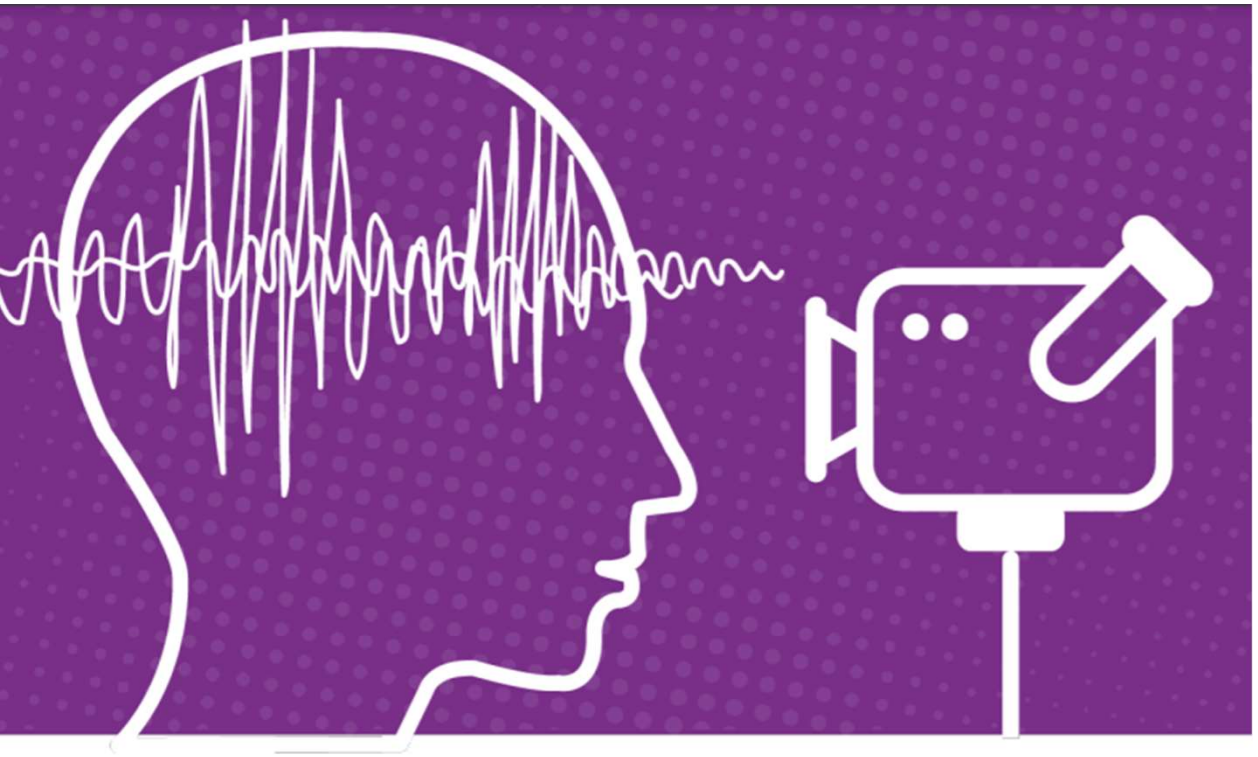


CORSO VIDEO EEG LICE
3° EDIZIONE
CATANIA, 24-27 OTTOBRE 2021

La diagnosi differenziale: non solo frontali…

Paola Proserpio

Centro di Medicina del Sonno

Neurologia, Dipartimento di Neuroscienze

Ospedale Niguarda, Milano

Non epileptic paroxysmal events out of sleep

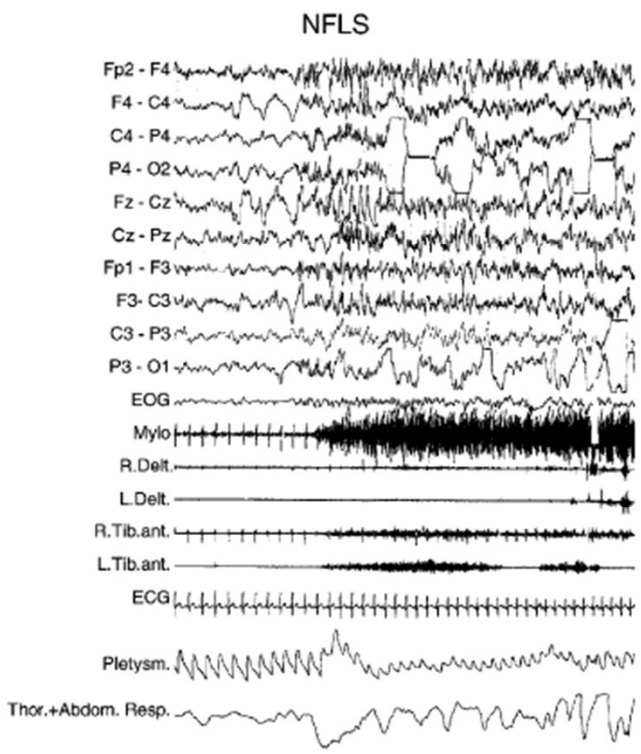
- Parasomnias
  - Non-REM arousal disorders
    - Confusional arousals
    - Sleep walking
    - Sleep terrors
  - Parasomnias associated with REM sleep
    - Nightmares
    - REM behavior disorder
    - Parasomnia overlap syndrome
  - Other parasomnias
    - Catathrenia (nocturnal groaning)
    - Sleep enuresis
    - Exploding head syndrome
    - Sleep related hallucinations
- Sleep-related movement disorders
  - Periodic limb movements of sleep
  - Sleep bruxism
  - Nocturnal leg cramps
  - Rhythmic movement disorders
- Narcolepsy
  - Hypnogogic/hypnopompic hallucinations
  - Sleep paralysis
- Sleep-related breathing disorders (OSA)
- Psychiatric and behavioral disorders
  - PNESs
  - Nocturnal panic attacks
- Isolated "benign" paroxysmal nocturnal events
  - Sleep starts (hypnic jerks)
  - Benign sleep myoclonus of infancy
  - Excessive fragmentary myoclonus
  - Propriospinal myoclonus at sleep onset
  - Hypnagogic foot tremor
  - Alternating leg muscle activation during sleep
- Nonneurological paroxysmal events
  - Gastroesophageal reflux

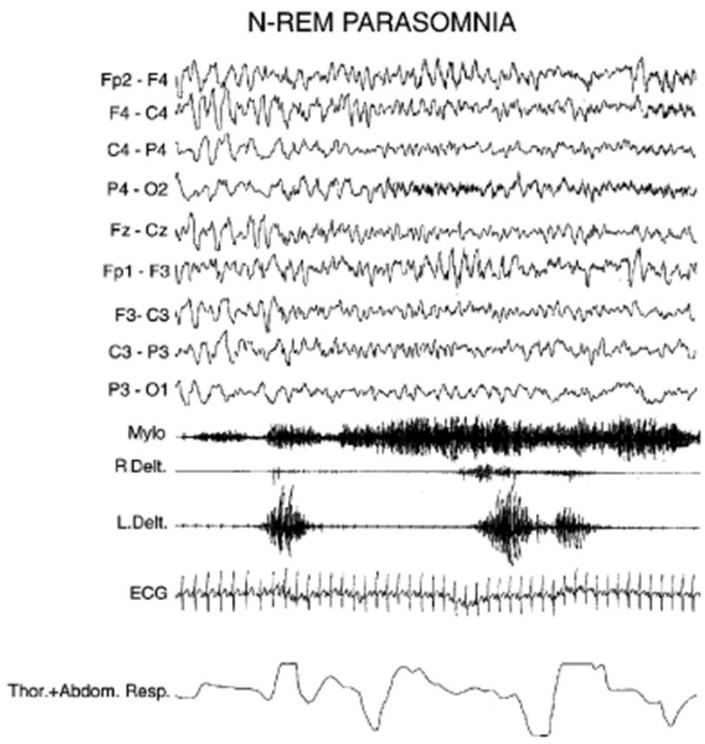
Vendrame et al., 2011

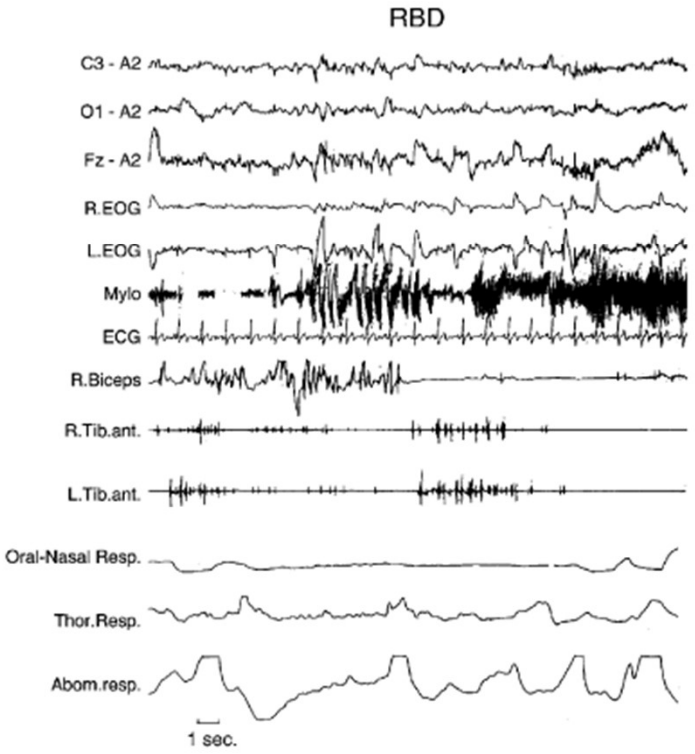
Movement disorders in sleep: Guidelines for differentiating epileptic from non-epileptic motor phenomena arising from sleep

Sleep Medicine Reviews (2007)

Paolo Tinuper*, Federica Provini, Francesca Bisulli, Luca Vignatelli, Giuseppe Plazzi, Roberto Vetrugno, Pasquale Montagna, Elio Lugaresi







Parasomnia

Parasomnias are undesirable physical events or experiences that occur during entry into sleep, within sleep, or during arousal from sleep. Parasomnias may occur during non-rapid eye movement sleep (NREM), rapid eye movement sleep (REM), or during transitions to and from sleep."

.... often they seem to be purposeful and goal directed. They may result in injuries, disturb of sleep (of the patient as well as the sleep of others), and they may cause untoward psychosocial developments.

ICSD3 (American Academy of Sleep Medicine 2014)

Classification of Parasomnias

NREM-related parasomnias (disorders of arousal)	REM-related parasomnias	Other parasomnias
Confusional arousals	REM sleep behavior disorder	Exploding head syndrome
Sleepwalking	Recurrent isolated sleep paralysis	Sleep-related hallucinations
Sleep terrors	Nightmare disorder	Sleep enuresis
Sleep-related eating disorder		

Proserpio P and Nobili L, 2017

Epidemiology

Table 1. Current and lifetime prevalence of the different types of NREM parasomnias.

NREM Parasomnia	Prevalence of Symptoms		
	Childhood	Current Prevalence	Lifetime Prevalence
Confusional arousals	17% [5]	6.9% [8]	18.5% [8]
Sleepwalking	14.5% [7]	1.7% [8]	6.9% [9]–22.4% [8]
SRED	-	2.2% [8] 16.7% [10]	4.5% [8]
Night terrors	17.3% [11]–39.8% [7]	2.7% [8]	10.4% [8]
Sexsomnia	-	2.7% [8]–6% [12]	7.1% [8]

Hrozanova et al., 2019

General clinical features of DOA

General clinical features
Common in childhood
Decrease with increasing age
Episodes in the first third of the night
A state between sleep and waking during the event, disorientation, and confusion
Presence of triggering factors
Long episode duration (minutes)
Minimal recall of the event
Strong familial pattern

Proserpio and Nobili, 2017

Constitutional and Precipitating factors

1.Constitutional or predisposing factors

- Genetic
- Developmental
- Sleep Deprivation
- Chaotic wake/sleep scheduling
- Psychologic

2.Precipitating factors

A) **Endogenous**

- Obstructive Sleep Apnea
- Gastroesophageal reflux
- Seizures
- Fever
- Periodic movements during sleep

B) **Exogenous**

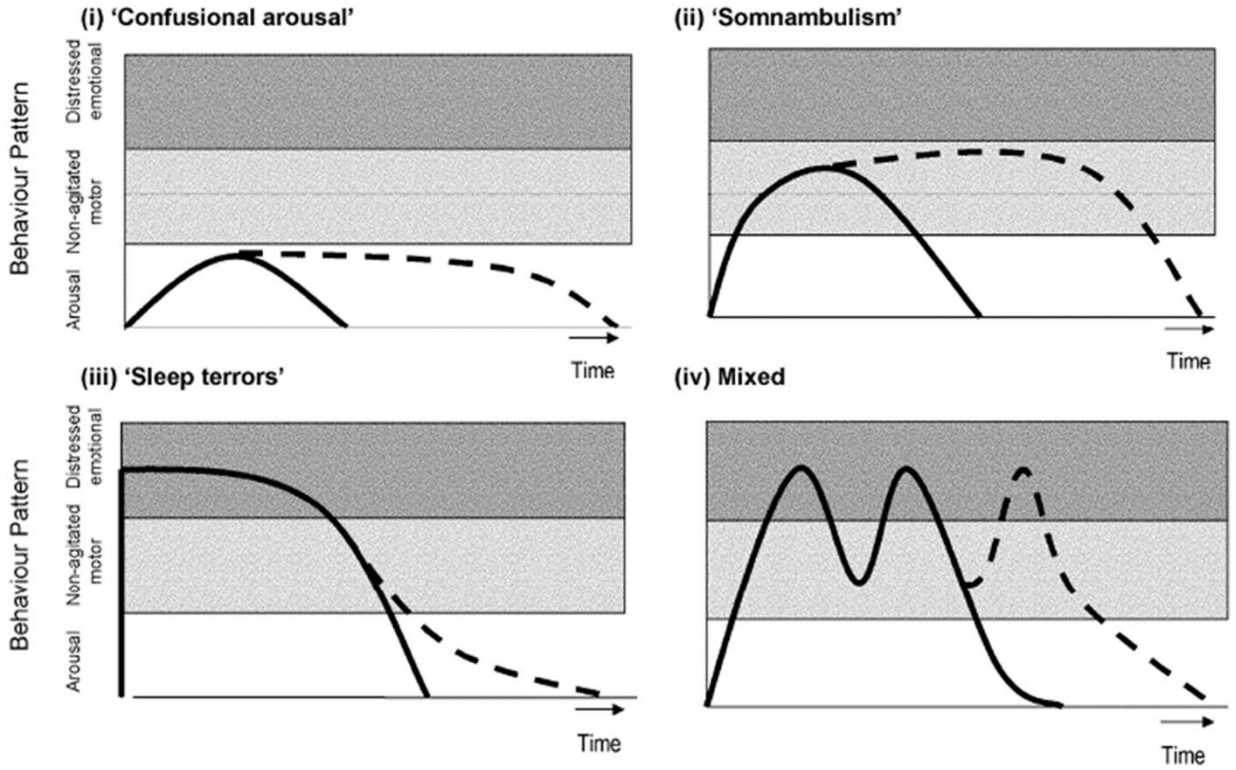
- Drugs
- Stimulation-auditory, tactile, visual

Modified from Ferber and Kryger: Principle and Practice of Sleep Medicine in the Child, 1995

General clinical features of DOA

	Confusional Arousal	Sleepwalking	Sleep terror
Age of onset	2-10 years	4-12 years	18 months – 10 years
Peak time of occurrence	First third of night	First third of night	First third of night
Ictal behaviour	Whimpering, some articulation, sitting up in bed, inconsolable	Walking about the room or house, may be quiet or agitated, unresponsive to verbal commands	Screaming, agitation, flushed face, sweating, inconsolable
Motor activity	Low	Complex	Rarely complex
Autonomic activity	Low	Mild	Intense
Complications	Rare (aggressioness)	Possible (violence)	Occasional (escape)
Typical duration	< 1 minute	1-20 minutes	5-20 minutes

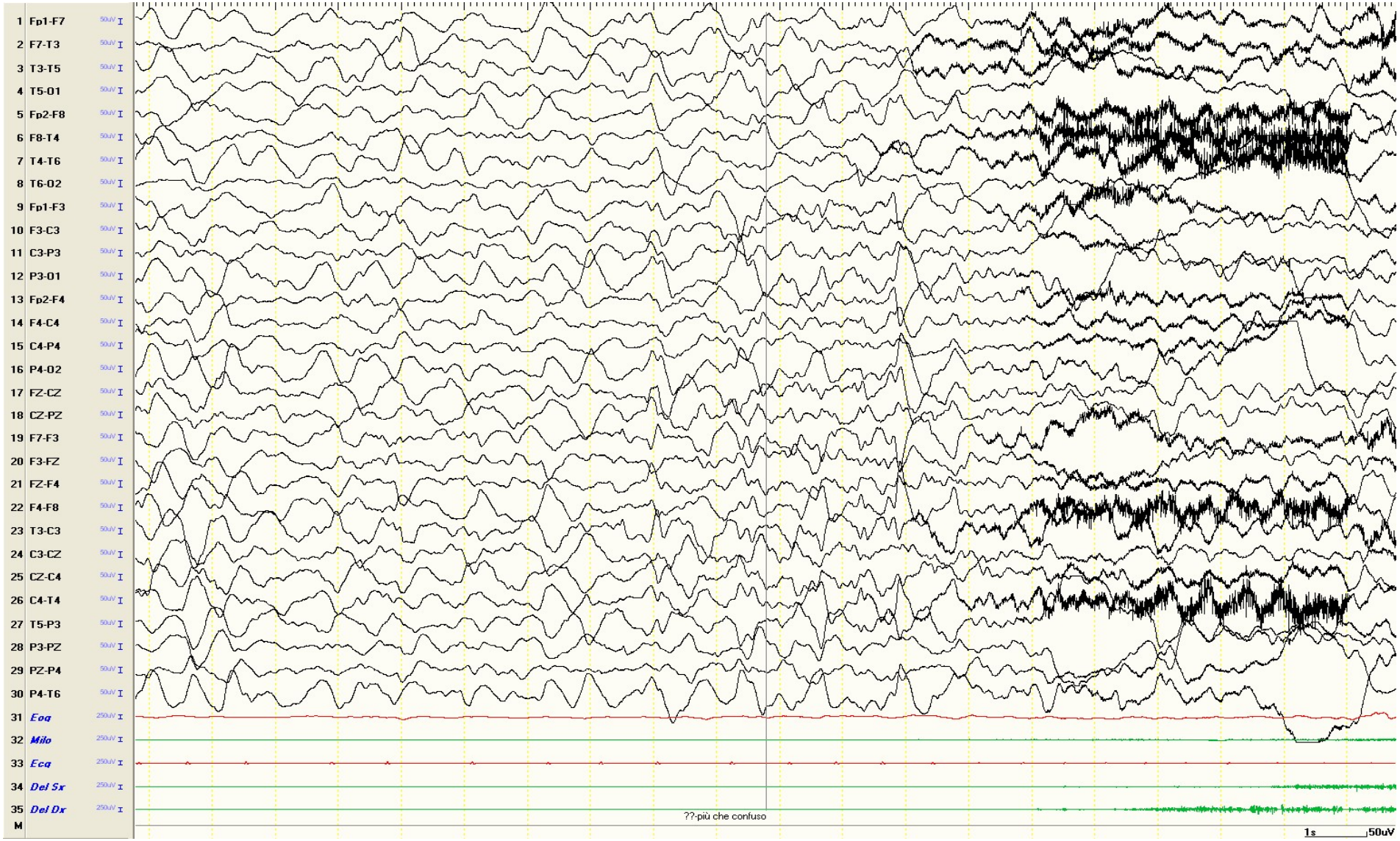
Modified from Proserpio and Nobili , 2017



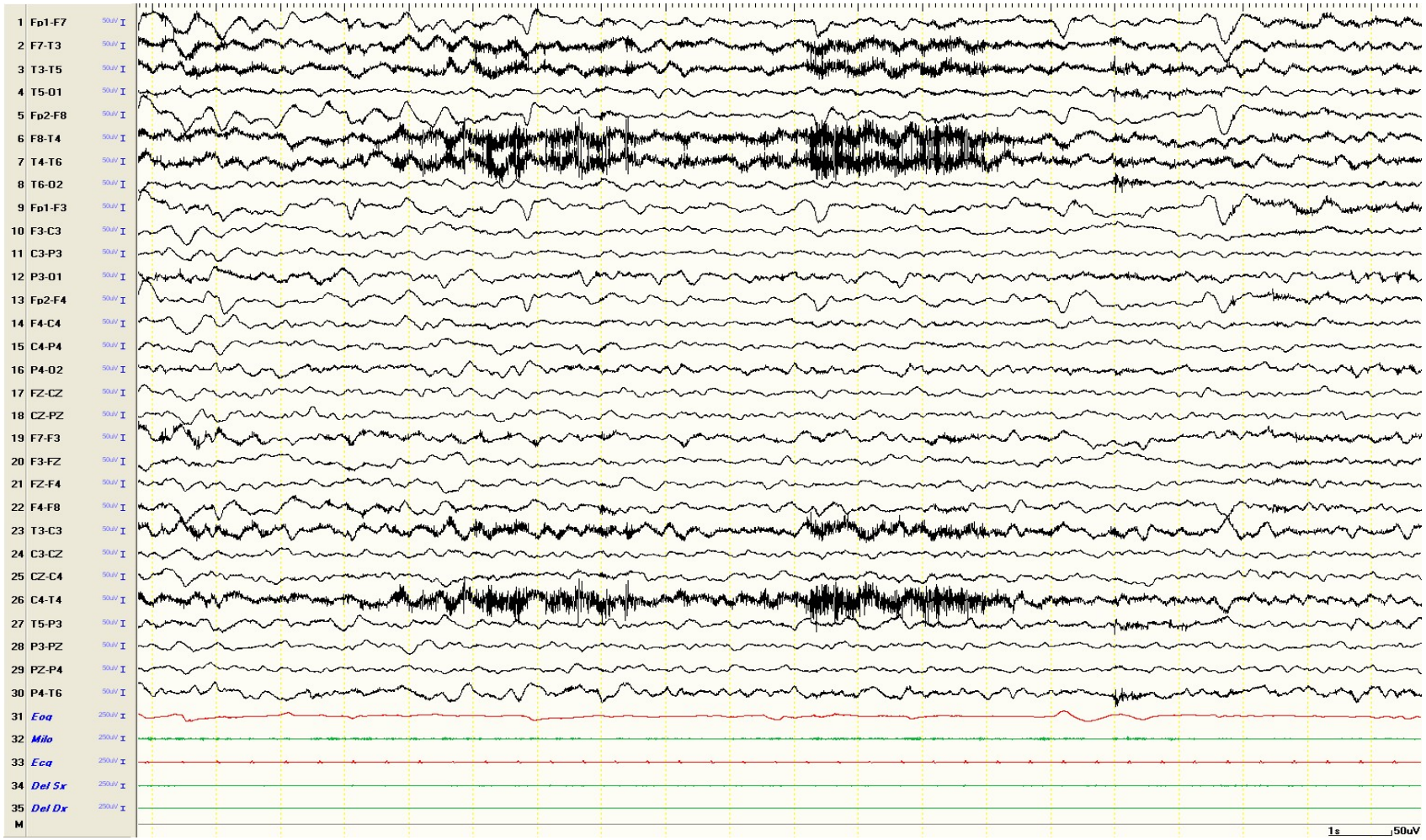
Classifying NREM parasomnias into strict distinct entities is probably an oversimplification; indeed there is a hierarchical continuum between different behavioral patterns of arousal parasomnias

