

# Sleep related movement disorders?

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# Nocturnal Frontal Lobe Epilepsy (NFLE)

- Seizures in NFLE may have bizarre clinical features, with vocalization, complex automatisms, and ambulation (only in the bedroom)
- Typically of the hyper-motor type,
  - Repetitive, high-amplitude, and high-velocity movements of the trunk and proximal extremities and
  - Asymmetric tonic seizures having dystonic, dyskinetic, and repetitive proximal movements.
- Complex motor seizures in NFLE have hypermotor manifestations,
  - Marked agitation with body rocking, kicking, boxing, thrashing, pedaling, bending, hitting, running, spitting, and various types of vocalization that include shouting and swearing

# Classification of movement disorders during sleep

## Physiologic Motor Activity during sleep or at sleep onset

Postural shifts, body &  
limb movements during sleep

Physiologic fragmentary myoclonus

Hypnic jerks

Hypnagogic foot tremor

Rhythmic leg movements

## Pathologic Motor Activity during Sleep

Motor parasomnias

Sleep-Related Movement Disorders

Isolated Sleep-Related Motor Symptoms  
(Apparently Normal Variants)

Nocturnal seizures

Miscellaneous Nocturnal Motor Hyperactivity

Voluntary Movement Disorders (Sleep-related  
Dissociative disorders )

# Abnormal paroxysmal events in sleep

- Polysomnography test → gold standard to distinguish
- How to perform clinical approach of this abnormal paroxysmal events in sleep
  - Sleep related movement disorders
  - Parasomnias
    - Non REM parasomnias
    - REM parasomnias
  - Frontal Lobe Epilepsy and Parasomnias Scale (FLEP)
  - Other sleep related epilepsy
  - Other persistent daytime abnormal movements
  - Sleep-related Dissociative Disorders

# Clinical approach

Abnormal paroxysmal events in sleep

Complex

Parasomnia

NREM

REM

NFLE

Functional movement

Simple

Sleep related movement disorders

Persistent daytime abnormal movement

Functional movement

# International classification of Sleep disorders 3<sup>rd</sup> edition (ICSD-3)

**Insomnia**

**Sleep related breathing disorders**

**Central disorders of hyper somnolence**

**Circadian rhythm sleep wake disorders**

**Parasomnias**

**Sleep- related movement disorders**

**Other sleep disorders**

## Sleep related movement disorders

- Characterized by relatively simple, usually stereotyped movements that disturb sleep

VS

## Parasomnias

- Undesirable physical or experiential events that accompany sleep without disrupting sleep architecture.
- Complex behaviors during sleep that ***appear purposeful and goal-directed***, but are outside the conscious awareness of the individual and are therefore inappropriate
- Consist of abnormal sleep-related movements, behaviors, emotions, perceptions, dreaming, and autonomic nervous system functioning
- Disorders of arousal, partial arousal, and sleep-stage transition

## Sleep-related movement disorders

Restless legs syndrome

Periodic limb movement disorder

Sleep-related leg cramps

Sleep-related bruxism

Sleep-related rhythmic movement disorder

Benign sleep myoclonus of infancy

Propriospinal myoclonus at sleep onset

Sleep-related movement disorder due to a medical disorder

Sleep-related movement disorder due to a medication or substance

Sleep-related movement disorder, unspecified

### Isolated Symptoms and Normal Variants

Excessive fragmentary myoclonus

Hypnagogic foot tremor and alternating leg muscle activation

Sleep starts (Hypnic jerks)

## Parasomnias

### NREM-related parasomnias

Confusional arousals

Sleepwalking

Sleep terrors

Sleep-related eating disorder

### REM-related parasomnias

REM sleep behavior disorder

Recurrent isolated sleep paralysis

Nightmare disorder

### Other parasomnias

Exploding head syndrome

Sleep-related hallucinations

Sleep enuresis

Parasomnia due to a medical disorder

Parasomnia due to a medication or substance

Parasomnia, unspecified



# Restless leg syndrome (RLS)

- Willis-Ekbom disease (WED) : A circadian disorder of sensory-motor integration manifested.

Criteria	Characteristics
The <b>urge</b> to move the legs	<ul style="list-style-type: none"><li>• Usually but not always accompanied by or felt to be caused by uncomfortable and unpleasant sensations in the legs</li><li>• “need to move,” “crawling,” “tingling,” “rest- less,” “cramping,” “creeping,” “pulling,” “painful,” “electric,” “tension,” “itching,” “burning,” “prickly</li><li>• Typical RLS sensations are felt deep inside the muscles and bones of the legs</li><li>• Bilateral legs (usually)</li></ul>
Begin or worsen during periods of <b>rest or inactivity</b> such as lying down or sitting	
Partially or totally <b>relieved by movement</b> , such as walking or stretching, at least as long as the activity continues	
Only occur or are <b>worse in the evening or night</b> than during the day	
The above features are not solely accounted for by other medical or behavioral conditions	<b>Exclude:</b> myalgia, venous stasis, leg edema, arthritis, leg cramps, positional discomfort, habitual foot tapping, and other nocturnal sensory-motor symptoms.

# Restless leg syndrome (RLS)

Clinical features supporting the diagnosis of restless legs syndrome/Willis–Ekbom disease (RLS/WED).

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The following features, although not essential for diagnosis, are closely associated with RLS/WED and should be noted when present:

1. Periodic limb movements (PLM): presence of periodic leg movements in sleep (PLMS) or resting wake (PLMW) at rates or intensity greater than expected for age or medical/medication status.
2. Dopaminergic treatment response: reduction in symptoms at least initially with dopaminergic treatment.
3. Family history of RLS/WED among first-degree relatives.
4. Lack of profound daytime sleepiness.<sup>a</sup>

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<sup>a</sup> RLS/WED shares this characteristic with other hyperarousal conditions including insomnia disorder.

# Pathogenesis

- Not fully understood
- Genetic factors
  - *BTBD9*, *MEIS1*, and *MAP2K5/SKOR1* genes
- Dopaminergic, adenosinergic, and glutamatergic pathways involved
  - ***‘hyperdopaminergic state’***
- Low central nervous system (CNS) iron stores may lead to down-regulation of the adenosine 1 receptor (A1R)
  - Contributes to both a hyperdopaminergic and hyper-glutamatergic state
- Deficiency in CNS opioid receptors in patients with RLS compared with controls

# Restless legs syndrome associated with major diseases

A systematic review and new concept

**Primary/ Idiopathic**  
Familial & genetic risk factors

## Other associated conditions

- Arthritis,
- Sensory neuropathy,
- Radiculopathy
- Diabetes,
- Renal disease
- Psychiatric disorders such as depression and
- anxiety is increased 1.5- to 2-fold in patients with RLS

## Secondary/ symptomatic

- Iron deficiency anemia (IDA),
- Multiple sclerosis (MS),
- Polyneuropathy, and
- Parkinson disease (PD)
- Common chronic diseases such as
  - Arterial hypertension or
  - Headache or
  - Conditions such as inflammation and pregnancy.

