Sleep in Epilepsy

Kurupath Radhakrishnan,

Retired Senior Professor (Emeritus), R. Madavan Nayar Center for Comprehensive Epilepsy Care, Retired Director, Sree Chitra Tirunal Institute for Medical Sciences and Technology,Trivandrum, Kerala

(Until 15.07.13)

(Until 30.09.13)



Acknowledgment



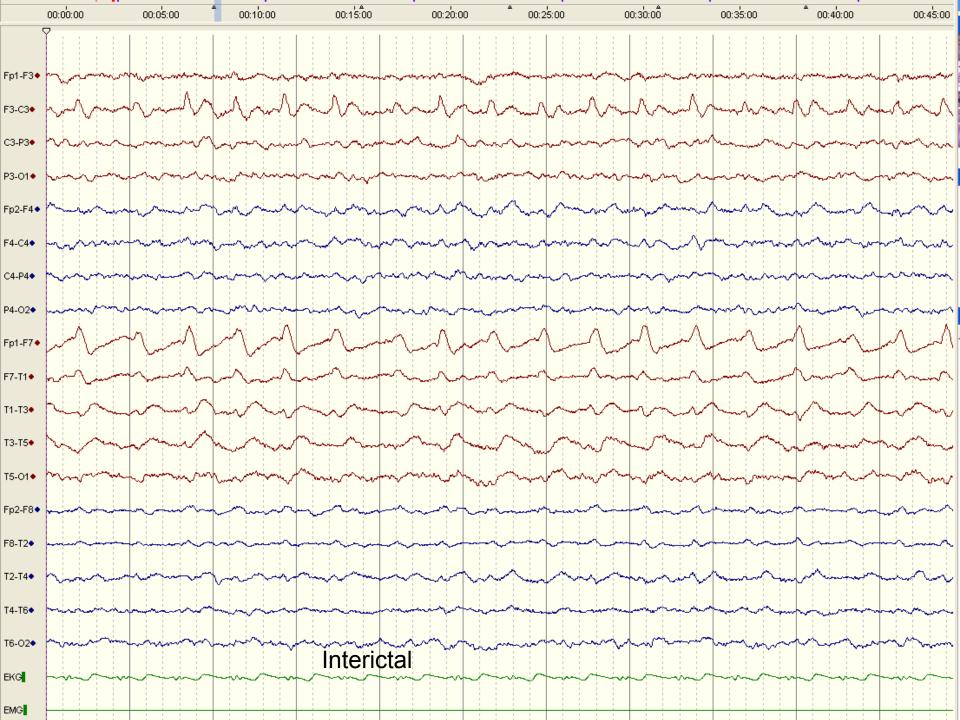
Patient 1

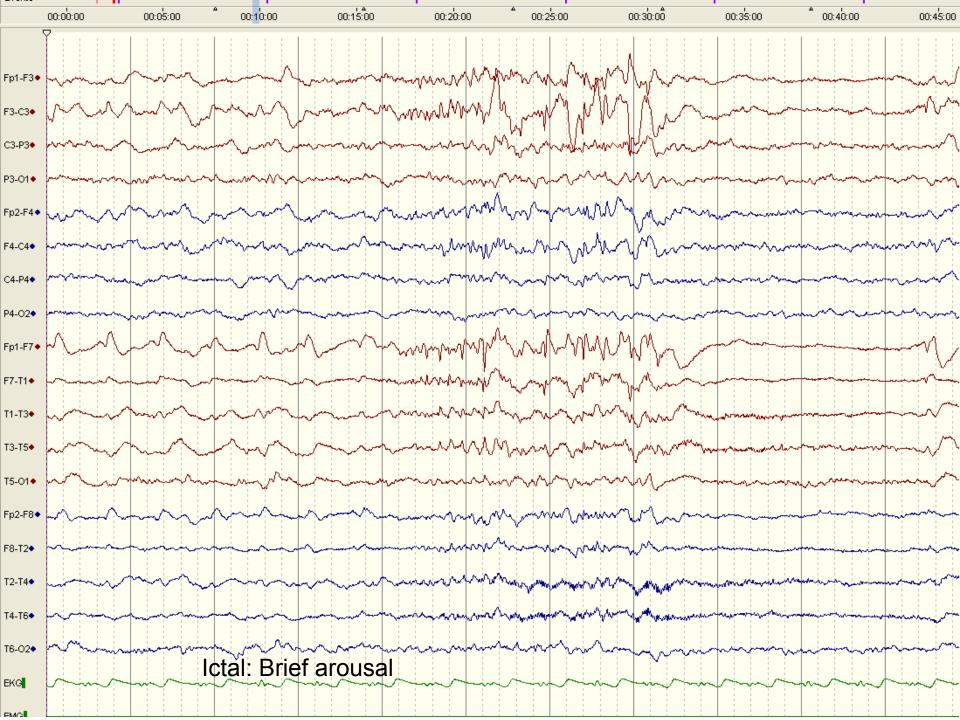


- 5-year old girl
- Frequent awakenings from sleep
- Disturbed night sleep
- Daytime sleepiness and poor school performance
- Normal development
- Normal MRI









Events										
	00:00:00	00:05:00	[▲] 00:1 <mark>0:</mark> 00	00:15:00	00:20:00	[♠] 00:25:00	00:30:00	00:35:00	[♠] 00:40:00	00:45:00
Fp1-F3•	-		www	mm	nanghanana	www.	manyaman	mann	houmann	nnmun
F3-C3•	have	www.	monorm	Winnwood	WWW.	mulunmulur	mmmmm	www.www.www	1 Marina	which which
C3-P3•	m	m	man	mmm	unhown	mmm	mmmmymm	mound	many	manya
P3-01•	Sum	~~~~~	mon	www.	manyan	www.www.www	m	manner	wwwwww	un
Fp2-F4•	m	man	mmmm	mm	mannin	mmmmm	mannan	manum	www.www.	man
F4-C4•	mar	mmm	mann	Mumm	monorm	mannam	mmmm	monowww	mount	mann
C4-P4•	m	mmmm	www.w	man	rohum	mmmm	mangerman	m	m	mm
P4-O2●	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~			m	m		m	mm	h	mm
