How to evaluate sleep complaints

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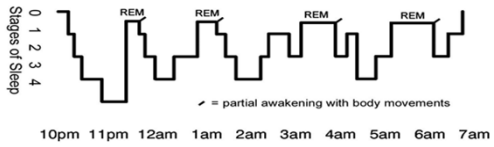
Sleep

- Sleep is essential to normal brain function
- Loss of sleep can result in changes in mood, cognitive impairment, and abnormal hormone rhythms
- Most adults sleep for between 7 and 8 hour a night
- The typical sleep pattern consists of 4 or 5 cycles of quiet sleep, alternating with paradoxical or rapid-eye-movement (REM) sleep
- Quiet sleep is often referred to as non-REM (NREM) sleep, and is divided further in to 3 or 4 stages

Stage of sleep

- Non rapid eye movement (NREM)
  - Light sleep
    - NREM stage 1 (N1)
    - NREM stage 2 (N2)
  - Deep sleep (slow wave sleep), (N3)
    - NREM stage 3 (N3), NREM stage 4 (N3)
- Rapid eye movement (REM)



Common sleep complaints

- Insomnia
- Hypersomnia
- Parasomnia

Sleep disorders in Neurology

- Parasomnia
- Nocturnal epilepsy
- Sleep apnea
- Narcolepsy

Parasomnias

Parasomnias

- A recurrent episodes of behavior, experiences or physical changes that occur exclusively or predominantly during or in relation to sleep
- Clinical
  - Subtle to complex & dramatic
- Types of parasomnias
  - Primary
  - Secondary

Primary parasomnias

- Sleep onset
  - Sleep starts (motor, sensory)
  - Hypnagogic hallucinations
  - Sleep paralysis
  - Rhythmic movement disorder
  - Restless legs syndrome
- Light NREM sleep
  - Bruxism
  - Periodic limb movements in sleep
- Deep NREM sleep
  - Arousal disorders (confusional arousals, sleep walking, sleep terrors)
- REM sleep
  - Night mares
  - REM sleep behavior disorder
- Waking
  - Hypnopompic hallucinations
  - Sleep paralysis
- Inconsistently related to stage of sleep
  - Sleep talking
  - Nocturnal enuresis
- Other primary parasomnias
  - Overlapped parasomnia disorder

Stores G. J R Soc Med 2001

Secondary parasomnias

- Physical disorders
  - Headaches
  - Respiratory disorders
  - Gastrointestinal conditions
  - Nocturnal muscle cramps
  - Cardiac arrhythmias
  - Sustained sleep starts
  - Some cases of restless legs syndrome or periodic limb movement in sleep
- Psychiatric disorders
  - Post-traumatic stress disorder
  - Nocturnal panic attacks
  - Other (including sleep-related eating disorder, psychogenic dissociative states)
  - Pseudoparasomnias
- Nocturnal epilepsies****

Stores G. J R Soc Med 2001

Parasomnia

- Waking: Cataplexy, sleep paralysis
- Sleep onset: Restless legs syndrome
- Light NREM sleep: Periodic limb movements in sleep
- Deep NREM sleep: Arousal disorders
  - Sleep walking, sleep terrors, sleep eating
- REM sleep:
  - REM sleep behavior disorder
  - Sleep apnea (any stage: more prominent in REM sleep)

Stores G. J R Soc Med 2001

Restless leg syndrome (RLS)

International RLS study group criteria

- Need to move the legs, accompanied or caused by unpleasant leg sensations
- Symptoms present during rest or inactivity
- Relieved by movements such as stretching or walking
- Symptoms worse in the evening or at night

RLS: Epidemiology

- Common but unrecognized disorder
- Prevalence: 2.5 - 15% of the general population
- Risk factors: aging, female
- Onset
  - Start any age
  - 25% onset 20 years (genetic RLS)

Sleep Med 2004
Rev neurol 2007
Sleep Med Rev 2006
Psychiatry Clin Neurosci 2005

RLS: Impact for individual & family

- Delay onset of sleep
- Poor quality of sleep
  - Awakening due to leg discomfort
- Poor quality of life