# RLS mimic

RLS mimic	Characteristics
<b>Neuropathy</b>	<ul style="list-style-type: none"><li>• Often worse at night and causes discomfort</li><li>• Not associated with an urge to move the legs</li><li>• Not relieved by movement</li></ul>
<b>Akathisia</b>	<ul style="list-style-type: none"><li>• Positive for an urge/ need to move body or restlessness</li><li>• Does not have a circadian evening propensity</li><li>• The sensation of restlessness is typically diffuse without predilection for the legs</li></ul>
<b>Muscle cramps</b>	<ul style="list-style-type: none"><li>• Predominantly or solely occur during sleep</li><li>• Result in painful muscle contractions</li><li>• Not associated with an urge to move</li></ul>
<b>Habitual foot tapping</b>	<ul style="list-style-type: none"><li>• A behavioral phenomenon that is not associated with an urge to move, and</li><li>• It can be suppressed.</li></ul>
<b>Positional discomfort</b>	<ul style="list-style-type: none"><li>• From pressure that compresses nerves, limits blood flow, or stretches body tissue.</li><li>• Resolved by changing body position without requiring any repetitive movement</li><li>• No urge to move</li></ul>
<b>Sleep starts (or hypnic jerks)</b>	<ul style="list-style-type: none"><li>• Short, massive body movements during the sleep/wake transition</li><li>• Involve the extremities of both sides synchronously but without periodicity</li></ul>

# RLS mimic

RLS mimic	Characteristics
<b>Sleep-related leg cramps</b>	<ul style="list-style-type: none"><li>• Worse at night and are relieved by movement</li><li>• Involve a specific muscle and usually require stretching of the muscle more than moving of the leg to relieve symptoms</li><li>• Residual pain or sensitivity after the event</li></ul>
<b>Painful legs and moving toes syndrome</b>	<ul style="list-style-type: none"><li>• Severe pain in one or both feet</li><li>• A sensation of burning and associated with frequent, repetitive movements of the toes</li><li>• Pain is not necessarily increased at night or relieved by movement.</li></ul>
<b>Vascular intermittent claudication</b>	<ul style="list-style-type: none"><li>• Leg pain or discomfort</li><li>• Relieved by rest and worsens during a prolonged upright position or walking.</li><li>• Absence of the typical circadian feature of RLS.</li></ul>
<b>Pain related to the narrow spinal canal</b>	<ul style="list-style-type: none"><li>• When lying in bed, pain is more pronounced in the supine position compared to a lateral position with bended knees.</li><li>• Combination with back pain, as well as with clinical signs of a myelopathy</li></ul>

# Restless Leg Syndrome and Objectively-Measured Atherosclerosis in the Canadian Longitudinal Study on Aging

**Key Words:** restless leg syndrome; carotid intima-media thickness; atherosclerosis; CLSA

## Reported:

### RLS & major diseases

- Renal failure
- HT
- DM
- Obesity
- Thyroid dysfunction
- Depression
- Anxiety

USG Carotid intima-media thickness

Excluded PLMS

RLS had significant carotid intima-media thickness more than non RLS patients

RLS is associated with a higher degree of atherosclerosis

Sympathetic hyperactivity, autonomic fluctuations, and hypertension in PLMS

Sleep deprivation & increase appetite/ sugar craving

RLS

Atherosclerosis

Microcirculation impairment in the legs and/or global hypoxia might cause leg discomfort

# (Non-pharmacological) Treatment

- Serum Iron : keep > 50-75 mcg/ml
- Transferrin saturation : keep > 20%
- Check exacerbating factors:
  - Lifestyle : Alcohol, smoking, sleep deprivation
  - Drugs :
    - Dopamine antagonist
    - Antidepressants - SSRI, TCA
    - Anti-histamine
    - Recent opioid discontinuation
  - Blood loss
  - Pregnancy (iron)



# Pharmacological Treatment

Drugs	Effective	Probably effective
Pramipexole	6 mo	1 year
Ropinirol	6 mo	1 year
Rotigotine	6 mo	5 years
Levodopa	-	2 years
Pregabalin	1 year	-
Gabapentin	-	-

# Dopamine agonists recommendation in RLS

D3 agents	Efficacy	Safety	Side effects
<b>Pramipexole</b>	Efficacious at doses of 0.25, 0.50, and 0.75 mg	Acceptable risk with special monitoring for augmentation	Nausea, lightheadedness, fatigue, augmentation
<b>Rotigotine</b>	Efficacious at a dose of 2–3mg	Acceptable risk with special monitoring for local site reactions and augmentation	Skin reaction, augmentation
<b>Ropinirole</b>	Efficacious at a dose of 0.78–4.6 mg	Acceptable risk with special monitoring for augmentation	Nausea, lightheadedness, fatigue, augmentation

# Treatment

**Table 5**  
Clinical consensus of the benefits and risks for each pharmacologic treatment of RLS/WED.

	Levodopa	Nonergot DA		Ergot-based DA	$\alpha_2\delta$ Ligand	Opioid	Clonazepam	
		Short-acting	Long-acting					
<i>The potential of the drug to cause the following adverse events</i>								
Augmentation	+++	++	+	++	0	NK	0	
LoE	+++	++	NK	++	+	+	NK	
ICD	0	+	0/+	NK	0	0	0	
EDS	NK	++	+	++	+++	+	++	
Negative mood	0	0	0	0	+	+	++	
Weight gain	0	0	0	0	++	0	0	
General toxicity	+	+	++	+++	+	++	+	
<i>The potential of the drug to have positive effect on these parameters</i>								
Subjective nighttime sleep	0	+	+	+	++	++	++	
Classic nighttime RLS symptoms	+	++	++	++	++	++	0	
QoL	NK	++	++	++	++	NK	NK	
Pain reduction	+	+	+	+	++	+++	0	

**Abbreviations:** RLS/WED, restless legs syndrome/Willis–Ekbom disease; DA, dopamine-receptor agonist; LoE, loss of efficacy; ICD, impulse control disorders; EDS, excessive daytime sleepiness; QoL, quality of life; NK, not known.

+++, is very likely to affect this parameter; ++, is somewhat likely to affect this parameter; +, is slightly likely to affect this parameter; 0, has no effect on this parameter.

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Ref: D. Garcia-Borreguero et al. / Sleep Medicine 14 (2013) 675–684

# Initial Treatment: Factors that impact the choice of agent

**Table 6**

Clinical recommendations regarding factors that affect the selection of an agent for initial treatment in patients with restless legs syndrome/Willis-Ekbom disease.

