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Changes in Time to Temporal Lobe Epilepsy Surgery

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Abstract

We examined whether duration of epilepsy prior to temporal lobe resection has decreased over the years as a result of increasing body of evidence in the literature showing the benefits of anterior temporal resection.

We stratified the 213 patients, who had their first temporal lobe resection at our center between 1996 and 2007 into three groups in order to detect any decreasing trends in duration over the years: group A (surgery between 1996 and 1999); group B (surgery between 2000 and 2003); group C (surgery between 2004 to 2007).

No difference in mean duration of epilepsy was detected between the three groups ($p=0.54$).

The mean duration in epilepsy prior to temporal lobe resection has not decreased over the years.

Keywords

Practice parameter; anterior temporal lobe resection; duration of epilepsy

1.1 INTRODUCTION

Studies suggesting that temporal lobe resection is an effective treatment for pharmacoresistant temporal lobe epilepsy (TLE) have been reported as early as 1950.¹ Recent data indicate that surgical treatment is superior to medical management in pharmacoresistant TLE in terms of improving quality of life and controlling disabling seizures.^{2–5} After a systematic review of 24 observational studies and a single randomized controlled trial, a panel of experts issued an American Academy of Neurology (AAN) Practice Parameter in 2003.⁶ It recommended that 1) patients with disabling seizures due to temporal lobe epilepsy who have failed trials of first-line anti-epileptic drugs be referred to

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an epilepsy surgery center and 2) appropriate patients who accept risks and benefits be offered surgery at the epilepsy surgery center.

Despite the availability of an effective therapeutic intervention, multiple studies indicate that the duration of epilepsy prior to temporal lobe epilepsy surgery is about 20 years.^{4, 5, 7} This delay in time to surgery for eligible patients is suboptimal, since evidence indicates that early epilepsy surgery might prevent cognitive and psychosocial decline.⁸ What remains unclear is whether the duration of epilepsy prior to temporal lobe resection has decreased over the years as a result of increasing body of evidence suggesting efficacy.

In this study, we compared the duration of epilepsy prior to temporal lobe resection among patients who had temporal lobe resection at our epilepsy center.

1.2 METHODS

Using our epilepsy surgery database, we performed a retrospective cohort study of epilepsy patients who had anterior temporal lobe resection at the Columbia Comprehensive Epilepsy Center between 1996 and 2007. This database includes patient clinical data relevant to the surgical decision-making and outcome measures. Patients were divided according to the year of their first temporal lobe resection: group A (surgery between 1996 and 1999); group B (surgery between 2000 and 2003); group C (surgery between 2004 to 2007). We grouped the patients into three equal time intervals of 4 years in order to detect trends in duration of epilepsy prior to surgery. Only those with first surgery occurring between 1996 and 2007 were considered. Onset age was defined as age at first non-febrile seizure.

Measures

Study endpoints—The primary study endpoint was epilepsy duration prior to first temporal lobe resection, calculated as the age at epilepsy surgery minus the age of onset of first non-febrile seizure.

Other variables—Education and occupation at the time of epilepsy surgery were used as proxies for socioeconomic status. Education was categorized as either less than college degree or $\geq$ college degree. Occupation was categorized as employed or not.

Statistical analysis

The primary outcome was analyzed using the ANOVA test for heterogeneity. We also adjusted for potential confounding by sociodemographic factors. The confounders analyzed were sex, marital status, employment, and education level. Test for linearity of relationship between surgery year and epilepsy duration prior to temporal lobe resection was performed using linear regression analysis.

The protocol was approved by the Institutional Review Board at Columbia University Medical Center.

1.3 RESULTS

A total of 213 patients underwent anterior temporal lobe resection at our center between 1996 and 2007: 83 patients during years 1996 to 1999 (Group A); 65 patients during years 2000 to 2003 (Group B); and 65 patients during years 2004 to 2007 (Group C). Table 1 describes these patients in terms of socio-demographic variables, stratified according to the year of surgery. No significant differences in socio-demographic factors were found across time intervals.

The mean duration of epilepsy prior to temporal lobe epilepsy for groups A, B, and C were 22.6 (± 12.7), 22.4 (± 15.4), and 21.1 (± 14.2) years respectively. Table 2 shows the ANOVA test result, which confirmed the lack of a statistically significant difference in duration of epilepsy prior to epilepsy surgery between the three groups. In order to test for possible negative confounding by socio-demographic variables, we adjusted our primary outcome by gender, marital status, employment status, and education. After adjusting for confounding, there was no statistically significant difference in duration of epilepsy prior to epilepsy surgery between the three groups.

