SHORT-TERM SURGICAL OUTCOMES IN PATIENTS WITH DRUG-RESISTANT EPILEPSY DUE TO LESIONAL TEMPORAL LOBE

Tran Dinh Van[1,2], Dong Van He[2]
Vu Van Hoe[1], Nguyen Thanh Bac[1]*

Abstract

Objectives: To describe the outcome of 35 cases of drug-resistant epilepsy due to the lesional temporal lobe surgery at Vietduc University Hospital from May 2018 to September 2022. ***Methods:*** A prospective description combined with retrospective, longitudinal follow-up of all patients diagnosed with drug resistance due to lesional temporal lobe epilepsy undergoing surgery at Vietduc University Hospital was conducted. ***Results:*** 35 cases of intractable lesional temporal lobe epilepsy surgery, male/female 1.5/1, partial seizures with loss of consciousness accounted for 99%, and 2/3 of cases occurred without aura. Seizure-free (post-operation 1 month) (Engel I) accounted for 74.3%, and the remaining (25.7%) had improved seizures (Engel 2, 3). Complications after surgery accounted for 17.1%, and there were no cases of death. ***Conclusion:*** Surgical treatment for drug resistance due to lesional temporal lobe epilepsy is safe and very effective, with a low complication rate.

Keywords: Selective amygdalohippocampectomy; Lesionectomy; Low-income; Temporal mesial sclerosis; Vietduc University Hospital; Temporal lobe epilepsy.

INTRODUCTION

Epilepsy is one of the most common nervous system diseases affecting people of all ages and sexes in the world in general and Vietnam in particular. The prevalence of drug-resistant epilepsy accounts for 20 - 30% of all people with epilepsy. Temporal lobe epilepsy (TLE) is the most common type of adult epilepsy, accounting for 80% of cases and has the highest rate of drug resistance, often necessitating surgery [1].

[1]Department of Neurosurgery, Vietnam Military Medical University
[2]Neurosurgery Center, VietDuc University Hospital
*** Corresponding author: Nguyen Thanh Bac (bacnt103@gmail.com)**
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The definition of a patient with drug-resistant epilepsy is one who failed adequate trials of at least two tolerated, appropriately chosen, and used antiepileptic drug schedules (as monotherapies or in combination) to achieve sustained seizure freedom and was diagnosed with drug-resistant epilepsy, as per the definition of ILAE (International League Against Epilepsy) [2]. TLE represents the majority of the partial symptomatic. Seizure types in TLE include simple partial, complex partial, and secondarily generalized seizures. Temporal lobe seizures most often arise in the amygdalo-hippocampal region. More than 90% of patients with mesial TLE report an aura, most commonly an epigastric sensation that often has a rising character. Temporal lobe seizures are usually stereotypic in their symptoms and duration. Patients with TLE often show impairments in attention, memory, mental processing speed, executive functions, mood, personality, and drive-related behaviors. Interictal depression occurs in approximately one-third of TLE patients. TLE is diagnosed by a history of characteristic partial seizure symptoms. The diagnosis is confirmed by the capture of a typical episode during an electroencephalogram (EEG) with epileptiform activity over one or both temporal regions. TLE is treated with medications, resective surgery, and vagus nerve stimulation (VNS). Epilepsy surgery should be considered in all patients with refractory epilepsy. Meanwhile, VNS provides palliation of seizure reduction for patients with medically refractory epilepsy. This is an expensive treatment used in high-income countries. VNS is indicated for symptomatic localization-related epilepsy with multiple and bilateral independent foci, symptomatic generalized epilepsy with diffuse epileptogenic abnormalities, refractory idiopathic generalized epilepsy, failed intracranial epilepsy surgery, and several other reasons for contraindications to epilepsy surgery.

Vietnam is a low-middle-income country in the ASEAN organization with a population of 99 million people. [3]. The incidence of epilepsy in Vietnam is 4.4 per 1,000 people (95% confidence interval (CI) 30.6 - 590). On meta-analysis reported that the incidence was four times higher in Vietnam than in Singapore (0.75 per 1,000 people, 95%CI 0.73 - 0.77). However, the epilepsy incidence in Vietnam is quite similar to that of the US (4.61 per 1,000 people, 95%CI 4.34 - 4.9) [3]. Epilepsy treatment in Vietnam is not paid enough attention, and the treatment gap is still large. Epilepsy surgery and multidisciplinary

collaboration were unavailable. The epilepsy surgery program in the neurosurgery center of Vietduc University Hospital started in 2015, includes TLE surgery, callosotomy, and endoscopic hamartoma hypothalamus [4]. Epilepsy surgery has since proliferated in Vietduc University Hospital, National Children's Hospital, as well as Ho Chi Minh University of Medicine and Pharmacy Hospital. This manuscript was conducted with aim: *To describe the clinical characteristics and early outcomes of surgery for drug-resistant epilepsy due to the lesional temporal lobe in Vietduc University Hospital*.

