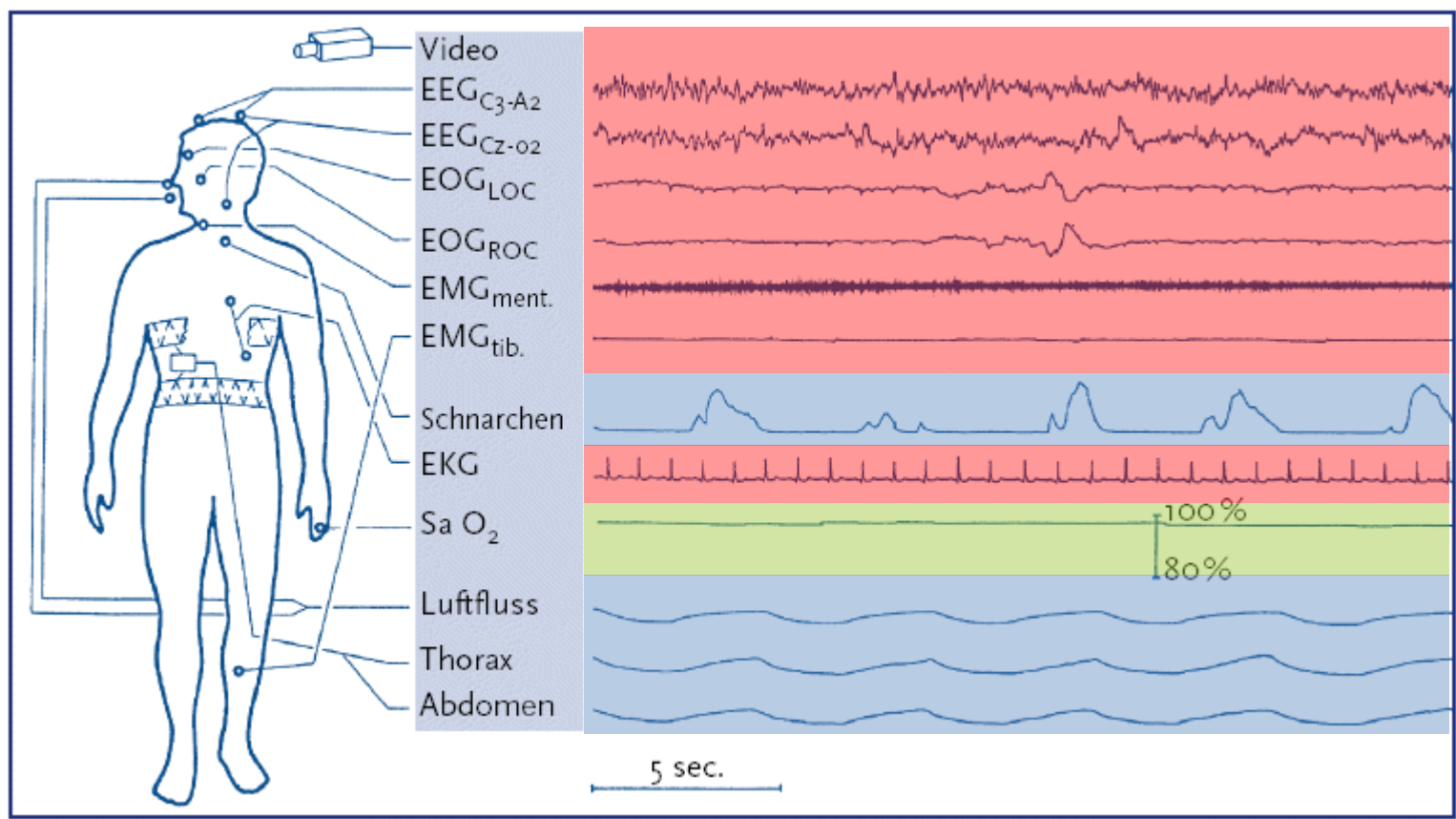


**Apnea**

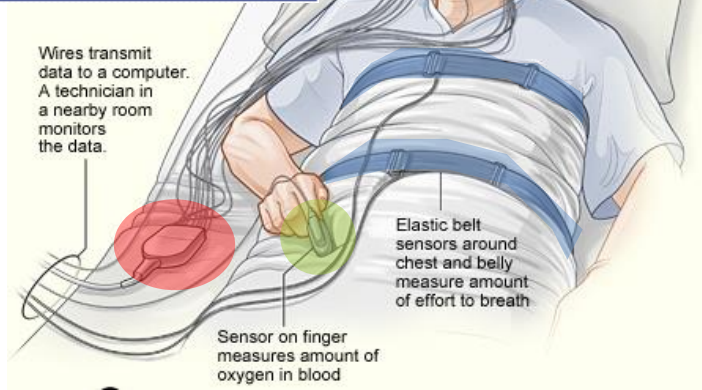
# Diagnostik



# Diagnostik



- Pulsoxymetrien** (Screening, Hausarzt, HNO)
- Resp. Polygraphie** (Diagnose möglich, Pneumologe)
- Polysomnographie** (erweiterte Diagnostik, Schlaflabor)



# Häufigkeit des **Obstruktiven Schlafapnoe-Syndroms**

M

**TABLE 2. PREVALENCE OF SLEEP-DISORDERED BREATHING AT DIFFERENT SEVERITIES AND SLEEP APNEA SYNDROME (RIGHT COLUMN) IN DIFFERENT LARGE-POPULATION STUDIES IN MIDDLE-AGED MEN**

Name/Citation of Study	OSA	Prevalence of AHI $\geq 15/h$ or $20/h$ (%)	OSAS
	Prevalence of AHI $\geq 5/h$ (%)		Prevalence of AHI $> 5/h$ and Symptoms of Sleepiness (%)
Young and colleagues (6) (n = 602; 353 M) studied in lab	24.0	9.1*	4.0
Bearpark and colleagues (18) (n = 486; all M); 294 studied in lab	25.9	3.4 <sup>†</sup>	3.1
Bixler and colleagues (19) 4,364 (all M); 741 studied in lab	17.0	5.6 <sup>†</sup>	3.3

Definition of abbreviations: AHI = apnea-hypopnea index; M = men.

\* AHI  $\geq 15$  episodes/h (reported by Young and colleagues [6]).

<sup>†</sup> AHI  $\geq 20$  episodes/h (reported by Bearpark and colleagues [18] and Bixler and colleagues [19]).

F

**TABLE 3. PREVALENCE OF SLEEP APNEA AND SLEEP APNEA SYNDROME IN WOMEN AND EFFECTS OF MENOPAUSE**

Study	OSA	OSAS
	Prevalence of AHI $> 15$ episodes/h (%)	Sleep Apnea Syndrome* (%)
Young and coworkers (6) (n = 602, 249 females)	4.0	2.0
Bixler and coworkers (20) (12,219 females, 1,000 studied in lab)		
All women	2.2	1.2
Premenopausal	0.6	0.6
Postmenopausal (overall)	3.9	1.9
On HRT	1.1	0.5
Not on HRT	5.5	2.7

Definition of abbreviations: AHI = apnea-hypopnea index; HRT = hormone replacement therapy.

\* In Young and coworkers, defined as AHI  $> 5$  with sleepiness. In Bixler and coworkers, defined as AHI  $> 10$  with reason to treat (e.g., sleepiness and/or hypertension).

**OSAS: f 2%, m 4%**

Häufigkeit zunehmend

2013: AHI  $\geq 15/h$

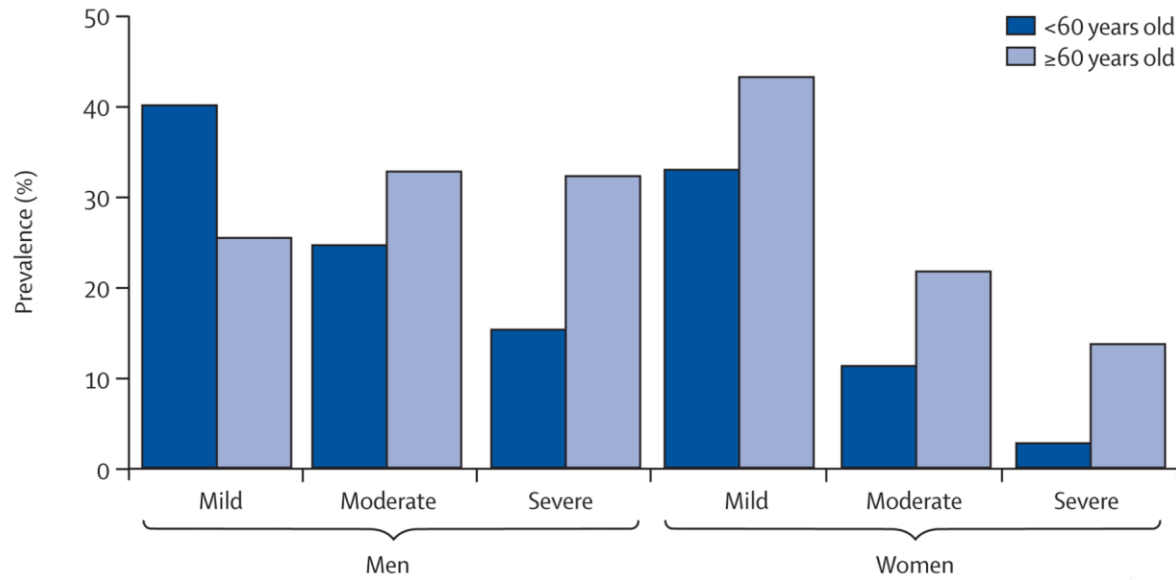
M/W 30-49: 10% / 3%

M/W 50-70: 17% / 9%

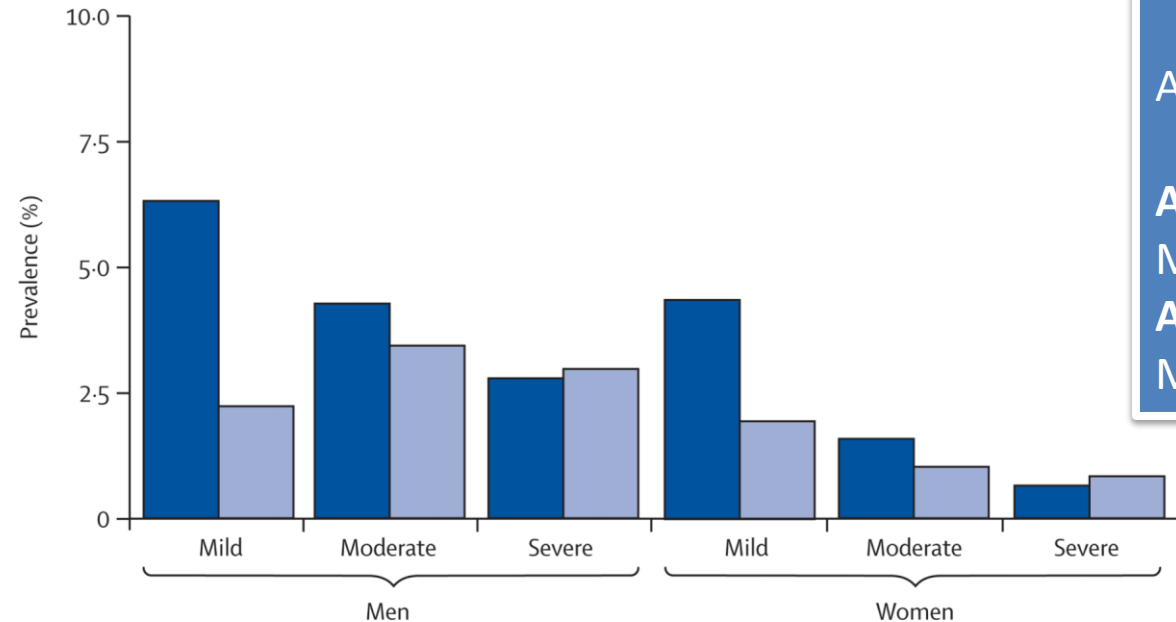
Peppard et al.; Am J Epidem; 177:1006-1014