RLS: Aetiology

- Idiopathic ~ 40-60%
  - Familial
    - Genetic factors?
    - ~ 50% positive family History
- Symptomatic
  - Common
    - Peripheral neuropathy
      - Sub-clinical PN ~ 25% in RLS
    - Uremia
    - Iron deficiency anemia & low ferritin level
- Symptomatic
  - Un-common
    - Myelopathies
    - Parkinson's disease
    - Rheumatoid arthritis
    - Thyroid disease
    - Pregnancy
    - ADHD
    - Varicose veins
    - Cigarette smoking
    - Certain drugs
      - Antidepressant
      - Antihistamine, etc.

Periodic limb movements (PLM)

or nocturnal myoclonus

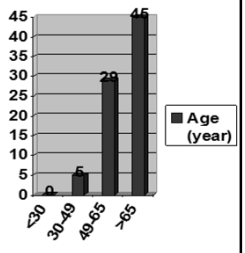
Periodic limb movements (PLM)

- Common in elderly: 24% of <u>age >60</u>
- Relatively slow clonic, polychronic, tonic-clonic muscle contraction
- Lasting 0.5-2(5) seconds
- Recurring in periodic sequences every 20-40 sec.
- The phenotype, intensity and frequency: vary widely
- Common: stage 2 sleep (NREM, 1st half)

American Academy of Sleep Medicine 2005

PLMS: Epidemiology

- A frequent finding in PGM (~13%)
- Prevalence
  - ~ 4 – 11% in adult



Res Common Chem Path Pharmacol 1982

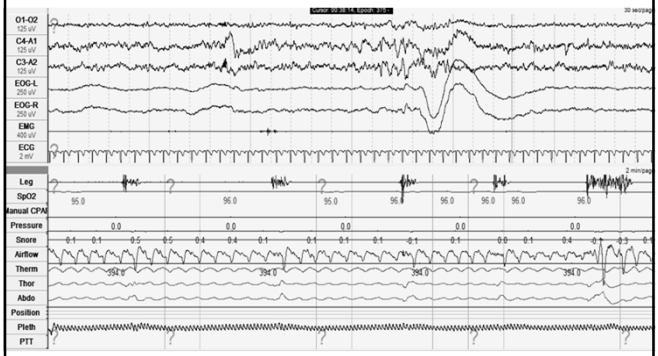
PLMS: Impact for individual & family

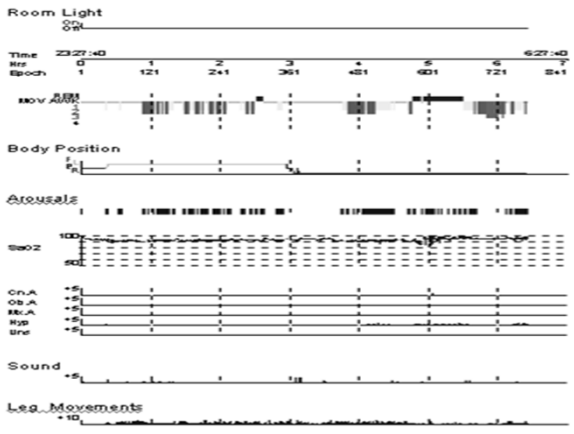
- Individual
  - Sleep deprivation
    - Micro-arousals / macro-arousals
  - Daytime somnolence
- Family
  - Disturb bed partner

PLMS: Aetiology

- Idiopathic -most common
- Associated condition
  - RLS
  - Narcolepsy
  - Sleep apnoea
  - Drug
    - Used
      - Tricyclic antidepressants & L-dopa
    - Withdrawal
      - Anticonvulsants & hypnotic-sedative drugs

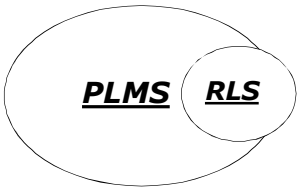
Periodic limb movement in sleep





RLS & PLMS are frequently confused

- 80% of RLS have PLMS while
- The majority of PLMS do not have RLS



Mov Disord 1997

Treatment of RLS & PLMS

- Dopaminergic drugs
- Benzodiazepines
- Gabapentin

Night terror

Sleep terrors

- A childhood phenomenon
- 1-7% prevalence
- Sudden awakening associated with behavioral and strong autonomic response
- Wriggle, struggle, sit up in bed, cry out or utter incomprehensive words

