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# Strange episodes during sleep – epilepsy or parasomnia?

CLINICAL REVIEW

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**In some forms of epilepsy, the seizures occur almost exclusively during sleep. This is particularly the case with hypermotor frontal lobe seizures. Clinically it can be difficult to distinguish such seizures from parasomnias and**

**psychogenic non-epileptic seizures. This clinical review article aims to highlight the importance of making the correct diagnosis, as these conditions require completely different treatment.**

Patients with episodic motor activity during sleep represent an issue that is familiar to GPs. Such episodes can result in poor sleep quality and are a cause of concern, not only for those affected but also for their relatives. Patients with these nocturnal episodes of restlessness can create difficult diagnostic considerations for doctors.

Episodes of severe, strange motor activity during sleep can be an expression of night terrors, incomplete awakening during non-REM sleep, nightmare disorder, REM sleep behaviour disorder, epileptic or psychogenic non-epileptic seizures. It can be difficult even for experts in the field to distinguish between these conditions on a purely clinical basis. The main reason is that the patient history is often incomplete and the pattern of the events may overlap. Although EEG recordings during epileptic frontal lobe seizures often do not show epileptic activity, these recordings, together with video recordings of the episode, can nevertheless be used to distinguish the conditions from each other.

The purpose of this clinical review article is to discuss the motor events that can occur during sleep, with particular emphasis on what distinguishes epileptic from non-epileptic episodes; moreover, after a diagnostic clarification, which treatment may be relevant. The article is based on a non-systematic literature search and the authors' own clinical experience.

## Sleep-related hypermotor seizures

Sleep-related hypermotor seizures are typical for frontal lobe epilepsy. Seizures of this type were first described in 1981 and were originally called nocturnal paroxysmal dystonia, and later nocturnal frontal lobe seizures. In recent years the name has been further changed to sleep-related hypermotor epilepsy, abbreviated to SHE (1). This is to emphasise that it is sleep that is the trigger for seizures, either night-time or daytime sleep. Although the form of the seizures reflects the activity in the frontal lobe, the seizures may start in other areas of the brain, and involvement of the frontal lobe is secondary.

In patients with epilepsy, drowsiness and non-REM sleep promote epileptic activity, while conversely REM sleep is inhibiting (2). It is therefore not surprising that the seizures in some forms of epilepsy, for example frontal lobe epilepsy and self-limited epilepsy of childhood (previously called benign epilepsy of childhood) usually occur during sleep.

Frontal lobe epilepsy is the most common form of epilepsy apart from temporal lobe epilepsy, and constitutes around 20–30 % of the focal epilepsies (3, 4). Many types of lesions can cause frontal lobe epilepsy. Examples are brain injuries, brain tumours, stroke and congenital malformations (particularly type II focal cortical malformations). Genetic causes have also been found in recent years, especially mutations in genes that code for nicotinic acetylcholine

receptor proteins, particularly in the CHRN genes, but mutations in other genes have also been reported (5). Acetylcholine may have a modulating effect on awakening.

The pattern of sleep-related hypermotor seizures is generally stereotypical. They occur during non-REM sleep, are short (< 60 seconds) and usually manifest themselves as severe motor activity. Patients seem frenetic and agitated; they kick, wave their arms or roll around in the bed. Many make repetitive sounds in the form of shouting, swearing or anguished screams. In some people, the behaviour can appear aggressive. Immediately afterwards the patients are fully awake, and their mood completely normalised. Some can remember what happened, but most patients have no memory of the seizure. Many patients experience several seizures on the same night (in some cases up to multiples of ten), distributed throughout the night (Figure 1, Table 1), but the frequency varies considerably (6).

