Abstract

Background: Transdermal nicotine patch has been widely used as an aid to smoking cessation. Nevertheless, its effects on sleep physiology still need to be further understood, despite the well-known fact that the administration of nicotine patch could influence the sleep architecture. Moreover, previous reports were generally based on visual sleep scoring method. While visual sleep scoring is useful for characterization of sleep architecture and continuity, it is insufficient for more refined, quantitative analysis of sleep electroencephalogram (EEG). This study, therefore, aimed at measuring the effects of transdermal nicotine patch on sleep EEG and EKG power spectra in order to examine its effects on homeostatic sleep propensity and autonomic nervous system function.

Methods: The author polysomnographically studied sixteen nonsmoking young healthy volunteers, for three nights including one adaptation night in a randomized, double blind crossover design and compared between the two nights with nicotine 14 mg or placebo patch all-night sleep variables and sleep EEG and EKG power spectra. The intelligent polysomnography system (IPSS), developed jointly by Division of Sleep Studies in Seoul National University Hospital and Institute of Biomedical Engineering in Seoul National University was used for digitally obtaining and analysing the data.

Results: Visual sleep scoring showed that transdermal nicotine increases
sleep latency, wake after sleep onset (WASO), and stage 1 sleep time percent and decreases total sleep time (TST), sleep efficiency, and REM sleep time percent. Spectral analysis of the sleep EEG revealed important changes as follows. Decreased slow wave activity (SWA) was observed in stage 2 sleep of the first NREM cycle after administration of nicotine patch. Decreased SWA accompanied by increased alpha activity were seen in the first cycle of REM sleep after administration of nicotine patch. The author found no differences in spectral analysis of EKG between the two night with nicotine or placebo patch, except that low to high ratio (indicating sympathetic nervous system activity) was correlated positively with WASO after administration of nicotine patch.

Conclusions: These results suggest that transdermal nicotine patch significantly disrupts sleep continuity, sleep architecture, and homeostatic sleep propensity. These effects of transdermal nicotine patch appears to be associated with the activation of sympathetic nervous system.

Key words: transdermal nicotine patch, sleep, sleep EEG power spectrum, sleep EKG power spectrum

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