Derry et al Sleep 2009

Confusional Arousals




1 Fp1-F7
2 F7-T3
3 T3-T5
4 T5-O1
5 Fp2-F8
6 F8-T4
7 T4-T6
8 T6-O2
9 Fp1-F3
10 F3-C3
11 C3-P3
12 P3-O1
13 Fp2-F4
14 F4-C4
15 C4-P4
16 P4-O2
17 FZ-CZ
18 CZ-PZ
19 F7-F3
20 F3-FZ
21 FZ-F4
22 F4-F8
23 T3-C3
24 C3-CZ
25 CZ-C4
26 C4-T4
27 T5-P3
28 P3-PZ
29 PZ-P4
30 P4-T6
31 Eog
32 Milo
33 Ecg
34 Del Sx
35 Del Dx
M
50uV
250uV
1s
50uV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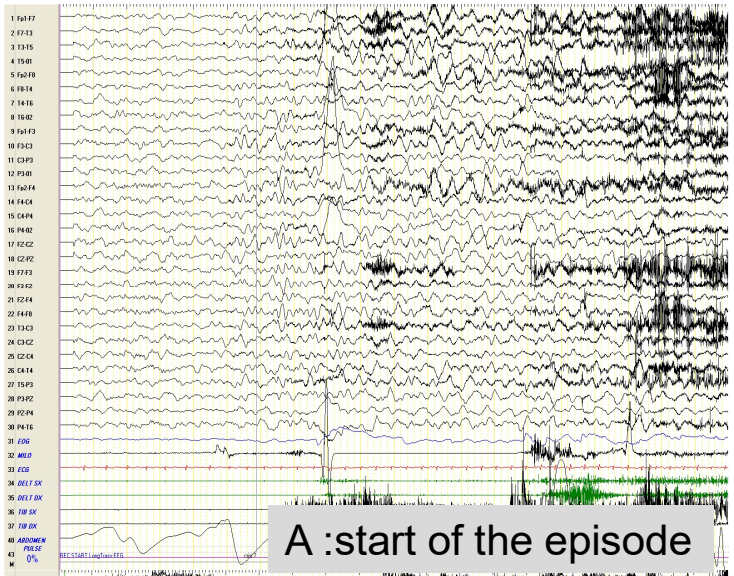
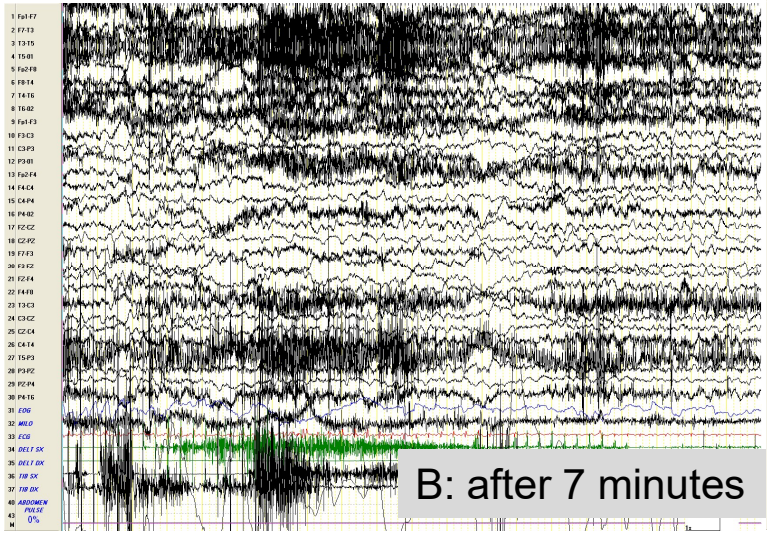
2 F7-T3
3 T3-T5
4 T5-O1
5 Fp2-F8
6 F8-T4
7 T4-T6
8 T6-O2
9 Fp1-F3
10 F3-C3
11 C3-P3
12 P3-O1
13 Fp2-F4
14 F4-C4
15 C4-P4
16 P4-O2
17 FZ-CZ
18 CZ-PZ
19 F7-F3
20 F3-FZ
21 FZ-F4
22 F4-F8
23 T3-C3
24 C3-CZ
25 CZ-C4
26 C4-T4
27 T5-P3
28 P3-PZ
29 PZ-P4
30 P4-T6
31 Eog
32 Milo
33 Ecg
34 Del Sx
35 Del Dx
M
50uV
250uV
1s
50uV

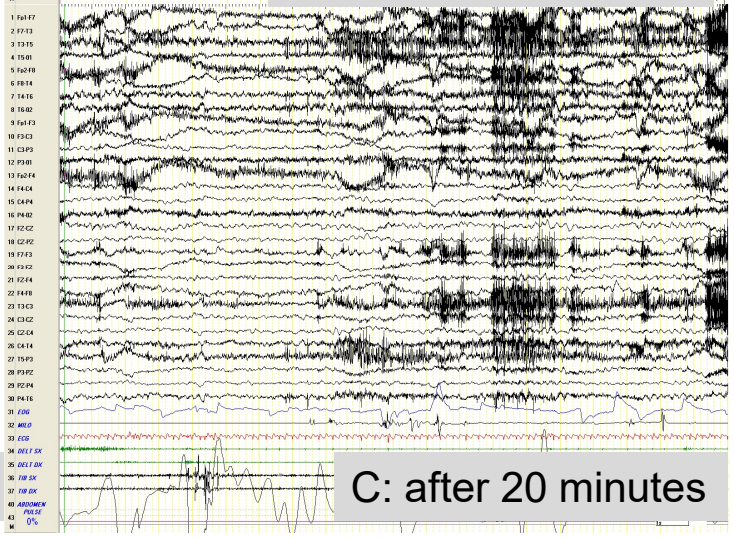
Sleep Terrors



A :start of the episode

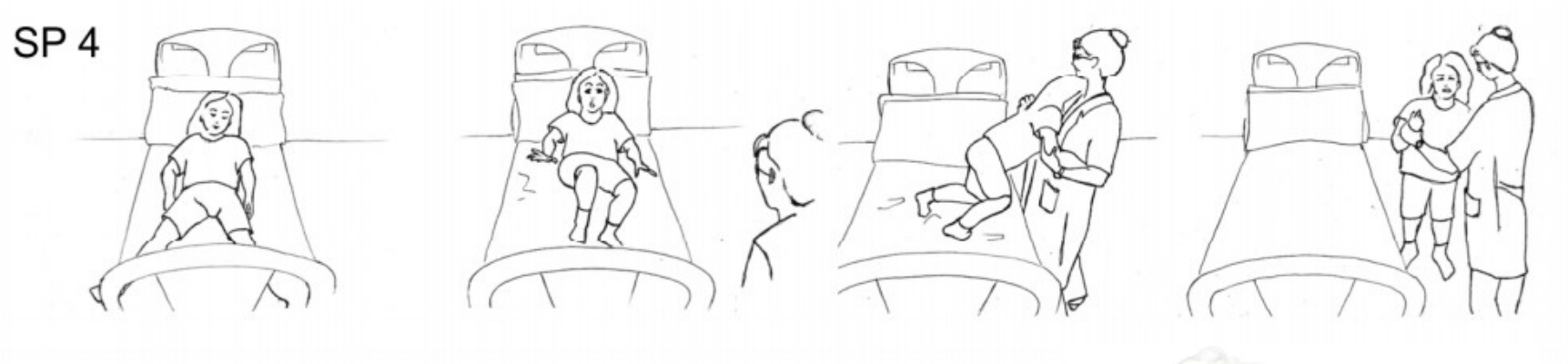


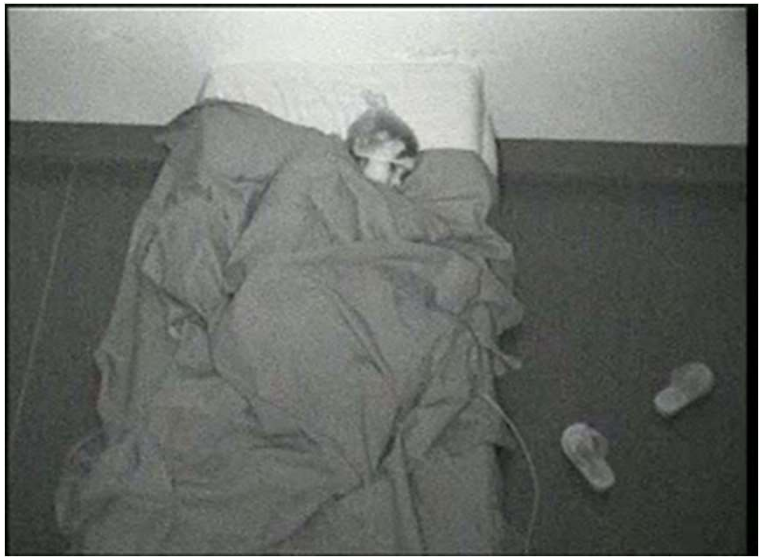
B: after 7 minutes

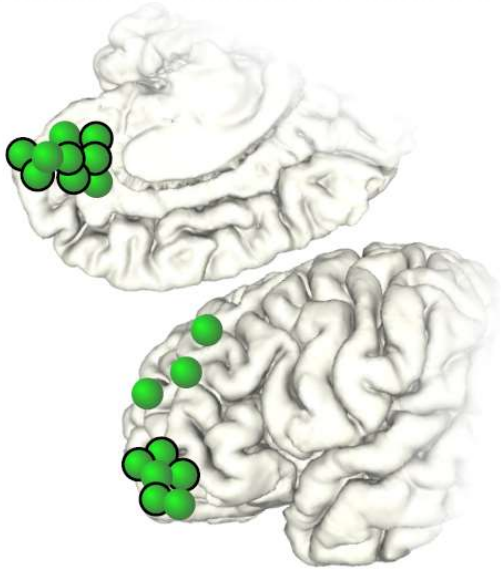


C: after 20 minutes

Differential diagnosis with SHE



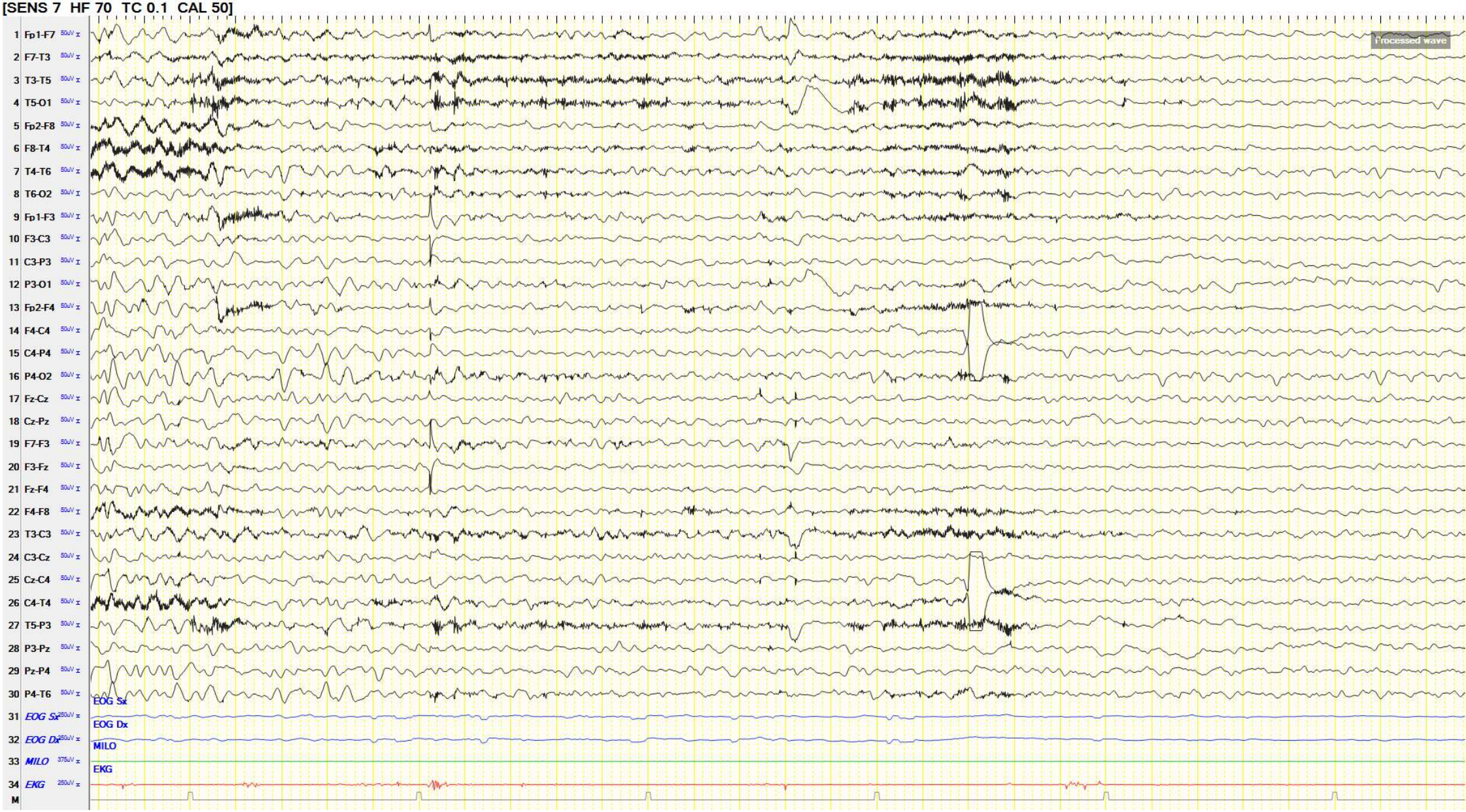




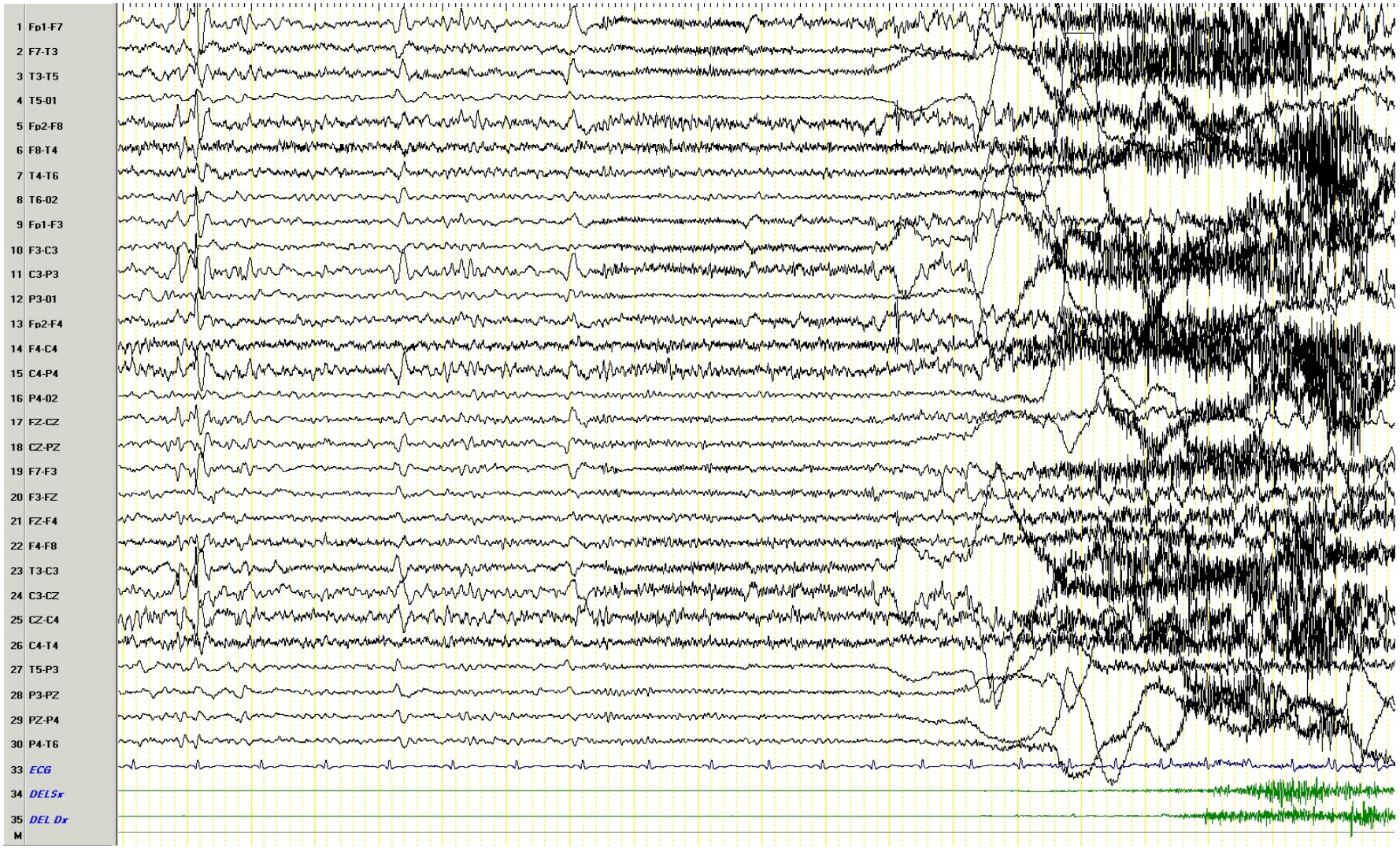
Gibbs et al., Epilepsia 2019

Sleepwalking

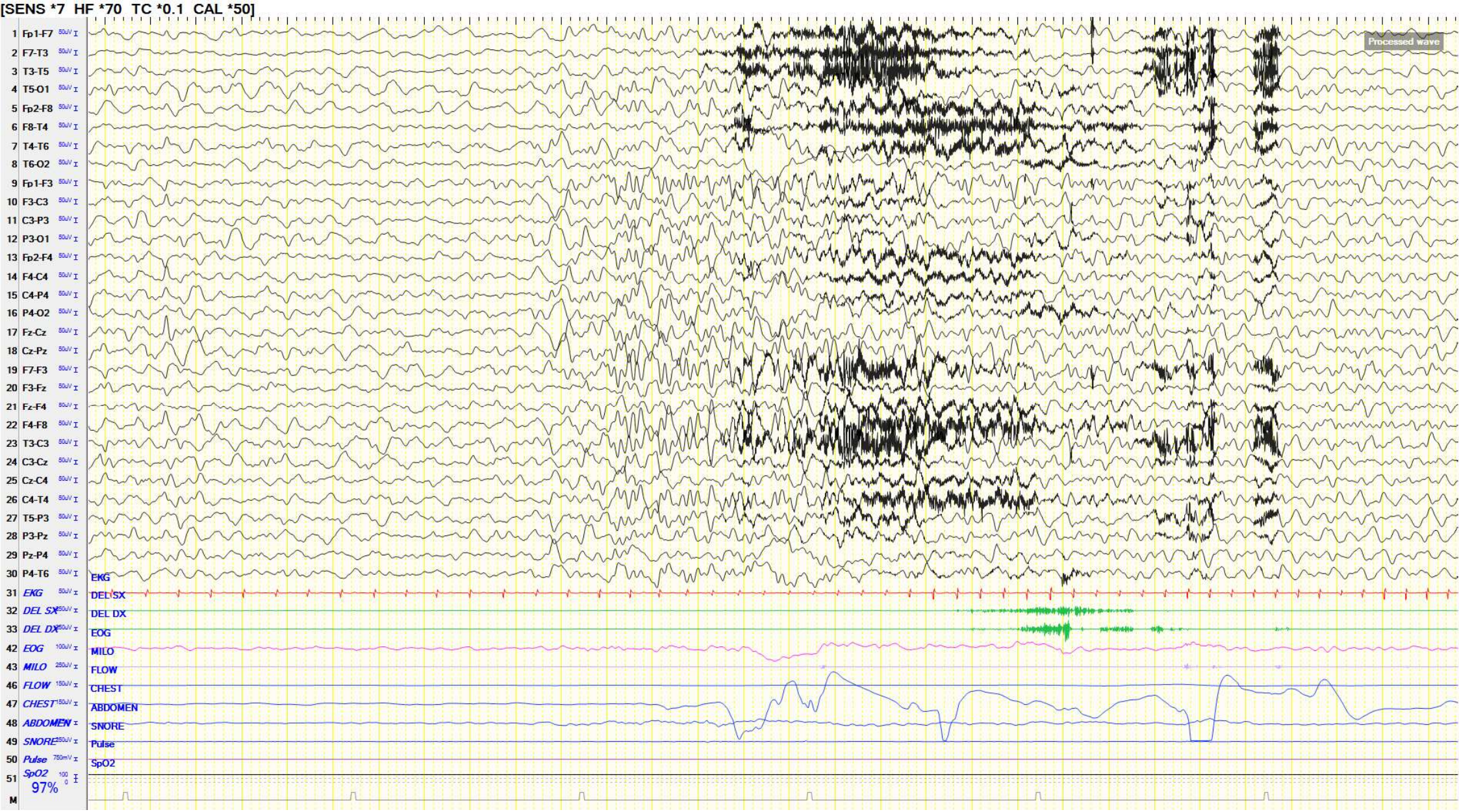

SENS 7 HF 70 TC 0.1 CAL 50]
Fp1-F7
F7-T3
T3-T5
T5-O1
Fp2-F8
F8-T4
T4-T6
T6-O2
Fp1-F3
F3-C3
C3-P3
P3-O1
Fp2-F4
F4-C4
C4-P4
P4-O2
Fz-Cz
Cz-Pz
F7-F3
F3-Fz
Fz-F4
F4-F8
T3-C3
C3-Cz
Cz-C4
C4-T4
T5-P3
P3-Pz
Pz-P4
P4-T6
EOG Sx
EOG Dx
MILO
EKG
Processed wave


