



Consideration of epilepsy surgery in adults should be independent of age

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ABSTRACT

Objectives: Epilepsy surgery is performed less frequently in persons over 45 years of age than in younger individuals, probably reflecting biases among patients, referring physicians and neurologists.

Methods: We report on a clinically heterogeneous cohort of patients aged 45 years or older who underwent epilepsy surgery for medically intractable epilepsy.

Results: Over a 15-year period, 42 patients with a mean duration of epilepsy of 27.3 years underwent elective surgery. The mean follow-up period was 48 months. Thirty-two patients had an Engel class I outcome, of which 23 were totally seizure-free (Ia). Six patients had a class II outcome (rare disabling seizures), one had a class III outcome (worthwhile improvement), and three had a class IV outcome (no worthwhile improvement). The majority of patients reported an improved quality of life and satisfaction with the epilepsy surgery. A subjective improvement in cognition was reported in 7 patients while a decline was reported in 10 patients. New neuropsychiatric difficulties were reported in three patients while three patients reported improved anxiety after surgery. Only one patient became newly employed after surgery while 23 returned to driving. Permanent complications occurred in four patients (thalamic infarct during a Wada test ($n = 1$) and asymptomatic visual field defect ($n = 3$)).

Conclusions: We report a favorable outcome from epilepsy surgery in a large series of older adults and conclude that age *per se* is not a contraindication to epilepsy surgery. We emphasize the lack of correlation between outcome from surgery and pre-operative duration of epilepsy.

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1. Introduction

Despite the increasing recognition of medical intractability and advances in the pre-surgical evaluation of patients, epilepsy surgery is underutilized [1]. In part, this may reflect lack of access to centers with expertise in epilepsy surgery. Nonetheless, the average time to referral for pre-surgical evaluation in the US remains more than 20 years from onset of epilepsy and more than 10 years after recognition of medical intractability [2]. Surgical intervention is a useful therapeutic option for disabling, medically refractory epilepsy in carefully selected patients [3]. Among epileptologists, attention is paid to the early identification of appropriate surgical candidates, particularly those with a well-defined etiology associated with medical refractoriness. These patients are usually young adults, typically under 40 years of age.

Less attention has been paid to older patients with intractable epilepsy [4]. This likely reflects bias among patients, referring physicians and neurologists. Traditionally, increasing age was thought to be a relative contraindication to epilepsy surgery [4–8]. This viewpoint reflects the perception of increased surgical risk for the older patient and reduced chances of a good therapeutic outcome. Intuitively, one might assume that the ‘average’ older patient with intractable epilepsy will have a longer clinical history of epilepsy with more psychosocial and medical co-morbidities. There is evidence that increasing duration of epilepsy before surgical intervention lessens the chance of permanent abolition of seizures, possibly due to formation of secondary epileptic foci remote from the original focus [8,9]. The patient may have a reduced chance of significant seizure reduction and may have a greater risk of medical, surgical and neuropsychological complications. Lastly, the patient may struggle to rehabilitate and thus not get the psychosocial benefit of epilepsy surgery.

However, many carefully selected older patients may experience benefit from epilepsy surgery [10]. This is particularly true for intractable focal epilepsy of temporal lobe origin [11–16]. We report

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our experience with epilepsy surgery in persons over 45 years of age with intractable temporal and extra-temporal epilepsy.

2. Patients and methods

2.1. Patient selection

We performed a retrospective analysis of patients aged 45 years or older operated on for disabling, medially refractory partial epilepsy at the Massachusetts General Hospital over a 15-year period (1992–2006). All patients underwent epilepsy surgery solely on the grounds of disabling, medically intractable partial epilepsy. Specifically, we excluded patients who had seizures in the setting of structural abnormalities (in particular growing tumors or vascular malformations) where the surgery was undertaken due to the nature of the structural abnormality rather than refractory epilepsy related to the lesion. Intractability was defined as occurrence of more than one complex partial or convulsive seizure per month despite appropriate use of at least three appropriate anti-seizure medications. A minimum 1-year follow-up was required for inclusion. The complete medical record was reviewed (particular attention was paid to the consensus opinion reached at the epilepsy surgery conference) and, in addition, all patients were contacted directly in follow-up by telephone interview by D.C. The telephone interview was structured and focused on the evaluation of the outcome parameters. Institutional Research Board approval was obtained for the study.

