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Introduction to Sleep Disordered Breathing 2020

Objectives

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- **Obstructive Sleep Apnea**

  - List the symptoms and associated comorbid conditions seen with OSA.
  - Define the polygraphic patterns associated with obstructive sleep disordered breathing.
  - Describe the major treatments used for OSA.

Objectives

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- **Central Sleep Apnea**

  - Define and identify central sleep apnea.
  - Describe the differences between obstructive and central sleep apnea.
  - List some treatment options.

Normal Breathing

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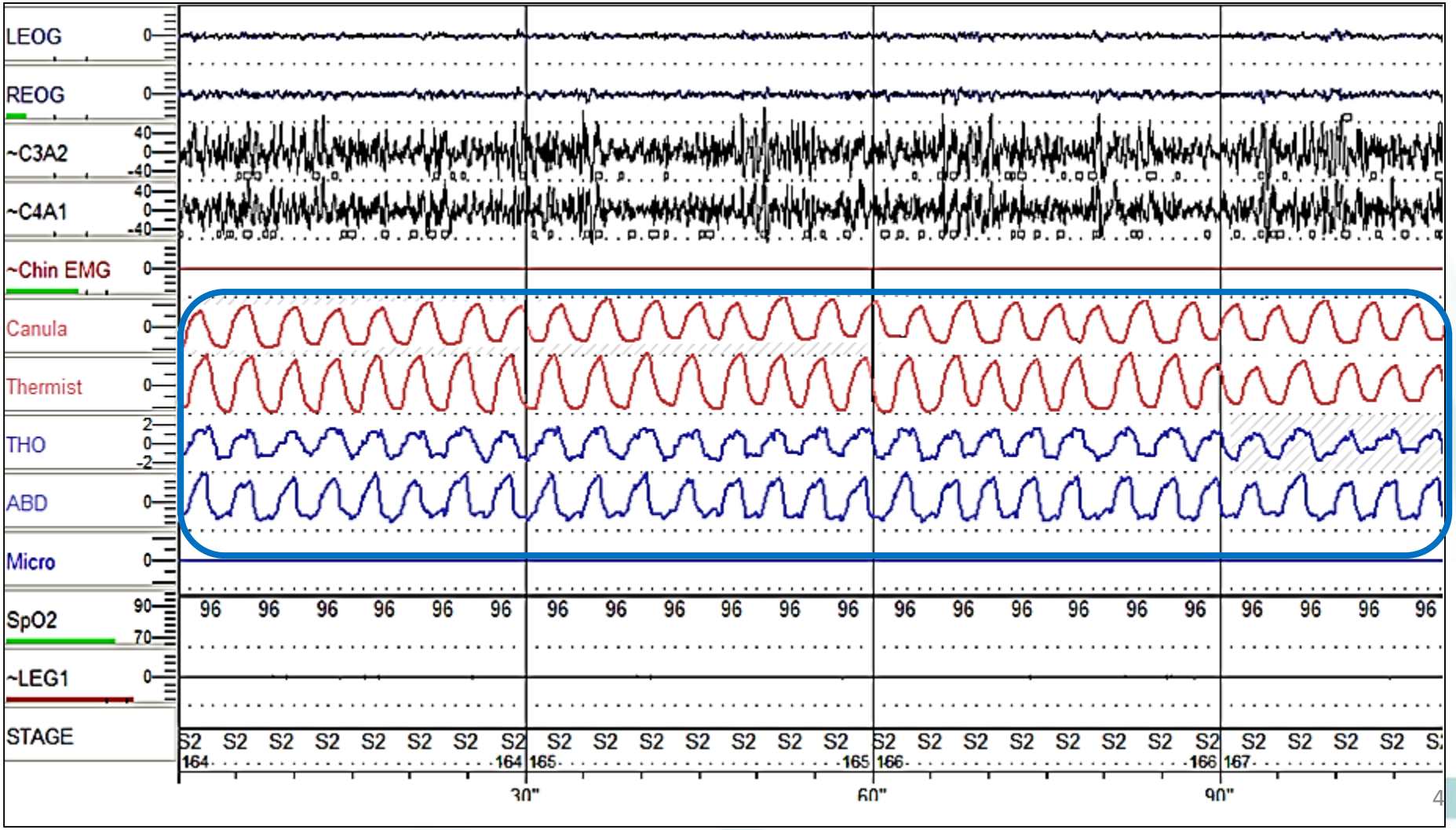

Representative Signal

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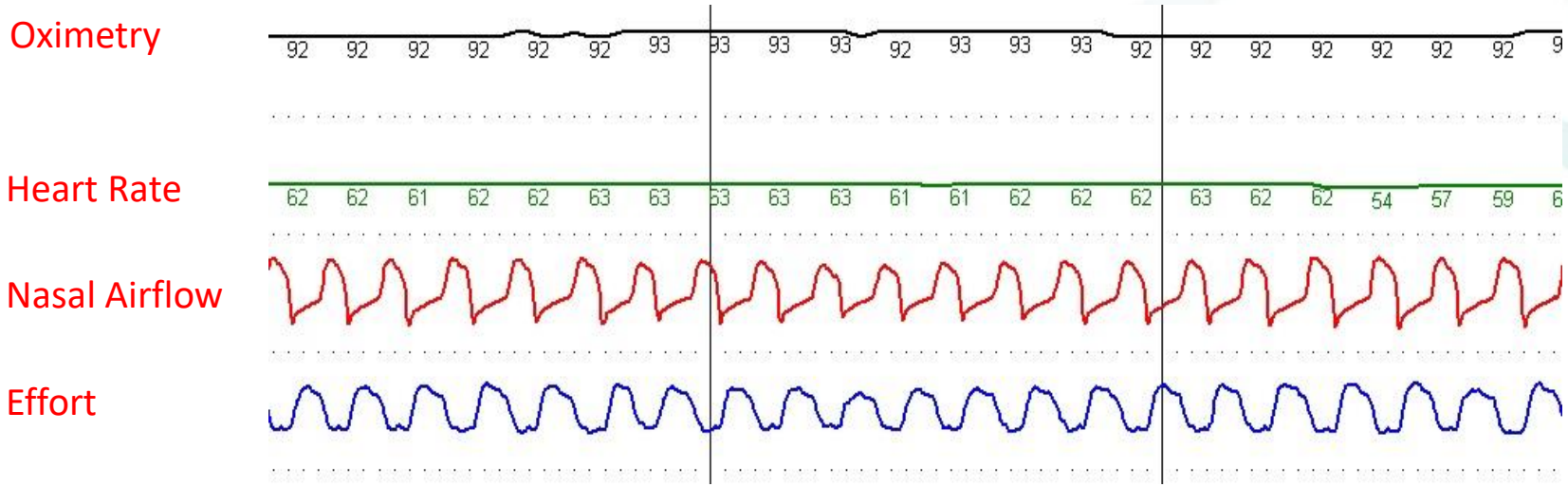
- **Normal Breathing**



← 30 sec epoch →

What is Sleep Disordered Breathing?

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- Is used to describe a group of disorders characterized by abnormalities of the respiratory pattern or ventilation during sleep.

What is Sleep Apnea?

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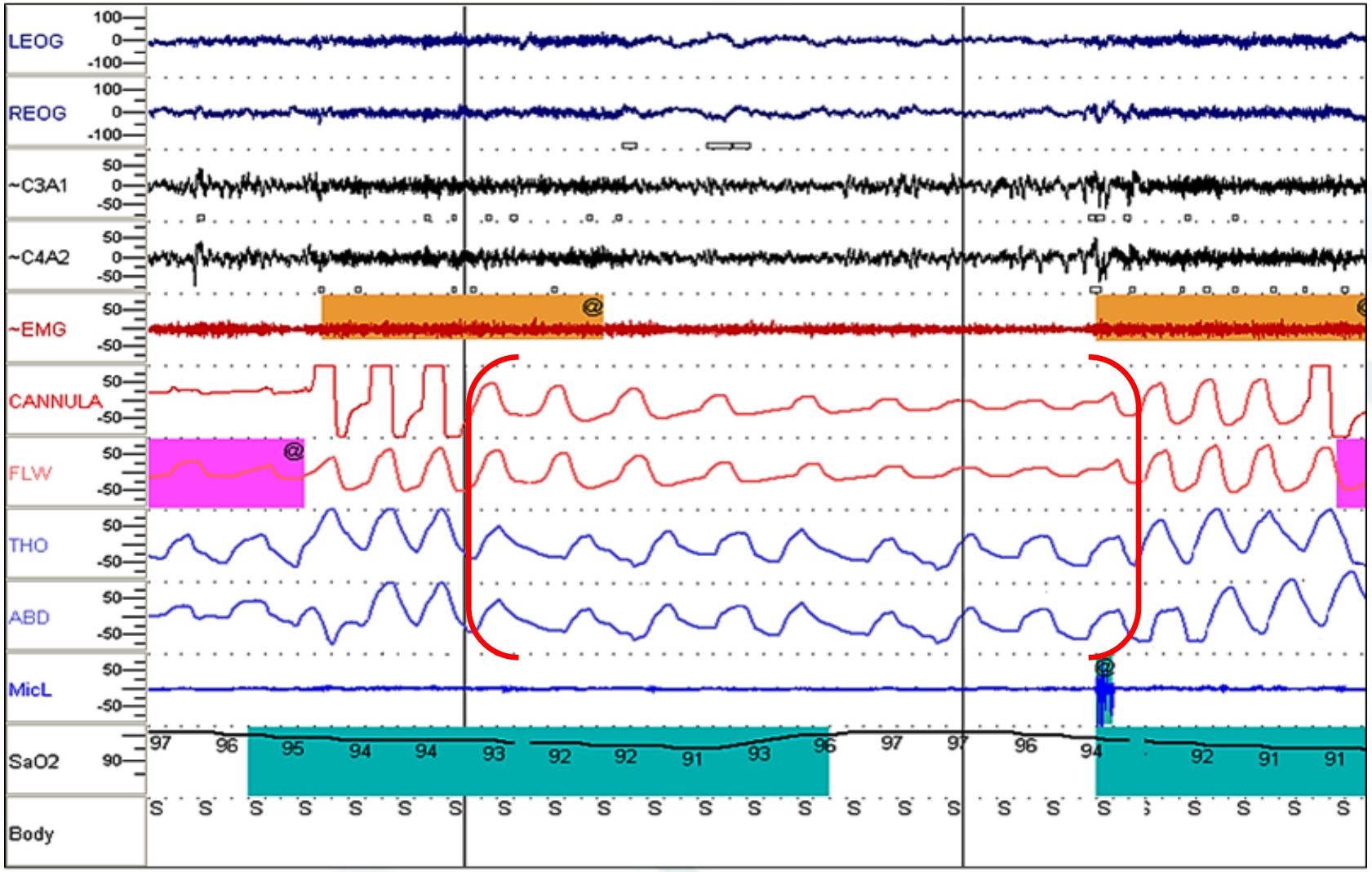
- Defined as a cessation of airflow for a minimum of 10 seconds.

Hypopnea



Categories of Sleep Apnea

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A. Obstructive Events

B. Central Events

C. Mixed Events

Apnea Patterns

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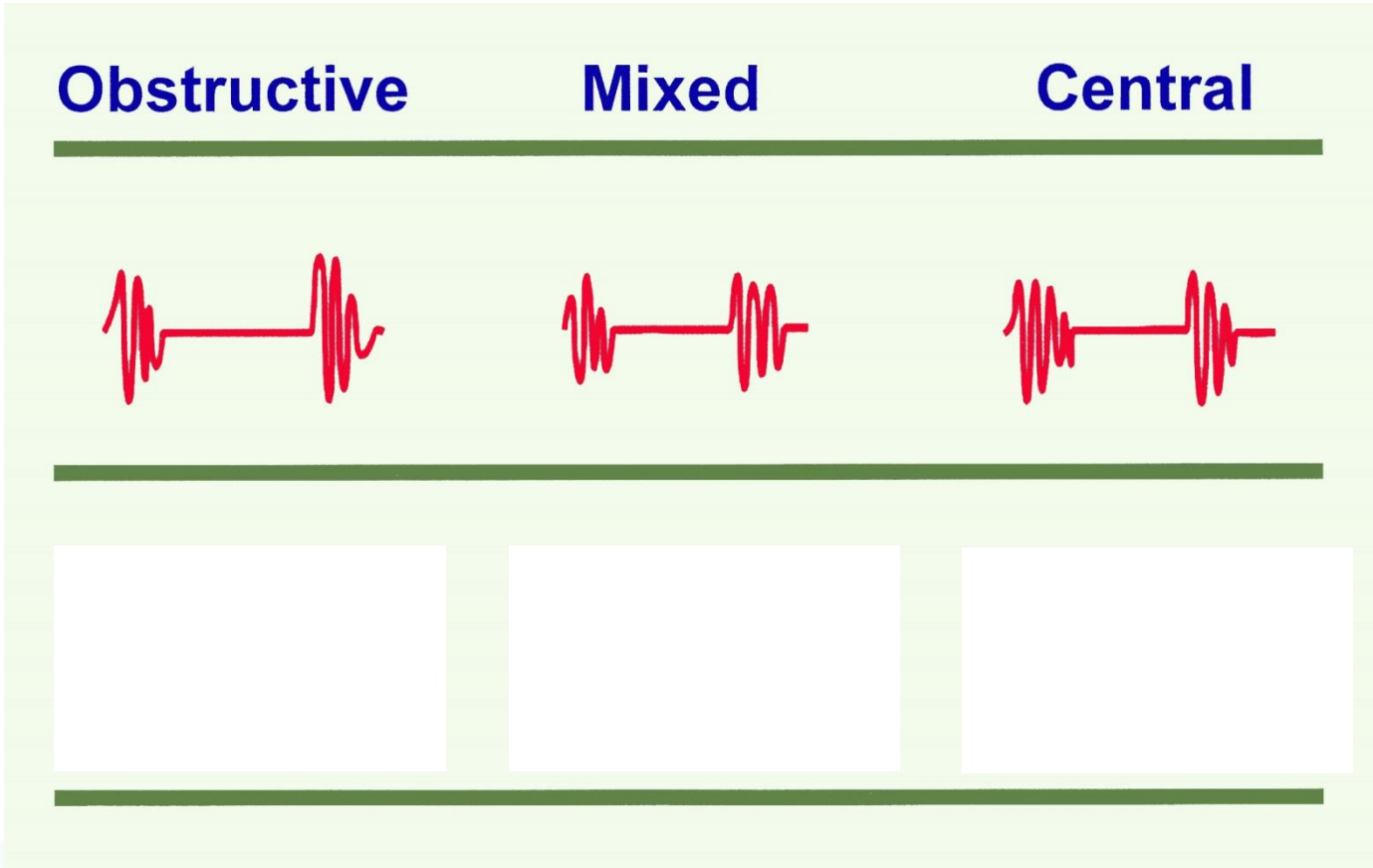

Is it familiar?

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A.) What is OSA?

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- **Criteria A & B**
- **Or Criteria C**

(ICSD), 3rd ed. 2014

A.) What is OSA?

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A. The presence of one or more of the following:

1. **The patient complains of sleepiness, nonrestorative sleep, fatigue, or insomnia symptoms.**
2. **The patient wakes with breath holding, gasping, or choking.**
3. **The bed partner or other observer reports habitual snoring, breathing interruptions, or both during the patient's sleep.**
4. **The patient has been diagnosed with hypertension, a mood disorder, cognitive dysfunction, coronary artery disease, stroke, congestive heart failure, atrial fibrillation, or type 2 diabetes mellitus.**

(ICSD), 3rd ed. 2014

A.) What is OSA?

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B. Polysomnography (PSG) or OCST[1] demonstrates:

1. **≥ 5 predominantly obstructive respiratory events (obstructive and mixed apneas, hypopneas, or respiratory effort related arousals [RERAs]) per hour of sleep during a PSG or per hour of monitoring (OCST).**

(ICSD), 3rd ed. 2014

A.) What is OSA?

