

Sleep disorders, sleepiness and the risk of traffic accidents

AKADEMISK AVHANDLING

som för avläggande av medicine doktorexamen vid Sahlgrenska akademien vid
Göteborgs universitet kommer att offentligen försvaras i
hörsal Ivan Östholm, Medicinaregatan 13 B, Göteborg

onsdagen den 30 april 2014, klockan 13.00

av

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Avhandlingen baseras på följande arbeten:

- I. Karimi M, Eder DN, Eskandari D, Zou D, Hedner J, Grote L. **Impaired vigilance and increased accident rate in public transport operators is associated with sleep disorders**
Accident Analysis and Prevention 2013; 51: 208-214
- II. Karimi M, Hedner J, Häbel H, Nerman O, Grote L. **A sleep apnea related risk of vehicle accidents is reduced by CPAP - Swedish Traffic Accident Registry data**
Submitted.
- III. Karimi M, Hedner J, Lombardi C, McNicholas WT, Penzel T, Riha RL, Rodenstein D, Grote L. **Driving habits and risk factors for traffic accidents among sleep apnea patients – a European multi-center cohort study**
Submitted.
- IV. Karimi M, Hedner J, Zou D, Eskandari D, Lundqvist A-C, Grote L. **Vigilance and attention deficits are associated with motor vehicle accidents in sleep apnea patients**
Manuscript.



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ABSTRACT

The aim of this thesis was to identify the prevalence of sleep disorders, mainly obstructive sleep apnea (OSA), among public transport operators (PTO's). Further to assess the risk of motor vehicle accident (MVA) in a group of patients with suspected OSA compared with the general population. Additionally, we aimed to identify specific risk factors linked to a history of MVA in these patients and to assess the prevalence of such factors in a large European sleep apnea patient database. We also determined the interventional effect of continuous positive airway pressure (CPAP) treatment on hypersomnolence, neurocognitive function and history of traffic accident. Finally, we investigated functional cognitive markers associated with history of MVA among PTO's as well as single and multi-center cohorts of patients with OSA. The study used objective and subjective methods to assess sleep, sleep disorders, hypersomnia, vigilance and daytime cognitive performance. Data was extracted from a nationwide traffic accident registry (STRADA) for individual identification of MVA history. Sleep disorders including OSA, excessive daytime sleepiness, insomnia and restless legs syndrome (25%, 13%, 10% and 2%, respectively) were prevalent among PTO's (n=87). Among clinical patients (n=1478) with suspected OSA the estimated risk of MVA was 2.5 times higher than in the matched general population. Measures of hypersomnolence, use of hypnotics, short sleep time, and driving distance (OR 2.0 to 2.7, $p \leq 0.02$) were associated with MVA risk, whereas conventional metrics of OSA severity were not. Compared with the general population, OSA patients were 1.9 times more likely to be injured in the MVA ($p=0.01$). We identified functional measures of neurocognitive dysfunction associated with MVA history ($p < 0.01$). A mean nightly CPAP use of at least 4.0 hours was associated with improved neurocognitive function, reduced hypersomnia and a 70% reduction of MVA. It is concluded that conventional metrics of OSA are insufficient for the recognition of risk while markers of neurocognitive function may provide better identification of patients at risk. Our findings suggest that the high risk of MVA in OSA and the effectiveness of treatment in terms of accident reduction call for effective programs for detection and treatment of OSA.

Keywords: motor vehicle accident, obstructive sleep apnea, neurocognitive function

ISBN: 978-91-628-8940-1

<http://hdl.handle.net/2077/34848>