A comparative study of methods for automatic detection of rapid eye movement abnormal muscular activity in narcolepsy

Objective: To evaluate rapid eye movement (REM) muscular activity in narcolepsy by applying five algorithms to electromyogram (EMG) recordings, and to investigate its value for narcolepsy diagnosis. Patients/methods: A modified version of phasic EMG metric (mPEM), muscle activity index (MAI), REM atonia index (RAI), supra-threshold REM EMG activity metric (STREAM), and Frandsen method (FR) were calculated from polysomnography recordings of 20 healthy controls, 18 clinic controls (subjects suspected with narcolepsy but finally diagnosed without any sleep abnormality), 16 narcolepsy type 1 without REM sleep behavior disorder (RBD), 9 narcolepsy type 1 with RBD, and 18 narcolepsy type 2. Diagnostic value of metrics in differentiating between groups was quantified by area under the receiver operating characteristic curve (AUC). Correlations among the metrics and cerebrospinal fluid hypocretin-1 (CSF-hcrt-1) values were calculated using linear models. Results: All metrics excluding STREAM found significantly higher muscular activity in narcolepsy 1 cases versus controls (p<0.05). Moreover, RAI showed high sensitivity in the detection of RBD. The mPEM achieved the highest AUC in differentiating healthy controls from narcoleptic subjects. The RAI best differentiated between narcolepsy 1 and 2. Lower CSF-hcrt-1 values correlated with high muscular activity quantified by mPEM, sMAI, lMAI, PEM and FR (p<0.05). Conclusions: This automatic analysis showed higher number of muscle activations in narcolepsy 1 compared to controls. This finding might play a supportive role in diagnosing narcolepsy and in discriminating narcolepsy subtypes. Moreover, the negative correlation between CSF-hcrt-1 level and REM muscular activity supported a role for hypocretin in the control of motor tone during REM sleep.

General information
Publication status: Published
Organisations: Department of Electrical Engineering, Biomedical Engineering, Glostrup University Hospital, Stanford University, Copenhagen University Hospital
Corresponding author: Olesen, A. N.
Contributors: Olesen, A. N., Cesari, M., Christensen, J. A. E., Sørensen, H. B. D., Mignot, E., Jennnum, P.
Pages: 97-105
Publication date: 2018
Peer-reviewed: Yes

Publication information
Journal: Sleep Medicine
Volume: 44
ISSN (Print): 1389-9457
Ratings:
BFI (2018): BFI-level 1
Scopus rating (2018): CiteScore 2.78 SJR 1.26 SNIP 1.154
Web of Science (2018): Impact factor 3.36
Web of Science (2018): Indexed yes
Original language: English
Keywords: Computer-assisted analysis, Electromyogram (EMG), Narcolepsy, Polysomnography, Rapid eye movement (REM) sleep behavior disorder, REM sleep without atonia

Electronic versions:
1_s2.0_S1389945717315927_main.pdf. Embargo ended: 21/12/2018
DOIs:
10.1016/j.sleep.2017.11.1141
Source: PublicationPreSubmission
Source ID: 142426422
Research output: Contribution to journal › Journal article – Annual report year: 2018 › Research › peer-review