Factor that impacts the choice of agent	Treatment choice
Time of day (daytime disturbance)	<ul style="list-style-type: none"> <li>• Preferably a long-acting agent</li> <li>• Twice a day dosing of a short-acting agent</li> </ul>
Sleep disturbance disproportionate to other symptoms of RLS/WED	$\alpha_2\delta$ Ligand
Comorbid insomnia	$\alpha_2\delta$ Ligand
Pregnancy risk	<ul style="list-style-type: none"> <li>• Avoid both dopaminergic agents and <math>\alpha_2\delta</math> ligands</li> <li>• Consider the use of iron</li> <li>• Select a drug that is not renally excreted</li> </ul>
Impaired renal function	Dopamine-receptor agonist
Increased risk for falls	$\alpha_2\delta$ Ligand
Painful restless legs	$\alpha_2\delta$ Ligand
Comorbid pain syndrome	$\alpha_2\delta$ Ligand
History of or current ICD	Dopamine-receptor agonist or $\alpha_2\delta$ ligand
History of or current alcohol or substance abuse	Dopamine-receptor agonist
Severe symptoms of RLS/WED	Dopamine-receptor agonist
Excess weight, metabolic syndrome, or obstructive sleep apnea	Dopamine-receptor agonist
Availability <sup>a</sup>	Dopamine agonist or $\alpha_2\delta$ ligand
Cost <sup>b</sup>	Dopamine agonist or $\alpha_2\delta$ ligand
Comorbid depression	Dopamine-receptor agonist
Comorbid generalized anxiety disorder	$\alpha_2\delta$ Ligand
Daytime sleepiness	<ul style="list-style-type: none"> <li>• Investigate the cause</li> <li>• Select drug that is not hepatically excreted</li> </ul>
Higher potential for drug interactions	

# Restless legs syndrome (RLS) / Willis—Ekbom disease with augmentation

- *RLS = a sensorimotor disorder with leg discomfort and the irresistible urge to move affected body parts with relieve by movement & usually occur in the evening.*

**Augmentation** is the condition that  
An earlier onset of the symptom or  
An expansion to other body parts or  
Paradoxical response to pharmacological treatment or  
have shorter duration of the treatment effect than during early treatment days.

## Risk factors for augmentation

High dosage of dopaminergic Rx and short acting dopamine agonist drugs



**Down regulation of DA receptor**

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Takahashi M. et al. PLOS one 2017  
Winkelman JW. Et al. Neurology 2016

# Other Risks of Augmentation

- **Increased risk** of augmentation in:
  - low iron stores
  - Greater severity of RLS/WED symptoms prior to initiation of treatment
  - Possibly a family history of RLS or lack of neuropathy (Primary RLS)

# PLMD

- Combination of the extension of big toe and partial flexion of ankle, knee and sometimes hip
- Lower extremities > upper extremities
- Typically, patient is unaware of movement
- Arousal may precede, coincide with or follow the movement.

PLMS is associated with hypertensive autonomic arousals

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# Periodic limb movement disorder

- **Accompany in**
  - RLS, RBD, OSA, narcolepsy, MSA, DRD
  - General medical conditions such as
    - Renal failure, anemia, CHF, peripheral neuropathy
  - In patients treated with some medications such as
    - Tricyclic antidepressants, neuroleptics and serotonin reuptake inhibitors
- **Associated features**
  - Higher rates of mood disorders,
    - Anxiety, attention deficits, oppositional behaviors and
  - parasomnias



# Periodic limb movement disorder: treatments

- **Treatment:**
  - Dopaminergic drugs:
    - Dopamine agonists esp. pramipexole and ropinirole
    - Levodopa
  - Gabapentin
  - Clonazepam

# Sleep related leg cramps

- Differential diagnosis:

## RLS:

- Leg discomfort during the sleep and sometimes complain of cramping sensation in RLS
- Actual spasm and hardening of muscle: critical differentiating factor
- Much briefer in leg cramp (a few second to sometimes several minutes) than RLS (persist for hours)

## Dystonia:

- Electrophysiological study: on-going co-contraction of agonist and antagonist muscles.
- Leg cramp can be relieved by stretching, while dystonia can not.

- Treatment:

- Local massage, stretching and movement of the limbs

# Sleep related bruxism

## Drugs that may induce bruxism (awake or sleep)

- - Anti dopaminergic drugs
- Selective serotonin reuptake inhibitors
- Calcium antagonists
- Alcohol, caffeine or cigarettes
- Cocaine
- Amphetamine

- 3% in elderly

## • Clinical subtypes

**Primary, idiopathic:** no medical/ dental causes

**Secondary :** associated with other disorders

- Children with cerebral palsy, mental retardation, ADHD
- Adults with abnormal movements such as facio-mandibular myoclonus, Parkinson's disease, RBD, tardive dyskinesia, dementia, and sleep related breathing disorders esp. OSA

**Iatrogenic :** Treatment-induced

# Sleep related bruxism

- **Pathophysiology: Multifactorial**
  - Physiologic central nervous system (oromotor, sleep-wake regulation, catecholaminergic)
  - Autonomic nervous system
  - Psychosocial factors
  - Genetic factors
- Non-REM stage 1,2 (80%) but can occur in all stage

# Sleep related bruxism

- Management: no specific cure exists

## Behavioral strategies

- Psychological or physiological relaxation: sleep hygiene
- Biofeedback techniques

