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Management of Epilepsy in Resource-Limited Areas: Establishing an Epilepsy Surgery Program in Iran

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Abstract

Background: Of about 40 million people with epilepsy, who live in developing countries, the majority do not receive appropriate treatment. Nonetheless, there are striking disparities among the so-called developing countries, however generally speaking, access to and availability of epilepsy management programs in developing countries are very limited and therefore, the issue of developing epilepsy centers in resource-limited settings in a large scale is very essential. The surgery for epilepsy, including temporal lobotomy, lesionectomy and corpus colostomy, for patients with medically-refractory seizures, defined as failure of adequate trials of two tolerated, appropriately chosen and using antiepileptic drug to achieve sustained freedom, from seizure has been proved to be feasible and cost-effective in developing countries. However, the success of epilepsy surgery depends upon the accurate identification of good surgical candidates based on the available resources and technologies without jeopardizing safety. In the current paper, we will share our experiences of establishing an epilepsy surgery program in Iran, despite all short-comings and limitations and try to provide some answers to those challenges, which helped us establish our program.

Keywords: Epilepsy surgery, Developing country, Limited resources, Iran.

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Introduction

The prevalence of epilepsy ranges between 0.6% and 1%, and perhaps fifty million worldwide suffer from this condition of whom 80% live in resource-poor countries (1). However, of about 40 million people with epilepsy, who live in developing countries, the majority do not receive appropriate treatment (2). As a consequence, they experience significant morbidity related to their seizures. Moreover, because of misconceptions and negative attitudes towards epilepsy seen particularly in developing countries, there are psychosocial consequences of stigma and discrimination (3).

The mainstay of treatment in patients with epilepsy is antiepileptic drug (AED)

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therapy. However, more than 30% of individuals with epilepsy have persistent seizures despite use of appropriate AEDs (4). Medically-refractory epilepsy is defined as failure of adequate trials of two tolerated, appropriately chosen and used AED schedules (monotherapies or in combination) to achieve sustained seizure freedom (5). If seizures are not controlled by AEDs, surgery should be considered. However, for the vast majority of medically-refractory patients with epilepsy, who live in the developing countries, the resources are limited. On the other hand, surgery has been proved to be feasible and cost-effective in developing countries (6, 7).

In a previous paper, we discussed the strategies for surgical treatment of epilepsies in developing countries (8). In the current paper, we will share our experiences of establishing an epilepsy surgery program in Iran, despite all short-comings and limitations.

Our experience

In our previous paper (8), we discussed some of the challenges to provide appropriate surgical treatment for patients with medically-refractory epilepsy in developing countries. Here, we provide some answers to those challenges that helped us establish our program.

1. *Training epileptologists*: A dedicated physician who can devote himself or herself to epilepsy, but also has knowledge and judgment to do a good job in controlling the symptoms, and who can organize and manage a team is probably the most important element of establishing a successful epilepsy care center. To achieve this goal seeking help from well-established and respected epilepsy programs in developed countries is of paramount significance. Self-study program and getting experience by try and error in practice, while you have limited resources, is not a good option. You have to be able to think globally and then act locally. Our epileptologist was trained at a respected epilepsy program, at Thomas Jefferson University, Philadelphia, Pennsylvania, USA.

2. *Expert neurosurgeons*: Also, a neurosurgeon or a team of neurosurgeons must be given expertise in epilepsy surgery. Our team includes two adult neurosurgeons, in which one trained in the USA, and other was an expert in pediatric neurosurgeon. Having access to trained epileptologist(s) and neurosurgeon(s) considered to be the main key and fundamental step in establishing a successful epilepsy surgery program in resource-limited countries. Some programs in developing countries have used twin affiliations between an advanced epilepsy surgery program and their own center in a developed country (9). However, we believe that active enrollment in an epilepsy fellowship program at an advanced center and obtaining appropriate training, is probably much more effective in the long-term, management of the disease.

