Scoring Movement Events

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Scoring Periodic Limb Movements in Sleep (PLMS)

1. **The following define a significant leg movement (LM) event.**

a. The minimum duration of a LM event is 0.5 seconds.

b. The maximum duration of a LM event is 10 seconds.

c. The minimum amplitude of a LM event is an 8 μV increase in EMG voltage above resting EMG.

d. The timing of the onset of a LM event is defined as the point at which there is an 8 μV increase in EMG voltage above resting EMG.

e. The timing of the ending of a LM event is defined as the start of a period lasting at least 0.5 seconds during which the EMG does not exceed 2 μV above resting EMG.

2. The following define a PLM series

a. The minimum number of consecutive LM events needed to define a PLM series is 4 LMs.

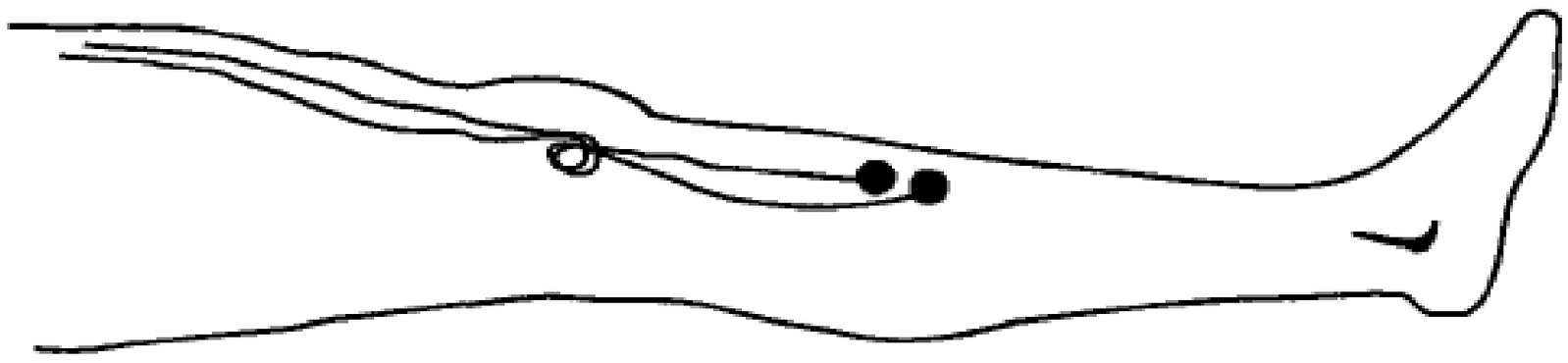
b. The minimum period length between LMs (defined as the time between onsets of consecutive LMs) to include them as part of a PLM series is 5 seconds.

c. The maximum period length between LMs (defined as the time between onsets of consecutive LMs) to include them as part of a PLM series is 90 sec.

d. Leg movements on 2 different legs separated by less than 5 seconds between movement onsets are counted as a single leg movement

