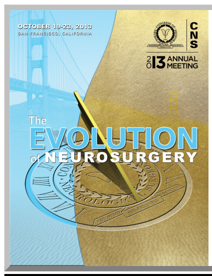

Utility of Stereotactic Depth Electrodes Compared with Grid and Strip Subdural Electrodes in Phase II Epilepsy Investigations

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INTRODUCTION

The success of resective surgery for medically intractable epilepsy relies on adequate localization of the ictal focus. When non-invasive electrographic investigations are inconclusive, phase II invasive monitoring is pursued. Conventional grid/strip electrodes provide excellent spatial coverage over the cortical surface. However, multiple depth electrodes may provide sufficient 2-dimensional spatial coverage alongside 3-dimensional data for epileptogenic zone localization, while offering advantages in ease of bilateral electrode placement, ability to optimize craniotomy for resection, and diminished surgical time.

Figure 1

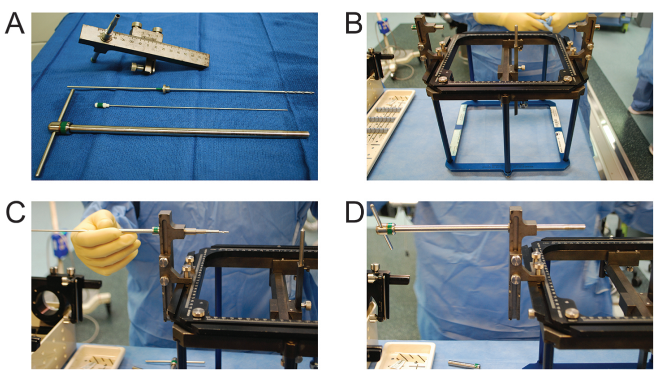

Figure 1: Leksell frame and stereotactic depth electrode placement apparatus. A. Stereotactic arm with skin corer, twist drill, probe, and bolt driver. B. Bilateral stereotactic arms in place. C. Twist drill within skin corer. D. Bolt driver.

METHODS

The study retrospectively reviewed 63 patients who underwent a total of 68 phase II investigations with depth and/or grid/strip electrodes from 2006-2012. All patients were refractory to medical management and had inconclusive non-invasive investigations. 33 depth studies and 35 grid/strip studies were performed.

RESULTS

Figure 2

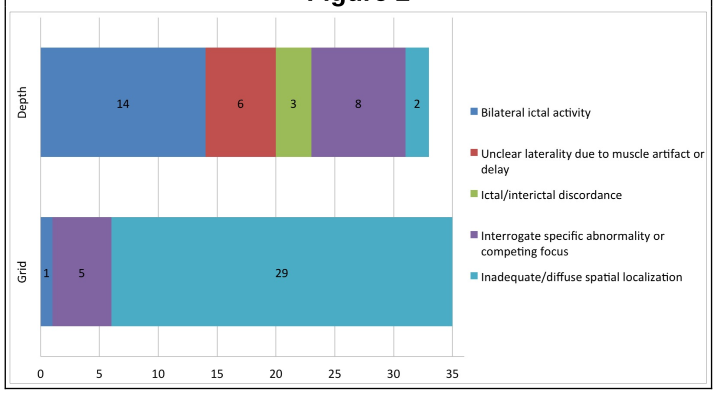

Figure 2: Indications for each type of phase II investigation, grouped by the five categories of motivation.

Figure 3

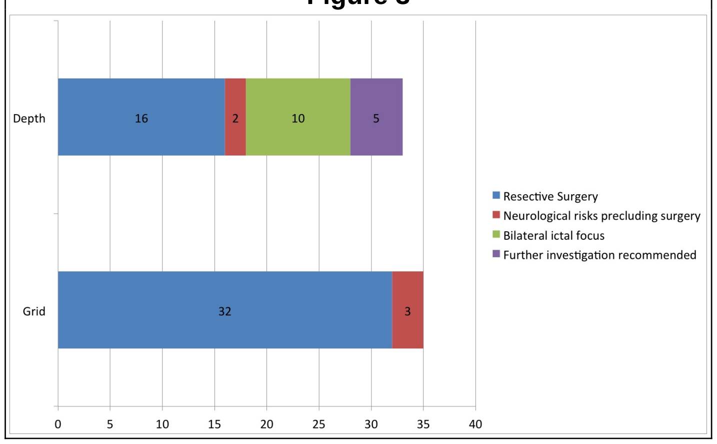

Figure 3: Outcomes of phase II investigations. Definitive outcome defined as referral for surgery, ictal focus determined to be non-resectable secondary to neurological risks, and bilateral ictal foci. 28/33 (84.8%) of depth electrode procedures resulted in definitive recommendations. 35/35 (100%) of grid/strip investigations resulted in definitive recommendations.

Figure 4

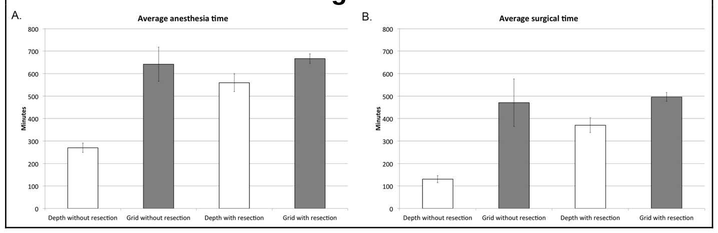

Figure 4: For patients who underwent resection, A. anesthesia time was reduced by an average of 16.1% ($p<0.01$) and B. surgical time reduced by 25.3% ($p<0.01$) amongst depth electrode patients compared with grid/strip patients. For patients who were not candidates for resection, A. anesthesia time was reduced by 58.0% ($p<0.01$) and B. surgical time reduced by 72.4% ($p<0.01$) in the depth electrode group.

CONCLUSIONS

This study supports the use of stereotactic depth electrodes as a primary invasive monitoring technique, with a high rate of conclusive study and statistically significant decreases in procedure time, most notably in patients with multifocal ictal onset precluding focus resection.

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Disclosures

The authors have no conflicts of interest to disclose.