Young, T. NEJM 1993, 328(17), 1230–1235.  
Bearpark H et al. AJRCCM 1995;151:1459–1465.  
Bixler EO et al. AJRCCM 1998;157:144–148.  
Pack, A. I. AJRCCM 2006, 173(1), 7–15

### A Sleep-disordered breathing



### B Sleep apnoea syndrome



**Hypnolaus-Studie, n=2121**  
Alter: 40-85j (Normalbevölkerung)  
**AHI > 5/h**  
Männer 83.8% / Frauen 60.8%  
**AHI > 15/h**  
Männer 49.7% / Frauen 23.4%

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# Risikofaktoren für die Entstehung von Obstruktiver Schlafapnoe



## Übergewicht

10 kg Gewichtsunterschied → 2x mehr OSAS



## Vergrösserte Mandeln

Häufigste Ursache bei Kindern



## Nasenatmungsbehinderung

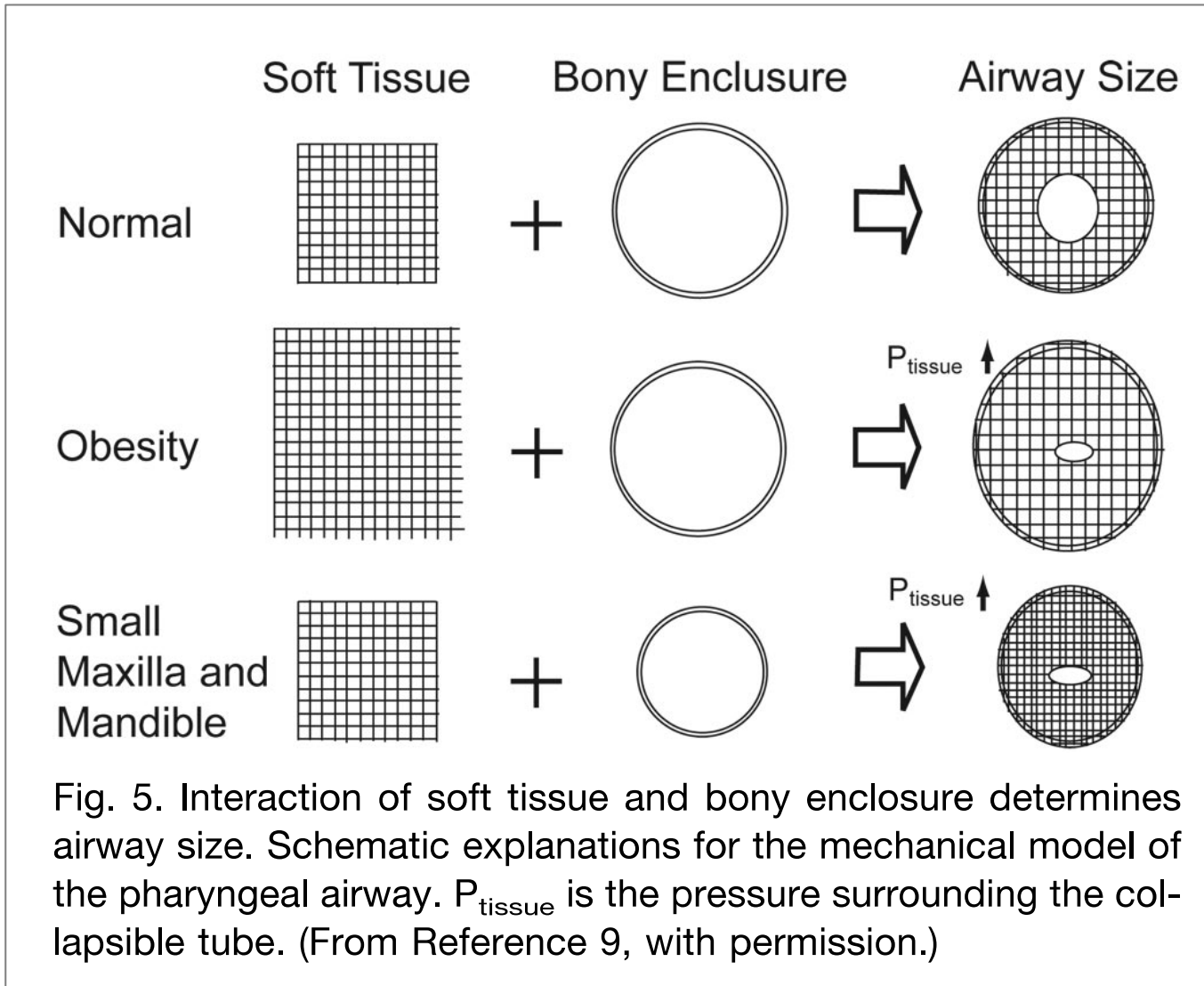
Septumverkrümmung, Heuschnupfen



## Retrognathie



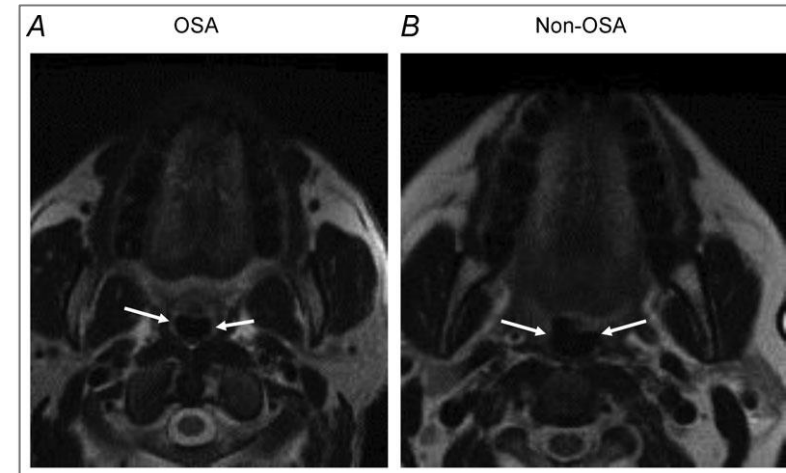
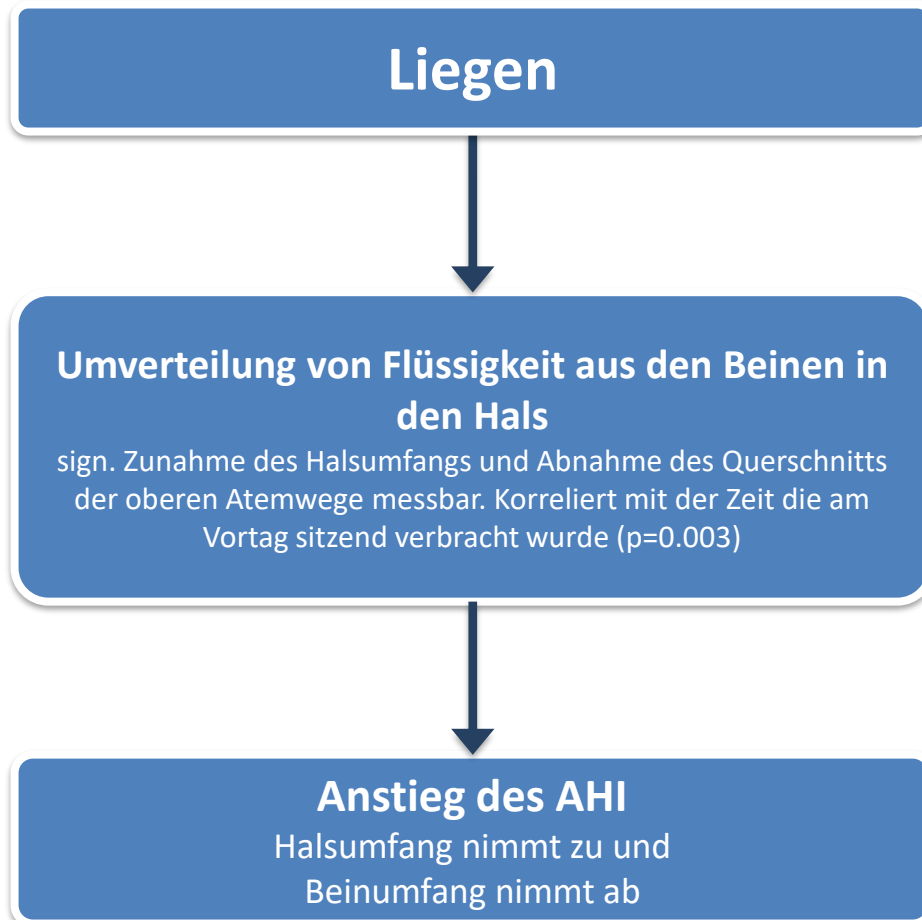
# Anatomie der oberen Atemwege – Das Donut-Modell



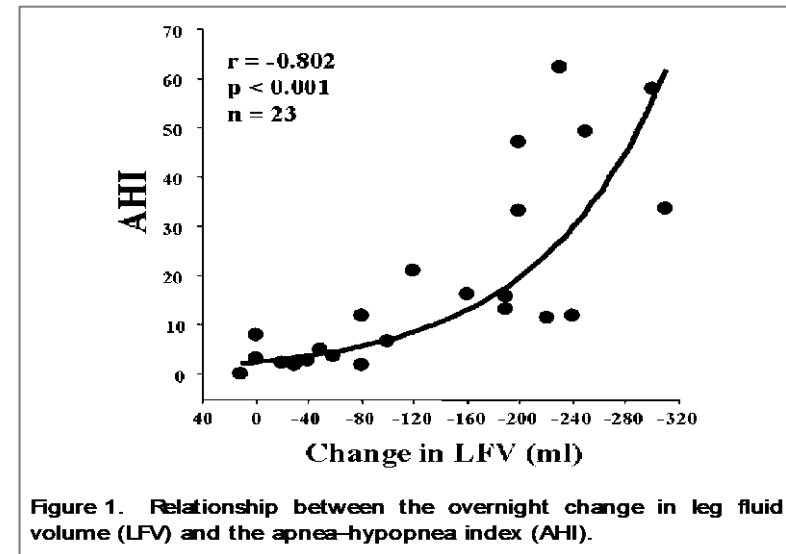
# Nächtlicher Flüssigkeitsumverteilung

Umverteilung von Flüssigkeit aus den Beinen führt zu einem Anstieg des AHI (bei Männern)

Bradley TD et al. AJRCCM 2009; 179:241-246.