Fp1-F7•	hm	\sim	m www.	Amm	multilan	www.www.www.www.www.www.www.	www.www.w	mmmm	mm	Mahan
F7-T1•	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		manageway	wayman	Northopopolism	munumen	mmmmmm	mmmm	mmmm	mmm
T1-T3●	h	~~~~~	mmmm	mm	mmmmm	haman and have a		an an an an and	manna	monorm
T3-T5•	~~~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	mmm	mmm	www.www.	mannan	mannim	www.www.www.www.www.www.	n	www.have
T5-01•	m		mmmm	m	manna		mmm	mont		vimmen
Fp2-F8•	\sim	Lange and the second		man	mmum	mannam	mmmmmm	man	m	mann
F8-T2•	~~~~~		man	mmm	www.www.w	and an and a second	mmun	monimum	and the second	manar m
T2-T4●	m	\sim	mmm	mon	n matrix sectors	n han han han han han han han han han ha	and managements	new management	le le anna ann ann ann ann ann ann ann ann a	all all and the second
T4-T6●	m		man	mmm	www.www.www.www.	a fan gleit stjer waard stermaa	man and a second se	and a second second second	When a share when the stand of	nolonomisterio
T6-O2●	mm	Martin Martin		mm	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	www.m	manning	mmmmmm	men my game he	and an and the
EKG			prolonged		*		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~			~~~~