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C. PSG or OCST demonstrates:

1. **≥ 15 events predominantly obstructive respiratory events (apneas, hypopneas, or RERAs)[3] per hour of sleep during a PSG or per hour of monitoring (OCST).**

(ICSD), 3rd ed. 2014

OSA Severity Criteria

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	AHI /hr
Normal	< 5
Mild	5 - ≤15
Moderate	15 - 30
Severe	> 30

Sleep. 1999 Aug 1;22(5):667-89.
Sleep-related breathing disorders in adults: recommendations for syndrome definition and measurement techniques in clinical research. The Report of an AASM Task Force

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Clinical Features of OSA

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1. Nocturnal Symptoms

- Snoring
- 40% of men, 20% of women report habitual snoring
- Associated with considerable social and marital hazard

2006 American Academy of Sleep Medicine

Prevalence of Sleep Apnea

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Young USA N = 802	4% Men 2% Women	AHI > 5 EDS Age 36-60
Kripke USA N = 355	9% Men 5% Women	AHI > 15 0_2 sat 4% Age 40-64
Olson Australia N = 2,202	5% Men 1.2% Women	AHI $\geq$ 15 Age 35-69
Bearpark Australia N = 400	10% Men 7% Women	AHI $\geq$ 10 Age 40-85

Prevalence in a Saudi Sample

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	Middle-aged Saudi Men (n=578) M	Middle-aged Saudi Women (n=400) M	Netzer et al[1] (n=744) M + F	Heistand et al[2] (n=1506) M + F	Sharma et al[3] (n=180) 80% Males
Mean age	44.6 ± 9.8	43.74 — 6.31	48.9 ± 17.5	49	--
Snoring	52.3%	40.8	52.2%	59.0%	--
Day time fatigue >3 time a week	19.3%	9.5%	38.8%	26.0%	--
Drowsy driving	29.6%		19.9%	32.0%	--
HTN (known)	18.0%	24.0%	26.0%	29.0%	53%
High risk	32.8%	39.0	37%	Males 31% Females 21%	44.4%

1. BaHammam et al. Saudi Med J 2008; 29: 423-426

2. BaHammam et al. Saudi Med J 2009; 30: 1572-76

Prevalence in a Saudi Sample

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Prevalence of Sleep Apnea

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Wali et al Saudi Arabia	**Men: 11.2%**
	Women: 4%

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Otherwise snore and this will happen to you….

Or sleep alone….

www.corbett.com.au

Clinical Features of OSA

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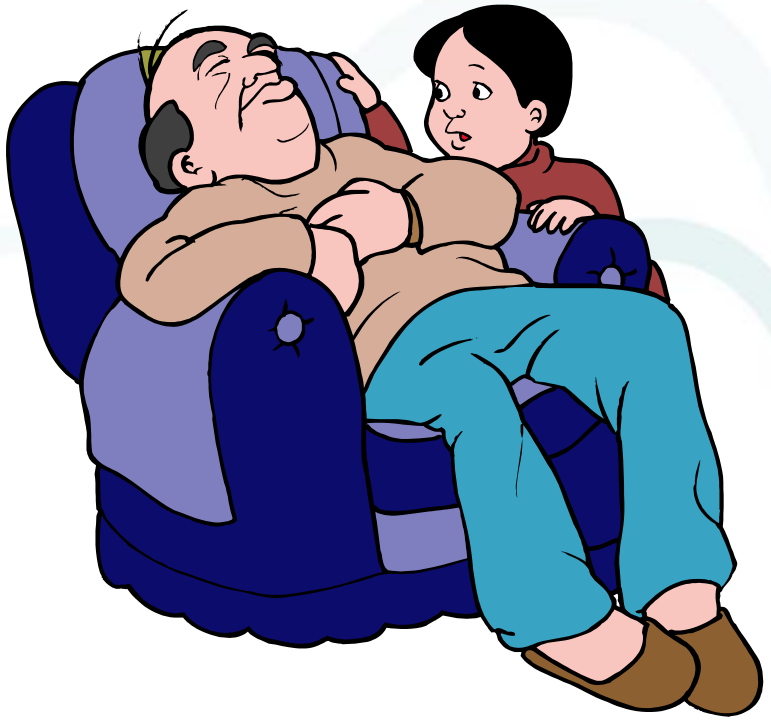
2. Daytime Sleepiness

- Differential diagnosis includes:
  - Insufficient Sleep
  - Medical and psychological disorders
  - Medications



Clinical Features of OSA

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- **Nocturnal Choking / Gasping**
  - Bed partners may recognize this more commonly than the patient.

Viner et al, Ann Int Med, 1991

Video

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Screening Daytime Sleepiness

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The University Sleep Disorders Center
King Khalid University Hospital

Epworth Sleepiness Scale

0 = would less than once a month doze
1 = slight chance of dozing
2 = moderate chance of dozing
3 = high chance of dozing

Situation	Chance of Dozing			
Sitting and Reading	0	1	2	3
Watching TV	0	1	2	3
Sitting inactive in a public place (in awaiting area or in a meeting)	0	1	2	3
As passenger in a car for an hour without a break	0	1	2	3
Lying down to rest in the afternoon when circumstances permit	0	1	2	3
Sitting and talking to someone	0	1	2	3
Sitting quietly after a lunch	0	1	2	3
In a car, while stopped for a few minutes in the traffic	0	1	2	3
Total score				
How long have you been like this (months/ year)				

Screening Daytime Sleepiness

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مستشفى الملك خالد الجامعي
المركز الجامعي لطب وأبحاث النوم

Epworth Sleepiness Scale

صفر : أقل من مرة في الشهر
1 : قليلة الحدوث
2 : متوسطة الحدوث
3 : تحدث بكثرة

الحالـــــــــــــــة	فرص أن تغفو أو تنام			
الجلوس للقراءة	صفر	1	2	3
مشاهدة التلفزيون	صفر	1	2	3
الجلوس بمكان عام دون عمل شئ (في صالة انتظار أو في اجتماع)	صفر	1	2	3
عندما تستقل سيارة كراكب في رحلة مدتها أكثر من ساعة بدون توقف	صفر	1	2	3
الاسترخاء بعد الظهر (عندما تسمح الظروف)	صفر	1	2	3
خلال الجلوس والمحادثة مع شخص ما	صفر	1	2	3
الاستراحة بعد الغداء	صفر	1	2	3
في السيارة عند التوقف لبضع دقائق خلال زحمة السير	صفر	1	2	3
مجموع التقييم				
منذ متى يحدث لك ذلك؟ (أشهر/سنوات)				

Stanford Sleepiness Scale (SSS)

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The Stanford Sleepiness Scale

Please record the scale value that best describes your state of sleepiness:

1. Feeling active and vital; alert; wide awake
2. Functioning at a high level, but not at peak; able to concentrate
3. Relaxed; awake; not at full alertness; responsive
4. A little foggy; not at peak; let down
5. Fogginess; beginning to lose interest in remaining awake; slowed down
6. Sleepiness; prefer to be lying down; fighting sleep; woozy
7. Almost in reverie; sleep onset soon; lost struggle to remain awake

SSS scores range from 1 to 7, with increasing scores indicating increased sleepiness.

From Hoddes E, Dement WC, Zarcone V. The history and use of the Stanford Sleepiness Scale [abstract]. Psychophysiology 1972;9:150; with permission.

University Sleep Disorders Center
College of Medicine, King Saud University

STOP Bang Questionnaire

Personal Profile

No.: PSG S No: Nationality: ☐ Saudi ☐ Non Saudi

Age (Years): Height(cm): Weight. (Kgs):

Neck Size (cm): Occupation:

Marital Status: ☐ Single ☐ Married ☐ Divorced AHI:

Hospital Name: City:

Please answer the following questions as accurately as possible. Where applicable, place a check mark (√) next to the best answer:

Snoring? Do you **Snore Loudly** (louder than talking or loud enough to be heard through closed doors)?	○ Yes	○ No
Tired? Do you often feel **Tired, Fatigued, or Sleepy** during the daytime?	○ Yes	○ No
Observed? Has anyone observed you **Stop Breathing** during your sleep?	○ Yes	○ No
Pressure? Do you have or are being treated for **High Blood Pressure**?	○ Yes	○ No
Body Mass Index BMI is more than 35?	○ Yes	○ No
Age Age older than 50?	○ Yes	○ No
Neck size large? Do you have a **Neck that Measures** more than 16 inches / 40 cm around (measure at Adam's Apple)?	○ Yes	○ No
Gender Male?	○ Yes	○ No

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استبيان STOPBANG

البيانات الشخصية

الرقم: الجنسية: ☐ سعودي ☐ غير سعودي التاريخ:

العمر (سنوات): الوزن (كيلو): الطول (سم):

قياس محيط الرقبة (سم): الوظيفة الحالية:

الحالة الاجتماعية: ☐ غير متزوج ☐ متزوج ☐ مطلق

المدينة: اسم المستشفى:

الرجاء الإجابة على الأسئلة أدناه لتحديد ما إذا كنت معرضاً للإصابة بتوقف التنفس أثناء النوم ، الرجاء الإجابة بدقة قدر الإمكان بوضع علامة √ بجانب الإجابة :

الشخير؟ هل تشخر بصوت عالٍ (أعلى من صوت الكلام المعتاد، أو أن شخيرك عالٍ بدرجة كافية يُسمع من وراء الأبواب المغلقة) ؟	o نعم	o لا
الشعور بالتعب؟ هل تشعر غالباً بالتعب أو الإرهاق أو النعاس خلال النهار؟	o نعم	o لا
الملاحظة؟ هل لاحظ أي شخص من قبل أن تنفسك قد توقف خلال نومك؟	o نعم	o لا
الضغط؟ هل تعاني من ارتفاع ضغط الدم أو هل تتناول علاج لارتفاع الضغط؟	o نعم	o لا
مؤشر كتلة الجسم أعلى من ٣٥؟ يتم حساب ذلك بقسمة الوزن مقدراً بالكيلوجرام على مربع الطول مقدراً بالمتر	o نعم	o لا
العمر هل عمرك 50 عاماً أو أكثر؟	o نعم	o لا
قياس محيط الرقبة؟ هل قياس محيط رقبتك أكثر من ١٦ بوصة أو حوالي ٤٠ سم؟ (يتم قياسها من مستوى تفاحة آدم)	o نعم	o لا
الجنس = ذكر؟	o نعم	o لا

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BERLIN QUESTIONNAIRE

Height (m) _____ Weight (kg)_____ Age_____ Male / Female
Please choose the correct response to each question.

CATEGORY 1

1. **Do you snore?**
_ a. Yes
_ b. No
_ c. Don't know

If you snore:

2. **Your snoring is:**
_ a. Slightly louder than breathing
_ b. As loud as talking
_ c. Louder than talking
_ d. Very loud – can be heard in adjacent rooms

3. **How often do you snore**
_ a. Nearly every day
_ b. 3-4 times a week
_ c. 1-2 times a week
_ d. 1-2 times a month
_ e. Never or nearly never

4. **Has your snoring ever bothered other people?**
_ a. Yes
_ b. No
_ c. Don't Know

5. **Has anyone noticed that you quit breathing during your sleep?**

_ a. Nearly every day
_ b. 3-4 times a week
_ c. 1-2 times a week
_ d. 1-2 times a month
_ e. Never or nearly never

CATEGORY 2

6. **How often do you feel tired or fatigued after your sleep?**
_ a. Nearly every day
_ b. 3-4 times a week
_ c. 1-2 times a week
_ d. 1-2 times a month
_ e. Never or nearly never

7. **During your waking time, do you feel tired, fatigued or not up to par?**
_ a. Nearly every day
_ b. 3-4 times a week
_ c. 1-2 times a week
_ d. 1-2 times a month
_ e. Never or nearly never

8. **Have you ever nodded off or fallen asleep while driving a vehicle?**
_ a. Yes
_ b. No

If yes:

9. **How often does this occur?**
_ a. Nearly every day
_ b. 3-4 times a week
_ c. 1-2 times a week
_ d. 1-2 times a month
_ e. Never or nearly never

CATEGORY 3

10. **Do you have high blood pressure?**
_ Yes
_ No
_ Don't know

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استبانة برلين

الاسم: _____ رقم الملف: _____ الطول (بالمتر) _____

الوزن (كلغم): _____ العمر: _____ ذكر/أنثى

الرجاء اختيار الرد الصحيح لكل سؤال فيما يلي:

الفئة الأولى:

1. هل تشخر؟
   - أ. نعم
   - ب. لا
   - ج. لا أعرف

إذا كنت تشخر:

2. كيف يمكن أن تصف ارتفاع صوت شخيرك:
   - أ. أعلى بقليل من صوت التنفس
   - ب. بنفس درجة ارتفاع الكلام
   - ج. أعلى من الكلام
   - د. مرتفع جدا - يمكن سماعه من الغرف المجاورة

3. كم مرة يتكرر شخيرك؟
   - أ. كل يوم تقريبا
   - ب. 3-4 مرات بالأسبوع
   - ج. مرة إلى مرتين بالأسبوع
   - د. مرة إلى مرتين بالشهر
   - ه. لا يحدث

4. هل سبق وأن سبب شخيرك الإزعاج للآخرين؟
   - أ. نعم
   - ب. لا
   - ج. لا أعرف

5. هل لا حظ أي شخص أنك توقف التنفس أثناء النوم؟
   - أ. تقريبا كل يوم
   - ب. 3-4 مرات بالأسبوع
   - ج. مرة إلى مرتين بالأسبوع
   - د. مرة إلى مرتين بالشهر
   - ه. لا يحدث

الفئة الثانية:

6. كم مرة تشعر بالتعب أو الإرهاق عند الاستيقاظ من النوم؟
   - أ. كل يوم تقريبا
   - ب. 3-4 مرات بالأسبوع
   - ج. مرة إلى مرتين بالأسبوع
   - د. مرة إلى مرتين بالشهر
   - ه. لا يحدث

7. هل تحس بالتعب أو الإرهاق أثناء ساعات اليقظة؟
   - أ. كل يوم تقريبا
   - ب. 3-4 مرات بالأسبوع
   - ج. مرة إلى مرتين بالأسبوع
   - د. مرة إلى مرتين بالشهر
   - ه. لا يحدث

8. هل سبق أن نعست أو نمت خلال قيادة السيارة أو الانتظار (الطبخ) مثلاً؟

□ أ. نعم

□ ب. لا

إذا كانت الإجابة نعم:

9. كم مرة يحدث هذا:

□ أ. كل يوم تقريبا

□ ب. 3-4 مرات بالأسبوع

□ ج. مرة إلى مرتين بالأسبوع

□ د. مرة إلى مرتين بالشهر

□ ه. لا يحدث

الفئة الثالثة:

10. هل أنت مصاب بارتفاع ضغط الدم؟

□ أ. نعم

□ ب. لا

□ ج. لا أعرف

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WHAT ARE THE RISK FACTORS?

Risk Factors of OSA

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1. Structural Abnormalities:

- Short Fat Neck

(Neck circumference >17”/16”)

Risk Factors of OSA

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- Small Mandible

Guilleminault C et al. Sleep apnea Syndromes. New York: Alan R. Liss, 1978.

