Brief Communination

Epilepsy Surgery in Hospital Universiti Sains Malaysia: Our Experiences since 2004

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Abstract

Epilepsy surgery has been performed by a few centres in Malaysia, including Hospital Universiti Sains Malaysia (HUSM). To date, a total of 15 patients have undergone epilepsy surgery in HUSM. The epilepsy surgery included anterior temporal lobectomy (ATL) with amygdalohippocampectomy (AH) and Vagal nerve stimulation (VNS). The surgical outcomes of the patients were assessed using the International League Against Epilepsy (ILAE) outcome scale. The ILAE scores for patients who underwent ATL with AH were comparatively better than those who underwent VNS. One of the patient who underwent ATL with AH and frontal lesionectomy was found to have psychosis during follow up. Epilepsy surgery has proven to be an important treatment for medically resistant epilepsy. Thus it is important to raise public awareness regarding epilepsy and its treatment.

Keywords: *epilepsy, surgery, Malaysia, vagus nerve, stimulation*

Introduction

The first epilepsy surgery was performed by Heyman K on a 11-year-old girl with cerebral abscess in 1831 (1).

In the early 1950s, there was a breakthrough with respect to the treatment of temporal lobe epilepsy. Experimental animal studies showed that stimulation of the mesial temporal structures results in seizure attacks, while stimulation of the amygdala, the head of hippocampus and pyriform region in animals, produced arrested movement, licking, chewing and swallowing (2, 3). In 1952, based on

this evidence, Wilder Penfield and Maitland Baldwin published their report describing subtotal temporal lobectomy involving removal of the anterior temporal lobe, amygdala and hippocampus (4).

The history of vagus nerve stimulation (VNS) actually dates back to 1938, when Percival Bailey and Federic Bremer reported that vagal stimulation caused changes in electroencephalograms (5). In 1988, the first human implant of a vagal stimulating device was performed (6) and in 1997, the Food and Drug Administration (FDA) approved the use of VNS as an adjunctive treatment for medically refractory epilepsy (7).

Epilepsy surgery has been performed by a few centres in Malaysia, including Hospital Universiti Sains Malaysia (HUSM). The first epilepsy surgery in Malaysia is reported to have been in 1996 (8).

Hospital Setting

Hospital USM (HUSM) is the Teaching Hospital of the School of Medical Sciences, Universiti Sains Malaysia and established in October 1983; funded by the Ministry of Higher Education (MOHE). This facility is located in the state of Kelantan and serves the East Coast community in Malaysia. HUSM currently has its own Department of Neurosciences, which combines the specialties of neurology, neurosurgery, neuro-anaesthesiology and critical care, neurorehabilitation and neurophysiology, and also includes the Center for Neuroscience Services and Research (P3Neuro) (9).

HUSM is among the earliest centres in Malaysia where epilepsy surgery was performed. To date, a total of 15 patients have undergone epilepsy surgery including VNS at HUSM. Patients undergoing epilepsy surgery and VNS need to be managed by multidisciplinary teams that include experienced adult and paediatric neurologists, clinical psychologists and neurosurgeons, as well as neuro-anaesthesiologists. The patients at HUSM were assessed pre-operatively in accordance with an established international epilepsy proforma for the suitability of surgery.

Patient Demographics

A review was conducted of the data for the 15 patients who underwent epilepsy surgery that included anterior temporal lobectomy (ATL) with amygdalohippocampectomy (AH) and VNS, at HUSM in last 13 years; their surgeries took place between 2004 and 2011. The patients' ages at the time of their surgeries ranged from 18 to 52 years. The diagnoses, based on their histopathologies, were mesial temporal sclerosis in all except for three patients, two of whom had been diagnosed with left temporal dysembryoplastic neuroepithelial tumours (DNET) and one who had frontal cavernous hemangioma with right mesial temporal sclerosis.

The durations of the illnesses before their surgeries ranged from 12 to 47 years. The associated risk factors that were assessed in these patients, including congenital abnormalities of the central nervous system, perinatal distress, febrile seizure, encephalitis, meningitis, brain infection, brain trauma and a family history of seizure revealed that only eight had febrile fits during childhood.

The demographic data are shown in Table 1.

Surgical Outcomes

Before their surgeries, the patients were investigated with the aid of electroencephalography (EEG), video EEG, magnetoencephalography (MEG), electrocorticography with *subdural electrodes* and also magnetic resonance imaging (MRI) to correlate with the semiology of the epilepsy. All patients had neuropsychological assessments. Only patients who were found to be suitable from among those who showed electro-clinico-radiological concordance were subjected to lesionectomy/anterior temporal hippocampectomy (ATH) and amygdala/hippocampectomy (AH).

The surgical outcomes of the patients were assessed using the International League Against Epilepsy (ILAE) outcome scale (shown in Appendix 1) and the Seizure Scoring System based on Engel et al. (shown in Appendix 2) (10). Patients' seizure rates were assessed both pre-operatively and post-operatively. The patients received regular follow-ups post-operatively by a neurologist who followed a protocol.

