Sleep-related movement disorders

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ABSTRACT

Sleep is a fundamental aspect in the daily life of human beings, because it has essential functions, such as immunological, restorative, conservation and restoration of energy, in addition to interfering with thermoregulation and memory consolidation.

Keywords: Disorders, Sleep, Human being.

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INTRODUCTION

Sleep is a fundamental aspect in the daily life of human beings, because it has essential functions, such as immunological, restorative, conservation and restoration of energy, in addition to interfering with thermoregulation and memory consolidation.

It is considered a biological process conceptually defined in science as a coordinated set of behavioral and physiological changes that occur simultaneously and are associated with specific patterns of brain electrical activity. This state is characterized by a relaxed posture, decreased or absent motor activity, and a high tolerance to external stimuli, which can be reversed by stimulus. On the other hand, wakefulness is marked by increased motor activity, increased responsiveness, and a neurochemical environment that facilitates information processing and interaction with the environment. The alternation between sleep and wakefulness follows a circadian rhythm, varying according to age, sex, and other individual characteristics.

In this sense, its deprivation can determine important short- or long-term impairment in the patient's daily activities, fostering social, somatic, psychological, or cognitive impairments. In addition, poor sleep quality or insufficiency are factors associated with pathologies such as obesity, mental disorders, hypertension and diabetes. Sleep is actively initiated through two mechanisms that coordinate the sleep-wake cycle:

(1) The homeostatic sleep impulse, which involves substances that promote sleep;

(2) Or circadian cycle

Controlled by the suprachiasmatic nucleus of the hypothalamus, which is responsible for facilitating awakening. The homeostatic factor refers to the increase in sleepiness after prolonged periods of wakefulness, due to the accumulation of adenosine, while the circadian factor addresses the cyclical variations in the state of wakefulness and physiological sleep throughout the day. After awakening, during the morning part, the homeostatic impulse to sleep is almost negligible and the circadian factor takes on excitatory influences that lead to awakening. Throughout the day, both homeostatic drive and circadian excitatory activity increase; However, during the night, this excitatory activity is reduced, promoting the onset of sleep. (MULLER et al, 2007) (NEVES et al, 2017) (SIMÕES et al, 2022).

It is important to note that sleep is composed of two discrete states that alternate in cycles over the course of a typical night.

- Rapid eye movement (REM)-> Occupying approximately 20 to 25% of total sleep time in young adults, it ranges in duration from 5 to 30 minutes. This phase is characterized by the occurrence of dreams and bodily movements.

- Non-rapid eye movement (NREM) -> NREM sleep, comprising about 75% of the sleep cycle, is subdivided into three stages (N1, N2, and N3), with the deepest stage being the last.

Changes in sleep patterns are common in all age groups, but it should be noted that international studies indicate a high prevalence of sleep disorders in adults. However, variations in the amount of sleep are more significant during childhood, decreasing from about 16 hours a day in the first days of life to approximately 14 hours at the end of the first month and to 12 hours at the end of the sixth month of life. Subsequently, the duration of infant sleep decreases by an average of 30 minutes per year until the age of five. In adulthood, the amount of sleep decreases and the sleep cycle varies depending on age and external factors.

As one advances in age, losses in duration, maintenance, and quality in the sleep pattern are observed. Several factors, such as pain, medication use, and different clinical conditions, can affect both the quantity and quality of sleep, and this influence is particularly relevant among the elderly, who are more susceptible to such conditions. In addition, irregularities in sleep characteristics, together with associated factors, such as being a woman, being >55 years old, consuming alcoholic beverages, using illicit substances, angina, obesity and depression, increase the vulnerability of chronic damage to the health of individuals.

Recent studies have identified the association between sleep disorders and increased morbidity and mortality. This is due to the systemic effects exerted, with changes in endocrine, metabolic, and immunological pathways, related to unfavorable health outcomes, such as depression, diabetes mellitus, systemic arterial hypertension, obesity, which also contribute to the development of cardiovascular diseases. (BARBOSA et al, 2021)

As a result, symptoms related to sleep disorders (ST) are frequent in children and adults, such as insomnia, excessive daytime sleepiness (EDS), inability to sleep at the desired time, and abnormal events during sleep. The Third International Classification of Sleep Disorders (ICSD-3), published by the American Academy of Sleep Medicine in 2014, identifies seven main categories: insomnia, breathing-related sleep disorders, centrally caused hypersomnolence, parasomnias, circadian rhythm disorders, movement-related sleep disorders, and other sleep disorders (Chart 1). (NEVES et al, 2017)

Chart 1: Sleep disorders according to the 3rd edition of the International Classification of ST (ICSD-3).

A-TRANSTORNO DE INSÔNIA
1.Transtorno de insônia crônica.
2.Transtorno de insônia de curto prazo
3.Outro transtorno de insônia.
4.Sintomas isolados e variantes da normalidade.
5.Tempo excessivo na cama.
6.Dormidor curto.