Sleep terrors

- Terrified expression, not respond to family members trying to console them
- Pale, tachypnea, tachycardia, mydriatic pupil, profuse sweating
- A few minutes → calm down spontaneously and return to sleep
- Cannot recall

Sleep walking

- Children: found 1-15%
- Peak 8-12 years
- Occur in the 1st part of the night (intense deep sleep)
- Gets up, walks around in a state of altered consciousness and impaired judgment
- Purposeful/ semi-purposeful tasks

Sleep walking

- Duration: 3-15 minutes
- Returns to bed and resume deep
- No/poor recollection
- Triggers
  - Sleep deprivation, fever, sleep-related breathing disorders, hypnotics and alcohol beverages

Sleep eating

Sleep eating

- A parasomnia event: shares many similarities with sleepwalking
- Age of onset: early adulthood
- Clinical manifestation
  - Awakens during sleeping hours
  - To eats or drinks, often excessively
    - Tend to eat foods high in calories or sugar
    - No interest in wasting time cleaning, either before, during or after the episode
  - Unconsciously, no memory of its occurrence
  - Eating episodes are completed, they will often return to bed

Sleep eating

- Risk factors
  - Women (more common than men)
  - Often in conjunction with dieting, anorexia or stress
  - Obstructive sleep apnea
  - Restless legs syndrome
  - Sleepwalking
- Complications
  - Potential undesired weight gain
  - Injury (hot dishes, chopping up ingredients)
  - Disrupts sleep (sometimes multiple times per night)
  - Other health concerns
- Treatment
  - effectively treated with medications for parasomnias
  - Avoid possibility of injuries

REM behavior disorder

REM sleep behaviour disorders (RBD)

- M: F = 8 : 1
- Late life (average age of 60)
- A history of apparent dream-enacted behavior
- A vivid dream mentation
- Arises from REM sleep episodes without atonia
- Obvious in the 2nd half of the night

Lancet Neurol 2006

REM sleep behavior disorders (RBD)

- Complex and often violent gestures
  - Animated or threatening discussions, moaning, punching and screaming
  - All typical attack or defense reactions
  - Rare: jump out of bed, continuing to vocalize
- Consistent and aggressive dream recall
- Sometimes occurs every night or many times on the same night
- Association: Neurodegenerative disorders
  - i.e. Parkinson's disease

Treatment of RBD

- Clonazepam 0.5 -2 mg before bedtime
- Melatonin 2-6 mg

Nocturnal epilepsies

Frontal lobe epilepsy (mesial or prefrontal)
Benign centrotemporal (Rolandic) epilepsy in children
Benign epilepsy with affective symptoms
Benign occipital epilepsy
Temporal lobe epilepsy and others
Nocturnal paroxysmal dystonia

Typical features of Nocturnal Frontal Lobe Seizures

(1) An abrupt, explosive, onset awakening the patient from NREM 2 sleep
(2) Accompanied by sustained asymmetric dystonic, tonic posturing, and hypermotor behaviors including thrashing, pedaling and kicking
(3) Tending to be stereotyped in appearance for the individual patient
(4) Brief, typically lasting 20 to 30 seconds (with tachycardia)
(5) Associated with preserved awareness
(6) No postictal confusion or amnesia
(7) No scalp-recorded ictal EEG activity accompanying them

Zucconi M, et al. J Clin Neurophysiol 1997

Undiagnosed paroxysmal sleep-related events

What to do next?

Scoring tools

- The Frontal Lobe Epilepsy and Parasomnias Scale (FLEP) may be used as an adjunct to laboratory testing to identify patients with nocturnal frontal lobe epilepsies.
- A score of zero or less is very unlikely to be seen in epilepsy, whereas patients scoring 3 or greater generally have epilepsy.