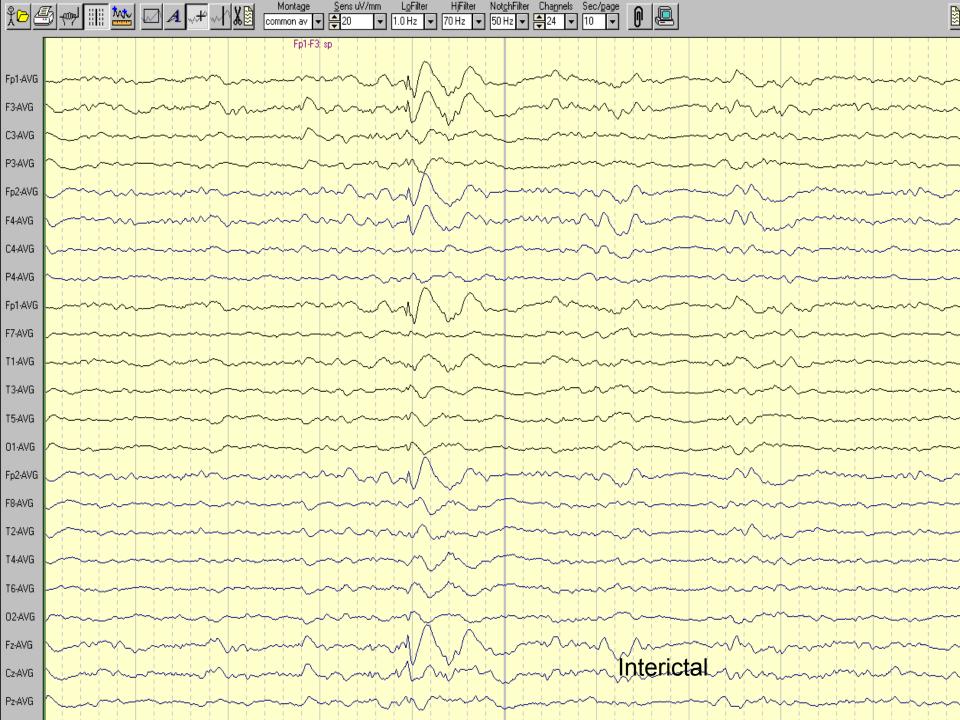
Patient 2



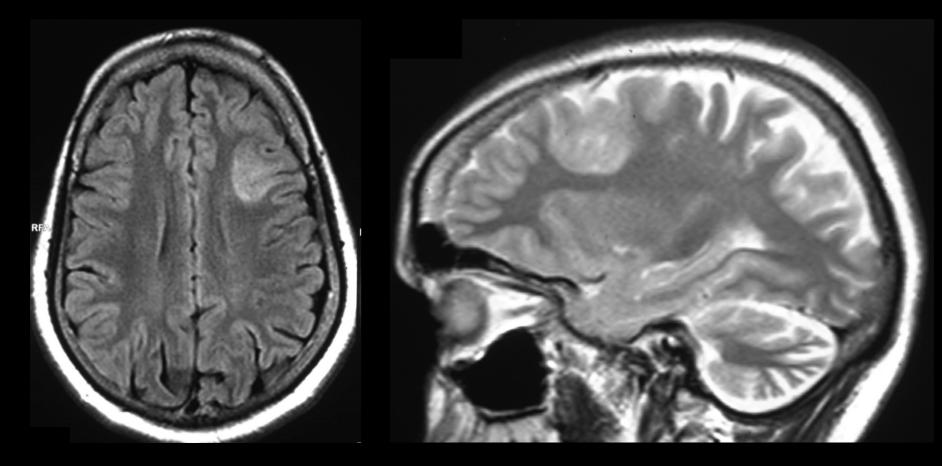
- 35-year old lady.
- Daily nocturnal stereotyped events since age 10 yr.
- Vocalization along with posturing of one upper
- limb and occasional incontinence.
- No day time events, but often somnolent.
- No response to multiple AEDs.
- Suspected to have nonepileptic events.



