Delayed Sleep Phase Type Sleep Disorder and Chronotherapy

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Abstract

Delayed sleep phase type sleep disorder is a circadian rhythm disorder that results in symptoms of sleep-onset insomnia and difficulty awakening at a desired time. Patients with delayed sleep phase-type sleep disorder can be treated with chronotherapy, light therapy, vitamin B12, or melatonin. Chronotherapy is a behavioral technique in which sleep time is systematically delayed. Herein we report a 48-year-old woman that presented with delayed sleep onset and describe chronotherapy as a treatment approach.

Key Words: Delayed sleep phase type sleep disorder, circadian rhythm, chronotherapy

INTRODUCTION

Coherence between biological and social rhythms in humans plays an important role in determining interpersonal interactions and behavior. Problems in behavioral and social domains, and physical health may arise when the 2 rhythms are discordant. Individuals with circadian rhythm sleep disorders are more likely to suffer from psychiatric disorders, depression being primary; conversely, some psychiatric disorders produce a variety of circadian changes.

Circadian rhythm sleep disorders are very well defined in psychiatric classification systems. Circadian rhythm sleep disorders in DSM IV-TR include delayed sleep phase type sleep disorder (DSPTSD), shift work type sleep disorder, jet lag type sleep disorder, and undefined type.

In DSPTSD cases there is a constant pattern of falling asleep and waking up later than desired. The disorder, which was first identified in 1979 (Weitzman et al., 1979), is characterized by a delayed rhythm, which seems like sleep onset insomnia followed by late awakening. The lag in the sleep and wake rhythm in this disorder also manifests itself in the measurement of endogenous circadian rhythms (such as body temperature and plasma melatonin levels). People with this condition are generally chronically sleep deprived and experience drowsiness during the daytime, while they are wakeful during the night. Consequently, people with DSPTSD experience problems in their professional and social relationships.

The disorder usually begins between late childhood and early adulthood. The prevalence among adolescents is 7% (Regestein and Pavlova, 1995) and 0.17%-0.7% among adults (Schrader et al., 1993; Ando et al., 1995). Anamneses of patients frequently show an episodic progression and unsuccessful treatments. Joseph-Vandenpool et al. (1988) revised the definition of DSPTSD and added 3 more measures: 1) Impaired functionality in social and occupational domains due to the sleep pattern; 2) Unsuccessful attempts to regulate sleep-wake times; 3) Difficulty maintaining a state of wakefulness in the morning.

The pathophysiology of DSPTSD has not been elucidated, but many investigators identify dysfunction of homeostatic mechanisms that regulate the endogenous circadian rhythm as the cause. Melatonin secreted by the pineal gland regulates the circadian rhythm and body temperature. Administration of melatonin in the evening causes the sleep phase to advance, while it delays
the sleep phase when administered early in the morning (Okawa and Uchiyama, 2007). Studies report the importance of human period 3 gene and 3111 CLOCK gene polymorphisms in the development of DSPTSD (Ebisawa et al., 2001; Iwase et al., 2002; Hamet and Tremblay, 2006).

The most widely used treatment options for DSPTSD include phototherapy or bright light therapy, melatonin administration, B12 administration, and chronotherapy (Dagan, 2002).

It is known that exposure to bright light affects circadian sleep phases. It was reported that a weeklong therapy regimen consisting of exposure to bright light (2500 lux) for 2 hours between 06:00 and 09:00, and avoidance of bright light during afternoons and evenings could facilitate earlier sleep onset (Rosenthal et al., 1990).

Chronotherapy is a behavioral technique that systematically alters sleep time. In this way a biological rhythm of more than 24 hours is achieved. For instance, a person who falls asleep at 13:00 and wakes up after 10 hours is told to go to sleep at 16:00 the following day, and again wake up again after 10 hours. The sleep time is shifted until the person's actual sleep time and the desired time coincide. The current paper describes the case of a patient with DSPTSD and the use of chronotherapy.

