Sexsomnia: Abnormal sexual behavior during sleep

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ABSTRACT

This review attempts to assemble the characteristics of a distinct variant of sleepwalking called sexsomnia/sleepsex from the seemingly scarce literature into a coherent theoretical framework. Common features of sexsomnia include sexual arousal with autonomic activation (e.g. nocturnal erection, vaginal lubrication, nocturnal emission, dream orgasms). Somnambulistic sexual behavior and its clinical implications, the role of precipitating factors, diagnostic, treatment, and medico-legal issues are also reviewed. The characteristics of several individuals described in literature including their family/personal history of parasomnia as well as the abnormal behaviors occurring during sleep are reported.

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1. Introduction

The fact that sleep is promptly reversible is probably the most important characteristic which differentiates it from most other states of altered consciousness. Electrophysiological studies in the 1950s demonstrated that there were two main states of sleep, non-rapid eye movement (NREM) and rapid eye movement (REM) sleep. The NREM sleep is recognized by low-frequency and high-amplitude waves, presence of sleep spindles on an electroencephalogram (EEG) recording, and muscle tone reduction. The electrophysiological features of REM sleep are a combination of desynchronized EEG, loss of electromyogram (EMG) activity, and the presence of rapid eye movements. The EEG reflects the intense cortical activity that distinguishes REM from NREM sleep, but its similarity to the EEG of wakefulness also led it to be called “paradoxical” sleep.

The homeostatic sleep drive appears to control NREM rather than REM sleep. Sleep is normally entered through NREM rather than REM sleep in adults with intensification of the homeostatic drive increasing the duration and depth of NREM sleep at the expense of REM. NREM sleep provides time for restorative processes to take place within the central nervous system (CNS) and other parts of the body. Overall, NREM sleep appears to be a state in which energy is conserved enabling both the CNS and other systems to either recover from the activity of the previous episode of wakefulness or to prepare for the next episode. In this sense, NREM, REM sleep, and wakefulness are not mutually exclusive states. The occurrence of states of incomplete awakening from sleep may generate parasomnias (Wills and Garcia, 2002).

2. Parasomnias

Sleep is a vital behavior and occupies approximately one-third of a person’s lifetime. The incidence of both sleep fragmenting disorders and chronic partial sleep deprivation is very high in our society (Bonnet and Arand, 2003), leading to a dramatic surge in the occurrence of sleep complaints and somnolence. There are several types of sleep disorders, one of the most fascinating of which is a category of parasomnias: well described and common nocturnal phenomena defined as “events that occur intermittently or episodically during the night” (Driver and Shapiro, 1993). These undesirable physical or behavioral phenomena may occur in any phase of sleep.

Parasomnias are undesirable behavioral or experiential phenomena which occur during sleep, or during transition from sleep to wakefulness (Mahowald, 2000a,b). These events are manifestations of CNS activation transmitted into skeletal muscle and autonomic nervous system. Parasomnias are considered medical disorders because they may result in injuries, may induce or are induced by sleep disruption, and have adverse health effects and psychosocial consequences. REM sleep behavior disorder (RBD) may herald the onset of a neurodegenerative disorder (Schenk and Mahowald, 1996; Boeve et al., 2001, 2003). RBD is a more recently described parasomnic disorder and is characterized by vigorous motor activity which occurs exclusively during REM sleep (Schenk et al., 1986); it consists of often injurious dream-enactment motor activity associated with vivid dreaming. RBD is more frequent in older adults and in males, its actual prevalence in general population is unknown but is estimated as 0.5% (Ohayon et al., 1997). A subgroup of RBD patients with NREM parasomnias (sleepwalking and sleep terrors) have been reported to have the Parasomnia Overlap Syndrome (Schenck et al., 1997). Overall severe parasomnias are distressing and, in some cases, can be hazardous to the sleeper and his/her bed partner.