Risk Factors of OSA

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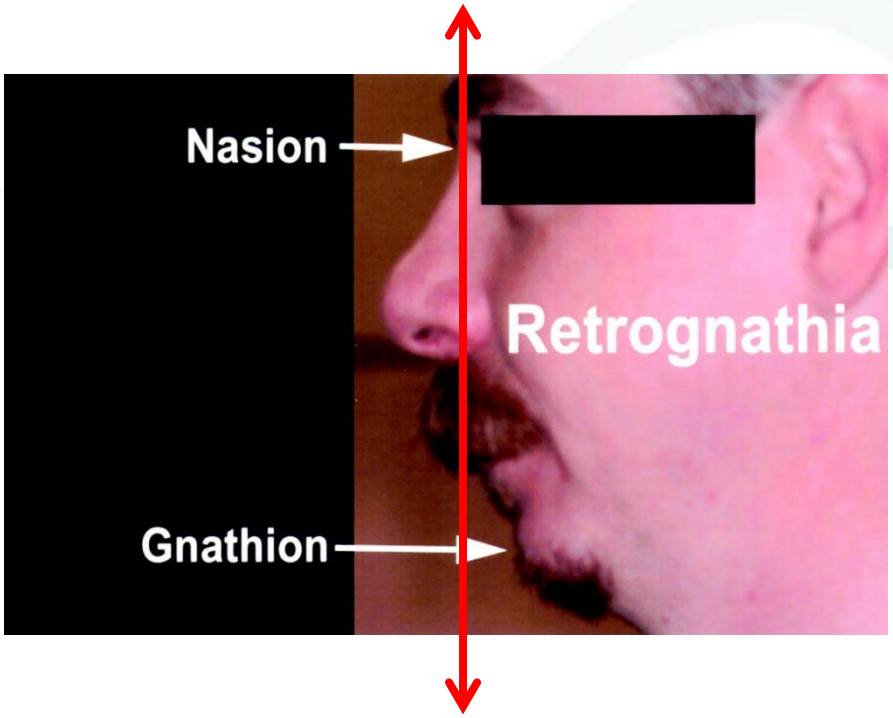
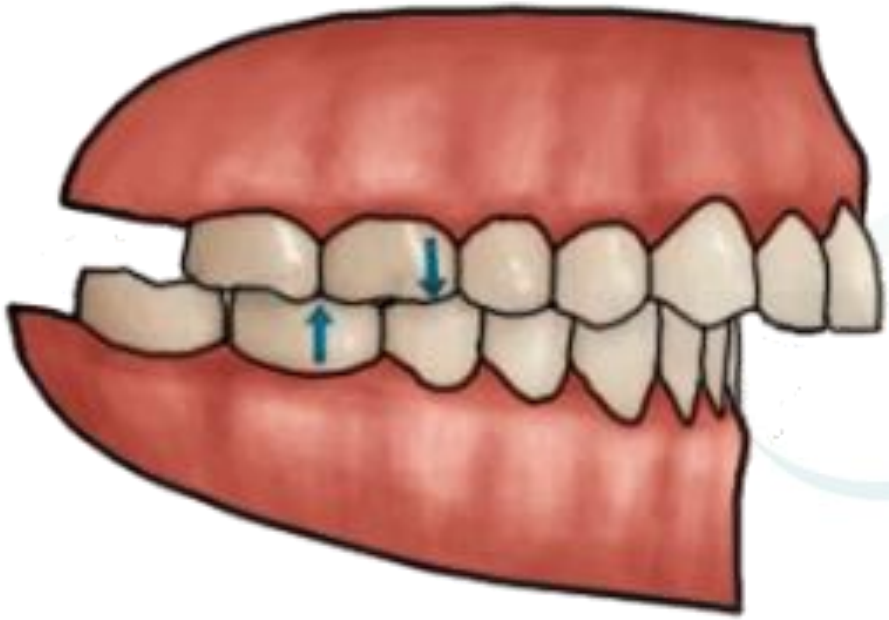
- Retrognathia



Overbite



Risk Factors of OSA

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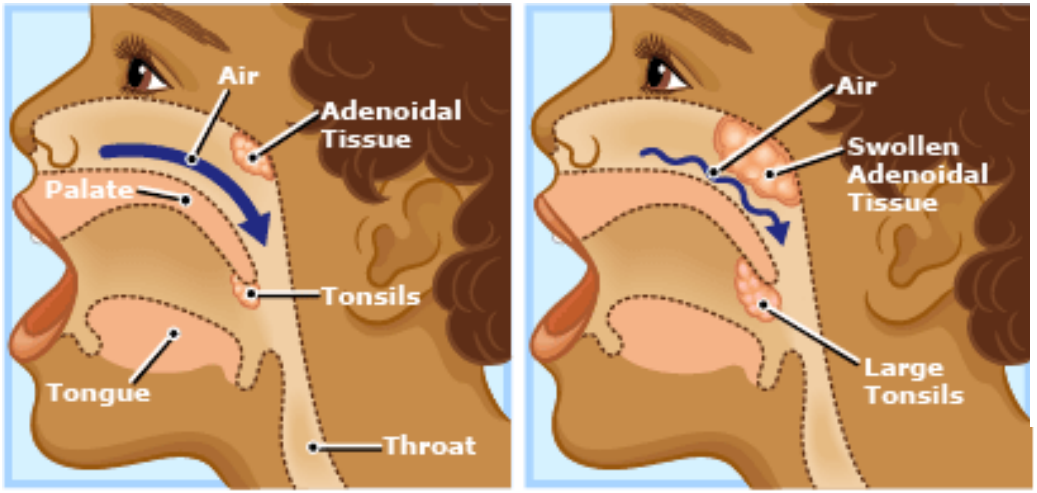
2. Upper airway narrowing:

- Large tonsils / adenoids



Normal Anatomy
Open airways allow air to flow easily.

Common Causes of Sleep Apnea
Large tonsils and adenoids make airflow more difficult.

Sleep apnea and children
www.dcsmiles.com/services/sleep-apnea/sleep-and-children/

Dr. P. Marazzi/Photo Researchers, Inc.

Cont..
(Upper airway narrowing)

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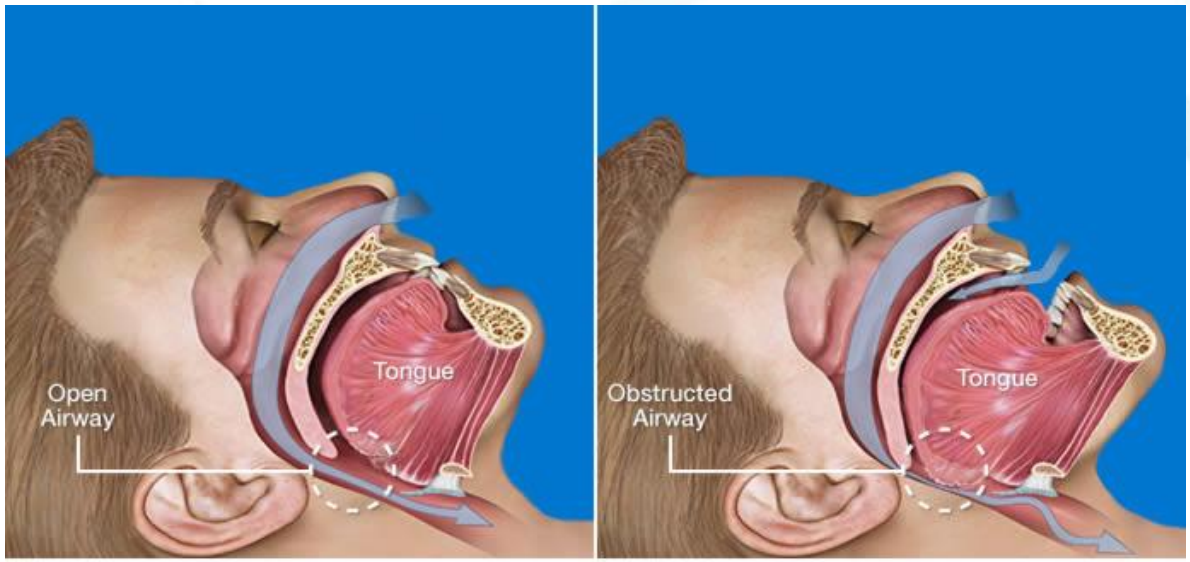
- Long uvula

Sleep Disorders & Sleep Apnea with Dr. Kushner, DDS
http://www.brownkushner.com/Sleep Apnea.pdf

Large tongue



Non-Obstructed Airway Obstructed Airway

Science-based Medicine https://sciencebasedmedicine.org/dental-management-of-obstructive-sleep-apnea/

Cont..
(Upper airway narrowing)

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Cont..
(Upper airway narrowing)

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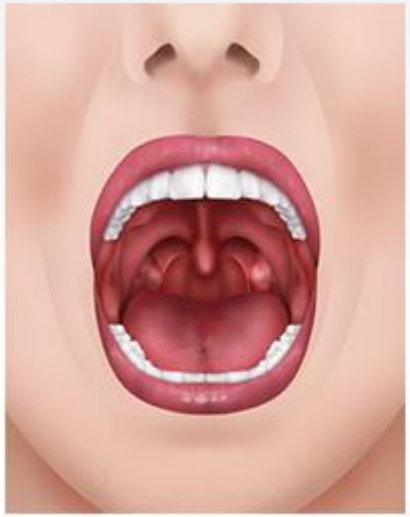
Mallampati Score to Help Predict Obstructive Sleep Apnea



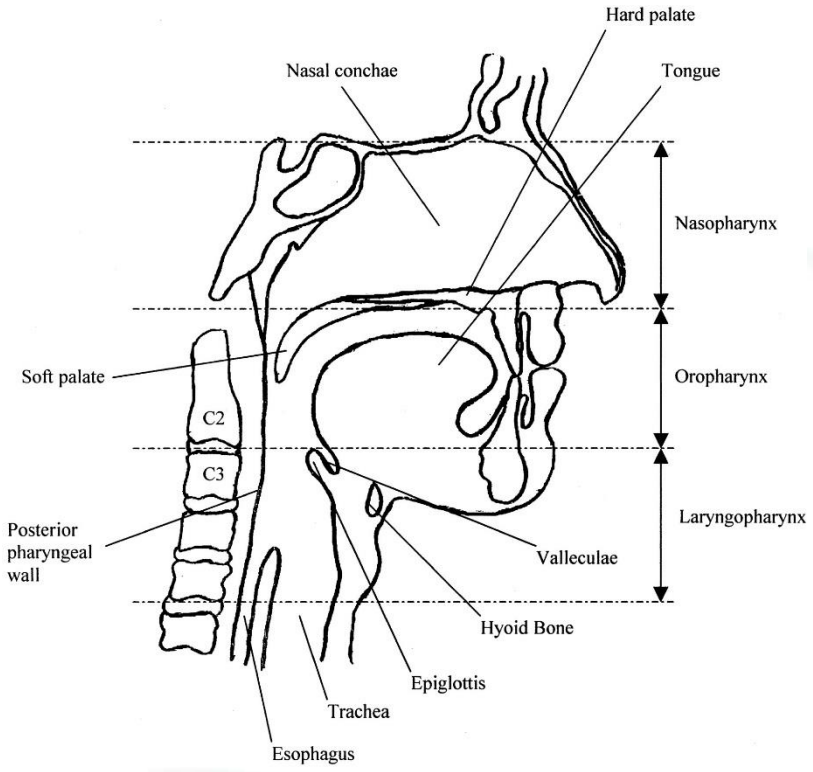
Mallampati I

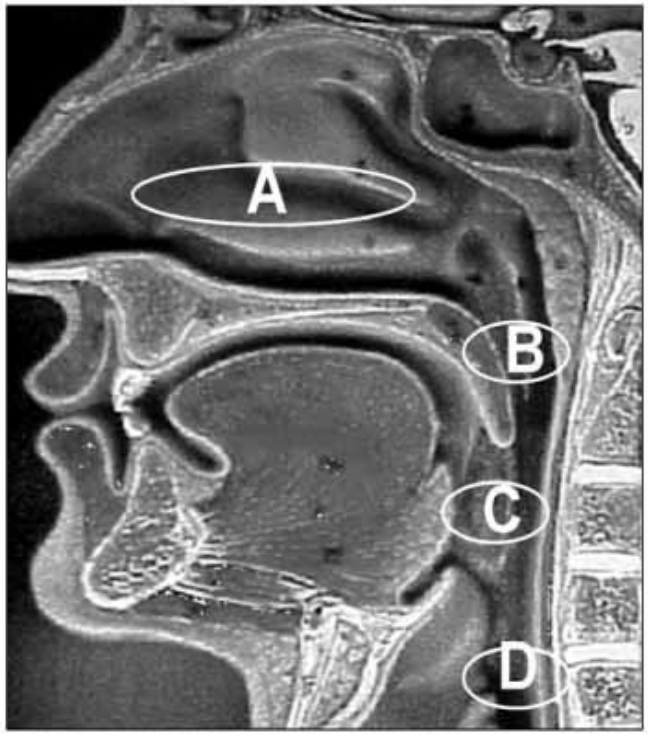
Mallampati II

Mallampati III

Mallampati IV

Levels of airway obstruction





Risk Factors of OSA

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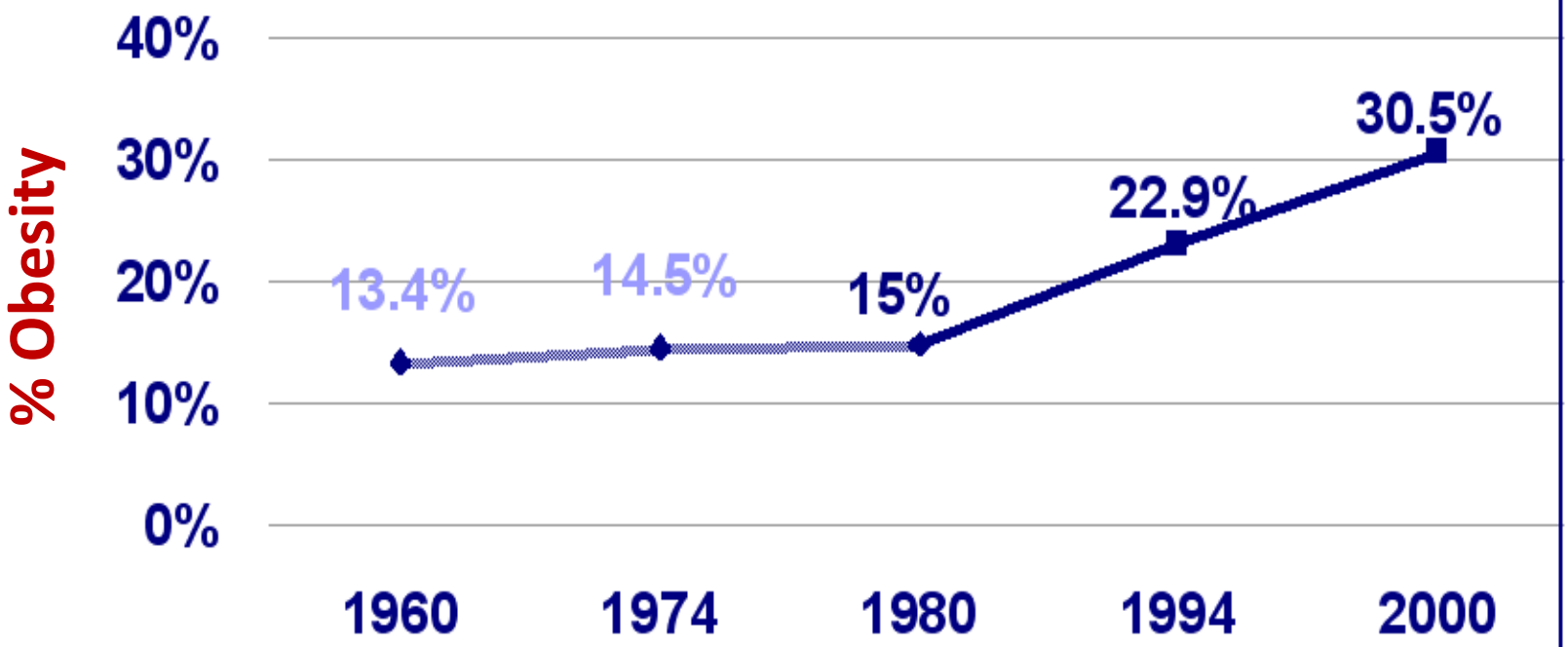
3. Obesity

- Strongest risk factor for OSA.
- Present in >60% of patients referred for a diagnostic sleep evaluation.

Twenty Years of Increasing Obesity



Source NCHS -- JAMA 2002:14:1723-27.