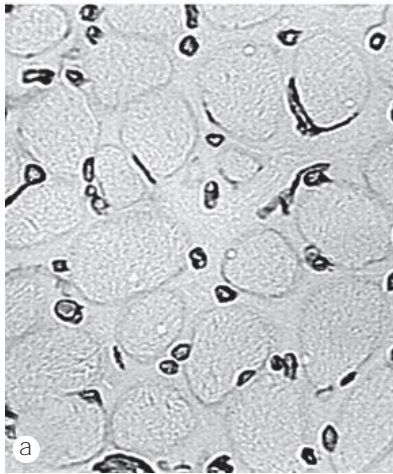


White, Bradley The Journal of Physiology 2013, 591(Pt 5), 1179-1193

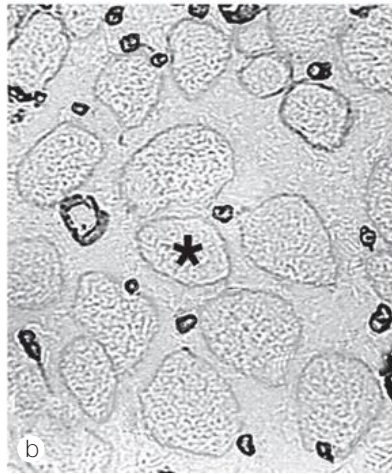




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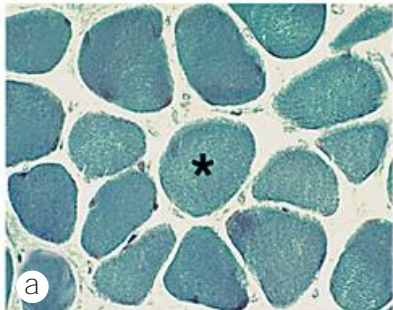


SDB

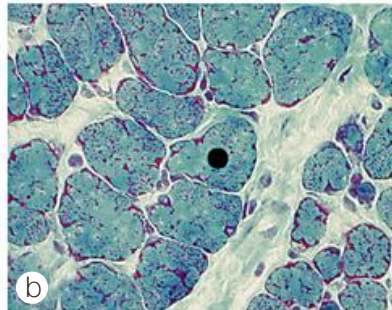


Deutlich verringerte  
Kapillardichte bei OSAS

Reference

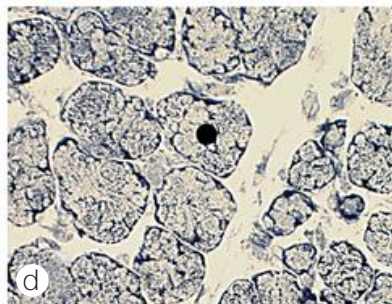
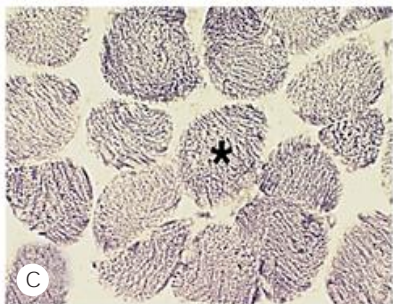


SDB



Abnormales  
Verteilungsmuster der  
Mitochondrien bei OSAS

GT



Ursachen unklar:  
Vibrationstraumen?  
Mitursache des OSAS bei  
Schnarchern?

NADH-TR

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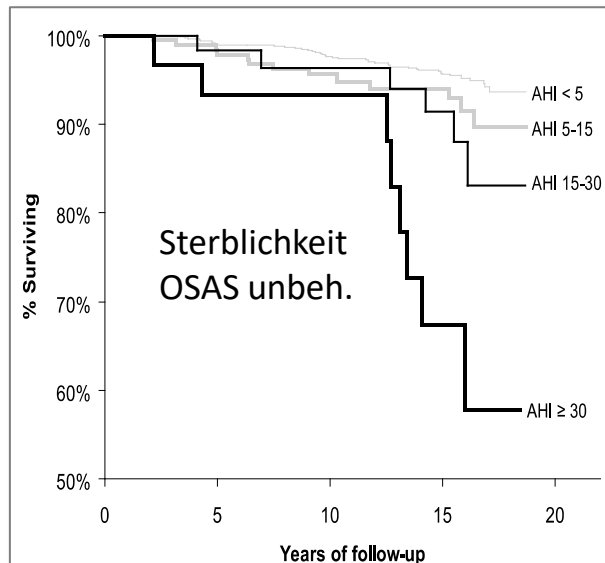
## OSAS ist assoziiert mit...

- ... Bluthochdruck
- ... Diabetes Mellitus Typ II
- ... Kardiovaskulären Erkrankungen
- ... Schlaganfall

*Leung et al. AMJRCM 2001; 164:2147-2165*  
*Quan et al. Circulation 2001; 109:951-957*  
*Ancoli-Israel et al. Chest 2003; 124:1400-1405*  
*Elmasry et al. J Intern Med 2001; 249:153-161*  
...

## ... Tod

*Young et al. SLEEP 2008; 31: 1071-1078*



### Baseline AHI category

None: 0 - < 5  
Mild: 5 - < 15  
Moderate: 15 - < 30  
Severe: ≥ 30

### Hazard ratio\* for all-cause mortality, accounting for comorbidity Hazard Ratio (95% CI)

Reference  
1.5 (0.8, 2.8)  
1.3 (0.5, 3.2)  
2.7 (1.3, 5.7)  
P-trend = 0.01

Hazard-Ratios allgemeine Mortalität,

**angepasst für:**

Alter, Geschlecht, BMI, Art. Hypertonie,  
D.M., KHK, Herzinsuffizienz, Herzchirurgie,  
Stroke

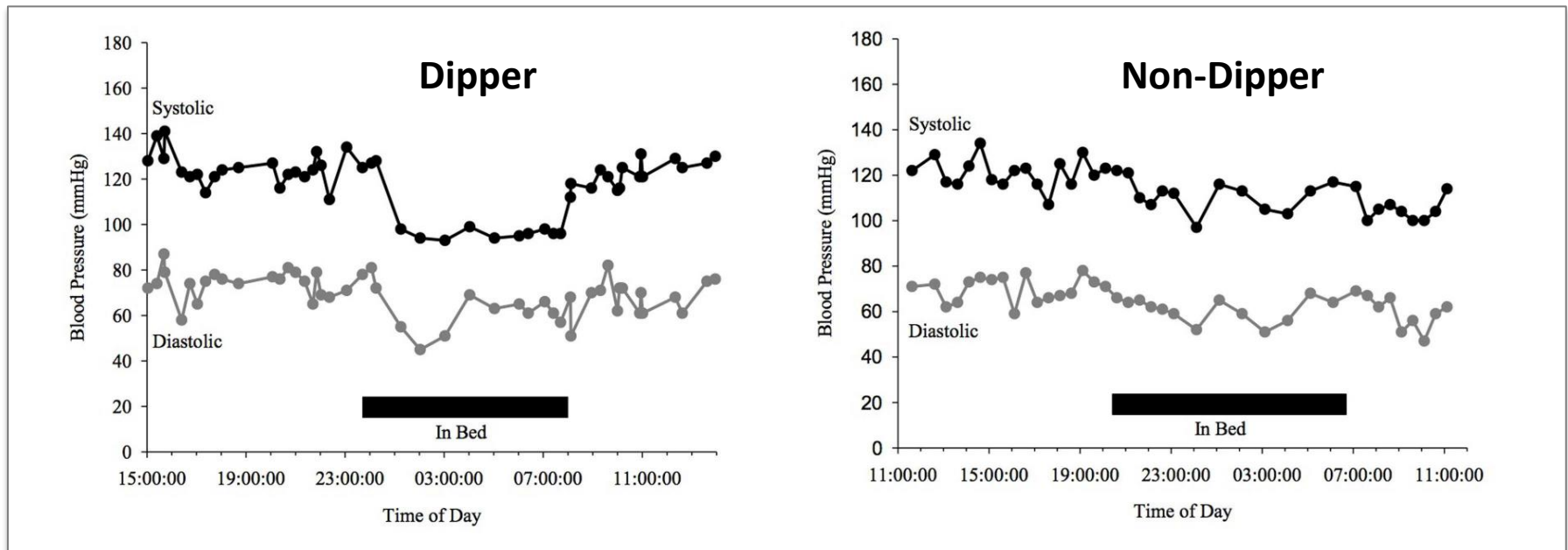
# OSAS und Bluthochdruck

50% der OSA-Patienten haben Bluthochdruck

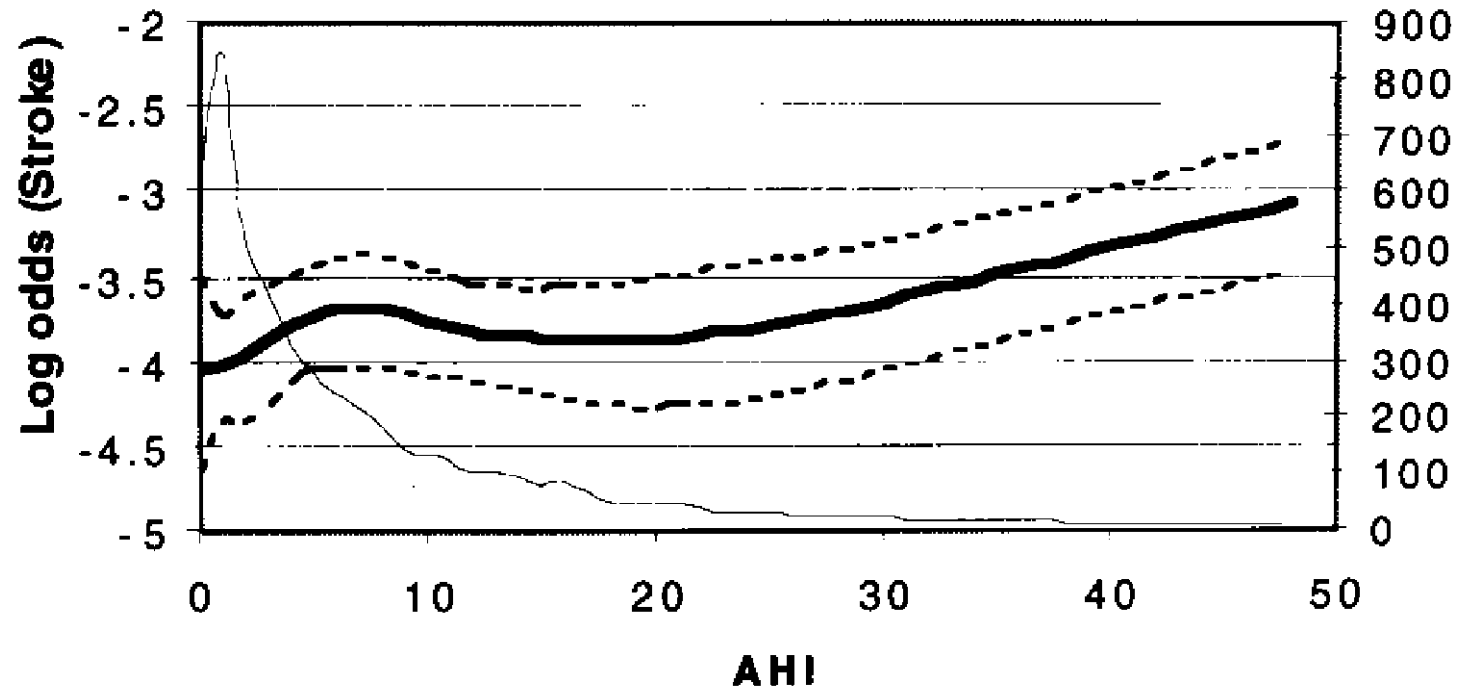
30% der Blutdruck-Patienten haben OSAS

≈ 1.6Mio Menschen in der CH haben BH > **OSA in CH: 0.5Mio** („Eisberg-Phänomen“)

85% der Pat. mit ≥ 3 Blutdruck-Medikamenten haben OSAS



## OSAS und Schlaganfall



**Sleep Heart Health Study, n=6424**  
OR 1.58 (Vergl. Quartil I mit IV)

*Shahar et al. AJRCCM 2001; 163:19-25*

### Prävalenz stummer Insulte

m, Alter  $\approx$  50j, BMI  $\approx$  28kg/m<sup>2</sup>, PSG und MRI  
Kein OSA 6.7%, AHI  $\geq$  15/h **25%**

*Minoguchi et al. AJRCCM 2007; 175:612-617*



## OSAS und Unfallrate

Unfallstatistik Deutschland 2005: 1700 Unfälle wg. Sekundenschlaf  
24% der tödlichen Unfälle auf bayrischen Autobahnen wg. Sekundenschlaf  
BFU (CH): bei 10-20% aller Unfälle ist Müdigkeit beteiligt oder ursächlich