Motor parasomnias are complex motor behaviors occurring during NREM sleep, REM sleep, or transitional states. They are classified as either arousal disorders, sleep–wake transition disorders, parasomnias associated with REM sleep, or other parasomnias (ICSD, 2005). Sleepwalking is one of the most frequent parasomnias occurring during NREM sleep, with variable degrees of complexity and duration. Benign forms of NREM arousal parasomnias occur frequently in childhood and attenuate in teenage years; however, they can persist into or begin in adulthood (Szelenberger et al., 2005). Sleepwalking is the end result of an often complex set of predisposing, priming, and precipitating factors (Pressman, 2007).

3. Sexsomnia: atypical sexual behavior during sleep

One of the most intriguing clinical entities of parasomnia is a distinct variant of sleepwalking known as sexsomnia, somnambulistic sexual behavior or “sleepsex” (Buchanan, 1991; Fenwick, 1996; Shapiro et al., 1996, 2003). Recently, Schenck et al. (2007) advocated the use of the terms pertaining to abnormal sleep and sex as sleep-related abnormal sexual behaviors, sexual behavior in sleep, among others. The authors went on to formulate the first classification of sleep-related disorders and abnormal sexual behaviors and experiences. The authors proposed this classification based upon the following rationale: (1) growing awareness that abnormal sexual behaviors can emerge during sleep; (2) expanding set of sleep disorders known to be associated with abnormal sexual behaviors, or misperception of sexual behaviors; (3) the cause of sleepsex can often be identified after clinical and polysomnographic (PSG) evaluations, and can be treated; (4) the forensic
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*Multiple Sleep Latency Testing revealed a mean sleep latency of 3.5 over four naps, three with OSA.*

**Patient reported some of the features of Klein-Levin syndrome (fluctuating appetite and libido and a history of heat stress requiring hospital admission).**

## Posttraumatic stress disorder and major depression.

### Paraphilia (group of psychiatric syndromes primarily characterized by a deviant sexual fantasies, cravings, urges, and/or behaviors — Cannas et al., 2006).

### S: subject; OSA: obstructive sleep apnea; y: young; NA: not applicable; SD: sleep deprivation; PSG: polysomnography.

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aspects of abnormal sleep-related sexual behavior have commanded increasing attention, and finally, (5) new data on periodic hypersomnia, e.g. Kleine–Levin syndrome, including its range and frequency of abnormal sexual behaviors that have recently been published.

The etiology of this parasomnia is not yet elucidated and most afflicted individuals do not seek therapeutic intervention, probably due to ignorance of the condition or embarrassment. Atypical sexual behavior during sleep has rarely been documented; however, because of recent case reports within forensic contexts, more attention has been paid to the matter (Guilleminault et al., 2002). Although there has been increased interest in all aspects of sleep-generating mechanisms and male sexual dysfunction, comprehension of sleep disorders as they relate to sexual behavior is still unclear.

In 2003, Shapiro and colleagues stated that sexsomnia should be considered a distinct entity in the family of parasomnias, since its unique combination of particular activated systems in sleep, namely, specific motor, and autonomic activation supports this view. Nevertheless, it may be quite challenging to distinguish between typical sleepwalking and sexsomnia. The uniqueness of the condition is the involvement of a partner (usually more than a witness). The typical behavior consists of complex autonomic functions, motor activities, and behavioral elements (Shapiro et al., 2003). As pointed out by Ebrahim (2006), sexual behavior in sleep is considered a variant of sleepwalking disorder as the overwhelming majority of people with this disorder have a previous and familiar history of sleepwalking. Of note, the repertoire of sexual behavior during sleep can vary from explicit vocalizations (with sexual content), violent masturbation, and complex sexual activities including oral sex, and vaginal or anal intercourse. In some cases sexual behavior during sleep is associated with injury to subject or his/her bed partner, being considered a special form of violence. Guilleminault et al. (2006) found that NREM sleepwalkers had an increased incidence of harmful behavior compared to patients with RBD. However, Mahowald and Schenck (1995) found that aggressive behavior was commoner in patients with RBD. In 2002, Guilleminault et al., in their series of 12 cases documented with PSG, reported the following diagnosis associated with sexual behavior during sleep: NREM sleep somnambulism, REM sleep behavior disorder, and frontal lobe seizures. As demonstrated in Table 1, previous history of sleepwalking is an underlying feature in most cases. This review presents and examines clinical case reports, court cases, and attempts to assemble the characteristics of a distinct variant of sleepwalking called sexsomnia from the seemingly scarce literature into a coherent theoretical framework.