B-TRANSTORNOS RESPIRATÓRIOS RELACIONADOS AO SONO
1.Apneia obstrutiva do sono.
(a) Adulto
(b) Pediátrico.
2.Apneia central do sono.
(a) Com respiração de Cheyne-Stokes.
(b) Devido à condição médica sem respiração de Cheyne-Stokes.
(c) Devido à respiração periódica da alta altitude.
(d) Devido a drogas ou substâncias.
(e) Apneia central do sono primária.
(f) Apneia central do sono primária da infância.
(g) Apneia central do sono primária da prematuridade.
(h) Apneia central do sono decorrente do tratamento.
3.Transtorno de hipoventilação relacionados ao sono.
(a) Síndrome da hipoventilação da obesidade.
(b) Síndrome de hipoventilação alveolar central congênita.
(c) Hipoventilação central de início tardio com disfunção hipotalâmica.
(d) Hipoventilação alveolar central idiopática.
(e) Hipoventilação relacionada ao sono devido ao uso de drogas ou substâncias.
(f) Hipoventilação relacionada ao sono devido à condição médica.
4.Hipoxemia relacionada ao sono.
(a) Transtorno de hipoxemia relacionada ao sono.
5.Sintomas isolados e variantes da normalidade.
(a) Roncos.
(b) Catatrenia.

C-TRANSTORNOS DE HIPERSONOLÊNCIA CENTRAL.
1.Narcolepsia tipo 1.
2.Narcolepsia tipo 2.
3.Hipersonia idiopática.
4.Síndrome de Kleine-Levin.
5.Hipersonia devido a uso de droga ou substância.
6.Hipersonia associada a transtorno mental.
7.Síndrome de sono insuficiente.
8.Sintomas isolados e variantes da normalidade.
(a) Dormidor longo.

D-TRANSTORNO DO RITMO CIRCADIANO DE SONO-VIGÍLIA.
1.Tipo atraso de fase do sono.
2.Tipo avanço de fase do sono.
3.Tipo sono-vigília irregular.
4.Tipo sono-vigília não de 24 horas.
5.Transtorno dos trabalhadores em turnos.
6.Jet Leg.
7.Transtorno do ritmo circadiano de sono-vigília não especificado.

E-PARASSONIAS
1.Parassonias do sono NREM.
(a) Transtornos do despertar (a partir do sono NREM).
(b) Despertar confusional.
(c) Sonambulismo.
(d) Terror noturno.
(e) Transtornos alimentares relacionados ao sono.
2.Parassonias do sono REM.
(a) Transtorno Comportamental do sono REM.
(b) Paralisia do sono isolada recorrente.
(c) Pesadelos.
3.Outras parassonias.
(a) Síndrome da cabeça explosiva.
(b) Alucinações relacionadas ao sono.
(c) Enurese noturna.
(d) Parassonia secundária a condição médica.
(e) Parassonia devido a uso de droga ou substância.
(f) Parassonia, não especificada
4.Sintomas isolados e variantes da normalidade.
(a) Sonilóquio.

F-TRANSTORNOS DO MOVIMENTO RELACIONADO AO SONO
1.Síndrome das pernas inquietas.
2.Síndrome dos movimentos periódicos dos membros.
3.Câimbras nas pernas relacionadas ao sono.
4.Bruxismo relacionado ao sono.
5.Transtorno do movimento rítmico relacionados ao sono.
6.Mioclonia benigna do sono da infância.
7.Mioclonia espinhal do início do sono.
8.Transtorno do movimento relacionado ao sono secundário à condição médica.
9.Transtorno do movimento relacionado ao sono devido a uso de droga ou substância.
10.Transtorno do movimento relacionado ao sono, não especificado.
11.Sintomas isolados e variantes da normalidade.
(a) Mioclonia fragmentária excessiva.
(b) Tremor hipnagógico do pé e ativação muscular alternante das pernas.
(c) Espasmos hípnicos.

G-OUTROS TRANSTORNOS DO SONO

APÊNDICE A- CONDIÇÕES MÉDICAS E NEUROLÓGICAS RELACIONADAS AO SONO
1.Insônia Familiar fatal.
2.Epilepsia relacionada ao sono.
3.Cefaléia relacionada ao sono
4.Laringoespasmo relacionado ao sono
5.Refluxo gastresofágico relacionado ao sono.
6.Isquemia miocárdica relacionada ao sono.

Source: Neves *et al*, 2017.

DISORDERS RELATED TO MOVEMENT AND SLEEP BEHAVIOR

Sleep-associated movement disorders are characterized by simple, stereotyped movements that occur during the sleep period, potentially disrupting its regular course. Generally, they are self-limiting and benign clinical conditions, however, difficult to diagnose and treat, and therefore the theme will be addressed and deepened in the present work. Patients complain or are observed with abnormal movements and behaviors during sleep. When the patient is a pediatrician, parents should be instructed to film the movements at home.