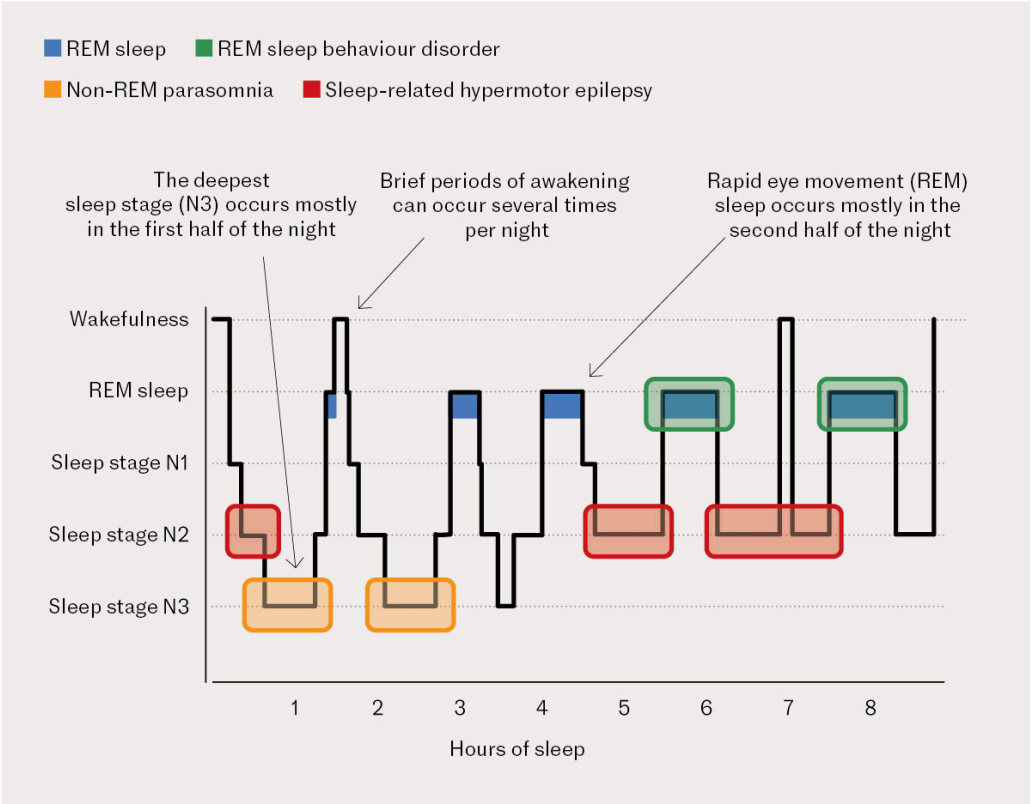


**Figure 1** Hypnogram showing sleep stages over time and typical behaviour for different nocturnal seizure episodes (6, 10, 12, 18, 19).

**Table 1**

The principle differences between nocturnal hypermotor epilepsy, psychogenic non-epileptic seizures, non-REM parasomnia and REM sleep behaviour disorder (6, 10, 12, 18, 19).

| | NREM-parasomnia | REM-sleep behaviour disorder | Sleep-related hypermotor epilepsy | Psychogenic non-epileptic seizure |
|---|---|---|---|---|
| **Age at onset** | Childhood | Early old age (> 60 years) | Varies, most often child to young adult | Varies, most often adolescent or young adult |

| | NREM-parasomnia | REM-sleep behaviour disorder | Sleep-related hypermotor epilepsy | Psychogenic non-epileptic seizure |
|---|---|---|---|---|
| **Episodes per night** | 1–2 | 1–2 | Usually several | Varies |
| **Duration of episodes** | 0.5–5 min. Can be longer | 0.5–1.5 min. | 10–30 sec. Can be longer | 1–30 min. Can be longer |
| **Semiology** | Starts as 'normal' wakening, long, complex behaviour. Perception of confusion. | Sudden, targeted, often aggressive behaviour. Sense of vivid dreaming involving threat. | Sudden, violent motor restlessness, non-targeted. Variable sense of having had a seizure. | Highly variable, often twitching or movements of varying intensity and side. |
| **Stereotype** | Non-stereotypical | Non-stereotypical, dependent on dream content | Highly stereotypical | Variable |
| **When at night** | First one-third of the night, sleep stage N3 | Second half of the night, during REM sleep | Throughout the night, usually in the transition between sleep stages or in stage N2 | Does not occur during documented sleep |
| **Afterwards** | Asleep, usually amnesic | Awake, remembers the dream | Rapidly awake, usually amnesic | Variable |

The form of the seizures varies somewhat, depending on the location of the area causing the seizure within the frontal lobe. Some patients may have relatively mild motor symptoms, for example only a brief extending of an extremity. The increased use of EEG recordings from stereotactically placed depth electrodes has resulted in several subtypes of these seizures being described in recent years (7).

EEG taken between – and even during – the seizures may often be normal or show only non-specific disturbances due to the violent movements.

The treatment follows normal principles for treatment of focal epilepsies (6); first antiseizure medications should be tried, for example low dose carbamazepine drugs (oxcarbazepine or eslicarbazapine) at night, lamotrigine, levetiracetam or valproate. Most patients gain control of their seizures with medication, but up to 30 % are pharmacoresistant (5, 6). In those cases surgery should be considered, particularly when a morphological substrate for the seizures has been found.

Although the prognosis in patients with typical sleep-related hypermotor seizures and without underlying brain changes is usually good (8), several years of fragmented sleep can cause cognitive impairment and poor quality of life (5).

## Parasomnias

A number of motor disturbances can occur during sleep, for example physiological hypnic myoclonus, bruxism (teeth grinding), nocturnal facio-mandibular myoclonus and periodic restless legs syndrome (9). These are seldom mistaken for epileptic sleep-related hypermotor seizures; however, it may be true for some other types of parasomnias.

### Non-REM parasomnias

Night terrors (*pavor nocturnus*) are often misinterpreted as nightmares. They affect up to 6 % of children from 3–4 years of age, and they grow out of them before reaching their teenage years (10). The events occur during deep sleep, generally early in the night (Figure 1, Table 1). They usually start with a scream and are followed by incomplete awakening. The children appear terrified, exhibit extreme motor restlessness and do not answer when addressed. They are difficult to wake and cannot be calmed or comforted. The episodes last for a few minutes and their intensity varies. The children do not remember the event the next day (10), and the condition is not associated with psychopathology.