<i>Autor</i>	<i>Studientyp</i>	<i>Ergebnis</i>
<b>Barbé 1998</b> <i>Am J Resp Crit Care Med; 1998; 158:18-22</i>	Case control n=60/60 AHI > 20/h	OR <b>2.3</b> (1 Unfall / 3 Jahre) OR <b>5.2</b> (>1 Unfall / 3 Jahre)
<b>Young 1997</b> <i>Sleep; 1997; 20:608-613</i>	Kohortenstudie n=913 AHI > 15/h	OR <b>10.9</b> (>1 Unfall / 3 Jahre)
<b>Terán-Santos 1999</b> <i>NEJM; 1999; 340:847</i>		OR <b>7.2</b> (1 Unfall)
<b>Masa 2000</b> <i>Am J Resp Crit Care Med; 2000; 162:1407-1412</i>	Interview, n=4002 Case control n=109 AHI > 15/h	OR <b>8.5</b> (1 Unfall)
<b>George 1987</b> <i>Lancet; 1987; 2:447</i>	Retrospektiv n=270	OR <b>10.9</b> (>=1 Unfall)

**OSAS führt zu vermehrten Verkehrsunfällen, OR 2.3 – 10.9**

## Unfallhäufigkeit beim OSAS

Modifiziert nach M. Orth, Mannheim, 03/2013

J. Connor, G. Whitlock, R. Norton, and R. Jackson; *Accid Anal Prev*, vol. 33, no. 1, pp. 31–41, Jan. 2001.

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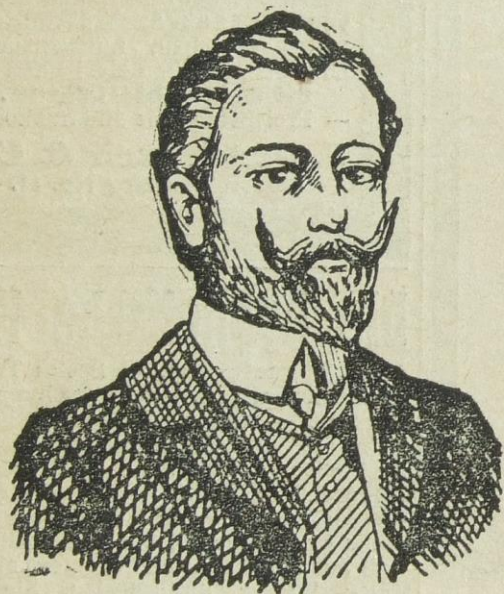
## **Überblick über Therapieoptionen**

Zusammenfassung

# Schnarchet **niemals wieder!**

Wenn jemand schnarcht, so belästigt er alle, die in der unglücklichen Lage sind, dieses unangenehme und laute Geräusch mit anhören zu müssen. Wird der Schnarcher älter, so wird die Angewohnheit **nach und nach**

**Mein Mittel wirkt sofort!**



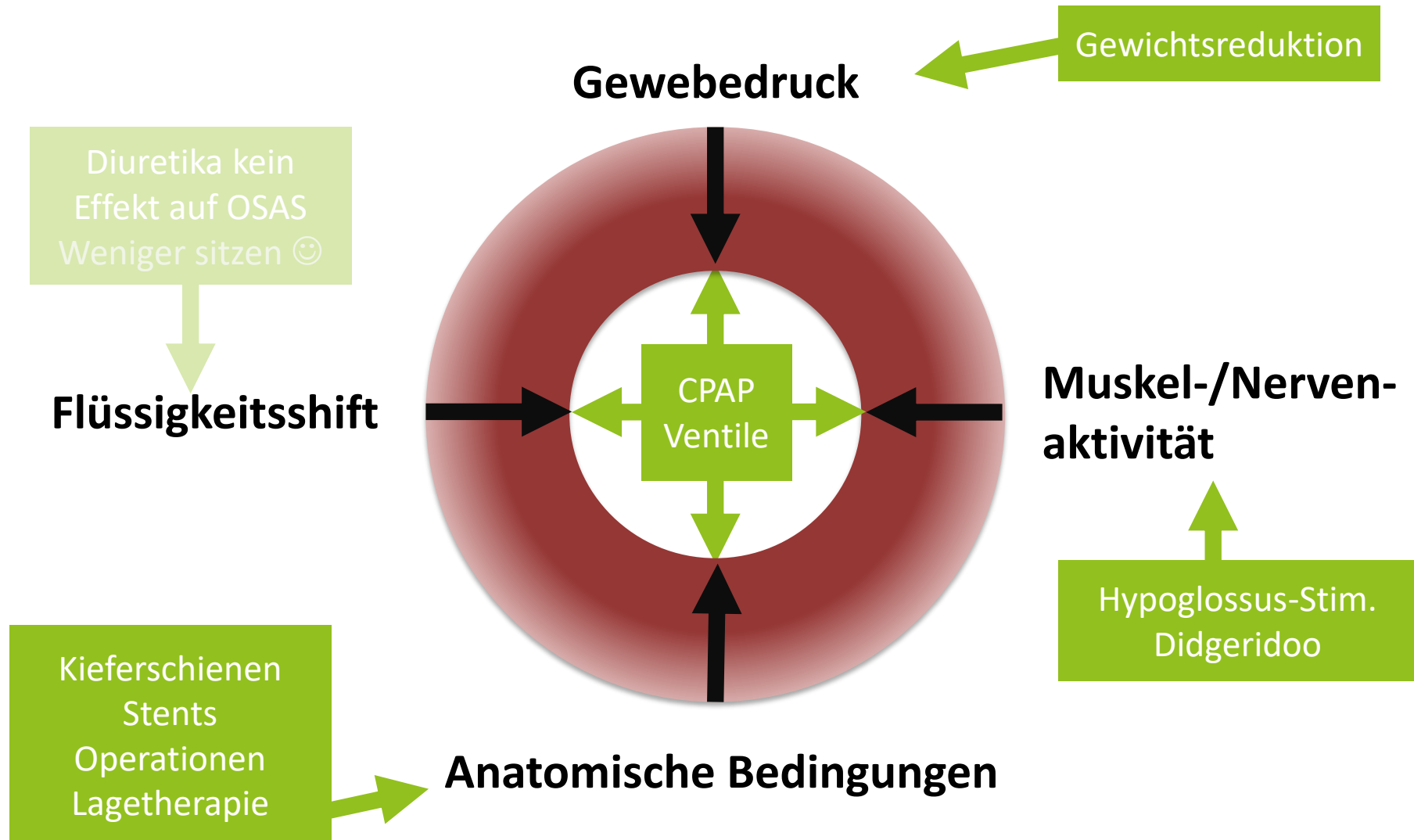
**schlimmer**; im Eisenbahnwagen, Café, in der Kirche und zu Hause im Stuhle fällt er leicht in Schlaf, und sofort beginnt das Schnarchen. Aus Höflichkeit beschwert sich niemand, mit Ausnahme vielleicht von Mitgliedern der eigenen Familie, und daher kann sich der Schnarcher auch wirklich nicht die große Störung, die er verursacht, vorstellen. **Mehr als die Hälfte sämtlicher Männer mittleren Alters** gehört zu den Schnarchern, und auch **viele Frauen** haben diese Gewohnheit.

Abgesehen von der Belästigung dieses unangenehmen Geräusches sind die Ursachen des Schnarchens oft auch **die Ursachen von Krankheiten der Lungen, des Halses und der Nase**, was von bekannten Ärzten zugegeben wird. Leute, die schnarchen, **erkälten sich leicht, bekommen Asthma, Katarrhe und ähnliche Übel**, die in vielen Fällen durch Beseitigung der Angewohnheit des Schnarchens verhindert werden können. Mein Mittel ist **unschädlich**, verursacht **baldiges Unterlassen** des Schnarchens, und **ich garantiere**, daß es erfolgreich wirkt. Ich sende ein kleines Paket **portofrei** gegen 50 Pf. (60 Hell. oder 60 Cents.) in

Briefmarken oder per Postanweisung. Ich sende das Mittel in einer versiegelten Schachtel, die weder Gebrauchsanweisung noch andere Aufschriften über das Mittel enthält; die Unterweisungen gehen in versiegeltem Kuvert zu. Niemand braucht zu wissen, daß Sie mein Mittel gebrauchen. Adresse:

**HORATIO CARTER, AA BERLIN SW. 68.**

# Therapeutische Ansätze

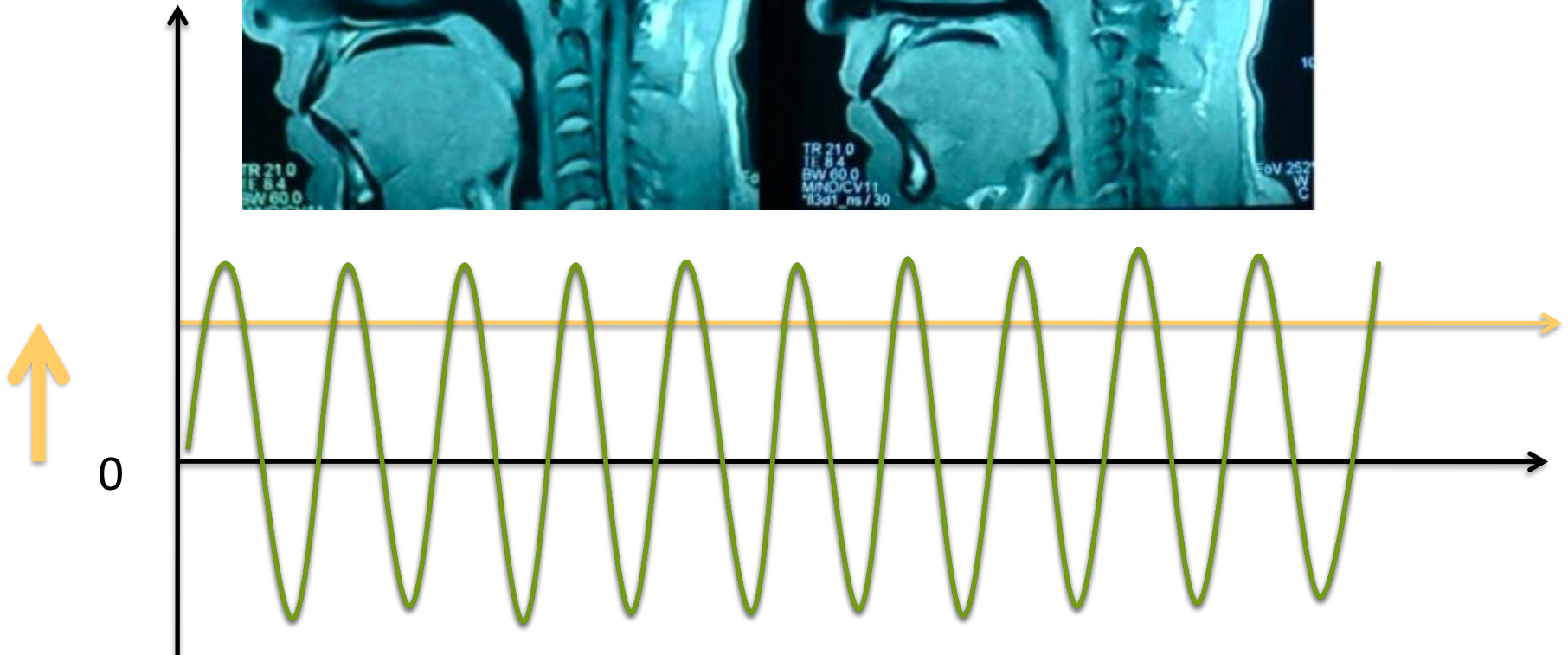
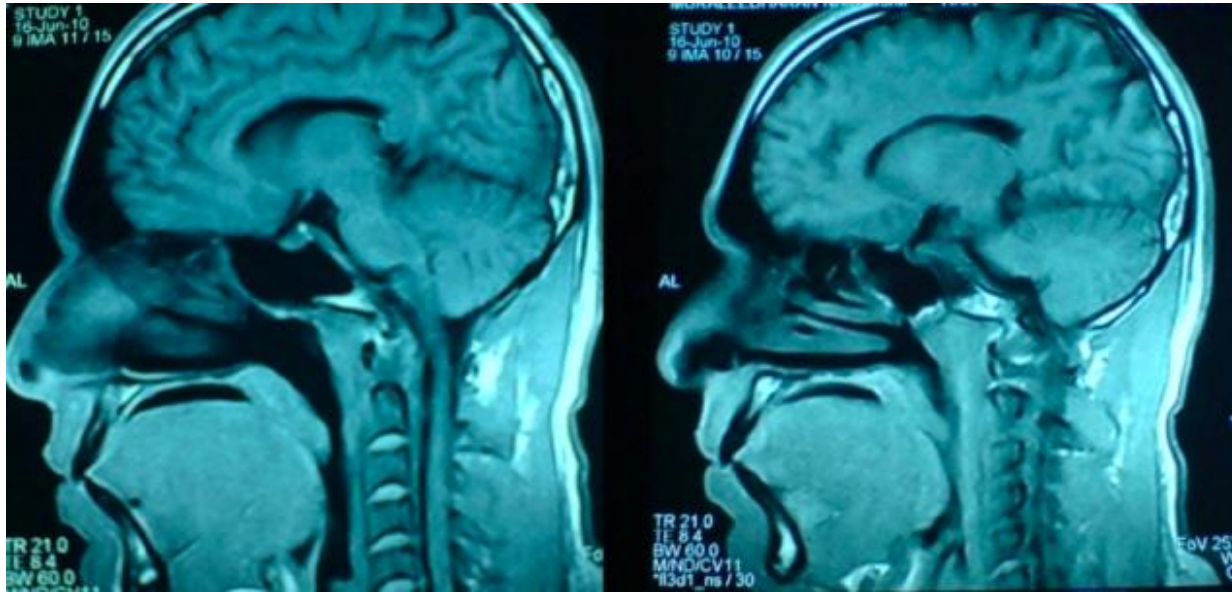