[SENS 7 HF 70 TC 0.1 CAL 50]
1 Fp1-F7
2 F7-T3
3 T3-T5
4 T5-O1
5 Fp2-F8
6 F8-T4
7 T4-T6
8 T6-O2
9 Fp1-F3
10 F3-C3
11 C3-P3
12 P3-O1
13 Fp2-F4
14 F4-C4
15 C4-P4
16 P4-O2
17 Fz-Cz
18 Cz-Pz
19 F7-F3
20 F3-Fz
21 Fz-F4
22 F4-F8
23 T3-C3
24 C3-Cz
25 Cz-C4
26 C4-T4
27 T5-P3
28 P3-Pz
29 Pz-P4
30 P4-T6
31 EOG Sx
32 EOG Dx
33 MILO
34 EKG
M
EOG Sx
EOG Dx
MILO
EKG
Processed wave

Epileptic nocturnal wandering



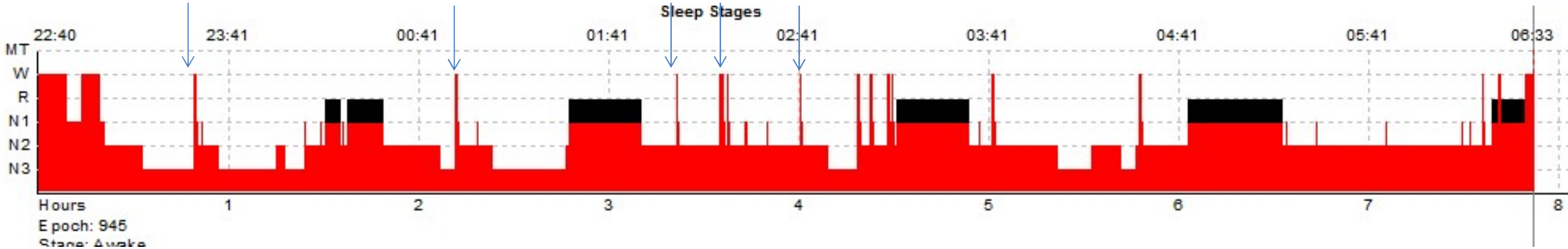
Minor episodes

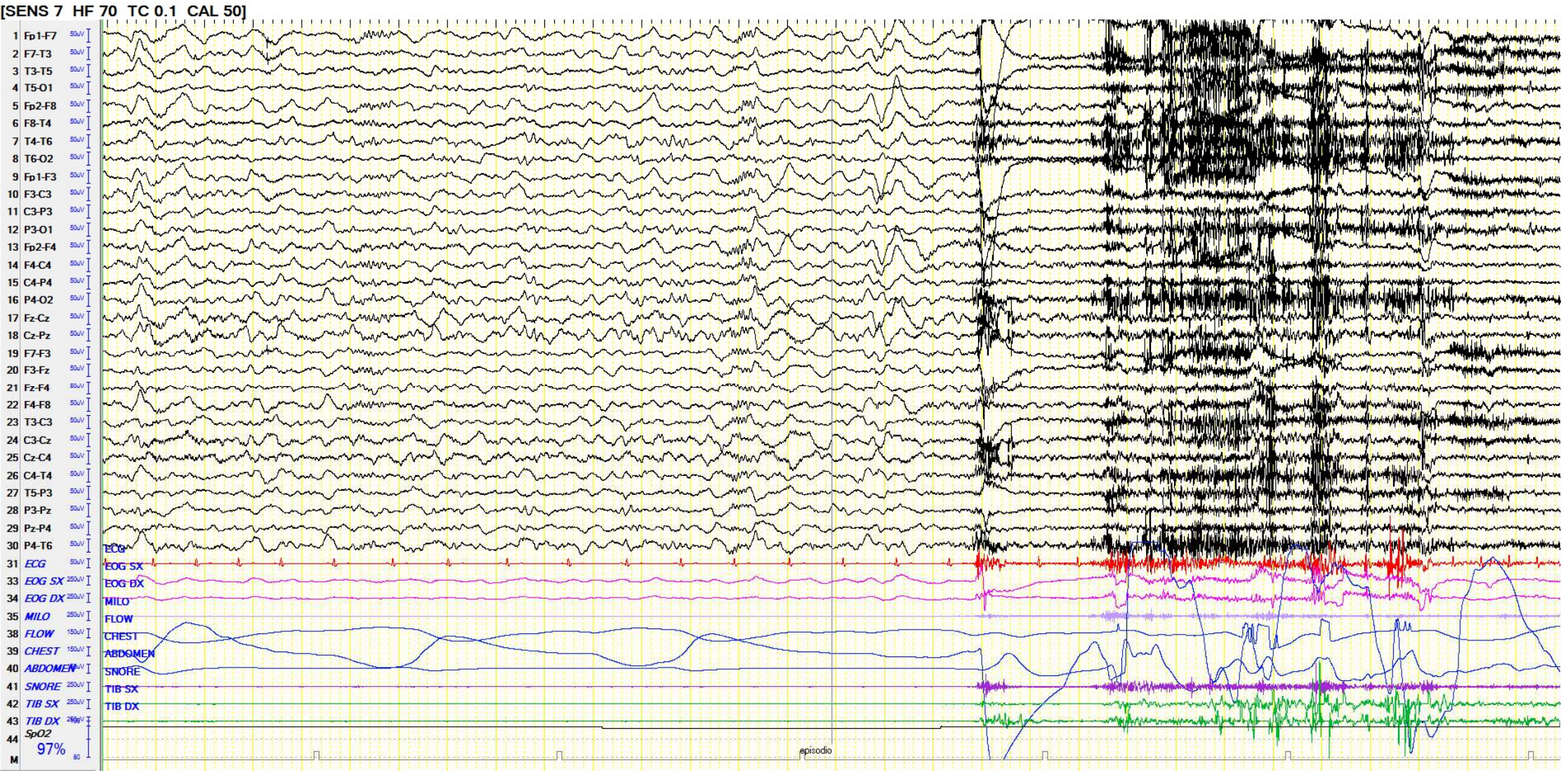

[SENS *7 HF *70 TC *0.1 CAL *50]
Processed wave
1 Fp1-F7
2 F7-T3
3 T3-T5
4 T5-O1
5 Fp2-F8
6 F8-T4
7 T4-T6
8 T6-O2
9 Fp1-F3
10 F3-C3
11 C3-P3
12 P3-O1
13 Fp2-F4
14 F4-C4
15 C4-P4
16 P4-O2
17 Fz-Cz
18 Cz-Pz
19 F7-F3
20 F3-Fz
21 Fz-F4
22 F4-F8
23 T3-C3
24 C3-Cz
25 Cz-C4
26 C4-T4
27 T5-P3
28 P3-Pz
29 Pz-P4
30 P4-T6
31 EKG
32 DEL SX
33 DEL DX
42 EOG
43 MILO
46 FLOW
47 CHEST
48 ABDOMEN
49 SNORE
50 Pulse
51 SpO2
97%
M
EKG
DEL SX
DEL DX
EOG
MILO
FLOW
CHEST
ABDOMEN
SNORE
Pulse
SpO2

Minor episodes


[SENS *10 HF *70 TC *0.1 CAL *50]
1 Fp1-F7
2 F7-T3
3 T3-T5
4 T5-O1
5 Fp2-F8
6 F8-T4
7 T4-T6
8 T6-O2
9 Fp1-F3
10 F3-C3
11 C3-P3
12 P3-O1
13 Fp2-F4
14 F4-C4
15 C4-P4
16 P4-O2
17 Fz-Cz
18 Cz-Pz
19 F7-F3
20 F3-Fz
21 Fz-F4
22 F4-F8
23 T3-C3
24 C3-Cz
25 Cz-C4
26 C4-T4
27 T5-P3
28 P3-Pz
29 Pz-P4
30 P4-T6
31 ECG
32 EOG
35 MILO
36 DELSX
37 DELDX
38 FLOW
39 CHEST
40 ABDOMEN
41 SNORE
42 TIB SX
43 TIB DX
44 SpO2
96%
M
ECG
EOG
MILO
DELSX
DELDX
FLOW
CHEST
ABDOMEN
SNORE
TIB SX
TIB DX

Atypical parasomnia

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4 T5-O1
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8 T6-O2
9 Fp1-F3
10 F3-C3
11 C3-P3
12 P3-O1
13 Fp2-F4
14 F4-C4
15 C4-P4
16 P4-O2
17 Fz-Cz
18 Cz-Pz
19 F7-F3
20 F3-Fz
21 Fz-F4
22 F4-F8
23 T3-C3
24 C3-Cz
25 Cz-C4
26 C4-T4
27 T5-P3
28 P3-Pz
29 Pz-P4
30 P4-T6
31 ECG
33 EOG SX
34 EOG DX
35 MILO
38 FLOW
39 CHEST
40 ABDOMEN
41 SNORE
42 TIB SX
43 TIB DX
44 SpO2
97%
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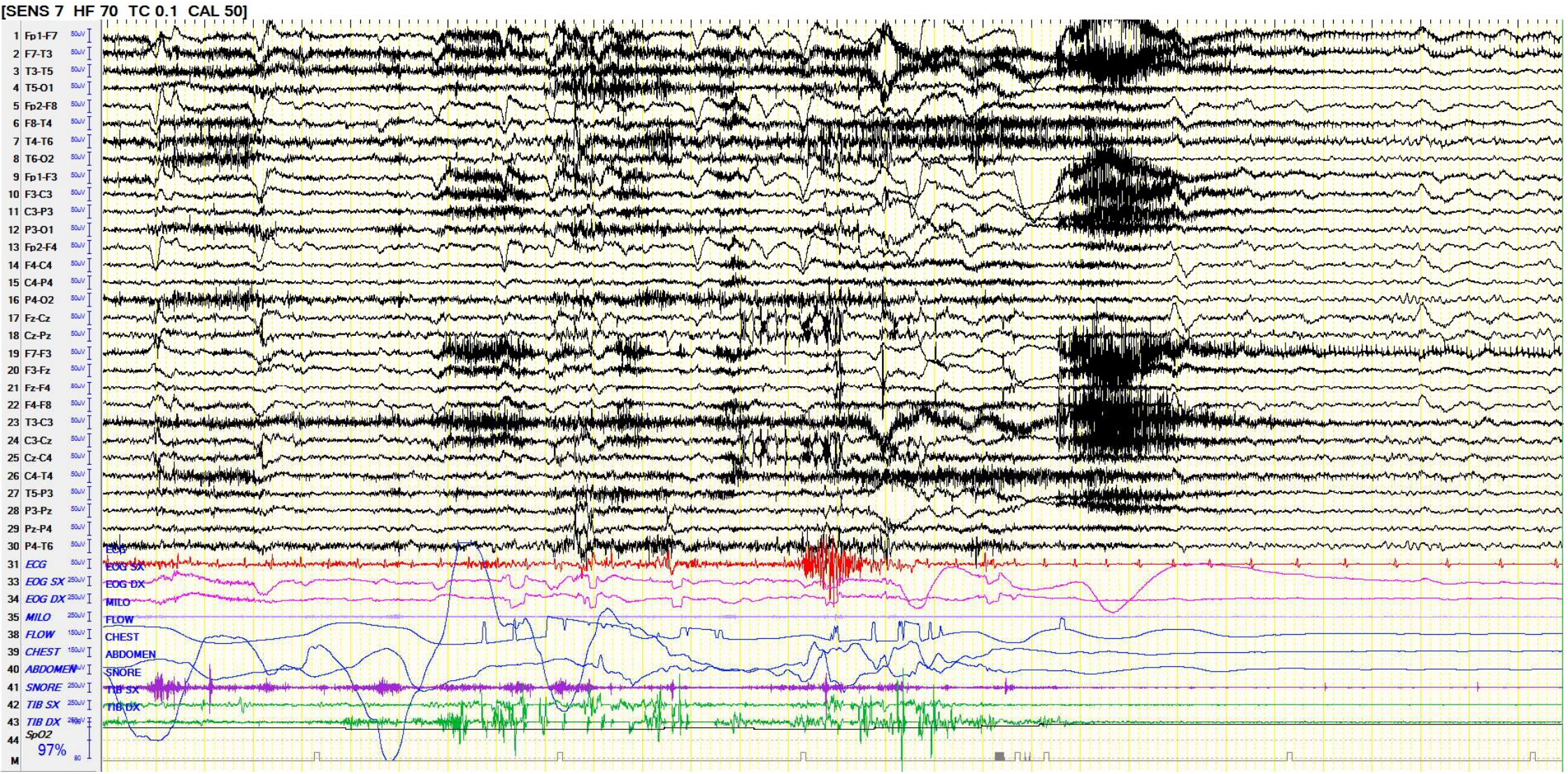
EOG SX
EOG DX
MILO
FLOW
CHEST
ABDOMEN
SNORE
TIB SX
TIB DX
episodio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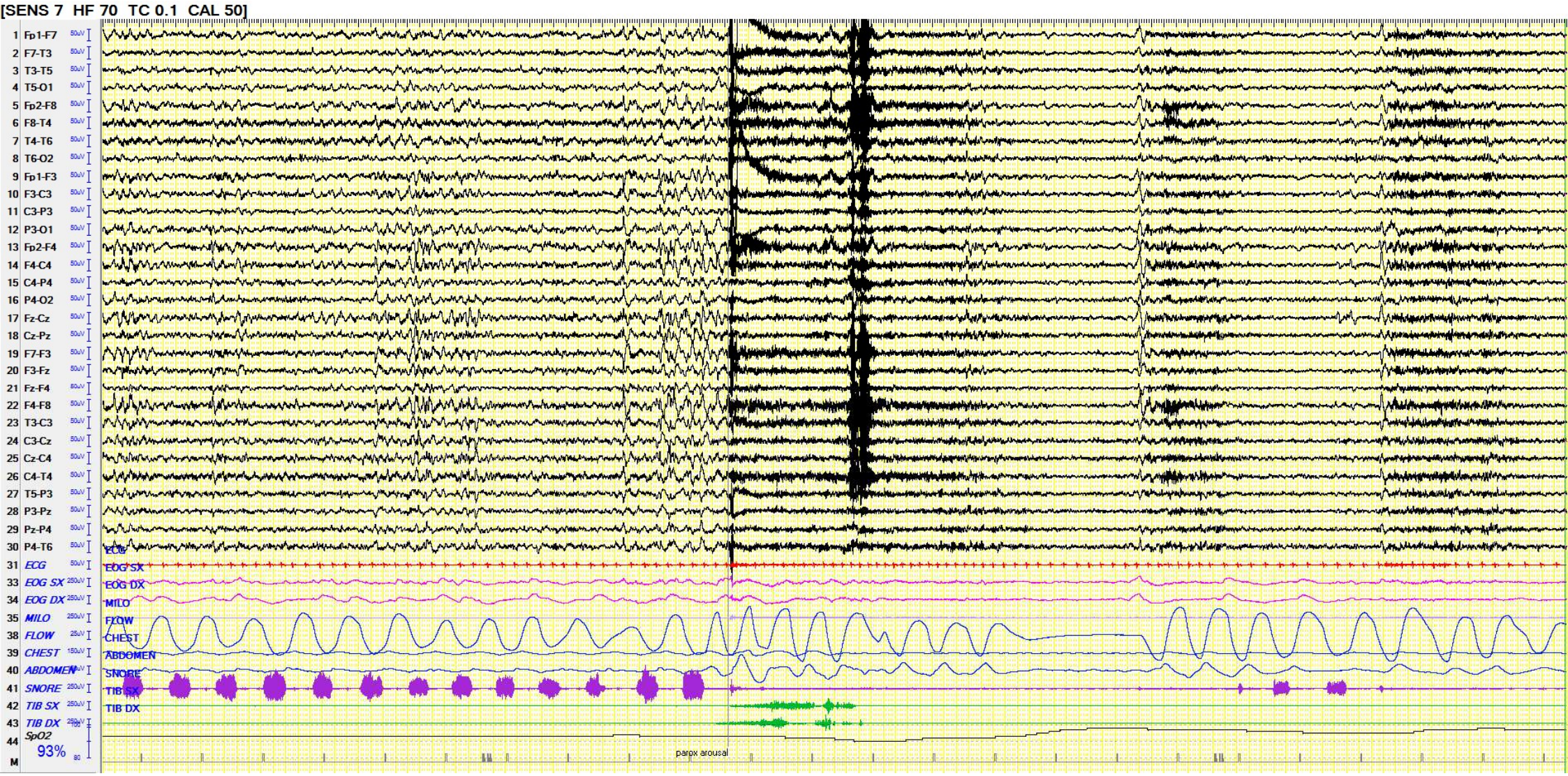
2 F7-T3
3 T3-T5
4 T5-O1
5 Fp2-F8
6 F8-T4
7 T4-T6
8 T6-O2
9 Fp1-F3
10 F3-C3
11 C3-P3
12 P3-O1
13 Fp2-F4
14 F4-C4
15 C4-P4
16 P4-O2
17 Fz-Cz
18 Cz-Pz
19 F7-F3
20 F3-Fz
21 Fz-F4
22 F4-F8
23 T3-C3
24 C3-Cz
25 Cz-C4
26 C4-T4
27 T5-P3
28 P3-Pz
29 Pz-P4
30 P4-T6
31 ECG
33 EOG SX
34 EOG DX
35 MILO
38 FLOW
39 CHEST
40 ABDOMEN
41 SNORE
42 TIB SX
43 TIB DX
44 SpO2
97%
M
ECG
EOG SX
EOG DX
MILO
FLOW
CHEST
ABDOMEN
SNORE
TIB SX
TIB DX


[SENS 7 HF 70 TC 0.1 CAL 50]
1 Fp1-F7
2 F7-T3
3 T3-T5
4 T5-O1
5 Fp2-F8
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8 T6-O2
9 Fp1-F3
10 F3-C3
11 C3-P3
12 P3-O1
13 Fp2-F4
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15 C4-P4
16 P4-O2
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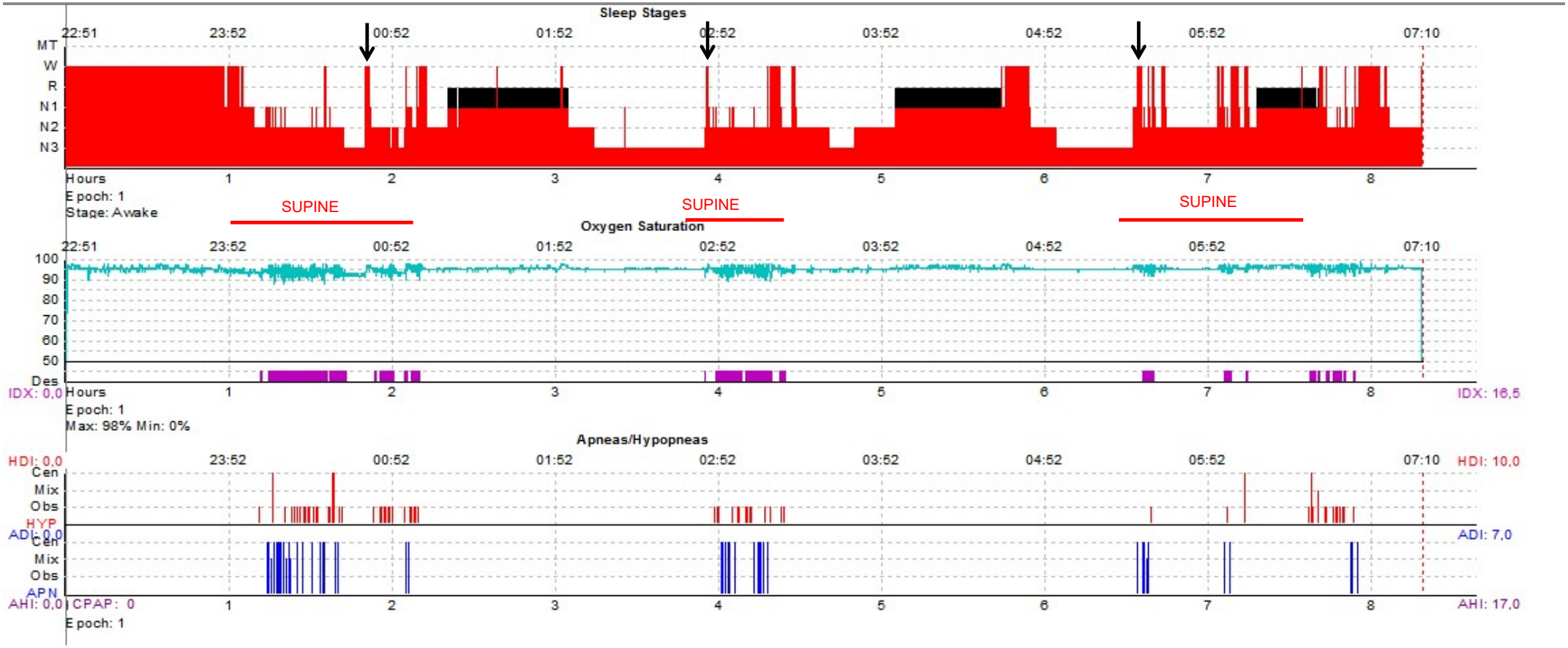
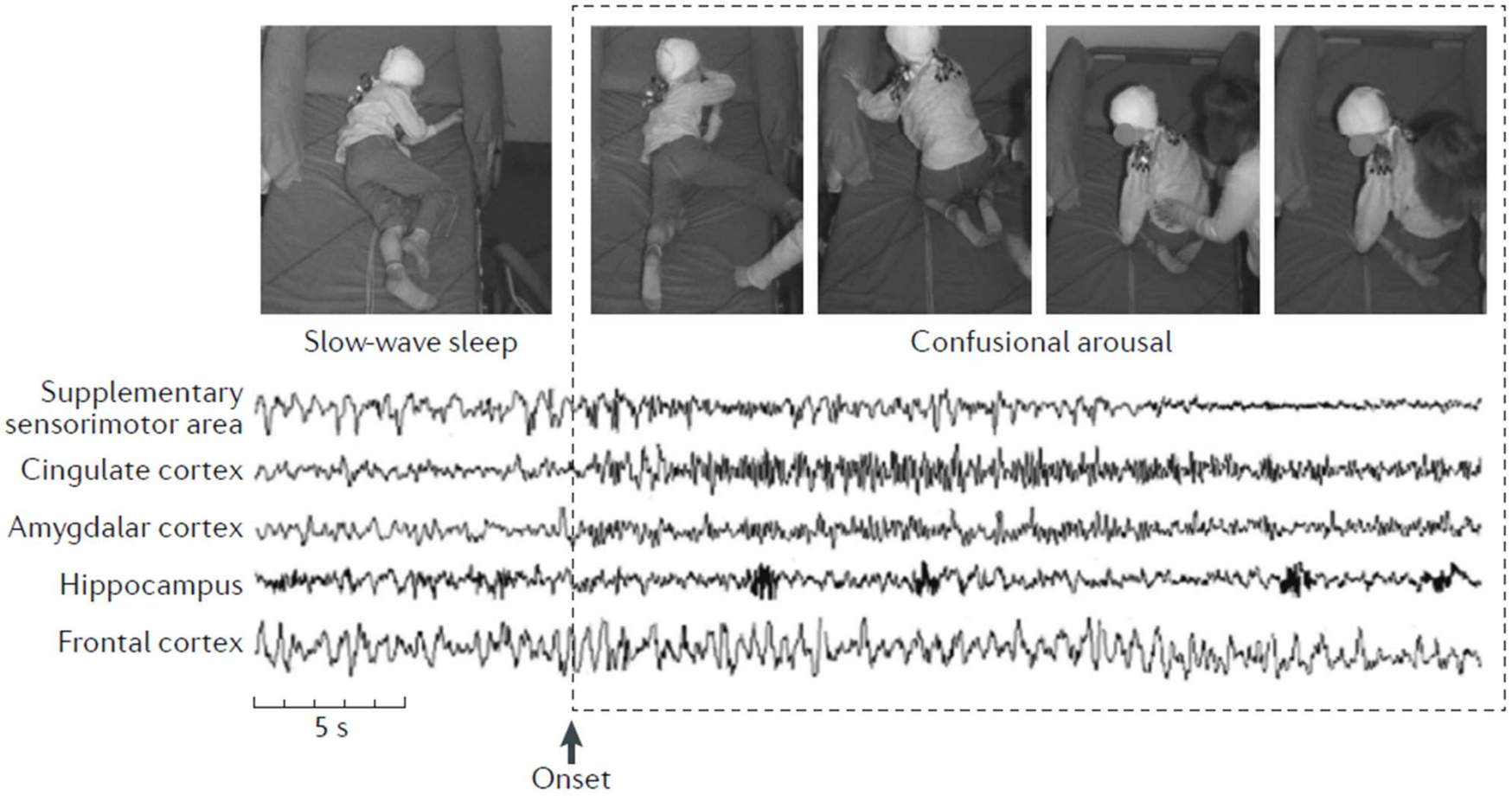
18 Cz-Pz
19 F7-F3
20 F3-Fz
21 Fz-F4
22 F4-F8
23 T3-C3
24 C3-Cz
25 Cz-C4
26 C4-T4
27 T5-P3
28 P3-Pz
29 Pz-P4
30 P4-T6
31 ECG
33 EOG SX
34 EOG DX
35 MILO
38 FLOW
39 CHEST
40 ABDOMEN
41 SNORE
42 TIB SX
43 TIB DX
44 SpO2
93%
M
ECG
EOG SX
EOG DX
MILO
FLOW
CHEST
ABDOMEN
SNORE
TIB SX
TIB DX
parox arousal