<u>Mv</u> common av man my my man mmyn Fp1-AVG F3-AVG mmm monummen C3-AVG Amalian WWWWW P3-AVG monorman mon Why MM mont Fp2-AVG mmmm monoment F4-AVG munum C4-AVG mound Win and man minimum P4-AVG MM AN mon May month Fp1-AVG mont F7-AVG man man T1-AVG T3-AVG an an an an and the second and the second 1 m T5-AVG mum 01-AVG monterman 1ml mmmmm mont Fp2-AVG montheastern man ww F8-AVG mm AMA minut T2-AVG T4-AVG mann warmen and when T6-AVG 02-AVG 1 MM MM Mining mining mmmmm Fz-AVG hand Mark Mark Mang manunan Mm Cz-AVG m My man man man man MM Pz-AVG in My Mark May Managhaannaala *EKG Ictal onset



Symptomatic localization-related epilepsy: Left frontal focal cortical dysplasia



Patient 3



- 49-year old male
- H/O multiple episodes of febrile seizures
- Recurrent nocturnal events from 35 years of age
- Semiology: loud vocalization, restlessness, may hit other persons
- Frequency: 3-4 per night
- No response to AEDs
- Normal MRI
- DD: Parasomia vs. Nocturnal frontal lobe epilepsy





<u>*</u>	Montage Sens uV/mm LoFilter HiFilter NotohFilter Channels Sec/page O O
Fp1-AVG	Marine Marin
F3-AVG	man
C3-AVG	man and the second of the seco
P3-AVG	
Fp2-AVG	when we
F4-AVG	have a second where the second where the second sec
C4-AVG	
P4-AVG	
Fp1-AVG	and the second
F7-AVG	where we
T1-AVG	
T3-AVG	man when we we have a second and the second of the second
T5-AVG	
01-AVG	
Fp2-AVG	and the second
F8-AVG	when a second when the second of the second
T2-AVG	wanter and the second of the s
T4-AVG	when we we have the second of
T6-AVG	
02-AVG	and the second
Fz-AVG	wannesserver and the server and the serve
Cz-AVG	
Pz-AVG	han a second the second and the seco

Interictal

.0		51 . I	11111	8.4		_ ₄ [1.0		Montage	<u>S</u> ens uV/m	n	L <u>o</u> Filter	Hiter	Not <u>c</u> hHiter	- Cha <u>n</u> nels	Sec/page	6	
7	(°) 📇	7~~~			A	A	~** ~~	ⅈ∖ቆቜ⊦	Montage	€10	-	5.0 Hz 🔻	70 Hz	▼ 50 Hz ▼	₽24 -	10 🔻	U	
																	-	

Fp1-AVG	month and the second of the se	M Luik		LI MANA		
F3-AVG	man	~~				
C3-AVG	man have a second with the second s	W			J. Mark	H
P3-AVG		npm	ANT IN THE REAL PARTY IN		Marth.	h
Fp2-AVG	minimum more and the second					
F4-AVG	and and the second of the seco		MMM.			I.
C4-AVG	mare an		MAN WAY			Į,
P4-AVG	man and the second of the second se		March	Manus	-	-
Fp1-AVG	month when the second of the s	~~	1 100	Print Mark		
F7-AVG	month and the second of the second					
T1-AVG	man have been been and the second an	~~	WW WWW W	an all and and	APPRIX P	ł
T3-AVG	and the second second and the second se		MANN N	and when	www.Wintyn	And
T5-AVG					North Anther Alle	NW)
01-AVG	man and the second of the seco	~~hhh	WWW WWWWW		1 million	
Fp2-AVG	minimum in the way when the way when the second of the sec			T		
F8-AVG	when the war we want the second of the secon	~~				N
T2-AVG		P I MI	M.Yman	A AMAGE AND A		ą,
T4-AVG	Mocturnal frontal lobe epileps	Sy		Halkah Arabah	Number	W
T6-AVG	which the product of the second of the secon	www.www.	TIMME	all all the second	MANNAM	M
02-AVG		mp	and the wheel	Law Marin	munt	w
Fz-AVG	an a	WWWWWW	WP MARK	Jawan Markey	MAMAN	澌
Cz-AVG	month in the second of the sec	mmm	Mr. Mary	Martinderstation	My Marting	M
Pz-AVG		m	M	Mummun	HAN	ľ,
*EKG		\square	\mathbb{N}	Nh.	N Y	
				1 11)	11	