The ILAE scores for patients who underwent ATL and AH were comparatively better than the scores of those who underwent VNS. The scores for the patients who underwent lobectomy ranged from one to three, where five people scored one and seven scored three. The

Table 1. Demographic data of epilepsy surgery patients at HUSM

Patient	Age (at surgery)	Sex	Diagnosis	Risk factor	Duration of illness before surgery (years)	Surgery
1	18	Male	Left temporal DNET	None	4	Left temporal lesionectomy
2	23	Female	Right mesial temporal sclerosis	Febrile fit	10	Right ATL & AH
3	18	Male	Right frontal cavernous haemangioma and right mesial temporal sclerosis	Febrile fit	12	Right ATL & AH and right frontal lesionectomy
4	22	Male	Left mesial temporal sclerosis	Febrile fit	7	Left ATL & AH
5	25	Female	Right mesial temporal sclerosis	Febrile fit	15	Right ATL & AH
6	23	Female	Right mesial temporal sclerosis	Febrile fit	10	Right ATL & AH
7	41	Male	Right mesial temporal sclerosis	Febrile fit	16	Right ATL & AH
8	46	Male	Right mesial temporal sclerosis	Febrile fit	37	Right ATL & AH
9	44	Male	Right mesial temporal sclerosis	None	24	Right ATL & AH
10	29	Female	Right mesial temporal sclerosis	None	15	Right ATL & AH
11	47	Male	Left mesial temporal sclerosis	None	43	Left ATL & AH
12	12	Male	Right temporal DNET	Febrile fit	3	Right ATL & AH
13	50	Male	Right mesial temporal sclerosis	None	18	VNS
14	52	Male	Bilateral mesial temporal sclerosis	None	47	VNS
15	43	Male	Bilateral mesial temporal sclerosis	None	25	VNS

post-operative seizure scores also continued to improve, ranging from one to three. This shows that these patients were in fact free from seizures or from having non-disabling simple partial seizures.

For those who underwent VNS, the pre-operative and post-operative seizure scores do not show any great changes. The ILAE scores for the patients who underwent VNS range from four to five (listed in Table 2).

Surgical Complications

The complications that were observed in all patients were divided into early and late. Early complications, such as infection or status epilepticus, were observed in only one patient, who had symptomatic intracranial haemorrhage.

Another complication that was observed was psychosis, which followed an anterior temporal lobectomy and frontal lesionectomy in one patient. This patient was initially well and fit free, and pre-operative neuropsychology

Table 2. Pre-surgery and post-surgery comparison of seizure frequency

Patient	Seizure score (pre)	Follow-up (months)	Seizure score (post)	ILAE score
1	9	12	1	1
2	8	12	1	1
3	9	12	2	3
4	8	12	2	1
5	9	12	2	1
6	8	12	2	1
7	7	12	3	3
8	7	3	3	3
9	8	3	3	3
10	8	3	3	3
11	7	3	3	3
12	7	3	3	3
13	8	12	8	5
14	8	12	8	4
15	8	12	7	4

testing did not show any psychotic disorder. However, seven months after his operation, his family members noted that he had become aggressive and unable to control his temper. He also described having auditory and visual hallucinations during which he was ordered to attack and destroy things. An EEG that was done showed no remarkable findings. The patient was referred to a psychiatry colleague for assessment and was administered antipsychotic medication. Throughout the follow-up at HUSM, he was fit free and was able to be weaned off the antiepileptic medication after his five-year follow-up.

Temporal lobectomy has been reported to cause psychosis (10, 11). The psychotic illnesses described resemble schizophrenia, with persistent persecutory delusions and auditory hallucinations (11). It is reported that the psychosis usually occurs within one year of the operation. The presence of pathologies other than mesial temporal sclerosis has emerged as a significant risk factor for the development of postoperative psychosis. There is no clear relationship between recurrence of the seizures and post-operative psychosis (12).

Numerous publications have reported on our epilepsy patients who underwent surgery since 2006, with various outcomes (13–17).

Conclusion

Epilepsy surgery has proven to be an important treatment for medically resistant epilepsy. However, for many reasons, only a small number of patients with refractory seizures have been able to receive the benefits of epilepsy surgery programs. Among the reasons for this are sociocultural factors involving patients and their families who have refused surgery. It is also crucial for medical personnel to be aware of the need to refer these patients to neurologists for assessment for epilepsy surgery. Therefore, it is very important to educate our first line colleagues about the treatment for epilepsy in their particular districts. It is equally important to raise public awareness of epilepsy and its treatment to allow for a better understanding of the condition and to avoid unnecessary mythology that sometimes circulates within the communities.

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Authors' Contributions

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Drafting of the article: ASY
Critical revision of the article for important intellectual content: JT, ZI, RK, JMA
Final approval of the article: ZI
Provision of study materials or patients: JT, ZI, SB, SAH, LAB, WMNWH, WHH, TYC, RK, BI, ARIG, JMA
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Appendix 1

ILAE outcome scale 1997 (9)

Class	Outcome
1	Completely seizure free, no auras
2	Only auras, no other seizures
3	1–3 seizure day/year, with/out aura
4	4 seizure days/years to 50% reduction of baseline seizure days, with/out auras
5	Less than 50% reduction of baseline seizure days, with/out auras
6	More than 100% increase of baseline seizure days, with/out auras

Appendix 2

Seizure scoring system (9)

Seizure frequency	Score
Seizure-free, off antiepileptic drug	0
Seizure-free, need for antiepileptic drug unknown	1
Seizure-free, requires antiepileptic drugs	2
Non disabling simple partial seizures	3
Non disabling nocturnal seizures only	4
1–3 per year	5
4–11 per year	6
1–3 per month	7
1–6 per week	8
1–3 per day	9
4–10 per day	10
10 per day but not status epilepticus	11
Status epilepticus without barbiturate coma	12