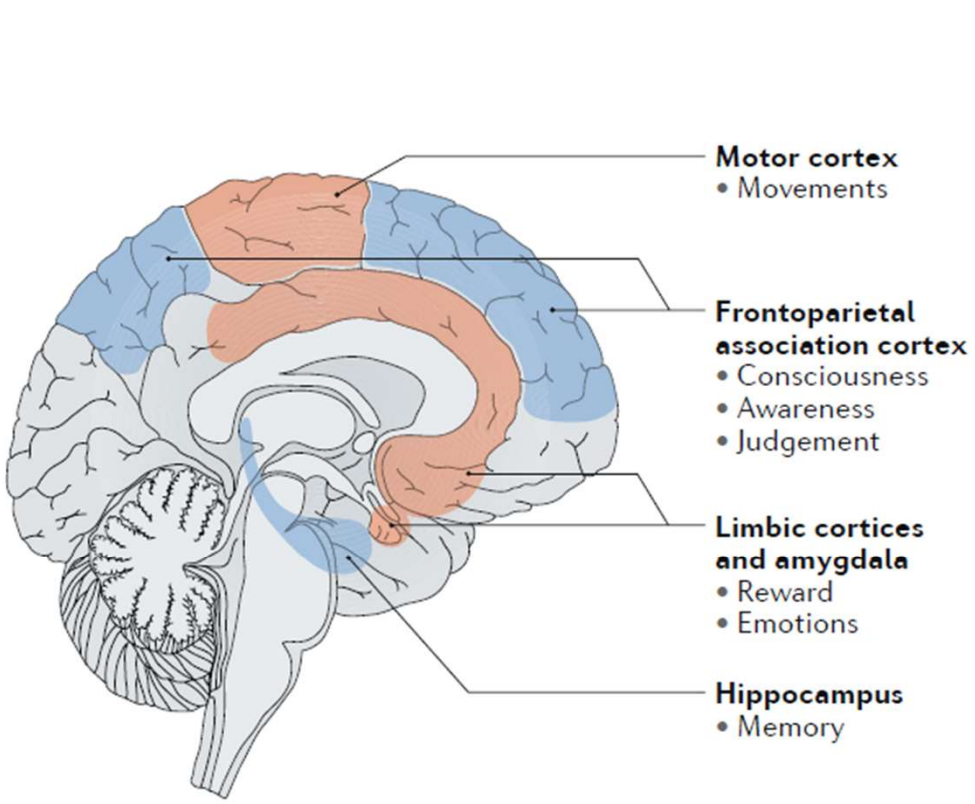

Sleep Stages
22:51
23:52
00:52
01:52
02:52
03:52
04:52
05:52
07:10
MT
W
R
N1
N2
N3
Hours
1
2
3
4
5
6
7
8
Epoch: 1
Stage: Awake
SUPINE
SUPINE
SUPINE
Oxygen Saturation
100
90
80
70
60
50
Des
IDX: 0,0
IDX: 16,5
Epoch: 1
Max: 98% Min: 0%
Apneas/Hypopneas
HDI: 0,0
HDI: 10,0
Cen
Mix
Obs
HYP
ADI: 0,0
ADI: 7,0
Cen
Mix
Obs
APN
AHI: 0,0
CPAP: 0
AHI: 17,0
Epoch: 1

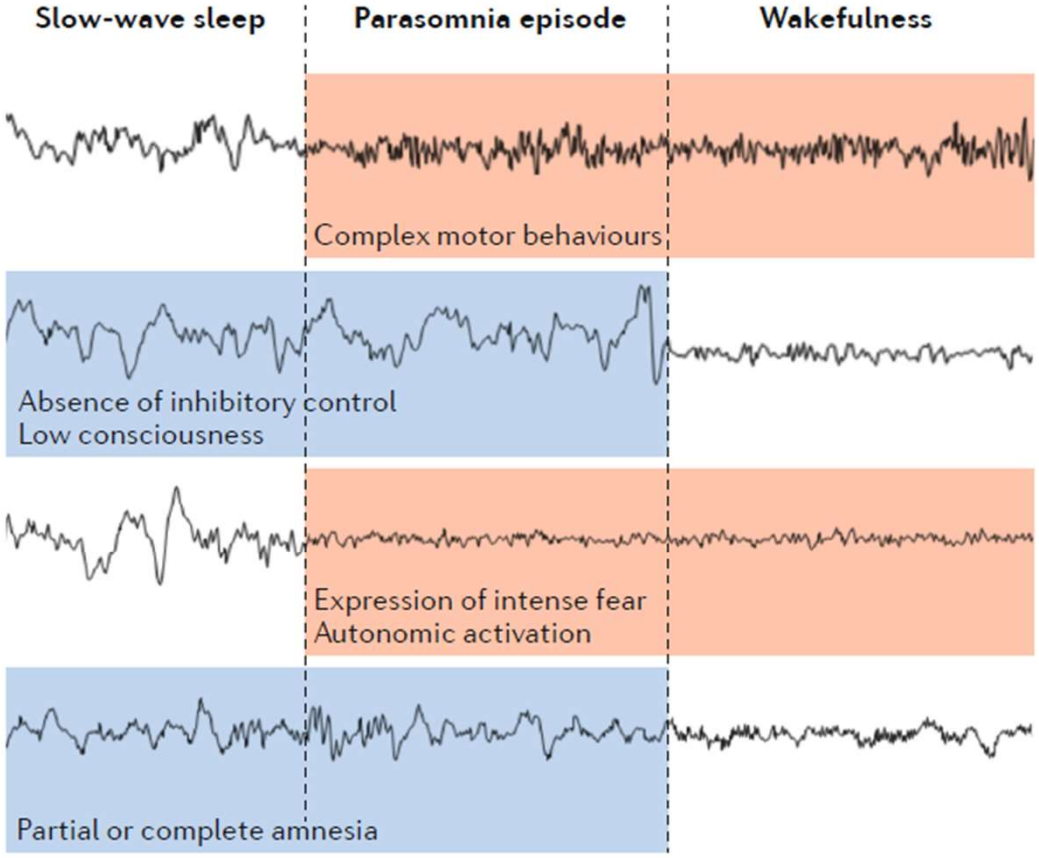
Stereo-EEG recordings



Castelnovo et al., Nature 2020

Sleep-wake dissociation in DOA



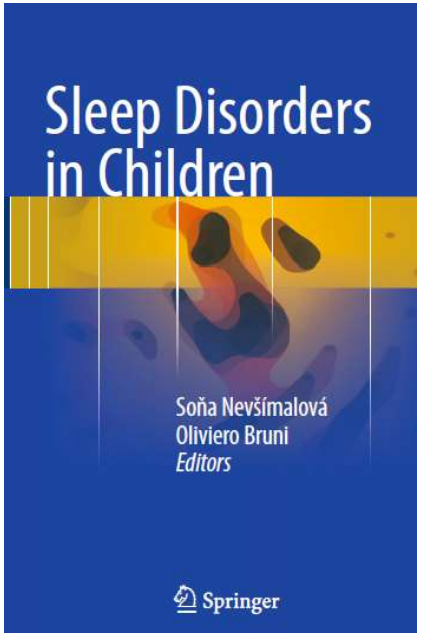


Castelnovo et al., Nature 2020

Differential Diagnosis between DOA and SHE

Table 14.6 Differential diagnosis between NREM parasomnia and nocturnal frontal lobe epilepsy

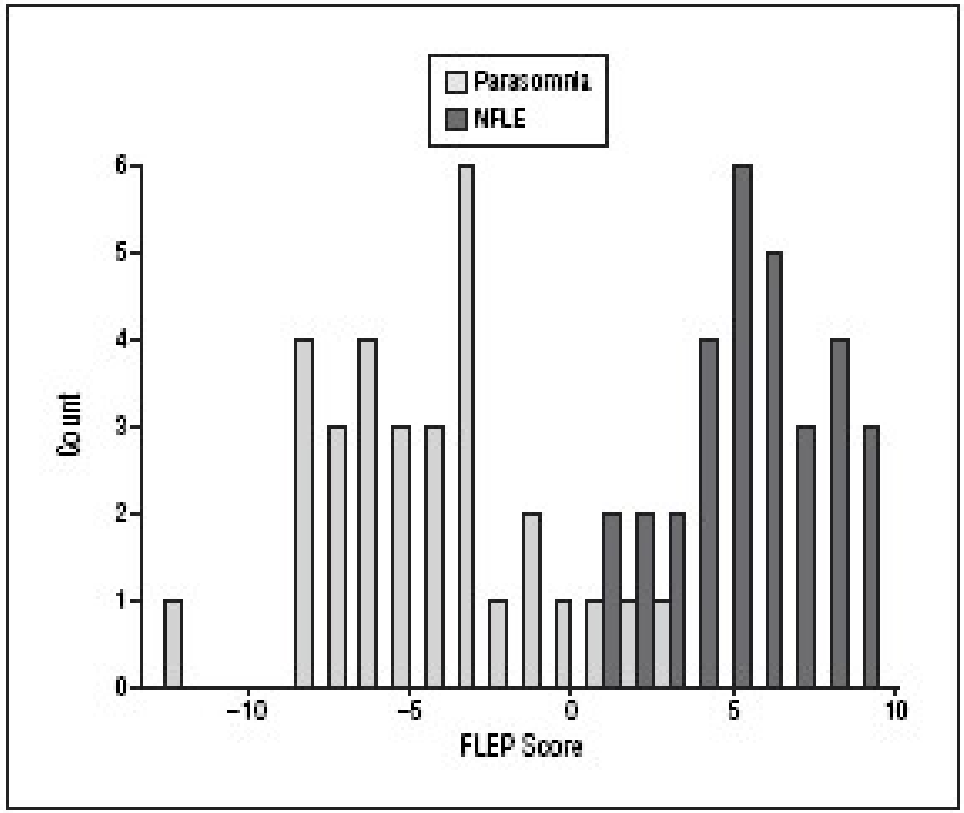
	NREM parasomnia	NFLE
Age at onset	3–8 years	Any age (peak in childhood)
Familial history	Frequently present	Possible
Peak time of occurrence	Usually during the first third	Any time
Sleep-stage onset of episodes	NREM sleep (usually N3)	NREM sleep (usually N2)
Frequency during one night	Usually one episode/night	Several episodes/night
Frequency	Sporadic	Almost every night
Duration	1–10 min	Seconds to 3 min
Evolution	Tend to disappear	Stable, increased frequency, rare remission
Predisposing factors	Frequent (sleep deprivation, febrile illness)	Rare
Stereotypic motor pattern	No	Yes
Consciousness	Usually impaired	Usually preserved
Amnesia	Frequent	Unconstant



The Frontal Lobe Epilepsy and Parasomnias (FLEP) Scale

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?	
Duration What is the duration of a typical event?	
Clustering What is the typical number of events to occur in a single night?	
Timing At what time of night do the events most commonly occur?	
Symptoms Are the events associated with a definite aura?	
Does the patient ever wander outside the bedroom during the events?	
Does the patient perform complex, directed behaviors (eg, picking up objects, dressing) during events?	
Is there a clear history of prominent dystonic posturing, tonic limb extension, or cramping during events?	
Stereotypy Are the events highly stereotyped or variable in nature?	
Recall Does the patient recall the events?	
Vocalization Does the patient speak during the events and, if so, is there subsequent recollection of this speech?	
Total score	



Derry et al Arch Neurol 2006

Epilepsia, 49(9):1581–1585, 2008
doi: 10.1111/j.1528-1167.2008.01602.x

FULL-LENGTH ORIGINAL RESEARCH

The FLEP scale in diagnosing nocturnal frontal lobe epilepsy, NREM and REM parasomnias: Data from a tertiary sleep and epilepsy unit

Raffaele Manni, Michele Terzaghi, and Alessandra Repetto

Unit of Sleep Medicine and Epilepsy, Institute of Neurology "C. Mondino Foundation," Pavia, Italy

The FLEP scale gave an incorrect diagnosis in 4/71 (5.6%) of the cases, namely NFLE patients with episodes of nocturnal wanderings and uncertain diagnostic indications in 22/71 subjects (30.9%)

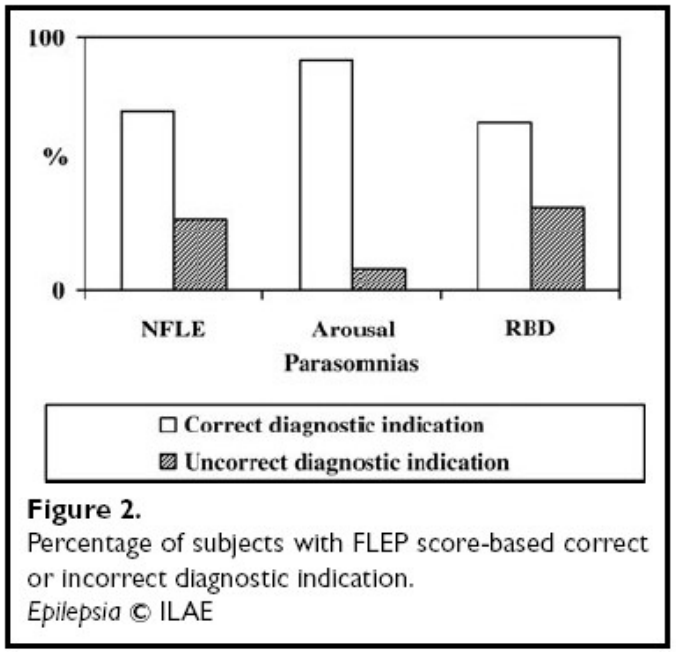


Figure 2.
Percentage of subjects with FLEP score-based correct or incorrect diagnostic indication.

PRACTICE PARAMETERS FOR PSG AND MSLT TESTING FOR CHILDREN

http://dx.doi.org/10.5665/sleep.2190

Practice Parameters for the Non-Respiratory Indications for Polysomnography and Multiple Sleep Latency Testing for Children

R. Nisha Aurora, MD[1]; Carin I. Lamm, MD[2]; Rochelle S. Zak, MD[3]; David A. Kristo, MD[4]; Sabin R. Bista, MD[5]; James A. Rowley, MD[6]; Kenneth R. Casey, MD, MPH[7]

SLEEP, Vol. 35, No. 11, 2012

The polysomnogram using an expanded EEG montage is indicated in children ***to confirm the diagnosis of an atypical or potentially injurious parasomnia or differentiate a parasomnia from sleep-related epilepsy*** *when the initial clinical evaluation and standard EEG are inconclusive.*

Limits of Video-PSG recording:

- ✓ Not always capture the event in a single-night recording
- ✓ Absence of epileptiform abnormalities in a substantial percentage of SHE patients
- ✓ interictal epileptiform abnormalities may occur in some DOA patients

NREM Arousal Parasomnias and Their Distinction from Nocturnal Frontal Lobe Epilepsy: A Video EEG Analysis

Sleep 2009

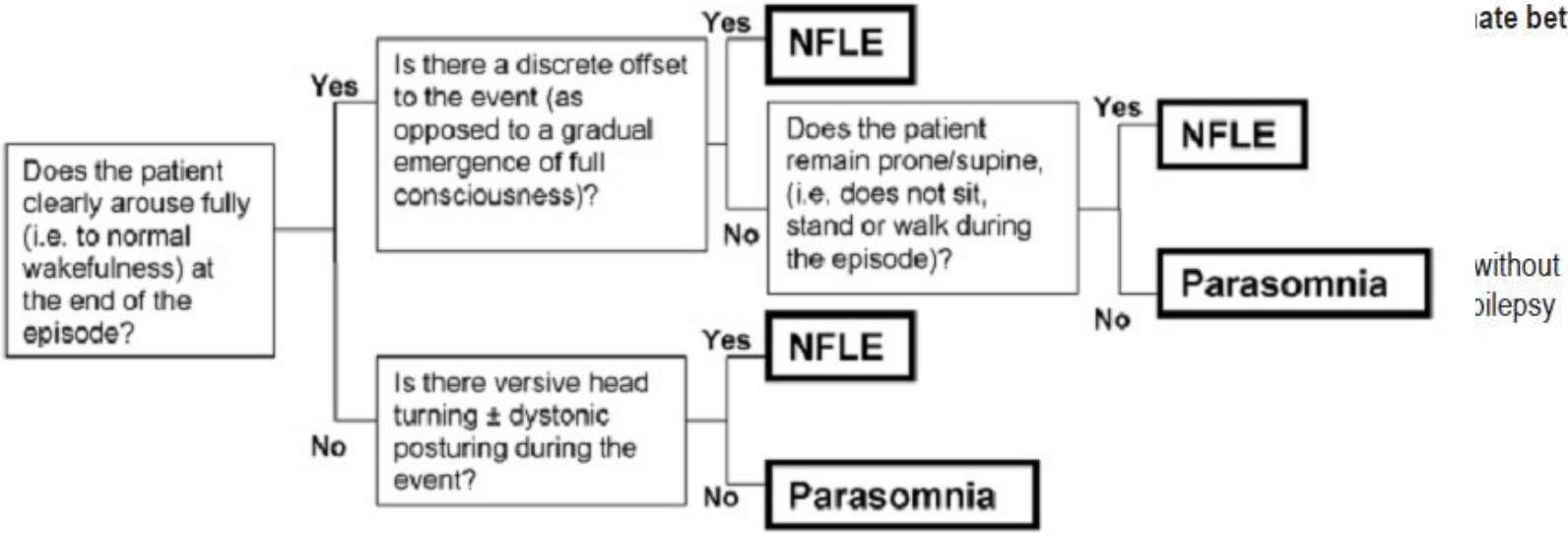
Christopher P. Derry, PhD[1,3]; A. Simon Harvey, MD[1,2]; Matthew C. Walker, PhD[3]; John S. Duncan, MD[3]; Samuel F. Berkovic, FRS[1]

[1]Epilepsy Research Centre, Department of Medicine, University of Melbourne, Victoria, Australia; [2]Department of Neurology, Royal Children's Hospital, Melbourne, Australia; [3]Department of Clinical and Experimental Epilepsy, Institute of Neurology UCL, Queen Square, London, UK

Table 2—Important Quantitative and Qualitative Features which can be Used in the Positive Identification of Parasomnias

Features stror ...ate between

Yawning
Scratching and
Rolling over in
Internal or exte
Waxing and wa
Physical or verl
Sobbing, sad e
Indistinct offset
Failure to fully
behavior
Prolonged dura
Discordance be
reported event



...without ...ilepsy

*Standing and walking do not, in usual circumstances, discriminate between parasomnias and NFLE. However, in individuals who rouse to full wakefulness after their events, and in whom events have an indistinct offset, standing or walking suggests a diagnosis of parasomnias over NFLE (see decision tree algorithm).

