The North American Survey of Placement and Adjustment
Strategies for Deep Brain Stimulation

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INTRODUCTION

Deep Brain stimulation (DBS) is gaining wide acceptance as treatment for Parkinson’s disease, essential tremor, and dystonia. Conventionally, DBS improves symptoms by functionally inhibiting certain brain areas, although the exact cellular mechanism of action is unknown. Our survey of 34 centers that perform DBS demonstrates variability in DBS Practice parameters within North America. This is not to mean to advocate any specific techniques but may serve as a resource for centers either developing or refining a DBS program. There are several drawbacks to surveys of this kind. Although we are not reporting the results for any specific DBS center, respondents have been asked to emphasize results preserved as better. We specifically did not ask for an estimation of efficacy because this is difficult to do and may be inflated. The respondents were heavily weighted toward academic settings; however the majority of DBS is implanted in academic movement disorder programs. All respondents were asked to query records as needed to ensure accuracy; however this can not be guaranteed by the author, and it is suspected that the results of some centers are more meticulously recorded than others. Nevertheless, we feel that this affords a reasonably good report of DBS practice parameters within North America.

METHODS

Centers known to participate in deep brain stimulator placement (Activa®, Medtronic Corporation) were sent a mailing with a detailed survey questionnaire regarding their surgical techniques, programming strategies and patient management practices. These centers were identified through the North American Survey of Placement and Adjustment of DBS Study Group database, other professional groups, and corroborated with purchasing records. The 46 centers that participated in the survey were all invited to participate. We required a minimum of 25 implanted patients for inclusion. The 46 centers were asked to identify all patients treated with DBS, the battery and ICD, the surgical procedure, any complications, post placement radiographic images, and a neurologic examination. In particular, results were sought for bilateral patients who met the inclusion criteria. Of the 46 centers that performed DBS, 28 centers have specific mechanisms or policies for bilaterally implanted patients varied, as 12 sites almost always implanted simultaneously whereas 13 sites almost never implanted simultaneously. Stereotactic frames included Leksell (17), CT (4), C-arm/CT/CT/MRI variety (5), and ventriculography (1). Two centers used more than one electrode per site. The 32 centers that used a single electrode averaged 2.3±1.4 passes per electrode (range: 1–18 passes). Most centers used macro-recordings to confirm placement by assessing the intraoperative clinical response (32), and to assess for adverse events (25) at high voltages, averaging 6.8±2.3 V (range: 4–10 V). The initial activation averaged 18±2 days after electrode placement (average range: 11±2 to 28±18 days, absolute range: 90 days). Most sites had multiple programmers; however the primary programmer was the neurologist’s staff (14), the neurosurgeon’s staff (6), the neurosurgeon (2), or a physiatrist (1). Patient assessments are automatically reduced in 48.9% of patients at their initial activation and programmed further in 15 centers. Over 60% of DBS patients are managed in academic affiliated. Twenty-seven centers use formal assessment protocols. Assessments of clinical response (32), and to assess for adverse events (25) at high voltages, averaging 6.8±2.3 V (range: 4–10 V). Some sites have marked bimodality as a result of patient management practices. Forty-six sites were identified through a DBS study designed specifically for the purposes of our survey. The respondents have implanted DBS into 4,478 patients (1,199 unilat VIM, 1,503 0.5V). Monitoring of DBS is gaining wide acceptance as treatment for Parkinson’s disease, essential tremor, and dystonia.