Analysis and recognition of these disorders typically involves identifying subjective complaints such as sleep disturbances during the night, excessive daytime sleepiness, or fatigue. This category encompasses a range of conditions, including restless legs syndrome, periodic limb movement disorder (PLMD), sleep-related leg cramps, sleep-related bruxism, sleep-related rhythmic movement disorder, benign childhood sleep myoclonus, sleep-onset propriospinal myoclonus,

systemic disease-related myoclonus, secondary sleep-related movement disorder, and more. In addition, some of these disorders may not have significant clinical consequences and may be considered normal variants, while others may be associated with underlying medical conditions or the use of certain medications. Therefore, a meticulous evaluation and multidisciplinary approach to diagnosis and treatment are key, involving sleep specialists, neurologists, and other healthcare professionals as needed. (MAINIERI et al, 2023).

STs are frequent and debilitating in the current situation, and therefore, based on the above information, the main objective of the present study is to review the specialized literature on the characteristics of the most frequent sleep movement disorders in the general population and their implications on the behaviors and quality of life of people with this condition. Since sleep alterations can compromise the individual's quality of life and safety, since estimates on the rate of accidents and deaths caused by sleepiness or fatigue range from 2% to 41%, with a high cost in financial and social terms. In addition, it emphasizes the importance of preventing/treating situations and diseases that favor this problem. (NEVES et al, 2017) (MULLER et al, 2007)

Epidemiology will be treated according to each disorder to be presented in this work.

PATHOPHYSIOLOGY

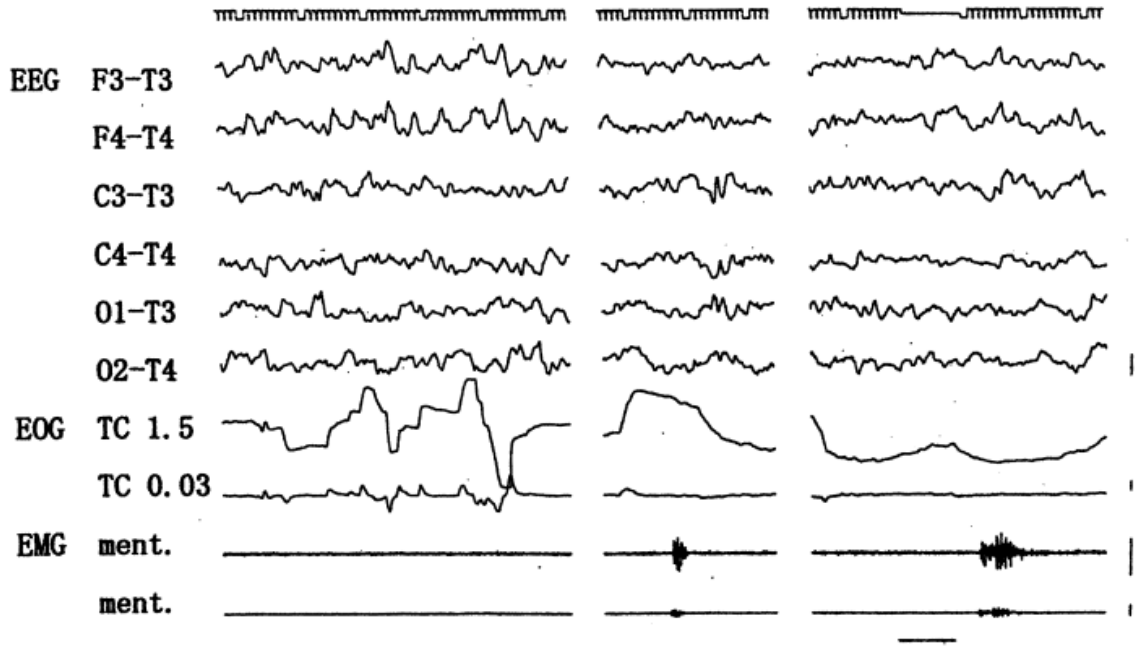
The REM and NREM phases of sleep are associated with important neurophysiological and neurochemical changes in the brain, which lead to changes in the control of motor functions. This explains why motor control disorders sometimes appear specifically during sleep. Multiple factors may be involved in the genesis of sleep-related disorders, from genetic factors to electrolyte disturbances and neurodegenerative conditions (e.g., Parkinson's disease). Focal brain damage, for example, is mostly related to nocturnal epilepsy.