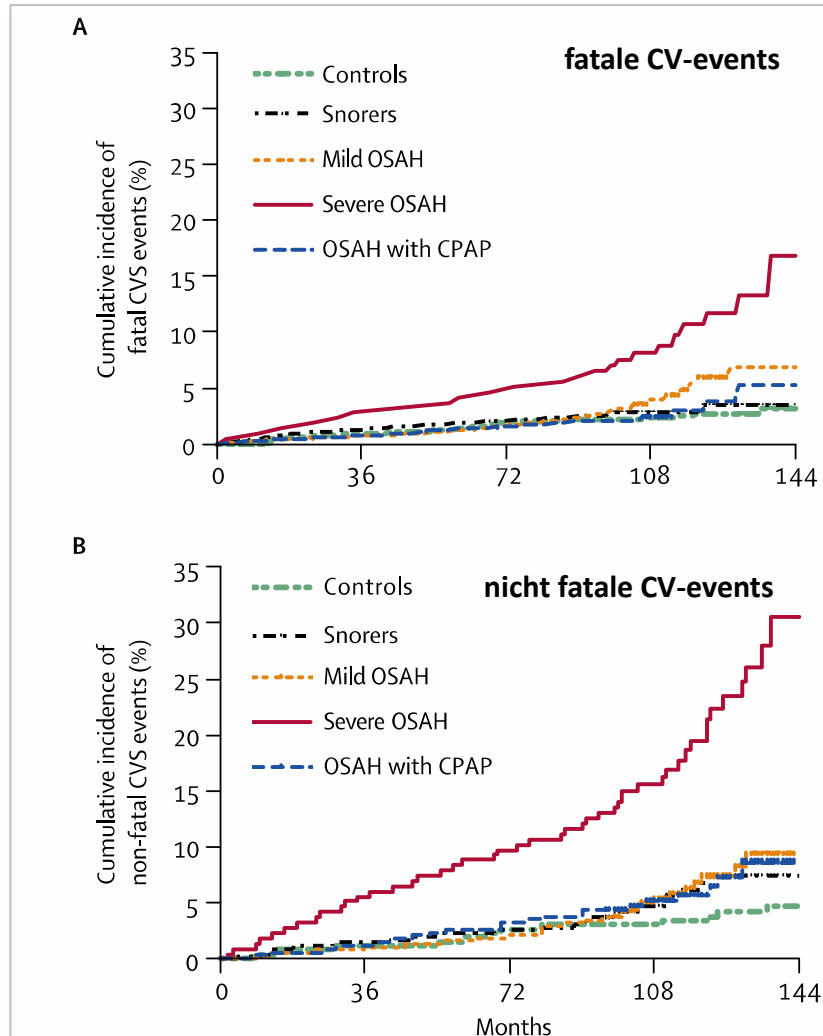
# CPAP-Therapie

Continous Positive Airway Pressure

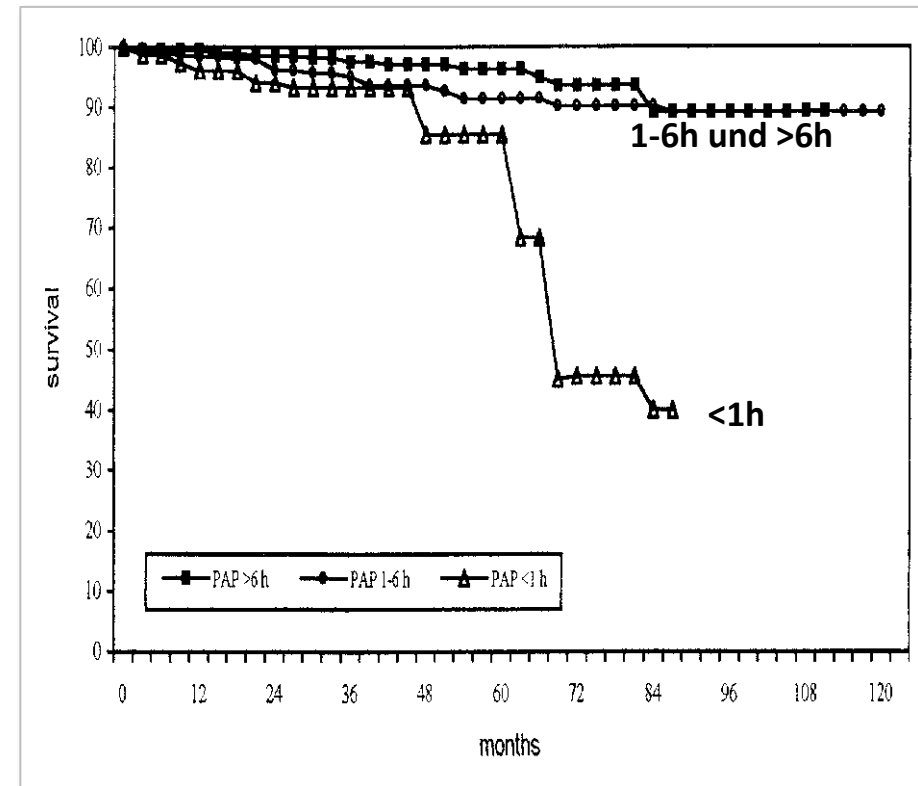
# CPAP Continuous Positive Airway Pressure



# Effekt der CPAP-Therapie



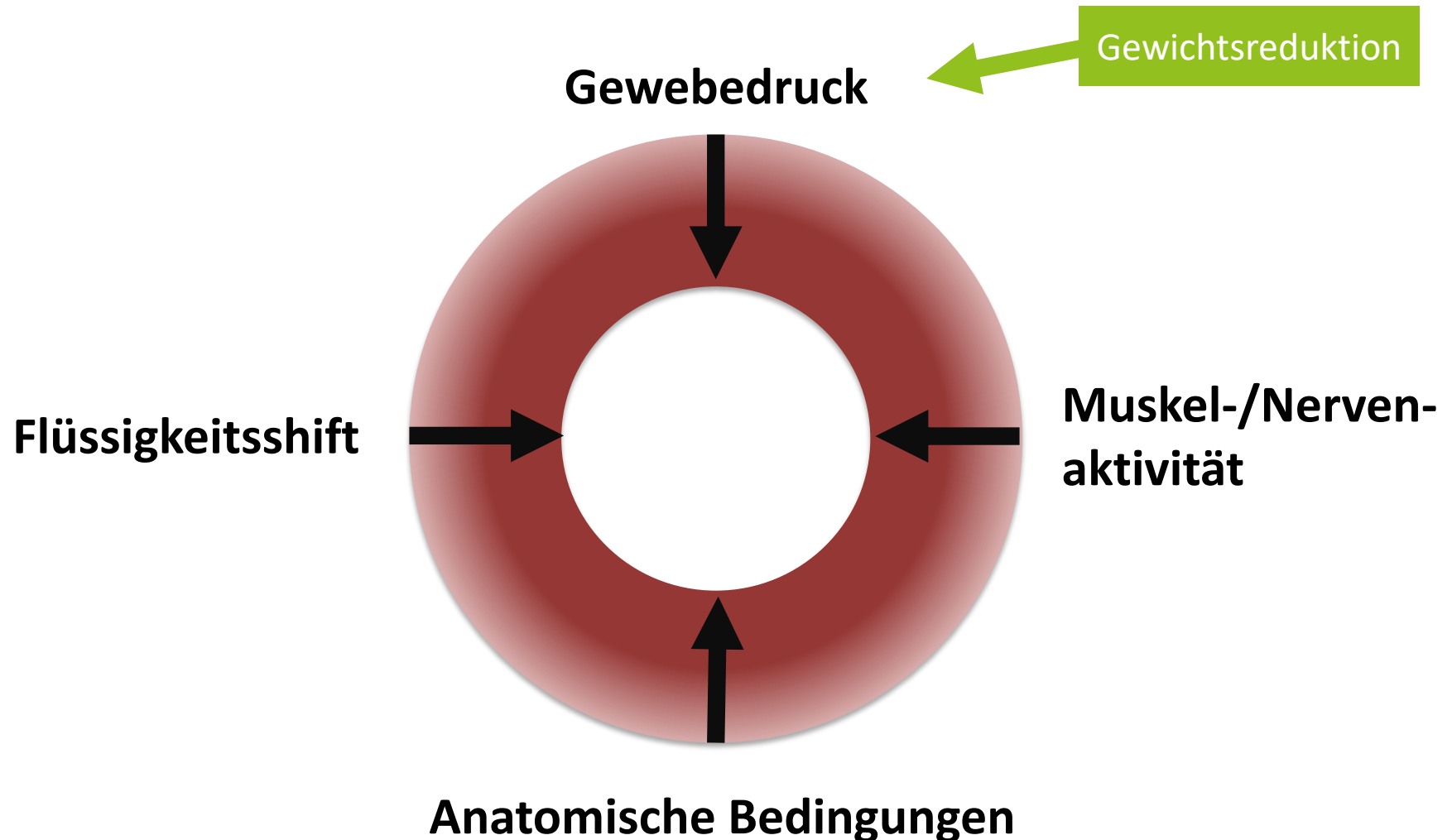
Marin et al. Lancet 2005; 365: 1046-53



Campos-Rodriguez et al. Chest 2005; 128:624-633



# Therapeutische Ansätze



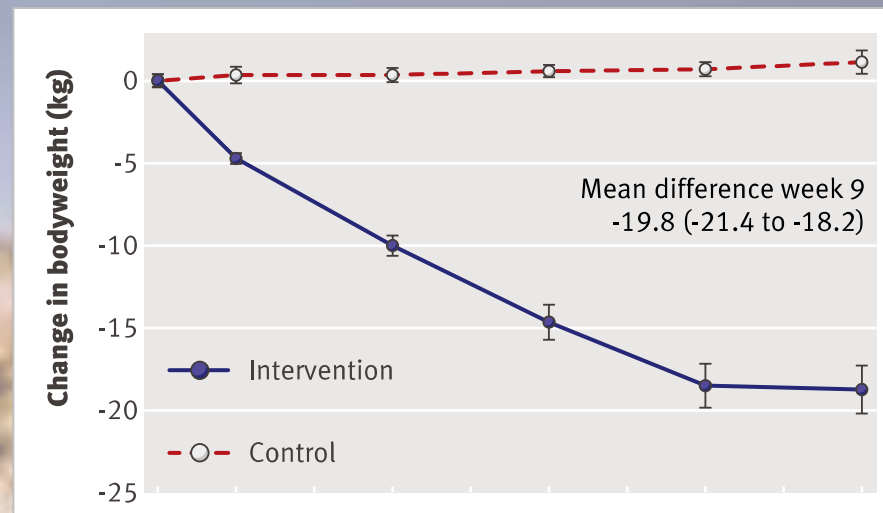
# „(fast) Null-Diät“

n=63, BMI 30-40, Alter 30-65, AHI ≥ 15/h

9 Wochen Diät (550kcal/d) vs. Kontrollgruppe

Gewicht -20kg, AHI 23/h (von 37/h)

