PRACTICE OF EPILEPSY SURGERY IN EMERGING AND DEVELOPING COUNTRIES : FOCUS IN SUBSAHARAN AFRICA: *A brief literature review*

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Abstract:

More than 85% of the total global burden of epilepsy is found in population of low- or middle-income countries. In the vast majority of these are African countries that however are less equipped to handle this disease and especially in his surgical component. Until recently the epilepsy surgery was been considered as treatment using expensive technology and therefore reserved for developed countries. Currently programs of this treatment are becoming common in Brazil, China and India. It is also introduced in many other developing countries including those in North Africa.

In sub-Saharan Africa, epilepsy surgery is still very little practiced. This literature review aims to address some results of the practice of epilepsy surgery in emerging and developing countries in general. In the other hand, to describe what is the practice of this surgery in the sub- Saharan African countriesand explore solutions proposed in literature to start this surgery in low-income countries.

Keys words: *Epilepsy- Developing countries-Sub-Saharan Africa - surgical treatment*

Introduction:

Over 85% of the overall weight of epilepsy is found in the world's population living in middle- and low-income countries. In the vast majority, it is African countries where annual health expenditures are below $ 50 per individual. The population of developing countries is 5 times greater than that of developed countries, but has at its disposalless than 5% of the total domestic capital production. These countries are thus the least prepared to support epilepsy patients[1,2,3,4,5].

The estimated mortality based on age, sex and cause of death in 1990 showed 127,000 deaths related to epilepsy in developed countries and 1.025 million in developing countries. The gap of epilepsy in the latter group of countries is alarming. Indeed, over 60% of patients with epilepsy in developing countries have no access to medical treatment or do not adhere to the treatment regimen[1,6,7,8,9].

Epileptic patients have a higher risk of premature death than the general population. In Ethiopia, a 1997 study showed that 6.3% of epileptics die within 2 years following the onsetof the disease and one third in 20 years. Causes of death include status epilepticus, falls, drowning, burns and sudden death[10]. Symptomatic epilepsy can reduce the life expectancy of over 18 years. The results of the projection of the demographic and epidemiological trends suggest that with the population growth, the number of epilepsy will continue to increase especially in the pediatric population in developing countries. This augurs the need for development of comprehensive management strategies for this pathology especially in African countries by including his surgical component[1,2,3,11].

This literature review aims to address some results of the practice of epilepsy surgery in emerging and

developing countries in general. In the other hand, to describe what is the practice of this surgery in the African sub- Saharan countries and explore solutions proposed in literature to start this surgery in low-income countries.

1. Epilepsy Surgery in emerging and developing countries in general

It was considered that the epilepsy surgery does not exist in many developing countries because of its cost and the lack of infrastructure in these countries to get up to the technological advances. At this infrastructure problem, the additional is the lack of qualified personnel in this field. It is true that the role of technology must be carefully assessed in the context of these countries. The tools used in assessing seizures must meet the cost-effectiveness balance criteria. The results of some studies from China and India suggested that the monitoring of EEG and MRI are adequate tools for identifying candidates for surgical treatment of epilepsy. Thus the lack of invasive investigative techniques should not be a handicap for surgery in patients who require[4,5,11,12,13].

In a review of the epilepsy surgery in developing countries published in 2000, surgery was presented in relation to the economic classification of national resources and well-being. Over 10 years, from 1980 to 1990, only 10 countries in this group reported achieving epilepsy surgery. The 1991-1999 report revealed that only 18% (26/142) of emerging and developing countries had acquired the practice of epilepsy surgery[11,14].

In India, the epilepsy surgery was introduced in 1995. From March 1995 to February 2002, 394 surgical procedures were performed including 370 anterior temporal lobectomy with amygdalo-hippocampectomy. Among surgical patients, 213 had a follow-up of 2 years and 77.9% of them were free of all seizures[4,14]. In Saudi Arabia, the epilepsy surgery began in 1998. From 1998 to 2012, 502 patients were operated at King Faisal Specialist Hospital and Research Centre. The results of these interventions were comparable to those reported in developed countries[12].

The national epilepsy surgery program was established in Brazil in 1994 under the sponsorship and coordination of the Health Ministry. The team of Sao Paolo Epilepsy Clinic reported in 2002 a series of 100 patients who underwent a cortical-amygdalo-hippocampectomy. This cohort represented 70% of patients undergoing epilepsy in this center. Eighty-nine patients were judged Engel Class I and 11 were class II [6,15].

In collaboration with the Zurich University in Switzerland, Cartagena hospital in Colombia started the epilepsy surgery in 1989. From 1989 to 1995, 490 patients had to receive surgical treatment and 195 were evaluated. It was observed good results with the anterior temporal lobectomy with 81% of patients become seizures free and 17% had rare disabling seizures[16,17].

In Morocco, epilepsy surgery was able to start in 2005 at the Rabbat specialties hospital in collaboration with Saint-Anne hospital in Paris (France). Fifty-one patients with lesional temporal partial epilepsy were operated from 2005 to 2011. After a follow-up of 7 years, 78% of patients were Engel Class I and among them 60.7% had seizures freedom[17].The first program of epilepsy surgery in Tunisia started in 2006 in collaboration with the Rouen hospital in France. Fifteen patients were included in the first study published

in 2010. Only 10 patients were operated. After surgery, all were seizures free without postoperative mortality or major complications[18].

Studies of surgical treatment strategies for epilepsy in developing countries suggest that surgery should not be considered as a last resort treatment after trying all combinations of anti-epileptic drugs. Indeed, follow up of the epilepsy natural history have shown that most patients who are destined to have a good seizures control, complete within 2 years after the onset of the disease. The persistence of seizures in childhood, adolescence and young adult age can lead to devastating consequences of psychosocial perspective, educational and occupational. After making the vicious attitudes, seizure control with surgery will have a minor impact on the quality of life. Hence, surgery should be considered relatively early[19,20,21,22].