PREVALENCE OF OBESITY IN SAUDI ARABIA

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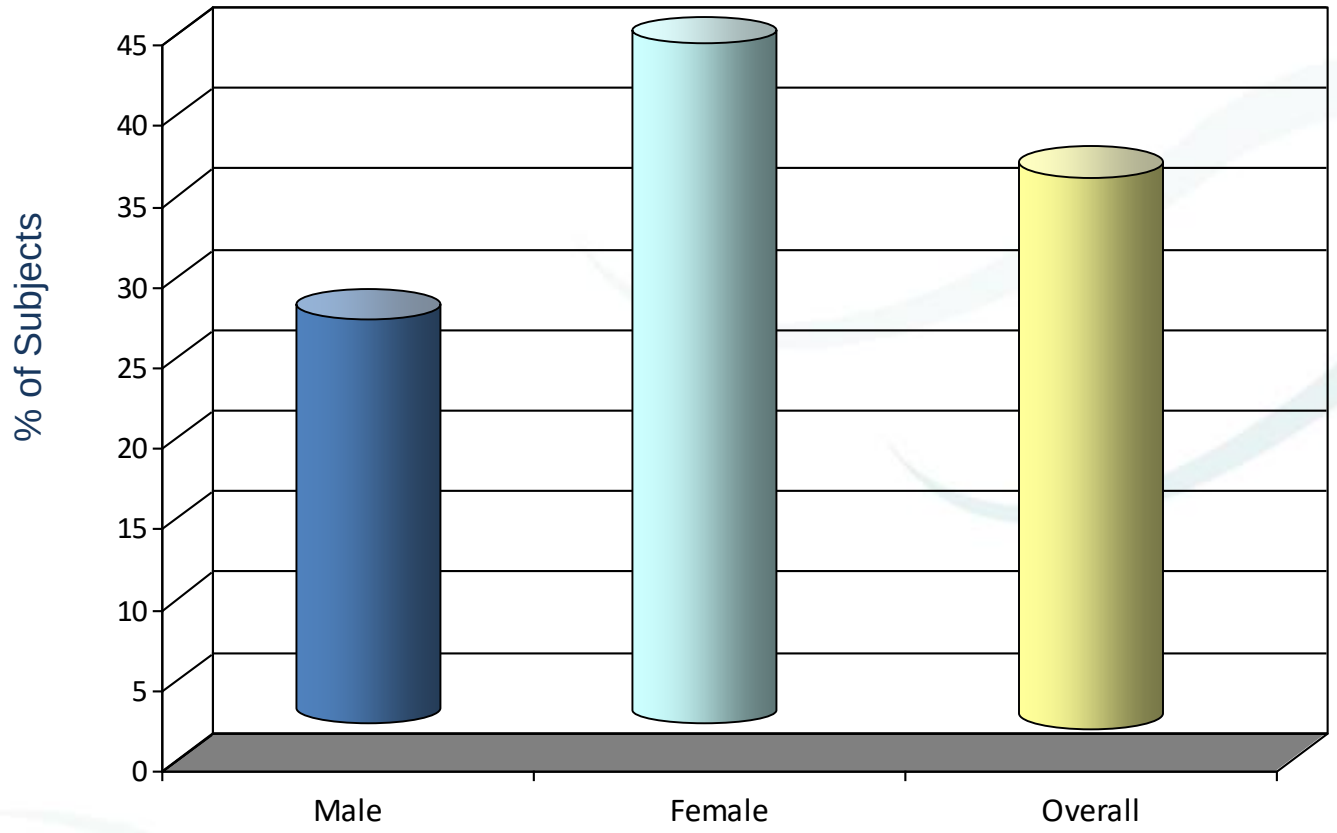

(BMI ≥ 30 kg/m²)

Al-Nozha et al. SMJ 2005;26:824-829

Patient Evaluation

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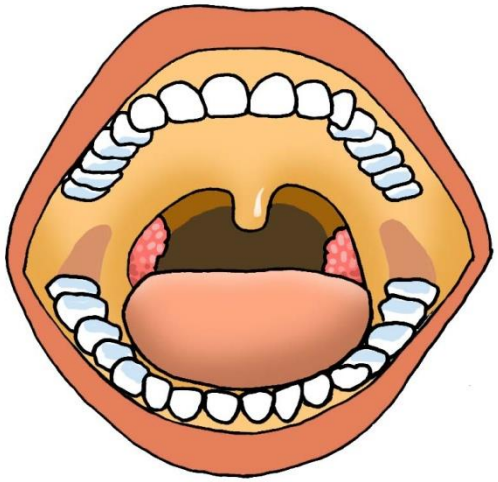
Normal Airway



Obstructed Airway

Sleep Disorders & Sleep Apnea with Dr. Kushner, DDS
http://www.brownkushner.com/Sleep Apnea.pdf

Sagittal Upper Airway MRI Images

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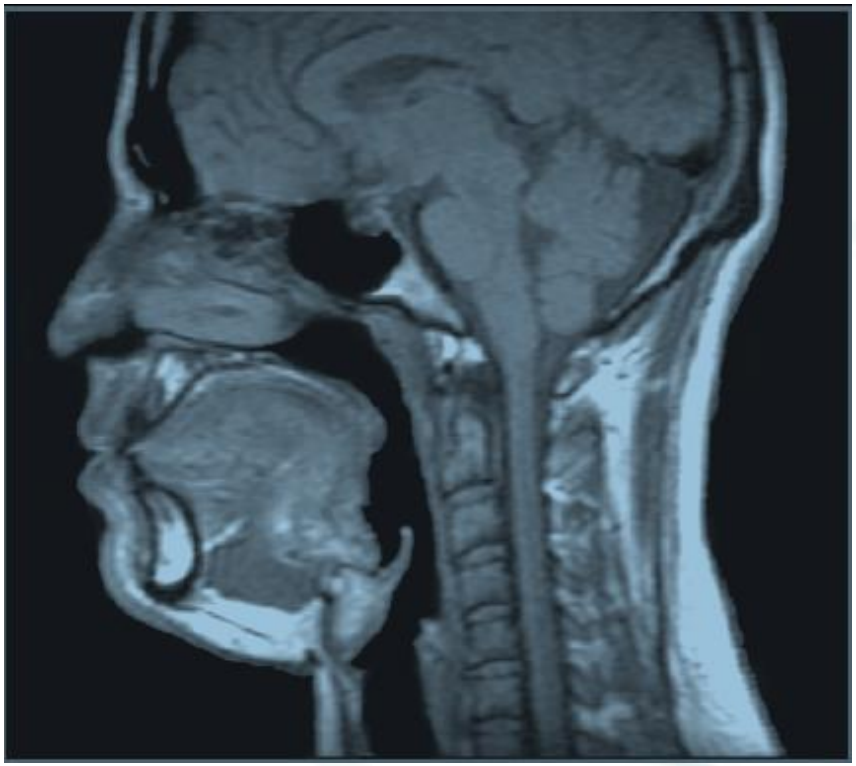
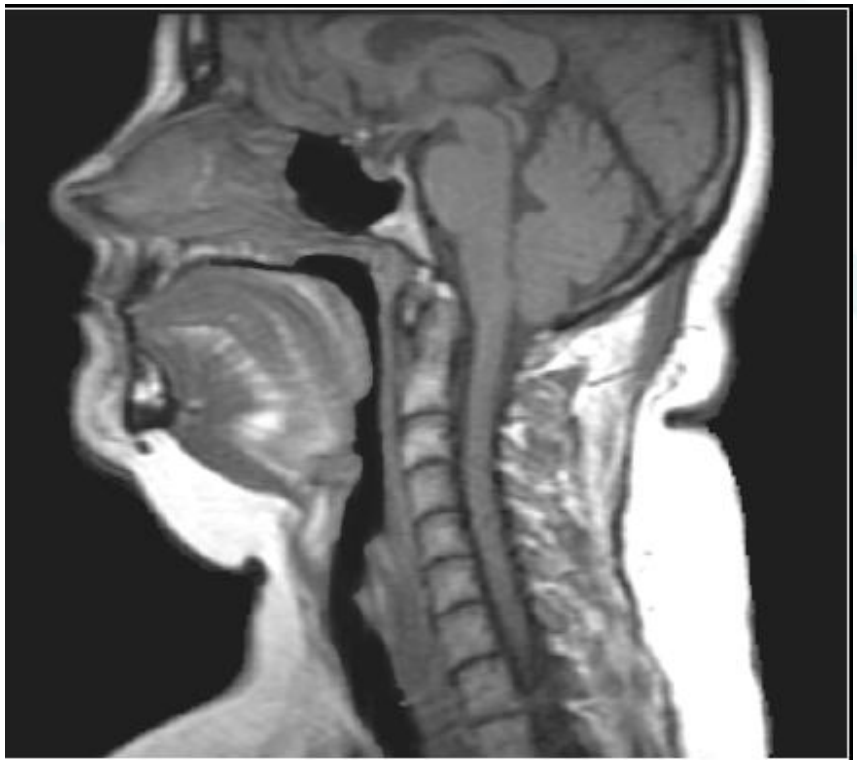
Normal



Apneic



(Schwab et al, Am J Respir Crit Care Med 152:1673, 1995)

OSA and Medical Comorbidity

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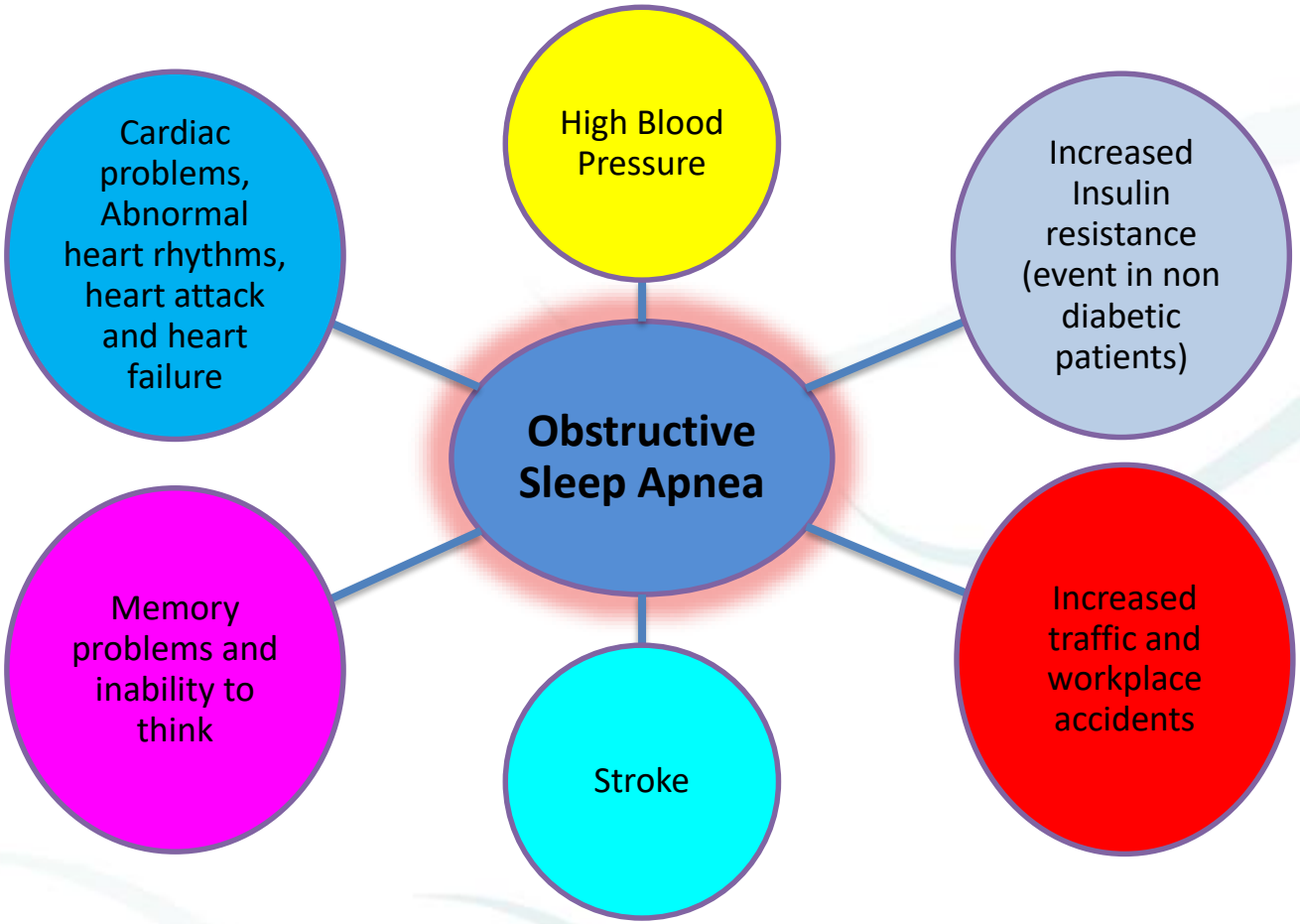

Representative Signals

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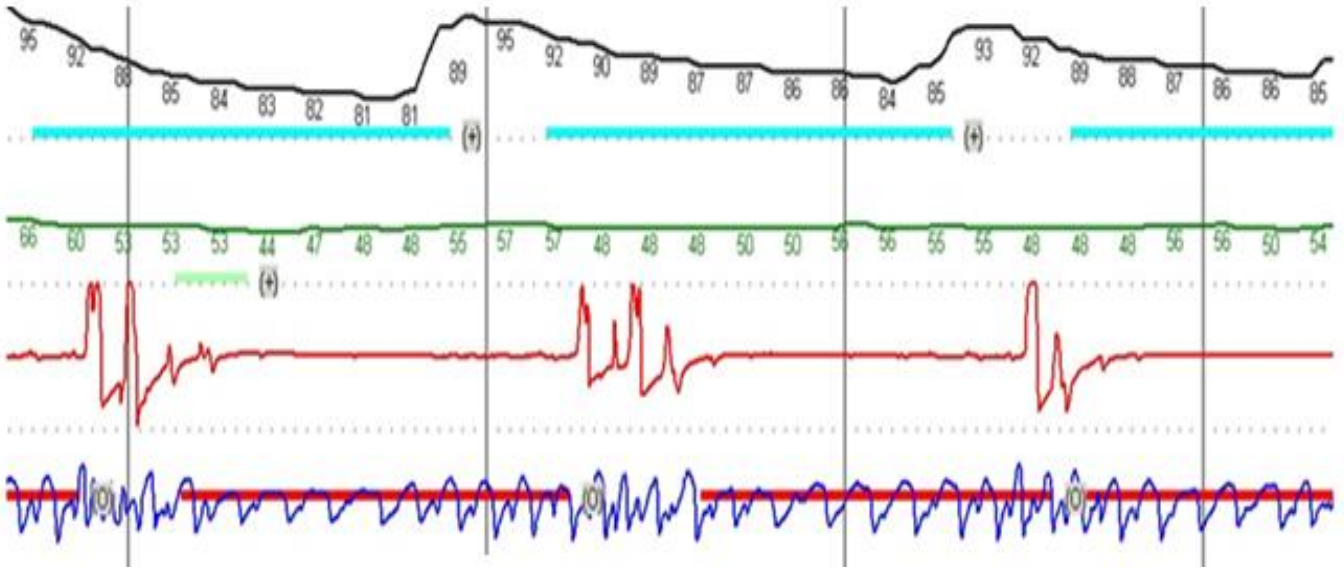
OSA