Johansson et al. *BMJ* 2009;339:b4609

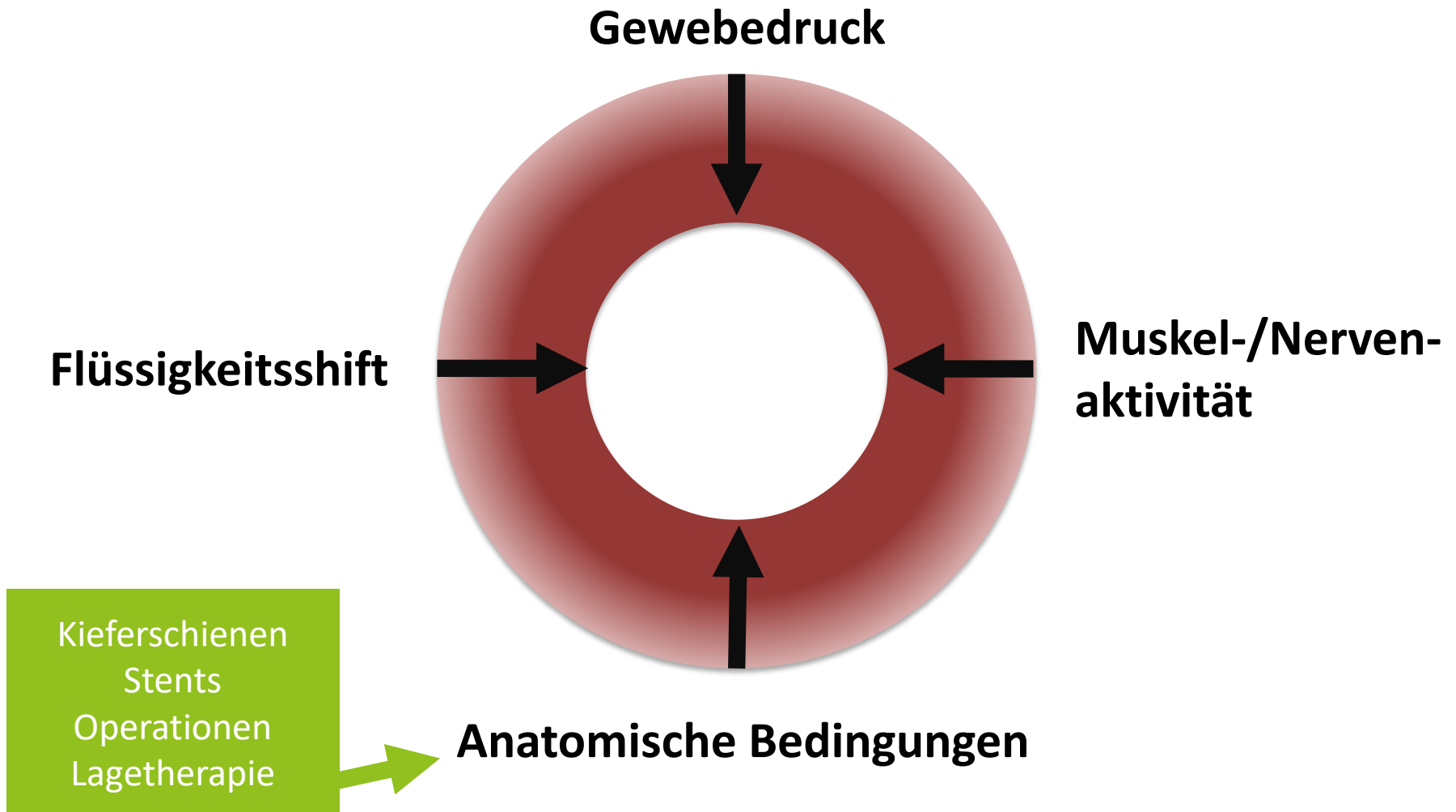


**Table 2** | Changes in obstructive sleep apnoea measures between baseline and week 9

	Intervention (n=30)	Control (n=33)	Mean difference	P
AHI (events/h)	-25 (17)	-2 (11)	-23 (-30 to -15)	<0.001
AHI (events/h; supine)	-27 (25)	-1 (12)	-27 (-36 to -17)	<0.001
Percentage supine time	-5 (25)	2 (22)	-7 (-5 to 18)	0.28
Oxygen desaturation episodes ≥4%/h of sleep	-19 (14)	-1 (9)	-18 (-24 to -12)	<0.001
Oxygen desaturation episodes ≥4%/h of sleep (supine)	-23 (23)	-0 (10)	-23 (-32 to -14)	<0.001
Nadir of arterial oxygen saturation (%)	5 (6)	0 (5)	5 (2 to 7)	0.002
Epworth sleepiness scale	-3 (5)	1 (3)	-4 (-6 to -2)	<0.001

Data are mean (SD) for within group comparisons, and mean (95% confidence interval) for between group comparisons. P values from independent samples *t* tests. AHI=apnoea-hypopnoea index.

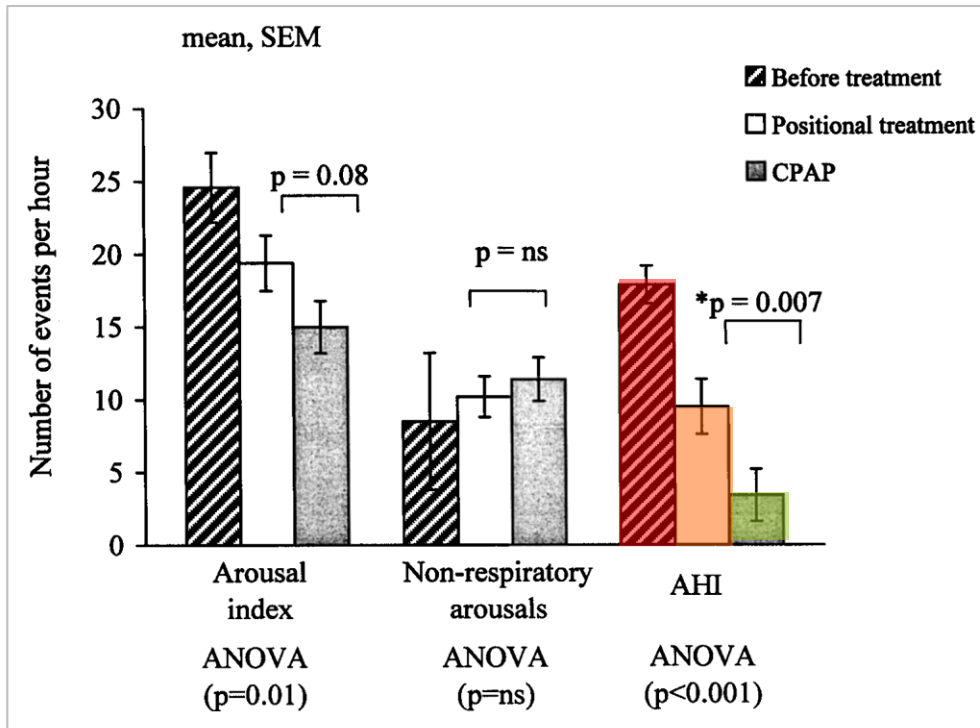
# Therapeutische Ansätze





**Lagetherapie**  
Verhinderung der Rückenlage

# Lagetherapie



Jokic et al. CHEST 1999; 115:771–781

Vgl. **CPAP** vs. **Lagetherapie**

N=13, Pat. mit lageabhängigem OSAS

AHI  $17 \pm 8$  /h



N=67, Tennisbälle für Lagetherapie  
Nachbeobachtung 2.5j

Nach 2.5 Jahren:  
6% nutzen die Therapie noch

13.4% geben an gelernt zu haben die  
Rückenlage auch ohne Therapie zu  
vermeiden

➔ **Lagetherapie nur unter  
regelmässiger Kontrolle**

Bignold et al. J Clin Sleep Med 2009;5(5):428-430.

# Kieferschienen

Gegen 100% Verbesserung des Schnarchens.

AHI kann in ca. 50% der Patienten signifikant (AHI <10/h) gesenkt werden.  
Ca. 40% waren Non-Responder mit persistierende hohem AHI.

Sollte nur durch erfahrene (!) Zahnärzte/Kieferorthopäden angepasst werden

## Empfehlung:

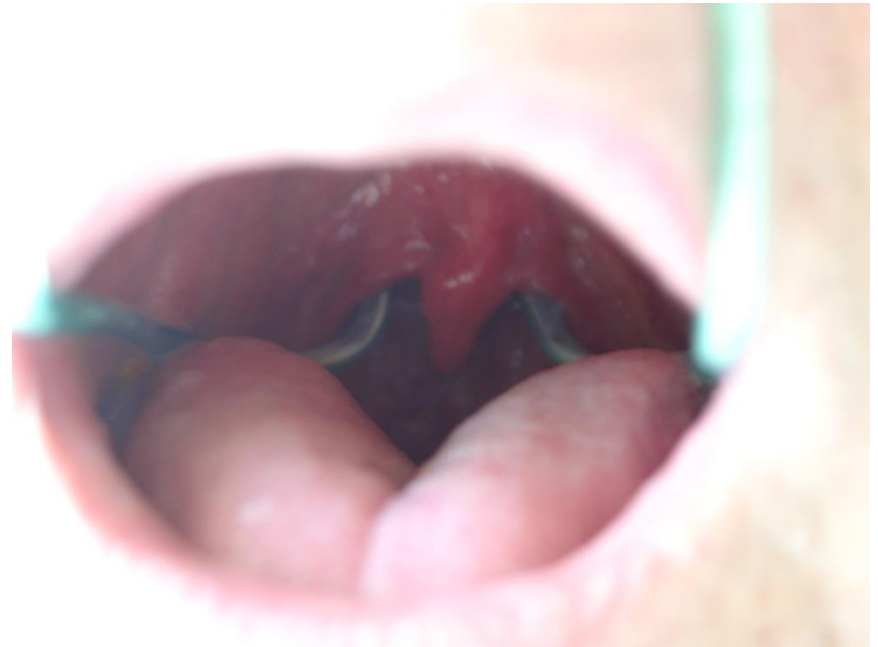
Unterkieferprotrusionsschienen (UPS) bei CPAP-Intoleranz oder Leichter bis mittelschwere Schlafapnoe

*Schmidt-Nowara, Am. Sleep Disorder Review, SLEEP 1995; 18:501-510*



# Velumount Schnarchschiene

[www.velumount.ch](http://www.velumount.ch)



# Vergleich Velumount und CPAP

*Table 1. Results of the respiratory polygraphy, of the body mass index, of the blood pressure measurement, of the questionnaires, and of the neuropsychological tests*