MATERIALS AND METHODS

1. Subjects

35 cases of surgical treatment for drug-resistant due to lesional temporal lobe epilepsy at Viet Duc University Hospital from 5/2018 - 9/2022.

* *Inclusion criteria:* Semiology of drug-resistant epilepsy followed by definition of ILAE, IRM finds a lesional temporal lobe, and/or interictal EEG finds epileptic waves concordant on the same side. Post-operatively, patients receive a clinical examination, EEG, and post-operative cranial IRM post-operative 1 month, 6 months, and 1 year.

* *Exclusion criteria:* Extratemporal lobe epilepsy, bi-temporal lobe epilepsy, a responsible anti-epileptic drug, semiology-EEG-IRM unconcordant, multi-lesion.

2. Methods

* *Study design:* A combination of a retrospective review and a prospective follow-up study.

* *Same size and same selection:* Convenient sample selection, apply the formula for calculating sample size for interventional studies before and after surgery as follows [6, 7]:

$$n = \frac{2 \times C \times (1-r)}{(ES)^2}$$

$C = (Z\alpha/2 + Z\beta)2$ with error $\alpha = 0.01$, $\beta = 0.20$, then $C = 13.33$, and r is the correlation coefficient between the two evaluations, choose this coefficient as 0.7. ES is the unknown influence factor. Based on a meta-analysis study by Joudi Mashhad (2020) [5], the coefficient of influence from many post-surgery evaluation studies of epilepsy by Binder (2009), Dunkley (2010), Jorgwellmer (2012) and Orio (2017) are 0.48; 0.57; 0.5; 0.78, respectively. Choosing the influence

coefficient according to author Binder (2009) is 0.57. Calculated sample size n = [2 x 13.33 x (1 - 0.7)]/(0.57)^2 = 24. With an estimated loss rate of 10%, we have to choose: 24/0.9 = 26 patients.

* *Research tools and techniques for collecting information:* All patients were operated on by the primary author at Vietduc University Hospital between 5/2018 and 9/2022. We evaluated clinical factors, EEG, IRM, surgical outcomes, and histopathology.

Preoperative assessment:

Each patient received a 3 Tesla cranial magnetic resonance imaging according to ILAE protocol [6], 32-channel scalp EEG with 30 minutes minimum electroencephalogram recording, memory assessment on the Weschler scale, and a quality-of-life assessment according to the short set of questions with the SF-36 were performed.

Indication of SAH technique: Hippocampal sclerosis on IRM

Indication of lesionectomy technique: Tumor, dysplasia on IRM

Post-operatively, patients receive a clinical examination, electroencephalography, and post-operative cranial magnetic resonance imaging, surgical outcomes were classified according to the Engel classification (Engel, 1993) at 1 month, 6 months, and 1 year.

* *Data processing:* The Chi-square test was used for dichotomous variables, and T-test was used for continuous variables.

3. Research ethics

Formal consent was obtained from all participants, and IRB approval was obtained number 178/2021/CNChT-HĐĐĐ, August 20, 2021 by Military Hospital 103's IRB.

RESULTS

Table 1. The demographic of the subject of study.

Character		Quantity (%)
Sex	Male	22 (62.9)
	Female	13 (37.1)
Age group	< 10	3 (8.6)
	10 - 19	11 (31.4)
	20 - 29	12 (34.3)
	30 - 39	9 (25.7)
	> 40	0

Character		Quantity (%)
Age of onset of seizures	< 10	20 (57.1)
	10 - 19	11 (31.4)
	20 - 29	3 (8.6)
	30 - 39	1 (2.9)
	> 40	0
Hospital stay (day)	< 7	6 (17.1)
	7 - 14	23 (65.7)
	15 - 30	5 (14.3)
	> 30	1 (2.9)
Number of seizures/months before surgery (median, IQR)		12 (2 - 150)

The demographic and clinical characteristics of our 35-patient cohort are listed in (*Table 1*). The male-to-female ratio was approximately 1.5:1. All patients were under 40 years old, with 10 to 29 years old accounting for most patients (65.7%). The age of onset was typically under 10 years of age (57.1%). Patients had an average of 12 seizures per month. The hospital stay was typically 1 - 2 weeks (65.7%), and only 1 patient had a 31-day hospital stay for meningitis treatment and made a full recovery.

Table 2. Drug-resistant temporal seizure characteristics table.