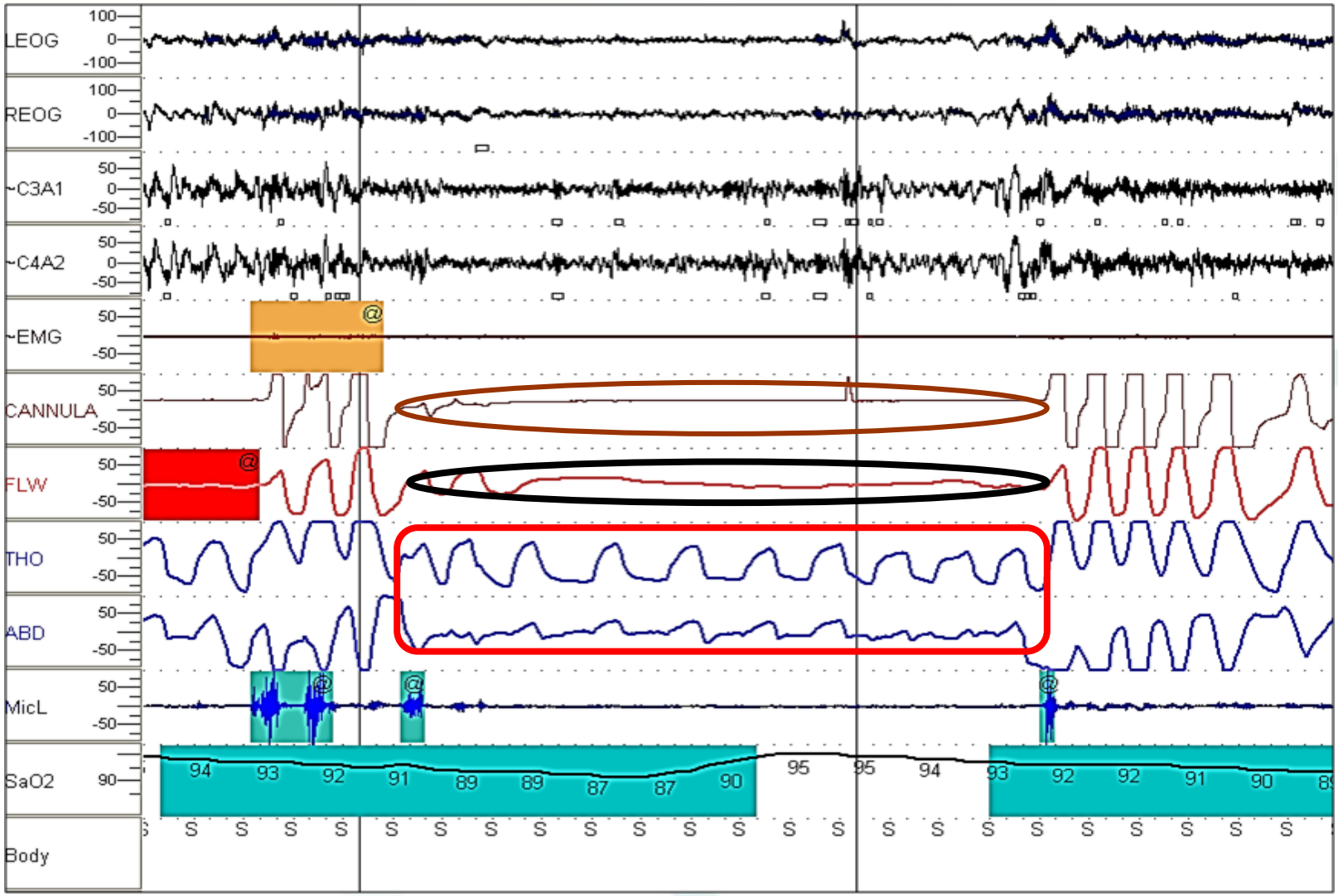
Oximetry

Heart Rate

Nasal Airflow

Effort




LEOG
REOG
~C3A1
~C4A2
~EMG
CANNULA
FLW
THO
ABD
MicL
SaO2
Body
94 93 92 91 89 89 87 87 90 95 95 94 93 92 92 91 90

Treatment

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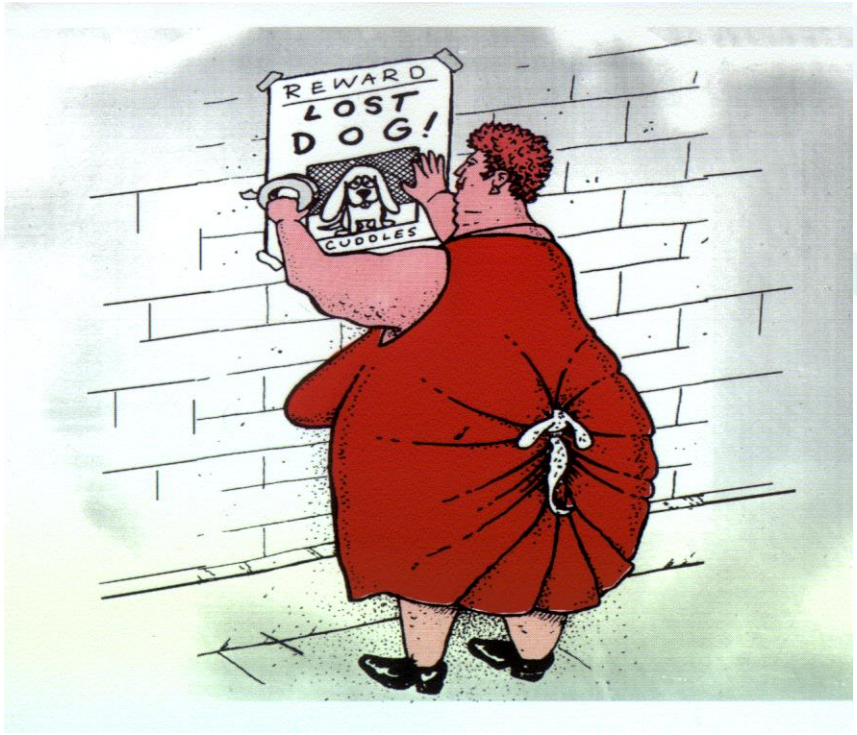
General Measures

- These measures should be tried in all patients with OSDB:
  - Weight loss
  - Avoidance of alcohol & sedatives
  - Sleep position
  - Driving and operation of heavy machinery

Weight Loss

- Weight loss is like getting into heaven….. It is SIMPLE but it is not EASY.



Sleep in Health & Disease
www.sleepsa.com

Positional Therapy

- Try sleeping on the side.

Sleep Position Training

Specific Measures

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- Continuous Positive Airway Pressure (CPAP)
- Intra – Oral Appliances
- Surgical Treatment
- Hypoglossal Nerve Stimulation

Continuous Positive Airway Pressure (CPAP)

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- Is the gold standard treatment

Continuous Positive Airway Pressure

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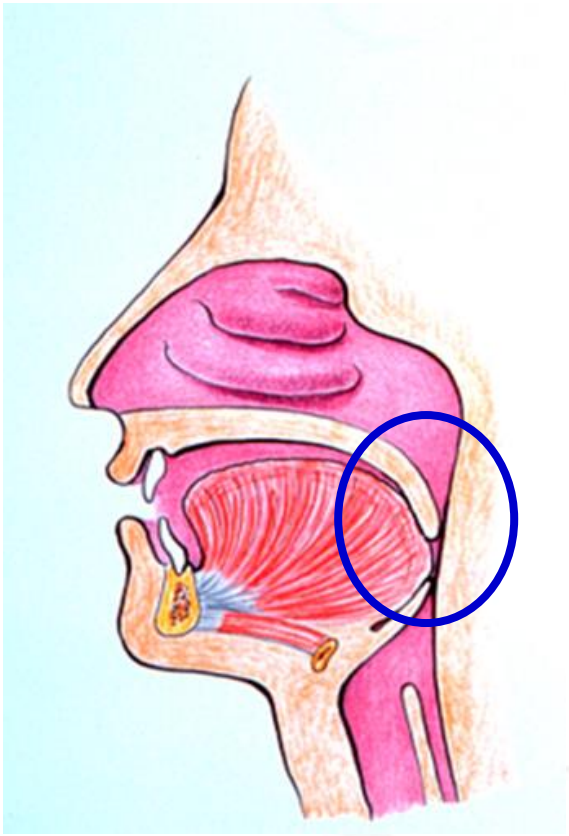
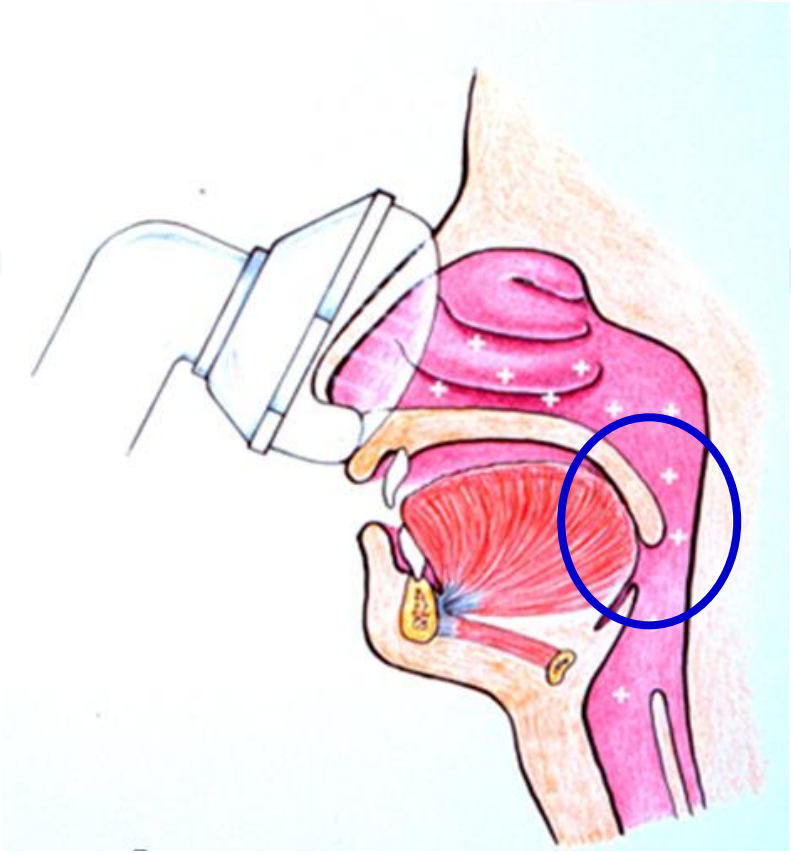
Before



After



Benefits of CPAP

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- Improves quality of life even in mild OSA
- Improves bed partner sleep
- Improves daytime sleepiness
- Decreases motor vehicle accident
- Improves hypertension

Cont… (Benefits of CPAP)

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- Increases ejection fraction in systolic CHF
- Improves insulin resistance
- Decreases inflammatory markers
  - CRP (C-reactive protein)

PubMed.gov
US National Library of Medicine
National Institutes of Health

PubMed ▾ Long-term compliance with continuous positive airway pressure in Saudi patients with o

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Abstract ▾ Send to: ▾

See 1 citation found by title matching your search:

Saudi Med J. 2015 Aug;36(8):911-9. doi: 10.15537/smj.2015.8.11716.

Long-term compliance with continuous positive airway pressure in Saudi patients with obstructive sleep apnea. A prospective cohort study.

BaHammam AS[1], Alassiri SS, Al-Adab AH, Alsadhan IM, Altheyab AM, Alrayes AH, Alkhawajah MM, Olaish AH.

⊕ **Author information**

Abstract

OBJECTIVES: To evaluate continuous positive airway pressure (CPAP) compliance and define predictors of CPAP compliance among Saudi patients with obstructive sleep apnea (OSA) after applying an educational program.

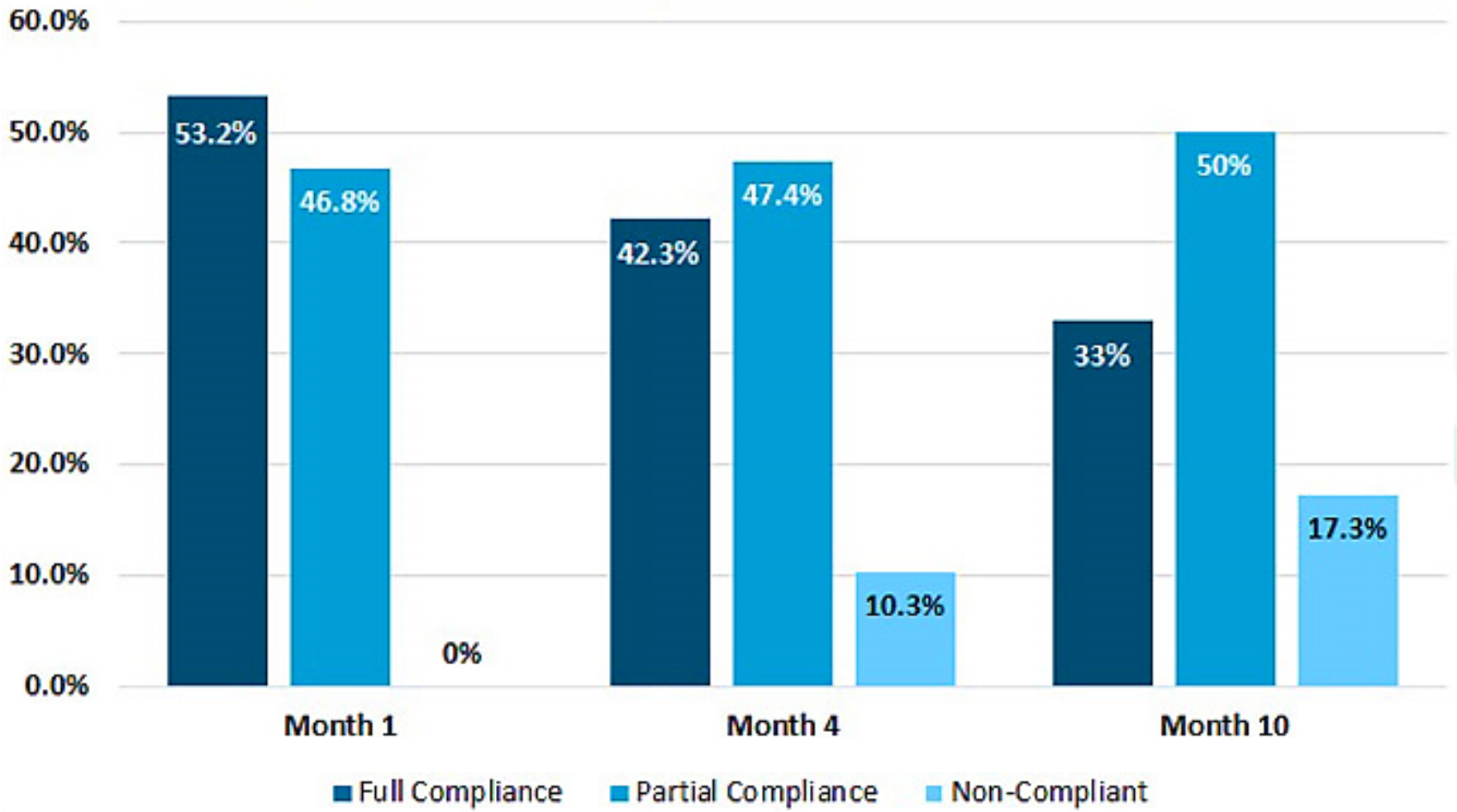
METHODS: This prospective cohort study included consecutive patients diagnosed to have OSA based on polysomnography between January 2012 and January 2014 in King Saud University, Riyadh, Kingdom of Saudi Arabia. All patients had educational sessions on OSA and CPAP therapy before sleep study, and formal hands-on training on CPAP machines on day one, day 7, and day 14 after diagnosis. The follow-up in the clinic was carried out at one, 4, and 10 months after initiating CPAP therapy. Continuous positive airway pressure compliance was assessed objectively. Logistic regression model was used to assess the predictors of CPAP adherence.

RESULTS: The study comprised 156 patients with a mean age of 51.9±12.1 years, body mass index of 38.4±10.6 kg/m2, and apnea hypopnea index of 63.7±39.3 events/hour. All patients were using CPAP at month one, 89.7% at month 4, and 83% at month 10. The persistence of CPAP-related side effects and comorbid bronchial asthma remained as independent predictors of CPAP compliance at the end of the study.

CONCLUSION: With intensive education, support, and close monitoring, more than 80% of Saudi patients with OSA continued to use CPAP after 10 months of initiating CPAP therapy.

PMID: 26219440 [PubMed - in process] PMCID: PMC4549586 **Free PMC Article**

Figure 1-A: CPAP compliance at 1, 4 and 10 months



Saudi Med J. 2015 Aug;36(8):911-9.

