

PROPAGATION OF INTERICTAL SPIKES IN EPILEPSY

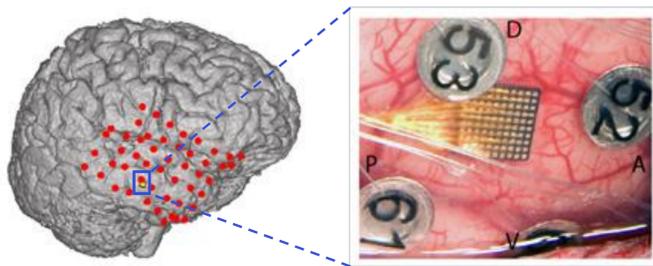
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SUMMARY

Although widely accepted as a sign of epilepsy, the precise role interictal spikes play in epileptogenesis remains vague. Here, interictal spikes were found to consistently propagate across the epileptic cortex in a directional fashion. This is consistent with studies of ictal spikes which have reported a similar directional propagation of these discharges (Bower et al.)



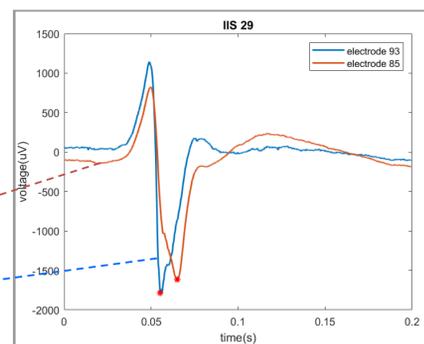
Implanted microelectrode array

OBJECTIVE

The goal of this work was to study and quantify spatial variations and temporal delays in interictal spikes from microelectrode array (MEA) recordings, as a means to evaluating their propagation patterns through the epileptic cortex.

1	2					8	10	14	4
65	66	33	34	7	9	11	12	16	18
67	68	35	36	5	17	13	23	20	22
69	70	37	38	48	15	19	25	27	24
71	72	39	40	42	50	54	21	29	26
73	74	41	43	44	46	52	62	31	28
75	76	45	47	51	56	58	60	64	30
77	78	82	49	53	55	57	59	61	32
79	80	84	86	87	89	91	94	63	95
3	81	83	85	88	90	92	93	96	6

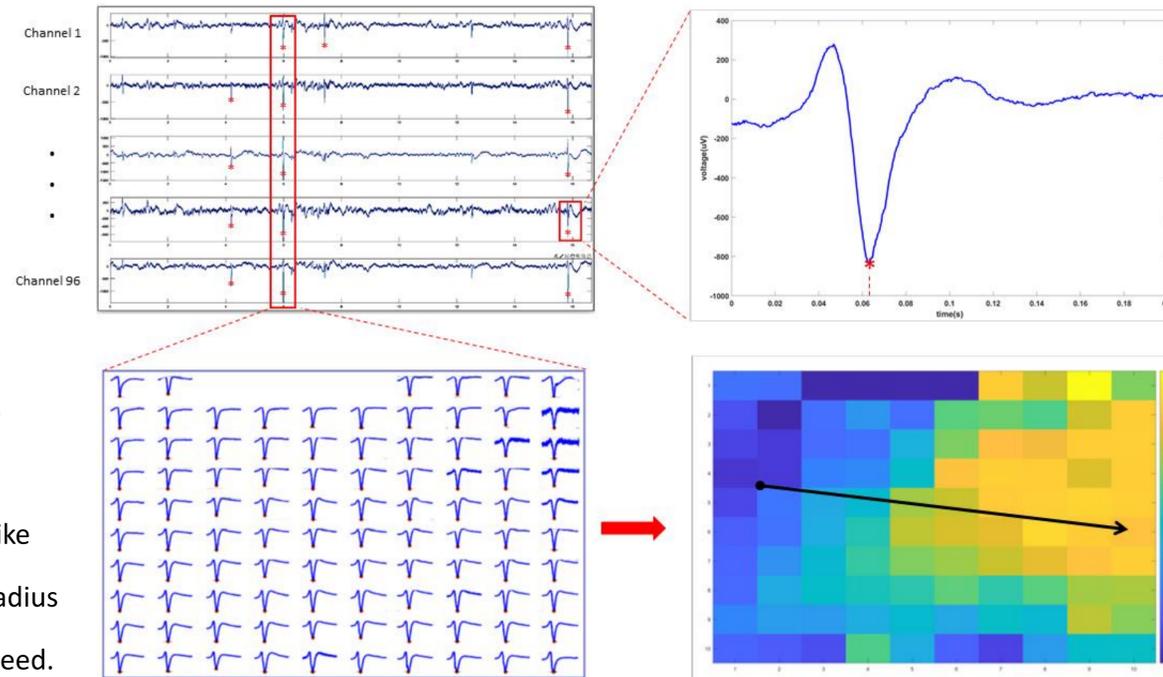
Interictal spike delays between channels



METHODS

Synchronous interictal spikes across all microelectrodes within the same 200ms time segments were identified.

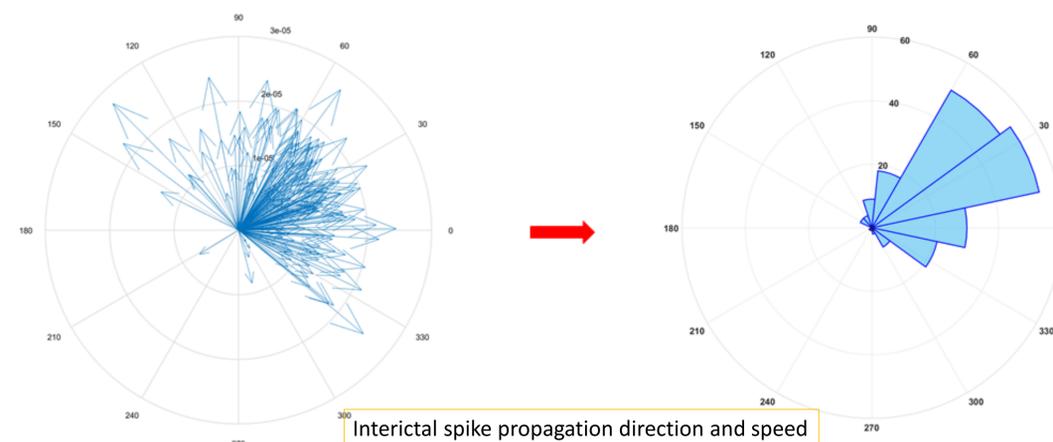
For each sequence, a directional gradient vector was computed using the timing of the negative peaks of interictal spikes across all microelectrodes. This vector pointed in the direction of interictal spike propagation, while its radius encoded propagation speed.



Interictal spike sequence detection and propagation

RESULTS

The results showed a consistent directional propagation of sequences of interictal spikes, with only a few 10s of degrees of variation in propagation direction.



Interictal spike propagation direction and speed

CONCLUSION

Interictal spikes consistently propagated in a precise directional fashion. Since interictal spike depolarization has been shown to facilitate aberrant hyperconnectivity among populations of neurons, it is proposed that consistent propagation of interictal spikes underlie the mechanism of recruiting cortical regions along the propagation path into the aberrant epileptic network through Hebbian mechanisms.

ACKNOWLEDGEMENT

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REFERENCES

