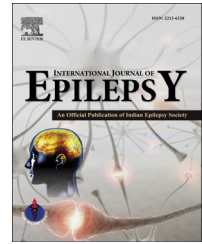


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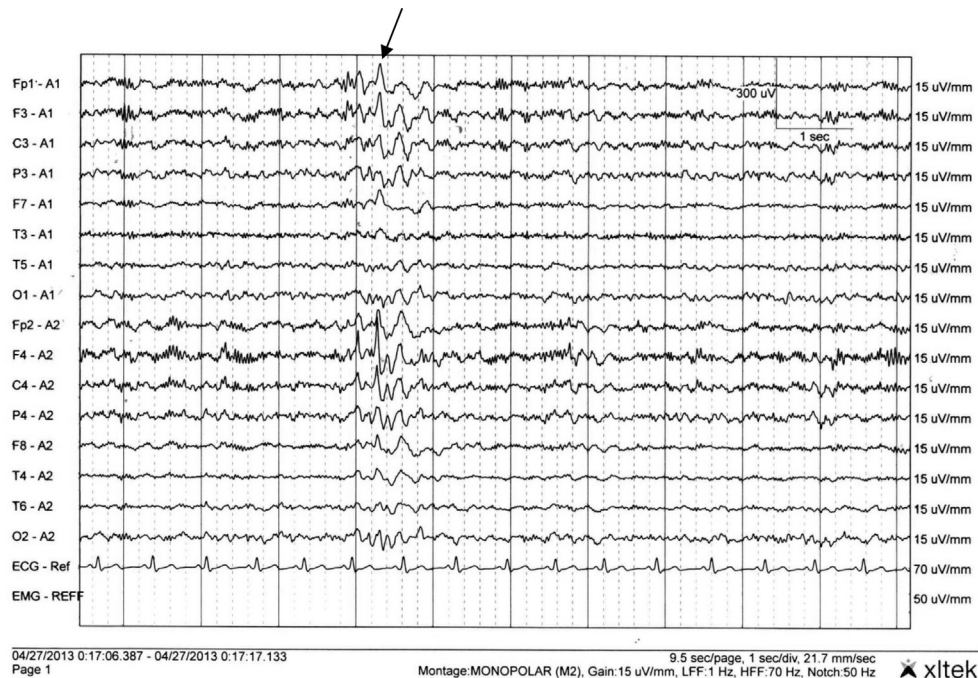
Teaching EEG series

Ipsilateral ear referential montage and source localization

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A 25 year old man presented with generalized tonic clonic seizures. A routine surface EEG has been performed.

2. Is any other montage useful in source localization in this case?



Exercise:

1. Can you identify the source of the spike/sharp wave seen in the 4th second (marked with arrow) of this EEG trace? Discuss the method by which you derive at this conclusion.

Answers:

1. One of the rules of localization is that, in a referential montage, the lead with highest negativity is the closest to the source of the negative spike generator, provided, the

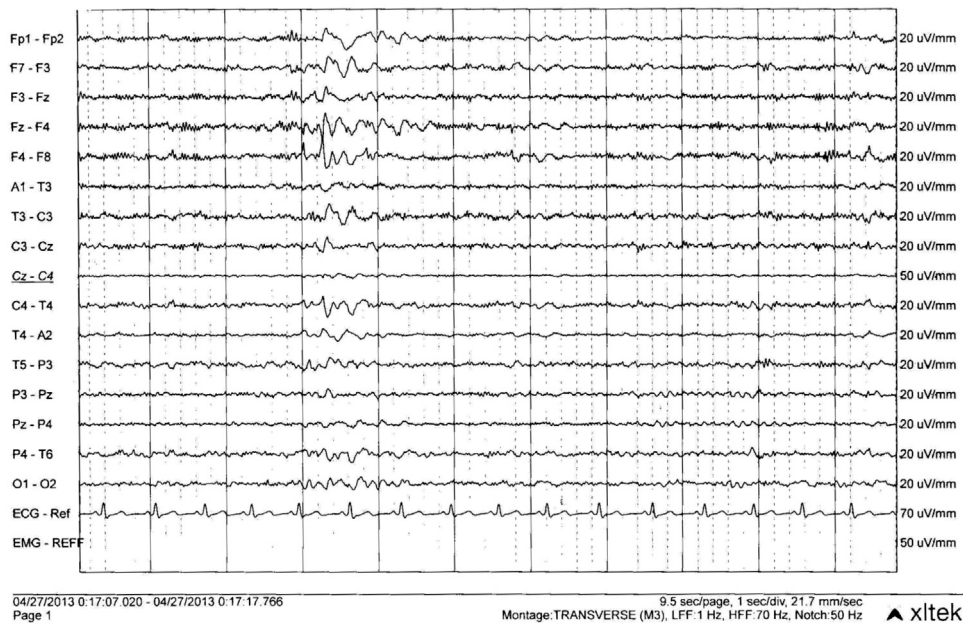
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reference electrode is truly inactive. The spike/sharp wave in the 4th second has a bilateral distribution in the fronto-central regions, but has greater amplitude in F4 than in F3. Thus, F4 may seem the obvious answer. However, there is a caveat that needs to be remembered. We have here an “ipsilateral ear” referential montage in which, all the left hemispheric electrodes have been connected to left ear and the right ones to the right ear. In this montage, there is no direct comparison of right versus left hemispheric electrodes to answer the question whether the right or left frontal region is the source of the spike.

2. We need a montage that directly compares the right and left hemispheres. Options include a common average

reference montage, a referential montage choosing a single reference far away from the activity as O1, or a transverse bipolar montage that crosses the region of interest. If concerned that the field involves A2, only A1 is good. But A1 would magnify potential amplitude of electrodes in the right hemisphere as compared to the left because of unequal inter-electrode distances between left and right sided derivations.

The same EEG trace has now been shown in bipolar transverse montage and clearly demonstrates phase reversal of the spike at F4. This confirms that the F4 is indeed the source of the spike.



Take home message: In the ipsilateral ear referential montage, when there are bilateral spikes/sharp waves, relying merely on the amplitude of the spike/sharp wave for source localization can be misleading. Instead, use of other montages discussed above is preferable.