Conclusions

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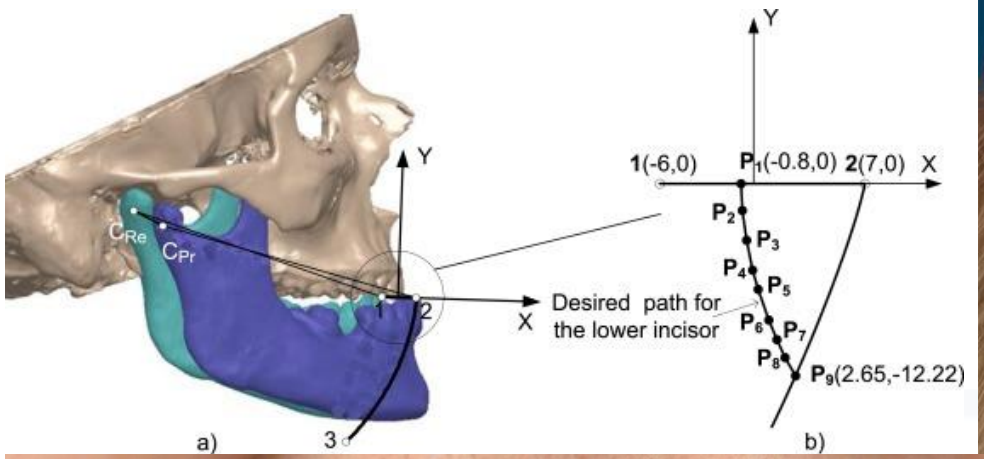
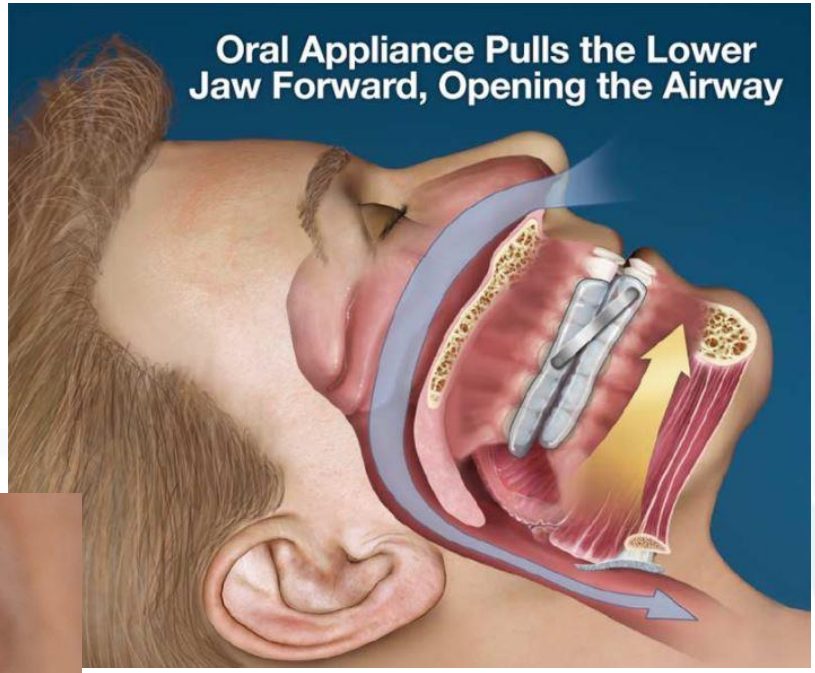
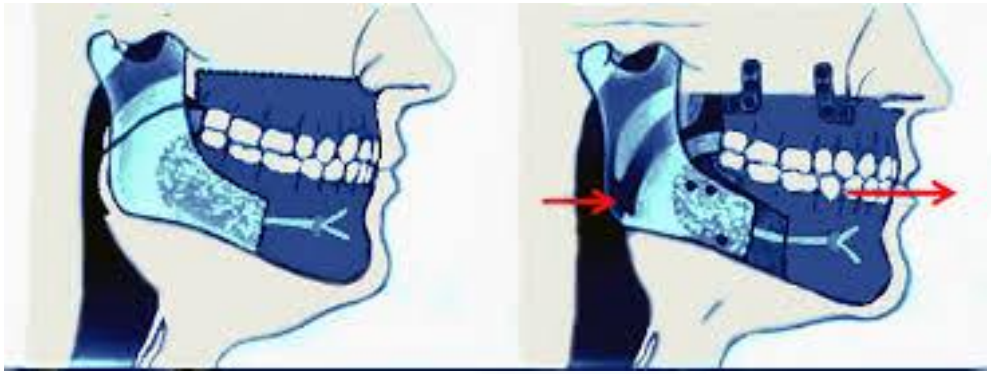
- Nasal CPAP is the treatment of choice
- Successful treatment in 95% of patients
- Not as costly as surgery
- Long term compliance 60-70%
- Improve long term survival
- Can re-titrate the pressure if the patient's clinical condition changes

Mandibular Advancement Device

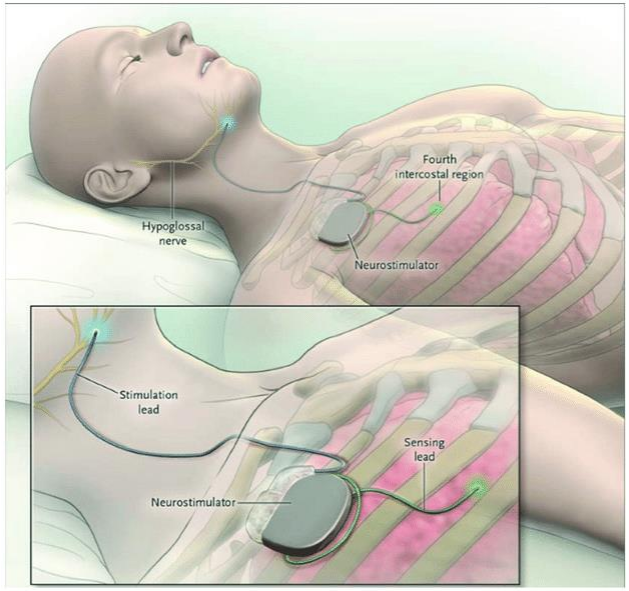


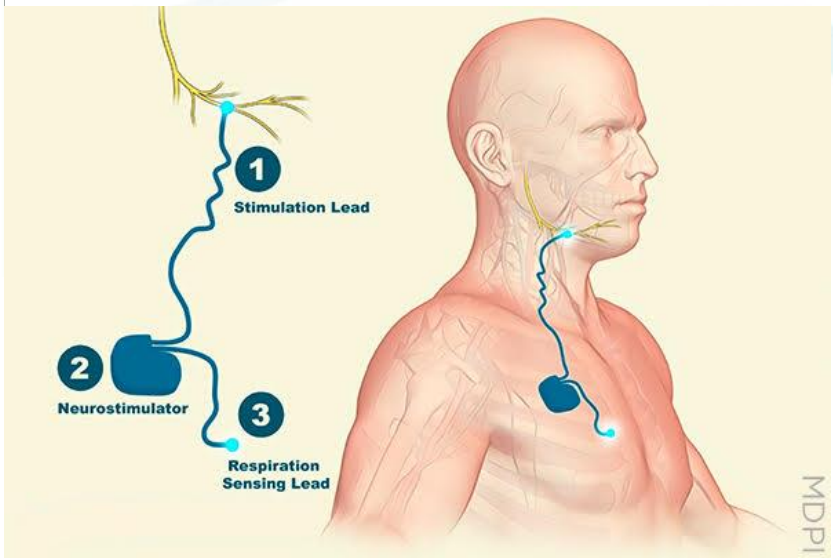


Maxillomandibular advancement



Hypoglossal nerve stimulation





B.) Obesity Hypoventilation Syndrome

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- Is defined by extreme obesity and alveolar hypoventilation during wakefulness.
  - Obesity
  - $PaCO_2$ >45
  - PaO_2 <70
  - Absence of significant pulmonary disease

Criteria A-C must be met

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A. Presence of hypoventilation during wakefulness ($PaCO_2$ > 45 mm Hg) as measured by arterial PCO_2, end-tidal PCO_2, or transcutaneous PCO_2.
B. Presence of obesity (BMI > 30 kg/m^2; > 95th percentile for age and sex for children).
C. Hypoventilation is not primarily due to
    - lung diseases,
    - medication use,
    - neurologic disorder,
    - muscle weakness,
    - or a known congenital or idiopathic central alveolar hypoventilation syndrome.

(ICSD), 3rd ed. 2014

Clinical Features of OHS

1. Extreme Obesity

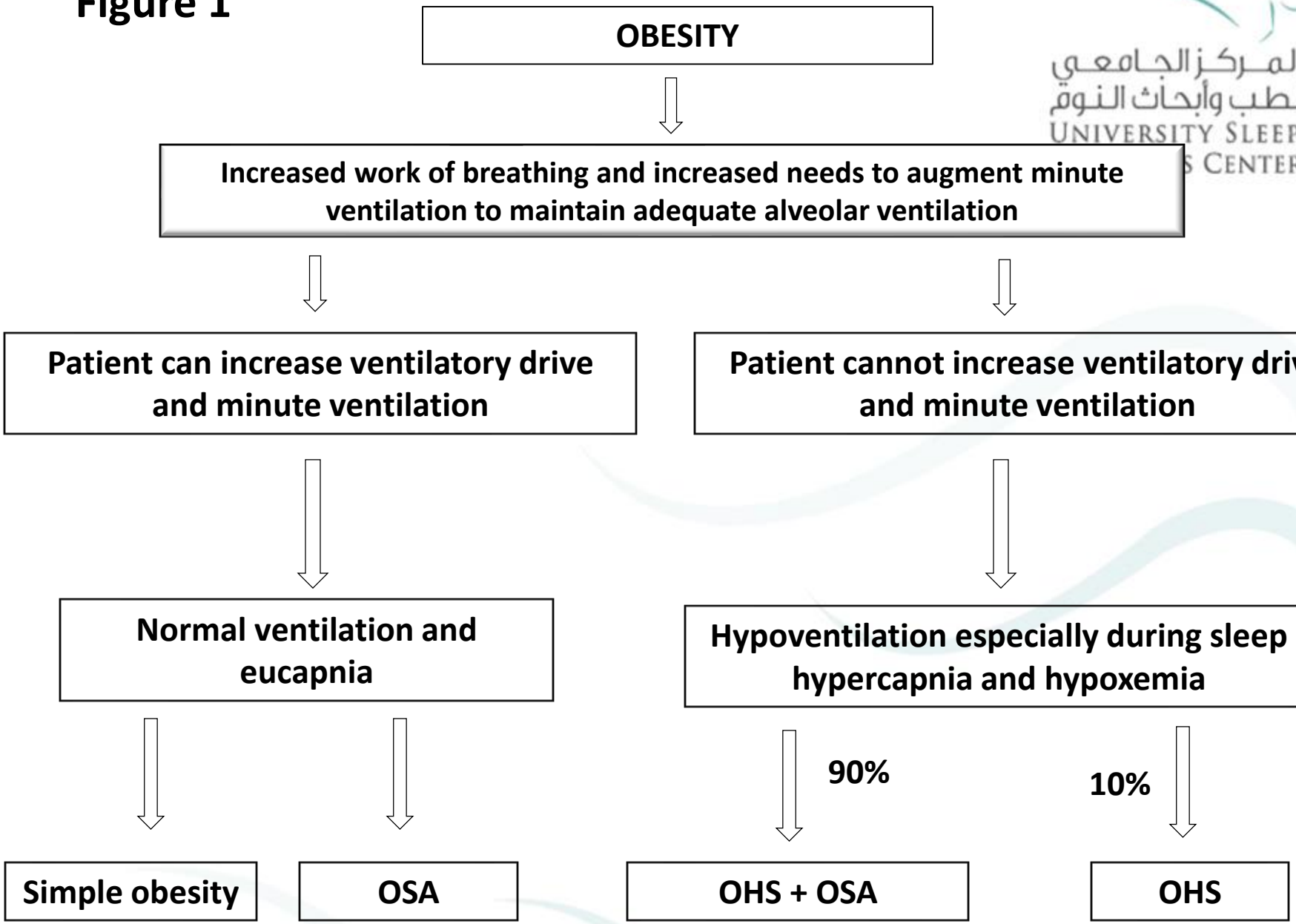
Clinical Features of OHS

2. Middle-aged

3. Significant sleep-disordered breathing (fatigue, hypersomnolence, snoring, morning headache)

4. Prone to develop severe pulmonary hypertension

Figure 1



AlDabal & BaHammam. ATM 2010

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Saudi Med J. 2015; 36(2): 181–189.
doi: 10.15537/smj.2015.2.9991
PMCID: PMC4375695

Prevalence, clinical characteristics, and predictors of obesity hypoventilation syndrome in a large sample of Saudi patients with obstructive sleep apnea

Ahmed S. BaHammam, FRCP, FCCP

Prevalence of OHS

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- Out of 1693 OSA patients, OHS was identified in 144 **(8.5%)** (**women 66.7%**).

Saudi Med J 2015; Vol. 36 (2)

Prevalence of OHS in OSA

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Authors	Number	Study Design	Country	Age	BMI	AHI	OHS %
Mokhlesi et al[22]	359	Prospective	USA	48	43	62	20
Laaban and Chailleux[18]	1,141	Retrospective	France	56	34	55	11
Verin et al[21]	218	Retrospective	France	55	34	51	10
Kessler et al[17]	254	Prospective	France	54	33	76	13
Resta et al[19]	219	Prospective	Italy	51	40	42	17
Glope et al[16]	175	Retrospective	Spain	N/A	32	42	14
Akashiba et al[14]	611	Retrospective	Japan	48	29	52	9
Trakada et al[20]	276	Prospective	Greece	54.7	34.7	33.6	13.8
Alzaabi et al[15]	107	Retrospective	UAE	45.6	33.8	48.4	16.8
BaHammam	1693	Prospective	Saudi Arabia	46.2	35.7	41.9	8.9

BaHammam AS. SMJ 2015; 36(2):181-9

Prevalence of OHS in OSA

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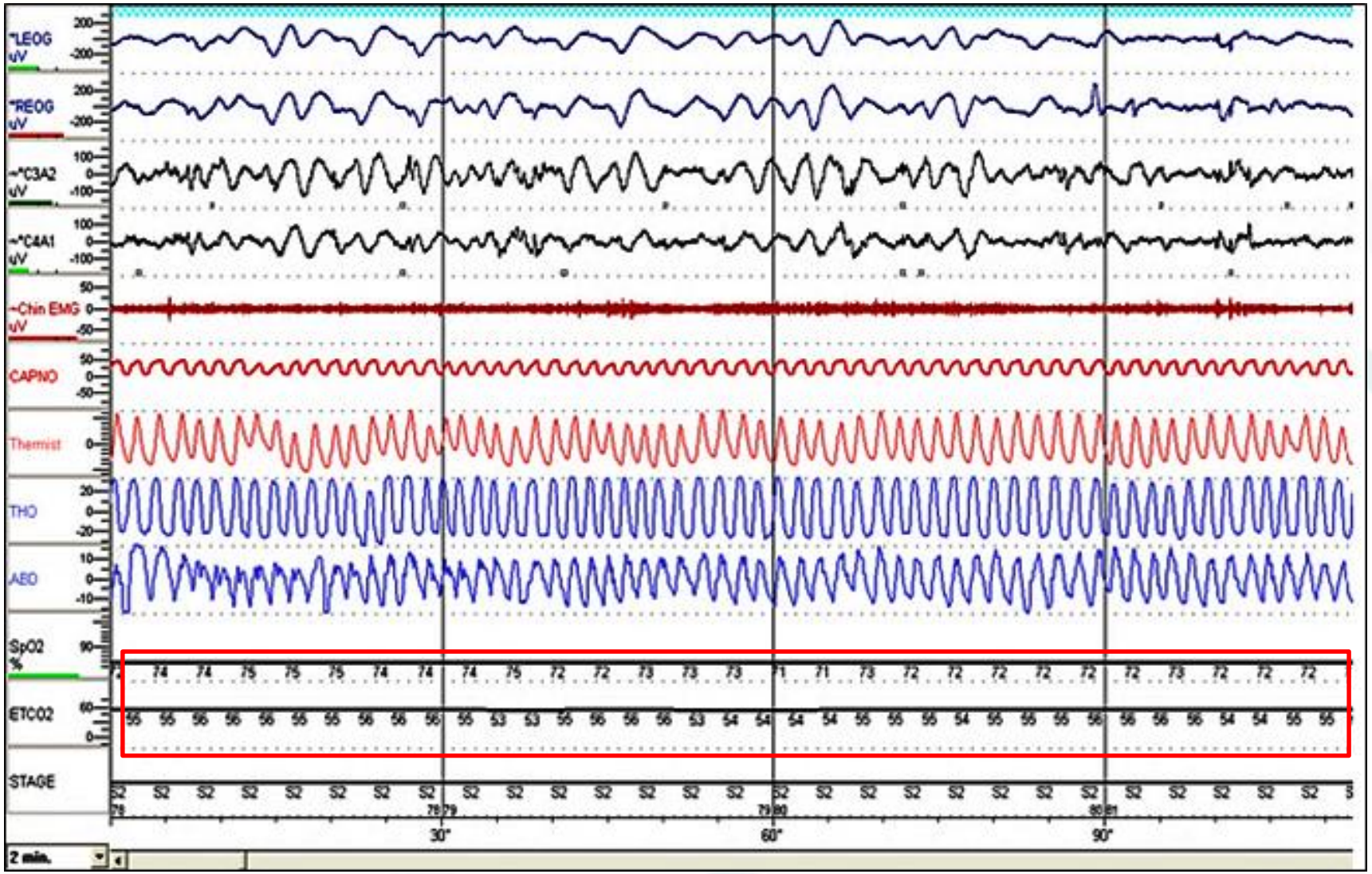
BaHammam	1693	Prospective	Saudi Arabia	46.2	35.7	41.9	8.9