	NATIVE <sup>a</sup>	ON CPAP THERAPY	WITH VELUMOUNT
AHI (/h) <sup>b</sup>	34.6 (20.9)	8.6 (5.0)	19.1 (14.2) **
Compliance adjusted AHI (/h) <sup>b</sup>		15.5 (8.1)	19.6 (14.0)
Average oxygen saturation (%) <sup>b</sup>	93.1 (3.0) <sup>o</sup>	95.2 (1.3)	93.9 (2.0) **
Body mass index (kg/m <sup>2</sup> )	28.6 (4.6)	28.5 (3.8)	28.5 (3.9)
Systolic pressure (mmHg)	138.8 (14.1) <sup>oo</sup>	141.7 (12.7) <sup>c</sup>	129.5 (18.6) <sup>c</sup> *
Diastolic pressure (mmHg)	86.8 (10.8) <sup>oo</sup>	88.6 (7.2) <sup>c</sup>	84.7 (9.6) <sup>c</sup>
ESS (0-24)	8.2 (4.9)	5.6 (3.4)	5.7 (3.0)
Snoring index (1-10) <sup>d</sup>	7.6 (2.6)	2.0 (2.0)	3.8 (2.2) *
Subjective sleep quality (1-10)	5.7 (2.6)	6.7 (2.2)	7.4 (1.6)
Number of side effects	–	4.3 (1.8)	1.2 (1.3) ***
Therapy satisfaction (1-10)	–	5.6 (1.3)	8.2 (1.6) **
Compliance (h/night)	–	5.7 (1.3)	7.0 (1.0) **
Compliance (%)	–	76.4 (19.0)	96.1 (6.9) **
Attention capacity <sup>e</sup>	–	46.4 (12.9)	53.4 (11.1) **
Paced Auditory Serial Addition Test		40.1 (18.5)	50.3 (18.5) **
Concentration Endurance Test		52.7 (10.2)	56.4 (9.0)
Memory of facts <sup>e</sup>	–	47.0 (13.4)	65.1 (12.1) ***
Rey-Osterrieth Complex Figure Test		48.3 (11.2)	65.4 (17.1) ***
Logical Memory Test		45.7 (18.5)	64.9 (13.3) ***

Schnarchindex besser  
ESS (Schläfrigkeit) besser  
AHI – 50%  
CPAP ist überlegen

*Note:* Difference between CPAP therapy and Velumount® device: \* significant between-group difference  $p < 0.05$ ; \*\* significant between-group difference  $p < 0.01$ ; \*\*\* significant between-group difference  $p \leq 0.001$ .

<sup>a</sup> Data from sleep laboratory reports of the cooperating clinics before onset of CPAP therapy:

<sup>o</sup> Native oxygen saturation was recorded in only 15 patients.

<sup>oo</sup> Native blood pressure was recorded in only 12 patients.

<sup>b</sup> In the current study, the patients were selected according to CPAP efficacy, tolerance, and compliance. The selection can lead to weighted results.

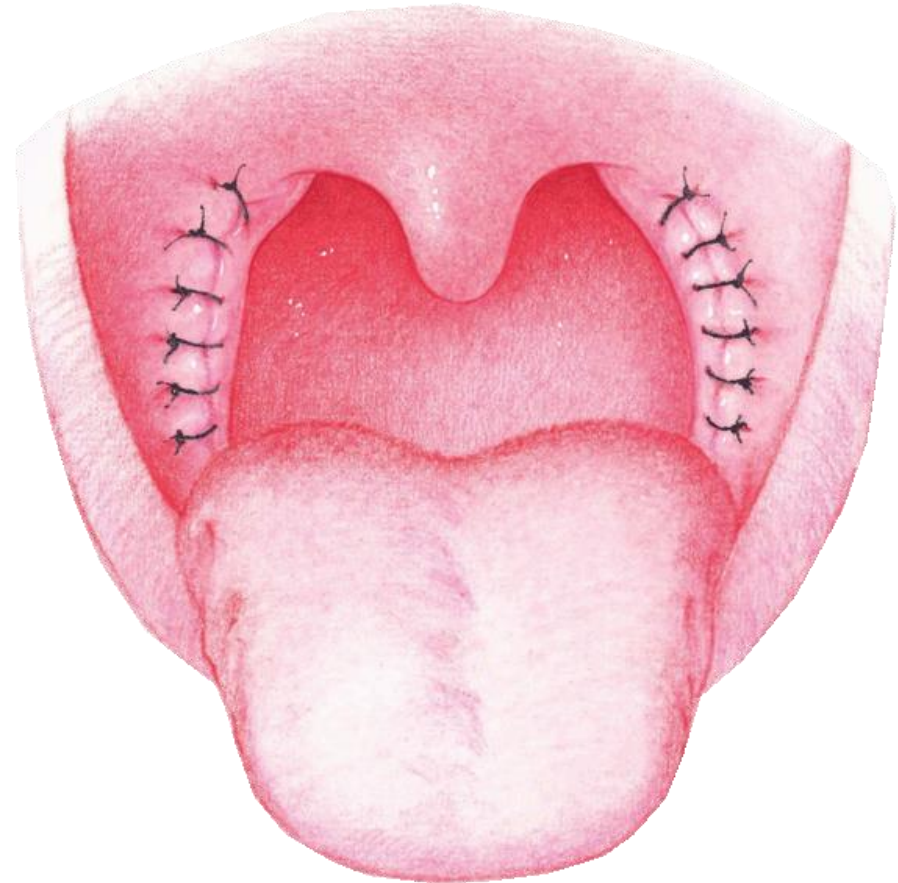
<sup>c</sup> N = 17: blood pressure data of one patient was excluded from the study because of new medication.

<sup>d</sup> N = 13: 5 patients are sleeping alone.

<sup>e</sup> N = 15: 3 patients did not repeat the neuropsychological tests. The influence of the repetition effect has to be considered.

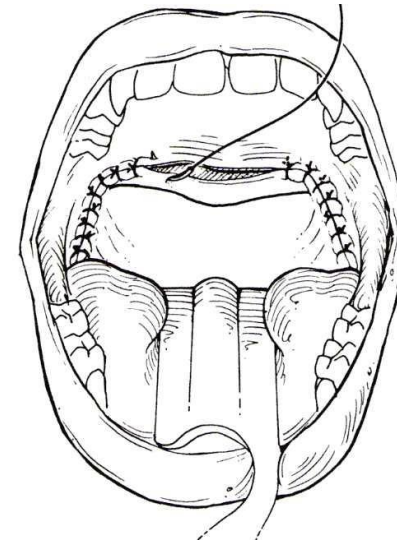
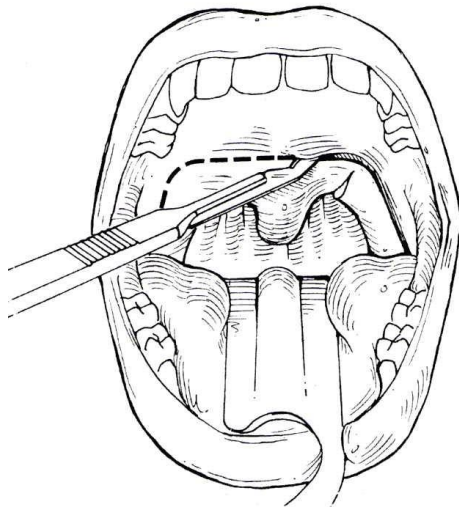


## Operative Verfahren - Tonsillektomie

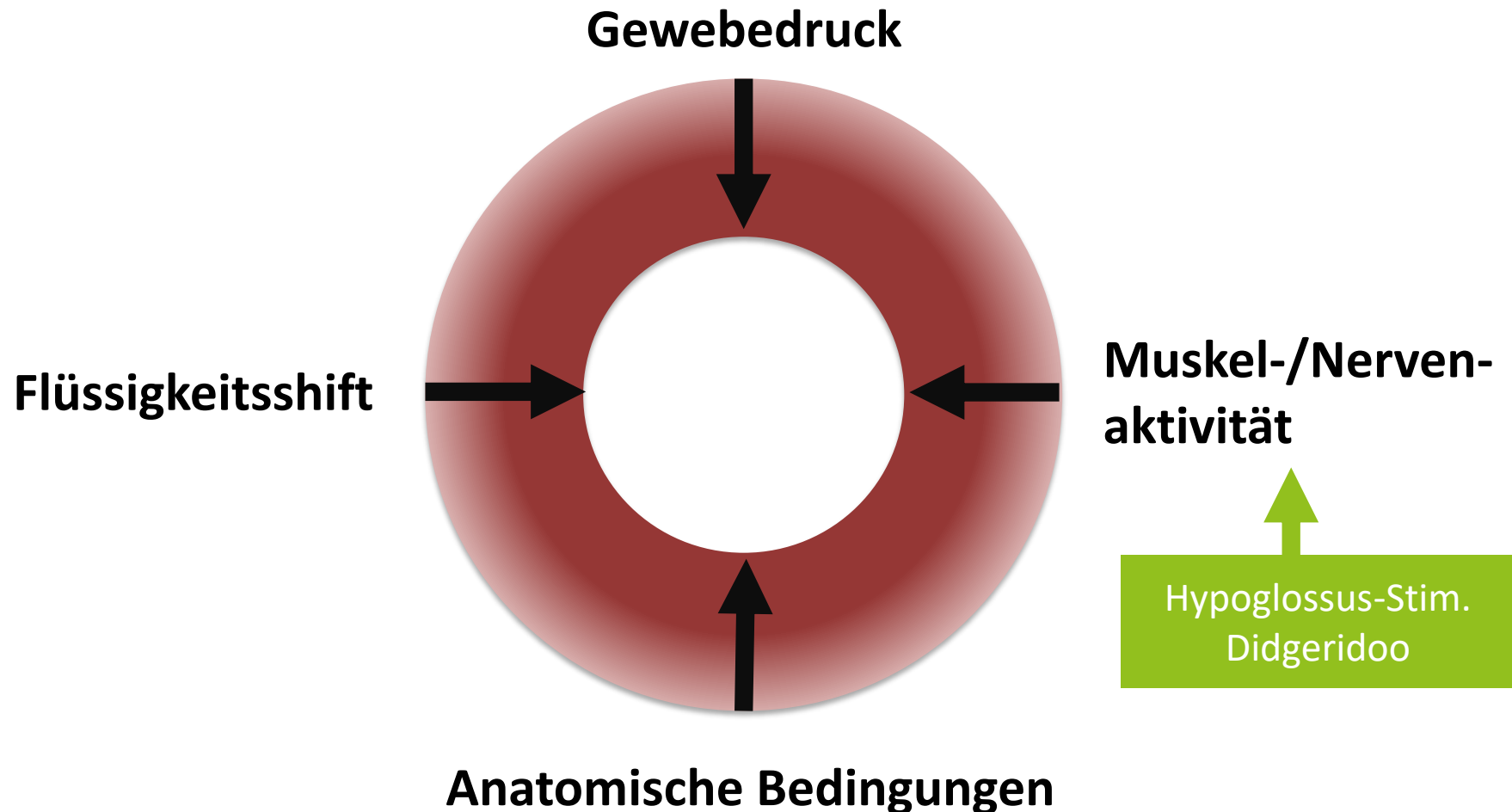


# Operative Verfahren – UPPP (UvuloPalatoPharyngoPlastie)

vorher - nachher



# Therapeutische Ansätze



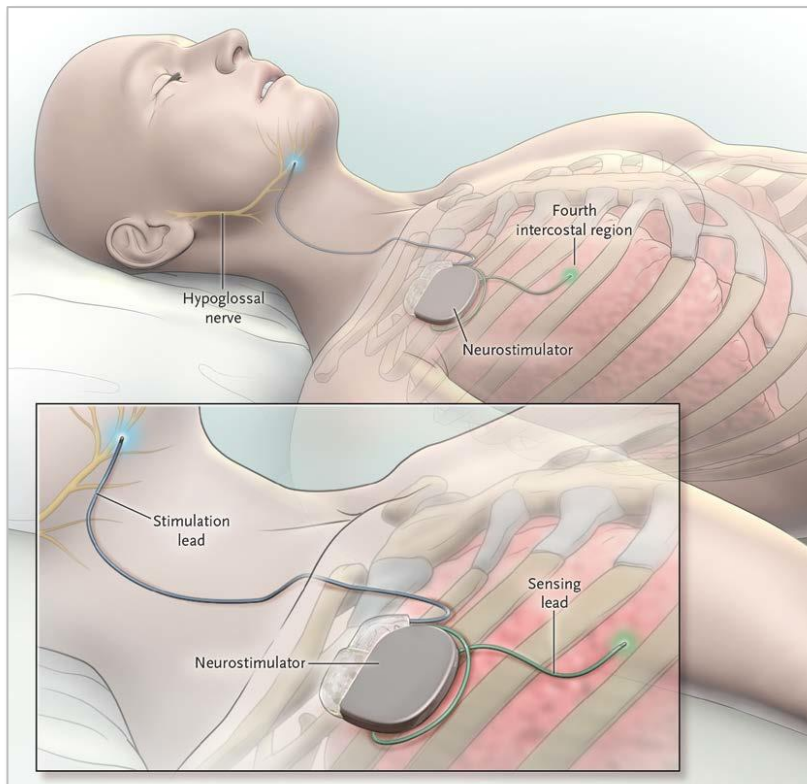
# Hypoglossus-Stimulation

*Strollo et al. N Engl J Med 2014;370:139-49.*

N=126, m 83%, Alter 54.5j, BMI 28.4kg/m<sup>2</sup>  
Multicenter, cohort, prospektiv