4. Background

Even though there is scant literature on this subject, there is at least one early report of sexual behavior during sleepwalking. In the Annales d’Hygiène et de Médecine Légale in 1897, Motet described a case of somnambulism and exhibitionism (see Thoinot, 1911). E.D. was arrested outside a public urinal on Rue Saint-Célie, where he had remained for more than half an hour attempting to entice a policeman by exposing his genitals. When he emerged from his state of half stupor, he claimed to remember nothing of the events surrounding his arrest but was convicted to three months’ imprisonment. The case is interesting since it exposes the relationship between mental state, automatic behavior, and sexual offenses in relation to sleep.

5. Physiological genital events during sleep

In 1944, Ohlmeyer and co-workers discovered the occurrence of penile erection cycles during sleep in adult males. Such sleep-related erections (SRE) appeared at 85-min intervals and had an average duration of 25 min (Ohlmeyer et al., 1944). As a result of this initial study, Oswald (1962) noted that erection accompanied some REM periods, but subsequent investigations of Fisher et al. (1965) and Karacan et al. (1966) demonstrated a strong temporal association between the occurrence of erection and REM. Erectile episodes were found to dovetail with over 95% of REM periods while erection was entirely absent during non-rapid eye movement (NREM) sleep, except immediately before and after REM periods (Fisher et al., 1965). Similarly, Karacan et al. (1966) reported that 80% of REM periods displayed this phenomenon although, there were also occasional instances of erection during NREM sleep. While men develop erection in REM sleep, women had vaginal lubrication (Fenwick, 1996).

Penile tumescence cycles in sleep occur in all normal healthy males from birth through adulthood and into old age (Hursch et al., 1972; Karacan et al., 1972a,b; 1976) regardless of the dream content (Hirshkowitz and Moore, 1996). For instance, by studying males from 3 to 79 years, Karacan and co-workers (1978) determined that there is a rapid decrease in total sleeping time throughout the teen years with no significant change from 20 to 50 years of age. Total REM time decreases throughout the preteen and teen years and in subsequent years remains stable at approximately 100 min per night. Total penile tumescence time decreases from age 13 through age 79. Tumescence time during these years is approximately 90 min per night, or 20% of total sleep time. The increase in total penile tumescence time during the prepubertal and very early pubertal years is associated with an increase in NREM-related tumescence as REM decreases. In addition, there is a steady albeit slight decline in REM-related erection from age 20 to the 70s with an associated increase in NREM-related erection. In the 20- to 29-year-old population, the average length of an SRE episode is 38 min, whereas the average length of the SRE episode is 27 min in the 61- to 67-year-old population. Not all SRE episodes are associated with full erection and, in fact, the incidence of partial erections increases during SRE with advancing age (Kessler, 1988).

More challenging to explain is erection during NREM sleep. Somnambulistic episodes occur out of stages 3 and 4 of NREM sleep, and the presence of an erection is not considered exclusion criteria for sleepwalking (Shapiro et al., 2003). Most parasomnia behavior, with or without sexual content, does not occur in slow wave sleep (SWS) but arises out of SWS, suggesting that the presence of erections implies sexual intent. The interpretation of NREM sleep erections is unclear.
Penile erections may also emerge during partial arousals from NREM sleep as a manifestation of emerging wakefulness with sexual arousal. However, it is unlikely that full wakefulness is established, since complete amnesia occurred in all reported cases of sexsomnia (Schenck et al., 2007).

