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Overview of Childhood Parasomnias

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Abstract Parasomnias, unusual behaviours or movement during sleep, can affect any age group but has preponderance in children. It includes many different disorders and can occur in any sleep stage. Most cases are benign and resolve spontaneously and do not require any pharmacological intervention. Nocturnal epilepsy is the most important diagnosis to be excluded.

Key words Children parasomnias

Introduction

Bizarre behaviours and movements during sleep are common in children and early adolescence and are frequently reported by anxious parents. However, children are often unaware of these undesirable phenomena. These unusual behaviours and movements are often a result of abnormal arousals and occur in different sleep stages. Collectively they are termed parasomnias.[1]

Besides insomnia and frequent nocturnal awakenings, parasomnias are the commonest sleep disorders in children.[2] They frequently affect healthy children and fortunately most of these disorders will spontaneously disappear in adolescence.[2,3] Reassurances and parent education on how to take care of the affected children are all that are required in most cases and aggressive treatment is not recommended especially if the symptoms are mild.[4,5] If other underlying disorders are suspected that cause or trigger parasomnias, further investigations and specific treatments should be considered.

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Parasomnias

The prevalence of parasomnias is the highest when compared with other sleep disorders in the age group of 3-13 years.[2] Laberge et al did a survey on 10 years old children in Quebec and found that 78% of the subjects experienced at least 1 episode of childhood parasomnia.[2] Indeed, the actual cause of parasomnias is still unknown,[3,4] but these disorders may be triggered by fever, emotional stress, medications, obstructive sleep apnoea and in the case of adults by alcohol consumption.[6,7] In addition, genetic and environmental factors can affect the occurrence of parasomnias.[8,9] Hublin et al reported that monozygotic twins had higher concordance rates of the occurrence of sleepwalking, bruxism and sleep talking than dizygotic twins.[8] Although some parasomnias are benign,[5] frequent occurrence might cause sleep disruption and leads to daytime fatigue and somnolence.[2]

Human sleep consists of 2 stages, the non rapid eye movement (NREM) sleep and rapid eye movement (REM) sleep. The NREM sleep are further subdivided into 4 stages from I to IV with stage III and IV sometimes termed as slow wave sleep (SWS). During REM sleep the brain is very active but there is generalised skeletal muscle atonia to prevent us from acting out of our dreams.

Parasomnias can occur in any sleep stage. They are classified into primary and secondary parasomnias.[10,11] Primary parasomnias are the disorders of sleep states.[10,11]

Secondary parasomnias are caused by other medical or psychiatric disorders that manifest during sleep.[10,11] Based on the sleep stage when the parasomnia happens, the International Classification of Sleep Disorder categorised primary parasomnias into four subgroups (1) arousal disorders, (2) sleep-wake transition disorders, (3) rapid eye movement (REM) sleep parasomnias, and (4) other parasomnias.[1]

Clinical Assessments and Investigation

Detailed daily activities and complete medical history from parents and caregivers is necessary.[4] Physical examination, psychological and developmental assessment should be performed.[4] Moreover, physicians must pay attention to the description of the abnormal phenomena, i.e. the time and frequency of the spells; conscious level; the duration of the events; the presentation of movements and behaviours; any intervention that can affect the events; intact memory or recall of the events.[4] Other supplemental information is also important and should be collected, like current drugs use; school performance; developmental problem; daytime sleepiness; snoring and other sleep problems; usual sleep and wake schedule; napping time and sleep environment.[4]

Overnight polysomnogram (PSG) with video recording is a necessary investigation to analyse the spells, and to confirm the diagnosis. In some situations, a single night's PSG is not adequate to capture the nocturnal abnormal events, hence sometimes patients may have to undergo PSG recording for a few nights.

It is important to note that epilepsy can present with bizarre behaviours during sleep with increased motor and autonomic activity. Dyken et al had shown that patients presenting with symptoms of sleepwalking, sleep terrors, nightmares or rhythmic movement disorders could have coexist nocturnal seizures.[12] Hence, PSG with expanded EEG channels and video recording would be needed in suspected cases to distinguish parasomnias from nocturnal seizure.[4,7,9,12]

An accurate diagnosis and treatment of causes that precipitate sleep disorders might eliminate parasomnias.[6, 12]

Arousal Disorders

Confusional arousals, sleep terrors and sleepwalking are examples of this group.[1] It is believed that the cause of arousal disorders is due to impaired or partial arousal that appears in slow wave sleep (SWS).[4,11] This type of arousals usually occurs in the first third of the night.[7] Moreover, total amnesia is the rule.[4,11] More children experienced these disorders than adults, probably because children have more SWS.[9]

