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DOES NIGHT WORK FAVOR SLEEP-RELATED ACCIDENTS IN POLICE OFFICERS?

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Several studies of sleep-breathing physiology have suggested that sleep deprivation may worsen obstructive sleep apnea. The aim of the study was to determine the direct effect of night work on breathing variables during sleep in fast-rotating shift workers. Twenty one men - police officers, fast-rotating shift workers, underwent polysomnography on 2 occasions: under a normal sleeping condition after day work and after sleep deprivations after night work. Both sleep studies were conducted within 2 to 3 weeks of each other. Approximately half of the group was tested under control conditions (day work) first, with the remaining subjects tested under sleep deprivation conditions (night work) first. After a night shift the subjects did not show a significantly different apnea-hypopnea-index (AHI). However, night work significantly increased several breathing variables recorded during sleep after it: total duration of obstructive apneas (OA) during REM sleep, mean duration of OA during arousal, total duration of OA during NREM sleep, apnea index during arousal, mean length of OA during sleep period time, total duration of OA during sleep period time, mean length of OA during total sleep time, mean length of hypopnea during REM sleep, total duration of hypopnea during sleep period time and during total sleep time, maximal length of central apnea and OA, and total sleep time. Night work does not favor obstructive sleep apnea episodes during sleep, but worsens many an obstructive sleep apnea variable, as measured by polysomnography.

Key words: apnea-hypopnea, breathing disturbances, shift work, sleep

INTRODUCTION

Several studies have suggested that sleep deprivation may worsen obstructive sleep apnea (OSA) (1, 2, 3). However, acute sleep deprivation does

not change most OSA variables measured by polysomnography (4). Additionally, sleep fragmentation seems to have more profound effects on upper airway collapsibility (5) than sleep deprivation. On the other hand, "we are chronically sleep deprived" and shift workers constitute approximately 15-30% of the industrialized world workforce (6). The problem of the sleep deficit seems to be important for health consequences of shift work and also for the pathogenesis of OSA. In an accompanying study (7) we did not confirm the hypothesis that chronic irregular work hours promote the occurrence of OSA in subjects aged 40-60 years. The aim of this study was to determine the direct effect of night work on breathing variables during sleep in fast-rotating shift workers.

MATERIAL AND METHODS

The study was approved by a local Ethics Committee. Informed consent was obtained from each subject of the study.

Twenty one men – police officers, fast-rotating shift workers, aged 47.1 ± 3.2 , BMI 28.1 ± 2.1 kg/m², underwent polysomnography (Alice 3 Respironics; Murrysville, PA) on 2 occasions: under a normal sleeping condition after day work and after sleep deprivation after night work (without sleep during the next day, i.e., after 36 h of sleep deprivation). Both sleep studies were conducted within 2 to 3 weeks of each other. Approximately half of the group was tested under control conditions (day work) first, with the remaining subjects tested under sleep deprivation conditions (night work) first. Data are presented as means \pm SD. Wilcoxon's test was used for the statistical analysis (Statistica for Windows). Pairwise comparisons between the levels of each variable were assessed. A P value <0.05 was accepted as indicating statistical significance.

RESULTS AND DISCUSSION

After a night shift, the subjects did now show a significantly different apnea-hypopnea-index (AHI) in comparison with the day shift; the mean AHI was 16.6 ± 2.9 after night and 16.3 ± 3.8 after day shifts. However, night work significantly ($P < 0.05$) increased several breathing variables on polysomnography during sleep after night work, as shown in *Table 1*.

Comparison of the prevalence of apnea events, occurring during sleep after a day shift with those during sleep after a night shift did not show significant differences in the investigated group of shift workers. The numbers of apneas and hypopneas per hour of sleep were not different in both situations. These data are in agreement with the observations of Desai et al (4) who have found only lower minimum oxygen saturation after sleep deprivation in subjects with mild OSA. In the present study, acute sleep deprivation, accounting to night work followed by a day without sleep, did not change the AHI. There were, however, increases in the breathing variables describing the severity of sleep-related breathing disturbances, which suggests that acute sleep deprivation due

Table 1. Differences in breathing variables during sleep after day and night shifts.

	Day shift	Night shift
Total sleep time (min)	359 ±92	424 ±12
Total duration of hypopnea during sleep (min)	4.7 ±6.1	7.2 ±8.0
Number of apnea/hypopneas during arousals	0.2 ±0.4	0.8 ±1.2
Duration of NREM sleep (min)	300 ±75	375 ±119
Maximum length of a central apnea (s)	9.8 ±11.5	15.2 ±11.3
Maximum length of an obstructive apnea (s)	15.4 ±11.2	24.5 ±16.3
Maximum length of an obstructive apnea with heart rate reduction (s)	9.3 ±12.0	17.7 ±15.3
Maximum length of an obstructive apnea with a decrease in saturation (s)	13.7 ±12.0	23.2 ±16.2
Total duration of hypopneas during NREM sleep (min)	3.8 ±5.6	5.9 ±6.6
Mean duration of hypopnea during REM sleep (min)	11.1 ±6.3	17.1 ±10.0
Total duration of obstructive apneas during sleep time (min)	3.6 ±7.1	7.2 ±13.1
Total duration of obstructive sleep apneas during total sleep time (min)	3.6 ±7.1	7.0 ±13.1

to night work may worsen the clinical picture of OSA. Such worsening may be of consequence for patients with cardiorespiratory diseases. The pathophysiological changes in OSA seem to be related to the duration of the disease; in the course of time, an impairment of physiological mechanisms involved in the regulation of cardiorespiratory function has been observed (8, 9). Further studies are needed to evaluate the age-related effects on OSA of acute sleep deprivation.

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