Motor control requires mechanisms of integration of the afferent and efferent systems, involving the spinal cord, brainstem, cerebellum, basal ganglia, and cerebral cortex. (BARGIOTAS; BASSETTI, 2017). Sleep-related motor manifestations arise from a disruption of such mechanisms, often in the form of abnormal activation and/or lack of inhibition of motor circuits. In most situations, dysfunction occurs in both systems, but the exact contribution of these (and corresponding neurotransmitters) to these disorders is not fully understood. Sleepwalking, sleep-related motor epilepsy, and nocturnal panic attacks are thought to be due to a primary ascending dysfunction where activation systems prevail. REM sleep behavior disorder is primarily attributed to a primary dysfunction of the descending inhibitory system. In sleep paralysis, the participation of the mirror neuron system and interaction between several regions of the brain, especially the prefrontal cortex and sensory feedback, is supposed. Restless legs syndrome is mainly related to reduced brain iron content and dysfunction of nigrostriatal dopaminergic pathways and mesolimbic networks

(association with Parkinson's disease and other neurodegenerative diseases), diabetes mellitus, rheumatoid arthritis, peripheral neuropathy, pregnancy (over 20 weeks), use of antihistamines and antidepressants. Oromandibular dystonia and Huntington's disease may evolve with bruxism. Nocturnal cramps are associated with diabetes mellitus, amyotrophic lateral sclerosis, hypokalemia, hypocalcemia, hypomagnesemia, and some medications (statins and diuretics)Nocturnal/sleep-related complex motor manifestations are thought to arise from abnormal (non-epileptic/epileptic) activation of innate (genetically-determined) or learned (central pattern-generating) motor patterns that are essential for survival.

Finally, these disorders could be explained by a "state dissociation", i.e., the coexistence of abnormally activated brain areas with others that exhibit characteristics of normal sleep, the phenomenon of which has already been documented by means of neuroimaging and neurophysiological methods (Fig. 1) (NEVES; M; GOMES, 2018; BARGIOTES; BASSETTI, 2017).

Figure 1. Parts of a real polygram showing rhythmic disturbance of movement. A *burst* REM (left), a short (middle) and long (right) chin phasic muscle activity (AMFQ), respectively. No chin phasic muscle activity occurred in association with a rapid eye movement (REM) sequence. Chin phasic muscle activity was identified in the tracing with calibration at 50 mV/5 mm and a time constant of 0.003. A high-gain (upper) trace was recorded simultaneously to verify the continuity of the AMFQ. Calibration: 1 s, 50 mV; EEG, electroencephalography; EOG, electrooculography; EMG, electromyography; CT, time constant.



Source: KOHYAMA et al., 2002.

SLEEP-RELATED MOVEMENT DISORDERS

SLEEP-ONSET PROPRIOSPINAL MYOCLONUS

Sleep-onset propriospinal myoclonus (PSM) is a condition characterized by involuntary spasms that affect several muscle groups, mainly in the abdomen, trunk, and neck typically during

the early sleep phase. It was first described in 1991 and has since been increasingly identified as a functional movement disorder in most cases. These movements are abrupt and can occur both during contraction and during muscle relaxation, and can vary in their intensity and frequency. Although sleep myoclonus is a common occurrence, affecting up to 70% of the population, it is generally considered benign, being more frequent in the male population in adulthood. However, in certain cases, it can be associated with more serious conditions such as Parkinson's disease, spinal injuries, neuroinfections, medications, paraneoplastic diseases, and head trauma. (EBERHARDT et al, 2017)

There are different classifications of myoclonus, the first of which is physiological myoclonus, characterized by spasms that occur during sleep in healthy individuals, in a benign way, most of the time, lacking a therapeutic regimen. (EBERHARDT et al, 2017)

Myoclonic epilepsy usually occurs by activation of the cerebral cortex and is characterized by epilepsy that receives electrical discharges from the brain, generating a myoclonus that is abruptly interrupted, as in juvenile myoclonic epilepsy. (EBERHARDT et al, 2017)

In idiopathic myoclonus, myoclonic movements arise spontaneously, without being related to other specific conditions or symptoms. The precise etiology of this phenomenon is unknown, although it is often attributed to hereditary influences, which can interfere with daily activities. (EBERHARDT et al, 2017)

When caused by other diseases, myoclonus is called secondary or symptomatic, indicating that it is a symptom of another underlying condition or may emerge as a result of circumstances other than a disease, such as injury or poisoning. Several pathologies can be responsible for this type of myoclonus, including neurodegenerative movement disorders, infectious diseases such as Acquired Immunodeficiency Syndrome (AIDS), Whipple's disease and viral encephalitis, metabolic causes and exposure to toxic substances, such as mercury, in addition to drug use, among other factors. (EBERHARDT et al, 2017). The propagation time of the movement helps us to differentiate myoclonus, so that its duration is slower when compared to the others. Spinal cord injuries caused by trauma or degenerative diseases are characterized by movements that occur outside the night, helping in the differential diagnosis.