Shapiro and co-workers (2003) made the observation that sexual behavior in sleep may arise from either a dreamlike experience (NREM dreaming) or, perhaps, dreaming with sexual content (a feature of REM sleep). They argue that this recall of dreamlike experience has been associated with NREM sleep parasomnias, and does not imply the occurrence of REM parasomnia. There is evidence that the organization associated with sexual behavior during sleep (as in the cases of DW and KB—Table 1) is different in sleep, but in some cases these behaviors can constitute a replication of patterns seen during wakefulness (e.g. LD).

Nevertheless, according to these authors, sexsomnia and sleepwalking present with distinct clinical features. The main features of sexsomnia often include sexual arousal with autonomic activation (e.g. nocturnal erection, vaginal lubrication, nocturnal emission, dream orgasms ("wet dreams"), sweating, cardiorespiratory response). In particular, ejaculation has been reported in some cases (e.g. case 7—Guillemineau et al., 2002). Sexsomnia without sexual arousal, however, was also reported as in the case of AF, and this may hinder correct diagnosis (Shapiro et al., 2003). A case of GL, a young male army private with a long history of sleepwalking illustrates this point. He was accused of a homosexual assault by caressing his colleague’s genitals. At the court martial, it was stated that at no time during the alleged assault did the defendant have an erection, and the court accepted that it was highly unlikely that a purposeful homosexual assault would take place without the defendant being sexually aroused. The timing of the event, 1 h after going to sleep, was suggestive of an episode occurring in SWS, and the absence of an erection was taken as supportive evidence (Fenwick, 1996). The court martial dismissed the case and the pilot returned to flying duties, as reported by Fenwick (1996).

These cases demonstrate that it is possible, in men, to differentiate between a conscious sexual assault and a somnambulistic automatism. Indeed, sexual assaults are likely to involve sexual arousal with an erection. Notwithstanding, if there is predominant behavior oriented towards the genital areas, there is a greater likelihood for sexsomnia, as opposed to parasomnic activity that is only sporadically and incidentally oriented towards the genital areas.

6. Precipitants of parasomnic behavior

Different trigger factors can precipitate a sleep automatism and should be identified when sexsomnia event occurs. The most common precipitants of a recurrence of parasomnic behavior in adults are stress, sleep deprivation/fragmentation, alcohol or drug consumption, excessive fatigue (tiredness), and physical overactivity in the evening. As pointed out by Schenck and co-workers (2007) precipitating factors for sexsomnia included physical contact with another person in bed (64%), stress (52%), fatigue (41%), alcohol use (14.6%), and drug abuse (4.3%). Moreover, sleep deprivation was another identified risk factor.

6.1. Sleep deprivation

Sleep deprivation per se represents a common type of stress that can lead to physiological consequences (Tufik et al., 1978; Rechtschaffen et al., 1983; Andersen et al., 2004, 2005a,b; Andersen and Tufik, 2006). Chronic insomnia leads to persisting tiredness and frustration due to lack of energy. Respiratory and other medical conditions may be exacerbated in sleep and may have potentially serious complications resulting in reduced life expectancy.

Disturbances in the sleep–wake rhythm and/or sleep deprivation are increasingly frequent due to tribulations of modern life in developed countries (Spiegel et al., 1999). For instance, constant exposure to artificial light and interactive activities, such as television or Internet, are combined with social and economic pressures to shorten the time spent asleep. Since sleep deprivation is reported to increase the frequency of complex behaviors in sleepwalkers (for review see Pressman, 2007), it must be considered as potential precipitating factor.