## Dental strategies

- Occlusal appliances

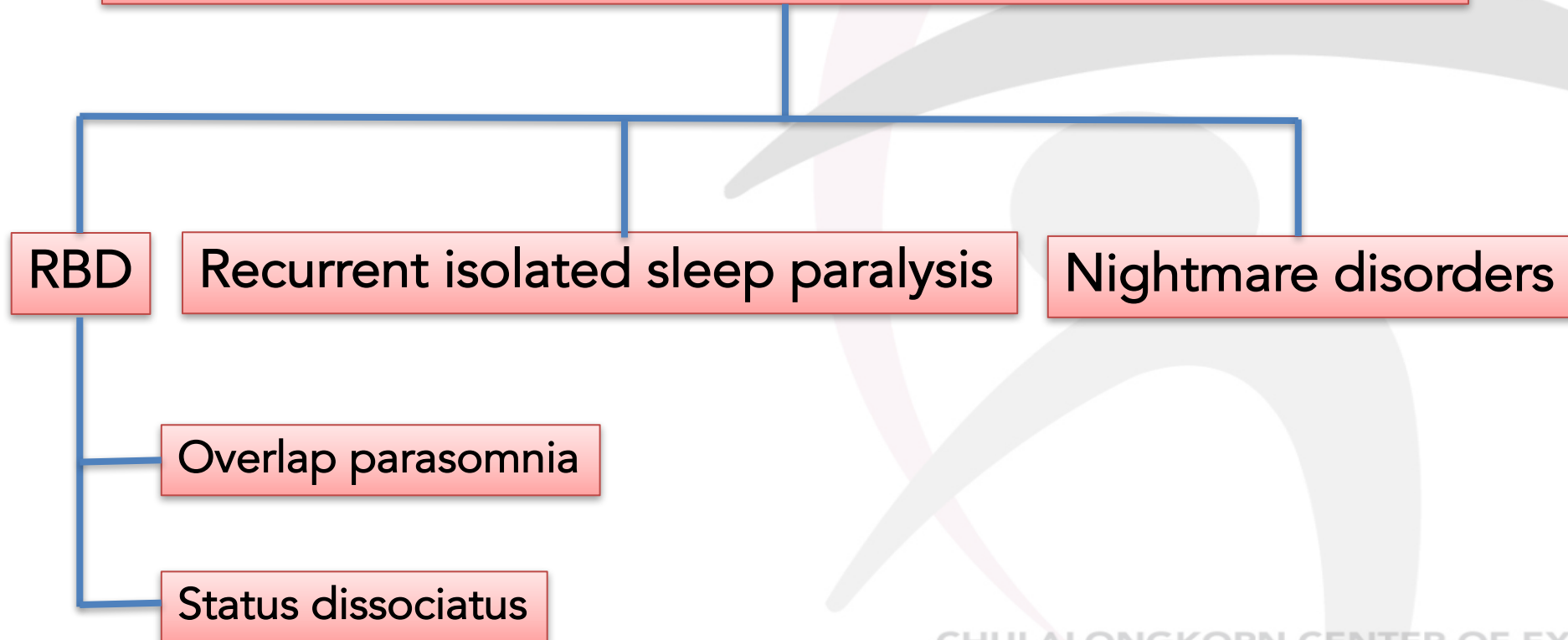
## Pharmacological strategies

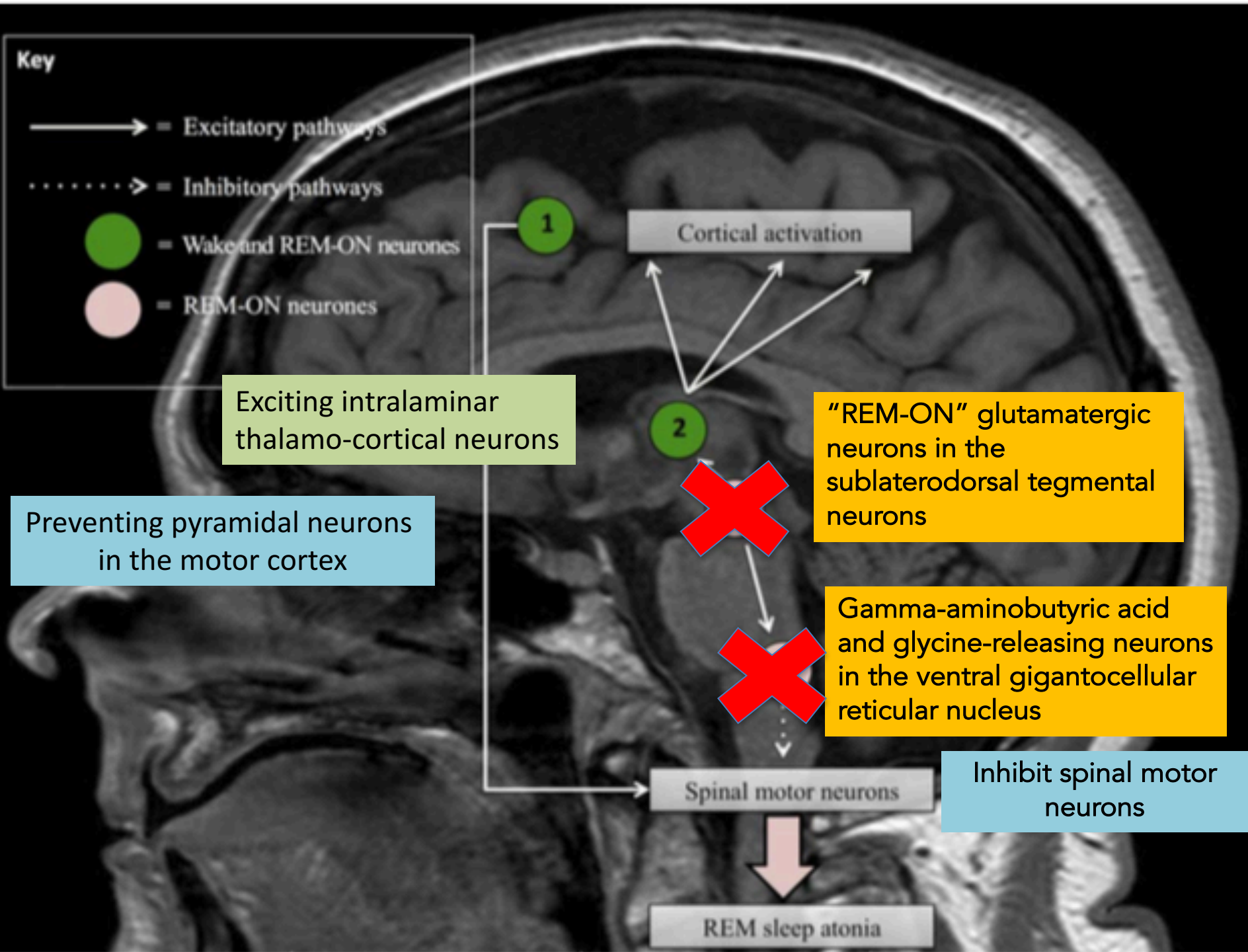
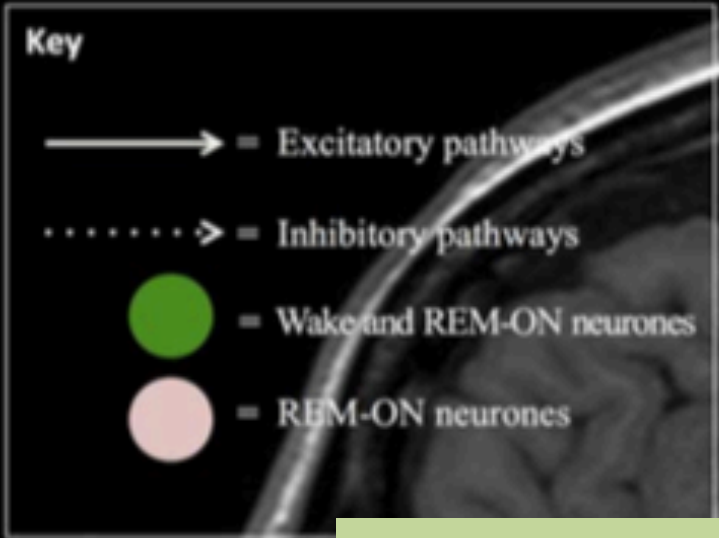
- Benzodiazepine
- Muscle relaxants
- Dopaminergic drugs
- Botulinum toxin injection
- Avoid Selective Serotonin Reuptake Inhibitor (SSRI): increase sleep related bruxism

# Others

- Benign sleep myoclonus of infancy
- Propriospinal myoclonus at sleep onset
- Sleep related movement disorder due to a medical disorder
- Sleep related movement disorder due to a medication or substance
- Sleep related movement disorder, unspecified

# REM PARASOMNIA







# Movements in RBD



- Short and abrupt,
- Sometimes jerky, and
- Mostly related to the extremities.
- Complex behaviors with violent actions (punching or kicking) or bed falls may occur.
- Dream content is usually unpleasant and may involve the individual being attacked, chased, or threatened (by a person or animal)

# RBD characteristics

## REVIEW

### REM Sleep Behavior Disorder: Motor Manifestations and Pathophysiology



Isabelle Arnulf, MD, PhD\*

*Sleep disorders unit, Pitié-Salpêtrière Hospital, Pierre and Marie Curie University, Inserm U975, CRICM, Paris, France*

- Behaviors during RBD are complex and varied.
  - Gesturing, reaching, grabbing, arm flailing, slapping,
  - Punching, kicking, sitting up, and leaping from bed
  - The forceful and violent aspect of these motor behaviors,
  - Often distal than proximal
- Usually associated with vivid, unpleasant, and active dreams
- Fighting or fleeing in response to danger (91%),
- Nonviolent elaborate behaviors during RBD, which were found in 18% of patients with PD
- In contrast to sleepwalking, only a minority of patients with RBD (3%)
- Occasionally stand up and walk and run, and most patients have the eyes closed

**\*\*\*"Acting out" of dream content\*\*\***

# Vocalization in RBD

The background features a stylized illustration of two human figures in motion, rendered in shades of gray. The figures are positioned as if they are jumping or dancing, with their arms and legs extended. The background is decorated with large, flowing, abstract shapes in light pink and white, creating a sense of movement and energy.

