

Controversy

Sleep-related violence: does the polysomnogram help establish the diagnosis?

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Abstract

With the growing number of legal cases of sleep-related violence coming to public attention, and the development of sleep medicine as an area of expertise, sleep clinicians are being turned to for help in discriminating those violent individuals who sustain a diagnosis of adult parasomnia of the arousal disorder type, (sleep walking, 307.46-0, sleep terrors 307.46-1, or confusional arousals 307.46-2) according to the International Classification of Sleep Disorders (The International Classification of Sleep Disorders: revised: diagnostic and coding manual. Rochester MN, American Sleep Disorders Association, 1997) from those whose episode of violence may have been carried out with full waking consciousness, or as the result of an impairment of judgement due to some psychiatric or neurological disorder. Clearly there is need to refine the diagnostic characteristics to resolve some of the contradictory descriptions of this disorder in the present literature. There is also the question whether the classical overnight polysomnogram is helpful in making this differential diagnosis, and if so, how should it be done to be maximally useful and what other testing is indicated. © 2000 Elsevier Science B.V. All rights reserved.

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1. Prevalence of sleep-related violence in adults

Recent reports of serious episodes of violent behavior arising from sleep have changed the perception of these from being exceedingly rare occurrences to a disorder with a wide range of night to night frequency and of severity. Crisp [1] refers to the sleep walking/night terror syndrome in adults as a 'closet disorder.' Certainly many who have committed a violent, sleep-related act have had previous episodes of sleep walking or night terrors, which either they were not aware of or did not think were cause for seeking help. Although the total number of murder cases brought to trial in which the defence of sleep walking has been invoked is not large, (the present estimate based on a

search of the forensic literature is sixty-eight), Ohayon et al. [2] report that the rate of those experiencing current episodes of sleep-related violence in the general population is 2%. This is based on their epidemiological study of a sample of almost 5000 surveyed by telephone in the UK. This is an important study as it is the first based on a large, non-clinical sample. The characteristics they found that distinguish the 106 subjects reporting violent behaviors in sleep (VBS) from the 4866 who do not (non-VBS), agree very well with the results from the large clinical samples comparing violent to non-violent sleep walkers in major sleep disorder centers. Schenck et al. [3] have reported on 100 cases, Guilleminault et al. [4] describe 41 patients, Moldofsky et al. [5] 64 and in our own laboratory 29 patients with violence during arousals from the first hour of sleep have been studied over the last 20 years. The acts that bring patients to seek

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some help range from relatively benign acts, such as punching the mattress and pillows or knocking the furniture about, to serious self-injury or attempted or completed murder of another.

2. Patient characteristics

The general agreement among all of these studies with the findings reported in the Ohayon article [2] are, that sleep-related violence is more common in males than females, with patients most often falling between the ages of 15 and 44. These people also experience other parasomnias such as night terrors, sleep talking, and bruxism. Seventy-one per cent of those with self-reported violence in the Ohayon study also report limb jerking. Patients frequently have nocturnal enuresis in their history as well.

Sleep laboratory studies confirm that patients show some instability of sleep with arousals occurring during the first hour of sleep, prior to the first REM period. Usually this is seen as repetitive arousals from the first delta sleep, (Stage 3/4) although in some cases arousals may occur out of Stage 2 as well. The hypnograms of these patients show not only the difficulty sustaining uninterrupted periods of deep sleep but that they frequently continue to have attempts to enter delta persisting into the later hours of the night. However this late night delta seldom results in a parasomnia event. After a sleep walk or terror attack with some aggression the patient may go back to sleep and have no memory for the event in the morning. If they do awaken at the time they do not recall any awareness of prior dream content. They may have some vague impression of a threat to themselves or to a loved one that accounts for the attack or rescue behaviors. One of our patients pulled his bed partner out of bed by her hair thinking the bed was on fire; another pulled the frame off a window thinking his sister and brother-in-law were trapped within. Others have reported having a sensation of suffocation. Several of our patients have rushed to or through a window with resulting injury. This lead to the suggestion that they may be hypoxic. There are reports of some apneic patients having episodes of sleep-related violence (Pressman et al. [6], Nofzinger et al. [7]). Ohayon et al. [2] found apnea to be a risk factor for

sleep violence only when this was accompanied by an anxiety or mood disorder.