MA

Ictal onset: Seizure 3

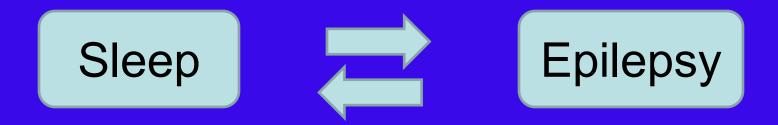
History: Sleep and Epilepsy

• Known since antiquity.

Aristotle and Hippocrates: occurrence of epileptic seizures during sleep.

- Late 19th century: Gowers commented the relationship of seizures to sleep-wake cycle
- Berger's discovery of EEG in 1920s.
- Gibbs and Gibbs (1947): IEDs activation during sleep.
- Janz (1962): differentiated awakening, nocturnal and diurnal epilepsies.

Sleep and Epilepsy



Sleep and epilepsy

Effects of sleep on epilepsy

- Sleep
 - Interictal epileptiform abnormalities in the EEG
 - **Epileptic seizures**
- Sleep deprivation
 - Interictal epileptiform abnormalities in the EEG Epileptic seizures
- Effects of epilepsy on sleep
 - Interictal epileptiform abnormalities in the EEG Epileptic seizures
- Effect of sleep disorders on epilepsy
- Effects of antiepileptic therapy on sleep
- Diagnosis between nocturnal seizures and parasomnias

Effect of sleep stage on eplileptogesis

NREM sleep	REM sleep
Synchronization of EEG	Desynchroniz
More frequent IEDs	Less frequent
Wider spread of IEDs	More localized
Increased likelihood of seizures	Infrequent sei
Greatest potential for epileptogenesis	Least potentia

onization of EEG

uent IEDs

lized IEDs

seizures

ential for epileptogenesis

Effects of sleep on epilepsy

Interictal epileptiform abnormalities in the EEG

IEDs gets activated in focal and generalized epilepsies >30%

Epilepsy syndromes associated with marked activation

Benign epilepsy with centrotemporal spikes

Landau-Kleffner syndrome

Epilepsy with continuous spike-wave during slow-wave sleep

West and Lennox-Gastaut syndromes

Temporal lobe epilepsy

IEDs maximum during NREM stages 3&4 (N3)

Becomes bilateral during NREM

IEDs least during REM

Effects of sleep on epilepsy Epileptic seizures

Nearly exclusively during sleep

Autosomal dominant nocturnal frontal lobe epilepsy α4 and β2 subunits of ACh nicotinic receptor, chromosome 20

Benign childhood epilepsy with centrotemporal spikes

Effects of epilepsy on sleep Epileptic seizures

Nocturnal GTCS

Disrupted sleep and awakening

Primary GTCS – after seizure

Secondary GTCS – both before and after

Decrease in REM, compensatory increase in NREM stage 2

Nocturnal focal seizures

Similar

Epilepsy without nocturnal seizures

Sleep fragmentation, increased awakening compared to controls

Sleep complaints in persons with seizure disorder

Excessive daytime sleepiness Insomnia Nocturnal spells

Excessive daytime sleepiness in persons with epilepsy

Nearly one-third have elevated scores on ESS

 Multifactorial AEDs Nocturnal IEDs and seizures Associated primary sleep disorders SDB and RLS