Confusional Arousals

Nearly 3% of children experience this disorder.[12] There is a strong familial predisposition and it is frequently associated with sleep terrors and sleepwalking. The child is awakened from SWS and may begin to have movements and moaning, followed by crying or calling out.[7,11,12] Although seeming to be alert and frightened, the child is disorientated.[9,11] The duration of each event is variable but usually lasts for 5-15 minutes.[11] The event terminates spontaneously, and the child returns to sleep afterwards.[11] There is amnesia for the attack. PSG shows that the child is confused during and following arousals from SWS. The disorder is self-limiting and requires no specific treatment. However, the sudden onset of the spell can be frightening to the parents, and reassurance should be provided. Proper sleep hygiene and preventing sleep deprivation can lessen the attacks.[5,11] Pharmacological treatment is not necessary. Although physical injury is rare, the child must be protected from potential trauma during such an episode.

Sleep Terrors (Pavor Nocturnes)

The exact prevalence is unknown. A survey estimated that the prevalence of sleep terrors was 17.3%, with 1.2% sufferers still experiencing sleep terrors at 13 years of age.[2] It is commoner in boys. Up to 10% of sleepwalkers also suffer from sleep terrors.

The attack starts in the first third of sleep with sudden awakening from sleep and a piercing scream or cry.[4,11] This is associated with intense autonomic nervous system discharge. The child seems scared, confused and panicky with papillary dilation, sweating, tachycardia and tachypnoea.[1,4,11] The child is inconsolable and parents have difficulties in waking up the child. The episode usually lasts for few minutes, and ends spontaneously with the child settling back to sleep.[4,11] There is amnesia for the event. The event is dramatic and frightening and frequently causes significant anxiety in parents.

Poor sleep hygiene, sleep deprivation, sleeping in a

different or new environment, febrile illness or use of central nervous system depressant drugs can sometimes trigger off attacks. Treatments are similar to confusional arousals and include avoiding auditory, tactile and visual stimuli early in the sleep cycle and better sleep hygiene. Relaxation therapy and anticipating awakenings may be helpful.[11] Rarely, medication is needed when significant family disruption is caused. Benzodiazepines are very effective in treating sleep terrors,[4] with L-5-hydroxytryptophan being an alternative.

Sleepwalking (Somnambulism)

The incidence of sleepwalking is about 17% in children[1,2,9] with the highest prevalence between 11 and 12 years. Boys and girls have similar incidence.[2] It usually occurs during the first one third of the night and during slow wave sleep. The frequency of attacks can be variable and can happen on a nightly basis in some children. Familial occurrence is common with 14% of affected children having one or both parents experiencing sleepwalking in childhood. Genetic markers have been implicated like DQB1*0501 which had been found in 35% of sleepwalkers.

The underlying pathophysiology has not been delineated. Single photon emission computer tomography during sleepwalking has shown activation of thalamocingulate pathways and persisting deactivation of other thalamocortical arousal systems. The significance of this however is not clear.

During the spell, the child walks around the room or house calmly.[9,11] Even though the eyes are open, he or she does not respond to any communication or only gives inappropriate answers.[7,11] Sometimes the child may act strangely such as urinating in a closet. The duration and degree of complexity can vary in different episode.[9,11] The episode usually ceases spontaneously and the child may be found asleep anywhere in the house in the morning. There is amnesia for the event. Treatment is not required in most cases. Rarely the child can injure him/herself and parents should pay attention to the child's safety, including preventing falling from stairs or getting out of the house. Scheduled awakenings a few hours after child has gone to sleep or just before the typical time of sleepwalking episodes are effective in many cases, with benefits sustained even after 6 months post-treatment. Low dose benzodiazepines might be used to treat embarrassing or dangerous spells.[11]

Sleepwalking may sometimes be associated with sleep disordered breathing (SDB). Guilleminault et al had demonstrated that sleepwalking and sleep terrors in children with SDB disappeared after their SDB was treated.[6] Hence, further investigations may sometimes be necessary to identify underlying physical disorders for treatment accordingly.

Sleep-wake Transition Disorders

This is a disorder that occurs during the transition from wakefulness to sleep or from one sleep stage to another.[4] The characteristic of this disorder is mild to frequent rhythmic movements.[4] Rhythmic movement disorder and sleep talking are the common sleep-wake transition disorders in children. Sleep starts (hypnagogic jerks) and nocturnal leg cramps are also categorised in this sub-group.[1]

Rhythmic Movement Disorder (Jactatio Capitis Nocturna)

This disorder presents rhythmic and repetitive movements involving large muscles.[1] It occurs during the transition from wakefulness to sleep.[13] Nearly two thirds of all infants have some form of rhythmic activity during sleep.[1,4] This disorder was reported to be more frequent in boys than girls with a ratio of 4:1.[4] Headbanging, head rolling, body rolling and body rocking are examples of this disorder, which occur during the transition from wakefulness to sleep.[4] Children with learning disabilities suffer with headbanging more than normal children.[3] Reassurance should be given to the parents that the disorders are benign. Nocturnal safety precaution combined with behaviour modification may be useful in controlling the condition.[5,7]

