

# Surgical treatment of chronic epilepsy with intracranial neoplasm and vascular lesion

Jung-Kyo Lee

Department of Neurosurgery, Asan Medical Center, University of Ulsan, College of Medicine, Seoul, Korea

## Abstract

The surgical treatment of epilepsy patients can be divided into various resection methods such as simple excision, lesionectomy, and lesionectomy plus cortisectomy. Recently, radiosurgery is included in the armamentarium. Several authors suggest that the radiosurgery is an alternative treatment to open respective surgery for intractable epilepsy, especially for mesial temporal lobe epilepsy. The optimal indication and efficacy of radiosurgery for epilepsy patients are still controversial. In our study, 153 patients with seizure/epilepsy and MRI visible lesion from 1993 to 2006, were included (157 operations). We reviewed the cases of the patients with epileptogenic lesions of neoplasm and vasculopathy who had been treated surgically to determine surgical outcome in relation with types of surgical treatment, pathology, and location of lesion.

## INTRODUCTION

The object of respective epilepsy surgery is complete resection of epileptogenic zone which is a cortical area generating seizures. It is important to define the localization of the epileptogenic zone and its relationship to the lesion. The surgical management of seizure patients with intracranial lesions (MRI visible lesions) consists of a removal of structural itself (simple excision), removal of the structural lesion itself with surrounding gliotic tissue (lesionectomy) and an excision of the structural lesion and surrounding epileptic cortex with electrocorticogram (lesionectomy plus cortisectomy). The debate over whether one surgical approach has particular advantages over the other remains unsolved.

## METHODS

Among 157 operations, neuropathologic diagnosis had tumor in 105 cases, vascular lesion in 27 cases and other benign lesions in 25 cases. Mean follow-up period was 8.7 years (2-15 years). The study group included 102 males and 51 females with a mean age of 33.8 years.

The types of surgery in extratemporal area were lesionectomy and lesionectomy plus cortisectomy, which depend on involvement of eloquent area. The lesions near language area were operated under awoken condition of the patient. In temporal area, standard temporal lobectomy was performed for lesion located in anterior temporal lobe within

4 cm. For lesion located in posterior temporal area beyond 4 cm, the patient underwent invasive study in the dominant area and lesionectomy in the non-dominant area. Patients with temporal lesion showing hippocampal atrophy or swelling near collateral sulcus confirmed by MRI underwent lesionectomy with amygdalohippocampotomy. In the cases of meningioma for epilepsy patients with brain tumor we performed simple excision. For dysembryoplastic neuroepithelial tumors (DNET) or ganglioglioma, invasive study was considered because these tumors frequently involving cortical dysplasia. For other cases with tumor, lesionectomy with biopsy was performed in order to confirm tumor margin. Gamma knife radiosurgery was also applied for tumor, vascular lesion and hypothalamic hamartoma. We then compare the postoperative seizure outcomes with respect to types of surgery, pathology and location of lesion.

## RESULTS

Among 98.6% of total patients who showed good post operative outcomes, 68.2% of them had overall postoperative seizure free rate and 30.6% of them had rare seizures. Pathology (tumor vs. vascular), location (temporal vs. extratemporal) and resection method (accompanying invasive study vs. lesionectomy alone) did not account for statistical significance with respect to seizure free rate, seizure improvement and

no improvement. On the other hand, there was statistical significance for difference between total resection and subtotal resection. The seizure free rate and rare seizure rate in tumor were 68.6% and 30.5%, while 55.6% and 44.4% in cavernous angioma, respectively. The seizure free rate and rare seizure rate were 64.9% and 33.8% in temporal lesions and in extra-temporal lesions, it was 71.3% and 27.5%. When performing lesionectomy alone, the rates were 66.1% and 32.2% with invasive study, the rates were 75% and 25%. With respect to the completeness of tumor resection, the seizure free rate and rare seizure rate were 79.4% and 19.8%, respectively, in total resection. For subtotal resection, the rates were 11.5% and 84.6% showing drastic difference. Despite the quantity of gamma knife radiosurgery cases in our study, they all had excellent overall postoperative outcome, the seizure free rate of arteriovenous malformation (AVM) treated by gamma knife surgery was 100% for all three cases in our study.

## DISCUSSION

Selecting the optimal surgical strategy for intractable epilepsy in order to control seizures is crucial. Simple resection of the lesion even can provide seizure control and the outcome of lesionectomy was excellent. However, some authors had a question about the efficacy of pure lesionectomy for epilepsy patients with temporal lesion.<sup>1,2</sup> In our cases, the seizure free rate of the group performed temporal lobectomy with amygdalohippocampectomy (84%) was higher than the groups performed the group with simple lesionectomy (66.2%).

In order to control seizure, clinical semiology, MRI, CT, PET, SPECT, ictal video-EEG and invasive intracranial monitoring are necessary factors in the presurgical evaluation. These tests can further provide accuracy to the localization of seizure onset. The complete resection of the lesion produces a favorable surgical outcome.<sup>3</sup> In this study, the seizure free rate was higher in patients with complete resection of lesion. Each surgical outcome varied with respect to type of pathology. The outcome of tumor lesion is more favorable than vascular lesion, in our cases. Other literature suggested the tumor type is correlated with seizure outcome; patients with ganglioglioma or oligodendroglioma become seizure free in > 90%, as opposed to patients with astrocytoma (only 66%).<sup>3</sup> Schauble *et al*<sup>6</sup> reported that the seizure free rate was 51% and

the rate of excellent outcome was 78%. On the other hand, the seizure free rate of AVM treated by gamma knife surgery in our study was 100% for 3 cases. The safety and efficacy of the gamma knife surgery for epilepsy patients with temporal lesion, hypothalamic hamartoma, AVM appeared good.<sup>4,6</sup> However, we still do not have long-term studies in epilepsy.

In conclusion, both lesionectomy alone and lesionectomy accompanying cortisectomy for seizure patients with space occupying lesion had equally good postoperative outcomes. The seizure free rate was higher in the cases of total lesion resection than that of subtotal lesion resection. Between different types of lesion, different lesion location, and the presence and absence of invasive study, there was no significance difference for seizure free rate or rare seizure rate. As an alternative treatment option for lesional epilepsy therapy, gamma knife radiosurgery can be considered and further study is needed.

## REFERENCES

1. Bauer R, Dobesberger J, Unterhofer C, *et al*. Outcome of adult patients with temporal lobe tumours and medically refractory focal epilepsy. *Acta Neurochir (Wien)* 2007; 149:1211-6; discussion 1216-7.
2. Clusmann H, Kral T, Fackeldey E, *et al*. Lesional mesial temporal lobe epilepsy and limited resections: prognostic factors and outcome. *J Neurol Neurosurg Psychiatry* 2004; 75:1589-96.
3. Luyken C, Blumcke I, Fimmers R, *et al*. The spectrum of long-term epilepsy-associated tumors: long-term seizure and tumor outcome and neurosurgical aspects. *Epilepsia* 2003; 44:822-30.
4. Regis J, Rey M, Bartolomei F, *et al*. Gamma knife surgery in mesial temporal lobe epilepsy: a prospective multicenter study. *Epilepsia* 2004; 45:504-15.
5. Regis J, Scavarda D, Tamura M, *et al*. Gamma knife surgery for epilepsy related to hypothalamic hamartomas. *Semin Pediatr Neurol* 2007; 14:73-9.
6. Schauble B, Cascino GD, Pollock BE, *et al*. Seizure outcomes after stereotactic radiosurgery for cerebral arteriovenous malformations. *Neurology* 2004; 63:683-7.