BaHammam AS. SMJ 2015; 36(2):181-9

Patient with OHS



C.) Central Sleep Apnea

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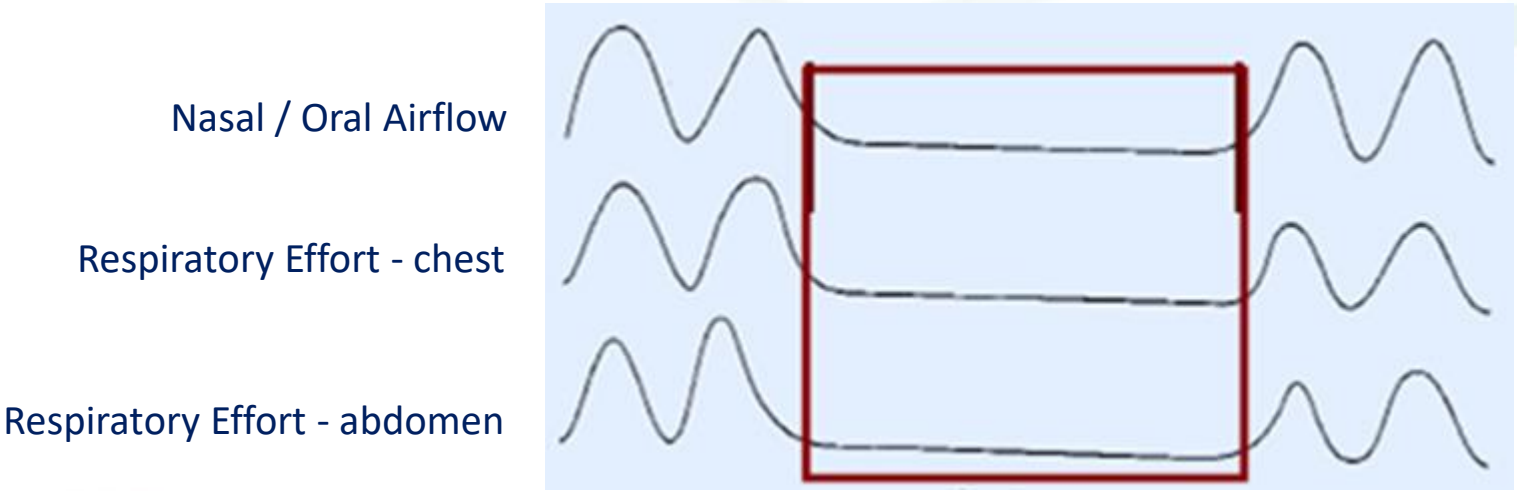
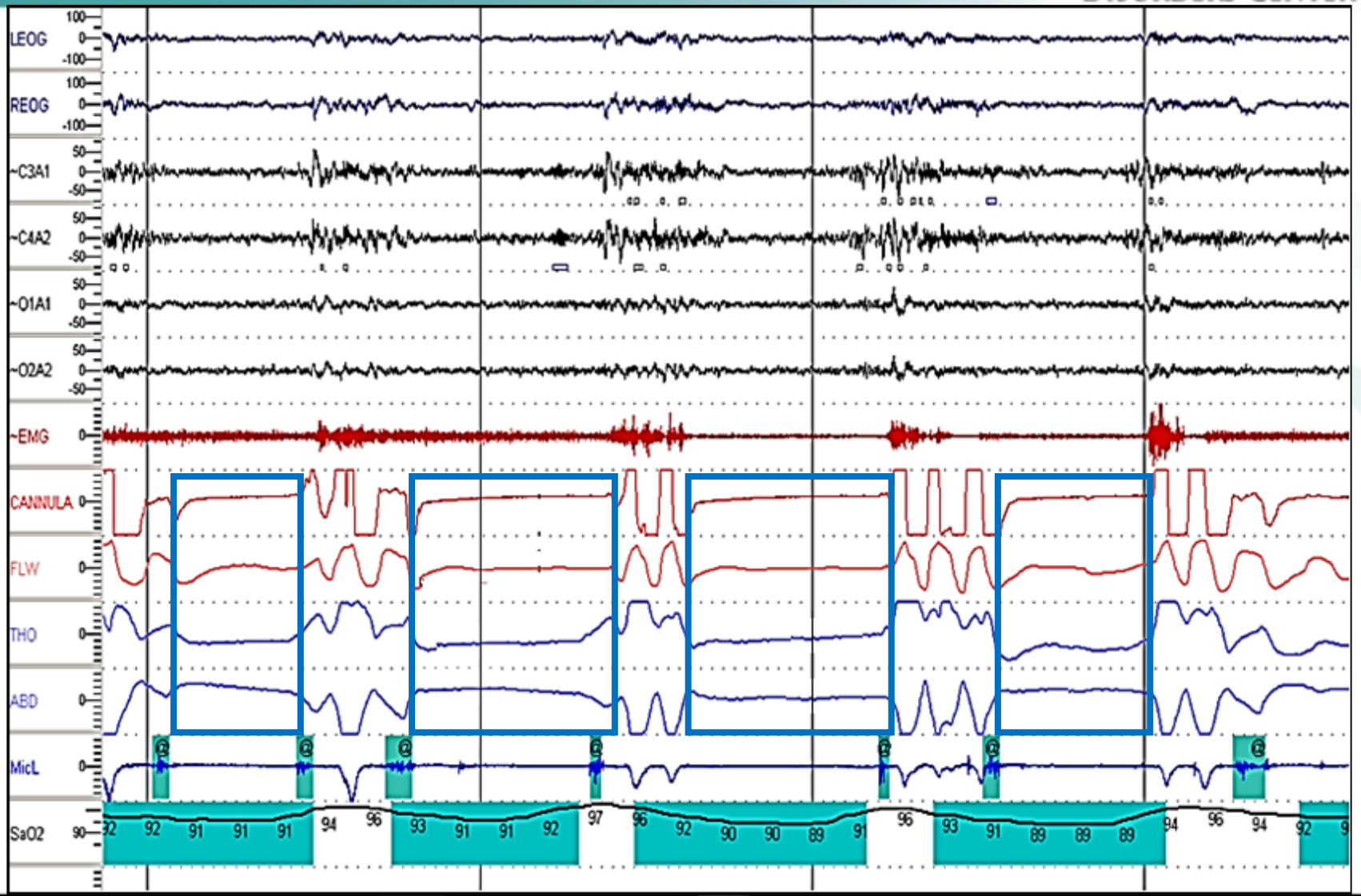
- Is a disorder of decreased breathing rate or depth, particularly during sleep due to a transient reduction or withdrawal of central output to the respiratory muscles (the diaphragm and intercostal muscles).

Central Apnea

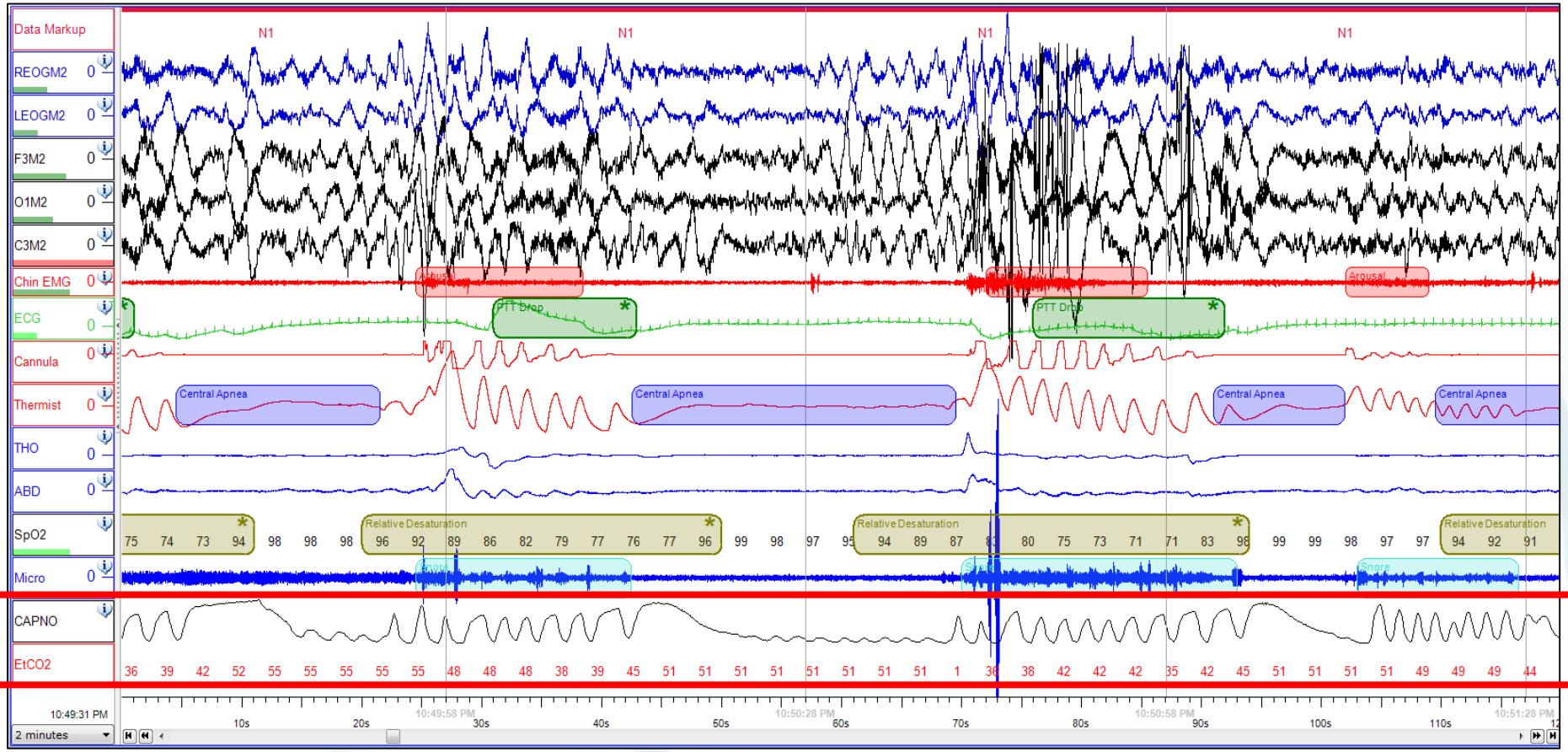
- Absent inspiratory effort throughout the entire period of absent airflow.



Central Apnea



Central Apnea



Cheyne Stokes Respiration

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Diagnostic Criteria

(A or B) + C + D satisfy the criteria

A. The presence of one or more of symptoms

B. The presence of

- **atrial fibrillation/flutter,**
- **congestive heart failure,**
- **or a neurological disorder.**

(ICSD), 3rd ed. 2014

Diagnostic Criteria

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C. PSG shows all of the following:

1. ≥ 5 central apneas and/or central hypopneas per hour of sleep.
2. The total number of central apneas and/or central hypopneas is > 50% of the total number of apneas and hypopneas.
3. The pattern of ventilation meets criteria for Cheyne-Stokes breathing (CSB).

(ICSD), 3rd ed. 2014

Cheyne Stokes Respiration (Periodic Breathing)

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- A breathing pattern characterized by regular "crescendo-decrescendo" fluctuations in respiratory rate and tidal volume.
- More common among patients with heart failure and low ejection fraction.
- Associated with poor prognosis in patients with heart failure.

Representative Signal

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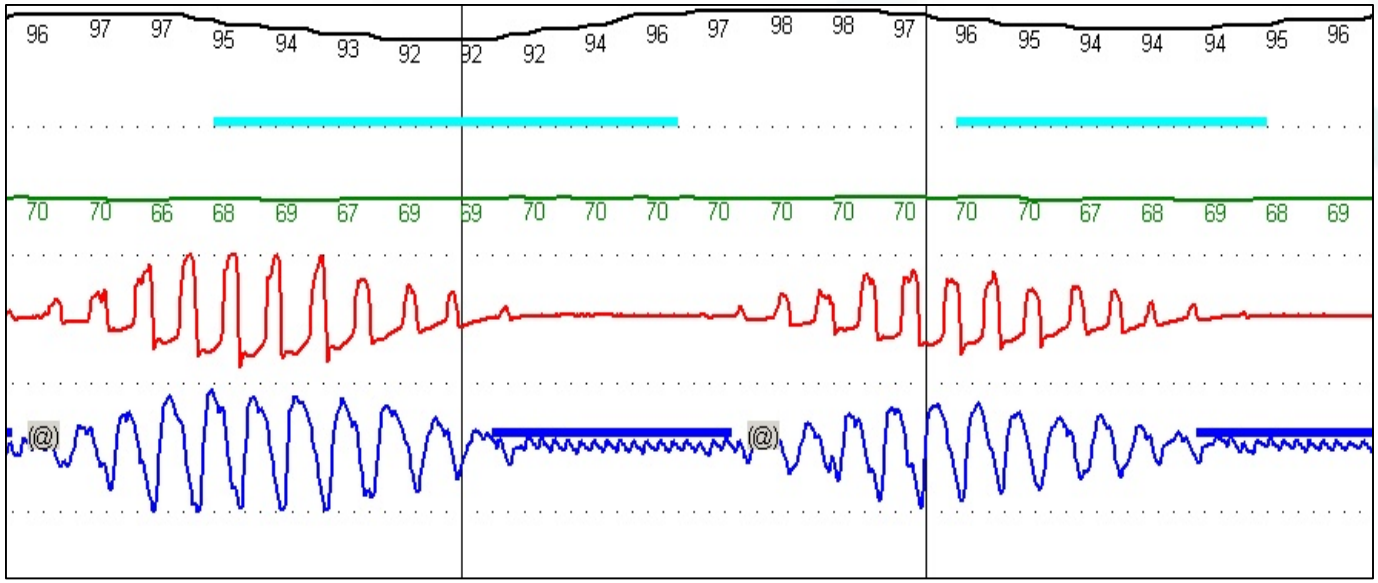
CSA - CSR

