

# **The Dentist's Role in the Diagnosis and Treatment of Snoring and Obstructive Sleep Apnea**

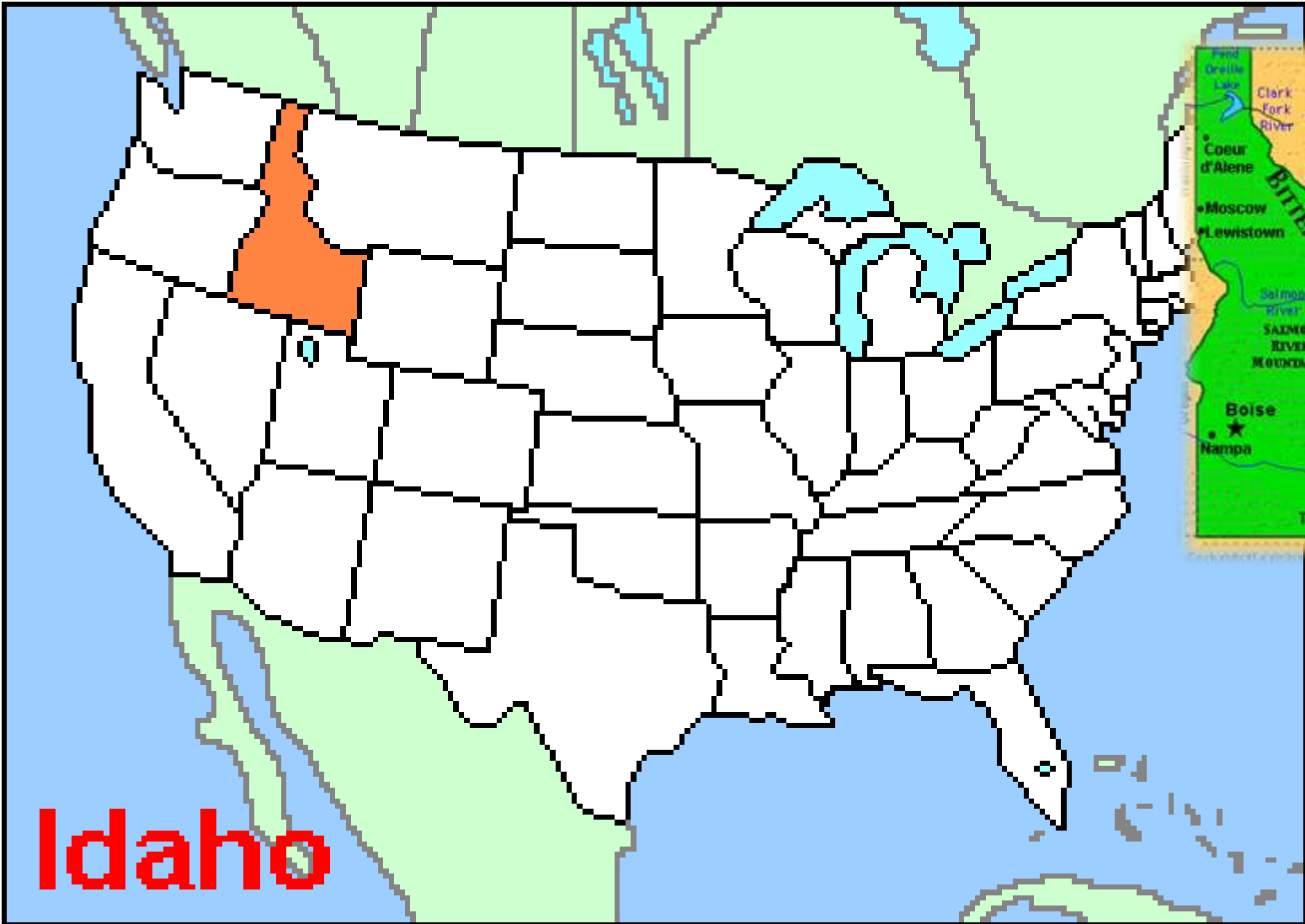
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Adjunct Faculty, Anatomy, Boise State University**

JRS 2014



Idaho



Idaho

"Gem State"

- Key
- ★ State Capital
  - City
  - Mountains
  - - - State boundary

Nevada Utah







Croft  
Park  
Center  
TMJ DISORDERS  
SLEEP  
NON-SURGICAL

THE CENTER FOR  
SLEEP APNEA &  
TMJ

Idaho  
facial  
imaging

James R. Spence, D.D.S.  
Orthodontic Center  
Sleep Therapy

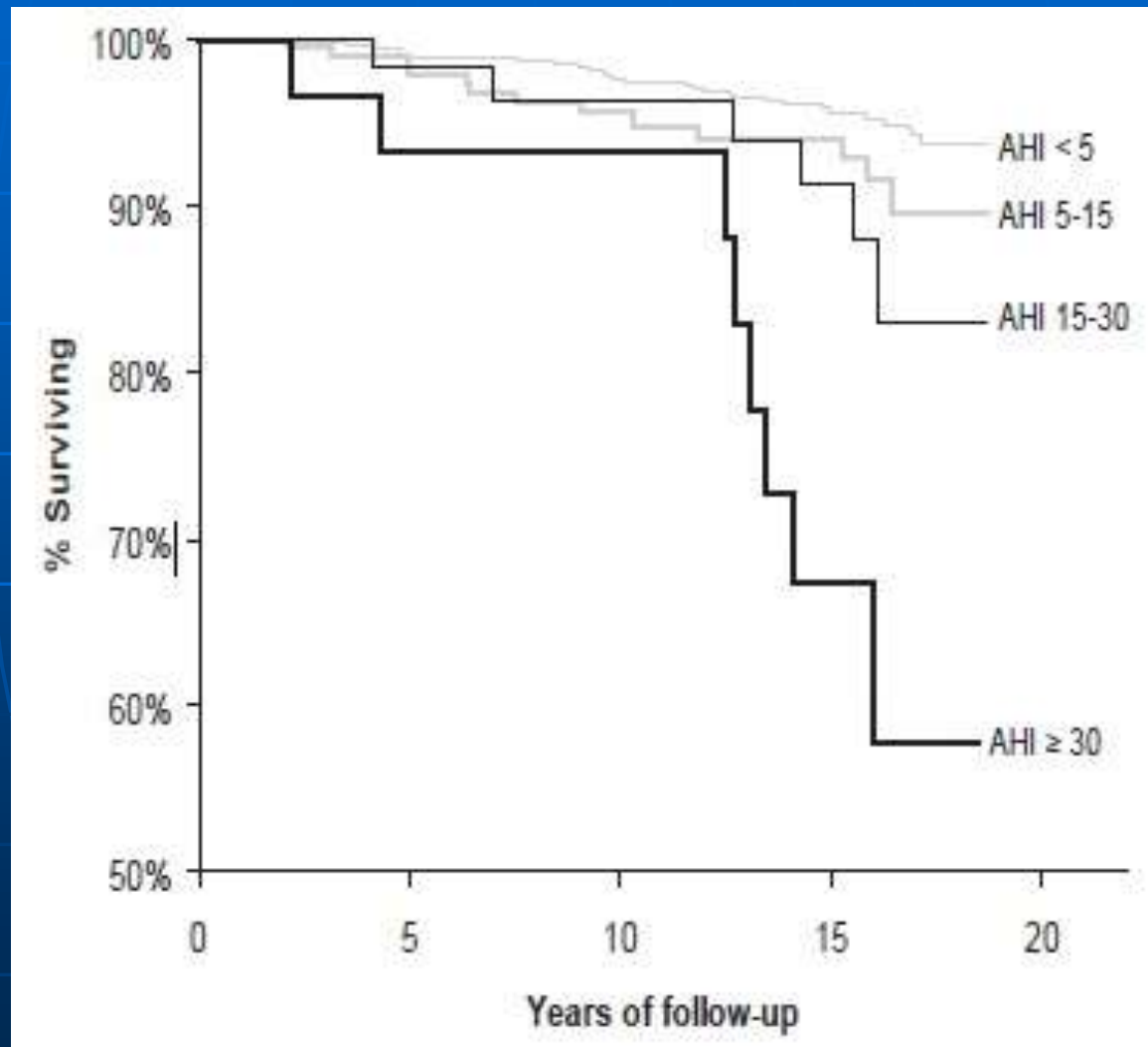








# Sleep Disordered Breathing and Mortality: Eighteen-Year Follow-up of the Wisconsin Sleep Cohort: *SLEEP*, Vol. 31, No. 8, 2008





# Today we will cover...

- The basics of normal sleep
- The basics of sleep disordered breathing
- Sleep apnea in adults and children
- Diagnosis and treatment of snoring and sleep apnea
- The dentist's role in screening, diagnosis and treatment of sleep apnea
- Oral appliance therapy for OSA

Medicine

**TEAMWORK**

Dentistry

# Definitions of Events

## Apnea

- complete cessation of breathing for at least 10 seconds

## Hypopnea

- decrease in tidal volume of 30-50% associated with a fall in oxygen saturation (4%) or arousal response

## Arousal

- shift in EEG for at least 3 seconds (in REM sleep requires also increase in EMG or movement)

# Index Definitions

- **Apnea Index** **AI**
- **Apnea Hypopnea Index** **AHI**
- **Respiratory Effort Related Arousal** **RERA**
- **Respiratory Disturbance Index** **RDI**

$$\mathbf{RDI = AHI + RERA}$$

# Apnea Hypopnea Index (AHI)

- Normal: less than 5 events per hour
- Mild: 5-15 events per hour
- Moderate: 16-30 events per hour
- Severe: over 30 events per hour

# Oxygen Saturation

- Normally, the blood oxygen level should be above 90%. With obstructions, you can have varying degrees of desaturations. The severity of the problem depends on %.
- Mild problem: 85-90%
- Moderate problem: 80-84%
- Severe problem: below 80%



# Normal Sleep

# Sleep Architecture

Sleep is an Active and Complex State

Non-REM Sleep:

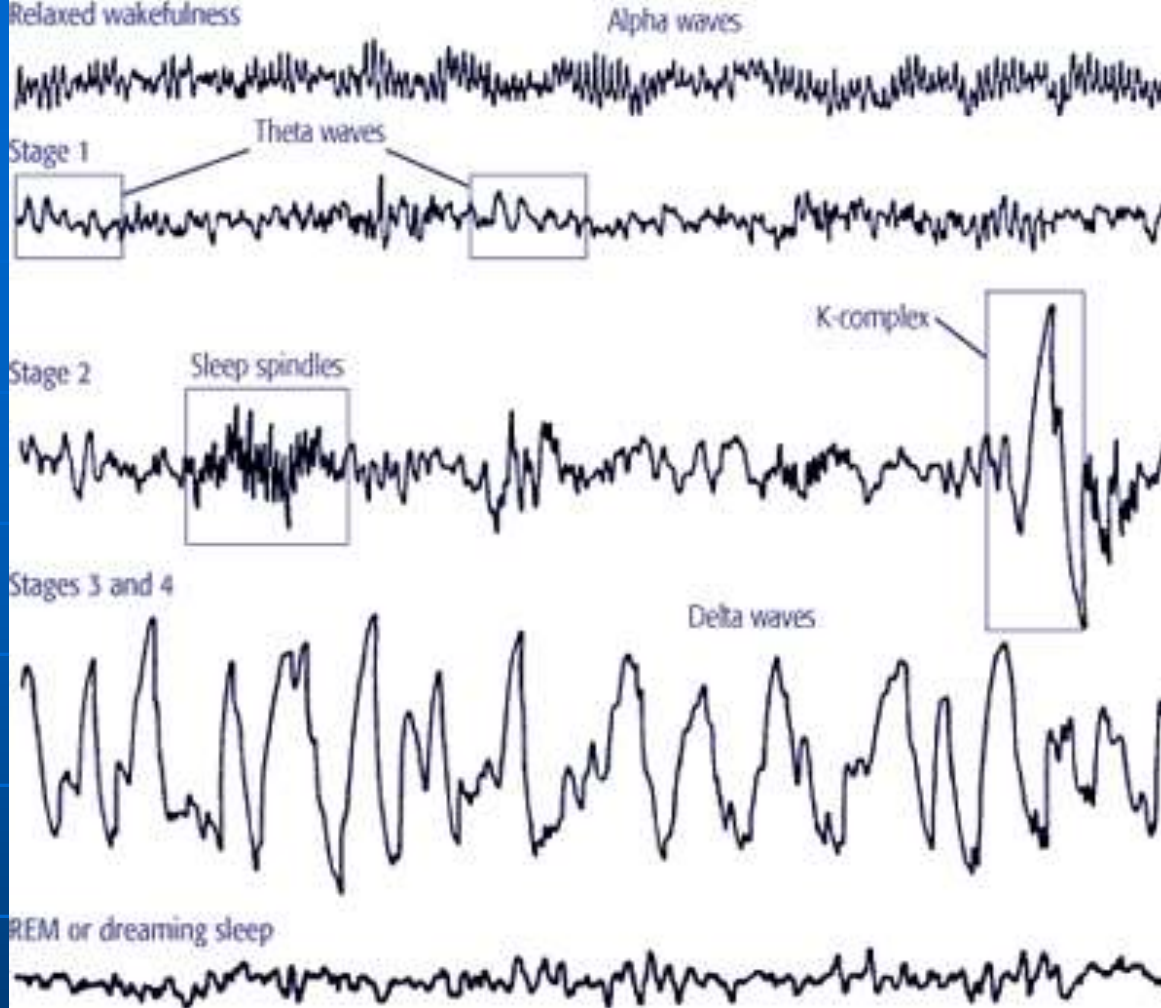
Stage 1 (N1): Transitional Phase—5%

Stage 2 (N2): Light Sleep—50%

Stage 3&4 (N3): Delta Slow Wave Sleep—20%

REM Sleep:

The Dream Stage—25%

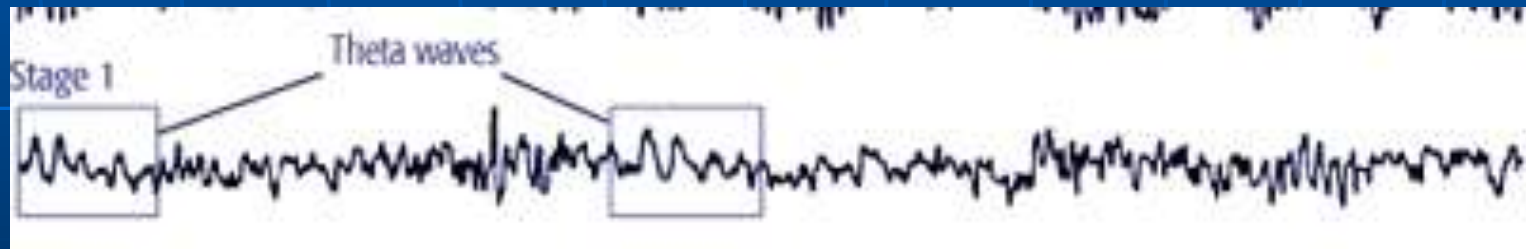


- These brain waves, taken by electroencephalogram, are used by sleep experts to identify the stages of sleep. Close your eyes and your brain waves will look like the first band above, “relaxed wakefulness.” Theta waves indicate stage one sleep. Stage two sleep shows brief bursts of activity as sleep spindles and K-complex waves. Deep sleep is represented by large, slow delta waves (stages three and four). Lawrence Epstein, M.D., [Improving Sleep: A Guide to a Good Night’s Rest](#),
- Harvard Health Publications 2007.

# Sleep Stages

## Stage 1 (N1) “Light Sleep”

4-5% of total sleep time is considered normal  
– increases to 15% by age 70



# Sleep Stages

## Stage 2 (N2) “Restful Sleep”

45-55% of total time





## **Stage III and Stage IV (N3) “Deep Sleep”**

- **Delta or slow wave sleep**
- **Range of total sleep: 10-20%**
- **Percentage decreases with age**
- **Above 40-50% in children; to total absence by age 40-60**
- **Usually appears only in the first 1/3 of the sleep episode**
- **Growth hormone usually appears in Delta sleep and reaches peak levels in Stage 4**

simplynoise

Pink Noise



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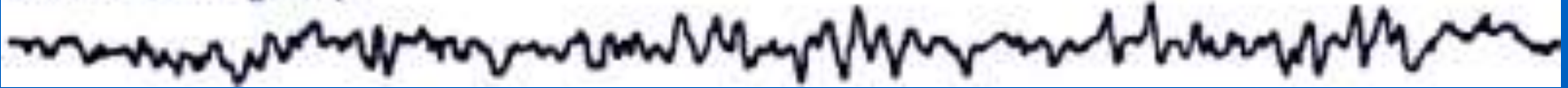
simplyrain

\$1



Available on the  
App Store

REM or dreaming sleep



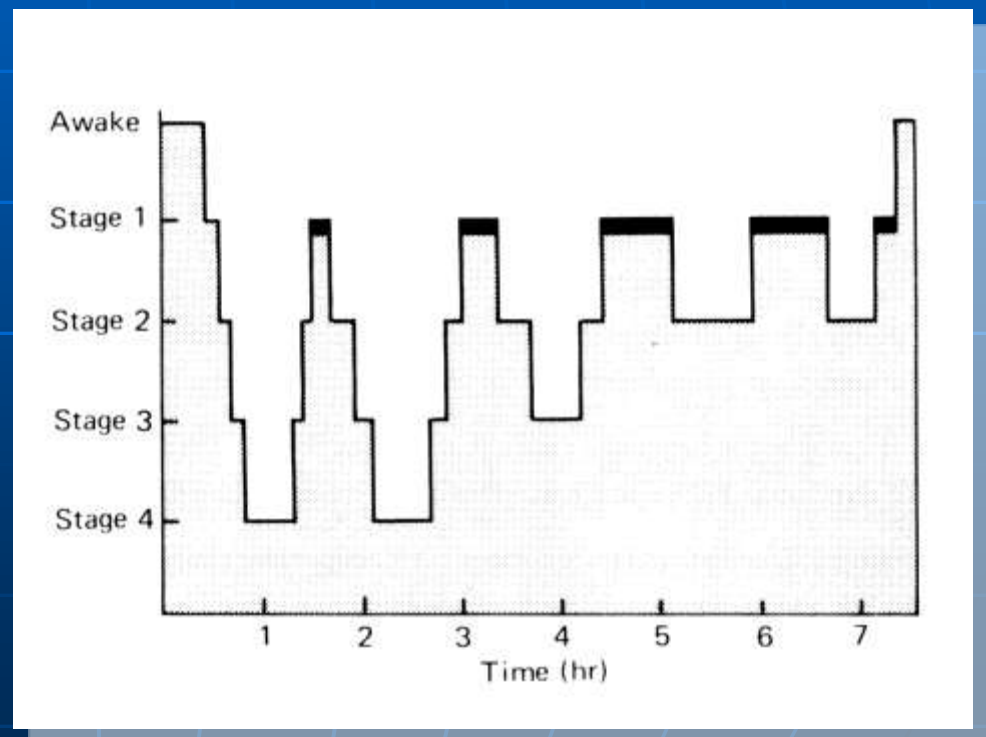
## **Rapid eye movement sleep - “REM”**

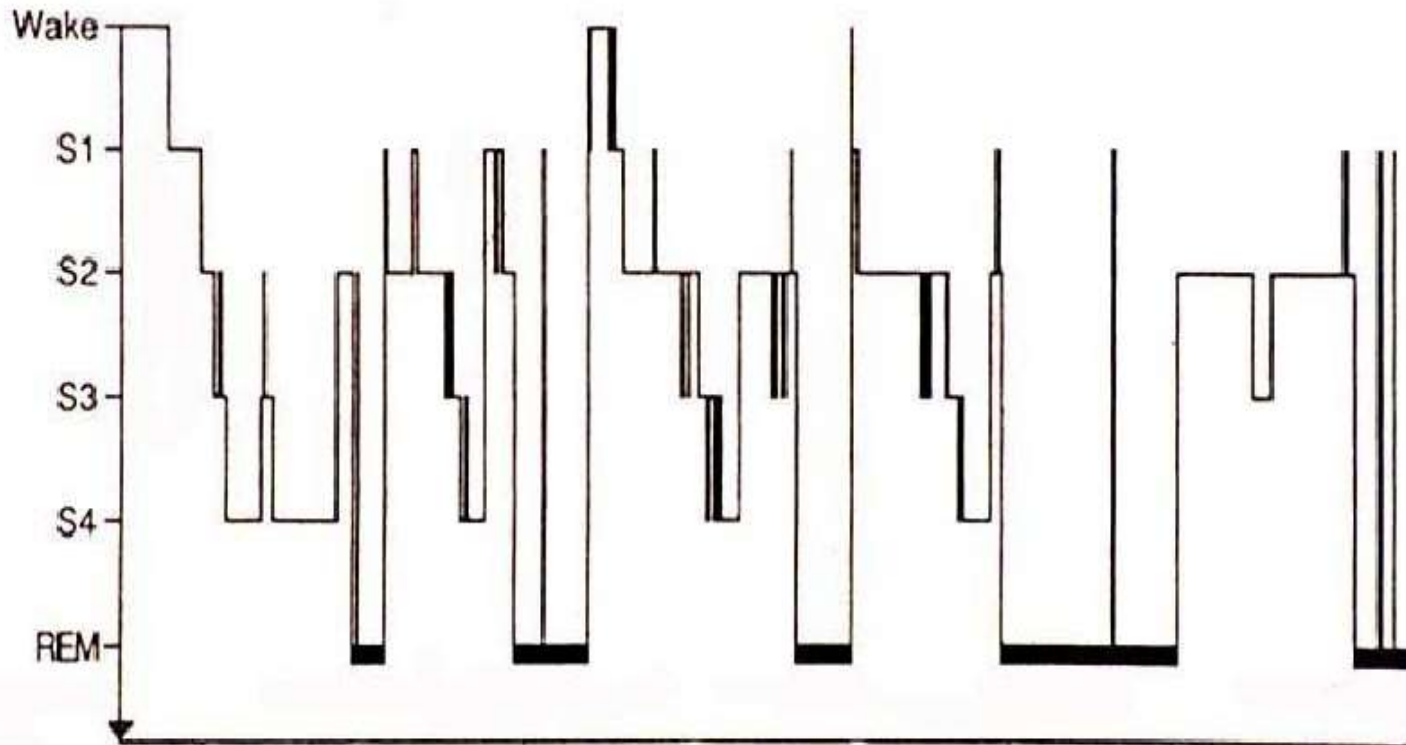
- **Observed eye movements**
- **20-25% total sleep time**
- **Body paralysis – atonia**
- **Mind very active**
- **Very vivid hallucinatory imagery or dreaming**
- **Do problem solving**



# What is the Sleep Cycle?

- Sleep is characterized by two distinct states, non-REM sleep and REM sleep that alternate in 90 to 110 minute cycles.
- A normal sleep pattern has 4-5 cycles throughout the night.