Many subjects can become chronically sleep deprived as a result of their current life style (Miro et al., 2002; Leibowitz et al., 2006). Of note is a common pattern of irregular sleep–wake schedules, one that restricts sleep during a working week, builds a sleep deficit which is then repaid by longer sleep at weekends resulting in high sleep efficiency, short sleep latency, and an increased duration of stages 3 and 4 NREM sleep. Waking later in the morning, however, causes a phase delay the subsequent day, which is often followed by an early wake-up time at the start of the working week. The duration of sleep is thereby considerably shortened and sleep deprivation resumes (Shneerson, 2000). Despite the fact that sleep deprivation has been cited as one of the major precipitating factor triggering sleepwalking episodes, we found 5 cases occurring in male subjects and one woman presenting with sleep deprivation prior to nocturnal abnormal sexual behavior (see Table 1).

6.2. Sleep fragmentation

Most sleep disorders, such as sleep apnea, periodic leg movements (PLM), restless legs syndrome, jet lag, or insomnia can lead to sleep fragmentation. Parasomnias are associated with high indices of sleep fragmentation such as microarousal, sleep stage shifts, and number of awakenings (Haba–Rubio et al., 2004). An abnormal deep sleep associated with a high SWS fragmentation might be responsible for the occurrence of sleepwalking and sleep terrors (Espa et al., 2000).

NREM sleep parasomnia patients present with higher degree of sleep fragmentation particularly during SWS (Espa et al., 2000; Besset and Espa, 2001). However, few studies have addressed the issue of sleep fragmentation as a trigger of parasomnia attacks. Espa et al. (2002) reported that a great number of arousal reactions in parasomnics are involved in triggering the parasomnia episodes. The authors emphasized the need to rule out potential causes of sleep fragmentation, such as sleep-related breathing disorders in adults with...
arousal-related parasomnia, and suggested the use of esophageal pressure monitoring to better detect respiratory effort events. Similar findings were reported by Guilleminault et al. (2003) in a population of children with sleepwalking. They reported a high frequency of sleep-related breathing disorder among these children, and in their family members. In their series treatment of sleep disordered breathing improved sleepwalking episodes. Another study showed that sleepwalkers presented with a high Cyclic Alternating Pattern (CAP) rate suggesting sleep instability. The authors concluded that subtle sleep disorders associated with chronic sleepwalking constitute the unstable NREM sleep background on which sleepwalking events occur, and that this subtle sleep disorder should be systematically searched for and treated when sleepwalking is associated to abnormal CAP (Guilleminault et al., 2006).

6.3. Alcohol or drug consumption

Drug ingestion, sometimes combined with alcohol, has been suggested as a precipitating factor for sexsomnia (Luchins et al., 1978; Huapaya, 1979; Nadal, 1981). For instance, among a group of seven subjects with sexual behavior in sleep (Shapiro et al., 1996), five had alcohol and/or substance abuse as common precipitants of their sexual parasomnias. The role of alcohol alone has not been firmly established although it was implicated in one third of cases of murder during sleepwalking (Bonkalo, 1974) and it is known that at the time of high alcohol blood levels (or alcohol intoxication), some sleep confusional behavior on awakening might be expected (Ebrahim, 2006).

In the JW case (Buchanan, 1991), further analyzed by Schenck and Mahowald (1998), the forensic psychiatrist testifying for the prosecution claimed that the consumption of alcohol reduced the defendant’s sexual inhibitions and he then engaged in an “opportunistic offence” when a sexual object (inadvertently) presents itself to him. The judge concluded that: “Fleeting disturbances of consciousness which are external to the person’s individual, emotional and psychological make-up do not fall within the concept of a disease of the mind. The evidence is that this episode was triggered by external causes”.

The “external causes” were alcohol, stress, and sleep deprivation. In fact, JW had engaged in at least two sleepwalking episodes in the context of excessive alcohol consumption (one during the night before his wedding in which he urinated next to his sister bed, and the night he was charged with child sexual misconduct). Schenck and Mahowald (1998) argued that the court could have called more attention to the issue of excessive alcohol consumption, since it played a central role in the sequence of events that resulted in criminal misconduct, and since it should have played a more relevant role in determining whether the defendant’s sleepwalking posed a “continuing danger”. Recommendation for clinical consultation either in regard to possible alcohol abuse or to his childhood-onset history of sleepwalking should have been provided (Fenwick, 1996). Furthermore, it is advisable that adults or teenagers with NREM sleep parasomnias be informed of the risks of co-sleeping, including with minors, especially after drinking alcohol or after sleep deprivation (Schenck et al., 2007).

