

## GAMMA KNIFE IN TEMPORAL LOBE EPILEPSY

### Gamma knife surgery for mesial temporal lobe epilepsy

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**OBJECTIVE:** Gamma knife radiosurgery (GKS) allows precise and complete destruction of chosen target structures containing healthy and/or pathological cells, without causing significant radiation damage to adjacent tissues. Almost all the well-documented cases of radiosurgery for epilepsy are for epilepsies associated with space-occupying lesions. These results prompted the authors to investigate the use of radiosurgery as a new way of treating epilepsy not associated with space-occupying lesions.

**METHODS:** To evaluate this new method, 25 patients who presented with drug-resistant mesial temporal lobe epilepsy (MTLE) were selected. A follow up of more than 24 months is now available for 16 patients. The preoperative evaluation was performed as it usually is in patients selected for microsurgery for MTLE. In lieu of microsurgery, the treatment of amygdalohippocampal structures was performed using GKS. Thirteen (81%) of these 16 patients are seizure free, and two are improved. The median latent interval from GKS to seizure cessation was 10.5 months (range 6-21 months). Two patients were immediately seizure free. The median latency in aura cessation was 15.5 months (range 9-22 months). Morphological changes on magnetic resonance imaging were visible at 11 months (median) after GKS (range 7-22 months). During the onset period of these radiological changes, three patients experienced headache associated, in two cases, with nausea and vomiting. In these three patients the signs resolved immediately after prescription of low doses of steroids. No cases of permanent neurological deficit (except three cases of nonsymptomatic visual field deficit), or morbidity, or mortality were observed.

**CONCLUSIONS:** This initial experience indicates that there is short- to middle-term efficiency and safety when using GKS to treat MTLE. Further long-term follow up is required. It seems that the introduction of GKS into epilepsy treatment can reduce the invasiveness and morbidity.

### COMMENTARY

Regis et al reviewed a relatively large (25 patient) series of mesial temporal lobe epilepsy patients treated using gamma knife surgery (GKS) at a single center since 1993. All met criteria for amygdalohippocampectomy (although specific preoperative testing was not described), and patients with space-occupying lesions were excluded. The number of patients with magnetic resonance imaging (MRI) findings of mesial temporal sclerosis, known to be a good prognostic factor for amygdalohippocampectomy, was not reported. Follow-up was over 1 year for all patients and was over 2 years for 16 patients.

The main difference between this form of therapy and traditional amygdalohippocampectomy is a delay in seizure reduction. Median latency to seizure freedom was 10.5 months. Although the mechanism of efficacy of this treatment is not known, the time of seizure reduction corresponded to the appearance of characteristic MRI changes.

Adverse effects were few and consisted of headache, nausea, and vomiting in three patients associated with the appearance of MRI changes and resolving with introduction of corticosteroids. Visual field deficits were seen in three patients (two asymptomatic superior quadrantanopsia and one symptomatic hemianopsia), although it is not clear whether formal visual field testing was performed. Memory testing was not specifically reported. In patients with over 2 years of follow-up, the overall rate of seizure freedom was 81%, with two patients (12%) improved and one unchanged.

Amygdalohippocampectomy has become the accepted standard of treatment in patients with refractory mesial temporal lobe epilepsy, with long-term, seizure-free rates of 70%-80% in large series. Although effective and reasonably safe, complications do occur. This series of GKS in comparable patients lacks long-term follow-up and demonstrates a delay in seizure



control; however, the ultimate seizure-free rate of 81% is comparable to that of traditional surgery. The only long-term complication reported was visual field deficit in three patients (12%), which is similar or less frequent than surgical series. Other complications of surgical treatment (infection, hemiparesis, memory deficits) were not seen, and the procedure avoids the (admittedly rare) complications of general anesthesia.

This report strongly suggests that GKS may be a reasonable option in patients with mesial temporal lobe epilepsy. The

optimal parameters for treatment of these patients remain to be defined. Further studies are also needed to address dose-related efficacy, effectiveness over longer follow-up periods, and neuropsychological effects of GKS. There are ongoing European- and National Institutes of Health-funded U.S. multicenter trials that will examine these issues and help further define the role of this promising new therapy.

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