**Normal sleep histogram of healthy young adult.**

# Circadian Biological Clock

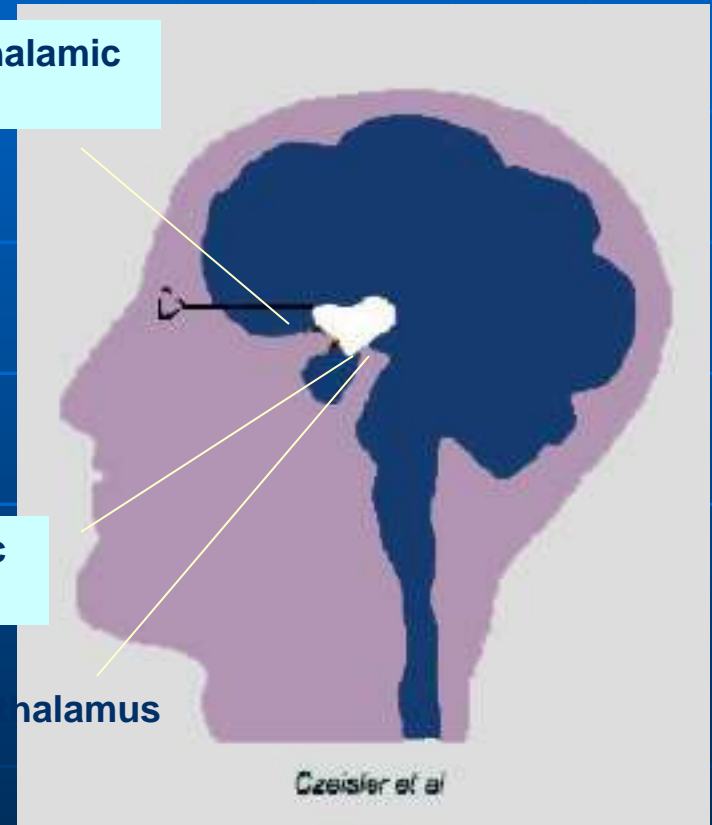
- Circadian rhythms
  - Synchronized or “entrained” to 24 hour day by environmental cues
  - Light most powerful cue; leads to suppression of melatonin secretion by the pineal gland
  - Peaks and troughs of alertness in 24 hours

Retino-hypothalamic tract

Suprachiasmatic Nuclei (SCN)

Thalamus

Czeisler et al



# Pharyngeal Patency

- **While awake, the pharynx is always held open except during swallowing.**
- **This is accomplished by reflexes controlling the activity of pharyngeal muscles.**
- **During sleep, reflex control of the pharyngeal muscles is lost.**
- **During sleep, the pharyngeal airway can narrow severely or close completely.**

# Sleep Disorders

## **I. Dysomnias**

- A. Intrinsic sleep disorders
- B. Extrinsic sleep disorders
- C. Circadian rhythm sleep disorders

## **II. Parasomnias**

- A. Arousal disorders
- B. Sleep-Wake transition disorders
- C. Parasomnias usually associated with REM sleep
- D. Other parasomnias

## **III. Medical/Psychiatric Sleep Disorders**

- A. Associated with mental disorders
- B. Associated with neurological disorders
- C. Associated with other medical disorders

## **IV. Proposed Sleep Disorders**

# The following can contribute to sleep disorders...

- Electric light
- Non-stop radio
- Non-stop television
- Fast paced lifestyles
- Internet and e-mail
- Cellular telephones
- Jet travel
- Pain
- Dietary factors
- Stimulants
- Drugs/Alcohol
- Irregular bedtime and wake times
- Poor sleep hygiene
- Obesity
- Distress

*“Seventy million Americans suffer from  
sleep disorders.”*

Carl E. Hunt, Director  
National Center on Sleep Disorders Research

# Sleep Disorders and Public Safety

- Aviation – pilot, control tower, security
- Medicine – surgeon, anesthesiologist, nurse, PA
- Military personnel
- Police
- Truck drivers
- Railroad engineer
- Boat, barge or ship captain



47% of truck drivers report falling asleep at the wheel at some point in their driving career; 25% report dosing off on at least 1 occasion in the past year.

*Study of Fatigue Related Driving Among Long Distance Truck Drivers, New York State, McCartt A, et al, 1997.*

# Does sleep deprivation impair cognitive and motor performance as much as alcohol intoxication?

Alice A Kuo

University of California,  
Los Angeles School of Medicine

West J Med. 2001 March; 174(3): 180.

## **OBJECTIVES**

To compare the relative effects on performance of sleep deprivation and alcohol.

## **PARTICIPANTS AND METHODS**

Performance effects were studied in 39 participants over a period of 28 hours of sleep deprivation and after measured doses of alcohol up to about 0.1% blood alcohol concentration (BAC). Of the 39 individuals, 30 were employees from the transport industry and 9 were from US military.

West J Med. 2001 March; 174(3): 180.

## RESULTS

After 17 to 19 hours without sleep performance on some tests was equivalent or worse than that at a BAC of 0.05%. Response speeds were up to 50% slower for some tests, and accuracy measures were significantly poorer than at this level of alcohol intoxication. After longer periods without sleep, performance reached levels equivalent to the maximum alcohol dose given to the participants (BAC of 0.1%).

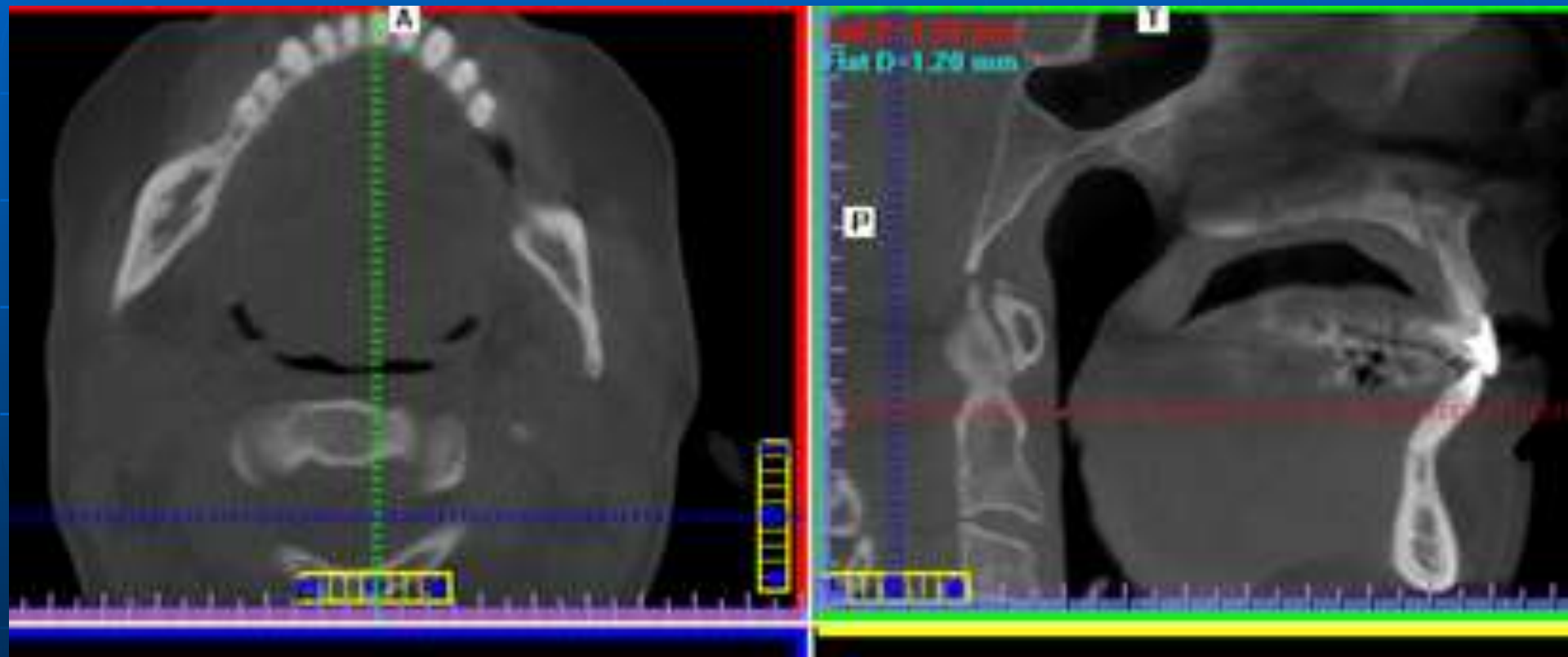
West J Med. 2001 March; 174(3): 180.

# Dental Parafunction

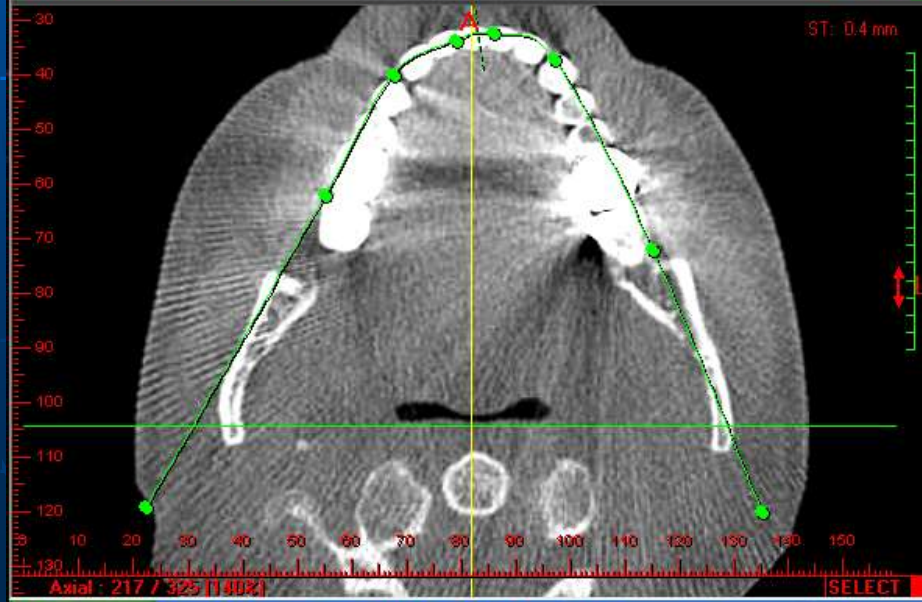
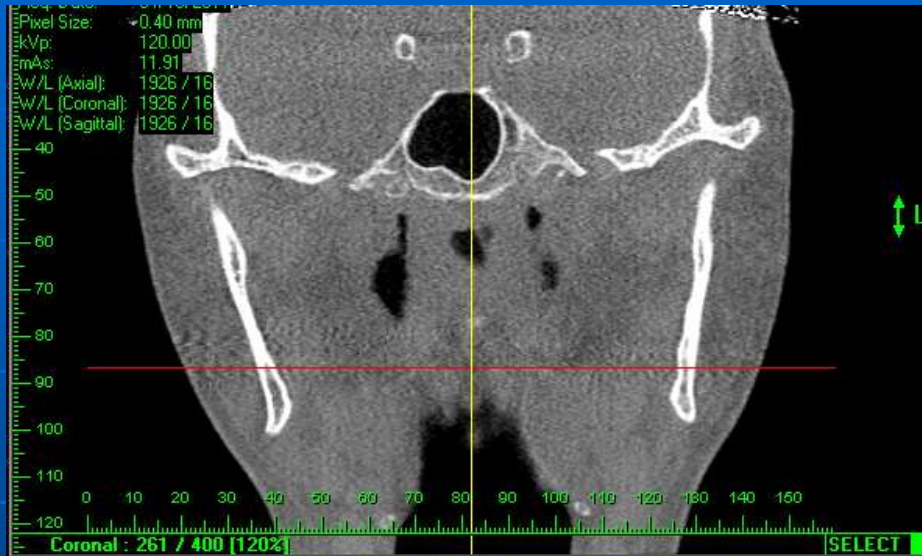
# Sleep Bruxism



# 1.2mm Airway!!!



# .8mm





# Snoring

# Simple Snoring

- **Vibration of the soft palate (25 times per second)**
- **Virtually no increase in resistance to airflow**
- **No compromise in respiratory status during sleep (i.e., normal arterial oxygen saturation)**
- **Occurs mainly in Non-REM sleep**



# Does Snoring and Sleep Apnea affect the Bed Partner's Sleep?

Mayo Clin Proc. 1999 Oct;74(10):955-8.

The effect of snoring and obstructive sleep apnea on the sleep quality of bed partners.

Beninati W, Harris CD, Herold DL, Shepard JW Jr.

- **MATERIALS AND METHODS:** We studied 10 married couples in which 1 member was undergoing polysomnography to evaluate suspected OSA. The patients and their spouses underwent simultaneous polysomnography. Midway through the 1-night study, the patients received nasal continuous positive airway pressure (CPAP) with the pressure adjusted to eliminate snoring and obstructive breathing events.

Mayo Clin Proc. 1999 Oct;74(10):955-8.

The effect of snoring and obstructive sleep apnea on the sleep quality of bed partners.

Beninati W, Harris CD, Herold DL, Shepard JW Jr.

- **RESULTS:** The patients (all male) demonstrated a median (range) apnea-hypopnea index of 26 (3-75) that decreased to 7 (0-34) during the trial of nasal CPAP therapy ( $P < .05$ ).
- During the CPAP trial, the median (range) arousal index of the spouses decreased from 21 (14-34) to 12 (4-27) ( $P < .01$ ), and the spouses' median (range) sleep efficiency increased from 74% (56%-80%) to 87% (64%-95%) ( $P < .01$ ).

Mayo Clin Proc. 1999 Oct;74(10):955-8.

The effect of snoring and obstructive sleep apnea on the sleep quality of bed partners.

Beninati W, Harris CD, Herold DL, Shepard JW Jr.

- **CONCLUSION:** The elimination of snoring and OSA in these patients was associated with an improvement in the quality of their bed partners' sleep, as indicated by improved sleep efficiency and continuity, even when the spouses had been habitually exposed to snoring and OSA. Assuming that 480 minutes were spent in bed for sleep, a 13% improvement in sleep efficiency (i.e., from 74% to 87%) translates to an additional 62 minutes of sleep per night for the spouses of snorers with OSA.

- “Everyone who snores will eventually have sleep apnea...if they live long enough.”

- James O’Brien, M.D.





# SnoreLab

## The Snoring Management App

Record, measure and track your snoring with the No.1 snoring management app for iPhone and iPad:

- ★ Generates charts of your night's snoring
- ★ Records snoring sound samples
- ★ Measures snoring intensity (Snore Score)
- ★ Tests the effectiveness of snoring remedies
- ★ Tracks the impact of lifestyle factors

SnoreLab has helped change lives for the better. If snoring impacts your life: *download it today!*



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# ***Sleep Apnea***

# Types of Sleep Apnea

## **Obstructive (OSA):**

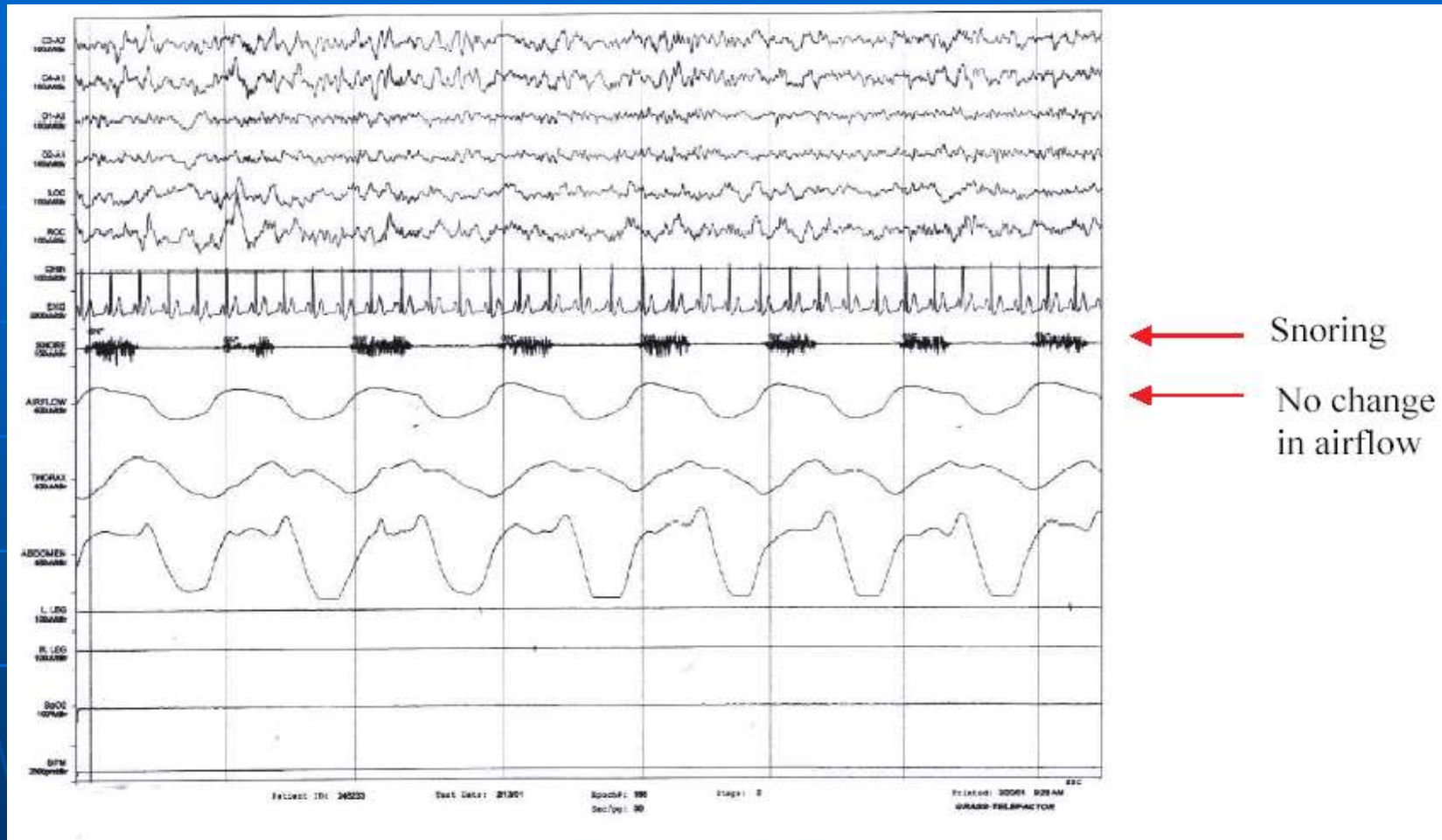
- **Apnea with ventilatory efforts due to pharyngeal collapse**
- **~90% of sleep apnea cases**

## **Central (CSA):**

- **Apnea without ventilatory effort due to withdrawal of central drive**
- **Thought to be due to decreased cardiac output**
- **Cheyne-Stokes respiration a subset of CSA**
- **~10% of sleep apnea cases**

## **Mixed/Complex:**

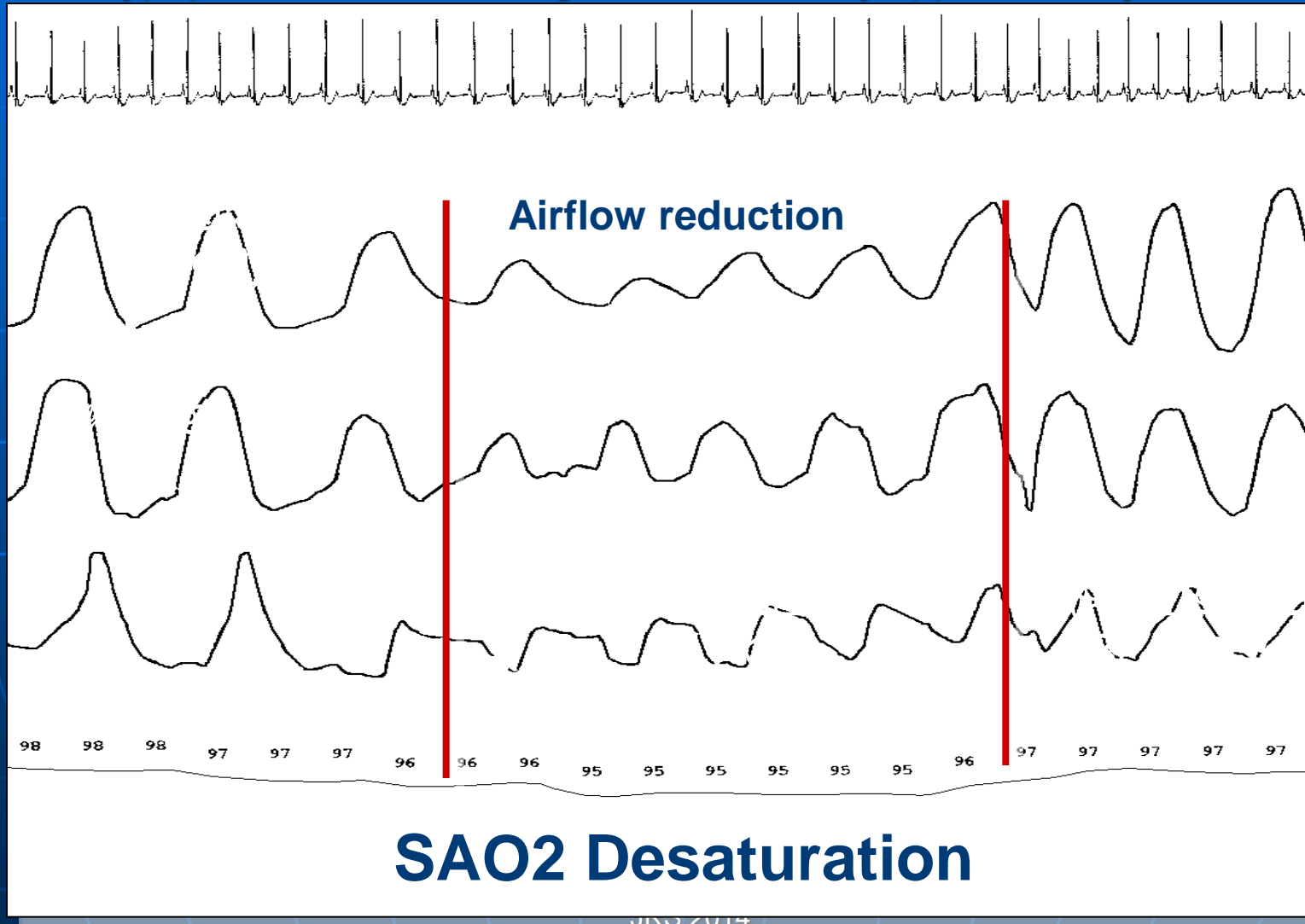
- **Apnea with central component followed by obstructive component**
- **Often classified as obstructive sleep apnea**