6.4. Stress

Stress seems to be an important trigger in some cases. Indeed, for one patient, fatigue and interpersonal tension appeared to precede each somnambulistic episode. Stress should be carefully distinguished from psychological disorders, such as depression and anxiety. In 2003, Lecendreux et al. identified stressful life events in 55.5% of their subject group that preceded the occurrence of sleepwalking. As pointed out by Pressman (2007), the stressful life events included family conflicts, work-related problems, and changes in sleep environment. For instance, AF (32 years old) was referred to the sleep clinic after having been accused of sexually assaulting a young girl. His sleep history was significant for sleep talking and, one occasion, sleepwalking, in addition to a family history of parasomnia. After a traumatic personal loss (AF had to identify his father’s crushed body) and initiation of excessive use of alcohol, his behavior changed (Shapiro et al., 2003). Mr. F was acquitted on the charge of sexual assault.

7. Medico-legal issues

It is not unusual that after an all-night party single people sleep over at a friend’s house, but, it has now become socially acceptable, in some cultures, for men and women to sleep together in the same room and even in the same bed, even if they have not known each other well (Fenwick, 1996). Thus, it is not surprising that an increasing number of criminal cases are coming before the courts where the interaction of sexual behavior and sleep is reported to have led to an offence, usually rape of or sexual misconduct with a child. In our review, sleepsex was far more injurious to the bed partner than to the person affected with parasomnia, although adverse psychosocial consequences were quite common in both patients and bed partners. Sequelae may also be accompanied by reactive emotional distancing that may lead to some marital estrangement with marriage counseling sometimes being sought (Schenck et al., 2007).

A crime committed during sleep is regarded in law as an automatism, the accepted legal definition of which was given by Viscount Kilmuir in the House of Lords appeal in the case of Bratty vs. Attorney General of Northern Ireland (Bratty, 1961). Viscount Kilmuir described an automatism as “the state of a person who, though capable of action, is not conscious of what he is doing….” In other words it means unconscious, involuntary action (see Buchanan, 1991).

In the analysis of JW case of sexual misconduct with a child by Schenck and Mahowald (1998), the authors raised the issue of whether a sleepwalker with episodes provoked by alcohol excess should be held legally responsible for his behavior during alcohol-provoked sleepwalking events.

A different category of sleep-related offences are alleged rapes or sexual assaults in which the assailant is awake and the victim is asleep (cases 6 and 7—Fenwick, 1996, as depicted in Table 1). A conviction of rape will be likely if the defendant admits that the victim was unquestionably asleep and did not wake up during intercourse (alcohol consumption or use of drugs should also be considered). If the intercourse took place in stages 3 or 4 of NREM sleep then there is a possibility that
the victim may not arouse. A more complex condition exists when the defendant claims that the victim was not asleep and the victim had indicated consent or consent was implied (e.g., the victim was sleep talking accompanied or not by eye-opening and closing, body movements, spontaneous tongue movements). All these phenomena are compatible with automatic sexual movements during sleep, and therefore the case may focus on the victim’s response to the assailant’s approaches. If consent could reasonably have been assumed to be given by the victim, then the sexual act would not constitute a rape (Fenwick, 1996).

As pointed out by Fenwick (1996), it would first be necessary to establish that the victim would not have wanted the sexual contact when awake. If it is clear that she/he would not have done so, then the deliberation of rape will turn to whether the victim was actually asleep, and secondly to the details of the assailant’s behavior and the behavioral responses of the victim. In addition it will depend on whether the victim’s behavioral responses are part of a sleep repertoire and could have been carried out during sleep. To assist in the determination of sleepwalking, the following criteria are generally regarded as essential for a diagnosis in the forensic context (for review Fenwick, 1996; Ebrahim, 2006 and references therein): General factors (family history, childhood sleepwalking, adolescent sleepwalking, and late onset sleepwalking) and specific factors (sleep stage, disorientation on awakening, confusional/automatic behavior, amnesia, trigger factors, and out of character behavior). Thus, this kind of parasomnia may lead to a variety of medico-legal consequences, all of which bringing moral and psychological damage. Cases of sleep-related sexual abuse of children typically have even more drastic long-lasting consequences.