3. Emergency behaviors

The acts of violence towards others reported by our patients include a young man who broke his mother's arm by hitting her repeatedly with a baseball bat. Another slashed his wife with a knife. A third threw an open scissors at his wife, and when she ran out of the house to escape him, he chased her to the garage and kicked in the door with his bare feet. Another man choked his wife to death following an abrupt arousal when she jumped on him playfully while he lay sleeping. Although this case raised some doubt due to his full awareness immediately after the attack and some suggestion of motivation involved. There have been drownings and shooting deaths as well. Despite all of this aggression, there are several well documented incongruities related to this behavior: 1. The people carrying out these acts are usually described as very nice people. They are rather unemotional during waking, and may be models of loving sons, husbands and good fathers. This brings up one of the areas of controversy about this disorder in the current literature: whether or not there is underlying psychopathology responsible for the incidents of adult sleep-related violence. 2. The second peculiarity to which we must turn our attention is that the person attacked is not usually one with whom there is any ongoing conflict. They may be, in fact, as one man said of the wife he stabbed 44 times, 'the only woman I ever loved and my best friend'. Bonkalo [8] who set out the criteria for this disorder, states that the target is anyone who is unlucky enough to be present. This brings up the second area of disagreement in the literature, the question of motivation for the attack: why do they do it? Is this purely a fight or flight emergency response to some internal or external danger signal or is it the acting out of some repressed impulse? The resemblance of these events to an emergency response comes from the subjects' own sense of danger, the enormous, and uncharacteristic strength exhibited during these attacks, and the analgesia to pain at the time. 3. The behavior is not necessarily of the short, poorly co-ordinated type descriptive of childhood sleepwalkers. It may be prolonged and motorically

quite complex, such as driving a fair distance as Ken Parks did (Broughton et al. [9] Cartwright and Lamberg [10]) prior to the murder of his mother-in-law. The Phoenix man recently convicted walked to his garage, changed into work clothes and set about trying to repair his pool motor, before stabbing the wife who interrupted him. It seems that in these and many other cases, spatial orientation and fine motor coordination are intact, yet there is no facial recognition at the time and no memory of the event. Consistently there is 'perplexity and remorse' as Bonkalo [8] puts it, when they are made aware of what they have done. They have no explanation for it and difficulty at first accepting that it was they who were responsible. Once they do, they are tremendously saddened, and guilt-ridden. What seems clear is that the visual pathway that terminates in the parietal lobes and controls visually guided movement is functioning normally but the visual pathway that terminates in the temporal lobe that adds the semantic and affective meaning to what is seen is not operational. Many authors have stated this is a disorder in which part of the brain is still asleep and part is awake. This difference in the functioning of the two aspects of visual system is one place where this is true. Other senses are also apparently turned off during an episode and return only slowly to full waking levels. Pain perception for self-inflicted wounds or those incurred in a struggle with another person is often delayed as it may also be in waking during periods of extreme stress. Auditory perception is also shut down. Although a buzzer has been used to stimulate an episode during a laboratory evaluation, during an act of violence patients have not responded to the cries of their victim or voices calling to them. Nor does cold water wake them up. The higher executive functions of reasoning and planning are clearly not working and the profound amnesia points to a block in memory formation. 4. Where does this behavior come from? If we believe the mind is never turned off completely, that it just shifts between activation and quiescence in different areas in the waking, non-REM and REM states, what accounts for this eruption into an arousal disorder when sleep should be at its deepest? Again there is a good consensus that there is likely a genetic flaw involved in the familial parasomnias making the mechanism that switches between deep non-REM to REM sleep vulnerable to disruption. Hublin et al. [11]

using the Finnish Twin Cohort conclude that there is a substantial genetic effect in sleepwalking in both children and adults but that environmental factors are also implicated. Lecendreux et al. [12] have identified a human leukocyte antigen (HLA) class II association in sleep walkers with 15 out of 26 having DQB1*05 positive which was found significantly more often in this group than in ethnically matched controls (11 out of 39).

4. Sleep characteristics

Among the 'environmental factors' that make this behavior more likely to occur are sleep disruption secondary to stressful events and prior sleep deprivation. Joncas et al. [13] have demonstrated this in the laboratory. They used sleep deprivation of 36–40 h as a probe in a small group of adult sleepwalkers and controls. They found the sleep walkers had increases in the frequency and the complexity of their events on a recovery night of sleep relative to baseline sleep, and that control subjects showed no such behavioral episodes. These two new studies, although still preliminary, give us hope for more sensitive techniques to aid in the diagnosis than presently exist.

Previously, the presence of hypersynchronous delta prior to an arousal from slow wave sleep had been implicated as a possible diagnostic sign of a parasomnia (Blatt et al. [14]). Guilleminault et al. [4] found this sign to be present in only seven of their 41 patients. Similarly, Schenck et al. [15] failed to find 'delta wave build-up' prior to a slow wave sleep arousal in their sample of 38 adults with injurious sleep walking and sleep terrors. In re-scoring the sleep studies conducted many months after the attack by the Phoenix man on his wife I found only three episodes of hypersynchronous delta prior to an arousal over 4 nights of recorded sleep. In contrast Pressman [16] reports that episodes of hypersynchronous delta bursts (two or more maximum amplitude delta waves within 10 s prior to an arousal) are common in patients being evaluated for sleep apnea. These typically followed a snore or an hypopnea although none had a history of sleepwalking or sleep terrors. This electroencephalograph (EEG) characteristic does not appear to be a sensitive or specific diagnostic sign.