CASE

Patient A was a 48-year-old married female and retired teacher. She sought medical assistance for complaints about the negative affects irregular sleep-wakefulness patterns were having on her family and social relationships, which had been ongoing for the last 25 years. She reported using sertraline 50 mg/day since she was diagnosed for depression 1 year earlier and that the severity of her depressive symptoms did not show seasonal variation. She expressed a loss of interest and desire, fatigue, and sleep problems as her primary concerns. The patient's history revealed that she received unsuccessful antidepressant treatment, including citalopram, venlafaxine, and fluoxetine, even though the doses and duration of administration were known to be generally effective. She also reported that her difficulty falling asleep at night and waking up in the morning began before her symptoms of depression, and that her sleep disorder had been present for about 25 years.

It was learned during the clinical interview that her regular bedtime was 0500 and the time she used to wake up was 1500. She reported that even though she went to bed earlier than the reported bed time, she could not fall asleep and had trouble waking up before her usual hour. It was understood that the delay in wake time and starting the day caused her serious problems with her daily activities and personal relationships.

The patient was asked to complete a 1-week sleep diary and the Pittsburgh Sleep Quality Index (Ağargun et al., 1996). According to the Pittsburgh Sleep Quality Index, the time between when she goes to bed and falls asleep (sleep latency) is about 120 minutes, and that she sleeps for approximately 10 hours. She evaluated her subjective sleep quality as very bad.

The patient was asked to keep a record of the times she goes to sleep and wakes up on the sleep diary chart. The chart she completed showed a profound backwards shift in her sleep time (Figure I).

The Clinical Global Impression Scale (Guy 1976), which broadly assesses the severity of the mental disorders and the alleviation of symptoms, was administered to the patient. She scored 5 points, which classified her condition as markedly ill. Clinicians that choose to use this scale evaluate, the disorder and its severity, and the alleviation of symptoms using a 7-point Likert-type scale, as well as the guidance of their knowledge and experience.

The patient scored 28 points on the Morningness-Eveningness Scale (Ağargun et al., 2003). This result suggested that the patient obviously fit the description of evening type. Definitions of morning and evening types enable determination of the time of day at which a person's physical and psychological performance are at their best, and it indicates their preferences in other areas, such as sleep and wake times.

Antidepressant drug treatment with sertraline 50 mg/day, which she had been taking for 1 year was not altered and she was asked to continue taking the medication during the 2-week-long chronotherapy procedure.

The Chronotherapy Protocol:

During an informative interview the patient was queried about her current sleep regime and sleep disorder, and the sleep diary she kept for 1 week to record her sleep-wake rhythm was reviewed.

She was informed that her sleep and wake times would purposely be delayed, because however paradoxical it might sound, her biological rhythm was inherently more inclined to be delayed than to be advanced.
The patient was told to delay her sleep and wake times by 3 hours each day. The chronotherapy protocol arranged according to these instructions is presented in Table I. The patient was told to strictly follow the protocol. After the seventh day, her sleep-wake chart was fixed according to the times she used on the seventh day and she had a control interview after 2 weeks.

The patient expressed that she followed the protocol properly and did not encounter any problems. She said that she was able to fix her sleep-wake chart after 1 week and remained on that time schedule.

**DISCUSSION**

This paper aimed to review DSPTSD, a commonly seen condition, and describe chronotherapy as a possible treatment method. DSPTSD may frequently co-occur with depressive symptoms and diagnosis can be difficult. In patient A’s prior experiences with psychiatrists, her condition was regarded as depression and her existing sleep problems were thought to be an extension of it, rather than a circadian rhythm sleep disorder. Depression is the most frequent comorbid psychopathology to occur with DSPTSD. Additionally, among people with a circadian rhythm sleep disorder, the reported prevalence of learning disorders is 19.3% and personality disorders 12.22.4% (Dagan and Einstein, 1999). Nonetheless, the relationship between the biological basis of DSPTSD and psychiatric symptoms is not known. One possible cause of DSPTSD could be a lack of engagement in normal social activities as a result of depression-induced anhedonia. The increase in diurnal sleep time and the decrease in exposure to daylight may trigger depression, especially seasonal depression. While antidepressants may not be effective for some people with DSPTSD and comorbid depression, some level of decrease may be observed in depressive symptoms if the sleep schedule is corrected a result of melatonin administration and bright light therapy. The phase delay in depression and DSPTSD should be distinguished, and any comorbid condition should be considered in cases that are unresponsive to treatment.

Circadian rhythm sleep disorders occur as a result of haloperidol treatment for a variety of diseases, such as Schizophrenia, Tourette’s syndrome, and Alzheimer’s disease. Findings in the literature suggest that sleep schedules return to normal following the withdrawal of haloperidol therapy (Dagan, 1999).

