

WILL THERE BE A NICHE FOR GAMMA KNIFE SURGERY IN MESIAL TEMPORAL LOBE EPILEPSY?

Gamma Knife Surgery in Mesial Temporal Lobe Epilepsy: A Prospective Multicenter Study

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PURPOSE: This article is the first prospective documentation of the efficacy and safety of gamma knife surgery (GKS) in the treatment of drug-resistant epilepsies of mesial temporal lobe origin.

METHODS: From July 1996 to March 2000, three European centers selected 21 patients with mesial temporal lobe epilepsy (MTLE) for a temporal lobectomy. The preoperative investigations included video-EEG with foramen ovale electrodes, magnetic resonance imaging, neuropsychological testing, and the ESI-55 quality-of-life questionnaire. In place of a cortectomy, radiosurgical treatment was performed by using the Leksell Gamma Knife (LGK) at a dose of 24 ± 1 Gy at the margin. The target included the anterior parahippocampal cortex and the basal and lateral part of the amygdala and anterior hippocampus (head and body). One patient (a heavy smoker) died of a myocardial infarction. Twenty patients were available for prospective evaluation. A minimum 2-year follow-up period included clinical, neuropsychological, and radiologic evaluations.

RESULTS: At each 6-month follow-up evaluation, the frequency of seizures was significantly smaller than that at the previous visit. The median seizure frequency of 6.16 in the month before treatment was reduced to 0.33 at 2 years after treatment. At 2 years, 65% of the patients (13 of 20) were seizure free. Five patients had transient side effects, including depression, headache, nausea, vomiting, and imbalance. No permanent neurologic deficit was reported except nine visual field deficits. No neuropsychological deterioration was observed 2 years after treatment. The quality of life was significantly better than that before surgery.

CONCLUSIONS: The safety and efficacy of the radiosurgical treatment of MTLEs appears good in this group of patient over the short-to-middle term. Delay of the seizure cessation was the major disadvantage of GKS. A longer follow-up period is required for confirmation of these results.

COMMENTARY

Gamma knife radiosurgery has tremendous appeal as a form of bloodless surgery. Radiosurgery has been used in the treatment of brain tumors and vascular malformations, particularly those that are not easily accessible to standard surgery (1,2) and has even been used as an alternative to functional neurosurgery for trigeminal neuralgia and some movement disorders (3). In patients with arteriovenous malformations and epilepsy, a beneficial effect on seizure control was noted, even when the vascular malformation was not obliterated (4). These findings encouraged the consideration of radiosurgery for nonlesional epilepsy. The use of radiosurgery for mesial temporal lobe epilepsy, for which the epileptogenic zone is well defined, is an attractive idea. However, in view of the excellent results and limited morbidity of standard surgery, radiosurgery will face a great challenge to find its niche.

Regis et al. have been pioneers in the use of radiosurgery for mesial temporal lobe epilepsy. Their initial experience was very encouraging and justified proceeding with a prospective study in three European centers. A U.S. multicenter study also is in progress. The overall seizure-free rate in the Regis et al. study was 65% at 2 years of follow-up. Seizure freedom occurred after a delay for most patients. For some patients, the delay was greater than 2 years, resulting in a recommendation that resective surgery should not be considered until at least 36 months after radiosurgery.

Investigation of radiosurgery for mesial temporal epilepsy is clearly a worthwhile endeavor that should be continued. Long-term follow-up of patients reported in this and other articles will be crucial to judge the stability of benefits from radiosurgery as well as the potential long-term adverse effects of this treatment. Long-term studies should include neuropsychological data, as it is not known whether the long-term risks to memory function

or other functions are any less than with conventional surgical resection. Another concern with radiosurgery investigation has been the inconsistent results across centers. In the current study, the seizure-free rate was 77% in the center with the greatest experience, compared with 50% and 33% for the other two centers. A recent small series from a U.S. center reported that none of five treated patients achieved seizure control (5). In addition to varying levels of surgical experience, the discrepancy in results may be related to differing methods and suggests the need to identify treatment parameters associated with optimal outcome, so that radiosurgical treatment can be standardized across centers.

Regis et al. indicate that a prospective, randomized trial to investigate properly the possible advantages of radiosurgery over resection is being conducted in centers of excellence in both epilepsy surgery and radiosurgery. Such a prospective trial would be highly valuable in delineating the differential advantages of each treatment method. However, it likely will be difficult to recruit patients willing to be randomized to two treatments that are so radically different. Most candidates will have strong opinions about needing immediate seizure control. The need to delay standard surgery by at least 36 months in case of radiosurgery failure may further limit the number of patients willing to be randomized.

The study of Regis et al. suggests that radiosurgery may have a place in the treatment of refractory mesial temporal epilepsy, for some patients. Assuming that the studies in progress confirm the current results, which patients should be considered for radiosurgery in the future? Patients considering this treatment will have to be informed of two main disadvantages: the long latency before success can be judged and the increase in seizure frequency preceding improvement or resolution of seizures. The patients most apt to pursue radiosurgery likely will be those opposed to brain surgery, as a matter of principle. Most centers do follow some patients who simply will not accept standard epilepsy surgery because of fear of

surgery or because they do not consider their seizures sufficiently serious to justify brain surgery. Other candidates for radiosurgery will include older patients or patients with medical conditions placing them at greater risk of complications with standard surgery. However, one concern in this group of patients is that they may require prolonged steroid treatment for the significant edema that may result from gamma knife therapy.

The most attractive application of radiosurgery in epilepsy will continue to be for symptomatic epilepsy with surgically inaccessible epileptogenic lesions (6). Radiosurgery also should be investigated for some focal epilepsies in which results of standard surgery are suboptimal or in which standard surgery may produce unacceptable deficits.

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