A rapid and reliable procedure to localize subdural electrodes in presurgical evaluation of patients with drug-resistant focal epilepsy

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Abstract

Objectives: To evaluate a novel method for localization of subdural electrodes in presurgical assessment of patients with drug-resistant focal epilepsy.

Methods: We studied eight consecutive patients with posterior epilepsy in whom subdural electrodes were implanted for presurgical evaluation. Electrodes were detected on post-implantation brain CT scans through a semiautomated procedure based on a MATLAB routine. Then, post-implantation CT scans were fused with pre-implantation MRI to localize the electrodes in relation to the underlying cortical structures. The reliability of this procedure was tested by comparing 3D-rendered MR images of the electrodes with electrode position as determined by intraoperative digital photography.

Results: In each patient, all electrodes could be correctly localized and visualized in a stereotactic space, thus allowing optimal surgery planning. The agreement between the procedure-generated images and the digital photographs was good according to two independent raters. The mean mismatch between the 3D images and the photographs was 2 mm.

Conclusions: While our findings need confirmation on larger samples including patients with anterior epilepsy, this procedure allowed to localize subdural electrodes and to establish the spatial relationship of each electrode to the underlying brain structure, either normal or damaged, on brain convexity, basal and medial cortex.

Significance: Being simple, rapid, unexpensive, and reliable, this procedure holds promise to be useful to optimize epilepsy surgery planning.