8. Diagnostic aspects

The history must include detailed description of the event and the degree of amnesia, current, past medical, as well as family history. Moreover, it should elicit presence of previously mentioned potential risk factors such as alcohol, drug or medication intake, sleep deprivation, stressful life event, anxiety, etc. prior to parasomnic episode. It is also recommended that social habits, employment records, and determination of the frequency of violence and its stereotypic nature are investigated. A collateral history from the spouse, bed partner, or family member is also helpful and should include: report of the event and prior events; timing of the event during sleep; frequency of events over time; age of onset; associated life events or traumas; degree of amnesia observed; and attitude of the subject when fully awake after the event. Finally, signs of febrile illness must be obtained (Guilleminault, AASM – Medsleep www.aasmnet.org).

A careful psychiatric evaluation is needed, because disassociative states and early dementia can be associated with abnormal behavior during the night (Guilleminault et al., 1998). In some cases repeated PSG recordings are necessary, sometimes even home recordings, in order to monitor the event. PSG is usually performed with additional EEG channels (minimum of 4 channels) and video monitoring (Plazzi et al., 2005; Derry et al., 2006). The evaluation of the test should rule out presence of: epileptic disorder; sleep-disordered breathing, narcolepsy, PLM; REM behavior disorder; or NREM sleep parasomnia. In fact, as reported by a recent review and other case series, sleepsex was rarely the only parasomnia behavior in the longitudinal histories of these patients (Schenck et al., 2007).

Sleep structure is usually normal, but an increase in arousals during SWS, and sudden arousals from SWS are frequently seen in sleepwalkers PSG (Espa et al., 2000). During the attack, the EEG is typically covered by movement artifacts, but in some cases it is possible to identify mixed high amplitude slow waves, slow alpha, and theta waves without evidence of wakefulness, between these artifacts (Zadra et al., 2004). The subject is usually in stages 3 or 4, more rarely in stage 2 NREM sleep, preceding the onset of the abnormal behavior (Zadra et al., 2004). A burst of hypersynchronous high amplitude delta waves may be seen in the seconds preceding the abnormal movement, persisting during the initial part of the activity (Ebrahim et al., 2005; Pilon et al., 2006), although, it has recently been considered as a non-specific finding (Szelenberger et al., 2005).

When diagnosis is difficult to obtain, some maneuvers can be applied to precipitate the sleepwalking episodes’, such as: prior sleep deprivation, arousing subject during SWS, or using alcohol prior to bedtime. Finally, other tests that may be useful in diagnostic screening include: actigraphy, multiple sleep latency test, and repeated nocturnal EEG recording at home (Guilleminault, AASM online).

9. Treatment

Safety precautions and good general sleep hygiene measures are recommended for individuals with a parasomnia (Wills and Garcia, 2002). When associated syndromes are recognized, their specific treatment is also a priority. Of note, patients with parasomnias, sleep apnea, and restless legs syndrome should be questioned (with their bed partners) about any associated sleepsex, as pointed by Schenck and co-workers (2007). Most primary motor parasomnia cases reported in the literature show a positive therapeutical response to benzodiazepines. Most disorders of arousal, such as sleepwalking, respond especially well to clonazepam (Remulla and Guilleminault, 2004), making it a good first line of therapy for these cases of “sexsomnia”. The usual recommended dosage ranges from 0.5 to 2.0 mg at bedtime.