- Mumbling,
- Talking,
- Shouting,
- Swearing profanities,
- Laughing, and
- Crying
- Modulate their voices according to the dream context

# Dreams and sleep behaviours

- *Eye usually closed*
- *No major differences in dream content* were found between patients with PD who did or did not have RBD
- *Dream recall is quite variable*, individuals are usually easily awakened and *often remember* their dreams, especially if questioned immediately after the behaviour.
- The dreams reported tend to have *negative emotional content*, or are often action-packed and aggressive but they can also be pleasant.
- *Falling out of bed is frequent*, but *deliberately leaving the bed is rare*.

# RBD1Q Questionnaire



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*Mov Disord.* 2012 June ; 27(7): 913–916. doi:10.1002/mds.25037.

**A Single-Question Screen for REM Sleep Behavior Disorder: A  
Multicenter Validation Study**

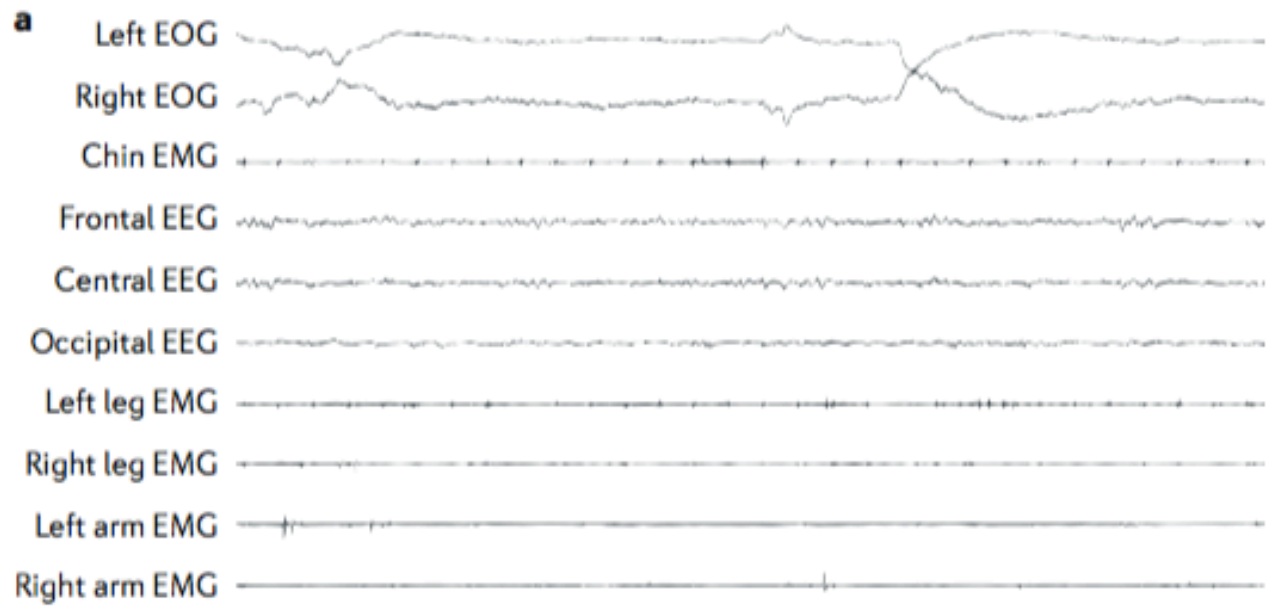
***Yes- No Question***

**“Have you ever been told, or suspected yourself, that you seem to ‘act out your dreams’ while asleep (for example, punching, flailing your arms in the air, making running movements, etc.)?”**

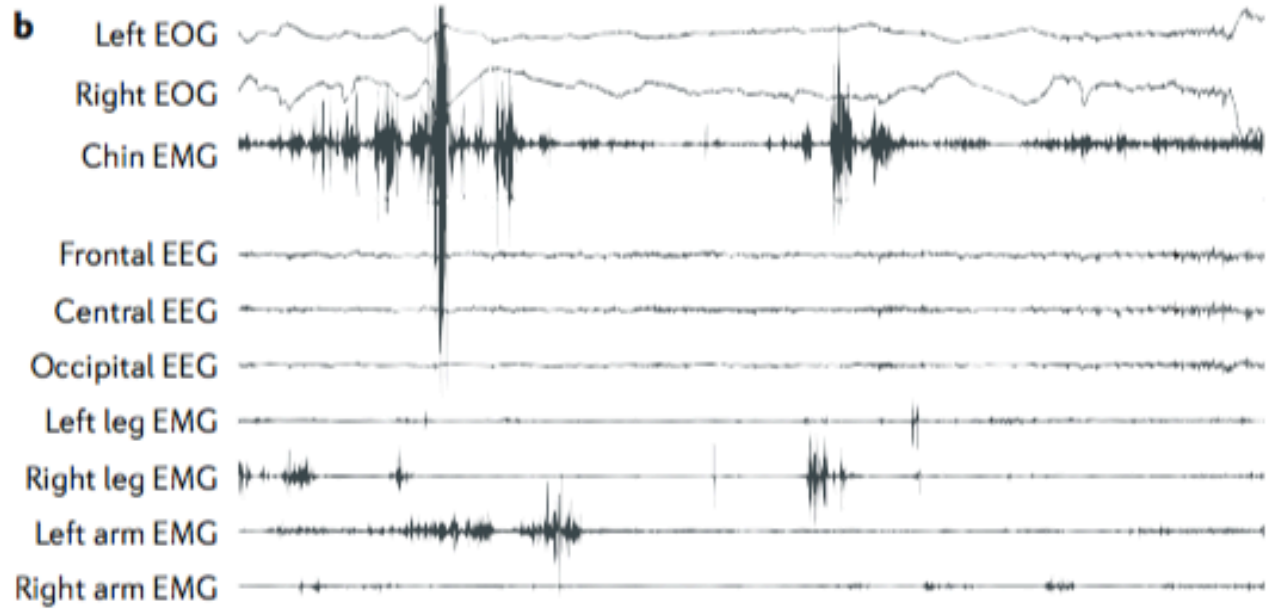
**A sensitivity of 93.8% and a specificity of 87.2%**

