Absence of cardiovascular autonomic modulation during sleep in patients with acute ischemic stroke: an analysis from the SAS-CARE study cohort.

Oppo V[1], Proserpio P[2], Tobaldini E[3], Stracuzzi M[3] Figorilli M[2], Scigliano V[1], Ghinzani S[1], Ott S[5], Agostoni E[1], Manconi M[5], Nobili L[2], Bassetti C[6], Montano N[3].
1) Stroke Unit, Departement of Neuroscience - Niguarda Ca' Granda Hospital - Milan, Italy.
2) Sleep Medicine Center, Epilepsy Surgery Center, Departement of Neuroscience – Niguarda Ca' Granda Hospital - Milan, Italy.
3) Departement of Internal Medicine, Fondazione IRCSS Ca' Granda, Ospedale Maggiore Policlinico - Department of Biomedical and Clinical Sciences "L. Sacco", University of Milan - Milan, Italy.
4) Universitätklinik für Pneumologie – Inselspital - Bern, Switzerland.
5) Sleep and Epilepsy Center, Neurocenter of Southern Switzerland - Civic Hospital of Lugano - Lugano, Switzerland.
6) Neurology Department - Inselspital, Bern University Hospital - Bern, Switzerland.

Background: cardiac autonomic changes are described in acute ischemic stroke (AIS) and correlate with a poor outcome. Insula seems to play a prominent role in autonomic cortical control. Cardiovascular autonomic control (CAC) varies across sleep stages, with a sympathetic predominance during REM and a vagal predominance during non-REM sleep. However, no data are available on CAC in AIS patients during sleep. Aim of the study was to assess CAC during wake and different sleep stages in patients with AIS.

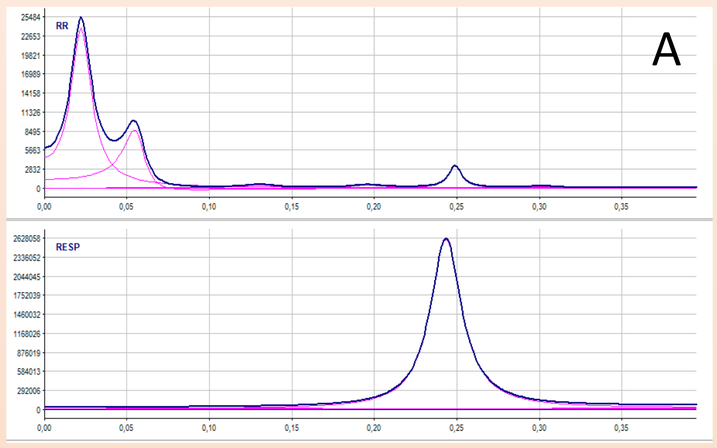
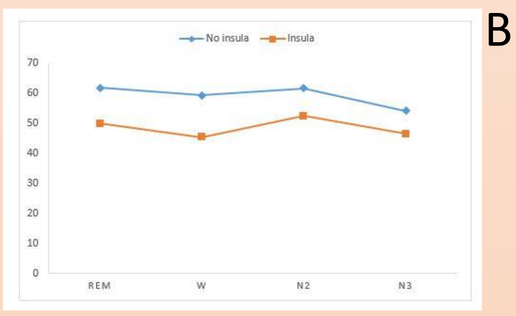
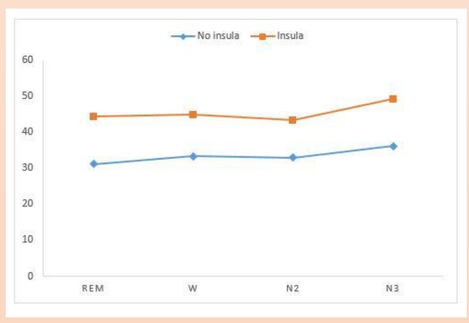
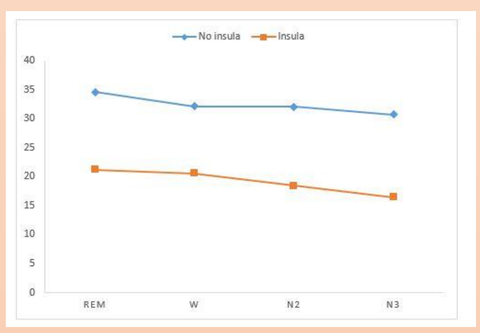
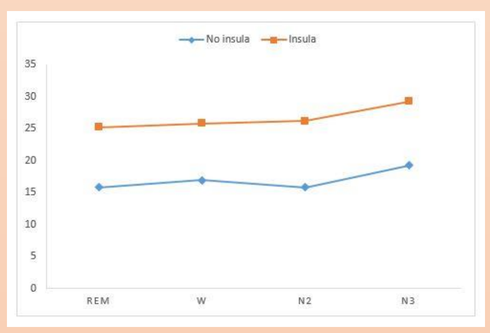


Fig A: example of power spectrum analysis.