Derry CP, et al. Arch Neurol 2006

Table. The Frontal Lobe Epilepsy and Parasomnias (FLEP) Scale

Clinical Feature		Score
Age at onset		
At what age did the patient have their first clinical event?	<55 y	0
	≥55 y	−1
Duration		
What is the duration of a typical event?	<2 min	+1
	2-10 min	0
	>10 min	−2
Clustering		
What is the typical number of events to occur in a single night?	1 or 2	0
	3-5	+1
	>5	+2
Timing		
At what time of night do the events most commonly occur?	Within 30 min of sleep onset	+1
	Other times (including if no clear pattern identified)	0
Symptoms		
Are the events associated with a definite aura?	Yes	+2
	No	0
Does the patient ever wander outside the bedroom during the events?	Yes	−2
	No (or certain)	0
Does the patient perform complex, directed behaviors (eg, picking up objects, dressing) during events?	Yes	−2
	No (or uncertain)	0
Is there a clear history of prominent dystonic posturing, tonic limb extension, or cramping during events?	Yes	+1
	No (or uncertain)	0
Stereotypy		
Are the events highly stereotyped or variable in nature?	Highly stereotyped	+1
	Some variability/uncertain	0
	Highly variable	−1
Recall		
Does the patient recall the events?	Yes, lucid recall	+1
	No or vague recollection only	0
Vocalization		
Does the patient speak during the events and, if so, is there subsequent recollection of this speech?	No	0
	Yes, sounds only or single words	0
	Yes, coherent speech with incomplete or no recall	−2
	Yes, coherent speech with recall	+2
Total score		

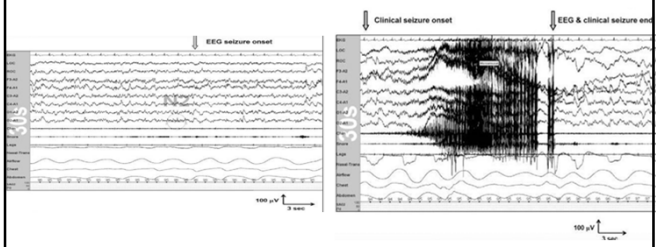
Derry CP , et al. Arch Neurol 2006

Special planning for PSG

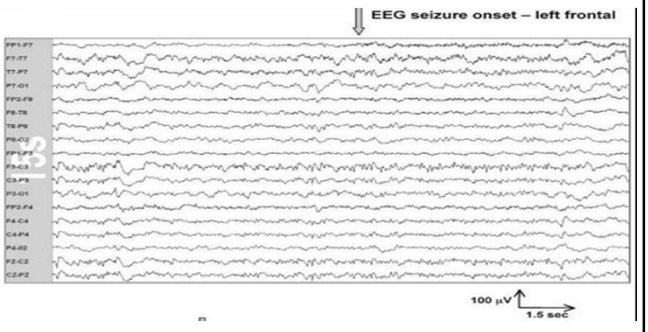
- In patient whose clinical is ambiguous or a FLEPscore of +1 to +3
- Expanded EEG montages and video

Foldvary-Schaefer N, et al. J Clin Neurophysiol 2006

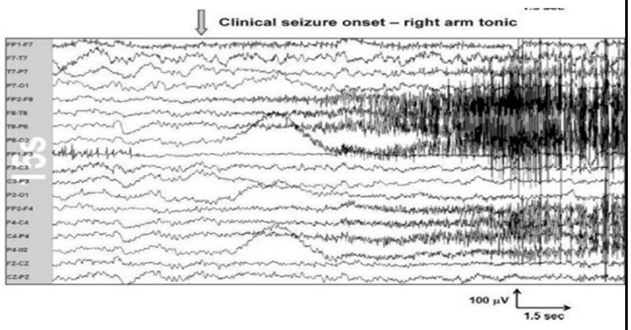
A routine PSG montage in 30-second epochs.