Correction of sleep disorders can improve seizure control

Sleep disorders and epilepsy

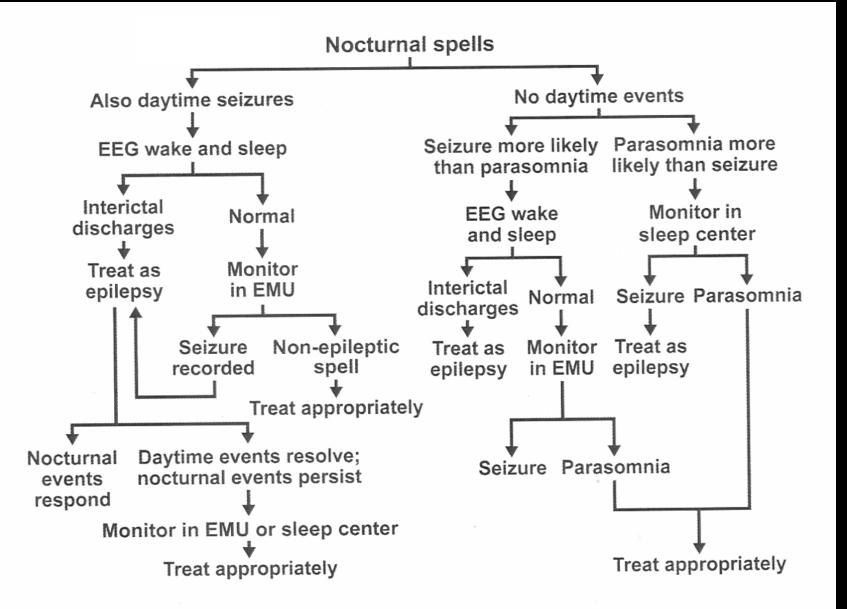
Sleep disordered breathing Valproate related obesity Sedation by BDZ and PB Vagus nerve stimulation (VNS) Restless leg syndrome Worsen with DPH, Zonisamide Benefit with GBP, VPA, CBZ, LTG