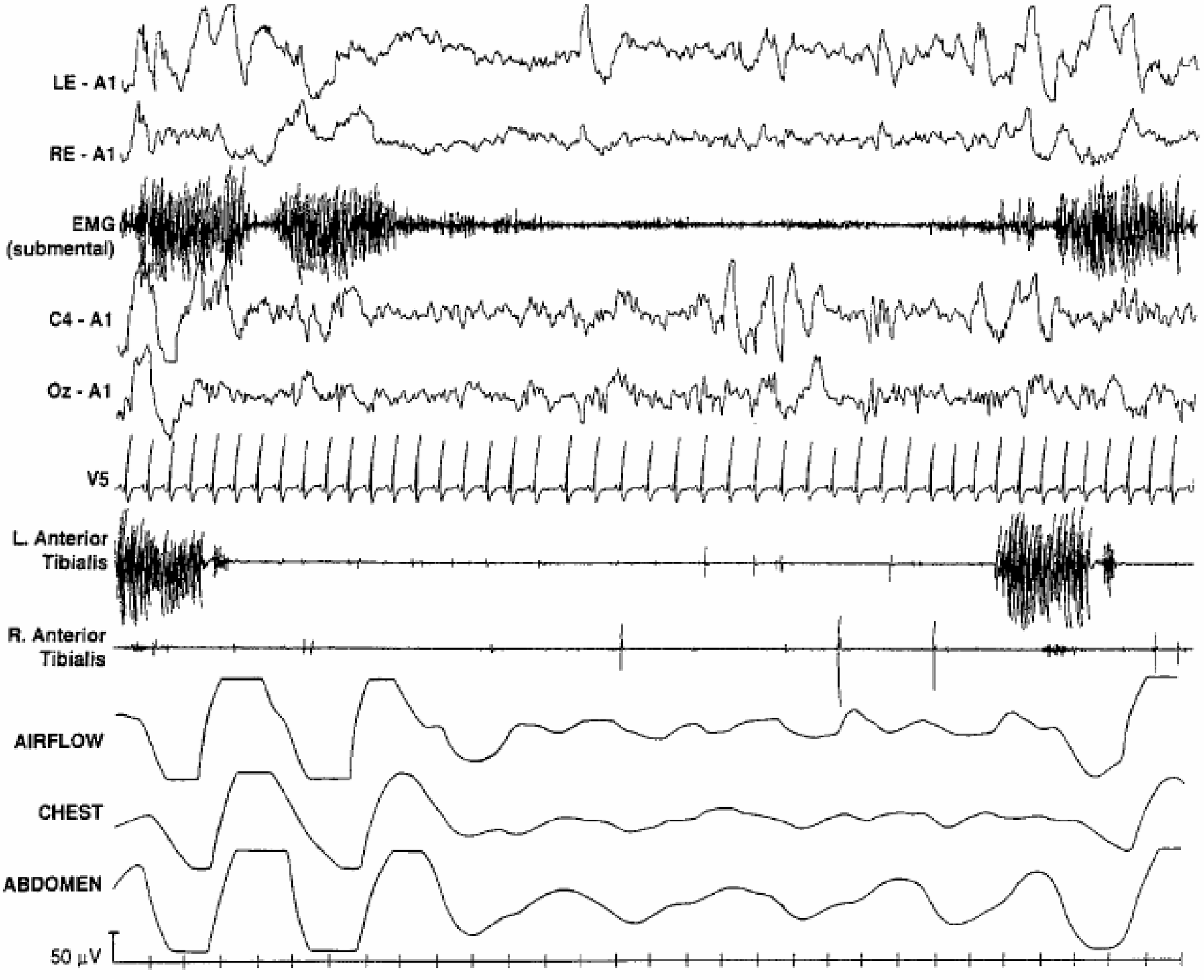
Application

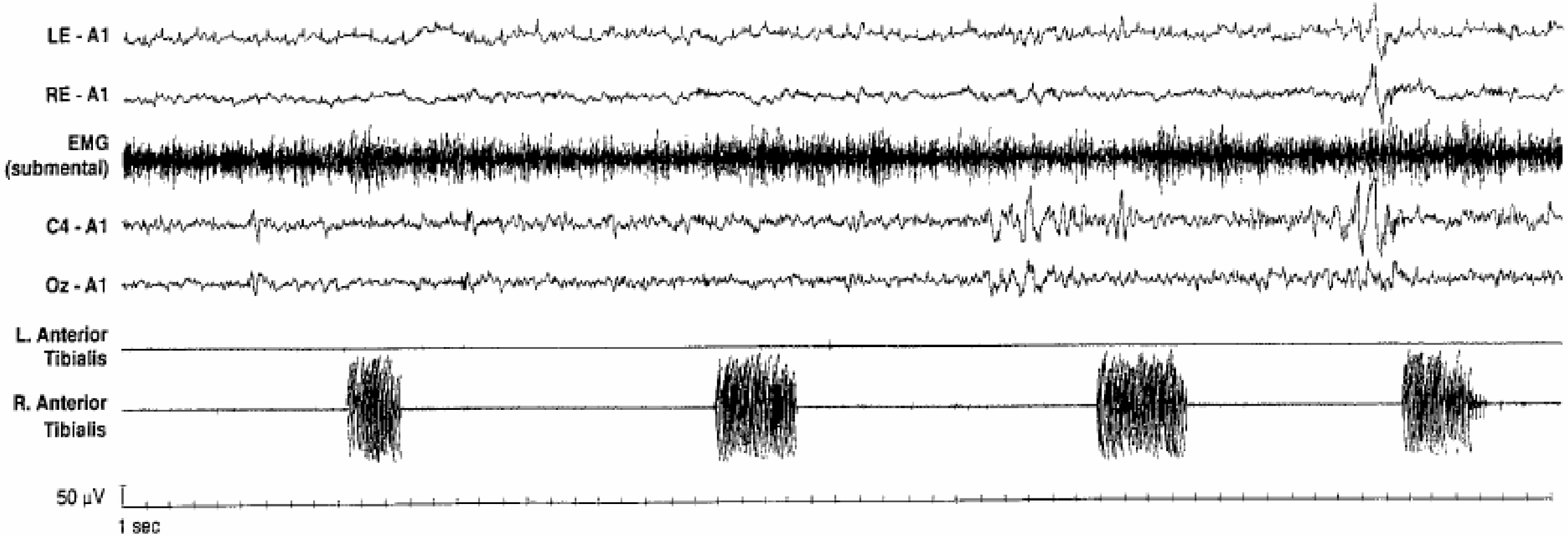
- Surface electrodes should be placed longitudinally and symmetrically around the middle of the muscle so that they are **2-3 cm apart** OR **1/3** of the length of the **anterior tibialis** muscle; whichever is shorter.