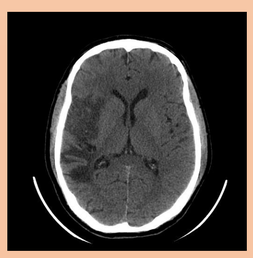




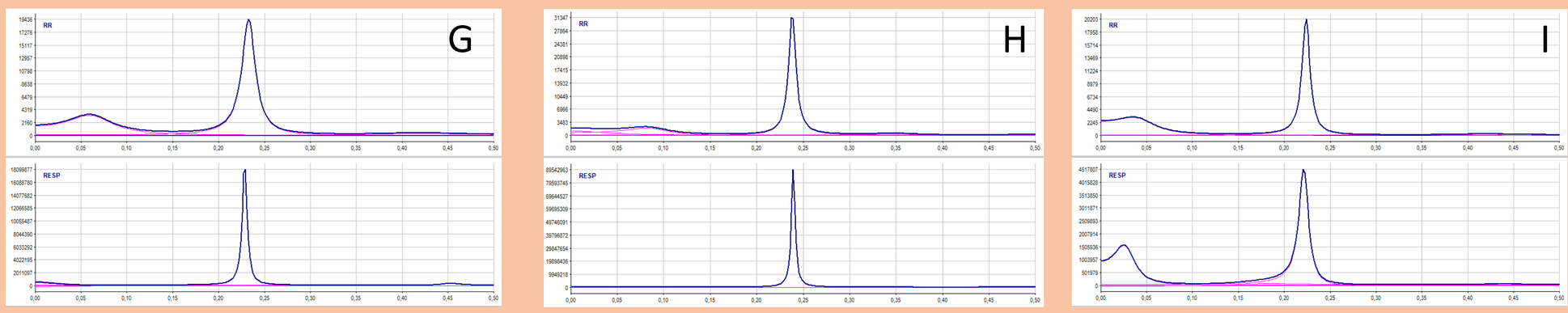


LF (fig. B) and 0V% (fig C) components (markers of sympathetic modulation) are significantly higher (P value respectively 0,007 and <0,0001) in patients (n=12) without insular involvement. HF (fig. D) and 2UV% (fig. E) components (markers of vagal modulation) are significantly higher (P value respectively 0,0027 and <0,0001) in patients with insular involvement (n=11). Statistical method: ANOVA.
No difference was detected between wake and different sleep stages (data not shown).

Methods: from the population of the SAS-CARE prospective study, 47 patients with a diagnosis of AIS and without relevant sleep apneas (Apnea Hypopnea Index <15) were prospectively enrolled. Polysomnography (PSG) was conducted within seven days from AIS. ECG and respiration were extracted from PSG and divided in 4 sleep stages: wake (W), non-REM 2 (N2), non-REM 3 (N3) and REM. Linear spectral (Sp) and non linear symbolic analysis (SA) were used for the analysis of CAC. Briefly, Sp identifies two oscillatory components, low frequency (LF), marker of sympathetic modulation, and high frequency (HF), marker of vagal control. SA recognizes three main indices, 0V%, index of sympathetic modulation, 2LV% and 2UV%, markers of vagal modulation. Corrected Conditional Entropy (CCE) was used to assess autonomic cardiovascular complexity. Site and size of lesions were analyzed.
Results: Sp and SA showed no differences among wake, non-REM and REM sleep. A reduction of total power and Heart Rate (HR), a decrease of 2UV%, marker of vagal modulation, and a reduction of CCE correlated with a worse neurological outcome. Among 23 patients with lesion volume >1 cm^3, those (n=11) with insular involvement showed a lower sympathetic modulation compared to the patients without insular involvement during both wakefulness and sleep, without differences across these states.



Power spectrum analysis in a patient with a whole insula ischemia (fig F) in W (fig G), N3 (fig H) and REM (fig I).



Conclusions: this study shows that patients with AIS do not display the physiological autonomic modulation during sleep. Moreover, a negative correlation between CAC impairment and clinical outcome is confirmed. Insular involvement seems to be associated with a predominance of vagal modulation.

Bibliography
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