Additionally, in a case of obsessive-compulsive disorder in which a 2.5-4-hour advance in the sleep phase was observed due to fluvoxamine treatment, it was reported that the circadian rhythm returned to normal after the administration of melatonin 3 mg/day in the evenings was added to the treatment (Hermesh et al., 2001). The present case report that she had been using sertraline for the previous year, but the onset of her delayed sleep phase type sleep disorder preceded the antidepressant treatment by a large amount of time. Even though the antidepressant treatment was not terminated during the ongoing chronotherapy, her sleep phase returned to normal.

Bright light therapy, melatonin, and chronotherapy are commonly used methods for the treatment of DSPTSD. Among these, chronotherapy is distinguished by its practicality, low cost, and effectiveness. Chronotherapy was used in the present case and was shown to be successful.

There had been numerous attempts to treat the patient’s condition, as well as self-administered trials at altering her rhythm. People with DSPTSD repeatedly try to advance their sleep-wake rhythm and fail. There are several reasons for such failure (Regestein and Monk, 1995). First, the endogenous circadian period that regulates the sleep-wake cycle can be too long. The difference between the length of this cycle and the length of the social rhythm is positively correlated with difficulty sleeping and wakening (Weitzman et al., 1982). The second reason is related to the daylight/night cycle. The circadian rhythm, therefore the sleep-wake rhythm, can be lengthened or shortened in response to exposure to bright light or daylight. The important factor here is the timing of the exposure. Exposure to daylight or bright light in the early hours of wakefulness can shorten the duration of the internal day (phase advance). On the other hand, exposure to light during later hours of wakefulness can shorten the duration (phase delay).

<table>
<thead>
<tr>
<th>Day</th>
<th>Sleep time</th>
<th>Wake time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day 1</td>
<td>05.00</td>
<td>15.00</td>
</tr>
<tr>
<td>Day 2</td>
<td>08.00</td>
<td>18.00</td>
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<tr>
<td>Day 3</td>
<td>11.00</td>
<td>21.00</td>
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<td>Day 4</td>
<td>14.00</td>
<td>24.00</td>
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<td>Day 5</td>
<td>17.00</td>
<td>03.00</td>
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<td>Day 6</td>
<td>20.00</td>
<td>06.00</td>
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<tr>
<td>Day 7</td>
<td>23.00</td>
<td>09.00</td>
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</tbody>
</table>
Treatment for DSPTSD was previously designed as phase advancement to achieve the desired times for going to sleep and waking up. Although advancing the phase by 5 minutes every 2 days or 30 minutes every week was proposed as treatment (Regestein and Monk, 1995), these options were unsuccessful. The term 'chronotherapy' was used for the first time by Czeisler et al. (1981) to describe the technique of delaying the sleep phase. In chronotherapy, sleep and waking times are progressively shifted to later hours, and this difference usually corresponds to a 3-hour duration. When the patient achieves the desired sleep/wake schedule, the schedule is finalized. In the case of patient A, a similar approach was followed and the ideal timing was achieved. Chronotherapy seems to be a preferable option for the treatment of DSPTSD due to its concordance with physiology and natural characteristics of the disorder.

**Figure I.** Record of the times of DSPTSD patient’s sleep and wake times on the sleep diary chart.

| Hours | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 01 | 02 | 03 | 04 | 05 | 06 | 07 | 08 | 09 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |
|-------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| Monday |    |    |    |    |    |    |    |    | ▪️ |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| Tuesday |    |    |    |    |    |    |    |    |    | ▪️ |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| Wednesday |    |    |    |    |    |    |    |    |    |    | ▪️ |    |    |    |    |    |    |    |    |    |    |    |    |    |
| Thursday |    |    |    |    |    |    |    |    |    |    |    | ▪️ |    |    |    |    |    |    |    |    |    |    |    |    |
| Friday |    |    |    |    |    |    |    |    |    |    |    |    | ▪️ |    |    |    |    |    |    |    |    |    |    |    |
| Saturday |    |    |    |    |    |    |    |    |    |    |    |    |    | ▪️ |    |    |    |    |    |    |    |    |    |    |

▪️ Sleep time
O Wake up time

**REFERENCES**