2. Epilepsy Surgery in sub-Saharan Africa

Although epilepsy surgery was introduced in Brazil in the 1950s, until recently the program of this treatment was not feasible in almost all low- or middle-income countries. As mentioned above, this surgery is currently feasible in some emerging and developing countries. In sub-Saharan Africa, it is still less practiced although the prevalence and incidence of epilepsy in this region of the planet are the highest in the world. Only a few countries such as South Africa, Kenya, Zimbabwe, and Uganda had to report a series of patients treated with surgery. Yet in many hospitals of the tertiary level of sub-Saharan countries, there are now better instrumentation and good surgical experience that when epilepsy surgery began at the time of Horsley and Penfield[23,24,25,26,27,28].

In Kenya, Ruberti reported in 1997 a series involving 97 patients undergoing epilepsy. Development of the investigations included the EEG, CT scan and morphological MRI. Throughout the series of operated patients, it has been noted no postoperative mortality or major complications[26].In Uganda, a pilot study of 10 patients with temporal lobe epilepsy was reported in 2009. The surgery was made possible through collaboration with an American team of Virginia. All patients received standard-amygdalo-hippocampectomy. After a follow up of least 12 months postoperatively, 60% of patients were seizures free and reduction of over 90% was achieved in 20% of patients[15,27].

In Southern Africa, from 2000 to 2005, more than 250 epilepsy patients were treated with surgery to Captown hospitalin South African Republic. In all cases the surgery was a success with patients become free of all seizures and this combined with a great improvement in quality of life[28].In Nigeria and other West African countries, until 2014, no programs of epilepsy surgery have been reported. Neurosurgeons are limited to surgery of epilepsy secondary to brain tumors and post-traumatic scars. Owolabi and colleagues published in 2013 a series of 302 patients with late-onset epilepsy. In 22% of cases, epilepsy was linked to the presence of a brain tumor[29,30].

In Democratic Republic of Congo, although neurosurgery is practiced since the 70s, there is to date no program of surgical management of epilepsy. Only cases of symptomatic epilepsy related to brain tumors or post-traumatic scaresare surgically treated. This is true for many other countries in sub-Saharan Africa where the practice of neurosurgery is effective[9,29,30].

3. Initiation tracks of epilepsy surgery program in a context of low-income countries

According to the word "epilepsy", the disease is seen through the lenses of many fears and superstitions and remains little understood by the general population. Customs, religious beliefs and spiritual conceptions of its etiologies particularly in African media often conflict with the basic treatment of modern medicine. This conflict becomes again a major challenge when it comes to discuss the possibility of surgery. Indeed, there is strong anecdotal evidence to cultural basis on general brain surgery that is often considered a high-risk treatment with reduced profit[9,22,32,33].Superstitious beliefs and fears of brain surgery contribute to the gap on the surgical treatment of epilepsy. However, most of this gap is attributed to the lack of information from the nursing staff on the risks and benefits of surgery. This situation is pejorative in low income countries where there is a clear lack of knowledge on recent advances in the diagnosis and surgical approaches for epilepsy. Indeed, these advances have greatly improved the safety and effectiveness of surgery[2,7,8,9,12,22,33,34].

Ouzzani and colleagues noted some arguments for the development of epilepsy surgery in countries with limited resources[17].First, theshareof drug-resistant epilepsies including partial seizures that are potentially surgical seems higher in developing countries. Then, because of the frequency of cerebral perinatal pathology and febrile convulsions, which are recognized as providers of mesial temporal lobe epilepsy with hippocampal sclerosis. Furthermore the new antiepileptic drugs are expensive and not available in our region[17,21].

In order to get the balance cost-effectiveness, epilepsy surgery centers in developing countries should aim excellent results in selecting candidates for seizures suppression. This limited through the use of available technology and local expertise without compromising patient safety. This can be achieved by selecting patients for whom the epileptogenic zone can be easily established based on the history of the disease, MRI or CT scan in default, ictal and interictal EEG. Patients with mesial temporal sclerosis, those with potentially epileptogenic circumscribed lesions fall into this category. Similarly, children with extensive unilateral lesions and developmental tumors can be selected for the surgical treatment[4,13,14,20,34,35].

The decision for the epilepsy surgery requires a multidisciplinary approach in which different investigators must work in conjunction to achieve an integrative picture of epileptogenesis. The minimum staff of this team should include a neurologist experienced in epilepsy and EEG, a neurosurgeon with expertise in epilepsy surgery, and a technician of the EEG. Will also be associated with this team, a clinical coordinator for scheduling meetings and appointments of patients as well as the management of the database. Additional staff will include a neuroradiologist, neuropsychologist, a neuropsychiatrist, a social worker and a biomedical engineer. It is a fact that such an approach is difficult to organize and maintain in developing countries where medicine is widely practiced on an individual basis. However, it remains the key to launch an epilepsy surgery program[4,13,20,22,36,37].

The Tunisian experience, Morocco and Uganda mentioned above, showed the feasibility of epilepsy surgery in developing countries especially in Africa. Furthermore, they have demonstrated the relevance of collaboration with the teams of developed countries and stressed the interest to start this surgery at least for the corresponding cases that require only easy and available resources in developing countries. These

resources include EEG, Video-EEG, MRI or CT scan and neuropsychology. A similar collaboration between developed and developing countries was reported in Colombia and Pakistan. This twinning model can be used to launch the epilepsy surgery programs in other developing countries, especially in sub-Saharan Africa. Multidisciplinary teams would work with the national leagues against epilepsy to be prioritization lobbies of the overall management of this disease[16,17,18,27,37,38,39].

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