Sleepwalking (somnambulism) most commonly occurs in children in the age group 8–12 years and generally occurs during waking from deep sleep. The children walk around in a daze, often with their eyes open, seldom for more than 10–15 minutes. They usually return to bed and continue sleeping. They do not remember the episode the following day. Sleepwalking usually occurs early in the night, and the vast majority grow out of it (10, 11). 20–30 % of the population have sleepwalked at least once in their lives (10). Those who fail to grow out of it may perform complex activities as adults, such as eating, walking out of their homes, or initiating sexual activity with a bed partner, so-called sexsomnia.

Some people may also have episodes that resemble both night terrors and sleepwalking. They can wake with a feeling of panic and attempt to exit the room with a perception that the house is on fire or that some other threatening event is about to happen. It may take some time before they achieve normal consciousness. They usually maintain that they were not dreaming prior to the event, but that while waking they perceived themselves to be in a threatening situation and that it took some time for them to realise that there was no real danger. This form of non-REM parasomnia is called confusional arousal (10, 11). In children it is perceived as a milder variant of night terrors. They appear more confused than frightened; they cry, push their parents away and are difficult to wake.

Common to non-REM parasomnias is that they occur in deep sleep, stage 3 (Figure 1). Irregular sleep or one night's lack of sleep often results in greater sleep pressure the following night, which is compensated for by more stage 3 sleep. This increases the risk of non-REM parasomnia (11). Episodes can be triggered by external stimuli such as touch or sound (11). It is assumed that

these stimuli cause partial waking and activation of areas of the brain responsible for automatic motor responses, while other parts of the brain that control consciousness are still asleep.

### REM parasomnias

Nightmares occur most frequently in children, and their prevalence decreases after the age of ten years (10). The person wakes from a very unpleasant or frightening dream, and in contrast to night terrors, remembers the content of the dream afterwards. Previous traumas, a difficult life situation and use of some medications can dispose people to nightmares (10).

REM sleep behaviour disorder is a rare condition (10, 12). It manifests itself as vivid, often threatening dreams without the normal muscle paralysis that occurs during REM sleep. The person participates actively in the dream, often acting out violently. They feel that they must defend themselves against an attack. In contrast to flashbacks in post-traumatic stress disorder, the content of the dreams varies and is not a repetition of an actual experience of a traumatic event. One result may be that the person attacks their bed partner. Most of the episodes occur in the second half of the night, when the proportion of REM sleep increases (Figure 1, Table 1). The condition most often affects older men with an incipient neurodegenerative disease (for example parkinsonism) or who are in the abstinence phase of alcohol use or of some medications (12). Around 1–2 % of the population are affected, and the condition is also seen in women with no connection to the abovementioned factors (12).

Good sleep hygiene measures are common to the treatment of parasomnias. To avoid injury, safety measures in the home may be necessary. If drug treatment is indicated, clonazepam has the best-documented effect, also in low doses of 0.5 mg daily (13). Clonazepam is not compatible with driving, but for doses up to 0.5 mg, it is possible to apply for an exemption (14). Melatonin, in gradually increasing doses from 3 mg to 18 mg daily, is the first-line treatment for both non-REM and REM parasomnias (13, 15, 16).

Melatonin can be combined with driving. Prazosin is effective for nightmares, particularly if post-traumatic stress disorder is the causal trigger (17).

## Psychogenic non-epileptic seizures

Psychogenic non-epileptic seizures can also occur at night, seemingly during sleep, but EEG recordings during the seizures show that the patients are awake. These seizures can take many forms, but they *may* be expressed as violent motor agitation – and thereby resemble hypermotor seizures.

Patients with seizures of this type should receive psychotherapy directed at the causes of the seizures. Any anti-seizure medication should be discontinued.

## Assessment

If we have patients with strange episodes of this kind during sleep, a thorough patient history is of utmost importance. Information must be obtained from both the patient and their relatives about the age of onset, when at night the seizures occur (Figure 1), how frequently they occur and whether there are several episodes on the same night. Questions should also be asked regarding the form the episodes take, the level of consciousness, the duration of the episodes and what the patient remembers afterwards (Table 1).

Recording of the events on a smartphone may be a useful supplement (18). A checklist (the FLEP scale) has been developed to aid in differentiating between parasomnias and frontal lobe epilepsy (19). In our opinion the usefulness of the list is limited.

When in doubt about the nature of the events, the patient can be referred to the nearest university hospital or the National Centre for Epilepsy in Sandvika, where we have long experience with this type of differential diagnostics. The episodes in question are recorded here using video and EEG recordings as well as polysomnography. A brain MRI is also usually included in the assessment.

## Conclusion

Patients experiencing severe episodes of motor activity during sleep should undergo a thorough neurological, neurophysiological and neuroradiological assessment. Because such disorders can be manifestations of epileptic or non-epileptic conditions that require completely different treatment, it is crucial to clarify the diagnosis.

*The article has been peer-reviewed.*

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