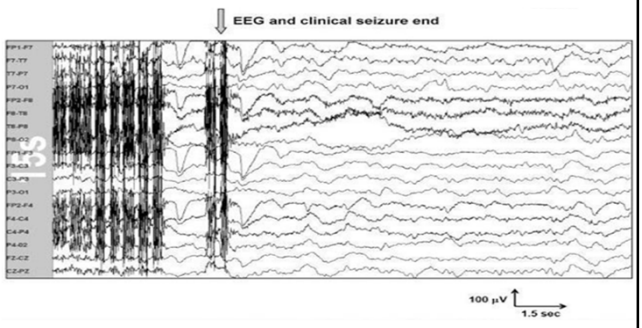
Expanded EEG 18-montages and consecutive 10-second epochs: a seizure arising from the left frontal lobe



Paroxysmal fast activity in the left frontal region. Clinical onset (right arm tonic) occurs ~7 seconds later



Evolving to clonic activity as seen toward the end of the event



Long-term monitoring

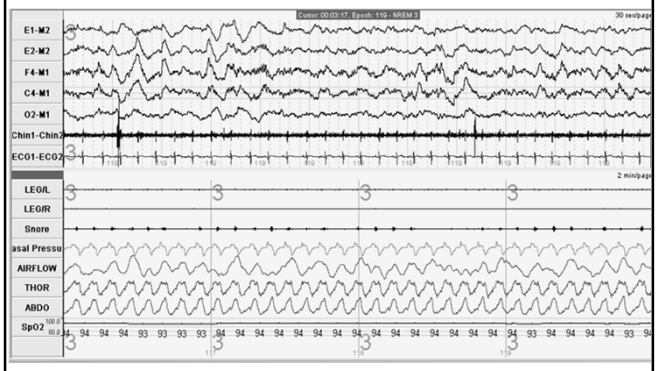
6 days: 6 attacks

Semiology & Ictal EEG

- Nocturnal frontal lobe epilepsy (stereotype)
- Lateralized on the left
- Onset: Frontal and temporal spreading
- Subdural grid: find epileptogenic area at left fronto-polar area
- Surgery: patho: cortical dysplasia
- Seizure free for 3 year since operation (on 2 medications)

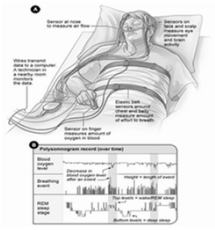
Sleep apnea

Typical normal polysomnogram



Sleep apnea

- A sleep disorder characterized by pauses in breathing or instances of shallow breathing during sleep
- Apnea + hypopnea



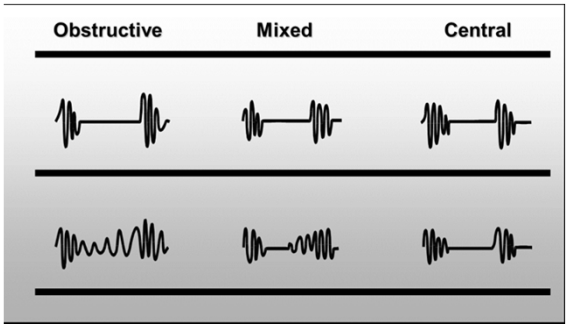
Apnea and hypopnea

- Apnea: Cessation of breathing for at least 10 seconds
- Hypopnea: Reduction of breathing from baseline for at least 10 seconds
  - A: … of at least 50%
  - B: ...Discernable reduction breathing WITH
    - drop ≥ 30% +
    - - Arousal OR Desat of >2%.
- Apnea/Hypopnea Index(AHI): Apneas + hypopneas per hour
- Grading
  - AHI 5-14 mild
  - AHI 15-30 moderate
  - AHI > 30 severe

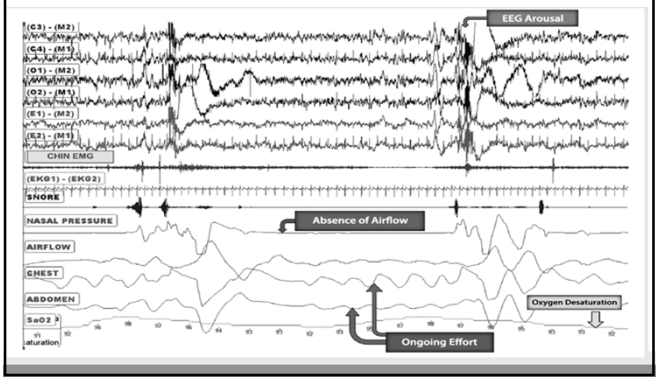
Classification of sleep apnea

- Obstructive sleep apnea (OSA)
  - If the majority of the events are obstructive apneas or hypopneas it is classified as obstructive sleep apnea/hypopnea
- Central sleep apnea (CSA)
  - If the majority of the events are central apneas or hypopneas it is classified as central sleep apnea/hypopnea.
- Mixed sleep apnea