# Primary Snoring

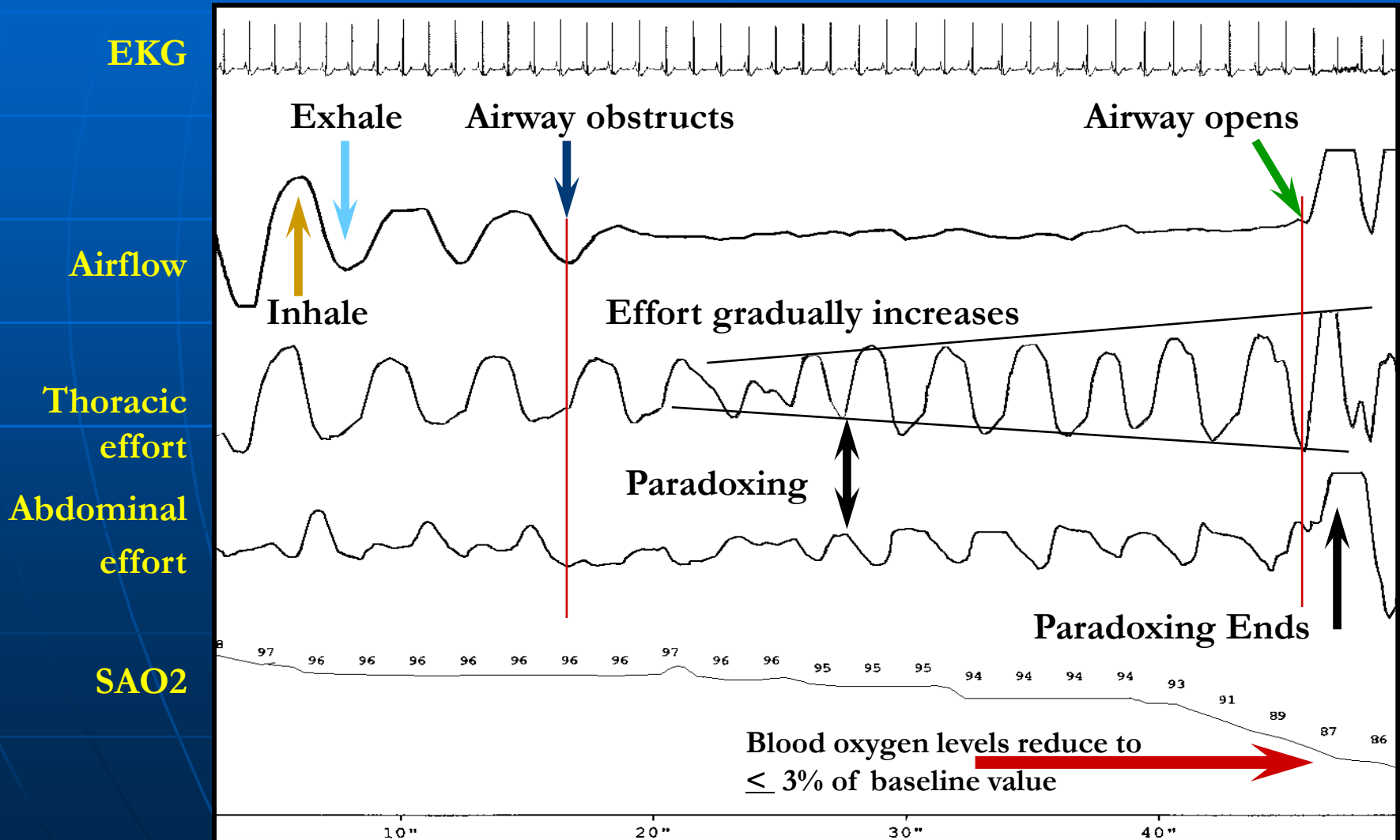
# Hypopnea

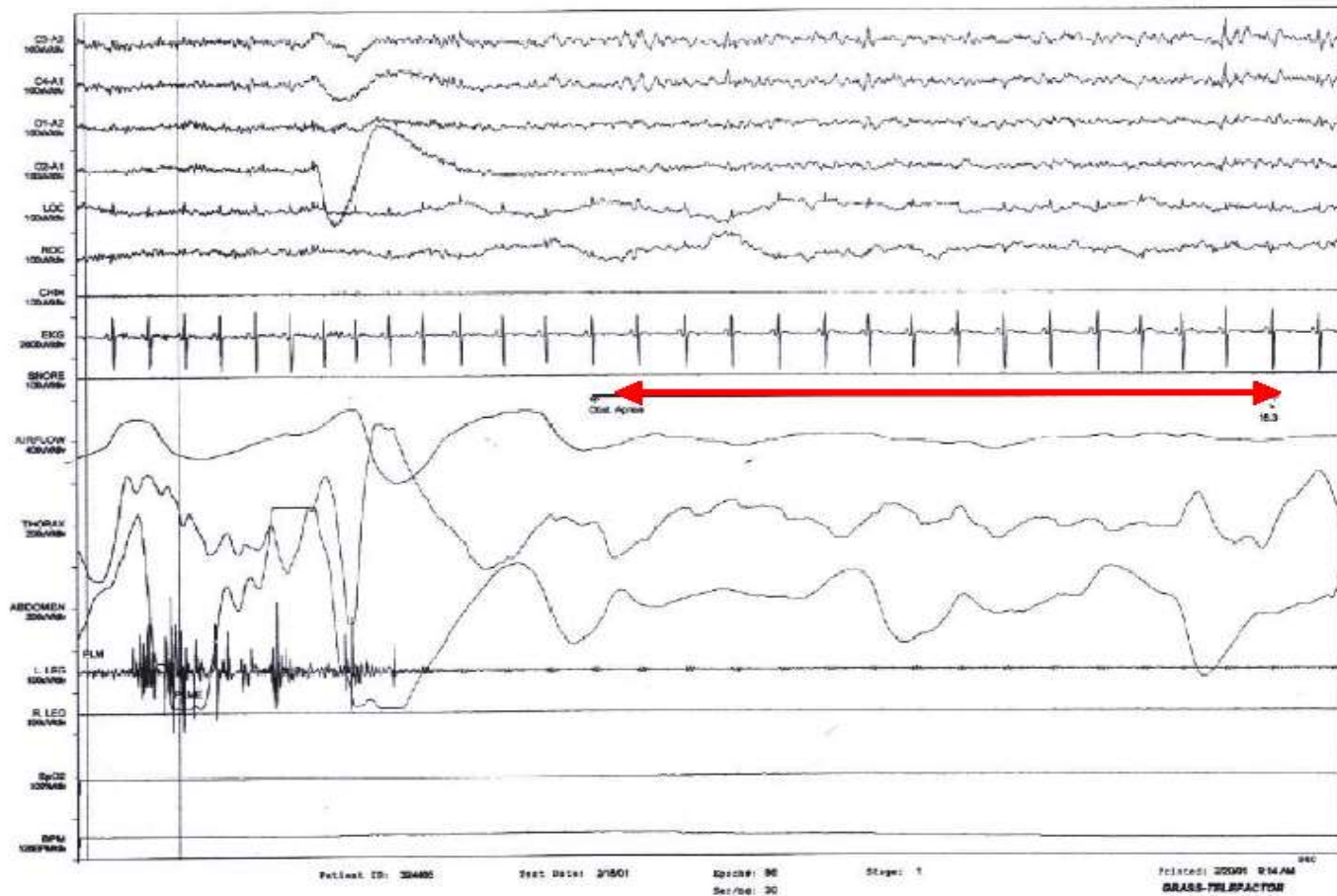
Hypopnic event-Airflow signal is reduced by approximately 50%



# Obstructive Apnea Recordings

A complete blockage of the airway despite efforts to breath.  
Notice the effort gradually increasing ending in airway opening.



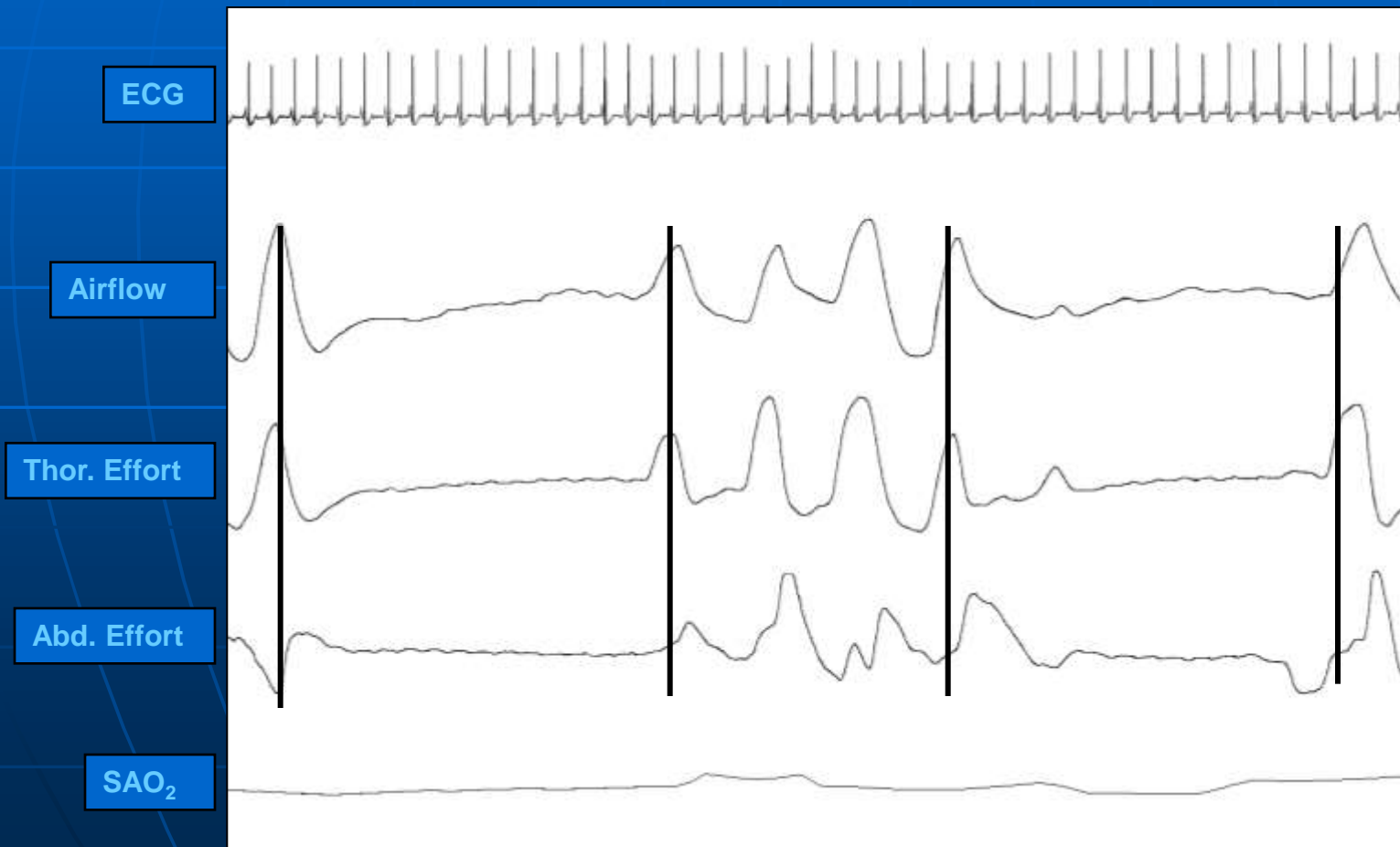


Obstructive  
apnea

**Obstructive apnea – no airflow even  
with chest and abdominal effort.**

# Central Apnea

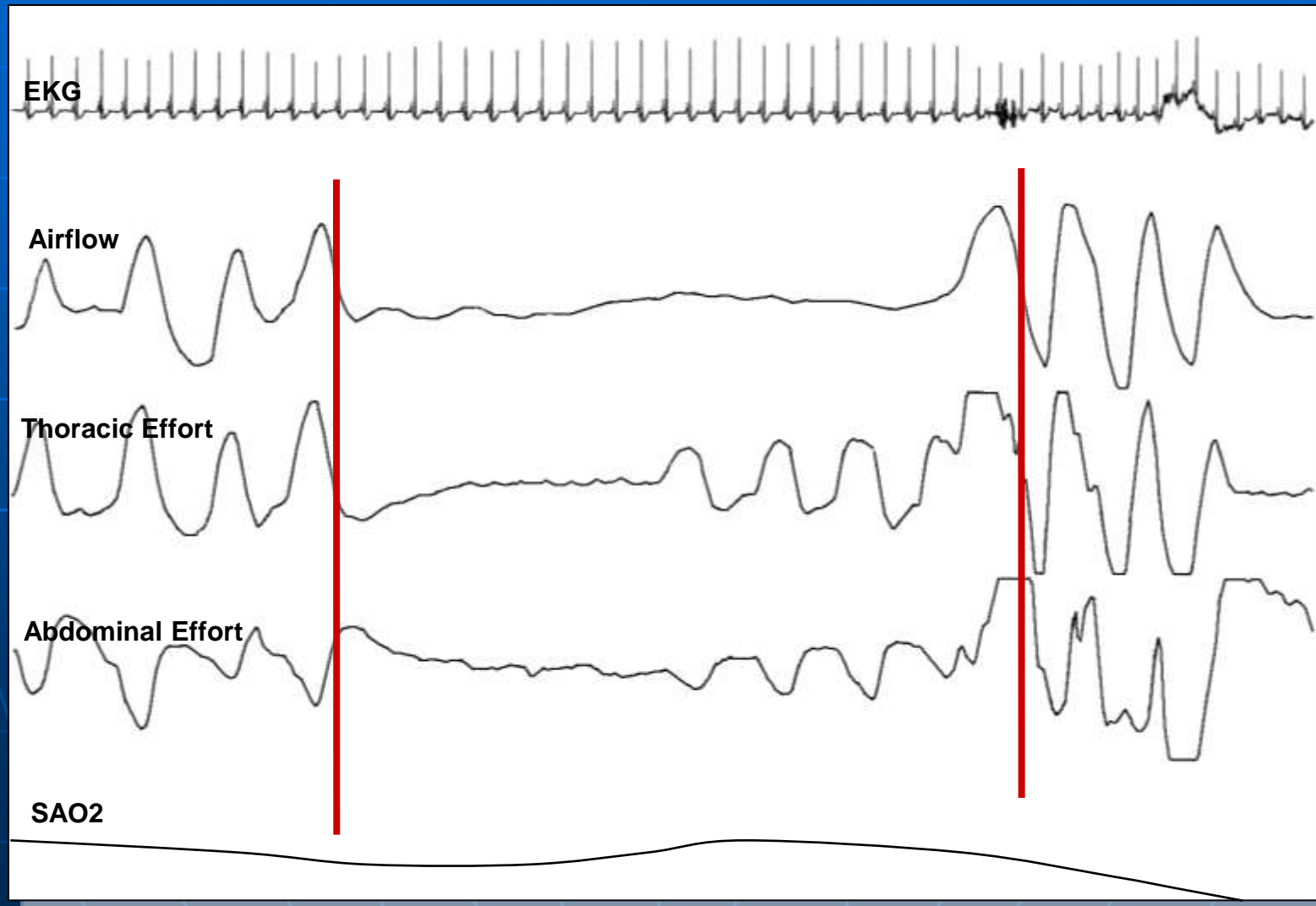
These are central apneas with minimal oxygen desaturation. Note the low  $SAO_2$  at the beginning of this tracing. This is associated with a previous apnea.





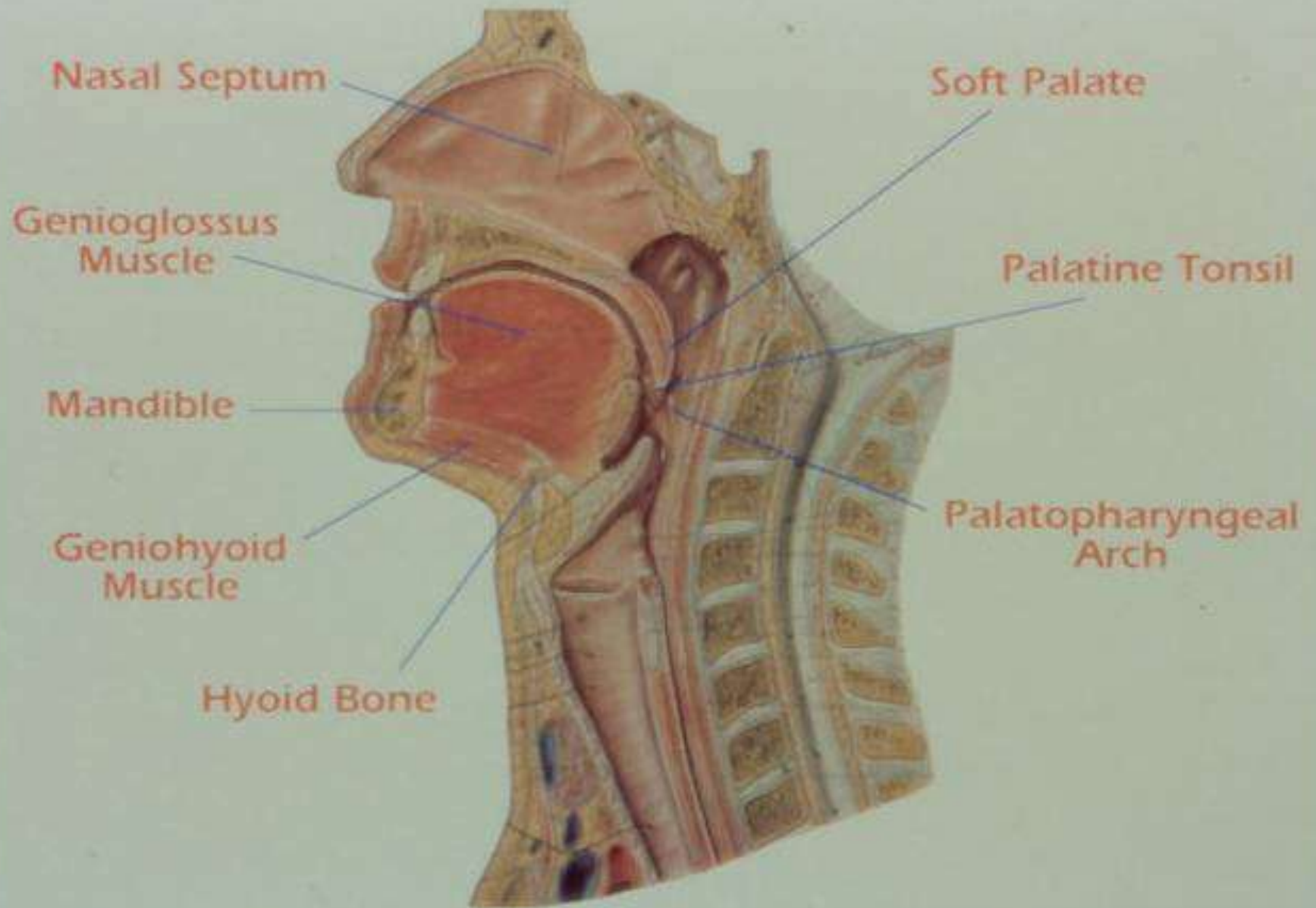
# Mixed Apnea

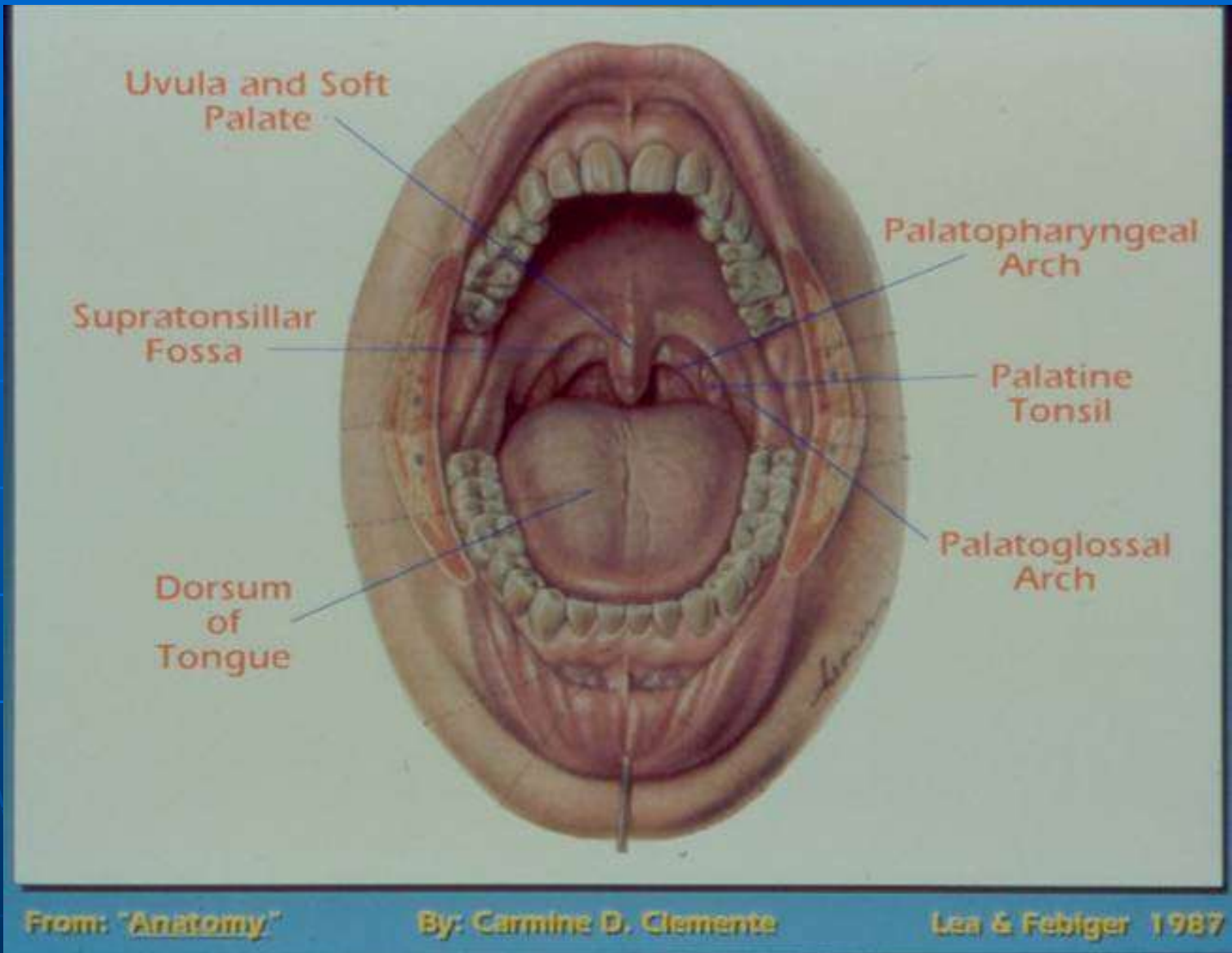
With both central and obstructive components





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From: "Anatomy"

By: Carmine D. Clemente

Lea & Febiger 1987

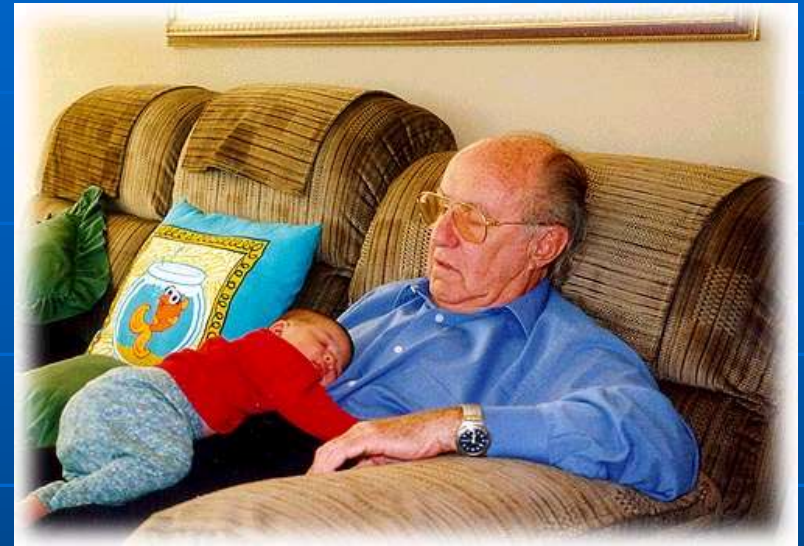
# Snoring and Sleep Apnea in the United States

## Snoring and Sleep Apnea

- More than 40% of adults over 40 snore
- 87 million Americans snore
- 45 million snore every night
- 9% of men and 4% of women have OSA
- 4% of men have OSA symptoms
- 2% of women have OSA symptoms

# Prevalence of OSA in the USA

- OSA - 20 million
  - Compare with
    - Asthma - 10 M
    - Diabetes - 16 M
  - More common in males than females
  - Progressively worsens with age
  - Progressively worsens with increasing weight



- Obstructive sleep apnea in non-obese patients: age, gender and severity
- Teimur Yeligulashvili, PhD
- Abstract presented at SLEEP 2009
  
- Results confirmed that OSA in **non-obese** patients is most prevalent in middle-aged men with larger neck sizes. **Fifty-four percent (2,906) of 5,426 non-obese patients were OSA positive**, and most of them were middle age (57 percent). An equal number of patients had mild OSA (50.4%) or moderate to severe OSA (49.6%). Male prevalence and neck size were significantly higher in the group with moderate to severe OSA.