Seizure characteristics		Quantity (%)
Seizure (type)	Focal and aware	1 (2.9)
	Focal, Impaired awareness, non-motor onset (absence)	12 (34.3)
	Focal, impaired awareness, motor symptoms	22 (62.8)
	Generalized seizures	0
Onset	Auras	14 (40)
	No Auras	21 (60)

All seizures were focal, with all but 1 case associated with impaired awareness. 40% of patients had auras.

Table 3. Relationship between age-subgroup of seizure onset and age-subgroup of operation.

Age-subgroup of operation (years old)		< 10	10 - 19	20 - 29	30 - 39	p
Age-subgroup of seizure onset (years old)	< 10	100	90.9	33.3	33.3	0.037
	10 - 19	0	9.1	50	44.4	
	20 - 29	0	0	16.7	11.1	
	30 - 39	0	0	0	11.1	

Age-subgroup of operation and age-subgroup of seizure onset have a statistically significant relationship with a p-value < 0.05.

Table 4. Surgical methods for treating drug-resistant epilepsy.

Characteristics	Quantity (%)
Selective amygdalohippocampectomy (SAH)	18 (51.4)
Lesionectomy	17 (48.6)
Units of blood transfusion peroperation (0 unit)	35 (100)
Units of blood transfusion peroperation (1 - 2 units)	0
Total operating time < 4 hours	17 (48.6)
Total operating time 4 - 6 hours	18 (51.4)
Meningitis post-operation	3 (8.5)
Soft tissue infections post-operation	2 (5.7)
Focal paralysis post-operation	1 (2.9)
Death	0

Selective amygdalohippocampectomy was undergone in 51.4% of cases that localized to the mesial temporal lobe. Lateral/neocortical lesions underwent lesionectomy (48,6%). The duration of surgery less than 4 hours was encountered in 48.6% of cases. No blood transfusions were needed. There were 6 postoperative complications (17.1%): Meningitis (8.5%), trainset focal paralysis (2.9%), and soft tissue infection (5.7%). There were no mortalities.

Table 5. Pathological results.

Pathological results	Quantity (%)
Hippocampal sclerosis	17 (48.6)
Focal cortical dysplasia	9 (25.7)
Ganglioglioma	7 (20)
DNET (dysembryoplastic neuroepithelial tumor)	2 (5.7)

Pathological results showed hippocampal sclerosis (48.6%), focal dysplasia (25.7%), and low-grade glioma (25.7%).

Table 6. Classification of post-operative seizures.

Engel outcome scale	Number of patients	Ratio (%)
Free of disabling seizures (Class I)	26	74.3
Rare disabling seizures (Class II)	8	22.9
Worthwhile improvement (Class III)	1	2.8
No worthwhile improvement (Class IV)	0	0
Total	35	100

After surgery, 74.3% achieved Engel I seizure freedom. The remaining cases had diminished but still presented seizures (25.7%).

Table 7. Seizure frequency pre-operation and post-operation 1 month.

Seizure frequency (per month)	n	Medium	SD	Median	p
Pre-operation	35	65.1	94.3	12	< 0.0001
Post-operation	35	7.3	35.6	0	

The seizure frequency post-operation was significantly reduced with $p < 0.05$.

DISCUSSION

This study presents a cohort of 35 patients who underwent selective amygdalohippocampectomy or temporal lesion resection with significantly improved post-operative seizure control and minimal complications, despite being in a low-resource environment. The results of post-operative seizure control (74.3%) are entirely consistent with similar temporal lobe surgery cohorts reported in the literature in high-income countries. It is similar to Yaşargil (2010) and Wei Li (2019).

Table 8. Engel outcome scale.

Authors	Number of patients	Surgical approach	Engel I
Tran Dinh Van (2023)	35	SAH (18) Lesionectomy (17)	74.3% (post-operation 1 month)
Wei Li. [7] (2019)	131	Temporal lobe surgery	78.6% (post-operation 12 months)
Mario A. Alonso Vanegas [8] (2017)		Review from series articles	65% - 69% (post-operation 12 months)
M. Gazi Yaşargil (2010) [9] (2010)	73	SAH	75.3% (post-operation 3 months)

Our overall complication rate of 17.1% was similar to other published series after drug-resistant TLE surgery [10]. However, there were a notable number of infections. Approximately 15% of infection rate: Three cases of meningitis and two soft tissue infections. These patients recovered well with conservative antibiotic treatment. The infection rate may represent difficulty with maintaining sterility in an operation room with drapes and surgical gowns that are repeatedly reused. This may explain why our infection rate was higher than in typical high-income countries, for which post-operative meningitis accounted for 6.6% and superficial incisional infections accounted for 1%.

CONCLUSION

Short-term surgical outcomes were favorable for a large majority of patients, highly effective and safe temporal lobe epilepsy surgical care is possible. The data in our study reveal that similar favorable surgical outcomes are achieved which is comparable to that reported in developing countries.

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