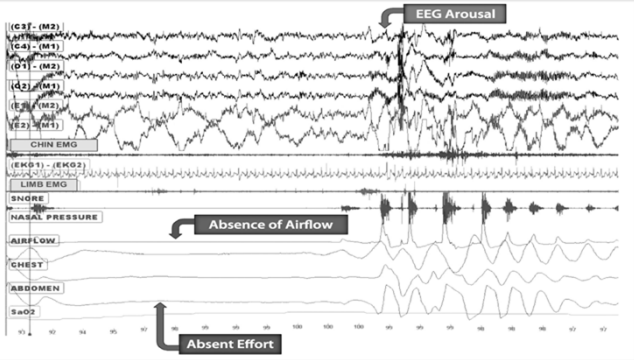
Sleep apnea



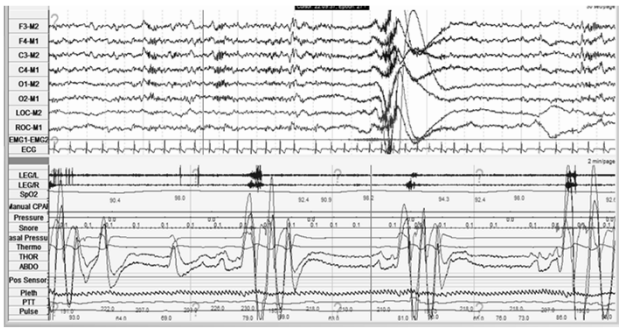
Obstructive sleep apnea



Central apnea



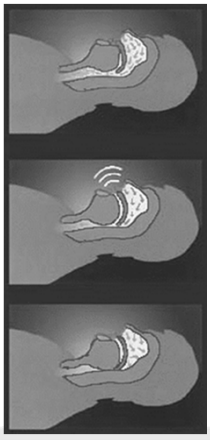
Mixed apnea

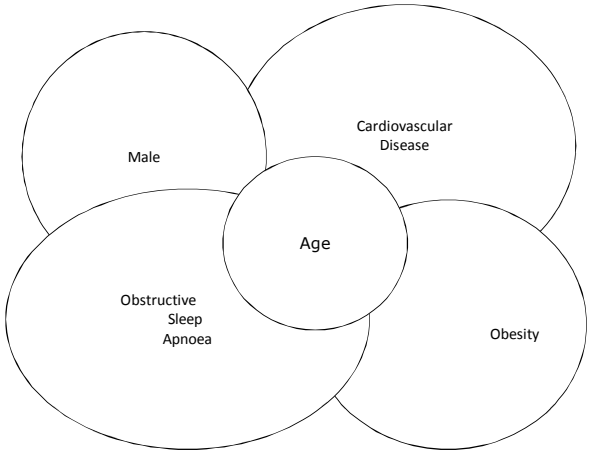


Obstructive sleep apnea (OSA)

Pathogenesis of OSA

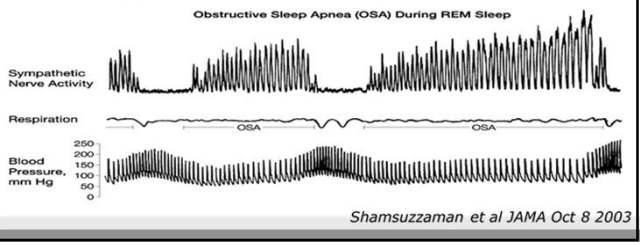
- Anatomically narrow upper airway
  - Wakefulness - increase reflex dilator tone - patency
  - Sleep - loss of this increase tone - Obstruction
- Abnormally large - decrease of upper airway dilators c/w Respiratory pump muscles in sleep - Obstruction