Antidepressant medication such as sertraline or GABAergic agents such as valproic acid and lamotrigine may also be used. However, many reported cases of sexsomnia do not have a description of treatment or its effectiveness. In cases associated with other sleep disorders, such as sleep-related breathing disorders, the treatment should be aimed at the main disorder. A case of a patient who had severe obstructive sleep apnea syndrome and a history of inappropriate sexual behavior during sleep which was abolished after tracheotomy has been described (Hurwitz et al., 1989). Sleep hygiene measures should also be applied by patients, since disorganization of sleep/wake schedule was pointed out by Moldofsky et al. (1995), as precipitating factor for increasing parasomnia attacks.
Since alcohol, drugs, stress, and sleep deprivation may trigger the episodes, the patient should be informed and carefully guided to avoid these factors. Stress management programs or psychotherapy may be helpful particularly if there is anxiety, depression, or other psychiatric conditions which may be associated with the sleep disturbance. It is known that sleep fragmentation, partial cumulative sleep deprivation, and total sleep deprivation in normal controls result in a significant increase in SWS when sleep is permitted to return to normal (see Pressman, 2007), supporting the assumption that parasomnias may increase in frequency after an abnormal sleep condition.

10. Final considerations

In the last few decades, we have experienced a remarkable increase in knowledge about human behavior during sleep, and about how sleep disorders (e.g. parasomnias) can emerge or be induced. We have also improved our diagnostic skills and treatment options of these disorders. Reports describing sexual activity of sleeping humans are still rather infrequent and the etiology of this peculiar sleep disorder is still obscure. It is not clear if this constitutes a new clinical entity of parasomnias, and indeed a new disorder (see Schenck et al., 2007). Moreover, sexsomnia is often a longstanding disorder that carries major adverse physical, psychosocial, and legal consequences. We anticipate that this condition is currently underreported.

It has been shown in the case series presented here that somnambulism associated with sleep sex is predominantly a male disorder. The basis for the male predominance in the reported cases of sexsomnia is not known (Schenck et al., 2007). If sexsomnia is similar in etiology to other NREM parasomnias such as somnambulism then perhaps the infrequency of female somnambulistic behavior is related to the fact that female genital exhibitionism and voyeurism are also unusual occurrences. Females almost exclusively engaged in masturbation and sexual vocalizations, whereas males commonly engaged in sexual fondling and sexual intercourse with females (Schenck et al., 2007). This may be due, not only to cultural and social factors, but also to relative sex differences.

All cases of suspected sexsomnia should be thoroughly evaluated with particular attention to the high-risk behaviors known to precipitate sleepwalking, such as sleep deprivation, drug abuse, alcohol, and stress. This report is in agreement with previous literature showing that violent behavior during sleep is more frequent in males (Moldofsky et al., 1995; Mahowald and Schenck, 1995; Ohayon et al., 1997; Schenck et al., 2007).

As there is an increasing proportion of sleep deprived adults as well as teenagers, special attention should be paid to the consequences of sleep loss. In the older population, sleep fragmentation and sleep respiratory disorders (e.g. sleep apnea) are very prevalent and have been described to precipitate sexsomnia in subjects with previous history of somnambulism. Shapiro and colleagues (2003) recommended that the bed-partner be present during the full PSG assessment. Since the incidence of parasomnic events is generally lower in the clinical setting (Mahowald, 2000a,b), the finding of a sexual behavior during sleep is rarely confirmed in the laboratory. In Shapiro’s study (2003), a PSG and video surveillance demonstrated that LD initiated sexual foreplay with his wife, which then led to intercourse. The PSG revealed that LD was “drifting” between stage 1 and wakefulness.

In summary, this sleep disorder should receive more attention. This condition appears to be underrecognized and it is suggested that questions about sleep and sex be included in the clinical evaluation of suspected parasomnias. Physicians assessing these cases should have a complete understanding of sleep physiology, behavior, and disorders. This unfortunate condition brings about not only personal, marital, and familiar turmoil, but frequently results in medico-legal consequences.

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