Sleep Talking (Somniloquy)

Sleep talking is common in children and can occur at any stage of sleep but the actual prevalence is not known.[1,2,4] One survey of school children showed that 50% of children suffered from sleep talking at least once a year but there is no correlation with age or gender. The attack is often brief, sporadic and self-limited. The speech can be coherent, or in form of mumblings or utterances.[1,4] The child cannot recall the events in the next morning.[4] It is frequently associated with other parasomnias but has not been shown to cause any long term clinical problems.

REM Sleep Parasomnias

Nightmares and sleep paralysis are parasomnias that occur during REM sleep.[4] In some children, their muscle paralysis is incomplete or absent in REM sleep, allowing them to act out their dreams. The sufferers can recall and narrate the events after awake. Other parasomnias including impaired sleep-related penile erections, sleep-related painful erections, REM sleep-related sinus arrest and REM sleep behaviour disorders are also classified in this sub-group.[1]

Nightmares

Nightmares are common in children.[1,4] The incidence was estimated to be 75% in some studies. The prevalence rate of chronic nightmares, defined as ones lasting more than 3 months, was 41% in 6 to 10 years old.

Nightmares usually occur in the later half of the sleep period.[4,5] The sufferers experience unpleasant, vivid and frightening dreams and they are awakened from the REM sleep.[1,4,14] The characteristics of nightmares are totally different from those of sleep terror. The sufferers can recall their dreams clearly.[4,5] During the events there is mild autonomic activity but the child can be calmed down easily.[4,5] Once calmed down, they stay fully awake for a period of time before returning to sleep.[4,5] The essential treatments are to provide reassurance and education to the parents and sufferers. Moreover, the maintenance of good sleep hygiene is also useful.[4,5] If the nightmares become frequent, it is necessary to identify any underlying medical and psychological attributes.[4,5,14]

Antiepileptics, antipsychotics and histamine can sometimes trigger nightmares. Frequent nightmares may also be associated with psychiatric disorders.

Sleep Paralysis

Sleep paralysis is described as inability to move the head, body and limbs with sparing of ocular and respiratory muscles at either sleep onset (hypnagogic) or upon awakening (hypnopompic).[1,4,7] The Chinese calls it 'ghost oppression phenomenon'.[7] This disorder is frequently under-reported as the event occurs while the child appears to be sleeping. As a result, many cases are missed by parents and children are usually too young to describe the events to them. Hence the exact prevalence is not known.[4] Sleep deprivation, stress and sleeping supine are associated with the problem.[7] Forty percent to 65% of patients with narcolepsy syndrome are found to have more frequent sleep paralysis attacks.[4,7]

The sufferer is conscious during the spells, but all of his muscles are paralysed, except the diaphragm and extraocular muscles.[4,7] This phenomenon can cause significant and profound anxiety, fear and mental imagery.[4] Sleep paralysis spells may last for few minutes, and cease spontaneously.[4]

EEG shows abundant alpha waves in the transition of REM-wake stage during attack, and muscle tone is at the lowest on PSG.[7]

The treatment is to reassure the parents that this frightening event is benign and that maintaining good sleep hygiene is important for prevention. In the absence of narcolepsy further investigation is not necessary.

Other parasomnias

Several primary parasomnias cannot be classified into the sub-group of primary parasomnias and are categorized as other parasomnias.[9,13] The underlying pathophysiological mechanisms of these parasomnias are not clearly understood, and they are not typically associated with specific sleep stages.[9,13] The disorders in this group include sleep bruxism, sleep enuresis, sleep-related abnormal swallowing syndrome, nocturnal paroxysmal dystonia, sudden unexplained nocturnal death syndrome, primary snoring, infant sleep apnoea, congenital central hypoventilation syndrome, sudden infant death syndrome, benign neonatal sleep myoclonus, and other parasomnias.

Sleep Bruxism (Nocturnal Bruxism)

Sleep bruxism is the rhythmic, forceful and repetitive teeth grinding during sleep[1] caused by involuntary contractions of the masseter, temporalis and pterygoid muscles.[4] A single episode involves many bursts of muscle contractions in a short period of time, and frequently this happens repeatedly during sleep.[4] Both children and adult can be affected but the prevalence progressively decreases with age.[2,7]

The prevalence of sleep bruxism in children has been estimated between 5% to 20%.[4] A phone survey by Ng and colleagues in 2005 in a group of Hong Kong primary school children aged 6-12 years showed that 20.5% of all responders had experienced sleep bruxism and the

prevalence was higher in boys.[15] Genetic factors may play a role as up to 50% of patients have a family member who was similarly affected during his or her childhood.

