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SHORT COMMUNICATION

# Afterdischarges during cortical stimulation at different frequencies and intensities

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Pulse width;
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**Summary**
*Purpose:* The occurrence of unwanted afterdischarges (ADs) impedes cortical stimulation for mapping purposes. We investigated the safety of several stimulation paradigms.
*Methods:* We compared the incidence of ADs and behavioral responses of two stimulation frequencies (50 and 100 Hz), at two intensities (1 and 0.2 ms pulse widths).
*Results:* Stimulation with 100 Hz was more likely to cause ADs than 50 Hz, and stimulation using 1 ms pulse width was more likely to cause ADs than 0.2 ms.
*Conclusions:* Stimulation using 50 Hz frequency with a pulse width of 0.2 ms might be safer during cortical mapping.


## Introduction

There is no established stimulation paradigm for cortical mapping in patients with refractory epilepsy undergoing presurgical evaluation. Unwanted afterdischarges (ADs) impede this procedure. Although the stimulated area is typically away from the seizure onset focus, ADs may occur in any brain region. These discharges may develop into a clinical seizure that may make any interpretation of behavioral responses to cortical stimulation difficult and require treatment with antiepileptic drugs (AEDs) that would further delay the mapping (Lesser et al., 1999; Motamedi et al., 2002; Szelenyi et al., 2007).

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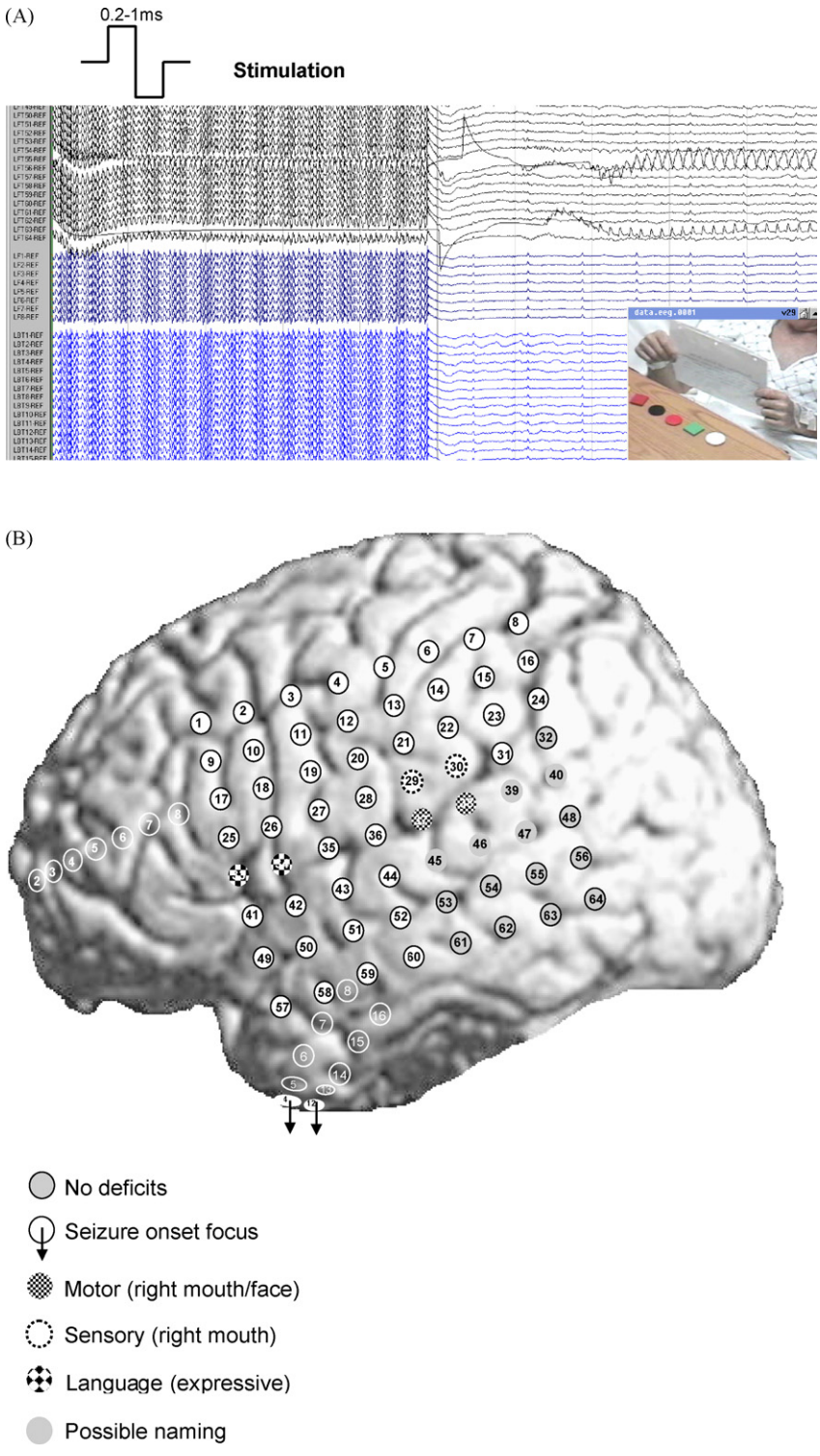


**Figure 1** (A) A 5 s long, 0.2 ms pulse width, 100 Hz simulation of electrodes LFT 55 and 63 induces ADs in the stimulated electrodes. Patient is reading a text as part of his language mapping procedure. (B) 3D reconstruction of the brain MRI with a $4 \times 8$ subdural grid placed over the left lateral temporal lobe and parts of the frontal and parietal lobes, a $2 \times 8$ strip covering the basal and medial temporal areas, and a $1 \times 8$ strip over the frontal lobe. Seizure onset focus was consistently in the anterior medial temporal region. Stimulated electrodes and the functional results are marked. The patient was back on his baseline AEDs including a high dose of topiramate at the time of testing and had significant difficulty with naming at his baseline. Therefore, his naming difficulty and decreased verbal output during the stimulation of some electrodes were considered as ''possible'' naming problem. The functional map was based on the results of stimulations using pulse width of 0.2 ms.