There was no linear trend in terms of reduction in epilepsy duration by surgery year (p-value=0.584). The mean duration of epilepsy prior to temporal lobe epilepsy at two extremes of the study period (1996 and 2007) was 23 and 21 years respectively.

1.4 DISCUSSION

In the past two decades, there has been an increasing body of evidence demonstrating the benefits of epilepsy surgery over continued medical management for patients with pharmacoresistant temporal lobe epilepsy. The evidence was systematically reviewed and synthesized into a strong recommendation by the AAN, which states that referral to epilepsy surgery center should be considered for patients with disabling seizures arising from the temporal lobe. We found that the duration of epilepsy prior to temporal lobe resection has not decreased over the years.

Understanding the delay in time to epilepsy surgery is important, because short duration of epilepsy and earlier age at surgery are associated with better cognitive functions and psychosocial outcomes postoperatively.^{9, 10} Furthermore, timely consideration of surgical option is particularly significant for adolescents and young adults during a critical period in psychosocial development. Children and adolescents with epilepsy are more likely to have social and educational problems persisting into adulthood, such as higher rate of under-education and unemployment, compared to healthy controls.¹¹

Our finding raises concerns regarding the current standard of care, while highlighting further studies that are needed. A major reason for the delay in time to surgery is thought to be due to lack of timely referral to epilepsy surgery centers by the treating neurologists or primary care physicians.¹² Based on a recently published survey¹³, this assumption seems in part confirmed. The responding neurologists varied on what constituted refractory epilepsy and overestimated the frequency of surgical complications. More than two thirds of the neurologists required failure of at least two different polytherapy trials as the criteria for refractory epilepsy. Fourteen percent of neurologists required failure of 4 or more antiepileptic medications, and an additional 19% required failure of all approved drugs. Responding neurologists overestimated the likelihood of surgical complications, with 64% believing that the permanent complication rate exceeded 5%.¹³

Our study has some notable limitations. First, this was a study from a single center with a limited number of study patients. Second, our study period from 1996 to 2007 may not be long enough to show an effect. However, there was no linear trend in terms of reduction in epilepsy duration over the years, and we did not find a significant difference in duration of epilepsy between patients who had surgery in 2007 versus those that had surgery in 1996. Third, we did not directly assess practice behavior of referring physicians. Directly assessing the behavior of referring physicians would identify factors that impacted their decision to refer and whether the guideline had any influence on their decision to refer. For example, surveys can examine whether referring physicians 1) are aware of, 2) are familiar with, and 3) agree with the content of the AAN Practice Parameter, similar to studies previously done

in other areas of medicine.¹⁴ Given our methodological limitations, we cannot draw conclusions regarding the impact of the AAN Practice Parameter on referring physicians. As the purpose of a guideline is to suggest appropriate health care for specific clinical circumstances,¹⁵ it might be unrealistic to expect dramatic changes within a relatively short period of time since its publication in 2003.

Our study finding underscores the need for further studies to clarify current practice pattern among physicians that treat refractory epilepsy patients and the barriers that exist that hinder physician adherence to guidelines. We have so far only focused on physician behavior. However, also needed are studies that assess self-referred patients or patients who fail to seek presurgical evaluations despite referral from their treating doctor. Such studies can explore patient factors that contribute to the delay in considering temporal lobe epilepsy surgery (such as exaggerated perception of the risks of surgery). Such studies will help formulate a framework for improving current practice pattern so that epilepsy surgery is considered in a timely fashion for appropriate patients.

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Table 1

Characteristics of the Study Population, Stratified by Timing of Temporal Lobe Surgery

	Group A (n=83)	Group B (n=65)	Group C (n=65)	P value
Mean Onset Age (S.D)	13.6 (11.6)	12.9 (11.3)	16.4 (11.1)	0.175 [*]
Mean age at surgery	35.8 (13.7)	34.8 (13.1)	38.0 (12.4)	0.393 [*]
Sex (% male)	42.2%	49.2%	67.6%	0.174 ^{**}
Marital status (%married)	46.1%	27.7%	48.5%	0.089 ^{**}
Education level (% with $\geq$ college)	54.2%	60%	53%	0.365 ^{**}
Employment status (%employed)	67.5%	66.2%	60.6%	0.119 ^{**}

^{*} ANOVA^{**} Chi-square test.

Table 2

Mean Values (SD) for Duration of Epilepsy Prior to Temporal Lobe Epilepsy Surgery According to Year of Surgery

	Group A	Group B	Group C	P value
Mean duration in years (S.D.)	22.6 (12.7)	22.4 (15.4)	21.1 (14.2)	0.54*

* ANOVA