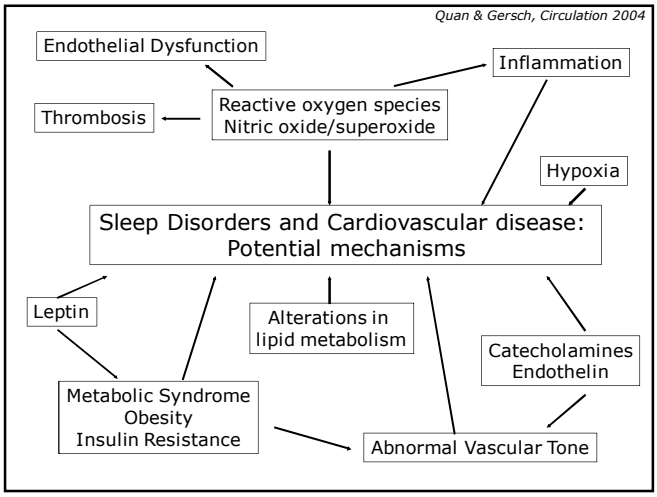
OSA – Acute effects

- Arousal
  - activate upper airway muscles ⇒ breathing
  - post-apnoeic sympathetic drive ⇒ ↑ HR
    ⇒ Peripheral vasoconstriction ⇒ ↑ BP
  - presence of airflow ⇒ ↑ sympathetic drive
  - resumption of venous return ⇒ ↑ cardiac output



Shamsuzzaman et al JAMA Oct 8 2003

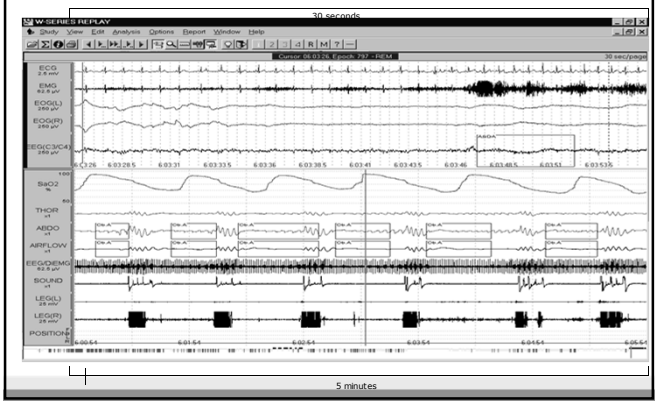
Quan & Gersch, Circulation 2004



OSA morbidity

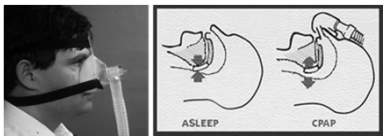
- Cardiovascular Disease
- Metabolic Disease
- Neuropsychological Function
  - Excessive Daytime Sleepiness (EDS)
  - Mood
  - Quality of Life
  - Work productivity
  - Motor Vehicle Accidents
  - Interpersonal Relationships

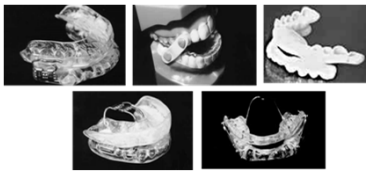
Severe OSA



OSA treatment

- Nasal CPAP
- Oral appliances
- Lifestyle modification
- Positional treatment
- Surgery





Central sleep apnea (CSA)

Central sleep apnea syndrome (CSAS)

- A sleep-related disorder
- The effort to breath is diminished or absent
- Typical 10-30 seconds associated with a reduction in O2 Saturation
- 20% of sleep apnea syndrome (SAS)
- Much less common than OSA