# Other RBD questionnaires

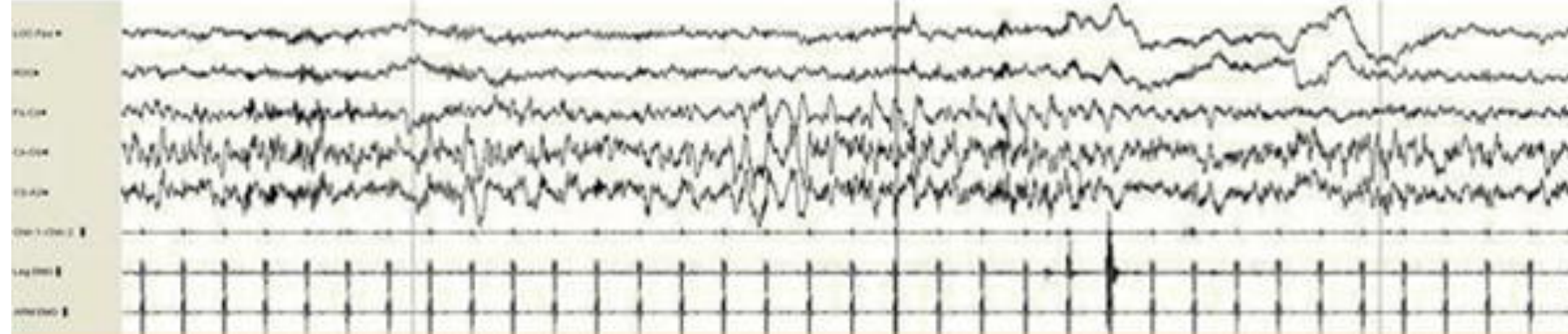
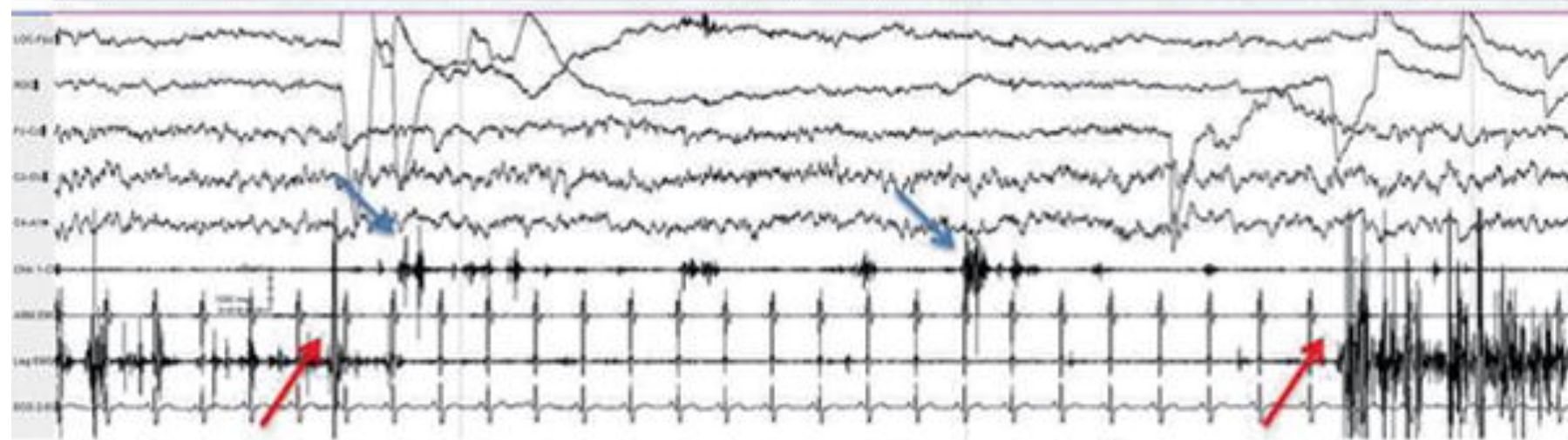
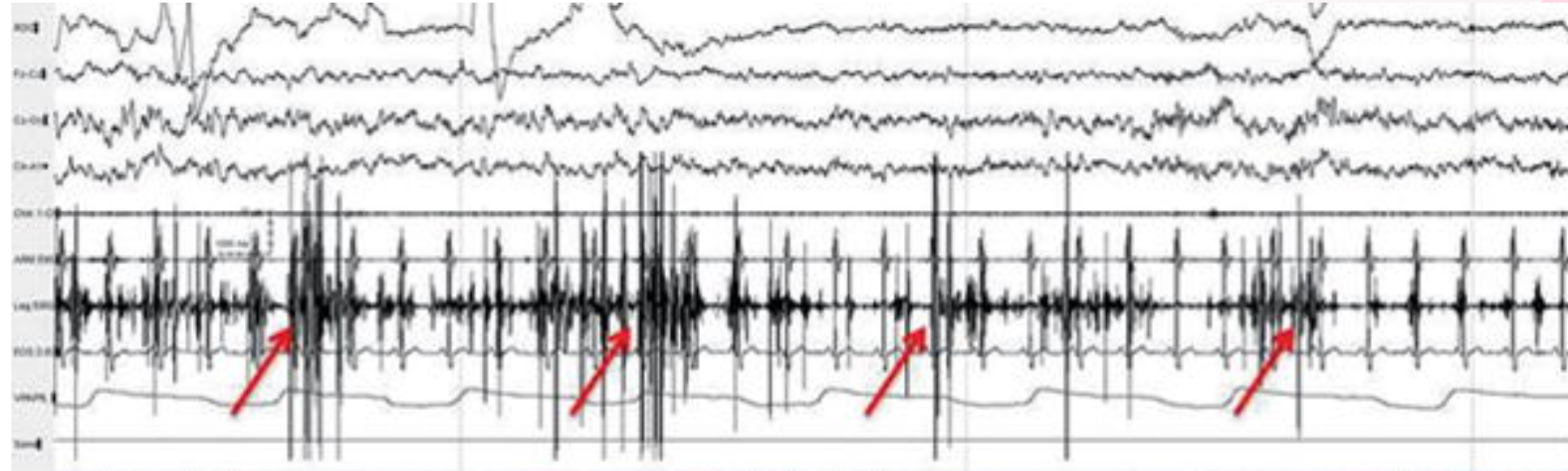
- **REM behavior disorder screening questionnaire (RBDSQ):**
  - 10- item questionnaire with scores ranging from 0 to 13.
  - Sensitivity of English version in PD for  $\geq 6$  cutoff 68-90%, specificity 63-82.8%
- **REM sleep behavior disorder questionnaire Hong Kong (RBDQ-HK):**
  - 13 item questionnaire.
  - Sensitivity 82.2%, specificity 86.9% mixed (idiopathic and secondary) RBD population
- **Mayo sleep questionnaire (MSQ) item 1:**
  - Single question.
  - Sensitivity in PD 90.3%, specificity 87.9% among PD patients meeting ICSDII criteria
- **Innsbruck REM sleep behavior disorder inventory:**
  - five item questionnaire.
  - In mixed (idiopathic and secondary) RBD population, sensitivity 91.4%, specificity 85.7%. For single RBD summary question, sensitivity 74.3%, specificity 92.9%.



