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NOCTURNAL SYMPATHETIC SURGES OF ELECTRODERMAL ACTIVITY LATERALIZE IPSILATERALLY TO THE SEIZURE ONSET ZONE

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RATIONALE:

Electrodermal activity (EDA) may identify the lateralization of a seizure focus based on interictal recordings (Poh et al., Epilepsia, 2009, 50(Suppl. 11):11). Little is known about the laterality of EDA 'sleep storms', which consist of sympathetic surges of EDA predominantly during NREM stage 2 and slow wave sleep (Sano and Picard, Conf Proc IEEE Eng Med Biol Soc. 2011;2011:777-80) and whether lateralization may also be present and related to the side of seizure onset.

METHODS:

Patients admitted to the long term monitoring (LTM) unit of the Edward B. Bromfield Epilepsy Service at Brigham and Women's Hospital, Boston, were invited to participate in this study. 46 subsequent patients were consented and enrolled prospectively. Throughout the duration of the Video EEG monitoring unit stay, patients were wearing wireless sensors that measure EDA, skin temperature, and three-dimensional accelerometry bilaterally at the level of the distal forearms. Average recording time was 1-4 days. EDA recordings were lowpass filtered with a baseline ≥ 0.2 μS (micro-Siemens). Age, gender, seizure laterality and epilepsy syndrome were analyzed. Sympathetic EDA bursts during sleep were visually identified during sleep as determined by actigraphy and EEG. Interictal differences between right and left EDA activity were considered to be significant with a difference of at least 0.5 μS between the left and right wrist and analyzed in relation to clinical data.

RESULTS:

Of the enrolled 46 patients, EDA storms during sleep were observed in 33 patients (14 males, 19 females, age range 19 – 66 years, median= 35). Of these, 14 patients had temporal lobe epilepsy (TLE), seven extra-temporal epilepsy (extra-TLE), two multifocal epilepsy and three idiopathic generalized epilepsy (IGE). Six Patients had psychogenic non-epileptic seizures (PNES) and were included as control subjects. EDA storms during sleep were not lateralized in 9 patients, lateralized to the right in 15 patients and to the left in 9 patients. Chi square tests were performed between different patient groups and did not reveal significant differences between patients with PNES as compared to Epilepsy patients ($p = 0.104$). However, when comparing PNES to localization related epilepsy syndromes only, there was a tendency of the latter to be more lateralized ($p=0.063$). Restricting the analyses to patients with recorded seizures and lateralized seizure onset zone, 5/5 patients with left sided

seizure onset zone revealed left lateralized EDA surges and 7/9 patients with right sided seizure onset zone revealed right lateralized EDA surges (p=0.013).

CONCLUSIONS:
Nocturnal sympathetic EDA surges during sleep may be asymmetric and lateralize to the side of the seizure onset zone in patients with focal epilepsy. Localization related epilepsies may more likely be associated with lateralized nocturnal EDA surges than generalized epilepsy syndromes, but more data is needed to confirm these findings in a larger cohort of patients.