Treatment is directed towards the management of underlying medical conditions, depending on the etiology and severity of symptoms, and may include the use of medications, for example, valproic acid may be prescribed as an integral part of the therapeutic protocol, in addition to levetiracetam and clonazepam. (EBERHARDT et al, 2017)

It is imperative to identify and treat any underlying medical conditions that may be triggering muscle spasms during sleep, such as neurological disorders, metabolic dysfunctions, adverse drug reactions, and more. In addition, it is recommended to consult a medical professional specialized in sleep disorders, such as a neurologist, for an accurate evaluation and appropriate advice regarding the

most appropriate treatment for this pathology, which should be individualized. (EBERHARDT et al, 2017)

BENIGN SLEEP MYOCLONUS OF INFANTS

Benign myoclonus of the baby's sleep can begin in the neonatal period and extend into the second half of life. Family history may be positive in 10% to 25% of cases. In this disorder, the patient presents myoclonic movements in *clusters* during sleep, which may affect all four limbs, with the arms being more reported, usually during non-REM sleep, in any phase of sleep (although less frequent in REM sleep). Movements are restricted to periods of sleep and resolve themselves upon awakening, and a slight restriction or even a simple touch is enough to reduce them. Myoclonus is focal, multifocal, or generalized, but in almost all cases focal myoclonic activity migrates to other sites. The concussions last for seconds and happen in about 3-15 minutes, but they can last up to 60 minutes. The movements can be so dramatic that even experienced neuropediatricians may mistake them for neonatal myoclonic epileptic seizures, and electroencephalography will be normal. The diagnosis is obtained through a clinical history (very detailed anamnesis with the child's routine, sleep schedules and movement characteristics) associated with nocturnal polysomnography. Polygraphic studies of benign neonatal myoclonus suggest that this movement pattern is mainly observed during non-REM sleep, however, up to 22% of events may occur during REM sleep or, less frequently, 3% of cases, during transitional sleep.

Electroencephalography is normal and may show motion artifacts. This test may be ordered to rule out epileptic myoclonus. The main differential diagnosis of this disorder is myoclonus of epileptic origin. The anamnesis should look for the presence of events also during wakefulness or possible alterations in neuropsychomotor development. Exclusion is performed by means of electroencephalography, which in benign sleep myoclonus will be normal, and may present only movement artifacts. Because it is a pathology with a good prognosis, it does not require specific treatment, as it tends to cease with growth and development (until the second half of life). The conduct consists of reassuring parents, and may associate behavioral strategies and sleep hygiene routines, such as avoiding exposure to the screen, reducing light and ambient music (EBERHARDT; TOPKA, 2017).

SLEEP BRUXISM

Bruxism is a condition characterized by grinding or clenching of the teeth, and can occur during the day (daytime bruxism) or during sleep (nocturnal bruxism). This condition can lead to a variety of problems, such as tooth wear, headaches, jaw pain, chewing difficulties, and even sleep disturbances. There are several causes associated with bruxism, including genetic, emotional,

psychological, postural, and even lifestyle-related factors. In addition, stress and anxiety are often pointed out as triggers of this disorder.

The diagnosis is usually made based on the patient's clinical history, self-report or complaints from those who may have witnessed the event, and on physical and dental examinations. In some cases, polysomnography may be necessary to diagnose sleep bruxism. (FURLANETTO, 2018). It is important to investigate other temporomandibular joint pathologies and malocclusions, anxiety, stress and attention deficit hyperactivity disorder (ADHD) that may be part of differential diagnoses.

Treatment may involve multidisciplinary approaches and conservative treatment is prioritized, including behavioral measures, use of bite plates, physical therapy, cognitive-behavioral therapy, and in some cases, the use of muscle relaxant medications, in some cases, Clonazepam is indicated in low doses of 0.6 to 4mg/day. Importantly, treatment should be individualized, taking into account the underlying causes in each patient. In short, this is a common condition that can bring several complications to the patient's oral health and well-being. Therefore, it is essential to seek professional help for an accurate diagnosis and an appropriate treatment plan (LAVIGNE et al, 2000).

MYOCLONUS RELATED TO SYSTEMIC DISEASES

Also known as secondary or symptomatic myoclonus, they are characterized by involuntary movements that interfere with the patient's sleep and that result from various diseases, including degenerative diseases such as some dementias and those affecting the basal ganglia. Therefore, its treatment consists of treating the underlying disease and the diagnosis is made by the patient's clinical history (EBERHARDT; TOPKA, 2017). They result from some pathologies in particular, as shown in Table 2:

Table 2. Causes of symptomatic myoclonus. In: CAMARGOS et al., 2012.

SLEEP-RELATED RHYTHMIC MOVEMENTS

Rhythmic movement disorder is also known as *nocturnal jactatio capitis*, it is considered a sleep disorder with significant prevalence in early childhood, common in children aged 9 months, with self-limited remission up to 4 years. It is characterized by repetitive movements, especially in the cephalic and cervical segments, in the early stages of non-REM sleep.