Normal control  
REM sleep



RBD  
EMG activity at  
chin  
TA  
FDS





# EMG activity during REM sleep

**Phasic activity:** a short burst of electromyography (EMG) activity lasting 0.1–5.0 s that is more than twice as high as the background EMG amplitude. Can be measured in 3 s mini-epochs or 30 s epochs.

**Tonic activity:** EMG activity increased by at least a factor of two or four compared with baseline in more than half of the epoch. Can be measured in 3 s mini-epochs or 30 s epochs.

**Any activity:** either phasic or tonic EMG activity. In addition, tonic and phasic muscle activity lasting between 5 and 15 s can be scored and can be measured in 3 s mini-epochs or 30 s epochs.

# Differential diagnosis RBD-like feature

- History of dream enactment behavior and daytime sleepiness with no evidence of REM sleep without atonia on PSG → **OSA**
  - Treatment with CPAP → eliminate the behavior (possible increased pressure for REM atonia prior REM sleep fragmentation)
- **NFLE**
- **PLMS**
- **NREM parasomnias** (such as sleepwalking, sleep terrors and confusional arousals, nightmares and sleep-related seizures (mainly sleep-related hypermotor epilepsy))

# NREM PARASOMNIA

```
graph TD; A[NREM PARASOMNIA] --> B[Disorders of arousal (DOAs)]; A --> C[sleep-related eating disorder (SRED)]; B --> D[Confusional arousals]; B --> E[Sleep walking]; B --> F[Sleep terrors];
```

Disorders of arousal (DOAs)

Confusional arousals

Sleep walking

Sleep terrors

sleep-related  
eating disorder (SRED)

# Confusional arousal

- Onset: peak onset before 5 years
- Abrupt onset out of slow wave sleep in the first third of the night, but may also occur out of stage N2
- *Appears confused with vacant look and may have automatic and inappropriate behavior (few seconds to minutes), behavior may be inappropriate & violent but no autonomic hyperactivity or signs of fear like STs*
- Multiple confusional episodes in the same night: uncommon
- Part of spectrum of sleep walking and sleep terror: all may occur in the same individual

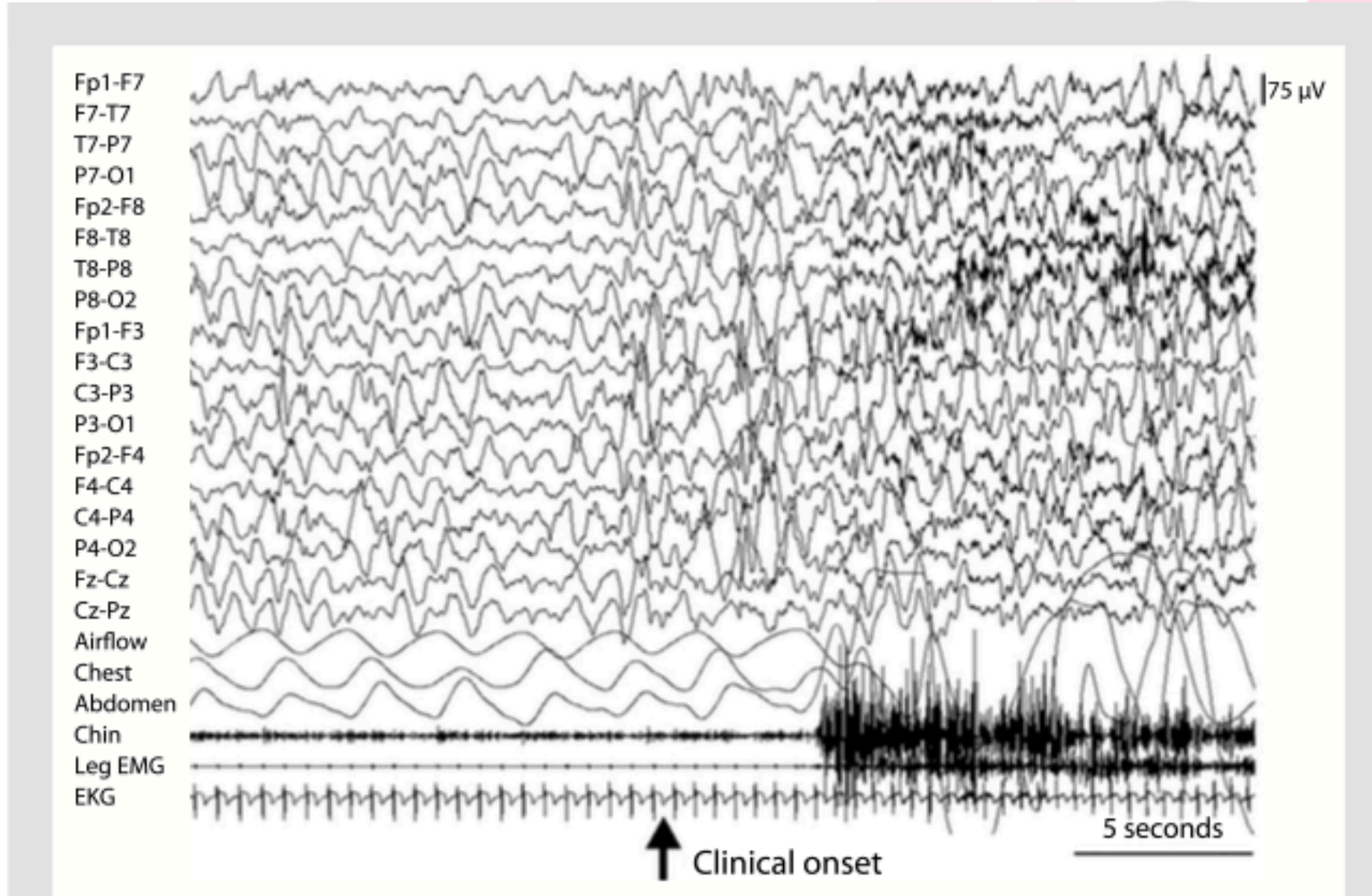
# Sleep walking (Somnambulism)

- Most common in children between 5-12 years of age.
  - Sometimes it persists in adulthood, rarely begins in adult (1/3).
- *Simply sitting up in bed, picking at the covers to walking, eye open but clumsy, more complex & violent & longer in adult.*
- Episodes last less than 10 minutes, or terminated by returning to bed or simply lying down and continuing sleep.
- Injury, violent actions but they can negotiate their way/ may have sleep-related sexual behavior or violence.
- Family history: positive
- Precipitating factors:
  - sleep deprivation, fatigue, sedatives, concurrent illness

# Sleep terror (Pavor Nocturnus)

- Peak onset is between 5 and 7 years of age
  - Sometimes it persists into adulthood
- Non-REM stage (slow wave sleep)
- *The spell begins with abrupt set of intense autonomic and motor symptoms*
  - *A loud piercing scream*
  - *Confuse and fearful/ diaphoretic/ tachycardia*
  - *Usually sits up in the bed but can not communicate*
- Many pts have history of sleep walking
- Precipitating factors: same as sleep walking