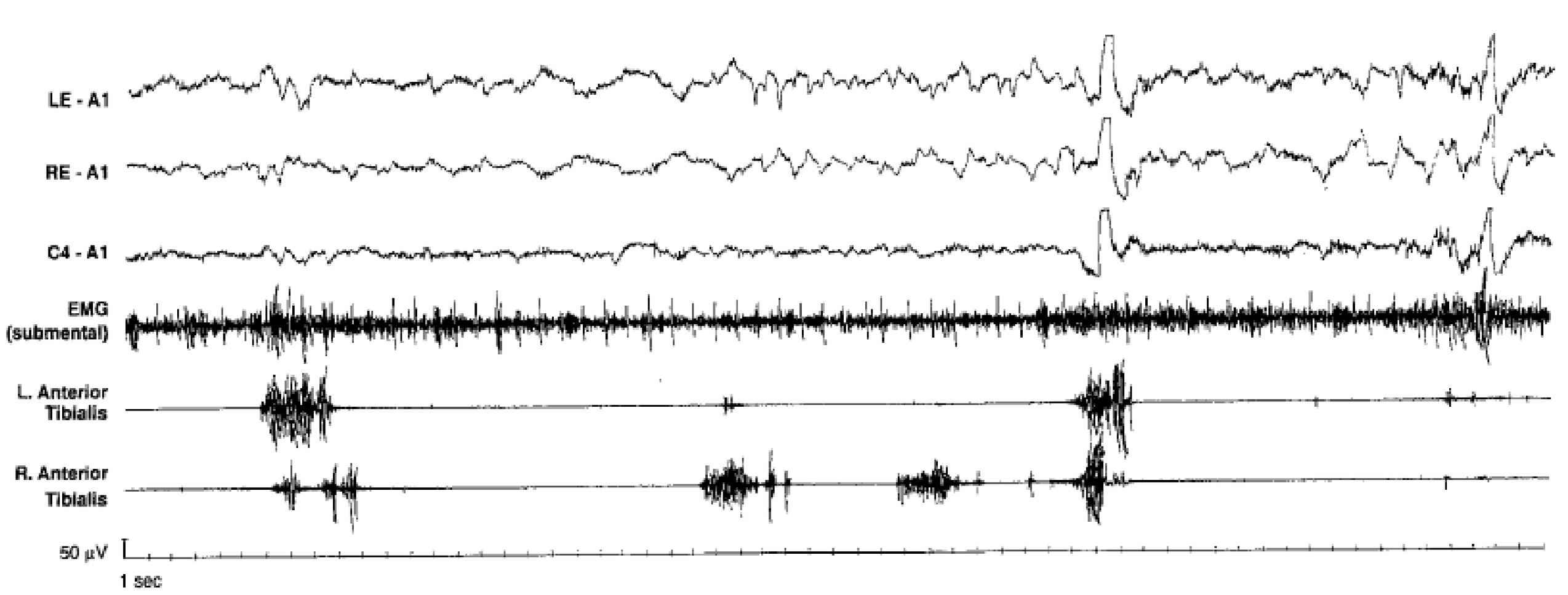


Scoring LMs

- Should not be scored if it occurs during a period from 0.5 seconds PRECEDING an apnea or hypopnea to 0.5 seconds FOLLOWING an apnea or hypopnea.