- Sleep apnoea is a common occurrence in females
- Karl A. Franklin et. al.
- European Respiratory Journal, August 2012
  
- We investigated 400 females from a population-based random sample of 10,000 females aged 20–70 years. They answered a questionnaire and performed overnight polysomnography.



- Sleep apnoea is a common occurrence in females
- Karl A. Franklin et. al.
- European Respiratory Journal, August 2012
  
- **Obstructive sleep apnoea (apnoea-hypopnoea index  $\geq 5$ ) was found in 50% (95% CI 45–55%) of females aged 20–70 years.** Sleep apnoea was related to age, obesity and hypertension but not to daytime sleepiness. Severe sleep apnoea (apnoea-hypopnoea index  $\geq 30$ ) was scored in 14% (95% CI 8.1–21%) of females aged 55–70 years and in 31% (95% CI 12–50%) of obese females with a body-mass index of  $>30 \text{ kg} \cdot \text{m}^{-2}$  aged 50–70 years.

# Clinical Signs & Symptoms of OSA



## Daytime Symptoms:

- **Excessive Daytime Sleepiness (EDS)**
- **Non-restorative sleep**
- **Poor memory, clouded intellect**
- **Poor concentration and performance**
- **Fatigue**
- **Morning headache**
- **Decreased sex drive, impotence**
- **Depression, irritability**
- **Gastro-esophageal reflux (GERD)**
- **Personality changes**

# Clinical Signs & Symptoms of OSA

## Nighttime Symptoms:

- **Snoring: intermittent with pauses**
- **Snorting, gasping**
- **Awakening with gasping or choking**
- **Apnea, pauses in breathing**
- **Frequent awakening**
- **Fragmented awakening**
- **Sweating**
- **Fragmented, non-refreshing, light sleep**
- **Thrashing in bed**
- **Insomnia**
- **BRUXISM**

# OSA in Children





## Symptoms of OSA in Children

- Snoring
- Hyperactivity (ADHD)
- Developmental delay
- Poor concentration
- Enuresis
- Nightmares
- Night terrors
- Headaches
- Restless sleep
- Obesity
- Large tonsils
- Noisy breathers
- Chronic runny noses
- Frequent upper airway infections
- Earaches
- BRUXISM

**“A rapid maxillary expander is an effective appliance for treating children with OSAS.”**

*Villa NP, Malagola C. Rapid Maxillary Expansion in Children with OSAS: 12 month follow-up. Sleep Med. 2007 January 17.*

Hypertrophy (enlargement) of the tonsils and adenoids is the most common cause of obstructive sleep apnea in children.

Brodsky L, Moore L, Stanievich JF. A comparison of tonsillar size and oropharyngeal dimensions in children with obstructive adenotonsillar hypertrophy. *Int J Pediatr Otorhinolaryngol* 1987 Aug;13(2):149-56.



Tonsil removal may improve school performance.

Gozal D. Sleep-disordered breathing and school performance in children.  
Pediatrics 1988 Sep;102(3 Pt1):616-20.



**Girls with adenoids**  
**From Walter Moore's *People's Health*,**  
**New-York McMillan, 1913**

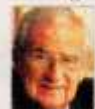
# Attention Deficit/Hyperactivity Disorder (ADHD)

- Snoring is associated with higher levels of inattention and hyperactivity.
- 81% of snoring children with ADHD (25%) could have their ADHD eliminated if their habitual snoring were effectively treated.

*Chervin, RD et al. Symptoms of Sleep Disorders, Inattention and Hyperactivity in Children, 1997, Sleep 20(12): 1185-1192.*

## Second Opinion™

By Dr. Isadore  
Rosenfeld



### A reason to remove tonsils?

About 4.4 million children have been diagnosed with attention-deficit/hyperactivity disorder. Since 1991, the number of prescriptions to treat the condition has increased by 500%. Now there may be another treatment option: removing the tonsils and/or adenoids of ADHD sufferers.

Years ago, most children had their tonsils removed if they often got sore throats. Today, the surgery usually is done only if a child is troubled by repeated ear and throat infections or obstructed breathing, especially while sleeping. A recent study at the University of Michigan found that respiratory symptoms improved in children after their tonsils and adenoids were removed. And about half of those with ADHD before surgery no longer qualified for that diagnosis one year later. The researchers theorize that the positive effect on ADHD may be the result of better sleep.

Doctors caution that these operations should not be done solely for ADHD but only if the tonsils and adenoids are causing serious respiratory problems. That's because tonsils function as part of the immune system.

**If your child has ADHD and trouble breathing, tonsils may be to blame.**

Children with Attention Deficit Hyperactivity Disorder  
are 2-½ times more likely to be bed wetters.

Robson WL, Jackson HP, Blackhurst D, Leung AK. Enuresis in children  
with attention-deficit hyperactivity disorder.  
South Med J, 1997 May;90(5):503-5.

# Enuresis

“Surgical removal of upper airway obstruction led to a significant decrease in or complete cure of nocturnal enuresis in 76% of children studied.”

Weider, DJ. Nocturnal enuresis in children with upper airway obstruction, *Otolaryngol Head Neck Surg* 1991;105:417-32.

“Nocturnal enuresis ceased within a few months in the 10 cases studied by using rapid maxillary expansion to reduce nasal constriction.”

Timms, D. Rapid maxillary expansion in the treatment of nocturnal enuresis, *The Angle Orthodontist* 1990, 60(3):229-33.

# Sleep Disorder Breathing Gets in the Way of Critical Functions



# Sleep Disorder Breathing Gets in the Way of Critical Functions







# Physical Characteristics of Obstructive Sleep Apnea

# Medical Sleep Apnea Risk Factors

- **Obesity**
- **Increasing Age**
- **Male Gender**
- **Anatomic Abnormalities of Upper Airway**
- **Family History**
- **Alcohol or Sedative Usage**
- **Smoking**
- **Hypertension**

# OSA Physical Exam

## Risk Factors

- BMI > 30
- Neck circumference > 16in
- High arched palate



- Micro/retrognathia



- Mallampati class airway



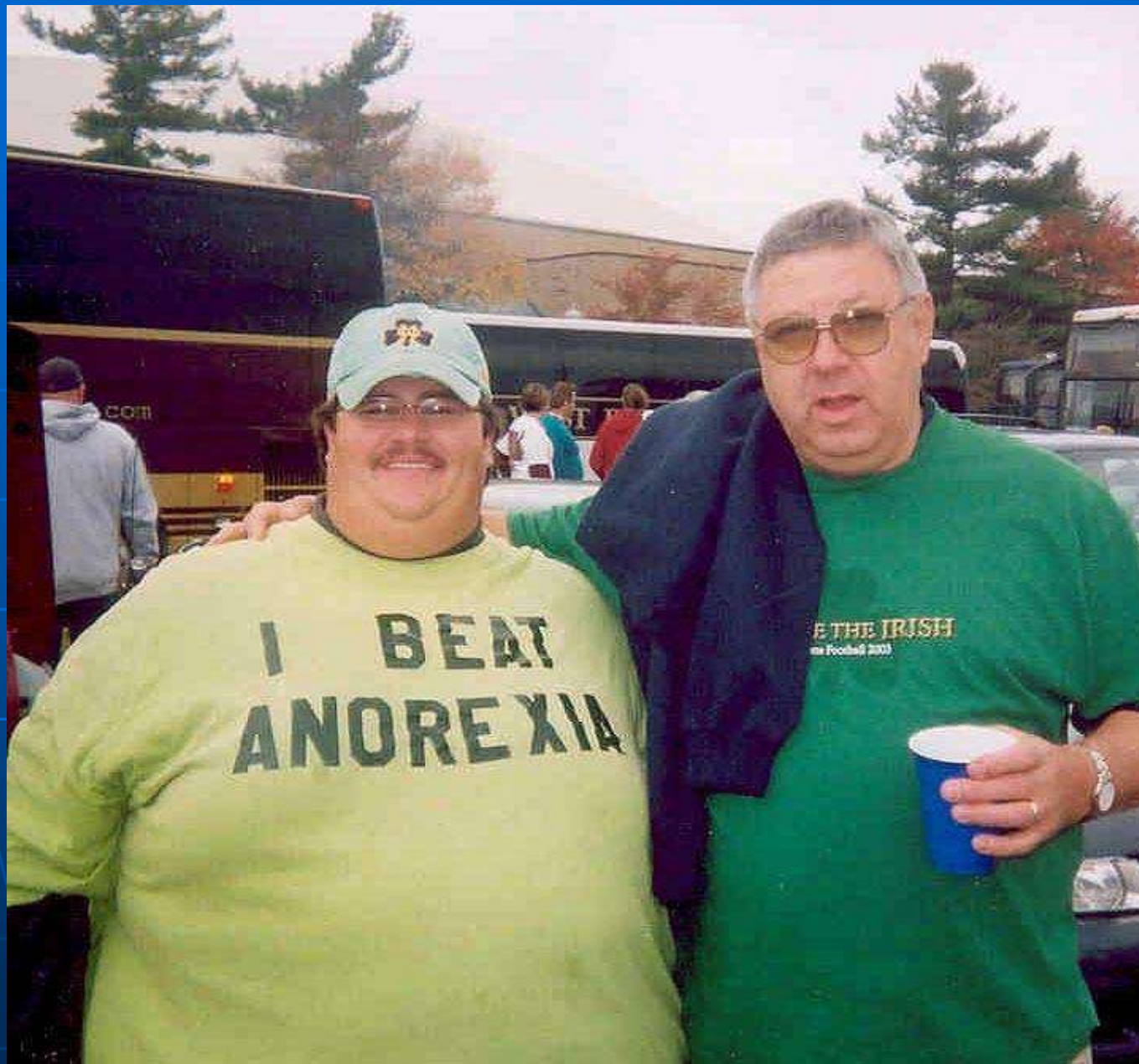
## Weight in Pounds

Height in Feet and Inches

	100	110	120	130	140	150	160	170	180	190	200	210	220	230	240	250
4'	30.5	33.6	36.6	39.7	42.7	45.8	48.8	51.9	54.9	58.0	61.0	64.1	67.1	70.2	73.2	76.3
4' 2"	28.1	30.9	33.7	36.6	39.4	42.2	45.0	47.8	50.6	53.4	56.2	59.1	61.9	64.7	67.5	70.3
4' 4"	26.0	28.6	31.2	33.8	36.4	39.0	41.6	44.2	46.8	49.4	52.0	54.6	57.2	59.8	62.4	65.0
4' 6"	24.1	26.5	28.9	31.3	33.8	36.2	38.6	41.0	43.4	45.8	48.2	50.6	53.0	55.4	57.9	60.3
4' 8"	22.4	24.7	26.9	29.1	31.4	33.6	35.9	38.1	40.4	42.6	44.8	47.1	49.3	51.6	53.8	56.0
4' 10"	20.9	23.0	25.1	27.2	29.3	31.3	33.4	35.5	37.6	39.7	41.8	43.9	46.0	48.1	50.2	52.2
5'	19.5	21.5	23.4	25.4	27.3	29.3	31.2	33.2	35.2	37.1	39.1	41.0	43.0	44.9	46.9	48.8
5' 2"	18.3	20.1	21.9	23.8	25.6	27.4	29.3	31.1	32.9	34.7	36.6	38.4	40.2	42.1	43.9	45.7
5' 4"	17.2	18.9	20.6	22.3	24.0	25.7	27.5	29.2	30.9	32.6	34.3	36.0	37.8	39.5	41.2	42.9
5' 6"	16.1	17.8	19.4	21.0	22.6	24.2	25.8	27.4	29.0	30.7	32.3	33.9	35.5	37.1	38.7	40.3
5' 8"	15.2	16.7	18.2	19.8	21.3	22.8	24.3	25.8	27.4	28.9	30.4	31.9	33.4	35.0	36.5	38.0
5' 10"	14.3	15.8	17.2	18.7	20.1	21.5	23.0	24.4	25.8	27.3	28.7	30.1	31.6	33.0	34.4	35.9
6'	13.6	14.9	16.3	17.6	19.0	20.3	21.7	23.1	24.4	25.8	27.1	28.5	29.8	31.2	32.5	33.9
6' 2"	12.8	14.1	15.4	16.7	18.0	19.3	20.5	21.8	23.1	24.4	25.7	27.0	28.2	29.5	30.8	32.1
6' 4"	12.2	13.4	14.6	15.8	17.0	18.3	19.5	20.7	21.9	23.1	24.3	25.6	26.8	28.0	29.2	30.4
6' 6"	11.6	12.7	13.9	15.0	16.2	17.3	18.5	19.6	20.8	22.0	23.1	24.3	25.4	26.6	27.7	28.9
6' 8"	11.0	12.1	13.2	14.3	15.4	16.5	17.6	18.7	19.8	20.9	22.0	23.1	24.2	25.3	26.4	27.5
6' 10"	10.5	11.5	12.5	13.6	14.6	15.7	16.7	17.8	18.8	19.9	20.9	22.0	23.0	24.0	25.1	26.1
7'	10.0	11.0	12.0	13.0	13.9	14.9	15.9	16.9	17.9	18.9	19.9	20.9	21.9	22.9	23.9	24.9

<http://www.freebmi-calculator.net>

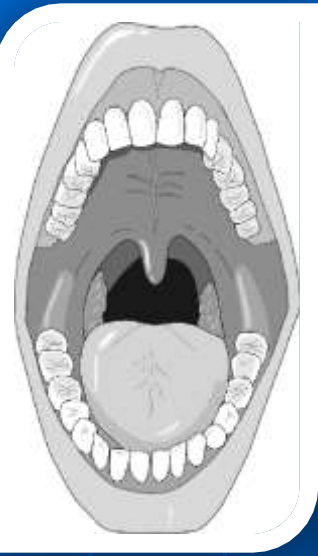
Underweight
  Normal
  Overweight
  Obesity



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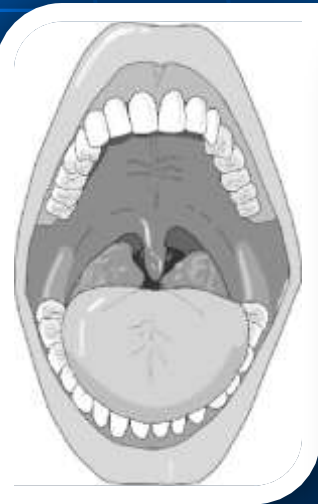


# Normal vs. Obstructed Airway



## Normal Airway

- Air passes through the nose and flexible structures in the back of the throat (soft palate, uvula and tongue).
- During sleep the muscles relax but, normally, the airway stays open.



## Obstructed Airway

- OSA is a situation in which the entire upper airway is blocked causing air flow to stop.
- Snoring is the vibration of the pharyngeal soft tissues as air passes through.









# Diagnosis of OSA

## Hospital Study

- polysomnogram (16+ channels)
- technician attended
- technician analyzed

# Polysomnography

## **Monitor Sleep Stages:**

EEG

EOG

EMG

## **Identify Apnea / Hypopnea and record airflow:**

nasal/oral thermistors

capnography

strain gauges

## **Assess Physiologic Consequences:**

EKG

Pulse oximetry

# Polysomnography

- How many apneas?
- How many hypopneas?
- How low was the oxygen level?
- Supine/non supine, REM/NREM/no REM
- Oximetry desaturations, RDI, AHI, Snoring intensity, nasal air flow, bruxism.







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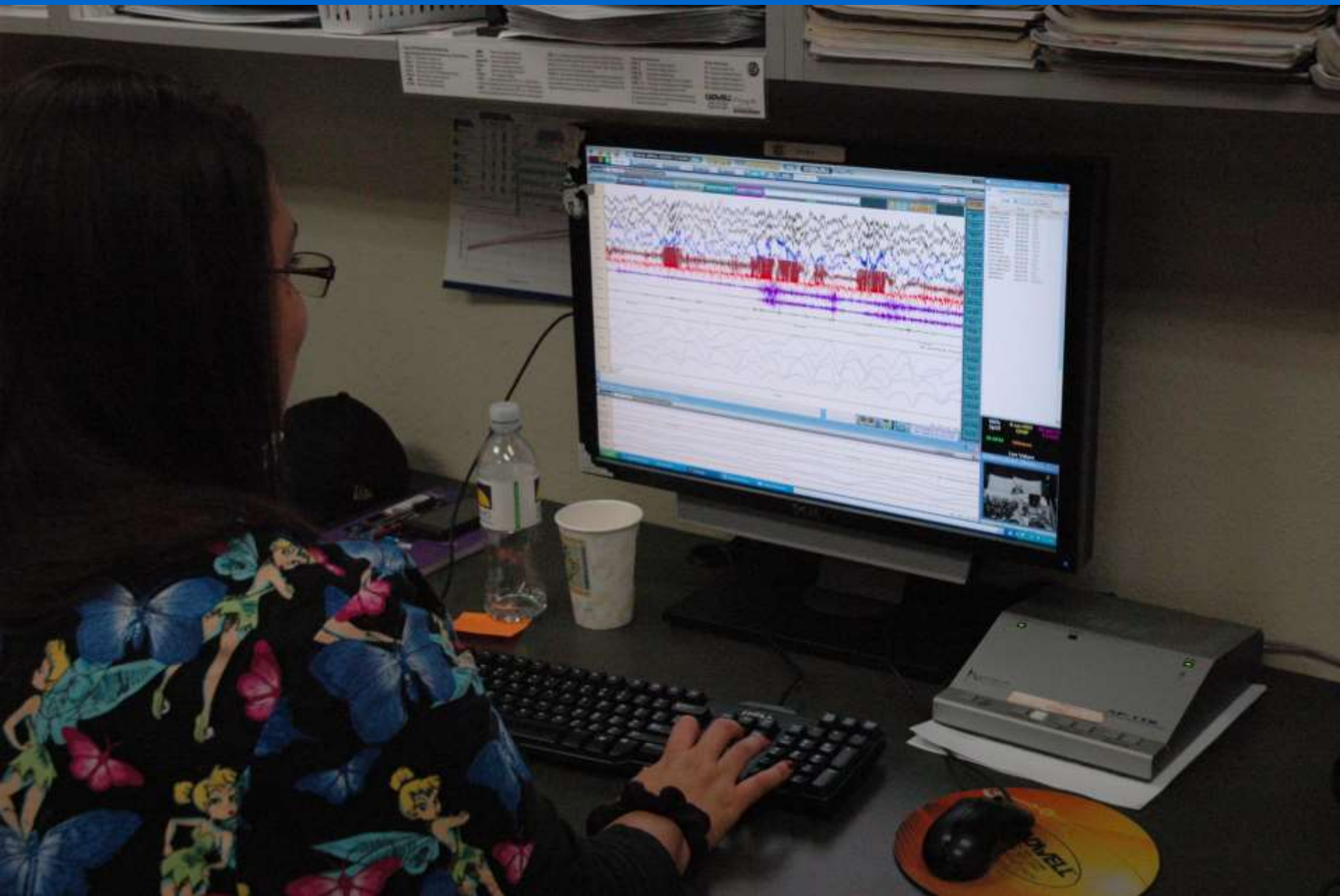


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# Problems with PSG

- Patient has a problem getting to sleep (so they give them a sleeping pill).
- Patient doesn't believe that they slept (amnesic nature of sleep).
- Patient "forced" to sleep on their back (which they say they don't at home).
- No one goes over the PSG in detail with the patient.

# Diagnosis of OSA

## **Portable Monitoring (“Home Sleep Testing”)**

- **Multiple channel**
- **Computer or tech scored**
- **May be interpreted by a sleep physician**
- **More convenient for the patient**
- **Less expensive**
- **Many insurance companies now will only pay for home testing unless the patient has medical necessity for an in lab study**



## MediByte Patient Guide

Your doctor or dentist has sent you home with the MediByte to screen for snoring or sleep apnea.

To use the device, put the sensors on as described in this guide, slide the ON/OFF switch to the ON position (white dot), press the Event button on the front of the MediByte and go to bed. When you wake up, press the Event button on the front of the MediByte, remove the sensors and slide the ON/OFF switch to the OFF position.

### Warnings

- Use the MediByte<sup>®</sup> as directed by your physician.
- Keep the MediByte<sup>®</sup> and its components away from flames and flammable components.
- Do NOT disconnect the MediByte<sup>®</sup> in any liquid. Damage will result.
- Do NOT take, shower or swim while wearing the MediByte<sup>®</sup>.
- Do NOT plug any MediByte<sup>®</sup> accessories into an electrical wall outlet.