There are three main types of movements:

-*Head banging*: consists of rhythmic movements of the head in an anteroposterior direction.

-*Head rolling* : consists of the lateral turning of the child's head while lying down in the supine position.

-*Body rocking*: with the hands on the knee, the child moves the body continuously in an anteroposterior direction.

In addition to these, there is even less frequent the swaying of the body and leg rhythmically, and the association of movements with vocalization. The episodes occur 1 to 2 times a night, and may persist in more frequent cases, starting as soon as the child falls asleep and lasting from seconds to 15 minutes. It is important to note that, in this age group, this disorder, even if "benign" and self-

limiting, can significantly impact quality of life, since sleep at this stage has important biological and cognitive functions, therefore, it is not uncommon for this disorder to be frequently related to irritability, tiredness, sleepiness, intellectual and socio-behavioral impairment (GOGO et al., 2019).

Diagnosis is obtained through clinical history and nocturnal polysomnography.

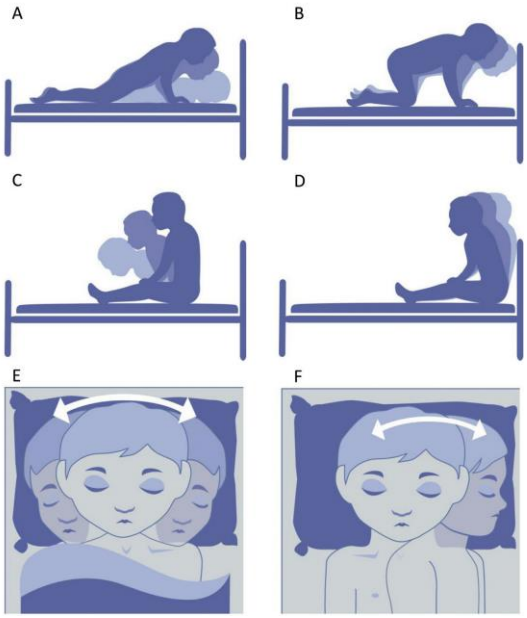
To differentiate from other possible causes, the child's sleep routine should be observed, as well as the characteristic of movements, durability, and the onset of episodes.

Polysomnography demonstrates the presence of rhythmic movement in the sleep-wake transition and in stage 2 of non-REM sleep, with the presence of slow-wave or REM sleep being rarer.

The differential diagnosis is made with other hyperkinetic disorders, mainly because it does not affect the neurological and cerebellar part, it is also differentiated by the period in which the episodes occur (soon after the onset of sleep). Also differentiate from movements related to children with autism spectrum or neuropsychomotor delay.

As it is a self-limiting resolution disorder, treatment guidance is given in relation to care so that physical damage does not occur during the episodes to avoid trauma. In general, remission occurs before 5 years of age, but in some cases episodes remain until this age. In these cases, the need to seek neuropsychological treatment to help with daily and school activities should be taken into account.

Fig.3 Different forms of rhythmic movements. A. Movement of the upper body that occurs with and without hitting the head on the pillow or mattress. B. Full-body movement that occurs with and without hitting the head on the headboard or wall. C and D. Swaying and slapping the body E. Rolling the head F. Rolling the body. All movements may be accompanied by rhythmic vocalizations. E/F may include slamming part of the body (e.g., head/limb) against a hard surface.



Source: GOGO et al., 2019.

MOVEMENTS RELATED TO MEDICATION OR SUBSTANCES

These are movements that impair sleep and are related to the use of medications or abstinence from a substance that promotes wakefulness. The diagnosis is made through careful anamnesis, and the treatment is based on the withdrawal of the drug and treatment of abstinence.

PERIODIC LEG MOVEMENT AND RESTLESS LEGS SYNDROME

Restless leg syndrome

Still with unknown cause, but some studies show it to be related to an imbalance of Dopamine in the body (a substance that improves the transport of electricity).

The origin of RLS is questioned as a dysfunction of the diencephalon-spinal dopaminergic system, or even serotonergic and opioid. That is, its pathophysiology is not yet fully defined/known. Patients report an irresistible movement of the lower limbs accompanied by a dragging sensation of the legs. This can lead to or can be a cause of depression, since lack of sleep can dysregulate dopamine, just like depression. This is the beginning of a cycle that is difficult to control. It is 2x more common in women than in men and its worldwide incidence is large, at 5%. There is underreporting and this is due to the fact that most patients do not direct their symptoms correctly to the doctor.