SLEEP, Vol. 32, No. 12, 2009

NREM AROUSAL PARASOMNIAS AND FRONTAL LOBE EPILEPSY

NREM Arousal Parasomnias and Their Distinction from Nocturnal Frontal Lobe Epilepsy: A Video EEG Analysis

Sleep 2009

Christopher P. Derry, PhD[1,3]; A. Simon Harvey, MD[1,2]; Matthew C. Walker, PhD[3]; John S. Duncan, MD[3]; Samuel F. Berkovic, FRS[1]

[1]Epilepsy Research Centre, Department of Medicine, University of Melbourne, Victoria, Australia; [2]Department of Neurology, Royal Children's Hospital, Melbourne, Australia; [3]Department of Clinical and Experimental Epilepsy, Institute of Neurology UCL, Queen Square, London, UK

Features which do *not* discriminate between parasomnias and NFLE

Brevity

Sitting

Standing or walking*

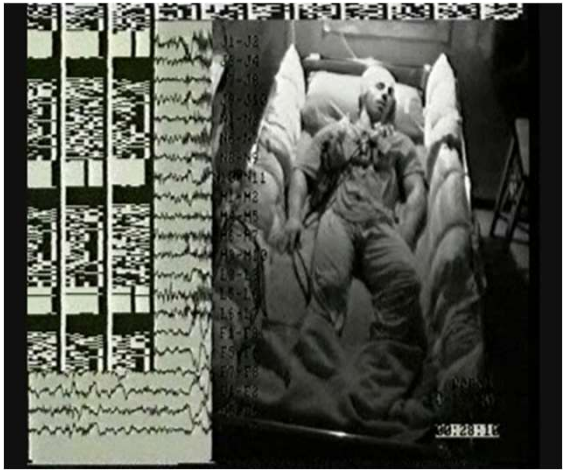
Preceding 'normal' arousal

Brief arousals (up to 10 seconds) without definite semiological features of epilepsy

Fearful emotional behaviour

DOA

SHE



Definition and diagnostic criteria of sleep-related hypermotor epilepsy

OPEN

Tinuper et al Neurology 2016

'If the captured episodes are minor motor events or paroxysmal arousals, and if few episodes are captured, the clinical diagnosis may be unreliable'

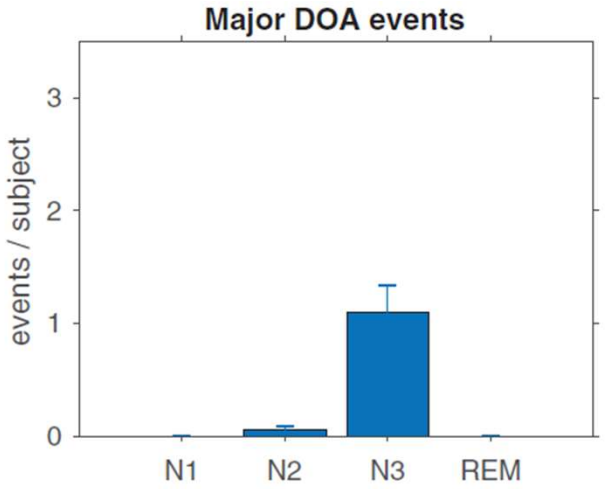
Polysomnographic features differentiating disorder of arousals from sleep-related hypermotor epilepsy

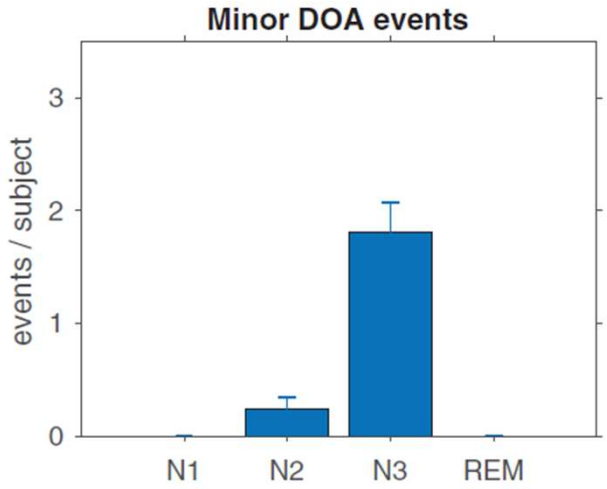
Paola Proserpio[1], Giuseppe Loddo[2,•], Frederic Zubler[3], Luigi Ferini-Strambi[4], Laura Licchetta[2,5], Francesca Bisulli[2,5], Paolo Tinuper[2,5], Elio Clemente Agostoni[1], Claudio Bassetti[3], Laura Tassi[1], Veronica Menghi[2], Federica Provini[2,5] and Lino Nobili[1,6,7,*]

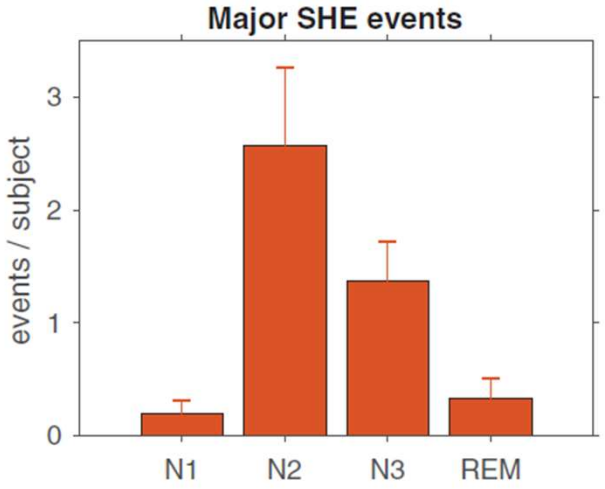
SLEEPJ, 2019,

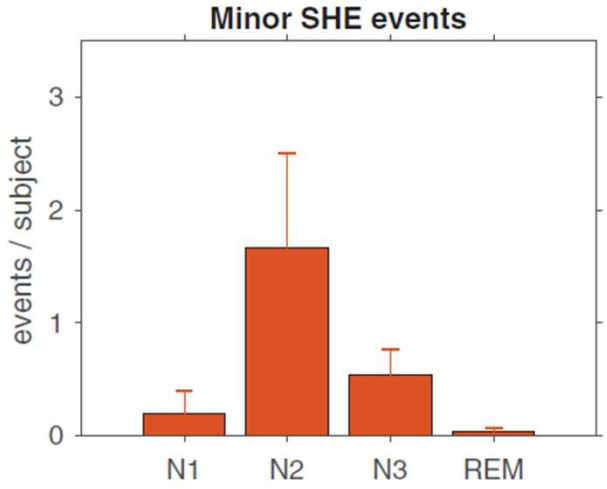
Table 1. Classifier performance

	DOA	SHE	*p* value
	(*N* = 59)	(*N* = 30)	
Sex (female)	25 (42%)	14 (47%)	0.7
Age (year)	28.4 ± 10.1	30.4 ± 14.4	0.81
Nb total events	3.2 ± 2.4	6.9 ± 8.2	0.03
Nb major events	1.15 ± 1.30	4.47 ± 5.20	1.25E-06
Nb minor events	2.05 ± 2.27	2.43 ± 5.81	0.07
Nb total events during N3	2.92 ± 2.21	1.90 ± 2.41	0.0036
Nb total events outside N3	0.29 ± 0.83	5.00 ± 7.43	8.56E-11
Nb major events during N3	1.10 ± 1.26	1.37 ± 1.96	0.91
Nb major events outside N3	0.05 ± 0.22	3.10 ± 4.89	2.19E-13
Nb minor events during N3	1.81 ± 1.94	0.53 ± 1.25	4.62E-05
Nb minor events outside N3	0.24 ± 0.82	1.90 ± 4.71	0.0023
Total events distribution index	0.50 ± 0.66	0.14 ± 0.71	0.0119
Major events distribution index	0.55 ± 0.77[a]	-0.01 ± 0.78	0.0026
Minor events distribution index	0.36 ± 0.67	0.25 ± 0.52	0.2015
N3 distribution index	0.38 ± 0.24	0.17 ± 0.37	0.0048

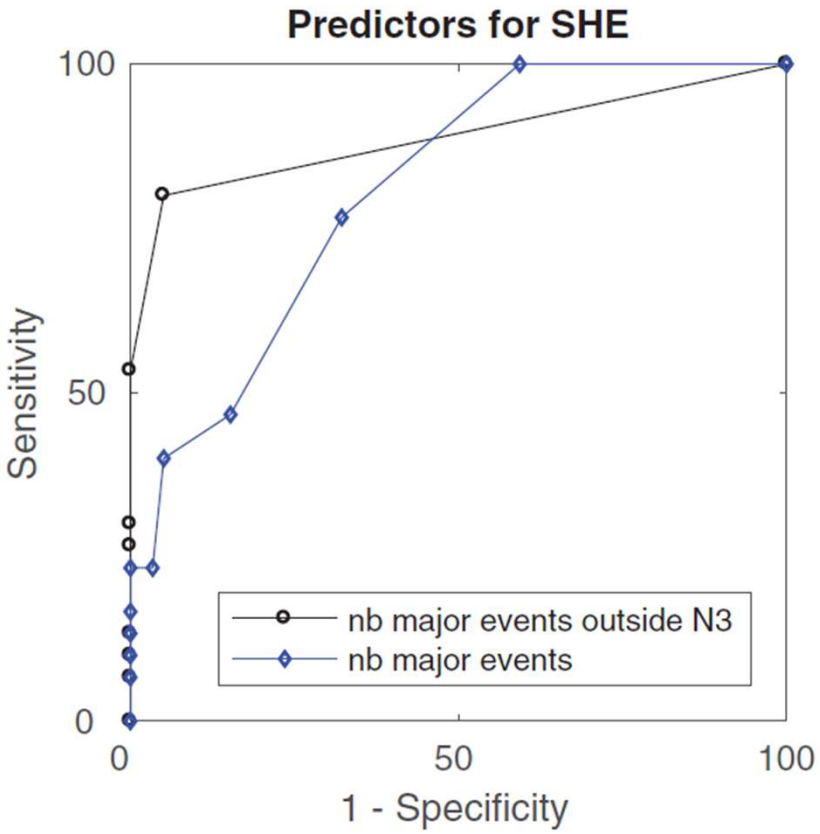


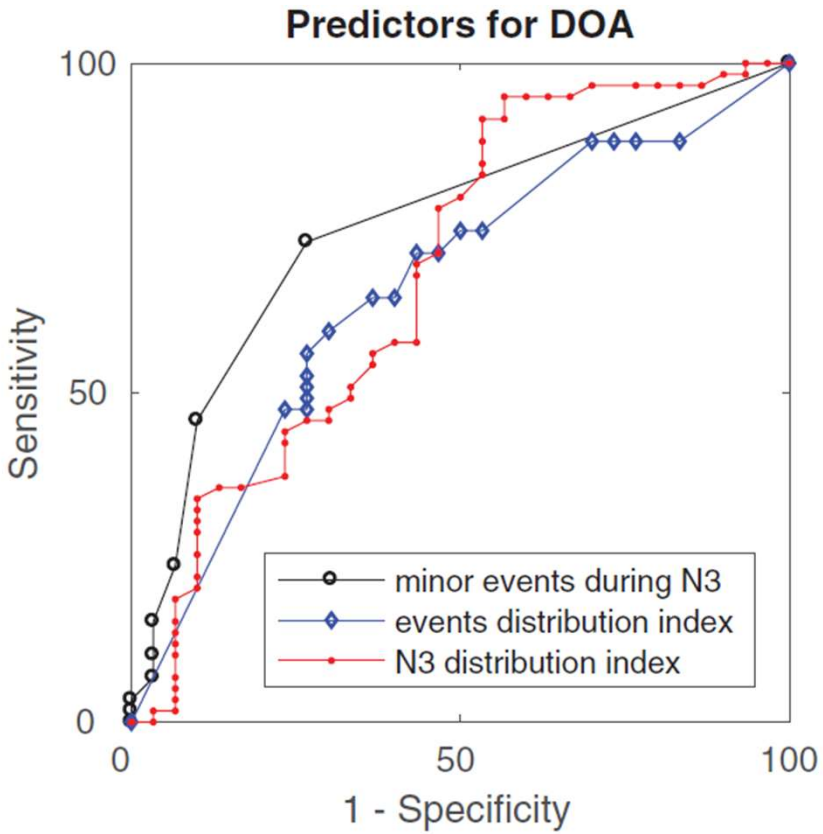






Performance of predictors





The occurrence of at least one major event outside N3 was suggestive for SHE
(accuracy = 0.898, **sensitivity = 0.793, specificity = 0.949**)

The occurrence of at least one minor event during N3 was suggestive for DOA
(accuracy = 0.73, **sensitivity = 0.733, specificity = 0.723**)

Seizures with paroxysmal arousals in sleep-related hypermotor epilepsy (SHE): Dissecting epilepsy from NREM parasomnias

Giuseppe Loddo[1] | Lorenzo Baldassarri[1] | Corrado Zenesini[2] | Laura Licchetta[1,2] | Francesca Bisulli[1,2] | Fabio Cirignotta[3] | Susanna Mondini[3] | Paolo Tinuper[1,2] | Federica Provini[1,2]

Epilepsia. 2020;61:2194–2202.

	SPAs (SHE)	SAMs (DOA)	Episodes resembling SAMs (Healthy Controls)	*P*
Total number of recorded episodes	121	140	11	<.001
Median duration, sec (IQR)	5 (4-8)	12 (8-16)	16 (15-17)	<.001
Sleep stage at onset, n (%)				
1 NREM	33 (27)	0 (0)	2 (18)	<.001
2 NREM	77 (63)	37 (26)	5 (46)	
3 NREM	9 (8)	103 (74)	3 (27)	
REM	2 (2)	0 (0)	1 (9)	
Body spatial distribution at onset, n (%)				
Focal	0 (0)	20 (14)	2 (18)	<.001
Segmental	4 (3)	11 (8)	2 (18)	
Multifocal	31 (26)	52 (38)	5 (46)	
Generalized	86 (71)	57 (40)	2 (18)	
Episodes with motor arrest, n (%)	0 (0)	61 (43)	1 (9)	<.001
Movement progression, n (%)				
Waning	0 (0)	75 (54)	1 (9)	<.001
Waxing	0 (0)	8 (5)	0 (0)	
Waxing-waning	0 (0)	10 (8)	0 (0)	
Waning-waxing	0 (0)	8 (5)	0 (0)	
Constant	121 (100)	39 (28)	10 (91)	

COMMENTARY

Can Homemade Video Recording Become More Than a Screening Tool?

A commentary on Derry et al. NREM Arousal Parasomnias and their distinction from nocturnal frontal lobe epilepsy: a video EEG analysis SLEEP 2009;32:1637-1644.

Lino Nobili, MD, PhD

Centre of Epilepsy Surgery "C. Munari" and Centre of Sleep Medicine, Department of Neuroscience, Niguarda Hospital, Milan, Italy

Sleep-Related Hypermotor Epilepsy vs Disorders of Arousal in Adults

A Step-Wise Approach to Diagnosis

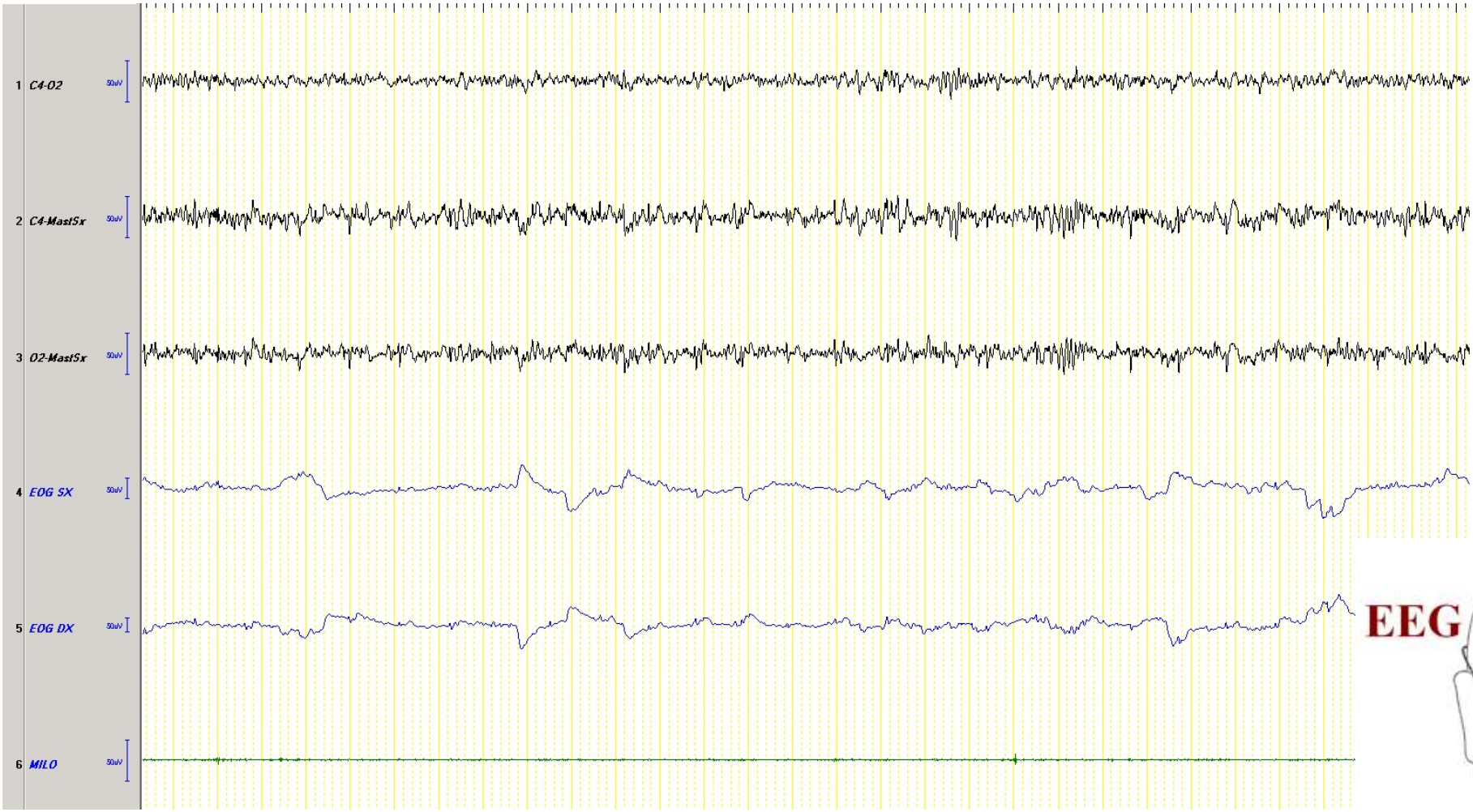
Chest 2021

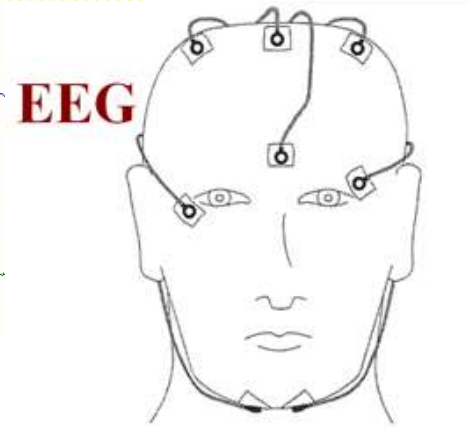
Angelica Montini, MD; Giuseppe Loddo, MD, PhD; Luca Baldelli, MD; Rosalia Cilea; and Federica Provini, MD, PhD

Three-level diagnostic algorithm

DOA	SHE
Clinical Interview • Confusional Arousals: sloppy movements with puzzled expression • Sleep Terrors: alarming vocalizations, agitated motor behaviors and autonomic activation • Sleepwalking: ambulation around or outside the bedroom	**Clinical Interview** • Bizarre and unnatural postures and/or repetitive, rhythmic movements • High frequency of episodes
Homemade video • Audio video recording of multiple events, even major events, thanks to the familiar environment and long-term monitoring • Neither stereotyped, hyperkinetic or ballistic movements, nor tonic/dystonic postures	**Homemade video** Audio video recording of highly stereotyped motor patterns including: • Tonic or dystonic postures • Hyperkinetic automatisms • Ballistic movements
Video-PSG core features • EEG: onset from stage 3 NREM sleep • Video: typically the patient with eyes opened raises the head, with or without limb and/or trunk movements, sits up, gets out of bed and walks around	**Video-PSG core features** • EEG: onset at any time during the night, with interictal and/or ictal epileptiform abnormalities • Video: hypermotor behaviors or asymmetric tonic/dystonic postures

REM sleep





REM sleep behavior disorder

Diagnostic Criteria

Criteria A-D must be met

A. Repeated episodes of sleep related vocalization and/or complex motor behaviors.[1,2]

B. These behaviors are documented by polysomnography to occur during REM sleep or, based on clinical history of dream enactment, are presumed to occur during REM sleep.

C. Polysomnographic recording demonstrates REM sleep without atonia (RWA)[3]

D. The disturbance is not better explained by another sleep disorder, mental disorder, medication, or substance use.

Notes

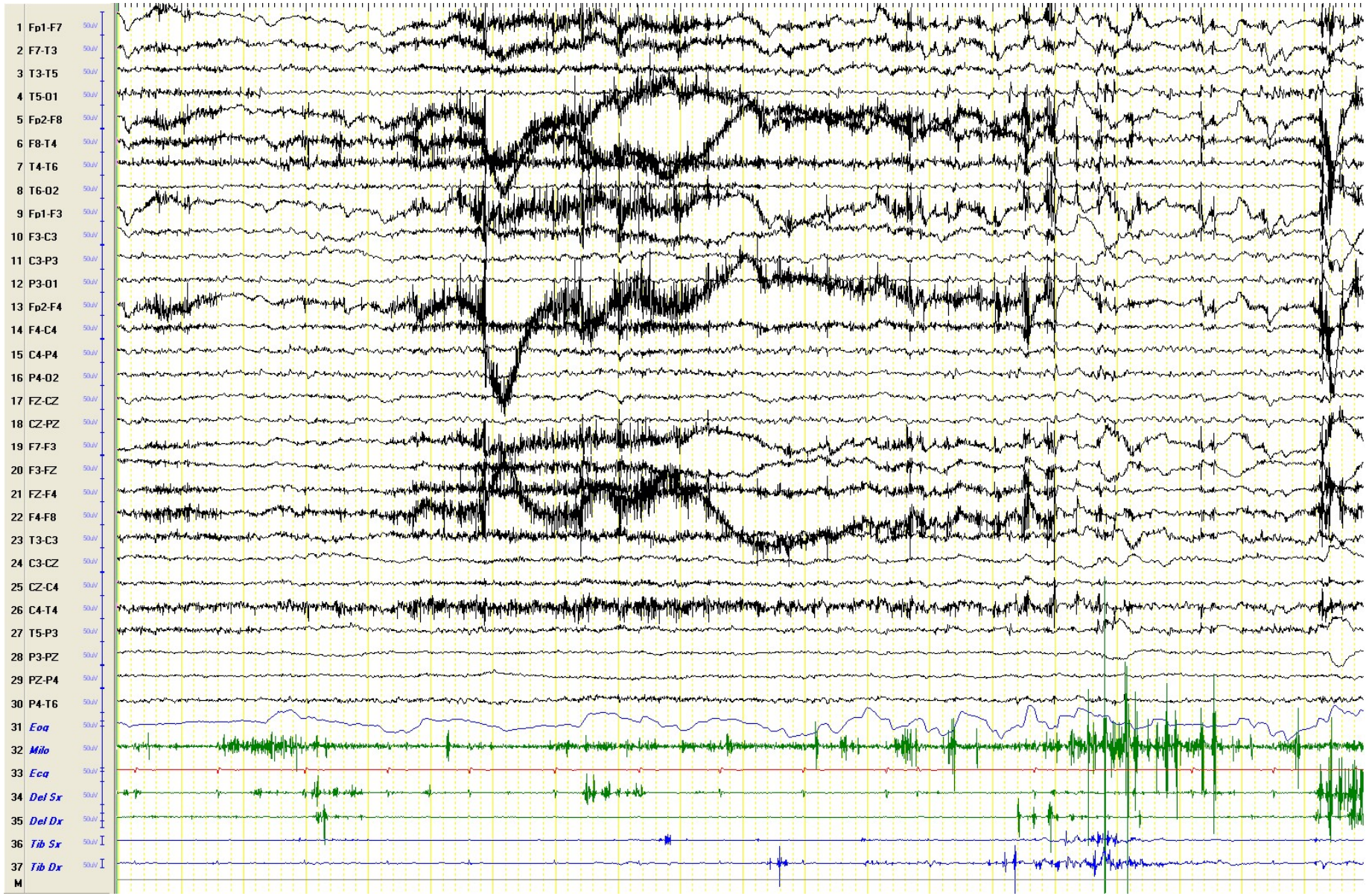
1. This criterion can be fulfilled by observation of repetitive episodes during a single night of video polysomnography.
2. The observed vocalizations or behaviors often correlate with simultaneously occurring dream mentation, leading to the frequent report of "acting out one's dreams."