100 Schickler Blvd  
 Austin, TX 78748  
 800-711-1111  
 512-353-8700

Approved by  
 FDA (510k) 17  
 2007 (2P) 510k  
 78-A144-0000-0000  
 Tel: 512-353-8700



DMR-4000-2.2 2010010





# NOX-T3



# Problems with Portable Monitoring

- Many devices cannot tell whether or not the patient is awake or asleep
- The patient has to set up the device themselves, and may do it wrong, or something may come off during the night
- **You can NOT rule OUT sleep apnea with a portable monitor...only IN.**

# Treatment of OSA & Snoring

# Treatment Options

## Non-surgical

- Avoidance of Risk Factors/ Behaviors
- Pharmacologic Agents
- Continuous Positive Airway Pressure (CPAP)
- Oral Appliance Therapy



## Surgical

- Tracheostomy
- Laser-Assisted Uvuloplasty
- Somnoplasty
- Uvulopalatopharyngoplasty (UPPP)
- Maxillary / Mandibular Advancement



# Treatment of Snoring

- Conservative measures (weight loss, avoidance of alcohol and sleep on side)
- Treat the nose (surgery, congestion, mechanical dilators)
- Pharyngeal surgery (UPPP, LAUP or radiofrequency tissue volume reduction)
- Oral appliances
  - These can be used separately or in combination

# Treatment of OSA

- Lifestyle modification
- CPAP
- Oral appliances
- Surgery

# Lifestyle Modification

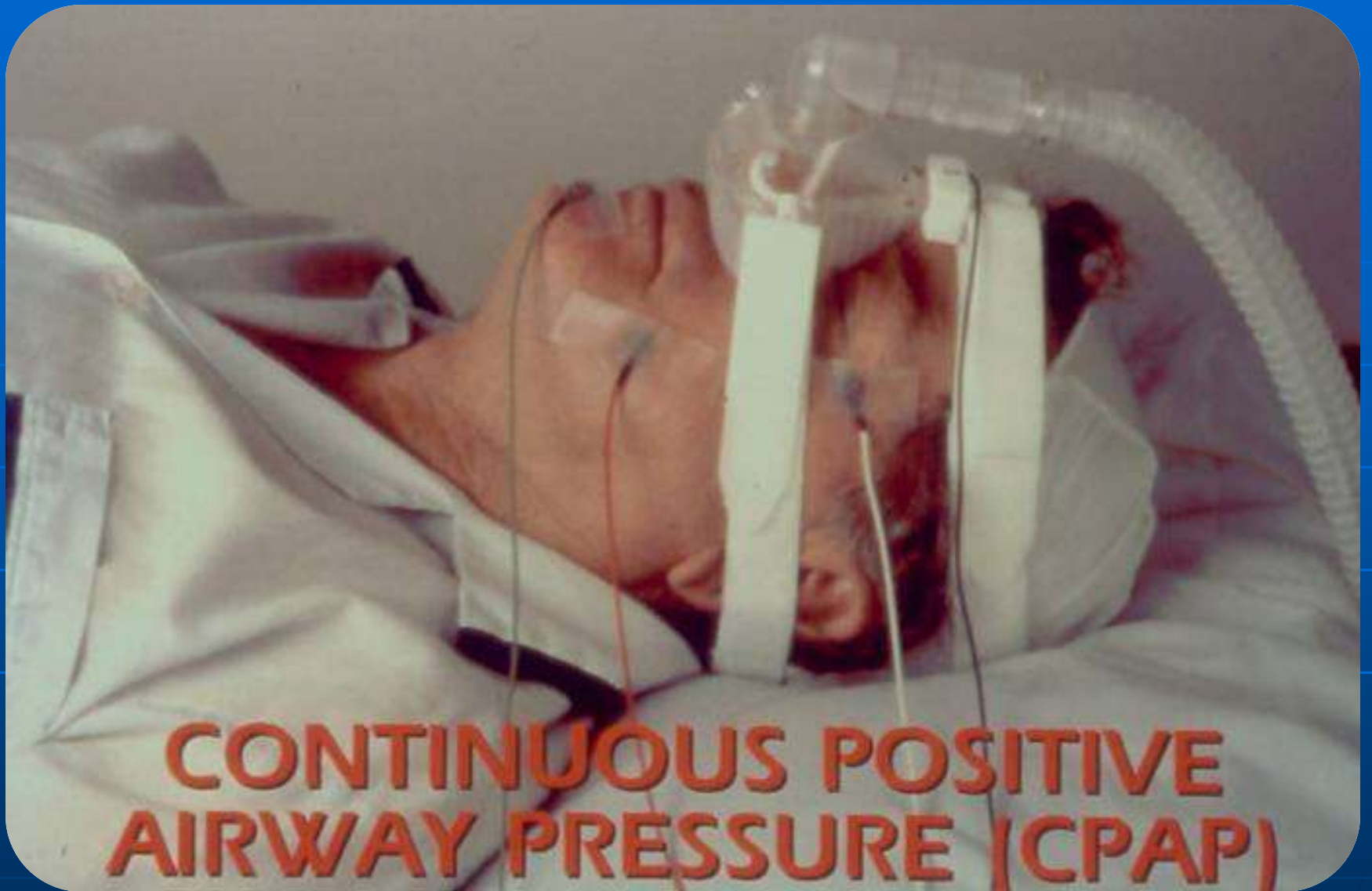
- Weight loss
- Exercise
- Cessation of alcohol consumption, sedative use and/or cigarette smoking

# Positional Therapy



B4





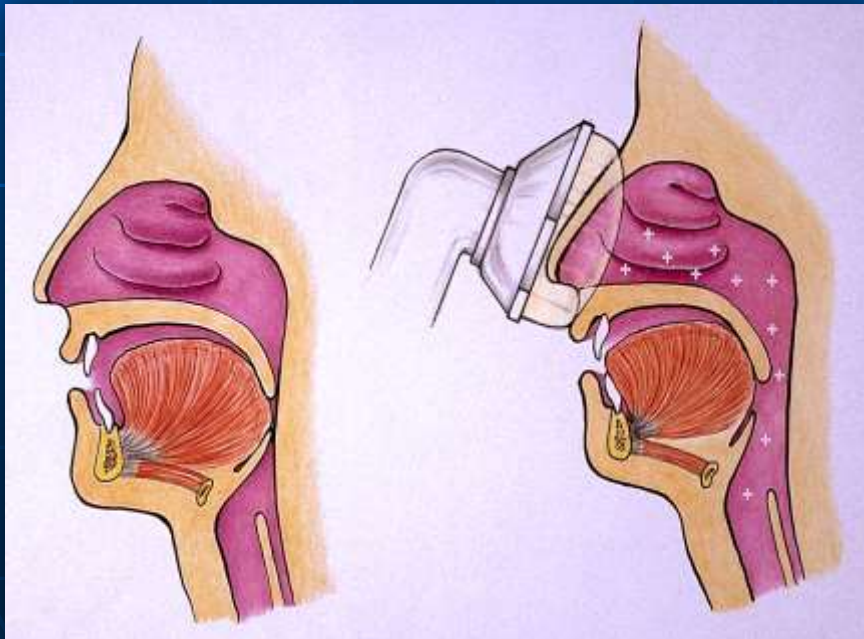
# CONTINUOUS POSITIVE AIRWAY PRESSURE (CPAP)

When in doubt....  
pressurize the snout.



# Positive Airway Pressure

- **Continuous Positive Airway Pressure (CPAP) machines deliver room air under pressure through the nose using a nasal mask.**
- **Pressure creates a pneumatic splint in the upper airway and prevents obstruction from occurring.**



# CPAP

- **Gold standard in treatment of OSA**
- **Those that benefit from it should stay on it**
- **Different models and features**
  - **Pressure changing/self titrating (BiPAP, AutoPAP, VPAP)**
  - **Humidifiers**
  - **Different masks/cushions/pillows**
  - **Compact/quieter**
- **There are complications and side effects**
  - **Including tooth movement**

# CPAP Masks - Nasal Mask

- **The most common mask**
- **Variety of masks to suit different nose sizes**
- **Made of : Gel, Silicon or Rubber**
- **Personal adjustment**



# OSA Surgery

# Surgical Treatment of OSA

- **Soft Tissue Techniques**
  - Nasal procedures – turbinate reduction, septoplasty
  - Adeno-tonsillectomy
  - Uvulo-palato-pharyngoplasty (UPPP)
  - Radiofrequency tissue reduction
- **Hard Tissue Techniques**
  - Genio-glossus advancement
  - Hyoid suspension
  - Maxillo-mandibular advancement
- **Airway Bypass**
  - Tracheotomy

# The Pillar Procedure

The Pillar Procedure is a simple, effective treatment for sleep apnea and snoring.

Less invasive and less painful than other surgical procedures

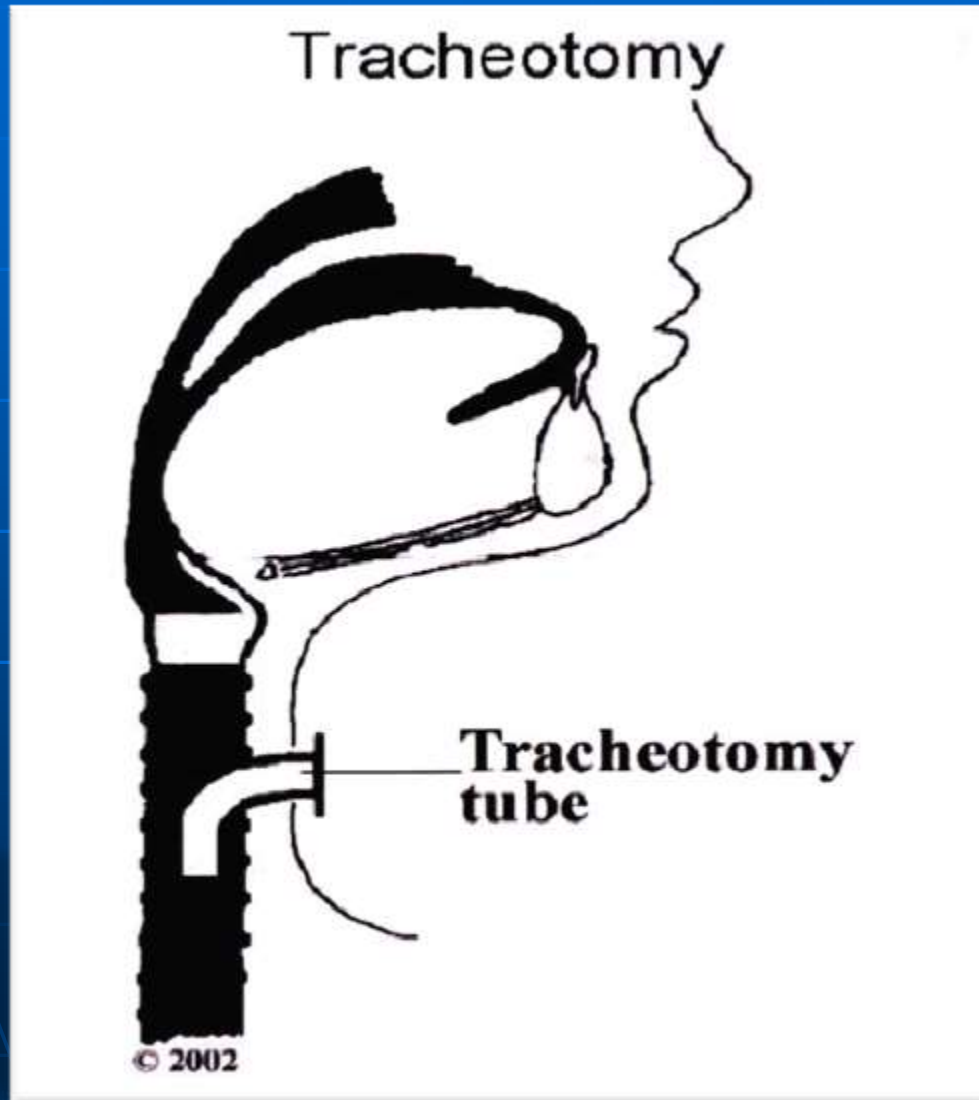
Completed in a single, short office visit

FDA-cleared and clinically proven, with results comparable to more aggressive surgical procedures





# Upper Airway Bypass



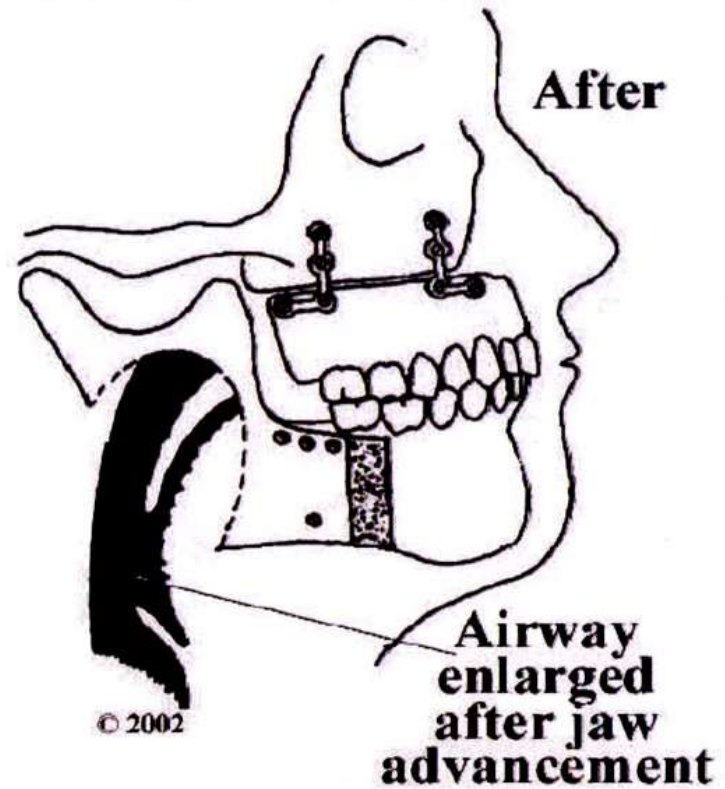
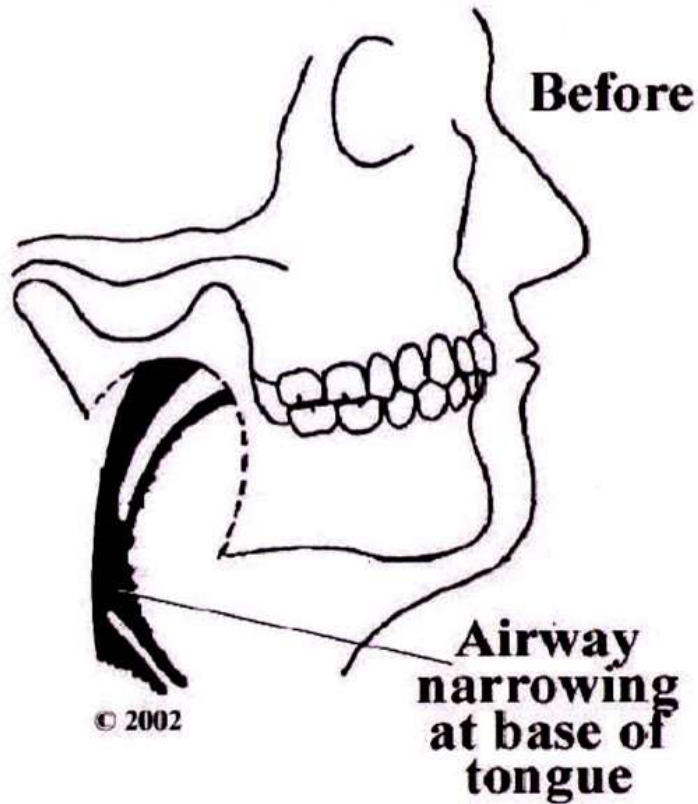
# Mandibular Advancement Surgery

**“The norm surgical advancement using LaForte and mandibular advancement combined surgeries is 12 mm. to achieve success.”**

Wayne Colin, DMD, MD  
March 3, 2007

# Jaw Advancement

## Maxillo-mandibular Advancement



# Dentistry's Role In the Diagnosis and Treatment of OSA



# Dentistry's Role



- Obstructive Sleep Apnea (OSA) is a life-threatening medical disorder
- Dentists are not medically qualified nor legally permitted to diagnose sleep disorders
- Diagnosis must be made by a physician

# Dentistry's Role



- Screening and referral
- Provide and monitor oral appliance therapy as part of treatment team with physician
- Monitor and treat potential side effects of oral appliance therapy
- Follow-up

# How do we best screen for OSA?

- History
  - Snoring w/ or w/o apnea/gasping
  - Non-restorative sleep
  - Excessive Daytime Sleepiness / Fatigue
- Co morbidities
  - Hypertension
  - GERD
  - Headaches
  - **Bruxism**
  - **TMD**

# Screening Tests for OSA

- Overnight oximetry
  - Not sensitive or specific
- **STOP BANG and Epworth Questionnaire**
- Home sleep testing



# Epworth Sleepiness Scale

## EPWORTH SLEEPINESS SCALE

How likely are you to doze off or fall asleep in the following situations?  
Use the following scale to choose the most appropriate number for each situation

0 = would never doze   1 = slight chance of dozing   2 = moderate chance of dozing  
3 = high chance of dozing

Sitting and reading ..... \_\_\_\_\_

Watching TV ..... \_\_\_\_\_

Sitting, inactive in a public place (theater, meeting) ..... \_\_\_\_\_

As a passenger in a car for an hour without a break ..... \_\_\_\_\_

Lying down to rest in the afternoon when circumstances permit ..... \_\_\_\_\_

Sitting and talking to someone ..... \_\_\_\_\_

Sitting quietly after a lunch without alcohol ..... \_\_\_\_\_

In a car, while stopped for a few minutes in traffic ..... \_\_\_\_\_

**Total**

## Epworth Sleepiness Scale (ESS) Key

The ESS is a standard self-administered questionnaire that measures a person's general level of daytime sleepiness. The ESS rates the probability of falling asleep in eight different situations.

**Instructions:** The written instructions on the ESS are meant to be vague. Do not give further instructions. Do not give patients an interpretation of their ESS score until they have completed the questionnaire.

**Scoring:** Add up the scores. If a patient scores in fractions (i.e.  $\frac{1}{2}$  or  $1\frac{1}{2}$ ) then record these at face value. If the total score includes a fraction, then round up the total score to the next whole number.

### ESS Key

**0 – 10** Normal

**11 – 24** Recommend medical follow-up for specialist treatment

# STOP BANG

## STOP - BANG

---

		Yes	No
1. Snore	Do you snore loudly? (Louder than talking or loud enough to be heard behind a closed door?)	<input type="checkbox"/>	<input type="checkbox"/>
2. Tired	Do you often feel tired, fatigued or sleepy during daytime?	<input type="checkbox"/>	<input type="checkbox"/>
3. Obstruction	Has anyone observed you stop breathing during your sleep?	<input type="checkbox"/>	<input type="checkbox"/>
4. Pressure	Do you have or are you being treated for high blood pressure?	<input type="checkbox"/>	<input type="checkbox"/>
5. BMI	Is your body mass index greater than 28?	<input type="checkbox"/>	<input type="checkbox"/>
6. Age	Are you 50 years old or older?	<input type="checkbox"/>	<input type="checkbox"/>
7. Neck	Are you a male with a neck circumference greater than 17 inches, or a female with a neck circumference greater than 16 inches?	<input type="checkbox"/>	<input type="checkbox"/>
8. Gender	Are you a male?	<input type="checkbox"/>	<input type="checkbox"/>

Questionnaires adapted from [www.EpworthSleepinessScale.com](http://www.EpworthSleepinessScale.com) and Chung F, et. al Anesthesiology 2008; 108(5):812-821.

8119 Ustick Rd. Boise, ID 83704 • (208) 376-3600 • Fax (208) 376-3616 • [www.cpcidaho.com](http://www.cpcidaho.com) • [www.sleepidaho.com](http://www.sleepidaho.com)

## STOP – BANG

The purpose of the STOP – BANG questionnaire is to determine “high” or “low” risk for sleep apnea.

### STOP

*High risk of OSA: answering **yes** to **two or more** questions*

*Low risk of OSA: answering **yes** to **less than two** questions*

### BANG

*High risk of OSA: answering **yes** to **three or more** items*

*Low risk of OSA: answering **yes** to **less than three** items*

*Anesthesiology 2008; 108:812–21 Copyright © 2008, the American Society of Anesthesiologists, Inc.*

### Sleep Screening Questionnaires

Please answer the questions below to help us assess for possible obstructive sleep apnea (OSA), a condition in which your breathing pauses or stops for periods of time while you sleep. Sleep apnea can increase your risk for many health conditions. It can also increase your risk for breathing problems after surgery.

Name \_\_\_\_\_ Date \_\_\_\_\_  
 DOB \_\_\_\_\_ Height \_\_\_\_\_ Weight \_\_\_\_\_

- |   | Yes                      | No                       |
|---|--------------------------|--------------------------|
| Have you ever been diagnosed with OSA?                      | <input type="checkbox"/> | <input type="checkbox"/> |
| Are you currently being treated for OSA?                    | <input type="checkbox"/> | <input type="checkbox"/> |
| Are you aware of a family history of OSA?                   | <input type="checkbox"/> | <input type="checkbox"/> |
| Are you aware of clenching or grinding your teeth at night? | <input type="checkbox"/> | <input type="checkbox"/> |

### ESS: Epworth Sleepiness Scale

How likely are you to doze off or fall asleep in the following situations, in contrast to just feeling tired?