3. *Training electroencephalography (EEG) technologists*: The epileptologist at our center trained three nurses to overcome this problem. We believe in places were there is no access to EEG technologist training programs (as ours), registered nurses who have enough knowledge of medicine and motivated to participate in a specialized epilepsy center are optimal candidates to receive such training. Of course, the epileptologist has the responsibility to provide such training. At our center, it took six months of daily training, for the nurses to receive enough knowledge and experience and became competent to do the video-EEG monitoring appropriately.

a. *Public health systems in developing countries should be arrange for patients to have access to basic investigative technologies [i.e., magnetic resonance imaging (MRI) and EEG (preferably, video-EEG monitoring)]*: MRI units were available in Iran. However, MRI for the evaluation of

patients with refractory epilepsy should be done using a special temporal lobe protocol and read by radiologists experienced with the findings in hippocampal sclerosis (10, 11). We collaborated with the radiology department at our center to establish an epilepsy protocol appropriate for imaging patients with epilepsy. Nevertheless, one expert radiologist was assigned to specifically collaborate with our epilepsy surgery team.

b. Long-term video-EEG monitoring devices with a reasonable customer and technical support have not been available in Shiraz, south Iran. Due to international sanctions provision of these systems needs a lot of financial resources with no sufficient technical support. Therefore, we decided to perform 2-hour video-EEG monitoring instead of using a digital video-EEG monitoring unit with limited capabilities (not able to record 24/7) at our center. The need for long-term inpatient video-EEG recording of seizures (ictal recording) in all epilepsy surgery candidates was extensively studied and evaluated by experts. They have emphasized the value of MRI and interictal EEG findings in patients who were considered candidates for surgery (12, 13). However, to increase the sensitivity of our video-EEG recording, we used extra-electrodes at T1 (left anterior temporal) and T2 (right anterior temporal) areas (14).

4. *Developing realistic presurgical protocols*: To select good surgical candidates a good history is the key. To solve this problem we developed and routinely used a pro forma to minimize the risk of missing important clinical findings including various type of seizure, seizure frequency, associated disabilities, and impacts of uncontrolled seizures (Appendix one). In addition, a 1.5 Tesla brain MRI (epilepsy protocol) and a 2-hour video-EEG monitoring (in wakefulness and sleep) were performed for all patients. In other words, we used semiological, interictal and radiological data to specify (if possible, localize) the epileptogenic zone. In the next step, when all pieces of information were available, patients were informed at an epilepsy surgery committee conference. This committee included the epileptologist, two adult neurosurgeons, one pediatric neurosurgeon, one adult neurologist, one pediatric neurologist and one radiologist. This multidisciplinary approach to the management of patients with medically-refractory epilepsy was unique at our center. In the past, epilepsy surgery had been offered scatteredly and on an individual basis by neurosurgeons in some centers in Iran. A multidisciplinary approach to treat patients with medically-refractory seizures was started in 2007-2008 in very few centers (one in each city for Tehran, Isfahan, and Shiraz) when trained epileptologists returned to the country after completing their fellowship in the Western countries. Since then, these programs had significant achievements in providing excellent care for patients with epilepsy. It should be mentioned that, there are more centers in the developmental phase. However, the limitation in resources and difficulty in access to epileptologists, staff, and equipments have hampered the speed of such development significantly.

At our center, after extensive discussions with all team members we decided to pursue three possible surgical scenarios in patients with medically-refractory epilepsy.

a. Lesional epilepsy resections: When there was an identifiable brain lesion in MRI but semiology and interictal EEG evaluations were not discordant with the lesion, and also when surgery had no significant risks.

b. Anterior temporal lobectomy in temporal lobe epilepsy: When MRI shows unilateral mesial temporal sclerosis and semiology and interictal EEG were concordant with MRI findings.

c. Palliative surgery (corpus callosotomy): When patients had intractable generalized seizures and were not considered as candidates for focal resections and also for patients with refractory frontal lobe seizures that could not be adequately localized (15).