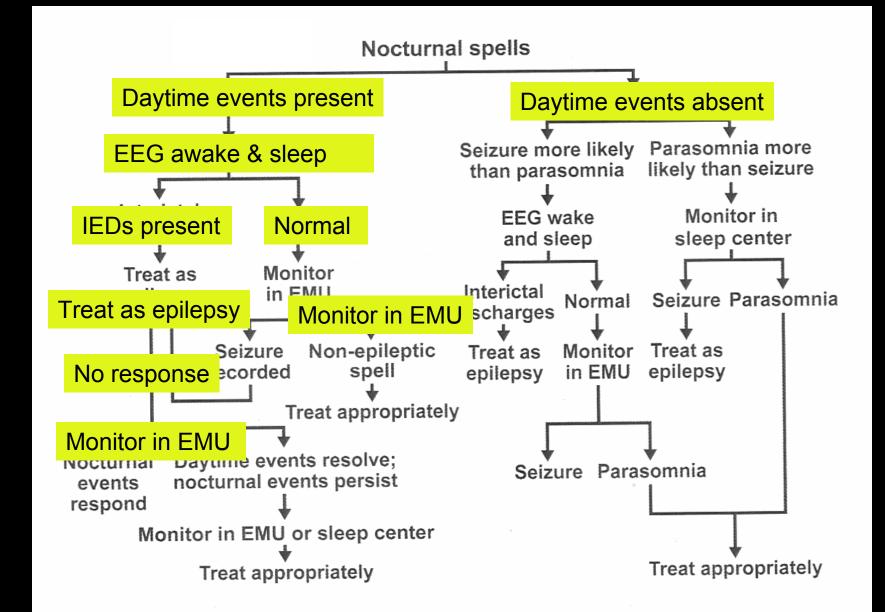


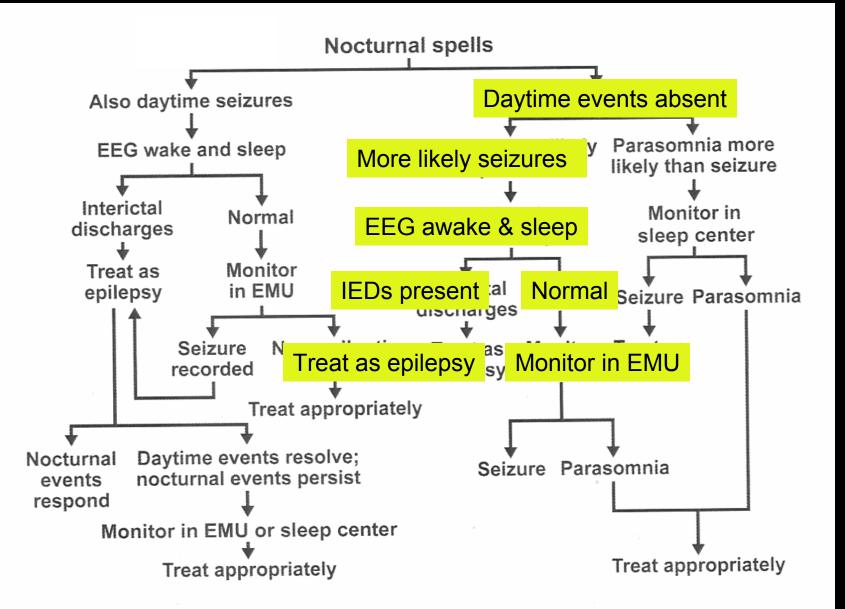
 In general beneficial Decrease sleep latency, increase efficiency Decrease REM, increase NREM stage 2

Old AEDs: VPA most beneficial, DPH least

Insomnia: Felbomate, Lamotrigine, Zonisamide



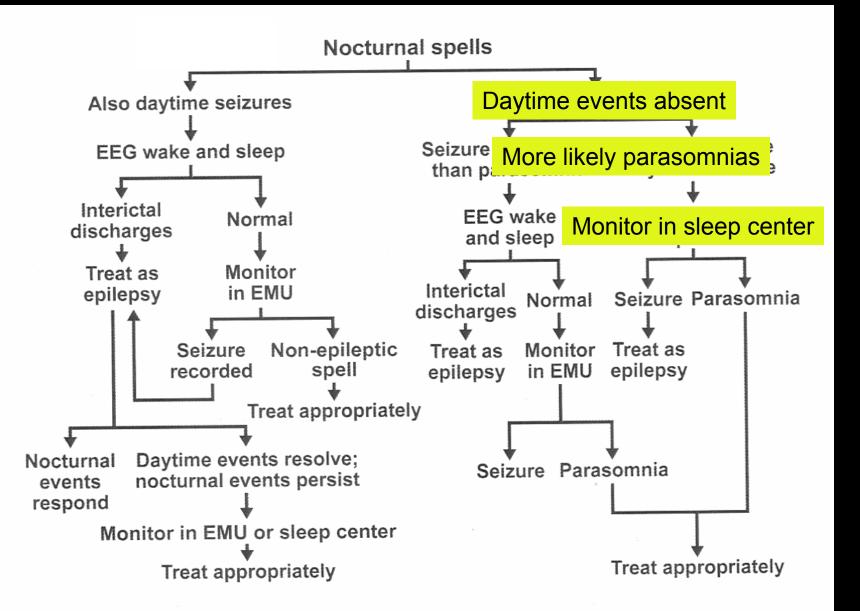




Frontal lobe epilepsy and parasomnia (FLEP) scale

- Age at onset <55 yr
- Duration of events <2 min
- Timing within 30 min of sleep onset
- Prominent dystonic posturing
- Stereotyped events
- Lucid recall

(Derry et al. Arch Neurol 2006;63:705-9)



Conclusions

The interaction between sleep and epilepsy is bidirectional and complex

Sleep is an activator of IEDs and seizures

Routine EEG in persons with suspected seizure disorder should include recording during sleep

Sleep disruption can disturb seizure control

Conclusions

Epileptic discharges alter sleep regulation and provoke sleep disruption

Excessive daytime sleepiness and insomnia in persons with epilepsy often indicate an underlying sleep disorder rather than the effect of epilepsy or AEDs.

Conclusions

Differential diagnosis between nocturnal seizures and parasomnias often need a close interaction between epileptologist and sleep specialist.