0 = I would never doze                      2 = I have a moderate chance of dozing  
 1 = I have a slight chance of dozing        3 = I have a high chance of dozing

Situation	Chance of Dozing
1. Sitting and reading	_____
2. Watching TV	_____
3. Sitting inactive in a public place (e.g. a theatre or a meeting)	_____
4. As a passenger in a car for an hour without a break	_____
5. Lying down to rest in the afternoon when circumstances permit	_____
6. Sitting and talking to someone	_____
7. Sitting quietly in a lunch without alcohol	_____
8. In a car while stopped for a few minutes in traffic	_____

### STOP - BANG

		Yes	No
1. Snore	Do you snore loudly? (Louder than talking or loud enough to be heard behind a closed door?)	<input type="checkbox"/>	<input type="checkbox"/>
2. Tired	Do you often feel tired, fatigued or sleepy during daytime?	<input type="checkbox"/>	<input type="checkbox"/>
3. Obstruction	Has anyone observed you stop breathing during your sleep?	<input type="checkbox"/>	<input type="checkbox"/>
4. Pressure	Do you have or are you being treated for high blood pressure?	<input type="checkbox"/>	<input type="checkbox"/>
5. BMI	Is your body mass index greater than 28?	<input type="checkbox"/>	<input type="checkbox"/>
6. Age	Are you 50 years old or older?	<input type="checkbox"/>	<input type="checkbox"/>
7. Neck	Males: Is your neck circumference greater than 17 inches? Females: Is your neck circumference greater than 16 inches?	<input type="checkbox"/>	<input type="checkbox"/>
8. Gender	Are you a male?	<input type="checkbox"/>	<input type="checkbox"/>

\_\_\_\_\_  
 Patient Signature

# Examination in the Dental Office

# Quick Screen

- Medical/Dental history review
- PSG review (level of AHI)
- ROM
- TMJ Evaluation
- Perio Eval (Pano)





# Bruxism



# Condition of Dentition

**At least 10 teeth in each arch are required for most mandibular repositioning appliances.**

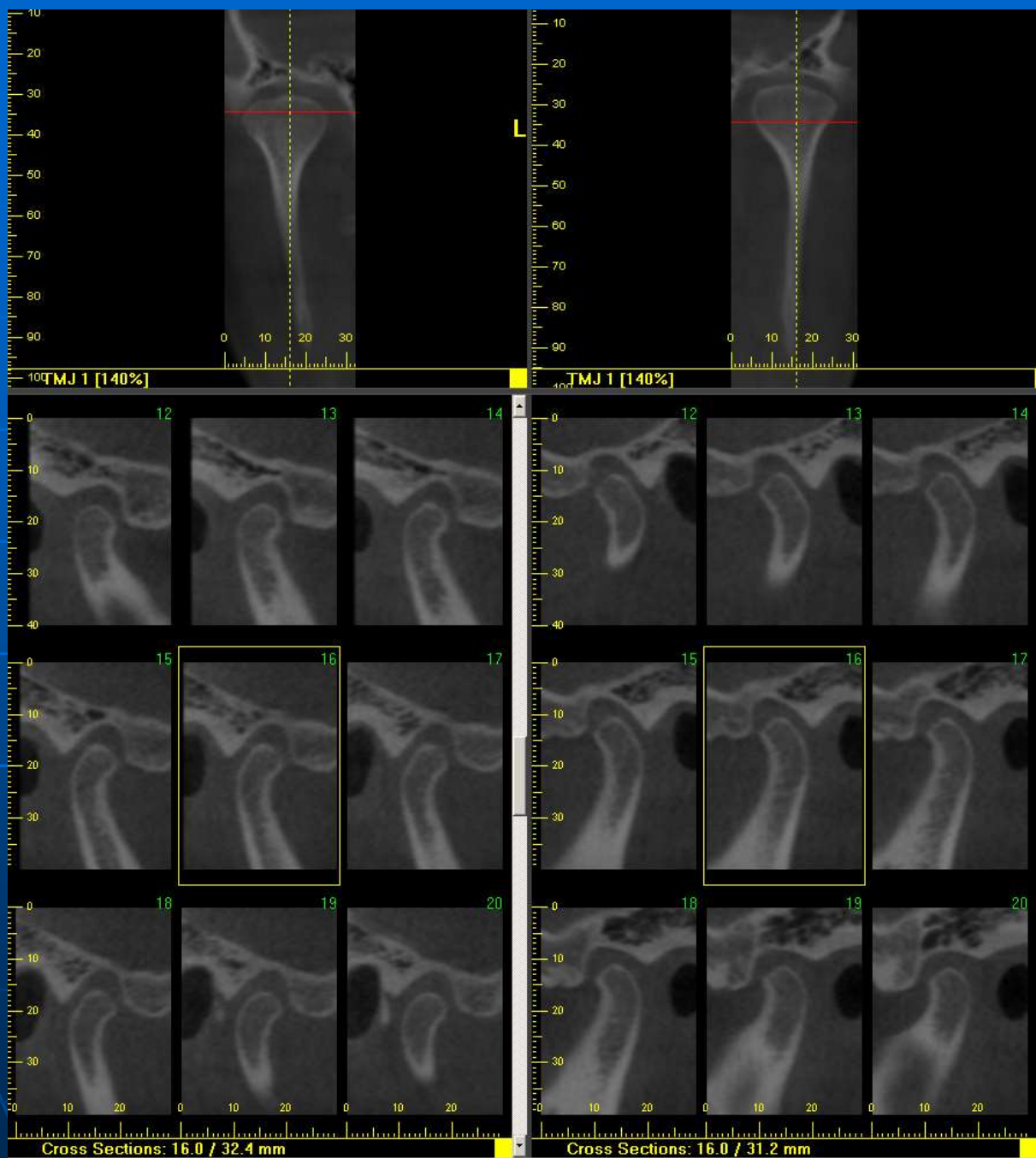


# Patient Examination

- **Periodontal Condition**
  - Gingival Recession/ Pocketing
  - Tooth Mobility
  - Periodontal Disease
- **Intraoral soft and hard tissue pathology**

# Patient Examination

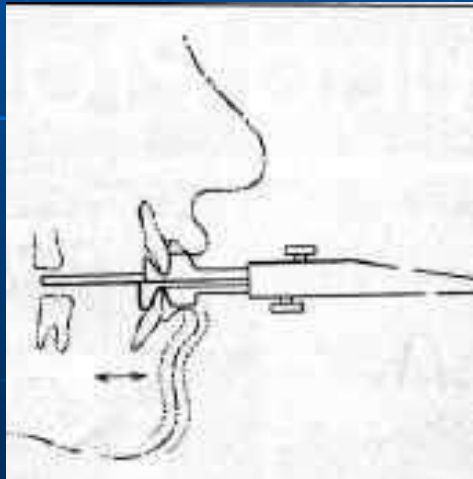
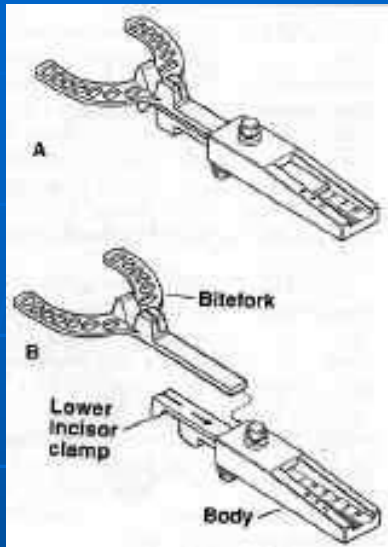
- **TMJ Evaluation**
  - Palpation
  - Auscultation
- **Muscle Palpation**
- **Jaw Range of Motion**
  - Maximum opening (40-60 mm)
  - Lateral and protrusive movement (> 8mm)



# Patient Records

- **Study Casts**
  - **With bite registration**
    - **Normal occlusion**
    - Initial treatment position
- **Radiographs**
  - **Panoramic or full mouth radiographs**
  - **Cephalometric**
  - **Cone Beam CT (ideal)**

# George Gauge

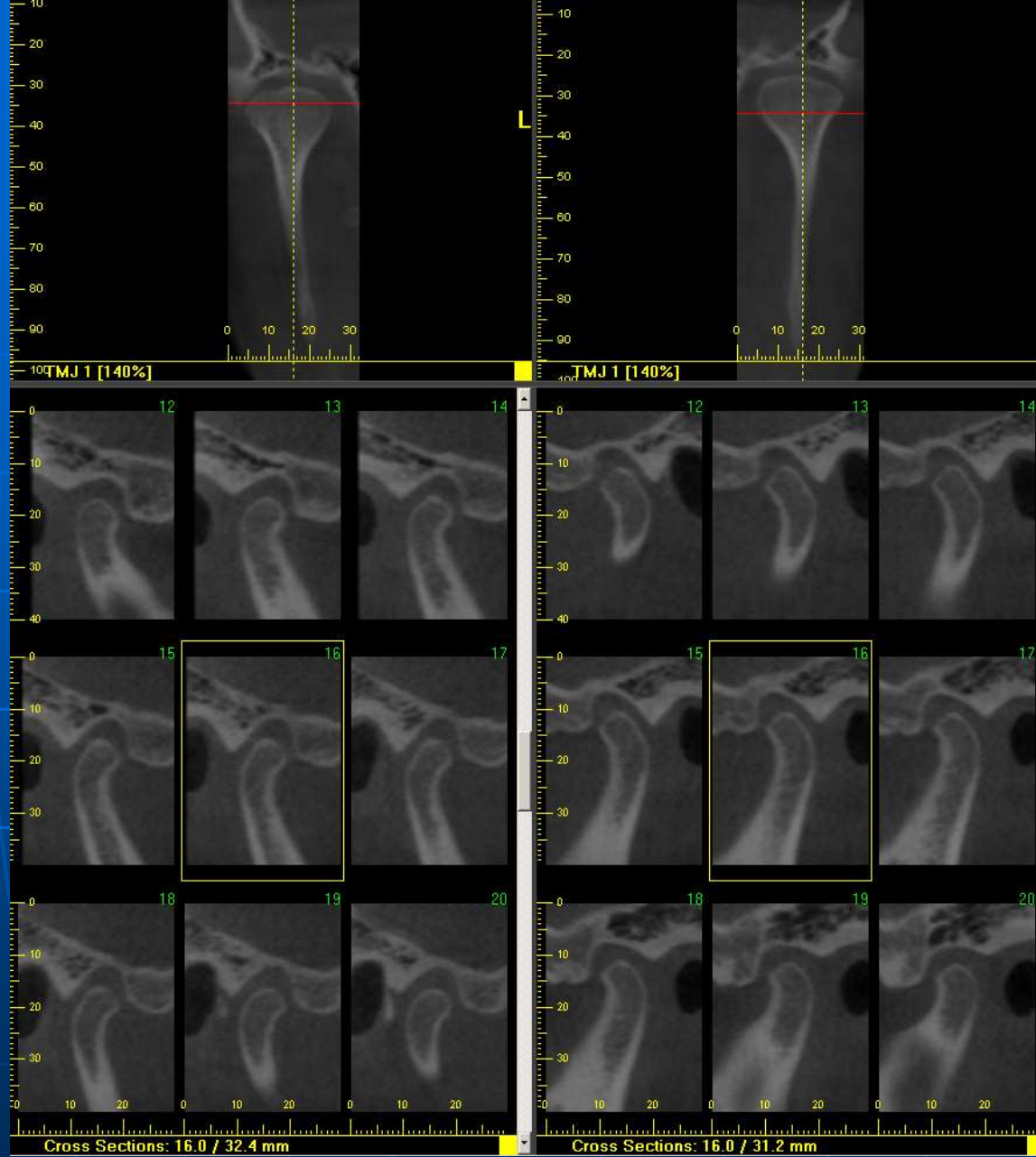


# Imaging



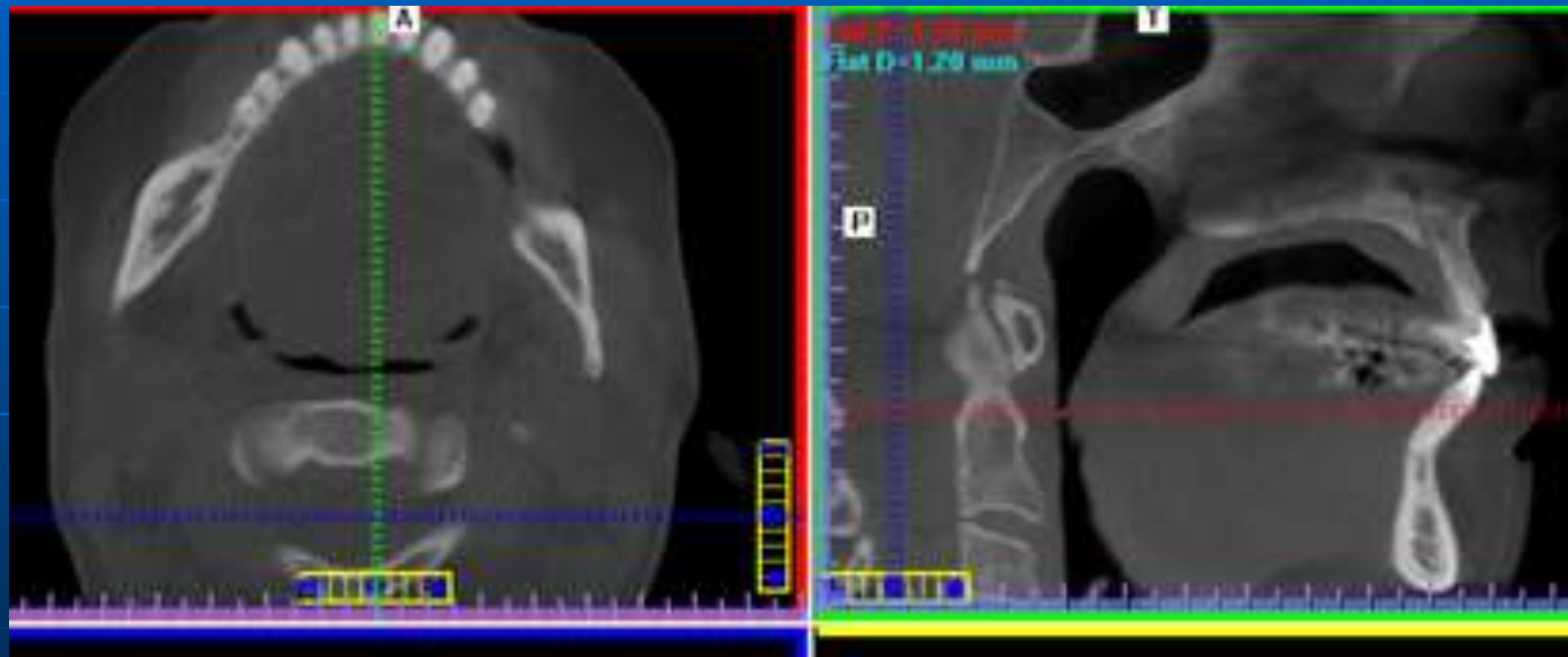
# Panoramic

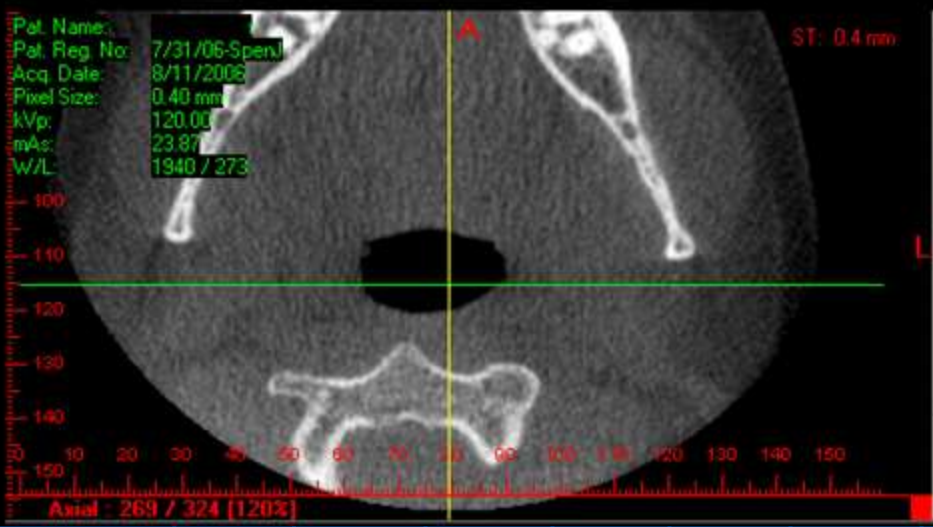
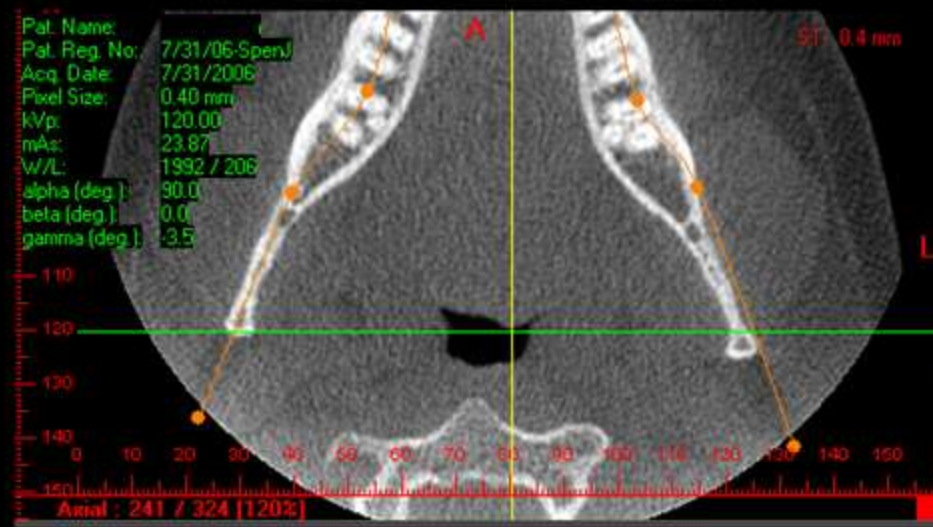




Cone Beam Scan of TM Joints

# 1.2mm Airway!!!





**Cone Beam CT showing pre treatment and with TAP II in place**



**ORAL APPLIANCES  
FOR THE MANAGEMENT  
OF SNORING  
AND OBSTRUCTIVE  
SLEEP APNEA**

“Oral appliances present a useful alternative to continuous positive airway pressure (CPAP), especially for patients with simple snoring and patients with obstructive sleep apnea who cannot tolerate CPAP therapy.”

Wolfgang Schmidt-Nowara et al. Oral Appliances for the Treatment of Snoring and Obstructive Sleep Apnea: A Review; Sleep, 1995; 18(6):501-510.

## PRACTICE PARAMETERS

# Practice Parameters for the Treatment of Snoring and Obstructive Sleep Apnea with Oral Appliances: An Update for 2005

An American Academy of Sleep Medicine Report

*SLEEP* 2006;29(2): 240-243

JRS 2014

# American Academy of Sleep Medicine Clinical Guidelines

Oral appliances are indicated in:

- patients with mild to moderate OSA who prefer them to continuous positive airway pressure (CPAP) therapy, or who do not respond to, are not appropriate candidates for, or who fail treatment attempts with CPAP.



# American Academy of Sleep Medicine Clinical Guidelines

- Until there is higher quality evidence to suggest efficacy, CPAP is indicated whenever possible for patients with severe OSA before considering OAs.

# Other Indications for Oral Appliance Therapy

- As an adjunct to CPAP
  - For use during travel
  - For use when electricity is not readily available (camping/hunting)
- In combination with CPAP to help reduce necessary pressures or to eliminate head gear
- As a predictor of success of “bi-max advancement” surgery

# Major Legal Concerns

- **Compliance with local licensing requirements (**Check with your State!!**)**
- **Issues of professional liability**

**Due to the nature of oral appliance therapy, certain aspects of treatment fall within the scope of practice of physicians and certain others dwell within the scope of practice of dentists.**

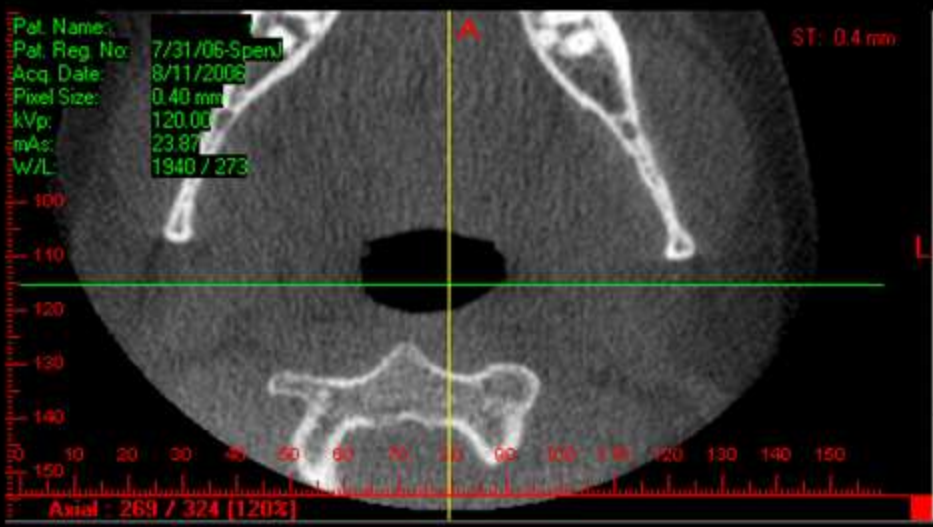
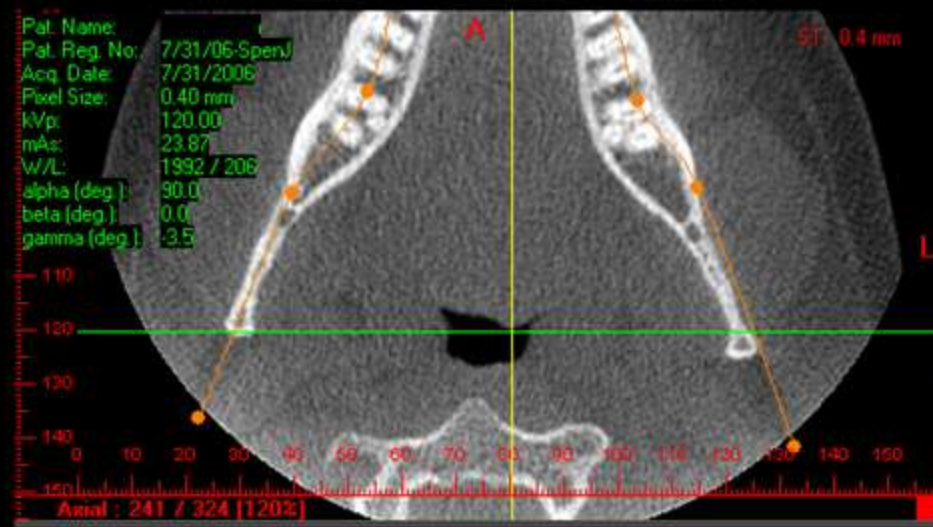
# CPAP and OA Treatment



CPAP Treatment



OA Treatment



# Types of Oral Appliances



# Functional Classification of Oral Appliances

- Tongue Retaining Appliances
- Mandibular Repositioning Appliances
- Combination Oral Appliance and CPAP

# Design Variations

- Method of Retention
- Flexibility of Material
- Adjustability
- Vertical Opening
- Freedom of Jaw Movement
- Laboratory vs. Office Construction

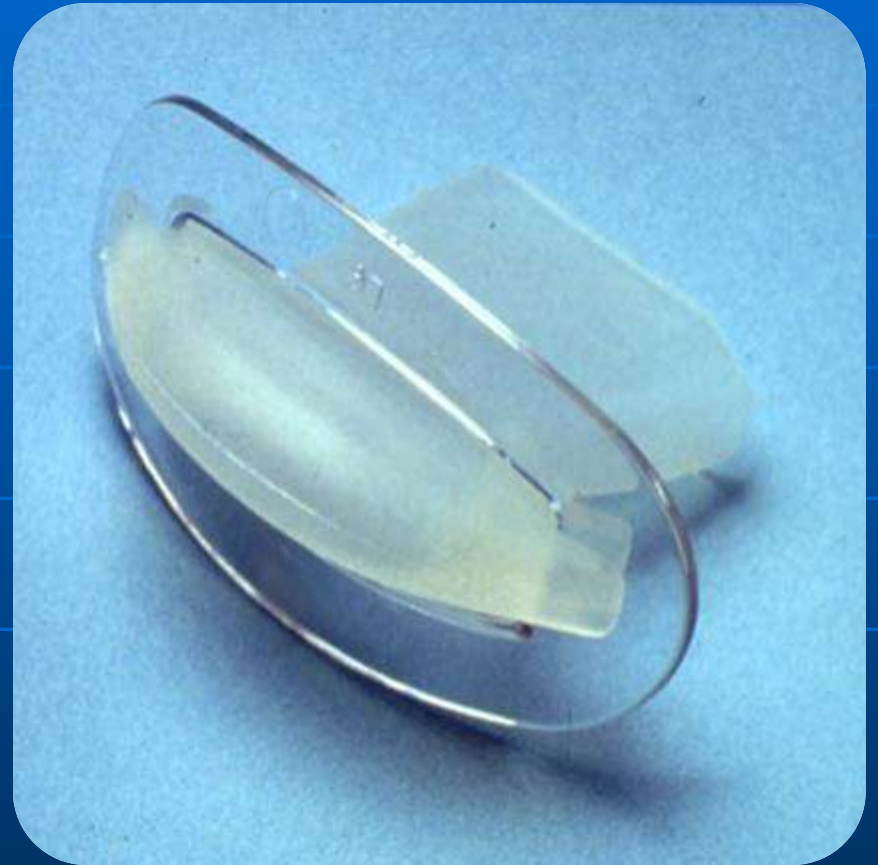


# Tongue Retaining Devices (TRDs)

# Indications for Tongue Retaining Device (TRD)

- Lack of tooth support or edentulous
- Non-apneic snorers or mild OSA
- **Down's Syndrome**

# SNOR-X



# Tongue Retaining Device (TRD)



# Tongue Retaining Device (TRD)

(With Airway Tubes)