LE - A1
RE - A1
EMG
(submental)
C4 - A1
Oz - A1
V5
L. Anterior
Tibialis
R. Anterior
Tibialis
AIRFLOW
CHEST
ABDOMEN
50 µV
1 sec


LE - A1
RE - A1
EMG (submental)
C4 - A1
Oz - A1
L. Anterior Tibialis
R. Anterior Tibialis
50 µV
1 sec


LE - A1
RE - A1
C4 - A1
EMG (submental)
L. Anterior Tibialis
R. Anterior Tibialis
50 µV
1 sec

Periodic Limb Movements Disorder (PLMD)

- PLMD typically involves a twitching, jerking, or flexing of the limbs during sleep, (frequently light or, non-REM sleep

- PLMD occurs only during sleep, while RLS happens when a person is awake and asleep.

Scoring Alternating Leg Muscle Activation (ALMA)

The following define ALMA

a. The minimum number of discrete and alternating EMG bursts of leg muscle activity events needed to score an ALMA series is 4 ALMAs.

b. The minimum frequency of the alternating EMG bursts in ALMA is 0.5 Hz.

c. The maximum frequency of the alternating EMG bursts in ALMA is 3.0 Hz.

Scoring Hypnagogic Foot Tremor (HFT)

1. The following define HFT:[N1,N2] OPTIONAL

a. The minimum number of EMG bursts needed to make a train of bursts in a HFT series is 4 HFT bursts.

b. The minimum frequency of the EMG bursts in a HFT is 0.3 Hz.

c. The maximum frequency of the EMG bursts in a HFT is 4.0 Hz.

Note 1. The usual range for duration of hypnagogic foot tremor is 250-1000 msec.

Note 2. HFT may simply be a benign movement phenomenon associated with characteristic EMG patterns as there have been no reported clinical consequences.

Scoring Excessive Fragmentary Myoclonus (EFM)

1. The following define EFM:[N1,N2,N3] OPTIONAL

a. The usual maximum EMG burst duration seen in fragmentary myoclonus is 150 msec.

b. At least 20 minutes of NREM sleep with EFM must be recorded.

c. At least 5 EMG potentials per minute must be recorded.

Note 1. EFM may be a benign movement phenomenon associated with a characteristic EMG pattern as there have been no reported clinical consequences.

Note 2. In many cases no visible movements are present. Gross, jerk-like movements across the joint spaces are not observed. When minor movement across a joint space is present, the movement resembles the small twitch-like movements of the fingers, toes, and the corner of the mouth intermittently seen in REM sleep in normal individuals.

Note 3. In some cases when visible movement is present, the EMG burst duration may be >150 msec.

Scoring Bruxism

1. The following define bruxism:[N1,N2] RECOMMENDED

a. Bruxism may consist of brief (phasic) or sustained (tonic) elevations of chin EMG activity that are at least twice the amplitude of background EMG.

b. Brief elevations of chin EMG activity are scored as bruxism if they are 0.25-2 seconds in duration and if at least 3 such elevations occur in a regular sequence.

c. Sustained elevations of chin EMG activity are scored as bruxism if the duration is more than 2 seconds.

d. A period of at least 3 seconds of stable background chin EMG must occur before a new episode of bruxism can be scored.

e. Bruxism can be scored reliably by audio in combination with polysomnography by a minimum of 2 audible tooth grinding episodes/night of polysomnography in the absence of epilepsy.

Note 1. In sleep, jaw contraction frequently occurs. This contraction can take 2 forms: a) sustained (tonic) jaw clenching contractions or b) a series of repetitive brief (phasic) muscle contractions termed rhythmic masticatory muscle activity (RMMA).

