The National Healthy Sleep Awareness Project involves a partnership between the American Academy of Sleep Medicine, Center for Disease Control and Sleep Research Society. The long term goal of the project is to promote improved sleep health in the United States. The project will increase public awareness of the importance of healthy sleep. It also will promote the treatment and prevention of sleep disorders.

Shift Work and Health

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CASE REPORT

35-year-old woman without significant medical history presented to the sleep center for evaluation of excessive daytime sleepiness. She had a near-miss accident while driving from work.

She is a nurse and for the past six months she has worked a night shift (11:00 p.m. – 7:00 a.m.) at a local hospital. Two weeks prior to presentation, while coming home from work at 7:30 am, she passed the red light and nearly hit the incoming traffic.

A thorough review of patient's activities revealed that upon returning home, she would assist in sending her children off to school, and then would pick up her 5-year-old son from school at noon. Her daytime sleep was restricted to three hours in the morning and an hour nap in the afternoon. Evening activities included helping her children with homework and she rarely had a chance to nap prior to her scheduled work. On days off, the patient sleeps at her preferred schedule-bedtime around 11:00 p.m. and wake time around 6:00 a.m.

DISCUSSION

Circadian rhythms are endogenous processes that repeat with a period of about 24 hours. Many biological functions in humans are under circadian control which allows for optimal physiological responses to the external changes resultant from the 24-hour light-dark cycle. One of the most apparent outputs of the circadian system is the sleep-wake cycle with promotion of sleep during the nighttime and alertness during the day.

Modern work schedules require round-the-clock work coverage; it is estimated that 20% of workforce is employed in a job that requires shift work. Misalignment between the native circadian rhythm and the imposed external work schedule leads to inability to get sustained and restful sleep during the expected rest period, and to decreased alertness with sleepiness during the expected work period.

In addition to causing an impaired alertness at workplace, shift work has been associated with a number of adverse health consequences. Among others, the risk of ischemic heart disease, stroke, obesity and metabolic syndrome, breast cancer, and depression is higher among shift workers than in general population. Several intermediary

mechanisms, such as increase in neuroendocrine stress system, cardiometabolic stress with impaired glucose tolerance, altered immune functioning, and oxidative stress are thought to be responsible for these deleterious effects.

The best way to manage sleepiness and insomnia related to shift work is to realign the work schedule with a physiological circadian rhythm i.e. to stop working non-daytime shifts. When this is not possible, strategies to mitigate symptoms due to shift work encompass two goals: to better align the endogenous circadian rhythm with the imposed schedule and to directly improve alertness and sleep quality. Although inherent, circadian rhythms are modifiable by circadian time givers or zeitgebers. The strongest circadian zeitgeber is light, but non-photic time cues such as exogenous melatonin supplements, feeding, social interaction, and physical activity may alter circadian timing, producing a phase shift. The direction and magnitude of phase shift is largely dependent on the timing of the zeitgeber. Phase response curves to light and exogenous melatonin are well-described. In an individual with 'normal' circadian phase, light shifts the circadian rhythm later when exposure occurs during the beginning of the biological night (the evening and first portion of the sleep period) and earlier when exposure occurs around the start of the biological day (the very end of the sleep period and morning). The response to melatonin is opposite, when dosed prior to the biological night (in the early evening) melatonin moves circadian phase earlier and if given during or just after the biological night (during the usual sleep period or morning) melatonin moves circadian phase later.

Bright light exposure during the night shift and avoidance of light in the morning may improve alignment of the circadian rhythm to night work as well as directly promote alertness during the shift. Melatonin prior to the daytime sleep period may also phase shift the circadian rhythm to better match a night work, day sleep schedule and directly enhance daytime sleep quality. Although not FDA approved, exogenous melatonin is not typically associated with any adverse effects.

Additionally, strategic sleep-wake scheduling promotes circadian alignment and reduces sleepiness during the nightshift. Ideally, a night wake, day sleep schedule should be maintained on days off. However, this is not acceptable to many shift workers; therefore, a simulated night work experiment defined a 'compromise position'. On days off, subjects with a sleep period scheduled from 3:00 a.m. to 12:00 p.m. had improved daytime sleep and shift performance when returning to simulated night work.

Treatments aimed directly at improving symptoms without altering the circadian rhythm are also highly beneficial. To improve sleep during the day, hypnotic medication is a potential strategy. However, the benefits of improved daytime sleep should be evaluated individually and weighed against a potential of worsening any comorbid sleep disordered breathing and reducing alertness due to persistent sedative effects of the hypnotic. Zopiclone has been successfully used to improve the ability to fall asleep in shift workers. For enhanced nighttime alertness, napping is an effective strategy. Taking an evening nap improves alertness during the night work period; using caffeine before and during the work period augments this effect. Taking a mid-shift nap may also improve alertness, as long as no demanding tasks are scheduled right after it. Stimulants, such as modafinil and armodafinil, at the beginning of the night shift have been studied and proved useful in improving alertness without affecting daytime sleep.

Assuring an environment conducive to sleep is paramount. In night shift workers, this sleep period is typically scheduled shortly after return from work which may coincide with peak activity of other household members. Assuring the sleeping space that is dark, quiet, and free of interruptions is essential.

Despite targeted treatments, impaired alertness is often persistent in shift-workers and poses a significant threat to safety. Return from work is the most vulnerable time for night shift workers and is typically associated with the highest sleepiness during the 24-hour period. Using public transportation rather than driving home after work may prevent accidents.

CASE FOLLOW-UP

Extension of sleep time was requested and the patient's retired mother was engaged in picking up the patient's son from school mid-day. Zaleplon was prescribed to improve the patient's ability to fall asleep. Finally, the patient was encouraged to have "protected time" between 9 and 10 pm to allow for a 30-minute nap. These interventions resulted in a mild improvement in ability to sleep during the day. The patient's sleep normalized after she started working a day shift six months later.

SUGGESTED READING

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