## Ausschluss-Kriterien:

AHI <20 oder >50/h, 25% zentrale oder gemischte Apnoen, AHI  
in Seitenlage < 10/h, anatomische Besonderheiten,  
konzentrischer Kollaps in DISE





# Wachzustand: Zungenbewegung bei Stimulation



0,9 V



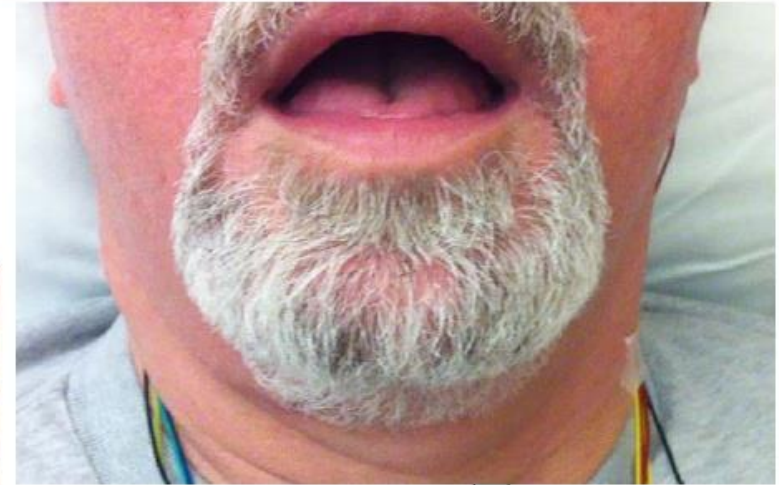
1,0 V



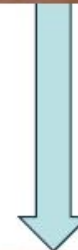
1,2 V



1,4 V



Klick video



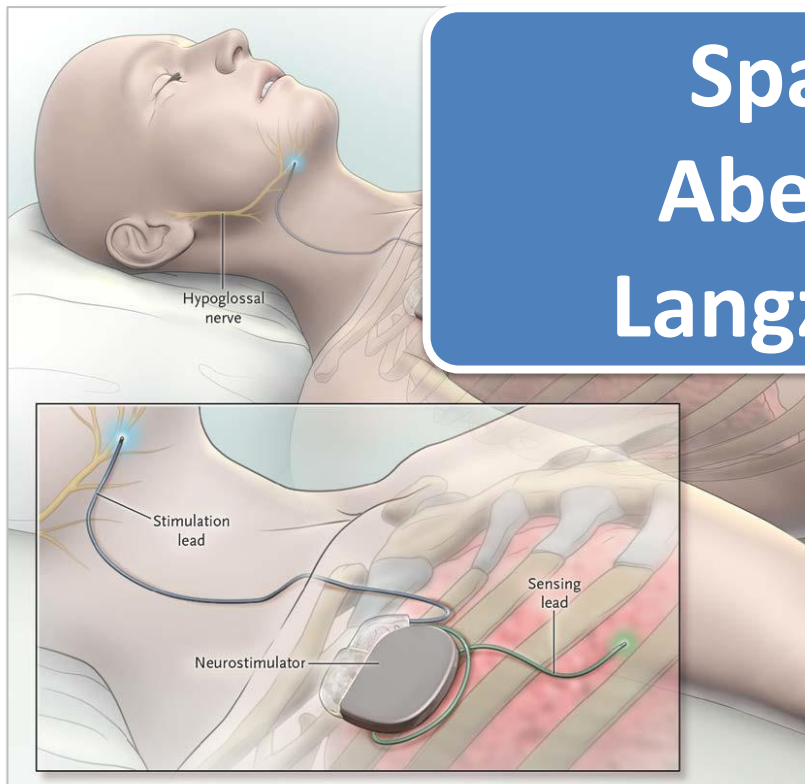
# Hypoglossus-Stimulation

Strollo et al. *N Engl J Med* 2014;370:139-49.

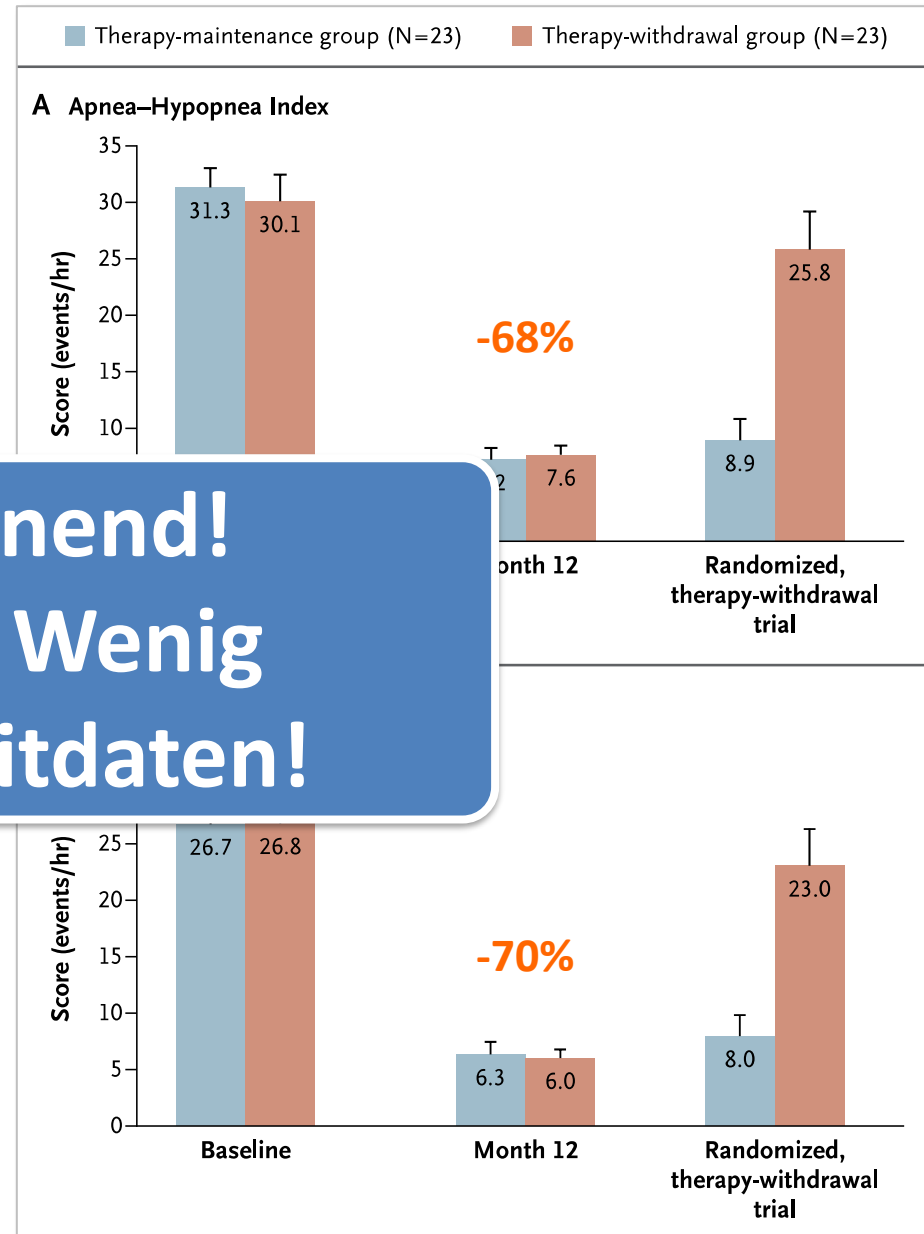
N=126, m 83%, Alter 54.5j, BMI 28.4kg/m<sup>2</sup>  
Multicenter, cohort, prospektiv

## Ausschluss-Kriterien:

AHI <20 oder >50/h, 25% zentrale oder gemischte Apnoen, AHI in Seitenlage < 10/h, anatomische Besonderheiten, konzentrischer Kollaps in DISE



**Spannend!  
Aber: Wenig  
Langzeitdaten!**





**Didgeridoo**

# Medizinisches Didgeridoo

N=25, AHI 15-30/h, Schnarcher  
 6d/Woche für 25min Didgeridoo-Spielen

*Puhan et al. BMJ 2006; 332:266-270*

Outcome	Didgeridoo group	Control group	Raw difference* (95% CI)	Adjusted difference† (95% CI)
<b>Epworth scale</b>				
At 4 months	7.4 (2.3)	9.6 (6.0)		
Change from baseline	-4.4 (3.7)	-1.4 (2.6)	-3.0 (-5.7 to -0.3), P=0.03	<b>-2.8</b> (-5.4 to -0.2), P=0.04
<b>Pittsburgh quality of sleep index</b>				
At 4 months	4.3 (2.1)	5.6 (2.7)		
Change from baseline	-0.9 (1.6)	-0.2 (1.7)	-0.7 (-2.1 to 0.6), P=0.27	-0.8 (-2.3 to 0.8), P=0.30
<b>Partner rating of sleep disturbance</b>				
At 4 months	2.3 (1.4)	4.8 (2.2)		
Change from baseline	-3.4 (2.4)	-0.6 (1.9)	-2.8 (-4.7 to -0.9), P<0.01	<b>-2.7</b> (-4.2 to -1.2), P<0.01
<b>Apnoea-hypopnoea index</b>				
At 4 months	11.6 (8.1)	15.4 (9.8)		
Change from baseline	-10.7 (7.7)	-4.5 (6.9)	-6.2 (-12.3 to -0.1), P=0.05	<b>-6.6</b> (-13.3 to -0.1), P=0.05

\*Two sample *t* tests.

†Analysis of covariance with adjustment for severity of disease (apnoea-hypopnoea index and Epworth scale) and weight change during study period.





# Fahrplan

Geschichte der Schlafapnoe

Definition / Diagnostik / Epidemiologie

Pathophysiologie

Auswirkungen Kardiovaskuläres Risiko, Müdigkeit / Schläfrigkeit, Strassenverkehr

Überblick über Therapieoptionen

# Zusammenfassung

## Zusammenfassung

Schlafapnoe ist häufig

85% aller OSAS-Patienten sind noch unbekannt

Schlafapnoe entsteht aufgrund verschiedener Mechanismen auf verschiedenen Ebenen im Hals-Rachen-Bereich

OSAS kann zu gravierenden Folgeerkrankungen führen (Herzinfarkt, Schlaganfall etc.)

Therapie der Wahl ist die CPAP-Therapie

Alternative Therapien können eine Verbesserung bringen, sind vergl. zu CPAP jedoch 2. Wahl

Alle alternative Therapien sollten mit einem erfahrenen Spezialisten abgesprochen werden um den grösstmöglichen Therapieeffekt zu erzielen.