ICSD 3

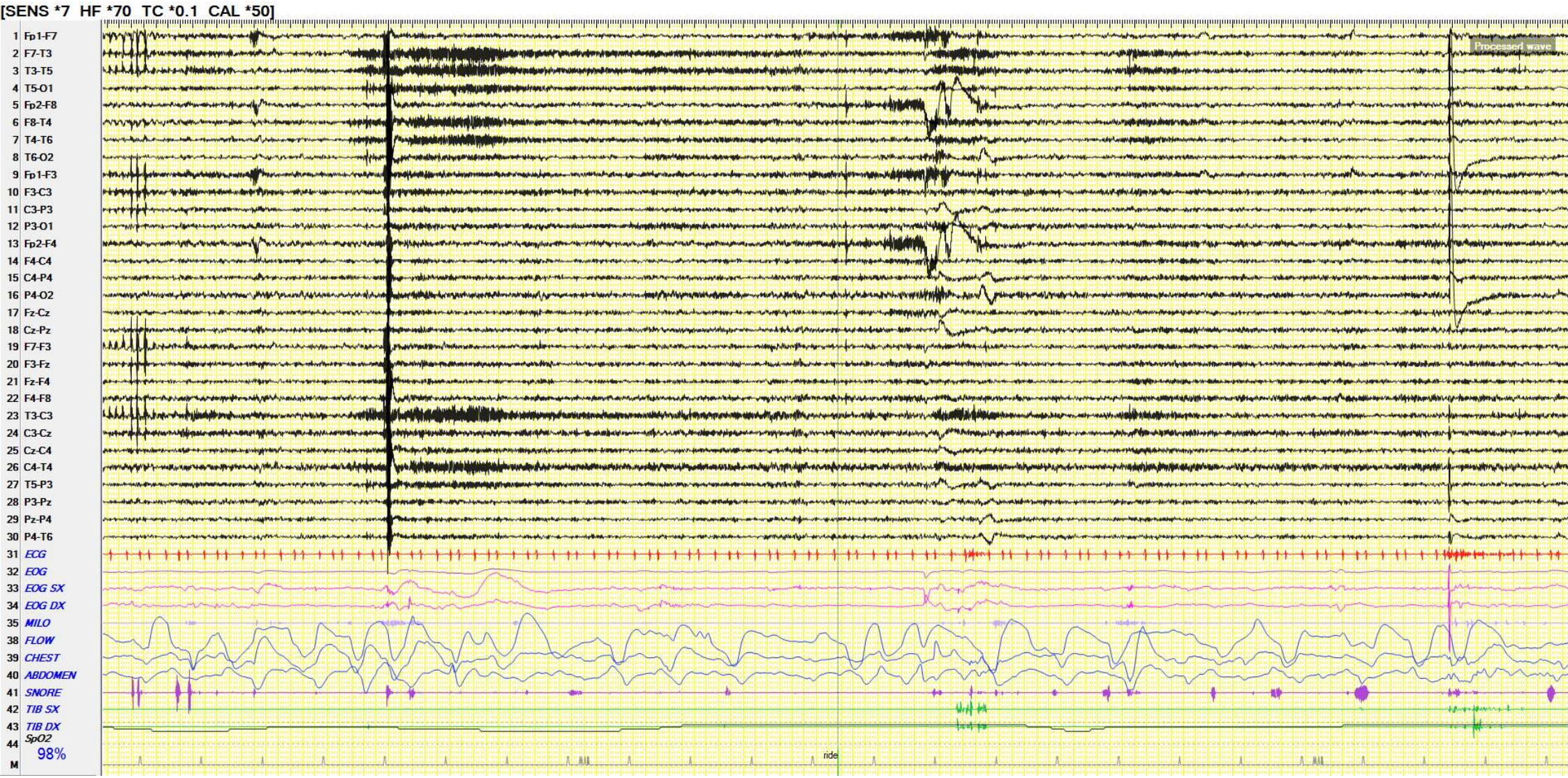
Figure 1—A patient with chronic RBD demonstrates his homemade restraint apparatus that he used every night for five years to prevent himself from leaving the bed and injuring himself during dream-enacting episodes.

:1 REM Sleep Behavior Disorder—Schenck et al

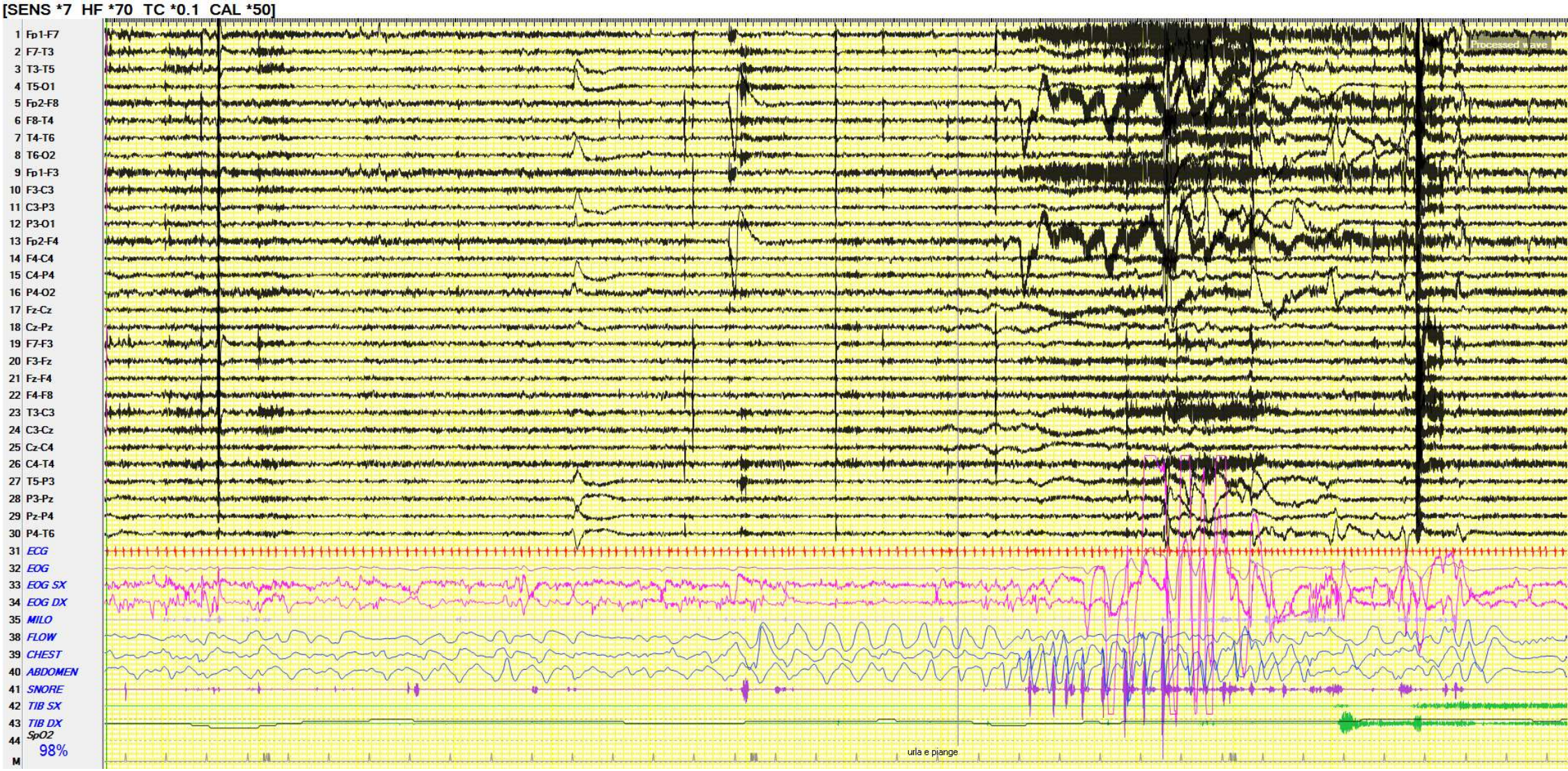
Chronic behavioral disorders of human REM sleep: a new category of parasomnia. Schenck CH, Bundlie SR, Ettinger MG, Mahowald MW. Sleep 1986


1 Fp1-F7
2 F7-T3
3 T3-T5
4 T5-O1
5 Fp2-F8
6 F8-T4
7 T4-T6
8 T6-O2
9 Fp1-F3
10 F3-C3
11 C3-P3
12 P3-O1
13 Fp2-F4
14 F4-C4
15 C4-P4
16 P4-O2
17 FZ-CZ
18 CZ-PZ
19 F7-F3
20 F3-FZ
21 FZ-F4
22 F4-F8
23 T3-C3
24 C3-CZ
25 CZ-C4
26 C4-T4
27 T5-P3
28 P3-PZ
29 PZ-P4
30 P4-T6
31 Eog
32 Milo
33 Ecg
34 Del Sx
35 Del Dx
36 Tib Sx
37 Tib Dx
M

RBD and Sleep Apnea



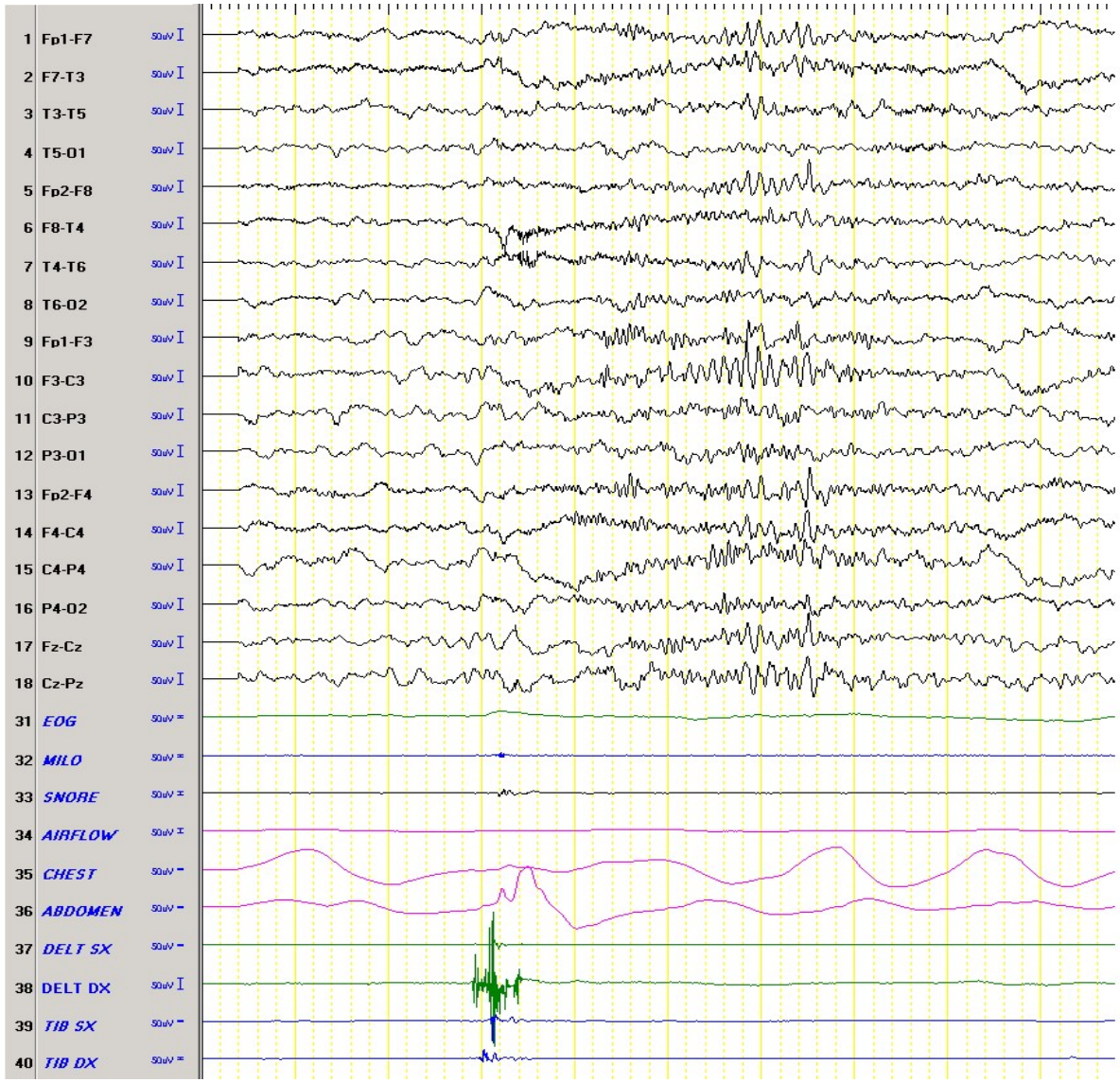
RBD and Sleep Apnea



	RBD	NFLS
Age at onset (yrs)	After 50	Any age
Gender	Male predominance	Male predominance
Family history of parasomnias	—	+
Spontaneous evolution	Rare spontaneous remission	Increased frequency?
Episodes/month	Almost every night	Almost every night
Occurrence during the night	At least 90 min after sleep onset	Any time
Sleep stage onset of episodes	REM sleep	NREM (mainly st. 2)
Triggering factors	—	±
Episodes/night	From one to several	Several
Episodes duration	1–2 min	sec to 3 min
Stereotypic motor pattern	—	+
Autonomic discharge	—	++(+)
Consciousness if awakened	Normal	Normal
Recall of the episode if awakened	Yes	Inconstant

Tinuper P et al., 2007

Sleep Starts (Hypnic Jerks)



Physiologic manifestations

Sleep Related Rhythmic Movement Disorder

Alternate Names

Body rocking, head banging, head rolling, body rolling, jactatio capitis nocturna, jactatio corporis nocturna, rhythmie du sommeil.

Diagnostic Criteria

Criteria A-D must be met

A. The patient exhibits repetitive, stereotyped, and rhythmic motor behaviors involving large muscle groups.

B. The movements are predominantly sleep related, occurring near nap or bedtime, or when the individual appears drowsy or asleep.

C. The behaviors result in a significant complaint as manifest by at least one of the following:[1]
   1. Interference with normal sleep.
   2. Significant impairment in daytime function.
   3. Self-inflicted bodily injury or likelihood of injury if preventive measures are not used.

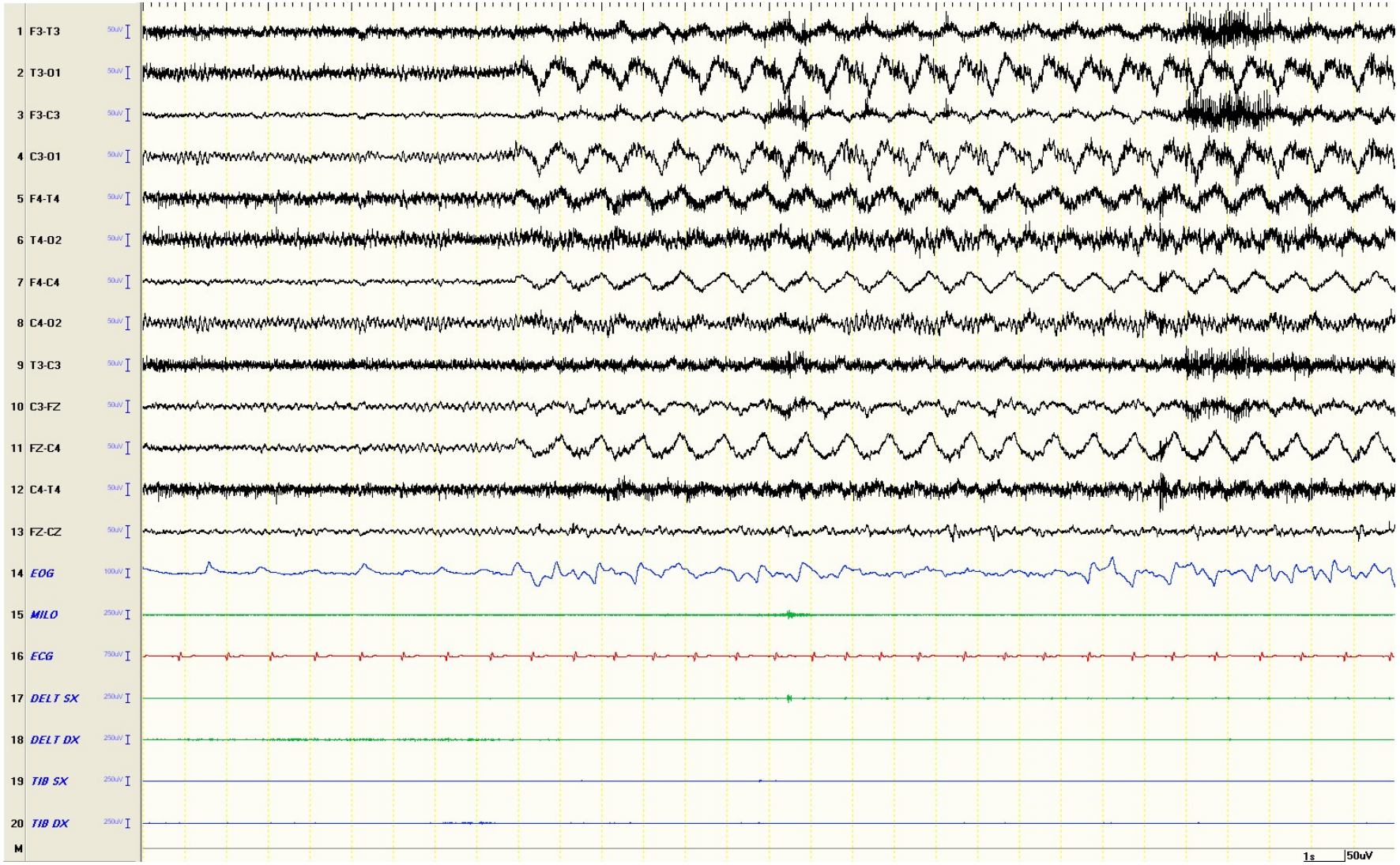
D. The rhythmic movements are not better explained by another movement disorder or epilepsy.

Notes

1. When there are no clinical consequences of the rhythmic movements, the rhythmic movements are simply noted but the term rhythmic movement disorder is not employed.

