Deep brain stimulation and seizures

To the Editor: We read with interest the recent publication in the Journal by Pouratian et al. (Pouratian N, Reames DL, Frysinger R, et al.: Comprehensive analysis of risk factors for seizures after deep brain stimulation surgery. Clinical article. J Neurosurg 115:310–315, August 2011). The authors rightly point out their work as an attempt to identify risk factors for seizures in patients undergoing deep brain stimulation (DBS) in a systematic fashion, and performed statistical analysis in 161 cases retrospectively. They reported a 4.3% incidence of postoperative seizures, all of them in patients with Parkinson disease (PD), correlating with increased age, transventricular trajectory, and abnormal postoperative images. This incidence is slightly higher than the 2.4% (or less) reported earlier by Coley et al.1 in 2009 in a literature review of 1254 patients.

In our experience seizures were encountered, but seldom enough that we do not recommend antiepileptic prophylaxis. In our review of 378 patients and 541 leads, we had 4 cases with postoperative seizures, amounting to a 1.06% incidence (0.7% when the total number of leads was taken into account).

Interestingly, all of our patients who developed postoperative seizures have PD (249 patients), and seizures occurred in only 1.6%. As the authors noted, seizures were not reported in 299 patients with PD (mean age 61.8 years) recently evaluated in a multicenter randomized study.2 However, it is known that seizures did occur from operating in both areas of the brain.

We tried to verify the postoperative imaging findings because Pouratian et al. have found this variable to be the only parameter of statistical significance in their multivariate analysis. Air, blood, and/or edema was observed in 77 instances postoperatively, but did not correlate with seizures. Fifty-nine of these were seen in patients with PD, and none of these patients developed postoperative seizures. However, postoperative imaging revealed leads passing through the lateral ventricle in 43 instances, and associated with seizures in 2 patients (4.6%). We have long since used a trajectory that avoids the ventricle.3

It is unclear why seizures occurred only in patients with PD, and why air, blood, and edema on postoperative images had no association in our cases. It is probable that postoperative seizures are not very common with DBS; the best estimates from Coley et al.1 reached 0.5% in their large cohort of patients, and sampling size and bias are the greatest source of variability.


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Disclosure

The authors report no conflict of interest.

References


Response: We thank Drs. Bakay and Vannemreddy for their thoughtful commentary on our recent publication, in which we attempted to identify potential risk factors for postoperative seizures after DBS surgery. It is generally agreed that postoperative seizures after DBS are indeed a rare event. Yet, because of what is known about the morbidity of seizures in other neurological conditions, we thought it would be worthwhile to identify potentially important risk factors.2

One question that is raised is with respect to the true incidence of seizures after DBS surgery. Although the precise rate reported in our series (4.3%) is higher than that reported by Coley and colleagues1 (2.4%), comparison of the 95% confidence intervals for each demonstrates significant overlap: 2%–8.9% versus 1.7%–3.3%, respectively. Moreover, it deserves clarification that the 0.5% rate of seizures reported by Coley and colleagues refers to the rate of developing a chronic seizure disorder, which we saw none of in our series. The reported incidence rates therefore do not necessarily represent significantly different rates of events. Moreover, one must recognize that differences in the goals and design of each study may bias results.

Although Coley and colleagues1 report is without doubt valuable, and is the first comprehensive analysis of seizures after DBS, they clearly state that one of the primary motivations was “to provide the United Kingdom’s Driver and Vehicle Licensing Authority (DVLA) some idea of the incidence of epilepsy following DBS,” and they acknowledge that the limitations and assumptions underlying their study make it such that the study does not have “the authority of a meta-analysis.” In their study, postoperative seizure events were extracted from reports whose primary end point was not to evaluate this specific complication. Studies with complete data sets that are specifically designed to assess the incidence of a specific complication are much more likely to capture such events, resulting in higher perceived incidence rates. Our study...
would have no doubt been strengthened, nonetheless, by integrating primary data across multiple institutions rather than focusing on a single institution. We acknowledge that there is still value in retrospective multistudy analyses, but suggest that such analyses would be facilitated by standardizing the way in which we report complications after DBS surgery in published clinical series.2,3

With respect to risk factors for postoperative seizures, we found that abnormal findings on postoperative imaging, including either ischemia, swelling, or hemorrhage, were significantly associated with postoperative seizures. This is consistent with what Coley and colleagues reported as well. On the other hand, our quantitative analysis revealed no correlation between intracranial air and post-DBS seizures. We therefore sought specifically to dispel the commonly held notion that post-DBS seizures are related to pneumocephalus, and instead suggest that such events are more likely to be related to brain trauma, as evidenced by edema, hemorrhage, or ischemia. Given this significant risk factor (as well as the transventricular trajectory), we suggest that one may consider placing patients at risk on prophylactic antiepileptic medication for a short duration, but that routine use of such prophylaxis is not warranted.

Finally, we agree that it is peculiar that almost all reported seizure events occur in patients with PD. Whether this is selection bias or a true phenomenon is unclear; further follow-up and studies will be needed to clarify this issue further.

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Please include this information when citing this paper: published online January 13, 2012; DOI: 10.3171/2011.8.JNS111654.

Hydrocephalus and radiotherapy


Communicating hydrocephalus (CH) is one of the comorbidities in patients treated with radiochemotherapy for glioblastoma multiforme (GBM). Montano et al.3 conducted their retrospective study in 124 patients with GBM who received surgery for removal of GBM and subsequent radiochemotherapy. They found CH as a complication in 7 patients in their study series. The significant factors associated with CH in patients with GBM included the following: 1) ventricular opening followed with radiochemotherapy; 2) ventricular opening when removing tumor for GBM recurrence; and 3) elevation of CSF protein levels. Moreover, early recognition and CSF shunting is one of the keys to improving the short-term outcome of GBM.

There is still little known about the underlying mechanisms of CH in patients with GBM who are receiving radiochemotherapy. In the Discussion section, the authors proposed a potential hypothesis of radiotherapy-induced fibrosis of arachnoid granulations to explain the mechanism of CH in this subgroup of patients. Based on previous studies of molecular cell biology in these lesions, we would like to propose some more evidence to support the authors’ hypothesis. In fact, radiation induced the production of transforming growth factor-β (TGFβ) in cerebral tissues2 and glioma cells.3,4 Moreover, TGFβ contributed to fibrosis in many studies,3,6 suggesting the role of radiotherapy-induced fibrosis in patients with GBM receiving radiochemotherapy.

This study has provided clinical evidence of CH after radiochemotherapy for GBM. It is necessary to understand the underlying mechanisms of CH to minimize the comorbidity. Future prospective studies, through molecular analyses of irradiated glioma cells and arachnoid granules, will open another field to identify the mechanisms of CH in patients with GBM undergoing radiochemotherapy.

(ftp://thejns.org/doi/abs/10.3171/2011.10.JNS111654)

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Disclosure
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