One of the causes is heredity, 3rd trimester of pregnancy, iron deficiency, peripheral neuropathy. There are several conditions that resemble RLS, but with a careful anamnesis, where circadian symptoms are associated with insomnia, they substantially help the differential diagnosis. Some of the DCS are: Hypotensive akathisia, neuroleptics-induced akathisia, peripheral neuropathy, lumbar radiculopathies, neurogenic claudication, vascular claudication, chronic pain syndrome, fibromyalgia, arthritis of the lower limbs, positional discomfort, nocturnal cramps, sleep myoclonus, depression with somatic symptoms, voluntary movements, peripheral vascular insufficiency, pruritus, painful legs syndrome and toe movements, Vesper's curse, Vesper's delirium infestation.

How to perform the Diagnosis? Polysomnography can be performed, where it is possible to check sleep time, sleep movements, apnea, etc., but it is not the first choice test, since polysomnography only checks the movements, but not the cause of the movements. Serum ferritin and transferrin dosage (in order to check for iron deficiency anemia).

Blood glucose, creatinine, TSH, pregnancy test, calcium and magnesium dosage, vitamin B12 and folic acid. Electroneuromyography should be ordered when peripheral neuropathy is suspected. A recent validated test is with the use of 100mg of Levodopa + 25mg of Benserazide at the onset of symptoms, with recording of the intensity of these symptoms every 15 minutes for a total period of 2 hours.

Computed tomography and magnetic resonance imaging have no diagnostic evidence in this syndrome.

Treatment

There is no single specific medication, but there are some that are prescribed in medical practice, according to their indication, such as: Pramipexole - Used for treatment of signs and symptoms of Idiopathic Parkinson's Disease. It is a dopamine agonist of the non-ergoline class. 0.125 to 0.75mg/day Gabapentin/Pregabalin - Anticonvulsants (used when the patient also has peripheral neuropathy) 188mg/day - Administered 2 hours before bedtime Tramadol - Centrally acting analgesic Muscle relaxants - CNS action Levodopa:Pregnant women. Maximum use of 200mg/day - Single dose 30 to 60min before bedtime Benzodiazepines - 0.2 to 1mg/day Iron Replacement (when needed) 4-6mg/kg/day Other recommendations: Warm bath before bed, relaxation, stretching, in addition to avoiding caffeine. Daily physical exercise is recommended, but never at night.

The following appendix refers to the article on the treatment of restless legs, which talks about the use of the medication Levodopa, where its effect of use in monotherapy and in combination is discussed.

"As monotherapy, RLS symptoms last only through the first half of the night. However, when used in combination, the benefits extend into the second half of the night."

Table 1 – Evidence for treatment of RLS with pharmacological therapy

Author/year	Sample size	Medication/dosage	Duration	Study design	Results	Side effects	Augmentation phenomena or rebound effect	Comments
Benes et al.[21] (1999)	35 (32 completed)	100-200 mg levodopa + 25-50 mg benserazide	2 cross-over periods of 4 weeks each	Double-blind randomized controlled multicenter cross-over trial	Improvement in number of PLMs/hour, time in bed without limb movements and subjective sleep quality	Diarrhea, reduced general drive, nausea and muscle weakness	No augmentation phenomena or rebound effect	—
Saletu et al.[22] (2003)	3 nights: 21 4 weeks: 18	100-200 mg rr-L-dopa/ benserazide + 100-200 mg sr-L-dopa/ benserazide	3 nights and a follow-up of 4 weeks	3 nights: double-blind, controlled, randomized crossover trial. 4 weeks: open non-controlled trial	Acute L-dopa/ benserazide improved PLM/h of sleep, total number of PLM, PLM/h of time in bed, PLM/h of REM and non-REM, PLM/h of wake time and PLM-arousals/h of sleep, but the subjective sleep quality only improved after chronic treatment	Nausea, stomachache, tachycardia, dry mouth, headache and nycturia.	One patient reported augmentation phenomena	—

Rev Bras Psiquiatr. 2006;28(4):308-15

Wayne H, Walters AS, Allen RP, et al. Impact, diagnosis and treatment of restless legs syndrome (RLS) in a primary care population: the REST (RLS epidemiology, symptoms, and treatment) primary care study. Sleep Medicine 2004;5:237-246.

Periodic Leg Movement

Many patients with RLS (Restless Legs Syndrome - 80%) also report having periodic leg movement, which are repeated movements of the lower limbs during sleep. This condition is more common in patients with advanced age and psychic conditions such as stress, irritability, depression, may also be accompanied. May be associated with: Nocturnal epilepsy, myoclonic epilepsy, sleep-onset concussions, normal physical activity of REM sleep, and fragmentary sleep myoclonus.

SLEEP CRAMPS

It consists of sudden contractions of the leg and calf muscles, accompanied by pain during sleep. The duration of the movements is between 0.5 and 5.0 seconds, and may occur in up to hours with intervals of 20-90 minutes, the patient may have sleep interruption.