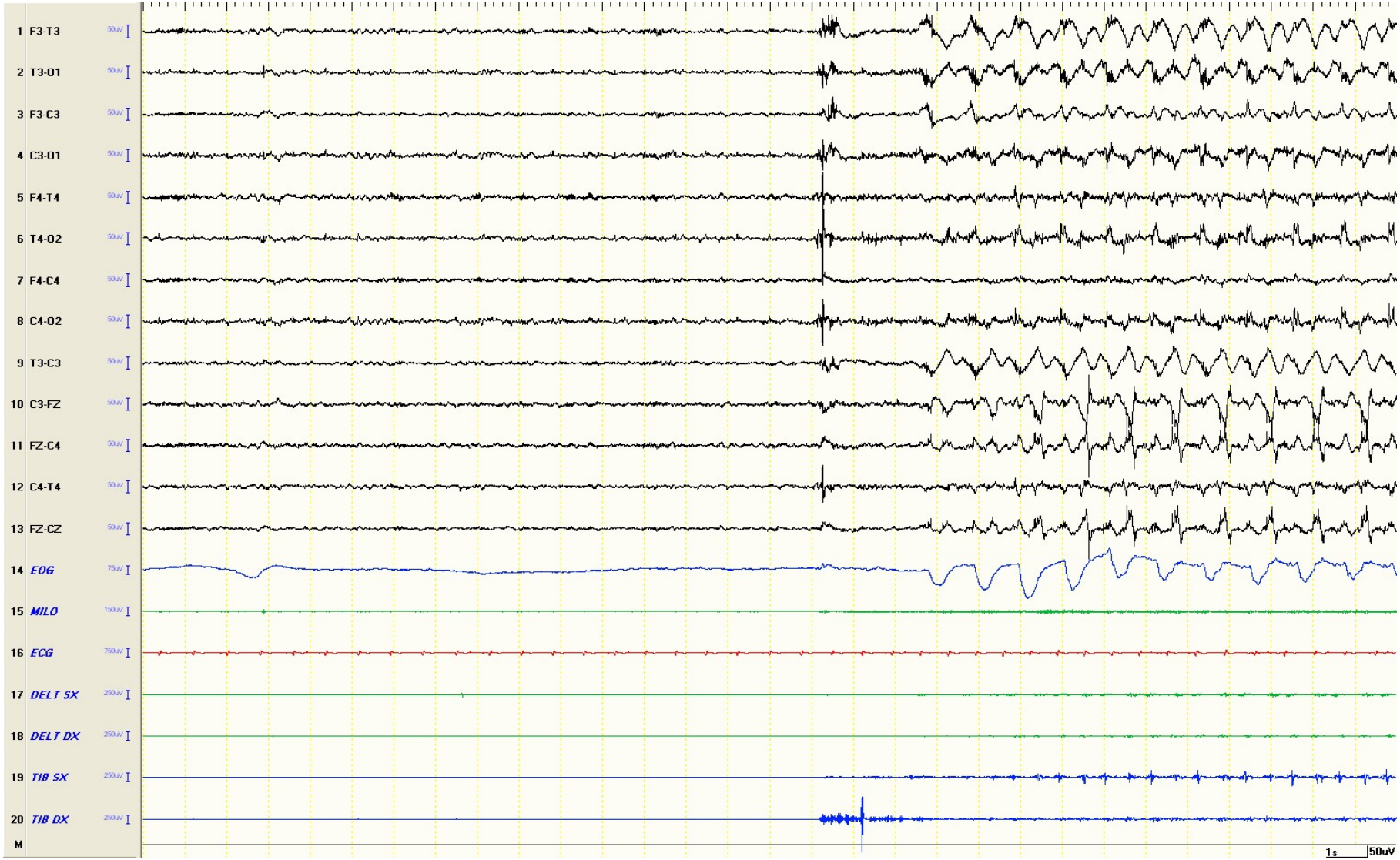
ICSD 3

Sleep Related Rhythmic Movement Disorder

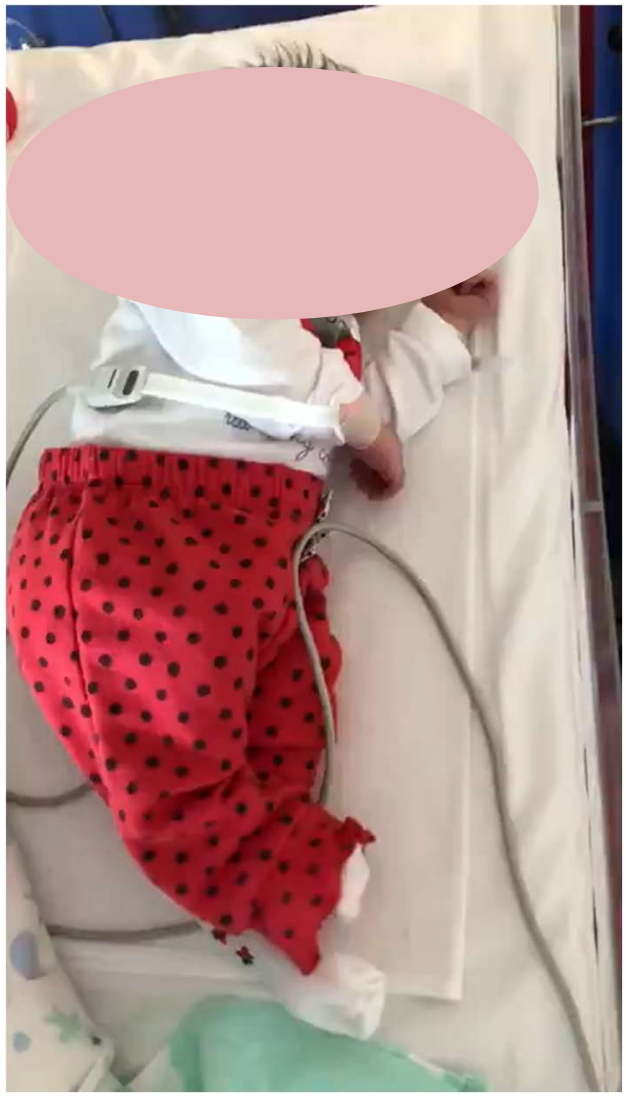


Sleep Related Rhythmic Movement Disorder

Sleep Related Rhythmic Movement Disorder



Benign Sleep Myoclonus of Infancy



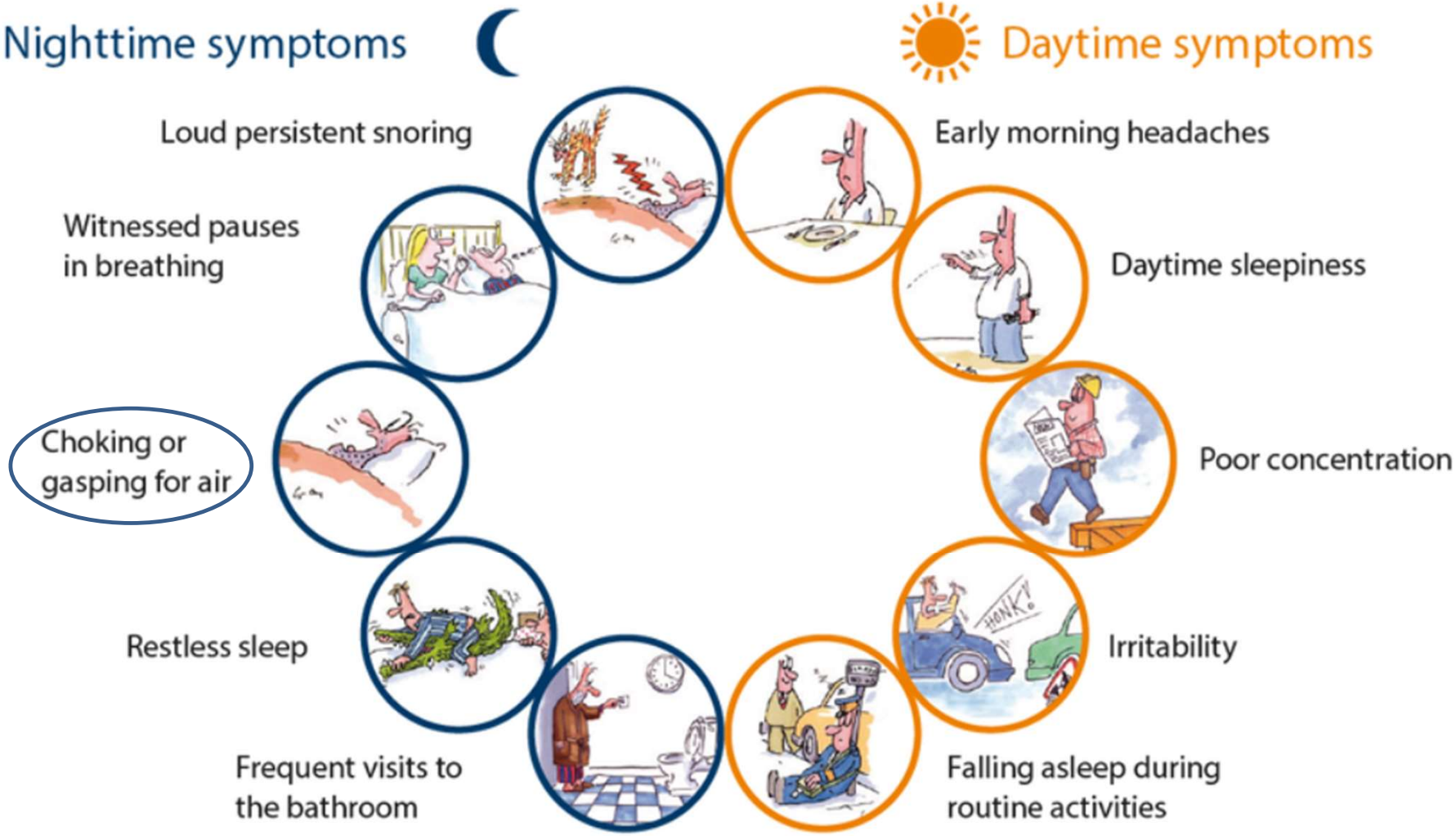
Diagnostic Criteria

Criteria A-E must be met

A. Observation of repetitive myoclonic jerks that involve the limbs, trunk, or whole body.
B. The movements occur in early infancy, typically from birth to six months of age.
C. The movements occur only during sleep.
D. The movements stop abruptly and consistently when the infant is aroused.
E. The disorder is not better explained by another sleep disorder, medical or neurological disorder, or medication use.

ICSD3

Sleep Apnea


Nighttime symptoms
Daytime symptoms
Loud persistent snoring
Witnessed pauses in breathing
Choking or gasping for air
Restless sleep
Frequent visits to the bathroom
Falling asleep during routine activities
Irritability
Poor concentration
Daytime sleepiness
Early morning headaches
HONK!

Risk factors for Sleep Apnea

Structural risk factors	Non-structural risk factors
Innate anatomic variations (facial elongation, posterior facial compression)	Obesity
Retrognathia and micrognathia	Central fat distribution
Mandibular hypoplasia	Male sex
Brachycephalic head form (associated with an increased AHI in whites but not in African Americans)	Age
Inferior displacement of the hyoid	Postmenopausal state
Adenotonsillar hypertrophy, particularly in children and young adults	Alcohol use
Pierre Robin, Down, Marfan, and Prader-Willi Syndromes	Sedative use
High, arched palate (particularly in women)	Smoking
	Habitual snoring with daytime somnolence
	Supine sleep position
	Rapid eye movement (REM) sleep

Buchanan et al., 2016

The patient was sent to our lab for a nocturnal Video-PSG.

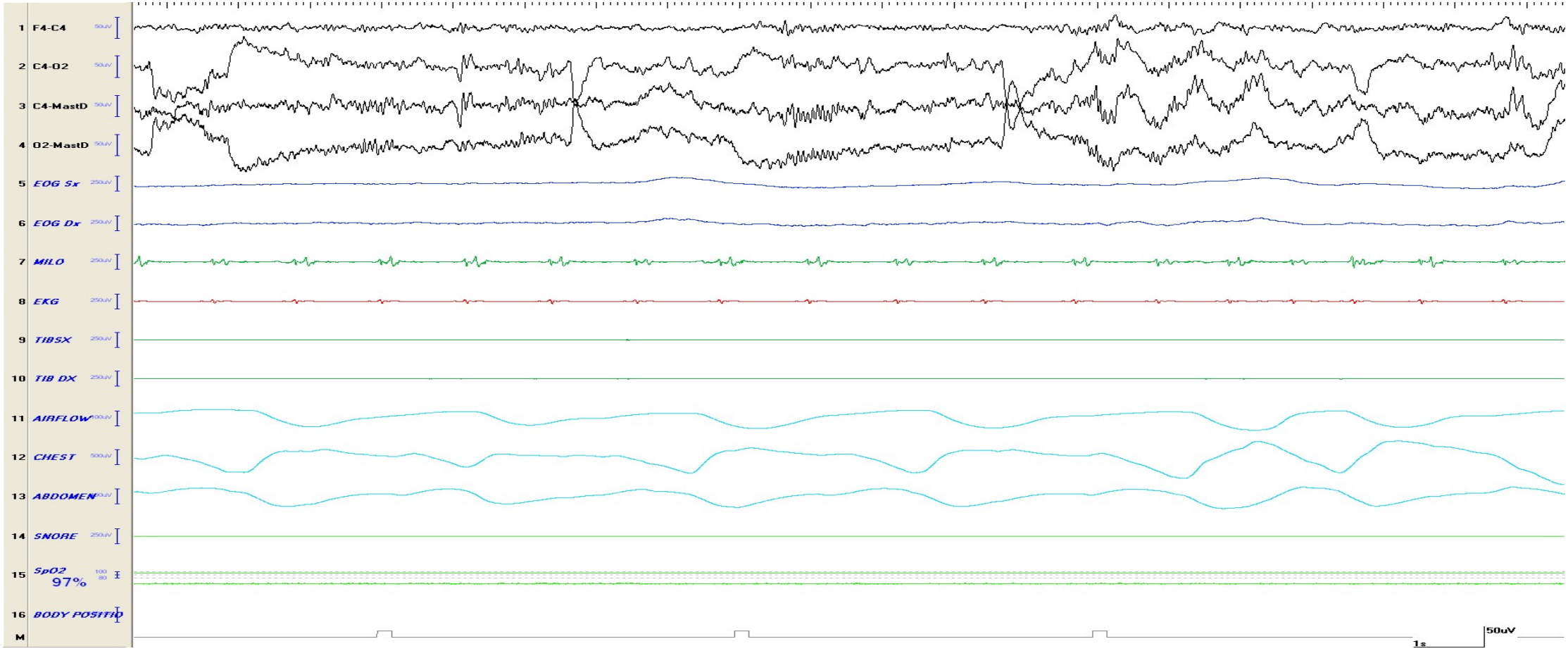
The patient reported the recent occurrence of very frequent awakenings characterized by breathing difficulties and often accompanied by agitation.

He also complained of somnolence during the day.

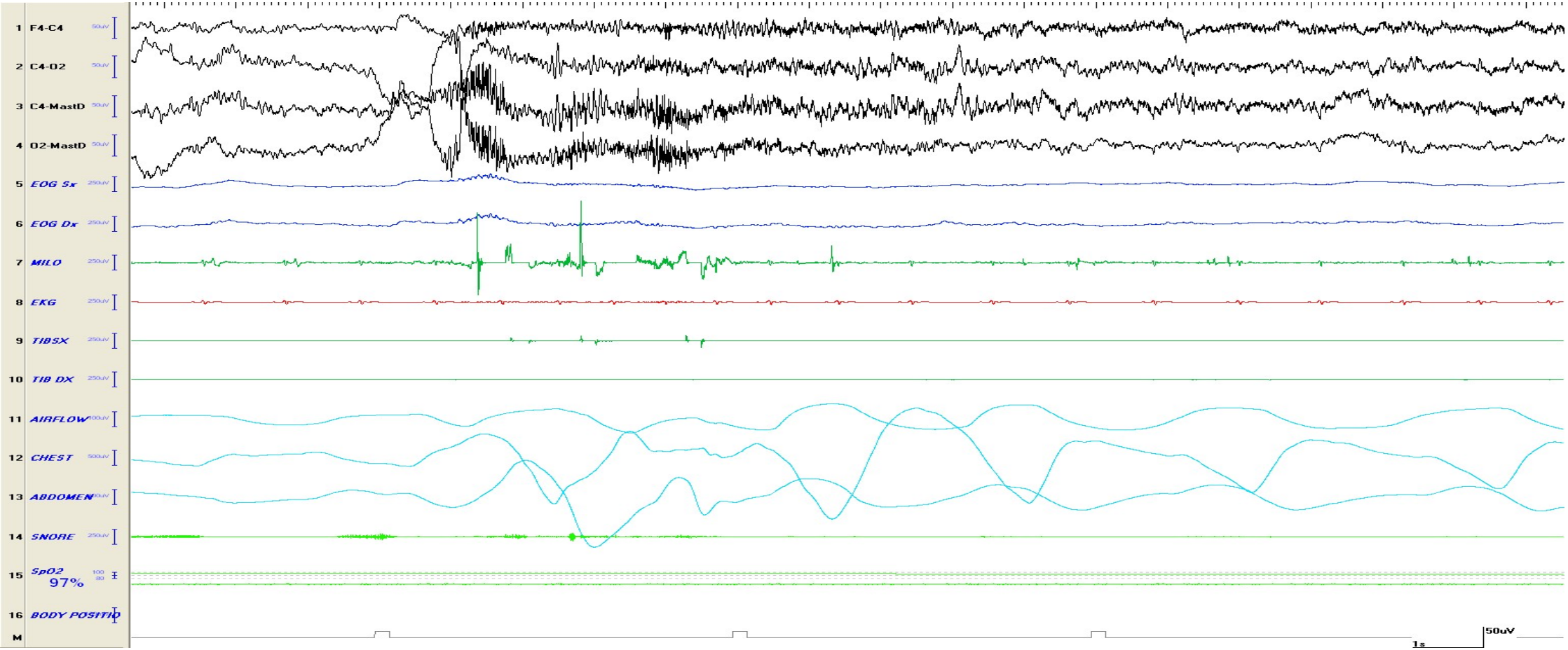
ESS:18

A previous cardio-respiratory monitoring did not revealed significative apneas.

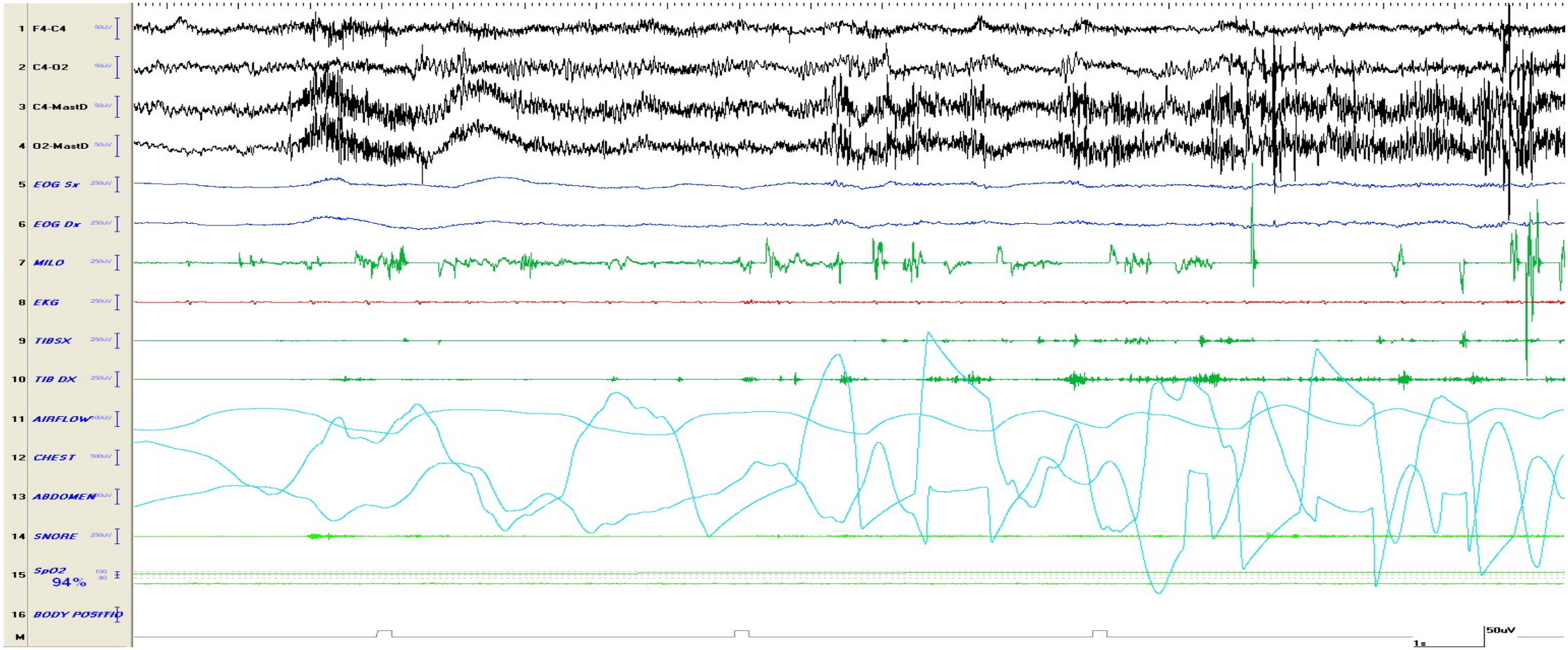
Episodio 1 (00.29.50)



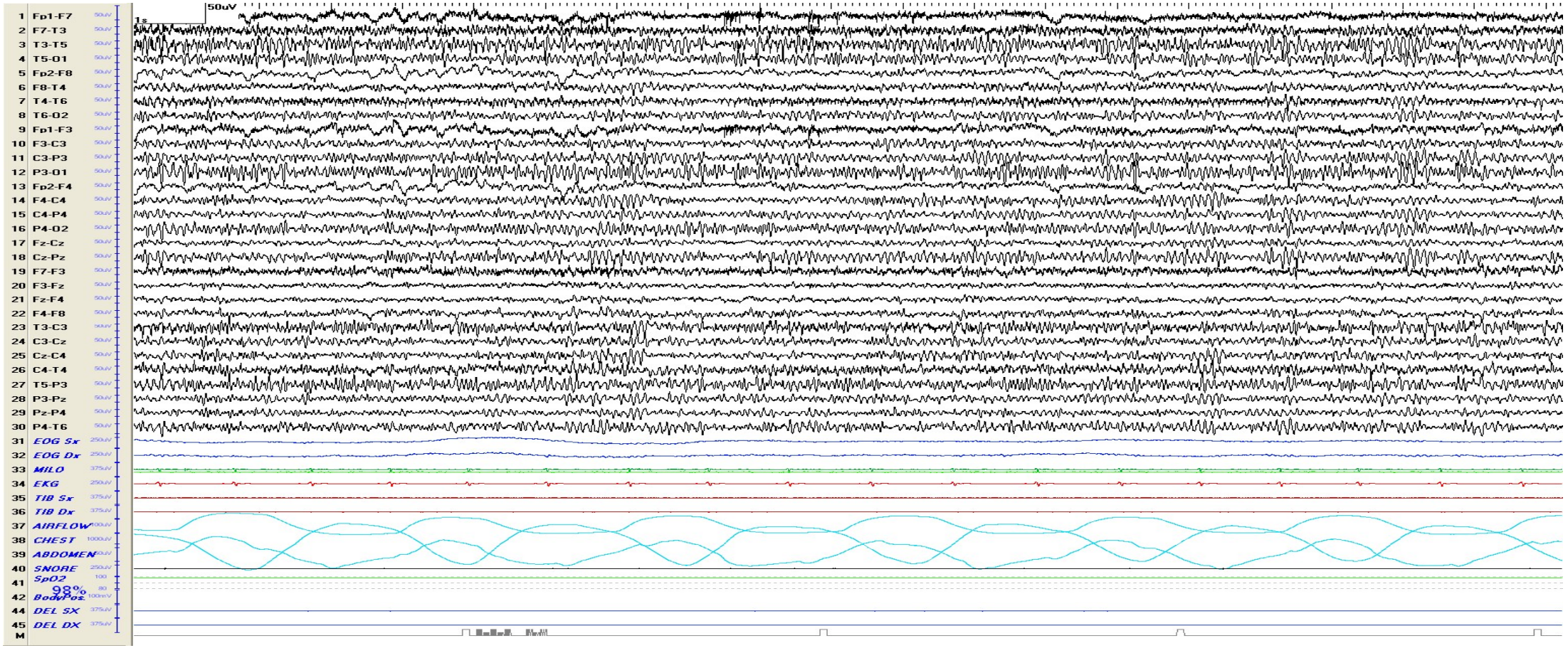
Episodio 1 (00.30.50)



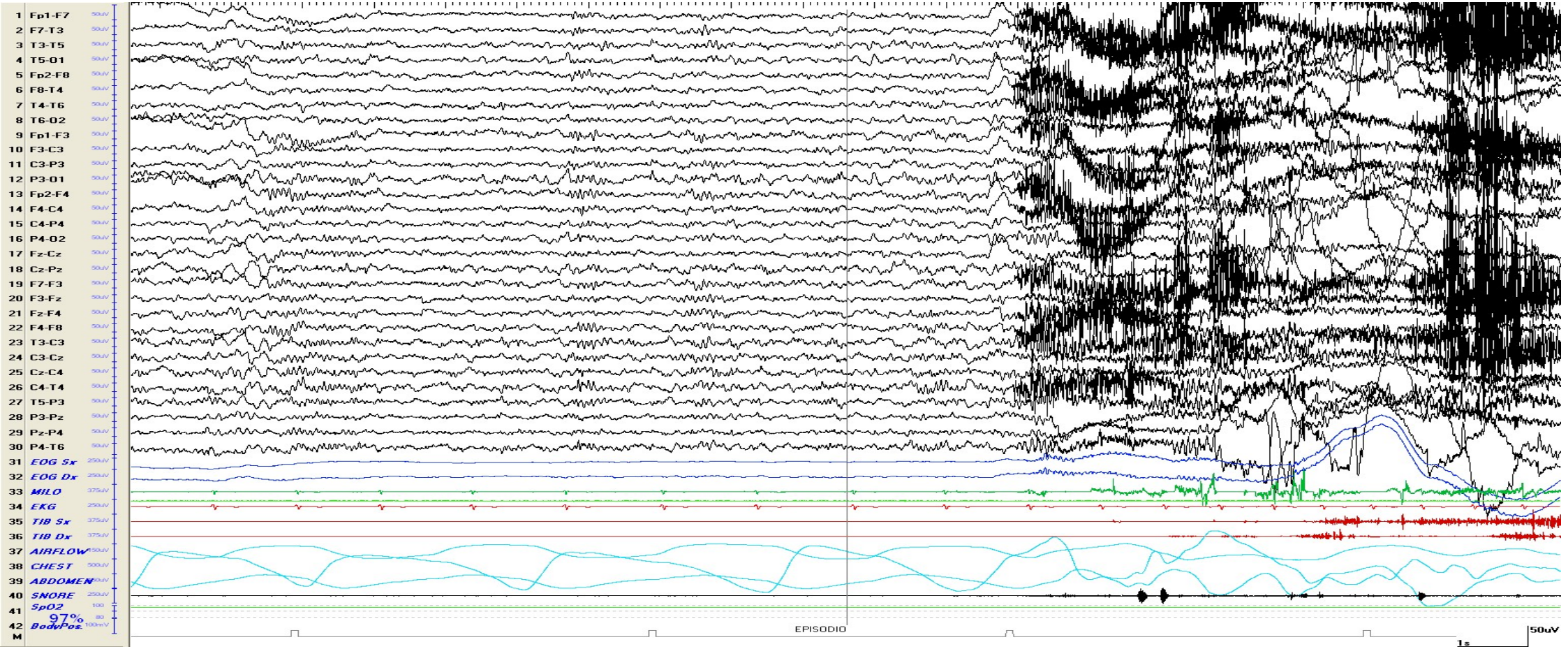
Episodio 1 (00.31.10)