# Mandibular Repositioners

# Mandibular Repositioners

*“Non-Adjustable”*

# Clasp Retained Mandibular Repositioner



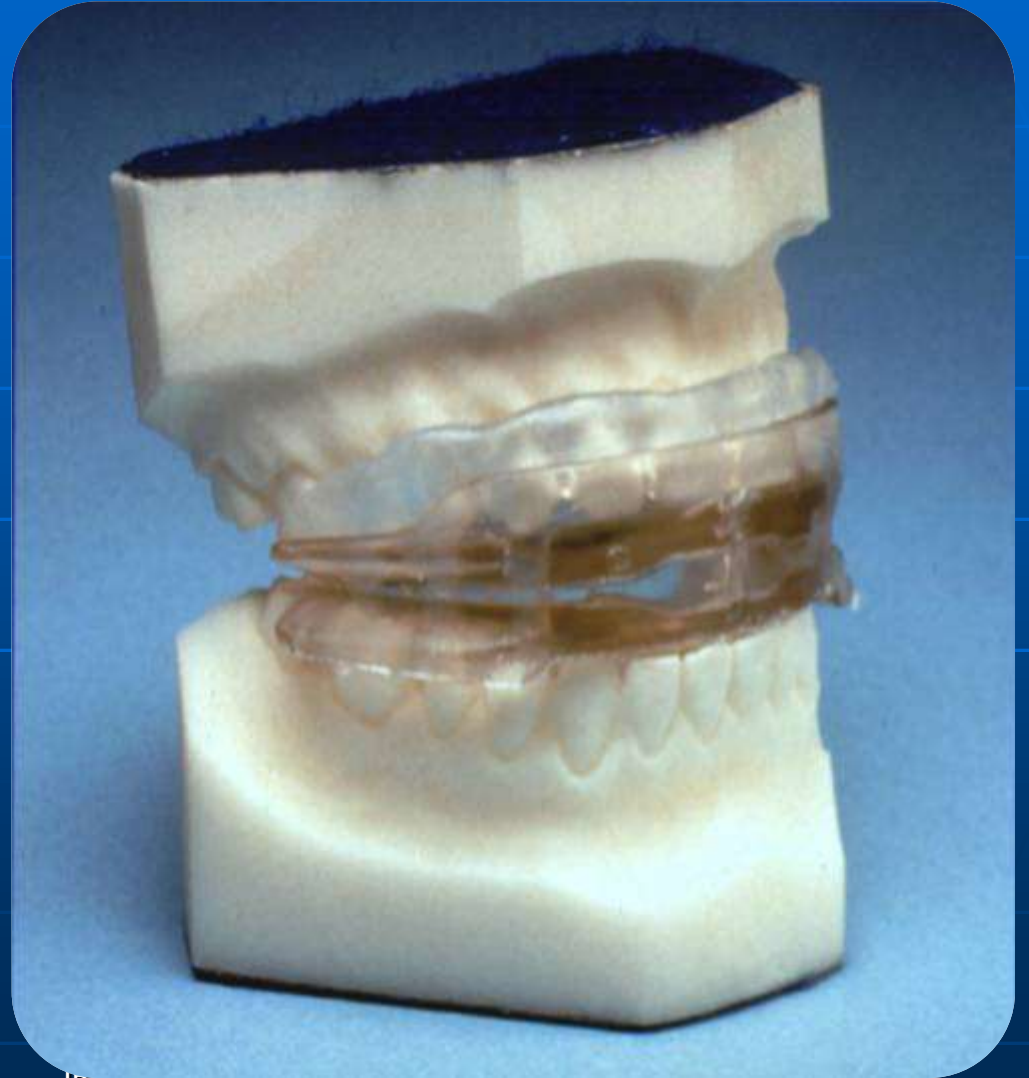


# Elastomeric Sleep Appliance



# TheraSnore

(Non-Adjustable)





**SNORE  
GUARD**



# Sleep Mandibular Repositioning Appliance



# Mandibular Repositioners

*Adjustable*

# Types of Appliances

- Anterior point stop (TAP, Silencer, MDSA, etc.)
- Push (Herbst, SUAD, etc.)
- Pull (EMA, Silent Night, etc.)
- Adjustable Mono block (Moses, PM Positioner, Klearway, etc.)
- Interlocking (Somnomed, Dorsal, Respire, etc.)
- Oasys
- Temporary/Trial (Boil and Bites, Silent Sleep, etc.)

# Anterior Point Stop



# Push





# Pull



# Elastic Mandibular Advancement (EMA) Appliance

STRAPS CHART

LENGTH	DUROMETER (FIRMNESS)			
	Soft (White)	Medium (Yellow)	Firm (Blue)	Extra Firm (Clear)
<b>#1 Extra Long</b> 21 mm (advances mandible 6 mm)				
<b>#2 Long</b> 19 mm (advances mandible 8 mm)				
<b>#3 Medium</b> 17 mm (advances mandible 10 mm)				
<b>#4 Short</b> 15.5 mm (advances mandible 11.5 mm)				
<b>#5 Extra Short</b> 14 mm (advances mandible 13 mm)				



# Adjustable Mono Block



# Interlocking



# Oasys



# Temporary/Trial



Warning

**Sales Pitch Coming.....**

# The Easy Airway

Customizable pre-fabricated oral appliance



The Prefabricated Tray



Filling the Tray with Lining Material



Filling the Tray, Continued



The Lined Tray in the Mouth



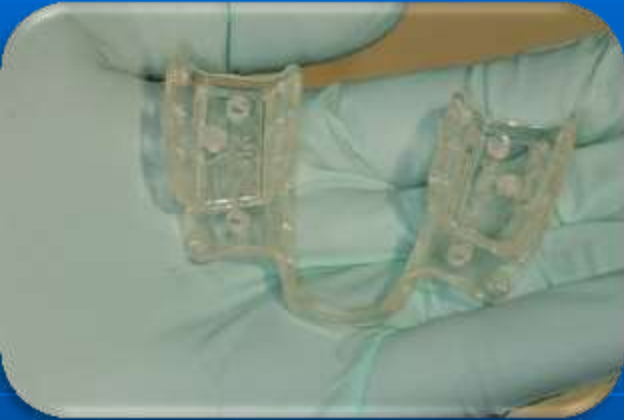
Using the Silent Sleep "Bite Gauge" to establish the mandibular position



The Finished Easy Airway Oral Appliance



# The Easy Airway



1. Non custom (less expensive)
2. Easily fit with VPS (denture reline material)
3. No boiling
4. Easy to alter position
5. May be relined as many times as needed
6. Excellent trial or temporary appliance
7. May be used in youth or children
8. May fit directly in the sleep lab
9. Dental/TMJ uses as well

**[MySilentSleep.COM](http://MySilentSleep.COM)**

# Fitting of the Easy Airway

- For patients who HAVE EVIDENCE OF BRUXISM and are committed to having a sleep study.
- In such a case, the Easy Airway is being fit FOR BRUXISM, and is billed out as a nightguard.

Easy Airway™  
CARDWELL  
Therapeutics



The Easy Airway Tray



Mixing the Putty



Fitting the Tray on the Teeth



Intra Oral Set Time of  
Approximately 2 Minutes



Jaw position determined  
using disposable gauge



Catalyst and Base Putty



Placing the Putty in the Tray



Disposable Bite Gauge used  
to Establish Jaw Position



The Finished Appliance

# Combination Oral Appliance and CPAP

# CPAP/PRO<sup>®</sup>



# Sleep Apnea Airway Management System (SAAMS™)



# Sleep Apnea Airway Management System (SAAMS™)



# TAP-PAP



# Custom Made Nasal / Oronasal Masks







# Custom Made Nasal / Oronasal Masks



# The Best Combination Therapy...



# Possible Complications & Side Effects of Oral Appliance Therapy

- Occlusal Changes
- Jaw Pain/Discomfort
- Tooth Pain/Discomfort

# To Avoid Occlusal Related Side Effects

- Have the patient floss daily
- Have the patient check their occlusion daily

Predict the Problems  
BEFORE  
They Occur

Normal



RDD



NRDD



Dr. Per-Lennart Westesson and Dr. Lars Eriksson  
University of Lund, Sweden.

Internal Derangements



DJD

# Potential Problems

- Patients with reducing disc displacement
  - Jaw may desire to stay more anterior
- Patients with non-reducing disc displacement
  - Added stress may result in previously asymptomatic problem becoming symptomatic
- These patients still need to be treated—just inform them!!



- Annual follow up
- Replace appliance every 3 to 5 years
- Oral appliance therapy is **LIFETIME** therapy for most patients.

# My Standard Protocol

- Referral from physician
- Initial exam
- Records (study models, bite registrations, imaging, other)
- Fitting of appliance
- Follow up visits for comfort and efficacy
- *Possible follow up objective study (Pulse-ox or Home Sleep Test)*
- Referral back to physician for consideration of follow up PSG with titration of the appliance in the sleep lab
- Alteration of the appliance for long term success
- Long term follow up with regular maintenance and replacement of the appliance

# How you might do things...

- Screen ALL your patients for bruxism, snoring and sleep apnea (Epworth, STOP-BANG, Bruxism Questionnaire)
- Treat your patient with a temporary appliance **FOR BRUXISM!!!!**
- Refer your patient **to a sleep doctor** for consideration of a sleep study (with a letter/phone call)
- Follow up with your patient for creation of a long term treatment plan

# The Bottom Line

- Sleep apnea is a serious health concern with a high prevalence in our society.
- Dentists can play an important role in the diagnosis and treatment of sleep disordered breathing (SDB).
- Oral appliances are useful in the treatment of SDB and are often better tolerated than CPAP and can be used adjunctive to CPAP or in combination with CPAP.
- **You Can Do It!!!!**

# **The Dentist's Role in the Diagnosis and Treatment of Snoring and Obstructive Sleep Apnea**

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Diplomate, American Board of Dental Sleep Medicine  
Adjunct Faculty, Tufts Craniofacial Pain Center  
Adjunct Faculty, Anatomy, Boise State University**

JRS 2014

# Parafunction

- Physical behavior that is without functional purpose and may be potentially harmful.



# But what if it isn't parafunction?

- A new paradigm regarding the etiology of many TMJ Disorders and Craniofacial Pain Problems

# Protective Function

- Physical behavior that is intended, whether conscious or subconscious, to improve survival.





# Protective Function

- Physical behavior that is intended, whether conscious or subconscious, to improve survival.



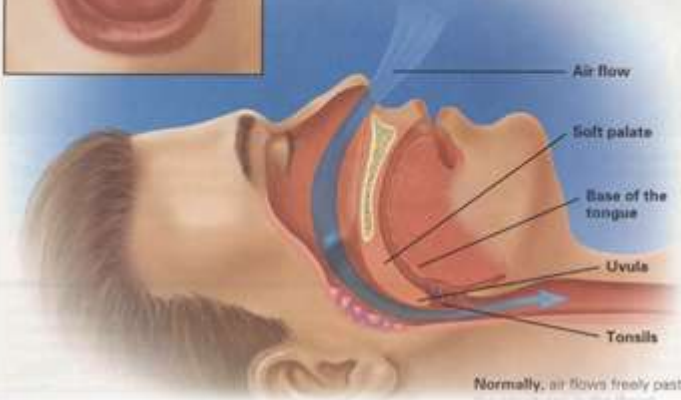


**The soft palate** is the tissue at the back of the roof of your mouth. It helps block off your nose when you swallow.

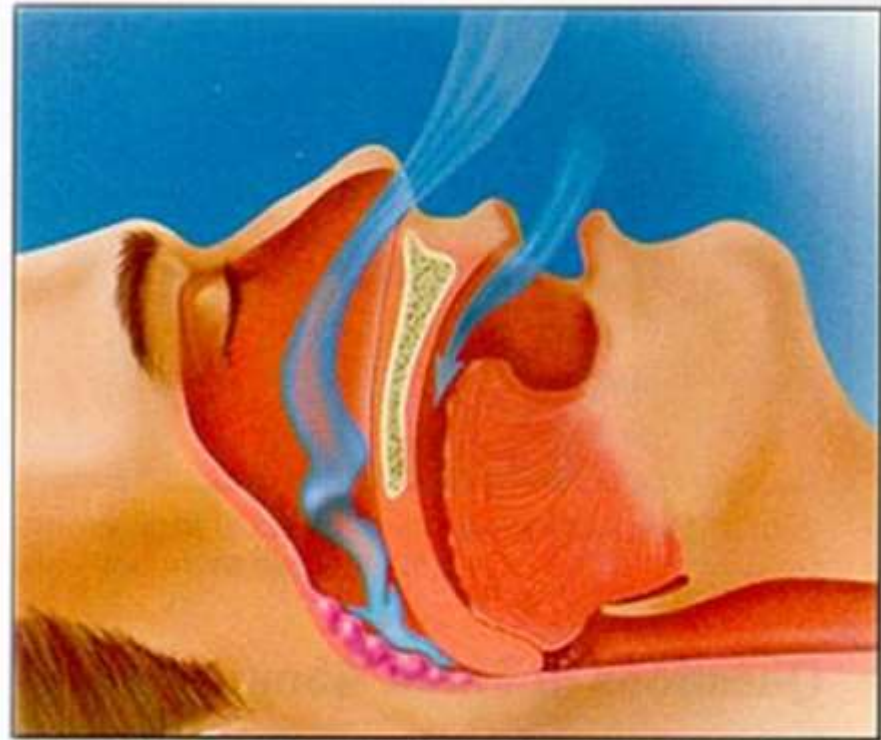
**The uvula** is a long flap of tissue that hangs from your soft palate.

**Tonsils** are balls of tissue in the throat. They may play a small role in helping your body defend itself against illness.

**The tongue** helps you talk, chew, and swallow.



Normally, air flows freely past



**During sleep apnea, air flow is completely blocked.**



**During snoring, air flow is partially blocked.**

# Nocturnal Bruxism

- Proposed Mechanisms

[Chest](#). 2008 Aug;134(2):332-7. Epub 2008 May 19.

A significant increase in breathing amplitude precedes sleep bruxism.

[Khoury S](#), [Rouleau GA](#), [Rompré PH](#), [Mayer P](#), [Montplaisir JY](#), [Lavigne GJ](#).

Faculté de Médecine Dentaire, Université de Montréal, CP 6128, Succursale Centre-ville, Montréal, QC, Canada

**BACKGROUND:** Sleep bruxism (SB) is a stereotyped movement disorder that is characterized by rhythmic masticatory muscle activity (RMMA) and tooth grinding.

**METHODS:** Polygraphic sleep recordings of 20 SB subjects without any sleep-related breathing disorders were analyzed for changes in respiration.

**RESULTS:** A positive and significant correlation was found between the frequencies of RMMA episodes and the amplitude of breath ( $R(2) = 0.26$ ;  $p = 0.02$ ). The amplitude of respiratory changes was 11 times higher when arousal was associated with RMMA in comparison to arousal alone.

**CONCLUSIONS:** To our knowledge, this is the first report showing that RMMA-SB muscle activity is associated with a rise in respiration within arousal.

• [Arch Oral Biol.](#) 2007 Apr;52(4):381-4. Epub 2007 Feb 20.

• Genesis of sleep bruxism: motor and autonomic-cardiac interactions.

• [Lavigne GJ](#), [Huynh N](#), [Kato T](#), [Okura K](#), [Adachi K](#), [Yao D](#), [Sessle B](#).

• Faculté de médecine dentaire, Université de Montréal, Montréal, Canada.

• We showed that RMMA are secondary to a sequence of events in relation to sleep micro-arousals: the heart (increase in autonomic sympathetic activity) and brain are activated in the minutes and seconds, respectively, before the onset of activity in suprahyoid muscles and finally by RMMA in jaw closing masseter or temporalis muscles.

• The above results suggest that the onset of RMMA and SB episodes during sleep are under the influences of brief and transient activity of the brainstem arousal-reticular ascending system contributing to the increase of activity in autonomic-cardiac and motor modulatory networks.

- [Sleep](#). 2003 Jun 15;26(4):461-5.

- Association between sleep bruxism, swallowing-related laryngeal movement, and sleep positions.

- [Miyawaki S](#), [Lavigne GJ](#), [Pierre M](#), [Guitard F](#), [Montplaisir JY](#), [Kato T](#).

- Facultés de médecine et de médecine dentaire, Université de Montréal, Québec, Canada.

- PARTICIPANTS: Nine patients with sleep bruxism and 7 normal subjects were matched for age and sex.
- In sleep bruxism patients, although sleeping time did not differ between the 2 sleeping body positions, 74% of rhythmic masticatory muscle activity and swallowing events were scored in the supine position compared to 23% in the lateral decubitus position.

# Nocturnal Bruxism

- Relationship to Sleep Apnea

- [Chest](#). 1986 Sep;90(3):424-9.

- Effect of sleep position on sleep apnea and parafunctional activity.

- [Phillips BA](#), [Okeson J](#), [Paesani D](#), [Gilmore R](#).

- Because sleep apnea leads to sleep arousals, and because sleep arousals are thought to result in increased parafunctional activity, we undertook the present study to determine the relationship between sleep apnea and parafunctional activity.

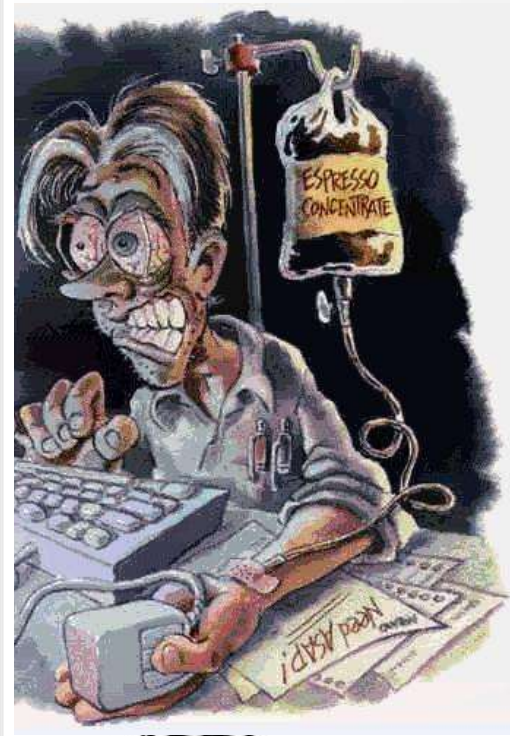
- 24 patients

- Nocturnal clenching was slightly higher in patients with sleep apnea than those without (12.2 vs 7.6 clenches/hr,  $p = 0.18$ ), and there was a correlation between the clench index (CI) and apnea plus hypopnea index (A + HI)

- There were significant falls in both the A + HI (64.4 +/- 28.8 vs 36.5 +/- 36.7,  $p = 0.02$ ) and CI (12.5 +/- 12.1 vs 7.0 +/- 8.6,  $p = 0.04$ ) in the lateral decubitus vs supine sleeping positions.

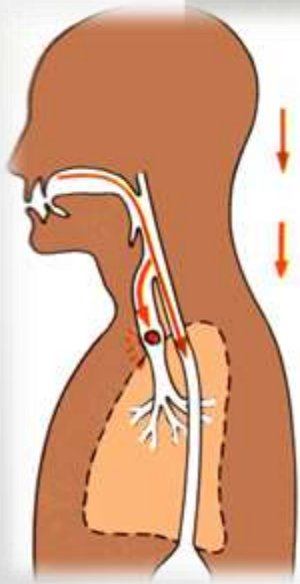


Why do people grind and  
clench their teeth?





ss?



Normal passage of food

Food inhaled down windpipe



# Bruxism and Sleep Apnea in Children

**Bruxism**  
(Teeth Grinding)



• [J Oral Sci.](#) 1999 Sep;41(3):99-103.

• Clinical findings in Japanese children with obstructive sleep apnea syndrome: focus on dental findings.

• [Kawashima S](#), [Niikuni N](#), [Lo CH](#), [Kohno M](#), [Nakajima I](#), [Akasaka M](#).

• Department of Pediatric Dentistry, Nihon University School of Dentistry, Tokyo, Japan.

- Twenty-seven OSA children.
- Apnea index (AI) of 5 or more on polysomnographs.
- Their clinical history was obtained from their mothers, and oral findings were also evaluated. The patient consisted of 15 males (56%) and 12 females (44%).
- Snoring was the most frequently observed finding (100%).
- In terms of dentistry, oral breathing was the most frequently observed finding.

- [J Bras Pneumol.](#) 2008 Jun;34(6):356-61.
- Symptoms of obstructive sleep apnea-hypopnea syndrome in children
- [Gregório PB](#), [Athanasio RA](#), [Bitencourt AG](#), [Neves FB](#), [Terse R](#), [Hora F](#).
- Instituto Cardiopulmonar, Salvador, BA, Brasil.
  
- Evaluated 38 children consecutively referred to the sleep laboratory with suspicion of OSAHS
- Severe cases of apnea were most common among children under the age of six
- In children with OSAHS, the most common symptoms were snoring and nasal obstruction,
- Excessive sleepiness and bruxism were seen in 29.4 and 34.3%,
- All of the children diagnosed with severe OSAHS also presented snoring and bruxism.