Results of epilepsy surgery committee discussions

Our epilepsy care unit was established in 2008, but our epilepsy surgery committee was established in March 2009. Authorities at Shiraz University of Medical Sciences and its affiliated hospital (Namazee Hospital) supported our proposal for establishing such a program and provided a ward with 10 beds and two video-EEG monitoring units (as described before) to establish an "Epilepsy Care Unit" . Meanwhile, we started considering epilepsy surgery and its benefits at local and national neurology / epilepsy congresses. When people were convinced that epilepsy surgery was a viable option for patients with medically-refractory epilepsy, they started referring patients to our center. So far, until May 2012, we have had 22 sessions of discussing patients with refractory seizures for selecting the best candidates for surgery at our epilepsy surgery committee conferences. In total, 140 patients with medically-refractory seizures have been evaluated in which; 81 (58%) operated, and 35 (25%) considered as being not appropriate candidates for surgery [due to lack of enough evidence for performing surgery or possibility of significant adverse effects (e.g., risk of damaging eloquent areas)), 7 on the waiting list for operation, and 17 (12%) refused to be operated [either they did not like brain surgery for anything less than 100% chance of seizure-freedom (three patients) or were anxious about the risks of possible adverse effects (14 patients)). 77 (55%) were male and 63 (45%) female. Ninety-five patients (68%) were 18 years of age and above and 45 (32%) below 18 at the time of treatment. The most common etiology for refractory seizures was mesial temporal sclerosis, which observed in 51 patients (36%). The disease was followed by brain tumors in 29 patients (21%), cortical malformations in 8 (6%), encephalomalacia in 5 (4%) and other etiologies in 47 (33%). Among 81 operated patients, 32 (39.5%) had anterior temporal lobectomy, 28 (34.5%) underwent corpus callosotomy, and 21 (30%) had lesionectomy. The results of these surgeries will be published in the near future, however they seemed promising. The total cost of outpatient assessments, inpatient assessments (presurgical evaluations) and operation at our center were less than $500 (15000000 Rials) for each patient and with medical insurance, the cost was even less than $300 (9000000 Rials).

Conclusion

Developing countries are not a homogeneous notion and there are striking disparities among the so-called developing countries in terms of their resources for treatment. However, generally speaking, access to and availability of epilepsy management programs in developing countries are very limited and therefore, the issue of developing epilepsy centers in resource-limited areas in a large scale is very essential (8). A substantial proportion of the current burden of epilepsy in resource-poor countries could be minimized by educating the public, informing primary and secondary physicians about current trends in the management of epilepsies, scaling up routine availability of AEDs, and developing cost-effective epilepsy surgery programs (16). This is particularly important in developing countries, where most people with epilepsy are living and for variety of reasons suffer from epilepsy and its consequences (1, 17). Such strategy might help bring an end to the social exclusion and prejudice which patients with epilepsy have endured for so long (3, 18).

Epilepsy surgery has been proved to be feasible and cost-effective in developing countries (6, 7). However, the success of epilepsy surgery depends upon the accurate identification of good surgical candidates based on the available resources and technologies without jeopardizing safety. Our experience shows that this goal can be achieved by selecting patients, whose epileptogenic zone can be established clearly, based on a detailed history, specific MRI study, and interictal video-EEG monitoring

findings. Patients with mesial temporal lobe epilepsy and those with an identifiable brain lesion are belong to this category. Moreover, corpus callosotomy is a valuable option for some patients who have intractable seizures and are not candidates for focal resections. A stepwise approach by reserving more difficult to treat patients to later date will help each center to understand its capabilities and limitations and to move forward. It would be essential to work with and educate the local public and medical professionals, if the epilepsy surgery program in a developing region was to have a lasting impact (19). It is encouraging to note that, despite major challenges several epilepsy centers in the developing world have successfully implemented epilepsy surgery programs, while they have produced results comparable to that from developed countries at a fractional cost (19). The key element in reaching the goal of establishing a successful epilepsy management program is having access to trained physicians, who are able to think globally and act locally.

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