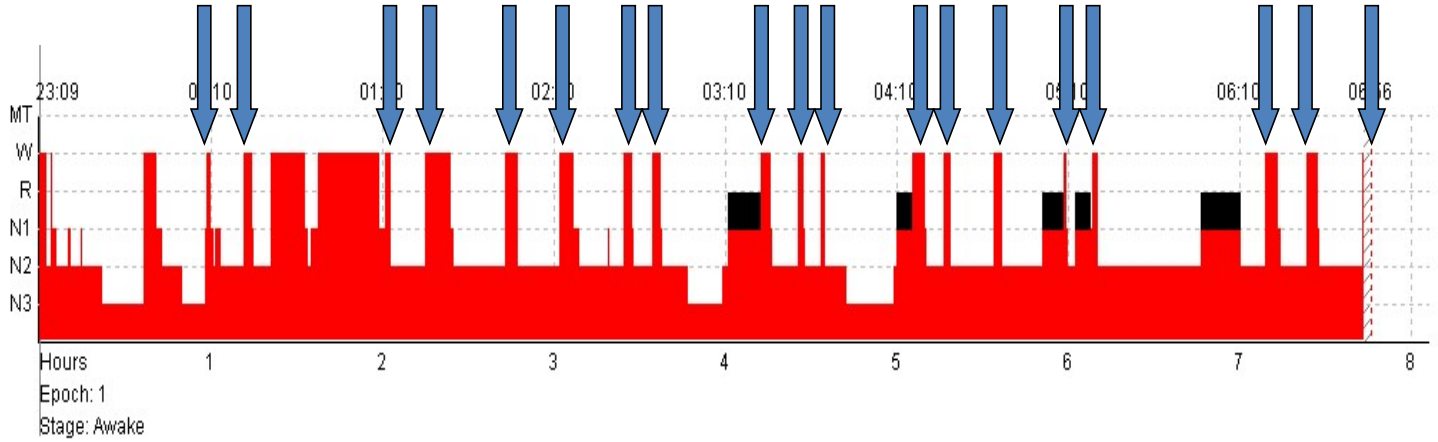
Montaggio 10-20 completo



Episodio 2 (01.25.02)



Ipnogramma



EPISODI
1 in MSLT
4 in REM
15 in NREM

Original Article

Choking during sleep: can it be expression of arousal disorder?

Mathilde Flamand [a], Bastien Herlin [a], Smaranda Leu-Semenescu [a,b], Valérie Attali [a,c,d], Claire Launois [a,c,d], Isabelle Arnulf [a,b,e,*]

Sleep Medicine ■■ (2015) ■■–■■

Choking at Night: A Case of Opercular Nocturnal Frontal Lobe Epilepsy

Case Reports in Pediatrics

Geetanjali Rathore,[1] Paul Larsen,[2] Manish Parakh,[3] and Cristina Fernandez[4]

Acta Neurol Scand 1998: 98: 67–71
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ISSN 0001-6314

Short communication

Nocturnal frontal lobe epilepsy misdiagnosed as sleep apnea syndrome

Oldani A, Zucconi M, Castronovo C, Ferini-Strambi L. Nocturnal frontal lobe epilepsy misdiagnosed as sleep apnea syndrome.
Acta Neurol Scand 1998: 98: 67–71. © Munksgaard 1998.

A. Oldani, M. Zucconi, C. Castronovo, L. Ferini-Strambi

Sleep Disorders Center, University of Milano, School of Medicine, Istituto Scientifico, H San Raffaele, Milano, Italy

Choking, asphyxiation and the insular seizure

Nimeshan Geevasinga [a], John Stephen Archer [b], Karl Ng [a,*]

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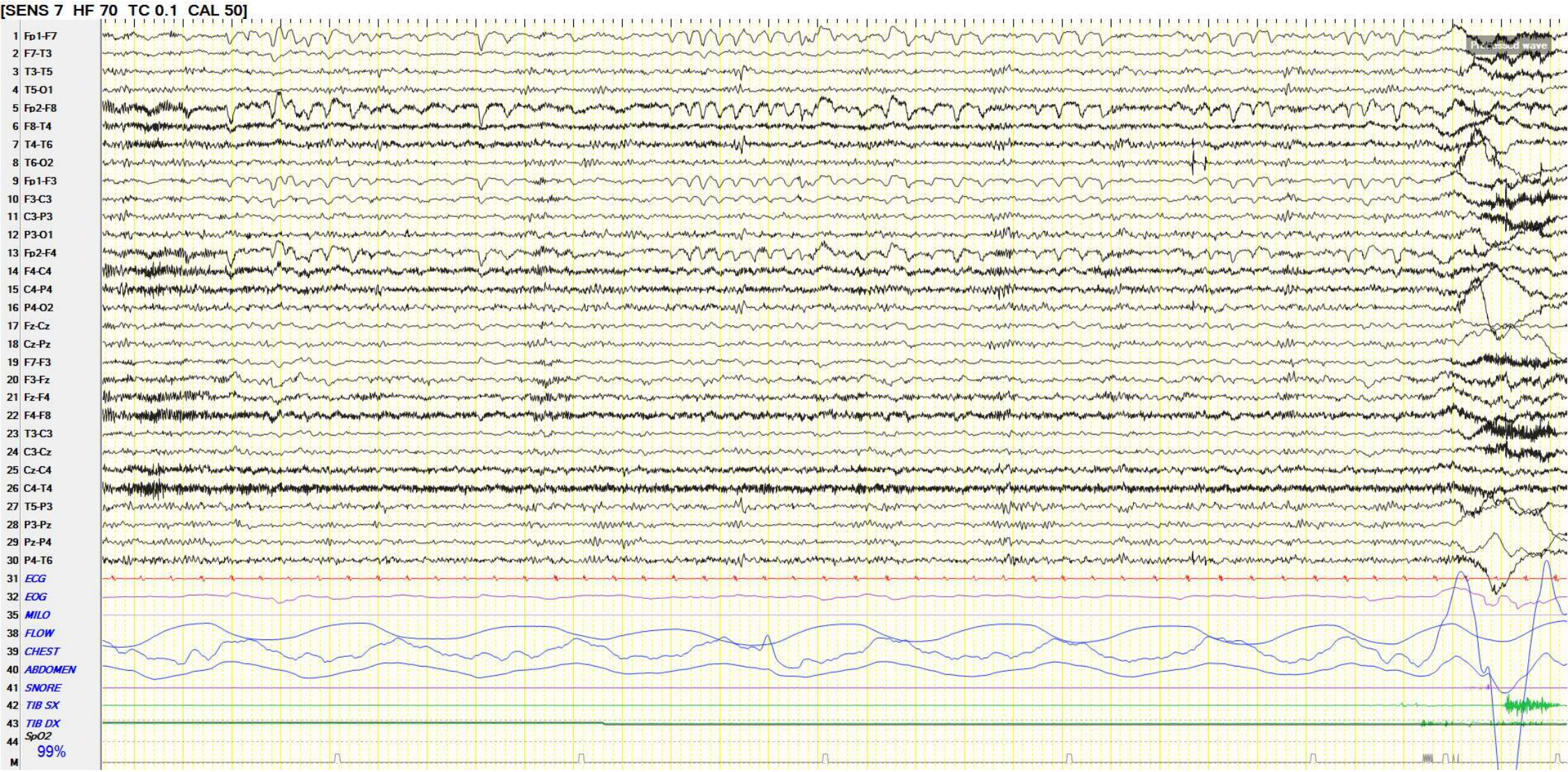
[b] *Department of Neurology, Austin Health and University of Melbourne, Melbourne, VIC, Australia*

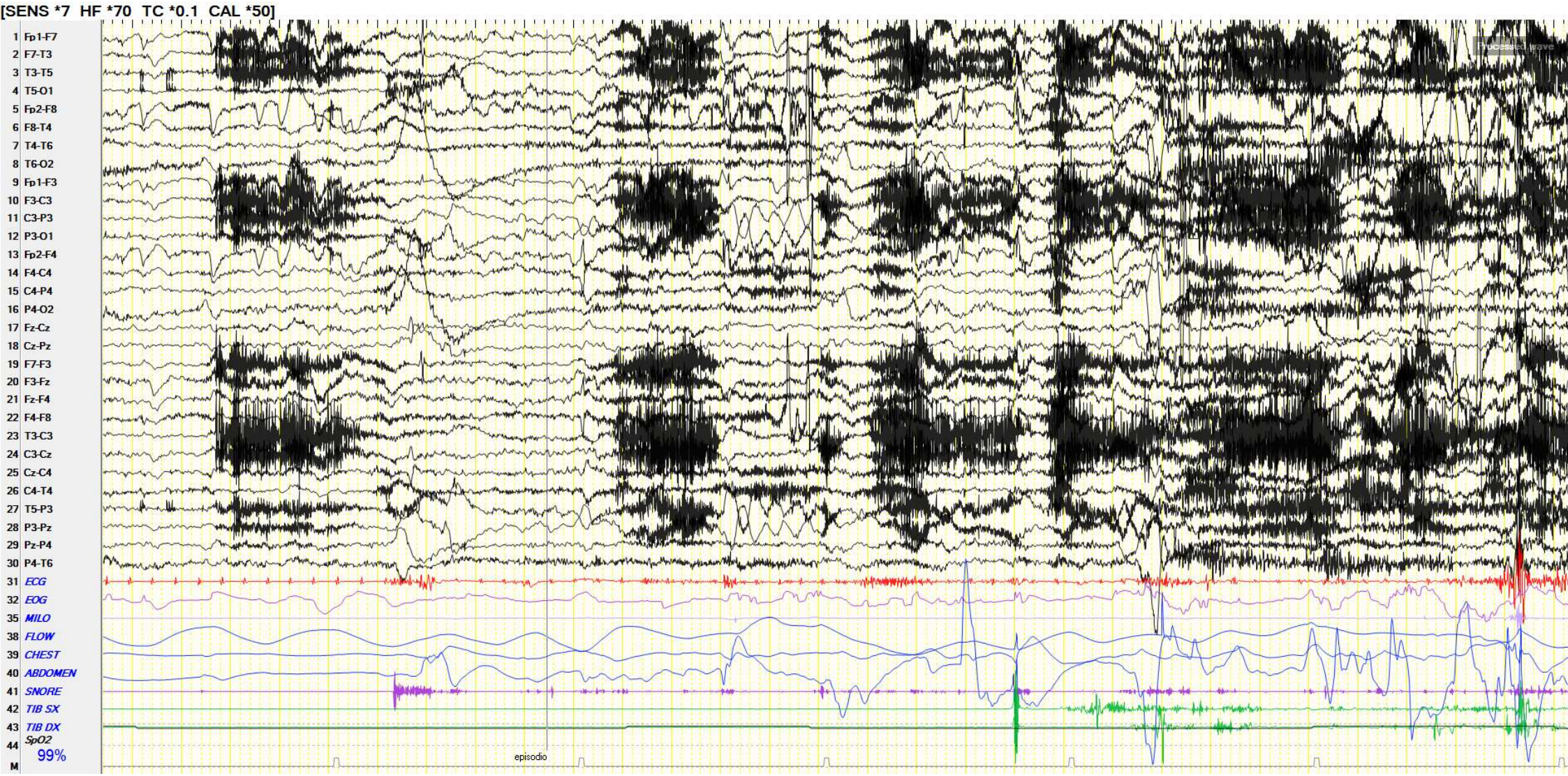
Case Reports/Journal of Clinical Neuroscience 21 (2014)

Psychogenic non-epileptic seizures during sleep



Psychogenic non-epileptic seizures during sleep

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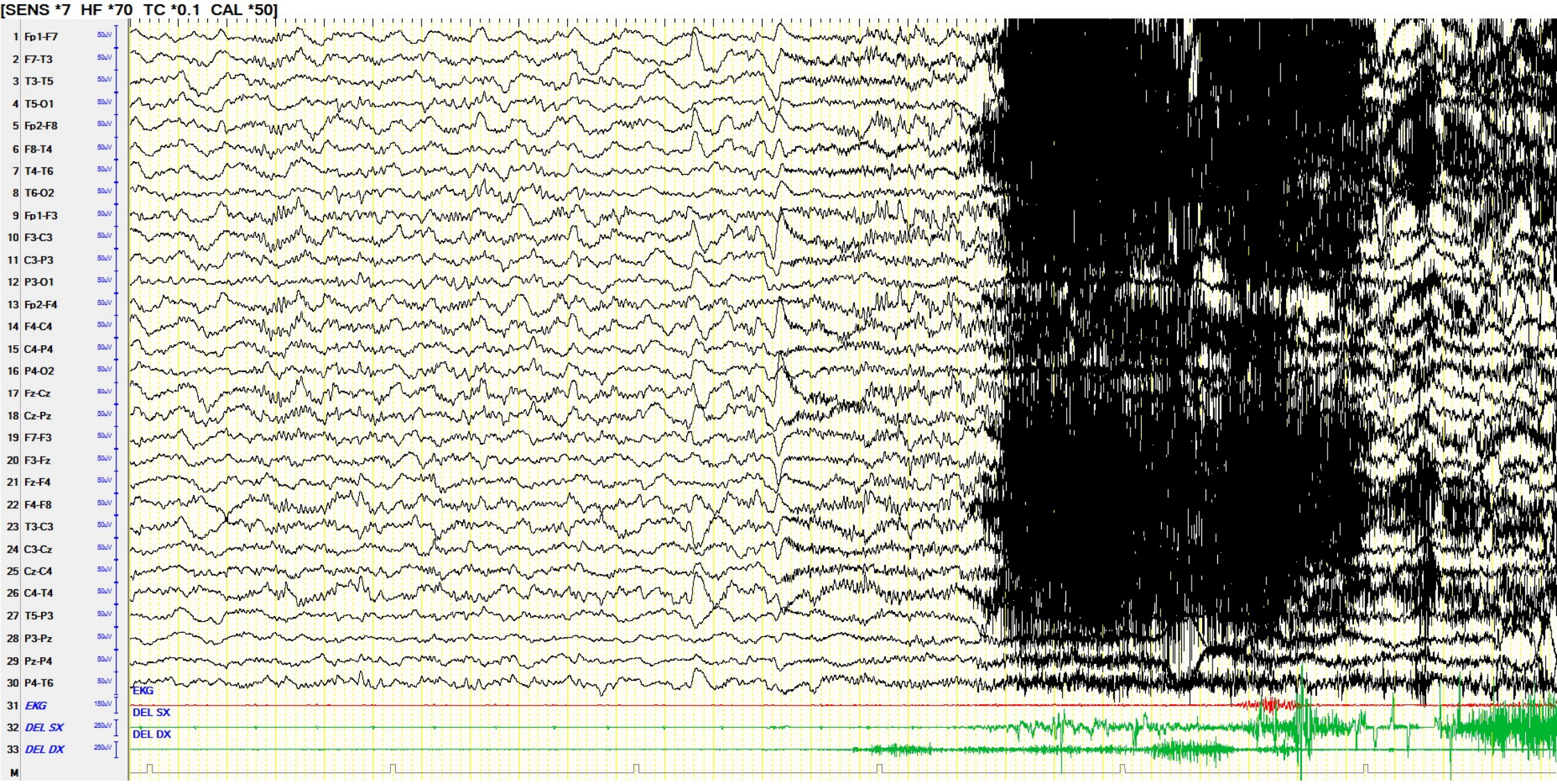
2 F7-T3
3 T3-T5
4 T5-O1
5 Fp2-F8
6 F8-T4
7 T4-T6
8 T6-O2
9 Fp1-F3
10 F3-C3
11 C3-P3
12 P3-O1
13 Fp2-F4
14 F4-C4
15 C4-P4
16 P4-O2
17 Fz-Cz
18 Cz-Pz
19 F7-F3
20 F3-Fz
21 Fz-F4
22 F4-F8
23 T3-C3
24 C3-Cz
25 Cz-C4
26 C4-T4
27 T5-P3
28 P3-Pz
29 Pz-P4
30 P4-T6
31 ECG
32 EOG
35 MILO
38 FLOW
39 CHEST
40 ABDOMEN
41 SNORE
42 TIB SX
43 TIB DX
44 SpO2
99%
M
episodio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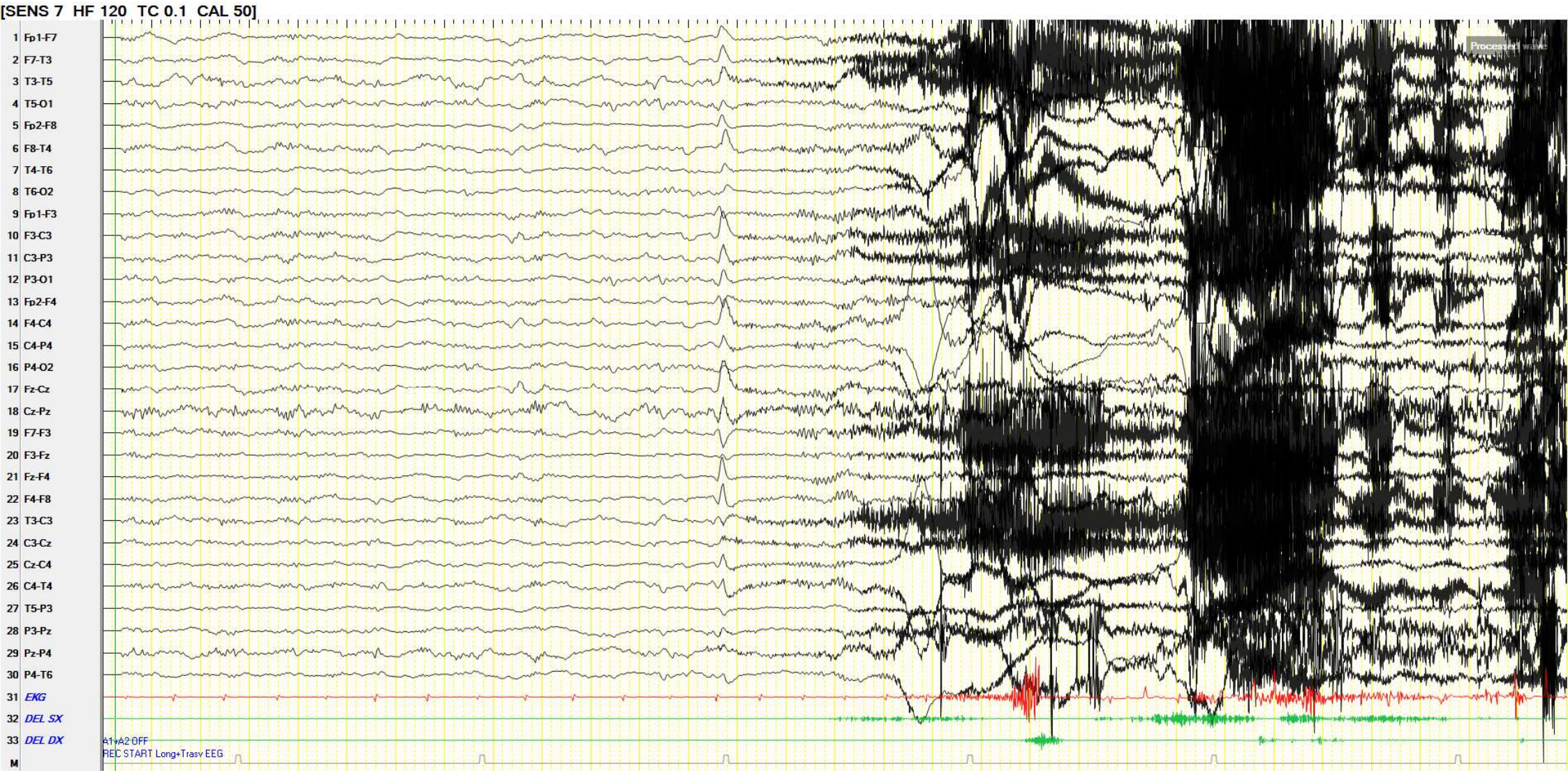
1 Fp1-F7
2 F7-T3
3 T3-T5
4 T5-O1
5 Fp2-F8
6 F8-T4
7 T4-T6
8 T6-O2
9 Fp1-F3
10 F3-C3
11 C3-P3
12 P3-O1
13 Fp2-F4
14 F4-C4
15 C4-P4
16 P4-O2
17 Fz-Cz
18 Cz-Pz
19 F7-F3
20 F3-Fz
21 Fz-F4
22 F4-F8
23 T3-C3
24 C3-Cz
25 Cz-C4
26 C4-T4
27 T5-P3
28 P3-Pz
29 Pz-P4
30 P4-T6
31 EKG
32 DEL SX
33 DEL DX
M
50uV
150uV
250uV
EKG
DEL SX
DEL DX


[SENS *7 HF *70 TC *0.1 CAL *50]
1 Fp1-F7
2 F7-T3
3 T3-T5
4 T5-O1
5 Fp2-F8
6 F8-T4
7 T4-T6
8 T6-O2
9 Fp1-F3
10 F3-C3
11 C3-P3
12 P3-O1
13 Fp2-F4
14 F4-C4
15 C4-P4
16 P4-O2
17 Fz-Cz
18 Cz-Pz
19 F7-F3
20 F3-Fz
21 Fz-F4
22 F4-F8
23 T3-C3
24 C3-Cz
25 Cz-C4
26 C4-T4
27 T5-P3
28 P3-Pz
29 Pz-P4
30 P4-T6
31 EKG
32 DEL SX
33 DEL DX
M

Paroxysmal Hypnogenic Dyskinesia



Thank you!