Approximately 20% of somniloquists were shown to suffer from sleep bruxism.[2] The reason for the co-existence is probably related to the fact that both disorders involve abnormal movement of orofacial muscles.[2] Sleep bruxism is also significantly associated with habitual snoring.[15]

The exact pathophysiology is not clear. During sleep the jaw is usually kept open due to motor suppression, and teeth grinding during bruxism is frequently associated with sleep arousal. This suggests that bruxism is a powerful micro-arousal event associated with transient central and autonomic nervous system activity during sleep.

Stress, dental malocclusion, cerebral palsy, mental retardation, stimulant medications and obstructive sleep apnoea are predisposing factors for bruxism.[4,9]

Sleep bruxism generates annoying noises and causes abnormal dental wear and dental damage.[2,7,9] It can also cause headache and temporomandibular joint dysfunction. There is no effective and specific treatment for bruxism but fortunately most cases are self-limiting.[7,9] It is important to identify and manage any underlying disorders.[4,7,9] Dental appliances can be used in severe cases to prevent teeth damage but it cannot stop bruxism.[4,7,9] Psychological treatment can be used in anxiety disorders, and modified lifestyle may also be useful.[4,7,9] Benzodiazepines, antidepressants and muscle relaxants may be beneficial sometimes to relief pain in severe cases, although this is rarely indicated in children.[7,9]

Sleep Enuresis (Nocturnal Enuresis)

Sleep enuresis is characterised by involuntary nocturnal voiding when volitional control of voiding is expected.[1] It occurs in any stage of sleep throughout the night.[9] The actual cause of bedwetting remains unknown.[9]

There are two types of sleep enuresis, primary and secondary. In primary enuresis the child has never been dry at night. For secondary enuresis, the child has been dry at night for at least 6 months before enuresis recurred.

The prevalence is higher in younger children, especially boys.[1] In Hong Kong the prevalence of primary and secondary enuresis in Hong Kong were found to be 5.2% and 3.7% respectively.[15] A study carried out by Quine in 2001 found that enuresis is more common in children with learning disabilities, probably because of problems in learning bladder control.[3] Bedwetting usually relates to SWS, but sometimes also occurs in REM sleep.[13] Between 2% to 4% of children with enuresis were associated with local urologic problems, hence careful assessment for neurological and spinal abnormalities is required.[9] About 8% of children with OSA had been found to have nocturnal enuresis and PSG is needed.

Bedwetting can cause significant social embarrassment and parental anxiety. Desmopressin and intra-nasal administrated vasopressin analog are effective.[9] As nocturnal seizure can cause enuresis, PSG with expanded EEG montages should be arranged to exclude this diagnosis.[9,13]

Sleep Hygiene

Good sleep hygiene or habits can improve parasomnias. This entails a few simple practical steps. Daytime napping must be avoided. Retiring to bed at night and getting up in the morning at the same time, even during holidays, are important to allow the body to develop a good rhythm. Alcoholic drinks, caffeinated beverages and heavy meals should be avoided in the evening. Light snacks such as a glass of warm milk at bedtime may sometimes help falling sleep. Strenuous exercises must be avoided before bedtime and distracting noises should be kept to a minimum. Television should be switched off. A well ventilated bedroom with comfortable ambient temperature and lights well blocked out are also essential for good sleep.

Conclusion

Parasomnias are common in healthy children. Most cases carry no clinical significance and children usually outgrow of these. Providing other disorders such as nocturnal seizures and SDB are excluded, no specific therapy or pharmacotherapy is needed. Reassurance is all that is required. However, since they can be very distressing for parents and can lead to significant anxieties, time should be spent to clearly explain to parents the benign nature of these disorders.

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Appendix 1

Classification of parasomnias

Arousals disorders	Somnambulism
	Confusional arousals
	Sleep terrors
Sleep-wake transition disorders	Rhythmic movement disorders
	Sleep starts (hypnic jerks)
	Somniloquy (sleep talking)
REM parasomnias	Nightmares
	Hypnagogic hallucinations
	Sleep paralysis
	Sleep-related priapism
	Sleep-related sinus arrest
	REM behaviour disorder
Other parasomnias	Bruxism
	Nocturnal enuresis
	Abnormal swallowing syndrome

Good sleep hygiene

No daytime napping
Sleeps and wakes up in the morning at the same time even during holidays
No alcohol, caffeinated beverages and heavy meals in the evening
Light snack at bedtime may help to sleep
No strenuous exercises before bedtime
A quiet sleeping environment
Television should be switched off
A well ventilated bedroom and light well blocked off