



Correlation Between Epileptogenic Areas and Afterdischarge Thresholds in Neocortical Epilepsy

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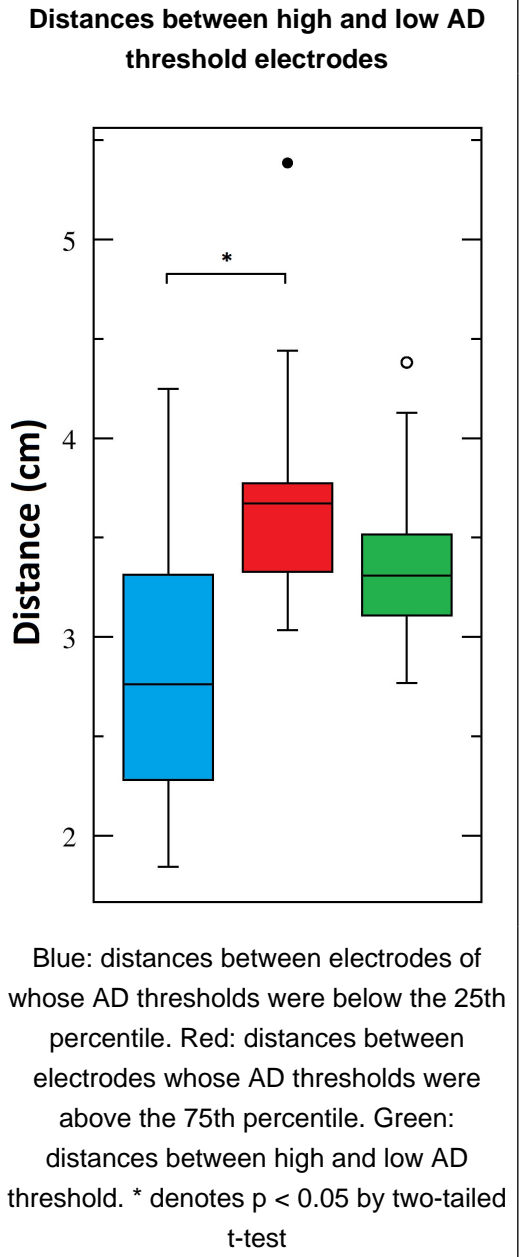
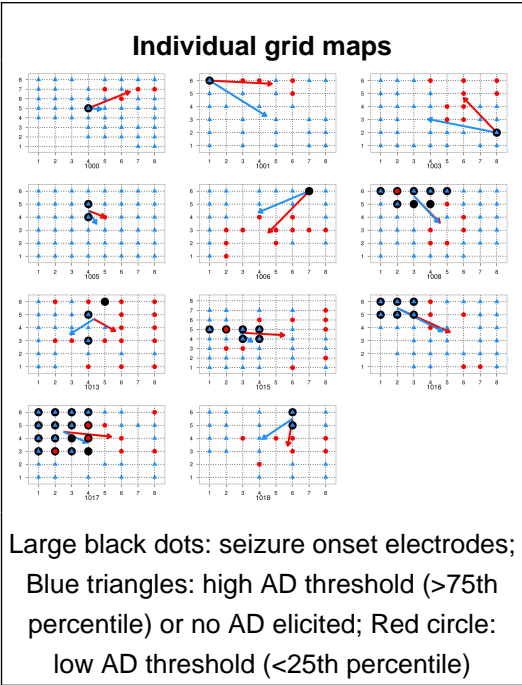
Introduction

When electrically stimulated above a threshold, the neocortex will fire a series of electrographic spikes called an afterdischarge (AD). The AD threshold varies considerably over the cortex of a single individual, and this threshold has been suggested to reflect the general cortical excitability. Some have proposed using the thresholds of electrical stimulation-evoked afterdischarges for seizure focus mapping. We sought to describe the association between seizure onset zone and features of cortical afterdischarges.

Methods

We examined the records of 11 patients with drug resistant focal epilepsy who were undergoing extraoperative monitoring with subdural electrode grids. We used the surgeon’s stimulation notes, which recorded the different currents used at each electrode pair, and the electrocorticographic (ECoG) trace during the bedside mapping session to determine AD threshold and AD intensity for each electrode pair. The neurology report reviewing the subdural grid recording during ictal events was examined to determine the electrodes representing the seizure onset zone. We analyzed the correlation between the seizure onset zone, the area of lowest AD threshold, and the surgical outcomes.

Patient characteristics							
Patient	Age in years at Operation	Diagnosis-Surgery Time (years)	Etiology	Preop Seizure Freq (episodes/wk)	Target Lobe	Handedness	Months of follow-up
1000	26	11	Idiopathic	10	L Temp	R	12
1001	43	25	Idiopathic	3	L Frontal	R	10
1003	25	5.5	Low grade glioma	63	L Frontal	R	24
1005	35	28	Cortical dysgenesis	70	R Frontoparietal	L	14
1006	36	4	Low grade glioma	3	L Temp	R	6
1008	36	31	Low grade glioma	31	L Frontal	R	20
1013	17	14	Cortical dysgenesis	56	R Frontal	R	18
1015	6	3	Cortical dysgenesis	700	R Frontotemporal	R	75
1016	12	9	Cortical dysgenesis	5	R Frontoparietal	R	36
1017	16	15	Cortical dysgenesis	4	R Frontoparietal	R	96
1018	44	30	Cortical dysgenesis	1	L Temp	R	114



Results

The average age of patients was 27 years old, and the most frequent epileptic etiologies were cortical dysgenesis, low grade glioma, and idiopathic (N = 6, 3, and 2, respectively). Of the 808 electrodes that were implanted, 49 (6%) belonged to the seizure onset zone. Only 7 (17%) of the 41 seizure onset zone electrodes that were stimulated had AD thresholds in the lowest quartile of stimulation for a given patient. There was no association between a patient having seizure onset zone electrode with a low AD threshold and the patient’s seizure reduction post-operatively or epileptic etiology. Electrodes below the 25th percentile in AD threshold were generally closer to one another than electrodes whose AD threshold was above the 75th percentile. This suggests that variations in AD threshold are not a purely random phenomenon.

Conclusions

Cortex of the seizure onset zone does not have lower AD threshold than surrounding cortex, and therefore AD threshold may be of limited utility in the localization of seizure foci.