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Does Sleep Hold the Key to treat Parkinson's Disease?

REM sleep behavior disorder is a very interesting disorder of REM sleep. In a nutshell, patients with this disorder act out their dreams. Frequently the bed partner may discover that the actions witnessed may correlate relatively well with what the patient later describes as what was occurring in the dream. These movements can be somewhat abrupt and even violent and may even result in injury to himself or his bed partner. REM sleep behavior disorder may be seen in patients with neurodegenerative disorders such as Parkinson's disease.[1]

The hallmark symptoms of Parkinson's disease are bradykinesia, rigidity and resting tremor. A study of 93 consecutive patients with REM sleep behavior disorder seen at the Mayo Sleep Disorders Center between January 1, 1991 and July 31, 1995 demonstrated some elucidating demographic statistics of patients with REM sleep behavior disorder. In this study, 81 patients (87%) were male. The mean age of REM sleep behavior disorder onset was 60.9 years (range 36-84 years) and the mean age at presentation was 64.4 years (37-85 years). During episodes of REM sleep behavior disorder, 32% of the patients had injured themselves and 64% had assaulted their spouses. In these cases dream content frequently involved defense of the sleeper against attack (87% of episodes). Neurological disorders were present in 57% of patients; the most common being Parkinson's disease, dementia without parkinsonism and multiple system atrophy. A very important note is that REM sleep behavior disorder developed before parkinsonism in 52% of the patients with Parkinson's disease. Interestingly, 5 of the 14 patients with multiple system atrophy were female, indicating that the usual male predominance in REM sleep behavior disorder is less evident in this condition.[2]

Normal subjects do not act out their dreams during REM sleep, and awake patients with Parkinson's disease do not move normally. However, an incredibly thought provoking study of patients with Parkinson's disease with REM sleep behavior disorder demonstrated that the movements seen during an episode of acting out a dream may actually appear to be relatively normal, at least in the sense of not demonstrating the expected tremor, rigidity, and bradykinesia that define the motor movements of this disorder during wakefulness. This amazing study entailed the evaluation of motor improvement as determined by each patient's bed partner as the patient acted out a dream during polysomnographically determined REM sleep. All 53 (100%) of the bed partners reported an improvement of at least one component of motor control during the REM sleep behavior disorder episodes in these patients. By history, movements were improved in 87% patients (faster, 87%; stronger, 87%; smoother, 51%), speech was better in 77% patients (more intelligible, 77%; louder, 38%; better articulated, 57%) and facial expression was normalized in 47% patients. 38% of bed partners reported that movements were 'much better', even in the most disabled patients. The video-monitored purposeful movements in REM sleep were also surprisingly fast, ample, coordinated and symmetrical, without obvious sign of parkinsonism. The movements were, however, jerky, violent and often repetitive. While all patients had asymmetrical parkinsonism while awake, most of the time they used the more disabled arm, hand and leg during the enacted dream. Movements involved the upper limbs and the face six times as often as the lower limbs. The authors proposed a possible explanation in that parkinsonism may disappear during REM sleep through a disconnect between pyramidal and extrapyramidal systems.[3] The pyramidal motor pathway is the main motor pathway used during volitional movement through the corticospinal system. Extrapyramidal motor pathways are thought to be more primitive and are used in reflexive actions such as turning suddenly in the direction of a sudden loud noise or a sudden flash of light. This type of motor movement is enabled through brainstem reflex mechanisms and conveyed by the reticulospinal tract.

It is at least conceivable that this observation may possibly some day lead to the utilization of such pathways during wakefulness, thus perhaps restoring an improved motor state of decreased motor rigidity, tremor, and bradykinesia so commonly seen in patients with Parkinson's disease. The most obvious possible intervention that would at least have the potential of disabling certain motor pathways while enabling others would be deep brain stimulation. Deep brain stimulation in patients with Parkinson's disease today frequently involves stimulation of either the internal globus pallidus or the subthalamic nucleus. It is unclear as to what the optimum location for the deep brain stimulation electrode would be in hopes of mimicking the improvement described in this study. Does a closer look at REM sleep behavior disorder in these patients hold the key to unlock their true motor potential? Only time will tell…

1 Neurol Neurochir Pol. 2005 Sep-Oct;39(5):380-8.
2 Brain. 2000 Feb;123 (Pt 2):331-9.
3 Brain. 2007 Feb;130(Pt 2):450-6.