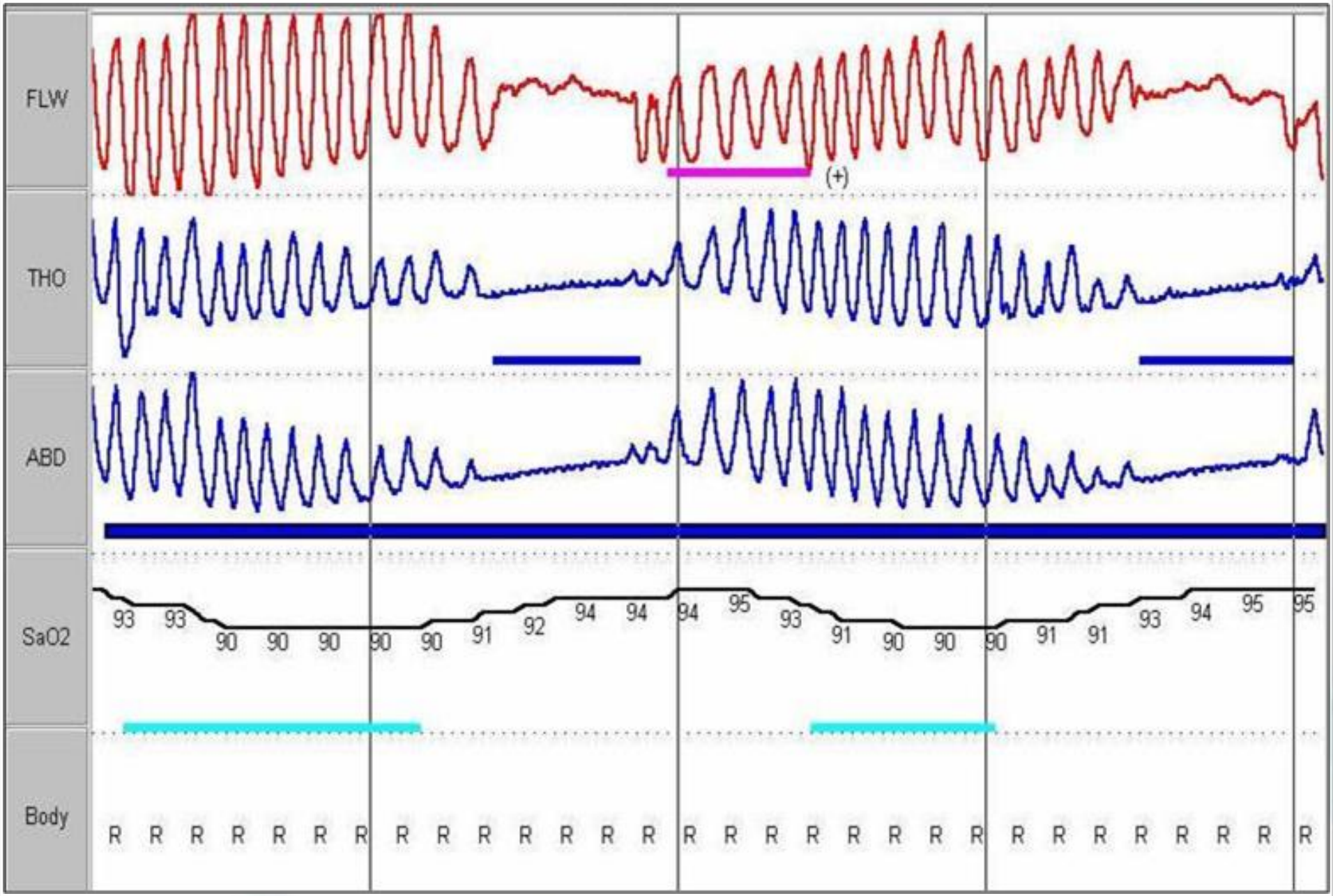
Oximetry

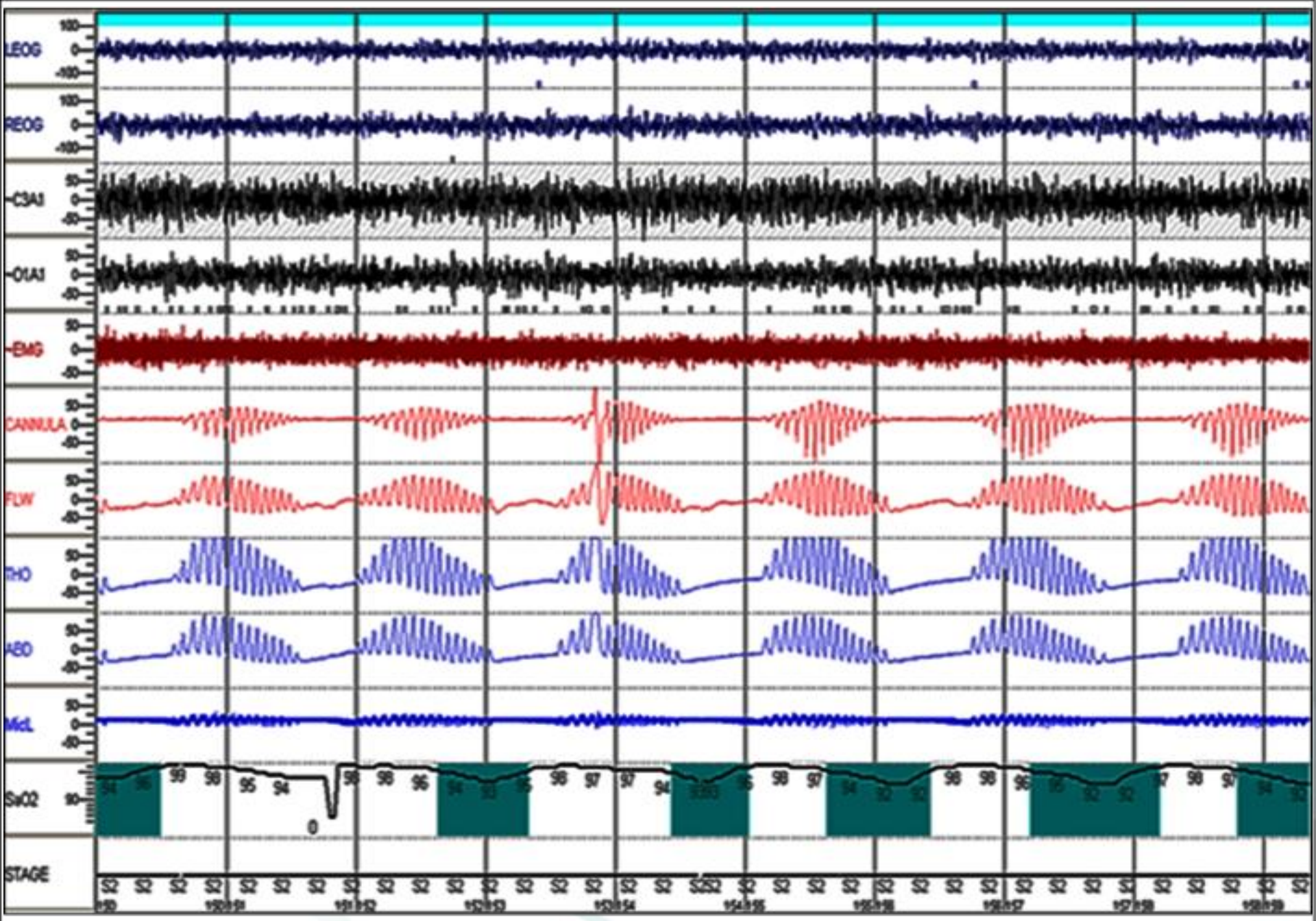
Heart Rate

Nasal Airflow

Effort




FLW
THO
ABD
SaO2
Body
(+)
93 93 90 90 90 90 90 91 92 94 94 94 95 93 91 90 90 90 91 91 93 94 95 95
R R R R R R R R R R R R R R R R R R R R R R R R R R R R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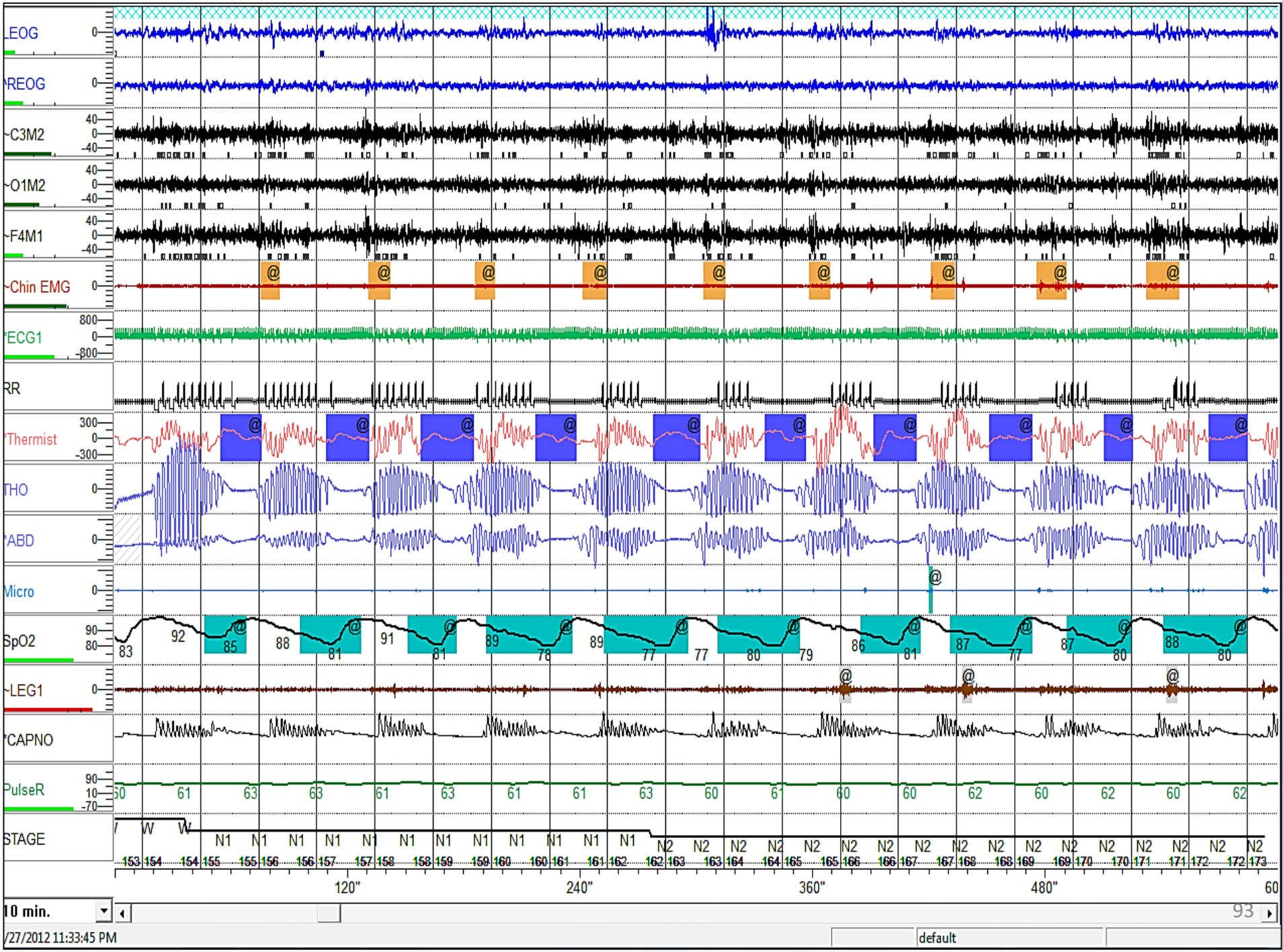
REOG
C3A1
O1A1
EMG
CANNULA
FLW
THO
ABD
Mcl.
SaO2
STAGE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REOG
C3M2
O1M2
F4M1
Chin EMG
ECG1
RR
Thermist
THO
ABD
Micro
SpO2
LEG1
CAPNO
PulseR
STAGE
120"
240"
360"
480"
10 min.
/27/2012 11:33:45 PM
default

D.) Mixed Apnea

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- Begins as central apnea followed by obstructive apnea
- Seen in patients with OSA
- Often found in Down's Syndrome

Mixed Apnea

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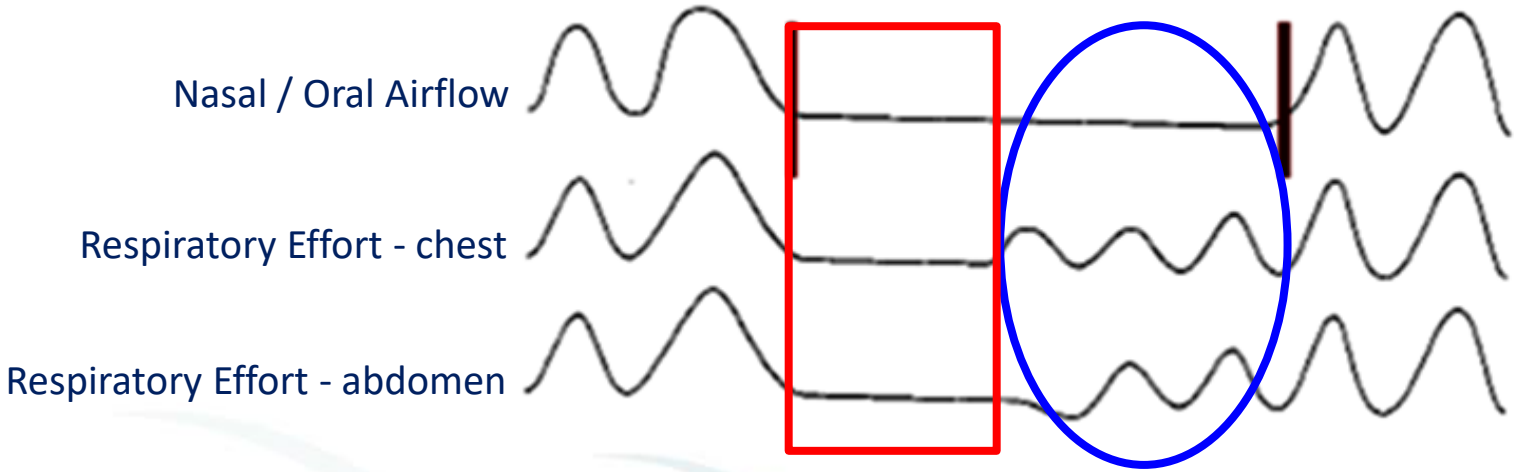
- Absent inspiratory effort in the initial portion of the event, followed by resumption of inspiratory effort in the second portion of the event.



Mixed Apnea

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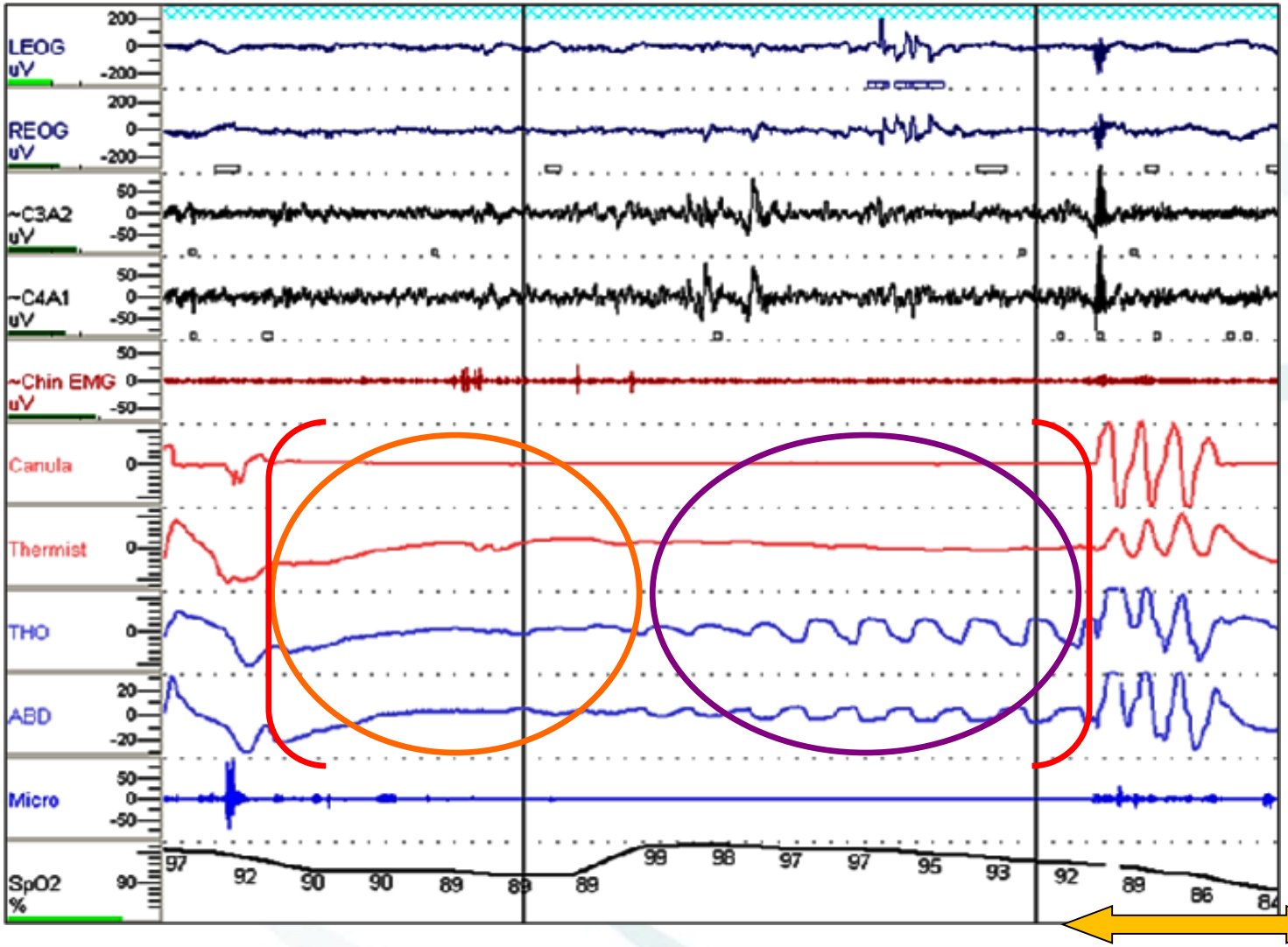

Key Points

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- Sleep Disordered Breathing is an important medical disorder that warrants active investigation by means of a clinical evaluation and polysomnographic sleep studies.
- Treatment is essential, not only to improve the symptoms that include sleepiness, but also to prevent the development of cardiovascular complications.
- Effective treatments exist that include behavioral, medical and surgical means; dramatic improvements in patient's well being can be achieved.

Question:

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- A breathing pattern characterized by regular "crescendo-decrescendo" fluctuations in respiratory rate and tidal volume.

  a. Obstructive Apnea
  b. Hypopnea
  c. Cheyne Stokes Respiration
  d. OHS (Obesity Hypoventilation Syndrome)

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Thank You