5. The diagnostic work-up

How then should these patients be worked up? What should the protocol be for a sleep evaluation and what other information should the sleep clinician seek before making the diagnosis in cases of sleep-related violence? All the evidence we have reviewed points to this being a multifactorial disorder. There is little controversy about the role of a biological vulnerability to this disorder of arousal. Genetic studies of the patients and their families will no doubt clarify this further. Where possible, relatives should be interviewed about their own and the patient's childhood history of sleep walking, and sleep terrors attempting to establish how soon after sleep onset these have occurred, the presence of any dream reports at the time, and the degree of amnesia for the events. All of this is suggestive of a disorder of arousal but not definitive.

Personality testing and psychiatric examinations to determine whether there is a current psychiatric diagnosis and any history of anxiety or mood disorder may be helpful although the patient's state following such an event may not accurately reflect their pre-event status. Interviews to gather information about the circumstances of the person's life prior to the episode are often illuminating. Acts of violence usually follow periods of poor sleep, whether these are due to the sleep interruption effects of a sleep-related breathing disorder, or insomnia related to anxiety such as Ken Parks experienced over his gambling debts, and the Phoenix sleepwalker had in connection with a work crisis, a history of disrupted night sleep, followed by a 'crash' into a recovery sleep is also supportive of the likelihood of the diagnosis. Finding a personality pattern that is well within normal limits on a Minnesota Multiphasic Personality Inventory (MMPI) is not unusual. Subtle signs of over-control of emotion and excessive conformity are also found. These are often people who do not express feelings easily and are likely to 'go it alone' when in trouble. Carrying troubles to bed makes for difficulty sleeping. Once deprivation of delta sleep has persisted it is likely to assert itself. If this occurs in a person with some inherent difficulty switching from delta to REM sleep an event may well be triggered.

A neurological examination and testing to rule out a seizure disorder or other neurological pathology is

useful prior to the polysomnograms. A medical history including past and present use of medication as well as alcohol and other substances is important. Night time alcohol increases snoring and breathing disorders and several cases of violence have followed the use of some illegal substance. A drug screen should precede sleep studies.

The question of how many nights should be run in the laboratory and whether there should be prior sleep deprivation, or attempts to stimulate an episode during delta sleep all point up the need for a standardized protocol to be established for the evaluation of these patients. There are presently no uniform guidelines. As a result there is difficulty in comparing studies and results from lab to lab. What seems sensible at this time is to run one or two diagnostic nights to rule out sleep apnea, periodic leg movements, nocturnal seizures, and REM sleep Behavior disorder, keeping in mind that snoring and minor episodes of hypopnea have led to delta arousals, and that there are overlapping cases of delta arousal sleep-related violence and RBD, as well as arousals from Stage 2 sleep. Since sleep deprivation appears to be an exacerbating factor, a period of 36 h of no sleep with actigraphy to monitor compliance, might be the next step. The question of whether sound stimulation should be employed is debatable. I have not found that either calling their name or using a tone has led to any abnormal arousal behaviors during polysomnography.

What cries out is the need to examine sleep-related violence as a stress disorder. It differs from Post Traumatic Stress Disorder in the absence of waking symptoms and of nightmares, as these patients have their arousal prior to REM sleep. When the violence is immediate, they do appear to have been startled out of sleep, and to be responding to a heightened sense of threat resulting in a fight or flight response or attempt to rescue another person from some impending disaster. There is another presentation, however, a delayed startle response. This was what happened to Ken Parks, who took a long uneventful drive while alone before the attack on his mother-in-law and to the Phoenix sleep-walker who arose from bed, walked out to the backyard pool and worked on the defective pool motor for a time before his wife came out to the area. Both men were engaged in doing something they had intended to do next day that their wives had

requested, visit the in-laws, fix the pool motor. The violence only came when they were interrupted in that task. Both experienced slow recovery of full consciousness following the attack and were without memory of the whole incident. These are the cases that raise the question of motivation. Was there underlying (unconscious) hostility involved? I do not find it necessary to invoke this construct when there is a documented period of prior sleep deprivation, in a person who is biologically vulnerable to delta arousal disorders, and who is presently experiencing a heightened level of pre-sleep anxiety. Perhaps if they had been able to get through the first hour of sleep and into REM sleep, with the protection of the muscle atonia, the disturbed affect might have been safely discharged in a dream. It is for this reason that psychotherapy as well as a pharmacological treatment appears to work well in some cases. With the help of clonazepam [17] they can get through the first delta period without arousal. Psychotherapy aimed at helping them develop ways to express affect in waking and to attend to their dream issues has proved to be protective in several of our own cases [18]. Others have used hypnosis to good effect [19] with the post-hypnotic suggestion for an awakening to full consciousness whenever their feet ‘hit the floor’[20].

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