Deep brain stimulation

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The rapidity and acceptance with which deep brain stimulation (DBS) has become established within neurosurgical practice have exceeded the expectations of nearly everyone, with the possible exception of Alim Benabid. A growing body of clinical experience, published largely as multiinstitutional studies, has demonstrated the feasibility and effectiveness of DBS in a handful of applications, the most visible of which has been in the treatment of Parkinson disease. This has foreshadowed what is almost certainly going to be an exciting proliferation of potential uses across a spectrum of diverse conditions. In this issue, Lee and Kondziolka present their experience with DBS in the treatment of essential tremor (ET). They describe the successful amelioration of symptoms in a series of 19 patients with ET, and although their report is limited in size and scope, it directly or indirectly highlights a number of issues.

With the exception of a few minor points, the surgical procedure and outcomes described in this paper are consistent with those reported by others, and there is little that is surprising in this particular article. Nevertheless, there are a number of points warranting mention. The report focuses on a sizable, single-institution, single-surgeon experience, unlike the majority of articles on DBS for ET. The technique described is straightforward and notable for its effectiveness in the absence of microelectrode recording and relatively little readjustment of initial stereotactic coordinates. Notwithstanding the shortcomings of surgeon assessment, outcome with respect to tremor is extremely good. Although ET and Parkinson disease share the common symptom of tremor, these movement disorders are distinctly unlike in their character and functional implications. By virtue of its usual diminishment in intention, parkinsonian tremor is less significant in its impact relative to the more disabling associated symptoms of rigidity and bradykinesia. Despite their obvious differences, however, DBS of the ventralis intermedius nucleus of the thalamus has repeatedly been shown to have a major effect on motor function and on quality of life in both conditions.

Deep brain stimulation has largely replaced lesioning in nearly all institutions. Mindful of the unrelated long-term commitment involved in treating patients in whom shunts have been implanted, neurosurgeons understandably have been more wary than neurologists about such a hardware-intensive intervention. Nevertheless, the advantages of DBS—its reversibility, flexibility, and adjustability, and in part because of these, its critically important bilaterality—have immediately become very apparent. We do not currently possess a full understanding of hardware issues that may arise during longer-term implantation, but the complications reported in the literature and those seen in this clinical series have been relatively few and very reasonable, given the marked benefits to the patient. The majority of difficulties seen in the present series—electrode migration, lead breakage at a connector, associated paresthesias and weakness—are potentially avoidable as the surgeon’s experience and the technique become further refined. Even at this relatively early stage of development, the risk–benefit ratio is highly favorable.

Perhaps the most important message of the paper by Lee and Kondziolka pertains to wider applications. The sustained effectiveness of DBS over the long term, in the setting of ET, renders it a treatment strategy that may be applicable to other nonprogressive conditions. As advanced neuroimaging and neurophysiological tools increase our understanding of functional disorders as disparate as epilepsy, obsessive–compulsive disorder, pain, obesity, addiction, and others yet barely imagined to be neurosurgical, the effectiveness, safety, and durability of this brain–machine interface become increasingly important.

RESPONSE: We agree with all of Dr. Roberts’ comments. In our practice, DBS has eliminated the use of radiofrequency thalamotomy. For elderly or infirm patients, we do offer radiosurgical thalamotomy to the same target.

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