Most patients present with idiopathic background sleep cramps. Because it is a symptom of hyperactivity and neural fatigue, it is common to report it in high-performance athletes. Neuropathic patients such as peripheral neuropathies and Parkinson's and amyotrophic lateral sclerosis (ALS), so there is a high prevalence in the elderly. There is an association with the use of statins (promote muscle damage), diuretics (cause hydroelectrolyte changes), antidepressants, fibrates, nicotinic acid, morphine, nifedipine, terbutaline, penicillamine, phenothiazine, and anticholinesterase drugs; Potassium-sparing ß-agonists and diuretics (these are more closely related to nocturnal cramps than non-potassium-sparing diuretics). Individuals undergoing treatment for chronic diseases like cancer, cirrhosis can cause neural damage causing cramps. Uremic individuals also have this symptom. (MCGRAW-HILL; 2001)

Some complementary tests can help in the diagnosis. Electromyography may be ordered in case of muscle weakness; Magnetic resonance imaging of the brain if muscle weakness or neurological signs suggest central nervous system involvement, but the diagnosis is well defined in the clinical history. Physical examination, reflex tests, palpation, and pulse checks can help identify pathologies that are associated with cramps.

Treatment is based on stretching the muscles, mobility exercises, metabolic compensation (controlling diabetes, making lifestyle changes), wearing shoes when sleeping to keep the muscle stretched, and removing or adjusting the precursor drugs of the cramp. Therapy and psychotropics to assist with depression-related sleep deprivation. In pregnant women, sodium supplementation and the use of multivitamins have benefits. For ALS, physiotherapy, antipathic and anti-inflammatory drugs are indicated. Most of the medications commonly prescribed to prevent cramps, such as calcium and magnesium supplementation are not as effective, there are quinines (since 2010 they are no longer used frequently due to many drug interactions). Diphenhydramine, benzodiazepines, mexiletine, carbamazepine, phenytoin, and gabapentin, as well as B vitamins and calcium channel blockers such

as verapamil and diltiazem, offer no efficacy and the adverse effects do not outweigh it. Avoiding caffeine and other sympathetic stimulants is essential. 2018 Brazilian Journal of Surgery and Clinical Research – BJSCR

Differential diagnosis

Sleep-related movement disorder is composed of several pathologies, which cause involuntary movements and disrupt the patient's sleep, they are: Bruxism, Restless Legs Syndrome, Periodic Leg Movement, Sleep Cramps, Sleep-Related Rhythmic Movements, Sleep-Onset Propriospinal Myoclonus, Medication-Related Movements, Myoclonus Related to Systemic Diseases and Benign Sleep Myoclonus in Babies. Thus, the differential diagnosis is given according to the pathology, as presented in each sleep movement disorder above.

Treatment - General Aspects

Each movement disorder has specific treatment demands (medication or not), but the need for behavioral strategies and sleep hygiene routines is common to all, such as avoiding exposure to the screen, reducing light and ambient music. Sleep hygiene is a method that aims to educate habits related to health and behavior that are beneficial or harmful to sleep. Sleep hygiene recommendations are as follows:

- Establish regular bedtimes
- Wake up regularly at the same time
- Regulate the amount of sleep you get each night
- Exercise daily and regularly, especially aerobics, but not at the end of the day.
- Sleep in a comfortable, quiet and cool environment
- Avoid caffeinated beverages and other stimulants (including smoking), especially around bedtime
- Avoid alcohol 3 hours before bedtime to sleep
- Avoiding Hypnotic Drugs
- Do something to relax before going to bed

Clinical case

Clinical history: Female, white, 78 years old, widowed.

2 months ago, she began to present a feeling of discomfort and paresthesias in her feet, legs and thighs, similar to "tingling", "burning", always at night, when lying down.

The patient reported partial improvement of symptoms when she got out of bed and walked.

Several diagnoses were made and several treatments were performed, including clonazepam, which did not improve the condition. The patient also reported insomnia and complained of depression.

Positive family history.

Physical examination: On physical examination, the patient was in good general condition, lucid, oriented, with normal vital data and no alterations in the general physical examination.

On neurological examination, the patient had depressive facies.

Complementary tests: No changes in the laboratory test.

Conduct: During treatment, the condition worsened with Mirgtazipine 30mg for 30 days, the patient was replaced by amineptin 200mg/day, which did not improve or worsen the symptoms and, finally, the use of pramipexole 0.125mg 2x/day caused the improvement of the symptoms.

Discussion: The origin of RLS is questioned as a dysfunction of the diencephalon-spinal dopaminergic system, or even serotonergic and opioid. The increase in brain serotonergic activity induced by the use of selective serotonin uptake inhibitor drugs can inhibit the release of dopamine by dopaminergic neurons, so patients with neuronal diseases that present reduced dopaminergic activity, such as RLS and Parkinson's disease, are at great risk of worsening the clinical picture**.**

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