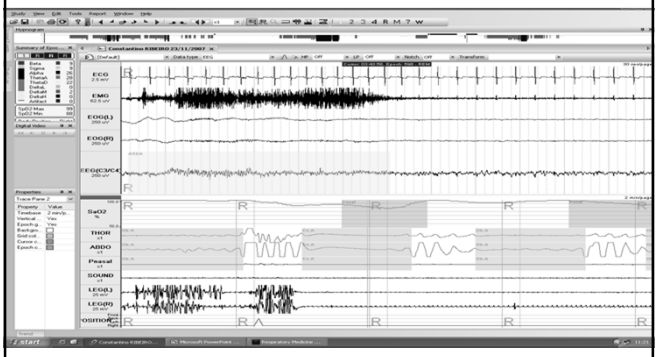
Etiologies of central apnea

- A central respiratory depressant drug
  - Opiates
  - Barbiturate
  - Benzodiazepines
  - Tranquilizers
  - Alcohol
- Neurological condition
  - Brainstem – upper cervical lesion, Chiari malformations
  - Parkinson's disease
  - Stroke

Etiologies of central apnea

- Heart disease
  - Congestive heart failure → Cheyne-Stokes respiration
    - Cheyne-Stokes respirations occur while both awake and asleep
  - Atrial fibrillation is an association with central sleep apnea
- Kidney failure
- People abruptly sleeping at higher altitudes
- OSA being treated with positive airway pressure (PAP) devices
- Idiopathic CSA: risk = age > 65, obesity, men

Central apnea



Treatment

- Fix etiologies
- No treatment (observe only)
  - Asymptomatic case
  - CSA without significant oxygen desaturation
  - CSA during sleep-wake transition
  - CSA during CPAP treatment of obstructive sleep apnea
- 50% of CSA can be managed on CPAP alone, otherwise BiPAP
- ? acetazolamide and theophyline

Narcolepsy

Narcolepsy

- The classic symptoms ("tetrad of narcolepsy")
  - Cataplexy
  - Sleep paralysis
  - Hypnagogic hallucinations
  - Excessive daytime sleepiness (most common)
- An excessive urge to sleep in inappropriate times
  - Such as while at work or at school
- When a narcoleptic falls asleep they generally experience the REM stage of sleep within 10 minutes
  - Normal after 90 minutes

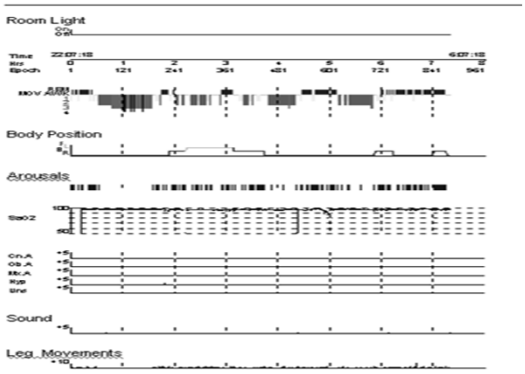
Cataplexy

- Not occur in all patients of narcolepsy
- An episodic condition featuring loss of muscle function
  - Slight weakness (such as limpness at the neck or knees, sagging facial muscles, or inability to speak clearly)
  - Complete body collapse
- Triggered by sudden emotional reactions
  - Laughter, anger, surprise, or fear
- Duration: a few seconds - several minutes
- The person remains conscious throughout the episode

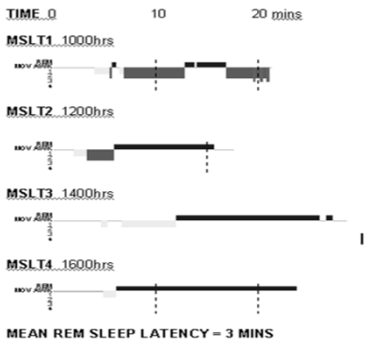
Sleep paralysis

- The temporary inability to talk or move when waking (or less often, when falling asleep).
- Lasting a few seconds to minutes
- Often frightening but not dangerous

Overnight polysomnography – nearly normal



Multiple sleep latency test



Summary

- Sleep is essential to normal brain function
- Sleep disorders affect quality of life for both individuals and family.
- Clinical and polysomnographic study are helpful to diagnose
- Prompt treatment can improve sleep quality and well being
- Common sleep disorders are classified as insomnia, hypersomnia and parasomnia