Note 2. In addition to the recommended placement of chin EMG electrodes as noted in the adult sleep staging rules chapter (IV.C), additional masseter electrodes may be placed at the discretion of the investigator or clinician.

Scoring PSG Features of REM Sleep Behavior Disorder (RBD)

6. For diagnosis of RBD, time-synchronized, audio-equipped video PSG is essential to document complex motor behaviors and vocalizations during REM sleep. A diagnosis of RBD is based on demonstration of such episodes or a characteristic clinical history of dream enactment in addition to polysomnographic evidence of REM sleep without atonia. RECOMMENDED

1. Score in accordance with the following definitions: RECOMMENDED

Sustained muscle activity (tonic activity) in REM sleep: An epoch of REM sleep with at least 50% of the duration of the epoch having a chin EMG amplitude greater than the minimum amplitude demonstrated in NREM sleep.

Excessive transient muscle activity (phasic activity) in REM sleep: In a 30-second epoch of REM sleep divided into 10 sequential 3-second mini-epochs, at least 5 (50%) of the mini-epochs contain bursts of transient muscle activity. In RBD, excessive transient muscle activity bursts are 0.1-5.0 seconds in duration and at least 4 times as high in amplitude as the background EMG activity.

2. The polysomnographic characteristics of RBD are characterized by EITHER or BOTH of the following features:[N1,N2,N3,N4] RECOMMENDED

a. Sustained muscle activity in REM sleep in the chin EMG

b. Excessive transient muscle activity during REM in the chin or limb EMG

Recall | Quit | Montages

27-Feb-02 5:38:18 | 08:25:55

Epoch: 866/1829 | Position: Right | CPAP: 6.0

Unmrkd | Awake | MT | Stg 1 | Stg 2 | Stg 3 | Stg 4 | REM | 7/8 | 0 PLM | 0 PLMA | Auto Stage | Epoch

LOC-Fpz

ROC-Fpz

Fz-Cz

Cz-Oz

C4-A1

CHN-CHZ

Larm-Rarm

LLg-RLg

ECG-ECGZ

vEST-RF

93 54 | 93 54 | 93 53 | 93 53 | 93 53 | 93 53 | 93 53 | 93 53 | 93 54 | 93 56 | 93 56 | 93 54 | 93 56 | 93 54 | 94 54

Scoring PSG Features of REM Sleep Behavior Disorder (RBD)

Note 1. Time-synchronized, audio-equipped video PSG demonstrating dream enactment or a characteristic clinical history are necessary to make the diagnosis of RBD in addition to polysomnographic evidence of REM sleep without atonia or excessive transient muscle activity in REM sleep.

Note 2. Transient muscle activity and occasional accompanying visible twitching of small muscle groups are a normal phenomenon seen in REM sleep (see IV.I.1). When larger muscle groups are involved, this activity is not associated with large, overt muscular activity acting across large joints. When smaller muscle groups are involved, the movement often involves the distal muscles of the hands and face or the corners of the mouth. Transient muscle activity may be excessive in RBD.

Note 3. The sustained muscle activity or the excessive transient muscle activity observed in REM sleep may be interrupted by superimposed (usually dream-enacting) behaviors of RBD.

Note 4. In normal individuals there is an atonia seen in REM sleep in the chin and anterior tibialis EMG. In this state the baseline amplitude of the EMG signal decreases markedly. This atonia of REM sleep is lost to a considerable extent in RBD, with variable frequency, and as a result, the EMG baseline amplitude is often higher. In this situation, the EMG can be said to be in a tonic rather than atonic state.

Scoring the PSG Features of Rhythmic Movement Disorder

1. The following define the polysomnographic characteristics of rhythmic movement disorder:[N1,N2]

RECOMMENDED

a. The minimum frequency for scoring rhythmic movements is 0.5 Hz.

b. The maximum frequency for scoring rhythmic movements is 2.0 Hz.

c. The minimum number of individual movements required to make a cluster of rhythmic movements is 4 movements.

d. The minimum amplitude of an individual rhythmic burst is 2 times the background EMG activity.

Note 1. Bipolar surface electrodes should be placed to record electrical activity of the large muscle groups involved.

Note 2. Time-synchronized video PSG, in addition to polysomnographic criteria, is necessary to make the diagnosis of rhythmic movement disorder.

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