2.2. Pre-operative evaluation

All patients underwent detailed neurologic history and examination, magnetic resonance imaging (MRI), interictal positron emission tomography (PET), and surface EEG-video recordings in the pre-operative period. Selected patients underwent neuropsychological evaluation, Wada testing or intracranial EEG recording.

2.3. Surgical procedure and complications

Patients were recommended for surgery based on proven medical intractability, secondary disability, and concordant pre-operative data, usually with an associated candidate structural lesion. Medical co-morbidities were factored into the decision-making process on a case-by-case basis. Complications related to the pre-operative work-up and early post-operative period were recorded.

2.4. Seizure outcome

Seizure outcome was determined by review of the medical record in addition to telephone interview in all patients. Seizure outcome was classified according to Engel's classification of epilepsy surgery outcome (Table 1) [17]:

2.5. Histopathology

The final neuropathological diagnosis was extracted from the formal neuropathological report.

2.6. Neuropsychological assessment

Each medical record was assessed for evidence of neuropsychiatric complications or cognitive decline in the post-operative period. In selected cases, where formal neuropsychometric assessments were performed before or after surgery, this data was reviewed. All patients were questioned regarding problems with

Table 1

Engel classification of epilepsy surgery outcome.

Class I (free of disabling seizures (excludes early post-op seizures))
1A: Completely seizure-free since surgery
1B: Non-disabling simple partial seizures only since surgery
1C: Some disabling seizures after surgery, but free of disabling seizures for at least 2 years
1D: Generalized convulsion with AED withdrawal only
Class II (rare disabling seizures "almost seizure-free")
2A: Initially free of disabling seizures but has rare seizures now
2B: Rare disabling seizures since surgery
2C: More than rare disabling seizures after surgery, but rare seizures for at least 2 years
2D: Nocturnal seizures only
Class III (worthwhile improvement)
3A: Worthwhile seizure reduction
3B: Prolonged seizure-free intervals amounting to greater than half the follow-up period, but not less than 2 years
Class IV (no worthwhile improvement)
4A: Significant seizure reduction
4B: No appreciable change
4C: Seizures worse

memory and intellectual function before and after surgery and the impact of surgery.

2.7. Mental health assessment

Symptoms of depression and anxiety were sought and their relationship to surgery was established. Particular attention was paid to the prescription of new psychotropic medications after surgery.

2.8. Assessment of impact of epilepsy surgery on employment and driving status, anti-seizure medication prescribing, and patient satisfaction with epilepsy surgery

Each patient was questioned on employment status and their ability to drive before and after surgery. Changes in anti-seizure medication prescribing were recorded. Five-point rating scales assessing the patient's satisfaction with epilepsy surgery and impact on quality of life were used. The patients were given five possible answers to the question 'How much did the surgery improve your quality of life?' namely, 'marked worsening, mild worsening, no change, mild improvement, or marked improvement'. In addition, the patients were given five possible answers to the question 'How satisfied are you with the results of the surgery for your epilepsy?' namely, 'very dissatisfied, dissatisfied, no opinion, satisfied, or very satisfied'.

3. Results

3.1. Demographic parameters

From a total of 244 patients who underwent surgery for intractable partial epilepsy during a 15-year period (1992–2006), 42 patients were 45 years of age or older. This represents 17.2% of the total cohort. There was an equal gender distribution with 21 female and 21 male patients. The distribution of age was as follows: 45–50 years (23 patients), 51–55 years (10 patients), 56–60 years (7 patients), 61–65 years (1 patient) and >65 years (1 patient).

3.2. Clinical parameters

In the overall cohort of 244 patients, the mean age at surgery was 33.1 years with a standard deviation of 12.2 years. In the overall cohort, age 45 represents one standard deviation above the mean

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