# Disorders of Arousal From Non-REM Sleep



# NREM PARASOMNIA

	Confusional arousal	Sleep walking	Sleep terrors
Sleep stage at onset	<b>N3</b>	<b>N3</b>	<b>N3</b>
Autonomic hyperactivity	No	No	<b>Prominent</b>
Loud scream	No	No	<b>Yes</b>
Ambulation out of bed	No	<b>Yes</b>	No
Confusion during episode	<b>Yes</b>	<b>Yes</b>	<b>Yes</b>
Amnesia (partial/complete)	<b>Yes</b>	<b>Yes</b>	<b>Yes</b>

PSG is not required in NREM parasomnia



# Sleep-related movement disorders VS Nocturnal epilepsy

Feature	NFLE	Arousal disorders	RBD
Age at onset	Variable, typically 1 <sup>st</sup> -2 <sup>nd</sup> decade	Usually 1 <sup>st</sup> decade	Over 50 years
Sleep stage of origin	NREM (N1,2, sleep wake transition)	NREM (N3)	REM
Timing of episode	Anytime	First third of sleep period	Last third of sleep period
Duration of episode	5-60 seconds	2-30 minutes	Seconds to 2 minutes
Frequency of episode	Nightly clusters	Sporadic, rare cluster	Sporadic, rare cluster
Onset and offset	Sudden	Gradual	Sudden
Seminology	Highly stereotyped, hypermotor, asymmetric tonic/dystonic	Not stereotyped, variable complexity	Not highly stereotyped, vocalizations, self-protective behaviors, dream recall
Level of consciousness during episode	Usually preserved	Variable	Poorly responsive
Postictal confusion	Typically absent	Present	Absent
Risk of injury	Low	High	Moderate
PSG with EEG	Epileptic activity < 50%	Slow-wave sleep arousals, rhythmic delta pattern	REM sleep without atonia

# Sleep-related Dissociative Disorders

- Emerge at the transition from wake to sleep or shortly following awakening with EEG evidence of wakefulness
- Psychiatric comorbidities
  - Mood disorders, post-traumatic stress disorder, and a history of sexual abuse
- Episodes are non-stereotyped and feature screaming, running, and self-mutilating, violent behaviors that may represent a reenactment of prior traumatic events.
- Can last from minutes to an hour or longer, waxing & waning
- 70% developed between 2<sup>nd</sup> and 4<sup>th</sup> decades
- Injury & female → common
- Psychogenic non-epileptic seizures (PNES)
  - Arise from awake
  - Seizure overlap (pseudosleep)

# Sleep-related Dissociative Disorders

## Motor manifestations

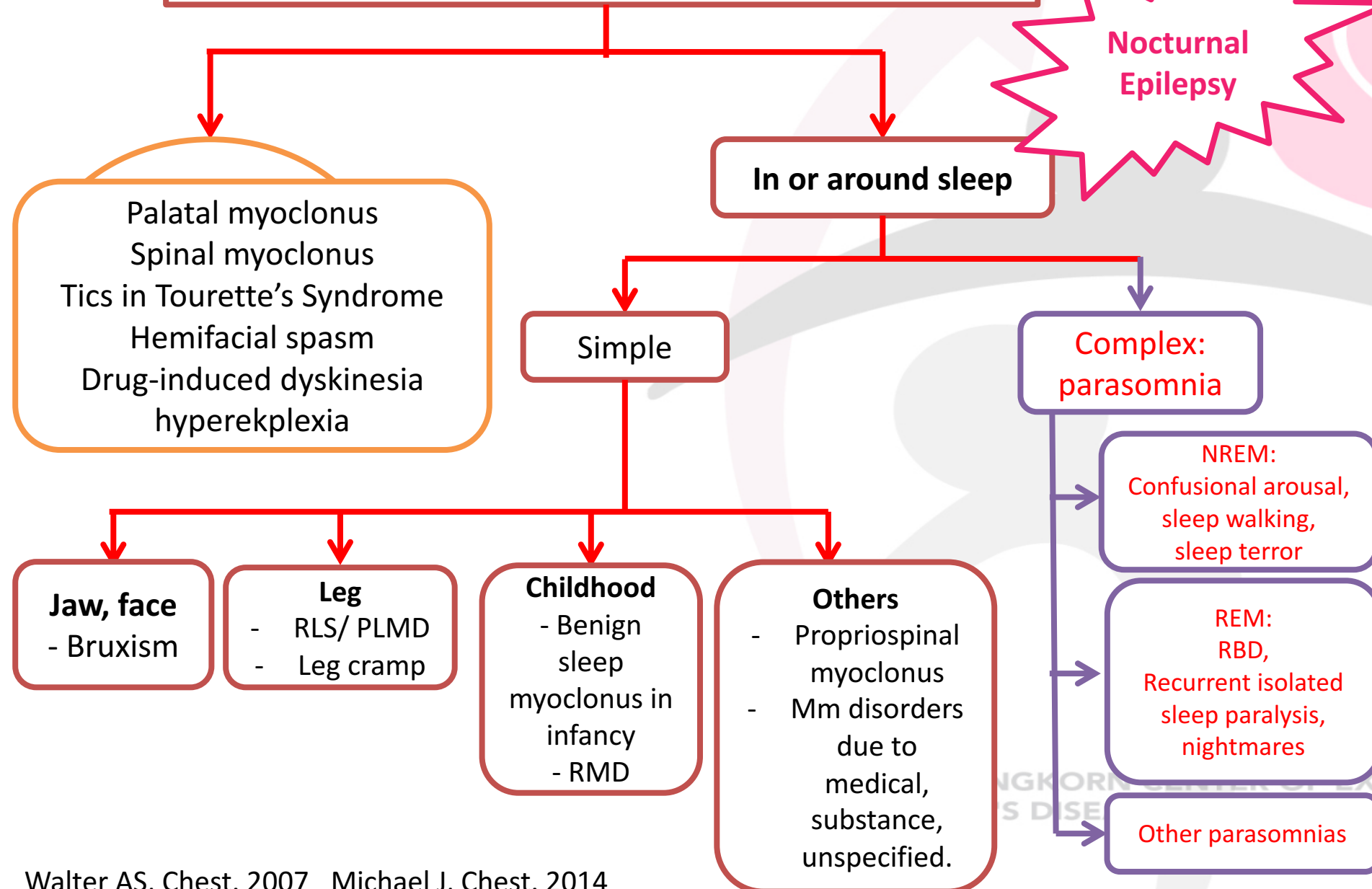
- Jactitation (restless tossing in bed),
- Asynchronous movements,
- Side- to-side head movements,
- Pelvic thrusting,
- Opisthotonic posturing,
- Prolonged body flaccidity,
- Preserved awareness during bilateral motor activity.
- Ictal eye closure and jaw clenching

## Affective manifestations

- Vocalizations,
- Ictal moaning and crying,
- Emotive speech,
- Ictal stuttering,
- Heart rate elevations
- Postictal crying

lateral tongue bites, urinary incontinence, event-related injury, and myalgia --> Seizure

# Movement disorders during sleep



The background features a stylized illustration of two human figures in shades of gray, one positioned above the other, with their arms outstretched. To the right, there are abstract pink shapes, including a large arrow-like form and a circular element. The overall aesthetic is clean and modern.

**Thank you for your attention**

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