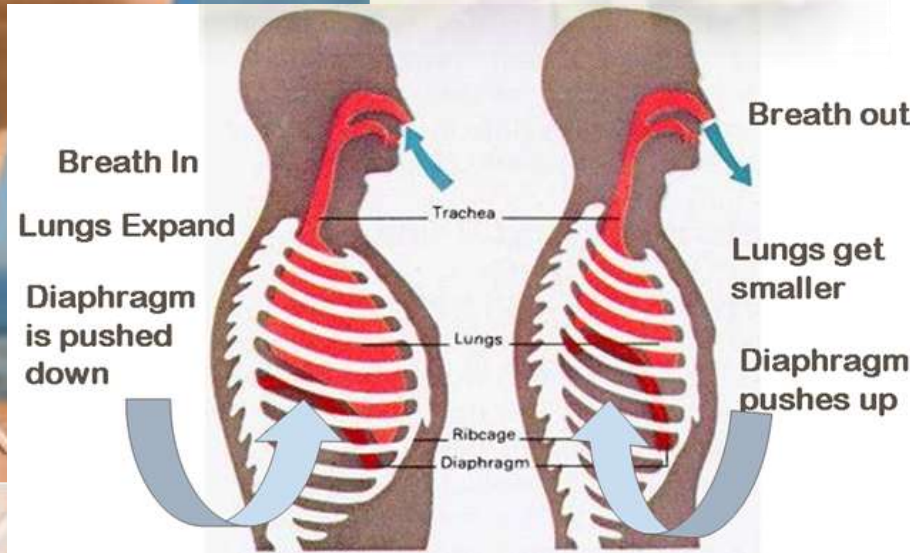
- [Int J Pediatr Otorhinolaryngol.](#) 2004 Apr;68(4):441-5.
  - Improvement of bruxism after T & A surgery.
  - [DiFrancesco RC](#), [Junqueira PA](#), [Trezza PM](#), [de Faria ME](#), [Frizzarini R](#), [Zerati FE](#).
  - Division of Otolaryngology, São Paulo University Medical School
- 
- Before surgery all the 69 children presented sleep apnea and 45.6% presented bruxism. Malocclusion could be found in 60.71%. Three months after surgery none of the children presented breathing problems and only 11.8% presented bruxism. There was no difference in malocclusion.
  - **CONCLUSIONS: This study suggests that there is a positive correlation between sleep-disordered breathing and bruxism. There was an important improvement of bruxism after T & A surgery.**

# Nocturnal Bruxism

- Effective Treatment



Breathe



# Nocturnal Bruxism

- Effective Treatment
- CPAP



# CONTINUOUS POSITIVE AIRWAY PRESSURE (CPAP)

AIRWAY PRESSURE (CPAP)  
CONTINUOUS POSITIVE

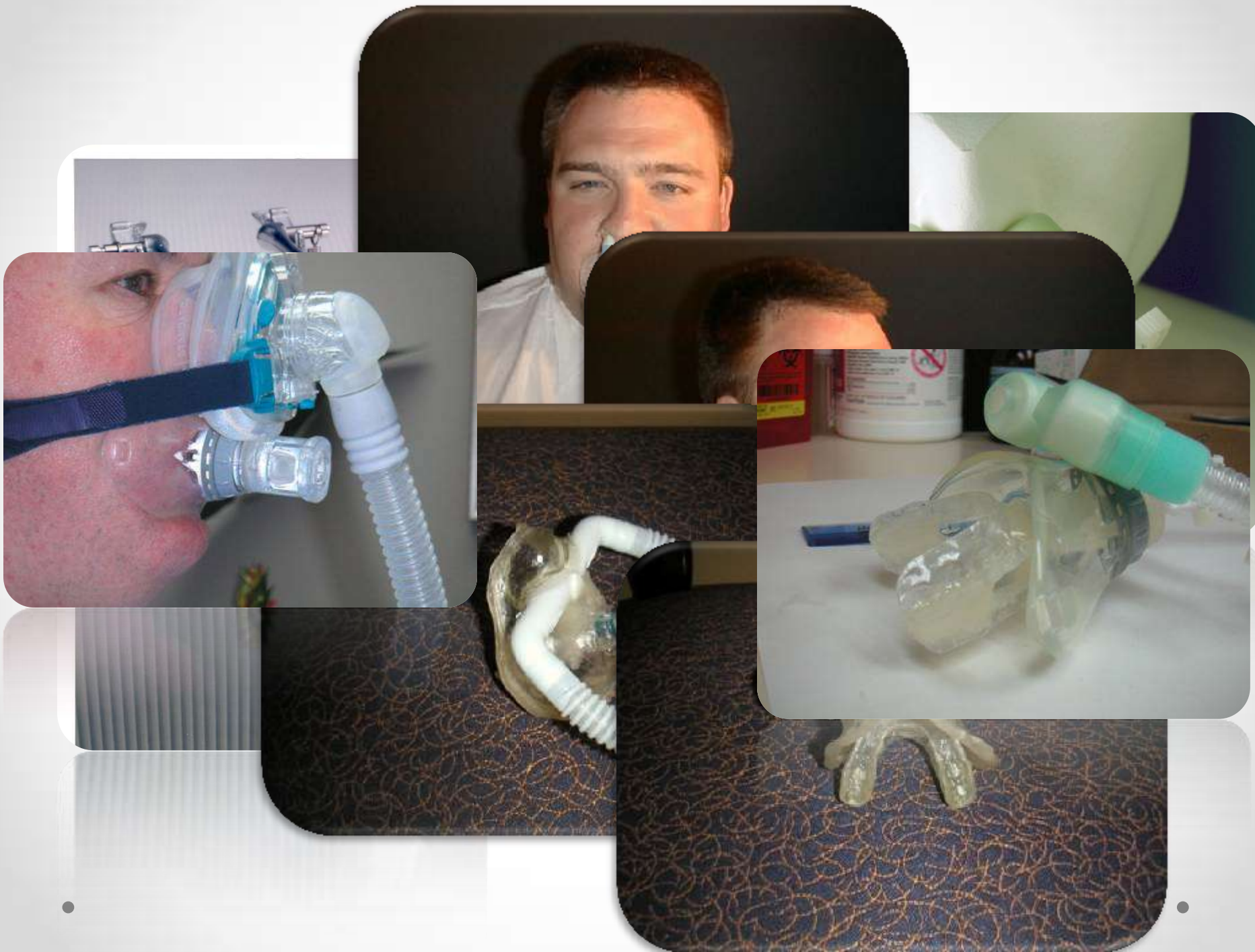
- [Sleep Med.](#) 2002 Nov;3(6):513-5.

- Sleep bruxism related to obstructive sleep apnea: the effect of continuous positive airway pressure.

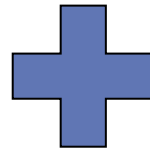
- [Oksenberg A, Arons E.](#)

- Sleep Disorders Unit, Loewenstein Hospital-Rehabilitation Center, P.O. Box 3, Raanana, Israel.

- During the CPAP titration night most breathing abnormalities were eliminated and a complete eradication of the tooth grinding events was observed. The results of this study suggest that when sleep bruxism is related to apnea/hypopneas, the successful treatment of these breathing abnormalities may eliminate bruxism during sleep.



# The Best Combination Therapy...



# Nocturnal Bruxism

- Effective Treatment
- Bite Splints (?)





## Stress Reduction Kit

**Bang  
Head  
Here**

### Directions:

1. Place kit on FIRM surface.
2. Follow directions in circle of kit.
3. Repeat step 2 as necessary, or until unconscious.
4. If unconscious, cease stress reduction activity.



Int J Prosthodont. 2004 Jul-Aug;17(4):447-53.

**Aggravation of respiratory disturbances by the use of an occlusal splint in apneic patients: a pilot study.**

[Gagnon Y](#), [Mayer P](#), [Morisson F](#), [Rompré PH](#), [Lavigne GJ](#).

Faculty of Dental Medicine, University of Montreal, Canada.

- Four patients experienced an aggravation in apnea diagnosis category on the night they used the splint. The AHI was increased by more than 50% in 5 of the 10 patients. The RDI showed a 30% increase from baseline to splint nights. The percentage of sleeping time with snoring also increased by 40% with the splint.

- Int J Prosthodont. 2004 Jul-Aug;17(4):447-53.

- **Aggravation of respiratory disturbances by the use of an occlusal splint in apneic patients: a pilot study.**

- [Gagnon Y](#), [Mayer P](#), [Morisson F](#), [Rompré PH](#), [Lavigne GJ](#).

- Faculty of Dental Medicine, University of Montreal, Canada.

- **CONCLUSION:** This open study suggested that the use of an occlusal splint is associated with a risk of aggravation of respiratory disturbances. It may therefore be relevant for clinicians to question patients about snoring and sleep apnea when recommending an occlusal splint.

# Nocturnal Bruxism

- Effective Treatment
- Mandibular Advancement

# CPAP and OA Treatment



CPAP Treatment



OA Treatment



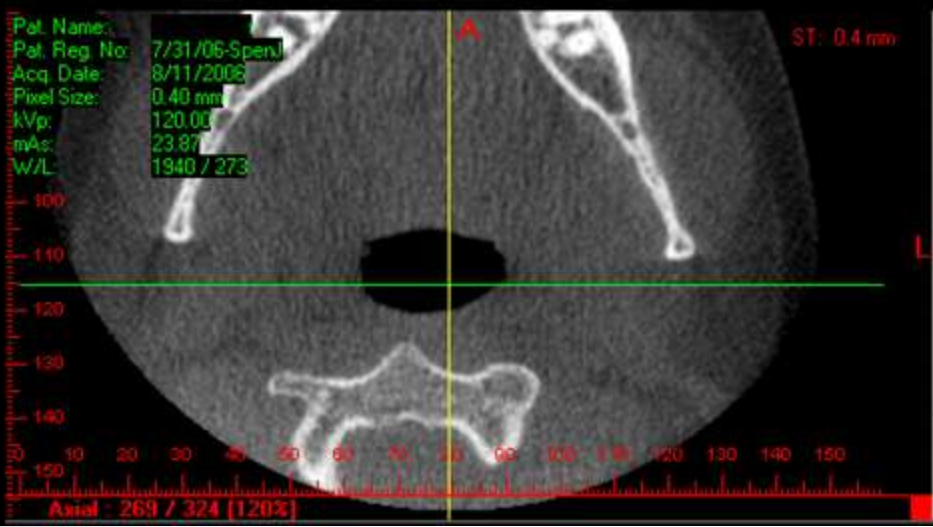
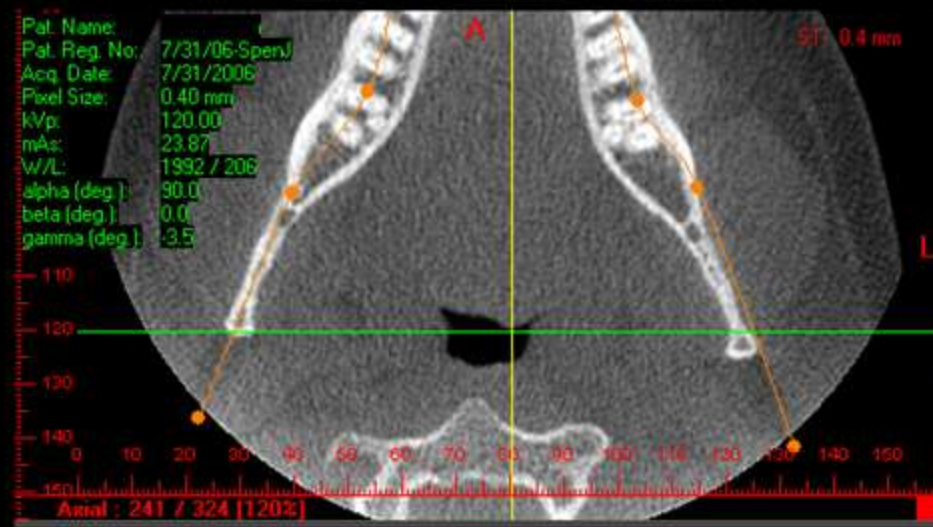
**SOURCE:** Copyright. American Heart Association. *Instructor's Manual for Basic Life Support*. Dallas: American Heart Association, 1987.

★ *Figure 2-5. Head-tilt/chin-lift technique of opening airway.*

★ *Figure 2-5. Head-tilt/chin-lift technique of opening airway.*

American Heart Association, 1987.

Instructor's Manual for Basic Life Support



Cone Beam CT showing mandible with TAP II in place

# The Silent Sleep

Customizable pre-fabricated oral appliance



The Prefabricated Tray



Filling the Tray with Lining Material



Filling the Tray, Continued



The Lined Tray in the Mouth



Using the Silent Sleep "Bite Gauge" to establish the mandibular position



The Finished Silent Sleep Oral Appliance





- [Int J Prosthodont. 2009 May-Jun;22\(3\):251-9.](#)
- Effect of an adjustable mandibular advancement appliance on sleep bruxism: a crossover sleep laboratory study.
- [Landry-Schönbeck A, de Grandmont P, Rompré PH, Lavigne GJ.](#)
- Department of Prosthodontics, Faculty of Dental Medicine, Université de Montréal, Canada.
- Twelve subjects
- 5 nights in a sleep laboratory. After habituation and baseline nights, 3 more nights were spent with an MAA in either a slight (25%) or pronounced (75%) mandibular protrusion position or with an MOS (control).
- CONCLUSION: Short-term use of an MAA is associated with a significant reduction in SB motor activity.

Int J Prosthodont. 2006 Nov-Dec;19(6):549-56.

**Reduction of sleep bruxism using a mandibular advancement device: an experimental controlled study.**

[Landry ML](#), [Rompré PH](#), [Manzini C](#), [Guitard F](#), [de Grandmont P](#), [Lavigne GJ](#).

Faculté de Médecine Dentaire, Université Laval, Canada.

- Thirteen intense and frequent bruxors
- The MOS was used as the active control condition and the MAD was used as the experimental treatment condition.
- Designed to temporarily manage snoring and sleep apnea, the MAD was used in 3 different configurations.
- CONCLUSIONS: Short-term use of a temporary custom-fit MAD is associated with a remarkable reduction in sleep bruxism motor activity.

# Screening Your Patients

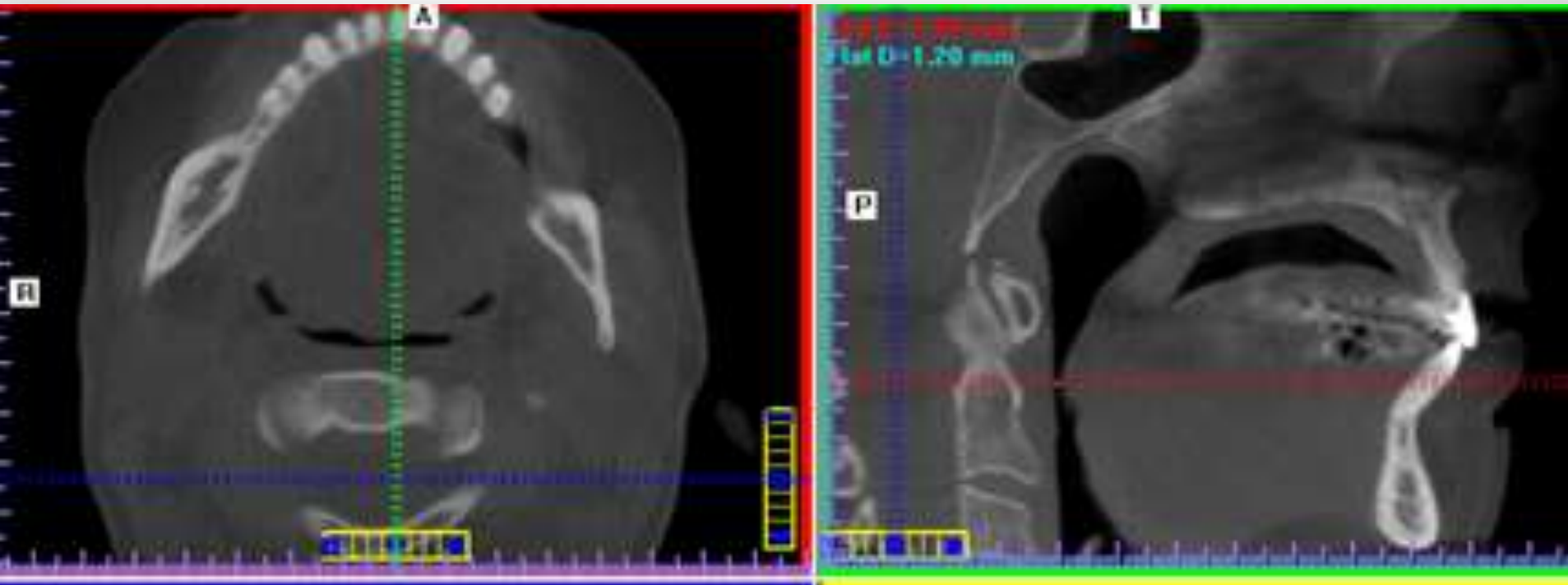


Worn teeth due to grinding (Bruxism)



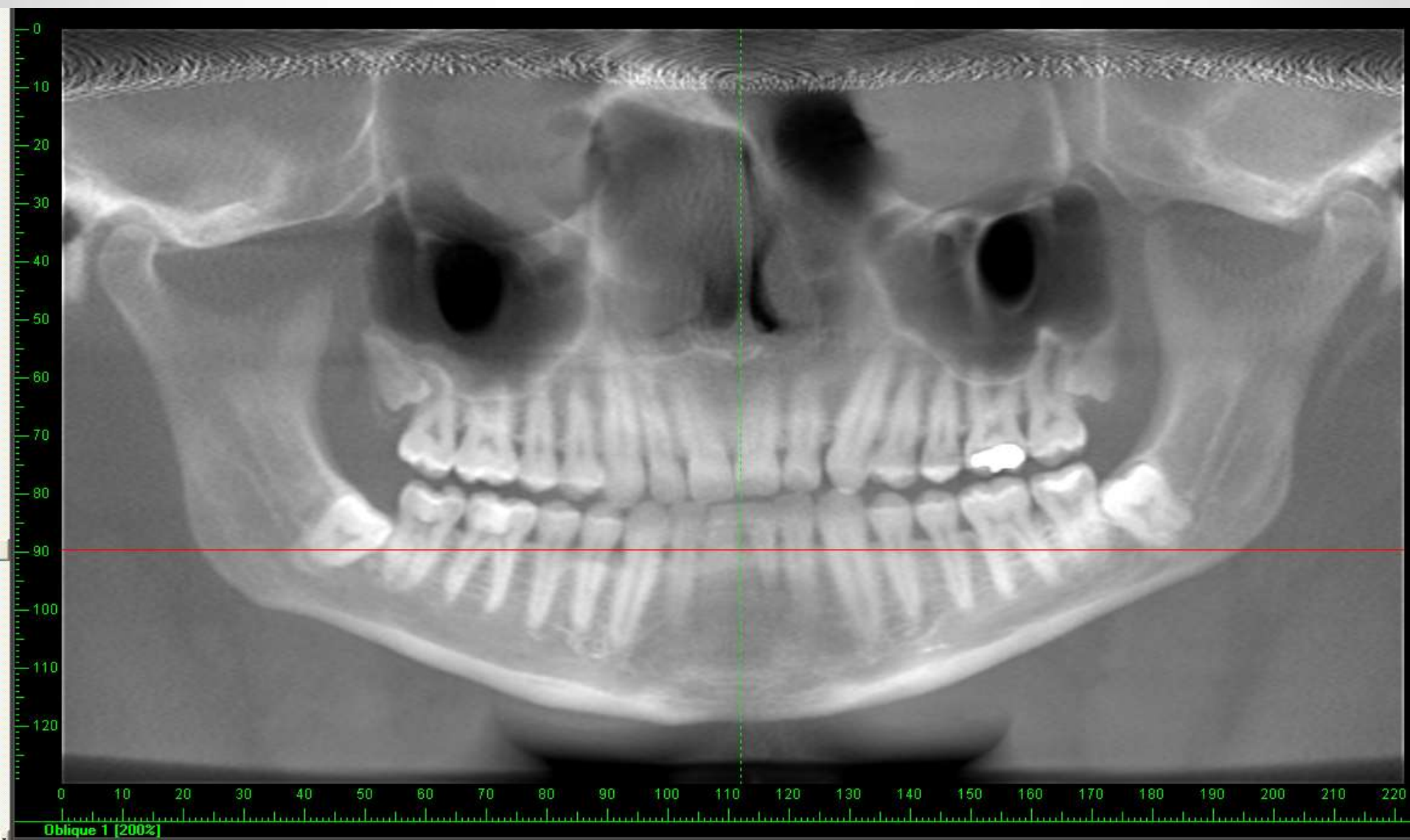


# 1.2 mm Airway!!!

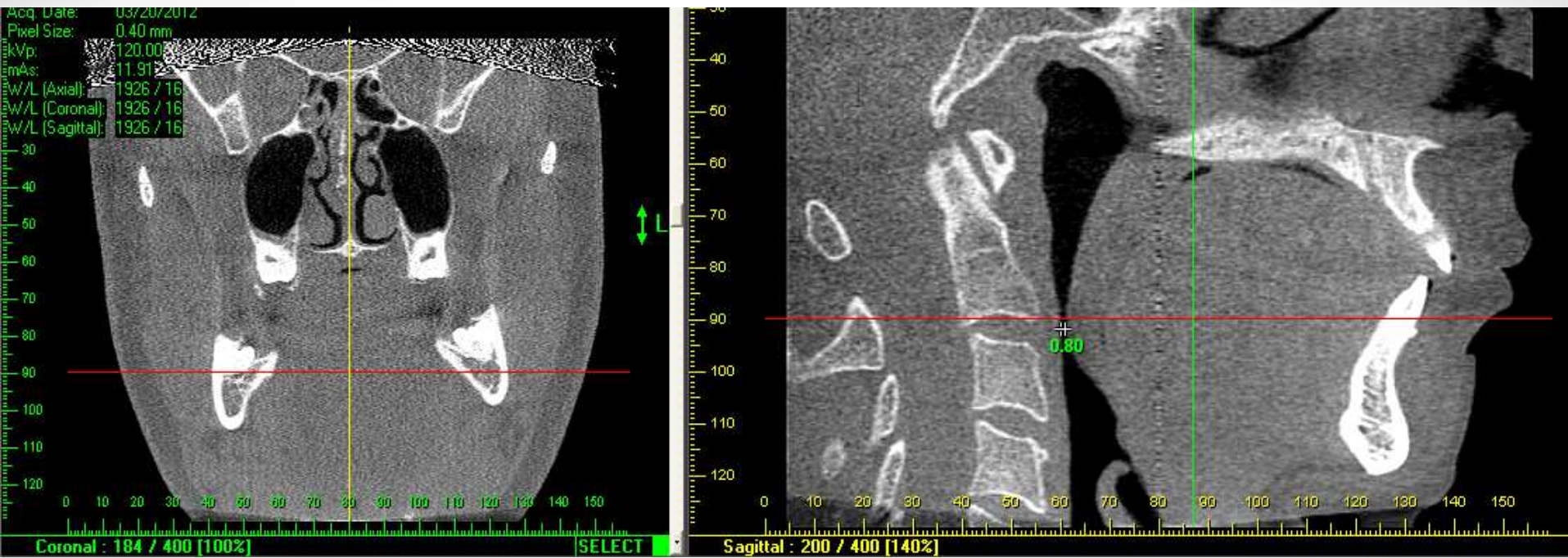








# 0.8 mm Airway!!!



**With Teeth Apart!!!**

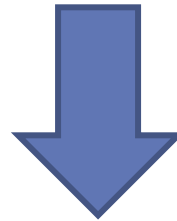


# Case Studies

# Nacho



- Male
- 42 years old
- Chief Complaint: Tired, lack of energy
- Doctor asks, “Do you snore?”
- Patient says, “Yes.”

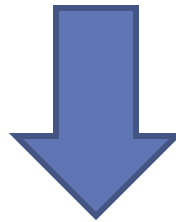


- Refer for Sleep Study

# Christy



- Female
- 44 years old
- Chief Complaint: “Tired, lack of energy”
- Doctor asks, “Are you having trouble sleeping?”
- Patient says, “Yes.”



# Becky

- 35yo,
- 5'5", 125 lbs, BMI 20.8,
- Healthy
- square jawed
- large tori
- snoring
- anterior wear (bonding which she broke off)
- "jaw has always popped,"
- NG for 4 years
- Referred to me by dentist for chief complaints of temporal headaches, bilateral jaw pain
- Patient thought her pain might have been brought on by stress since her husband went to China and she has 3 small boys.



• **AHI = 24**

# Linda

- 54yo woman
- 5' 2", 122lbs, BMI 22.3,
- AHI 11, supine AHI 21, REM AHI 36
- Chief complaints of extreme facial pain, jaw clicking, jaw pain, ear pain (2007 sleep study—CPAP intolerant, history of chronic TMD and facial pain among other problems, treated with antidepressants)



- **The mystery is in the history...**





**THE DOCTORS**

Botox for TMJ?

# In Conclusion

- Headaches and TMJ Disorders in general may be related to “parafunctional” activity
- Parafunction may actually be Protective Function
- When the etiology of the Headache/TMD is bruxism related to OSA, treatment of the OSA often results in improvement or elimination of the TMD.
- Before initiating treatment that has the potential to negatively affect the airway (flat plane splints, NTI, botox injections, etc.), or that is irreversible (surgery, dental reconstruction, etc.), rule out OSA.

# “All you need is love”

- The Beatles



“All I need  
is the air that I breathe,  
and to love you”



- The Hollies



# **The Dentist's Role in the Diagnosis and Treatment of Snoring and Obstructive Sleep Apnea**

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**[www.AACFP.org](http://www.AACFP.org)**