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Implementing an epilepsy surgery center. Initial experience at a university hospital in Brazil

Implementação de um centro de cirurgia de epilepsia. Experiência inicial em um hospital universitário no Brasil

Gabriel Pereira Escudeiro[1], Rafael Teixeira Magalhães Leal[1], Heros Henrique Melo de Almeida[1], Marcus Andre Aciolly[1], José Alberto Landeiro[1], Bruno Lima Pessoa[1]

ABSTRACT

Epilepsy is a serious neurological condition, often without a full and effective treatment. In some cases, surgery is beneficial, despite being underused. Our aim herein is to describe the implementation of an epilepsy surgery center in a federal university hospital, sharing the initial experience gained, as well as describing the main challenges and first results. **Methods:** Experience report of an epilepsy surgery center implementation. Retrospective review of 13 drug-resistant patients who underwent surgical treatment. **Results:** Thirteen patients underwent surgical epilepsy treatment, five patients categorized as the International League Against Epilepsy class 1, two in class 2, three in class 3, zero in class 4, and two in class 5; with a 30.76% complication rate. **Conclusion:** Despite the challenges, it was possible to implement an epilepsy surgery center with favorable results and acceptable incidence of complications, which were not higher than the incidences found in more experienced centers.

Keywords: epilepsy; neurocirurgical procedures; developing countries.

RESUMO

Epilepsia é um problema neurológico sério e para o qual não há um tratamento efetivo e definitivo. Apesar de o tratamento cirúrgico ser bastante benéfico em alguns casos, ainda é subutilizado. O objetivo deste trabalho é descrever a implementação de um Centro de Cirurgia de Epilepsia em um Hospital Universitário Federal, divulgar a experiência inicial obtida, os principais desafios, as dificuldades e os resultados iniciais. **Método:** Relato da experiência na implementação do Centro de Epilepsia. Análise retrospectiva de série de treze pacientes com epilepsia resistente a medicação e que foram submetidos a tratamento cirúrgico. **Resultados:** Treze pacientes submetidos a tratamento cirúrgico, 5 com a Liga Internacional Contra Epilepsia classe 1, 2 com classe 3, três com classe 3, zero com classe 4 e 2 com classe 5; com uma taxa de complicação de 30,76%. **Conclusão:** Apesar das dificuldades, foi possível a implementação de um Centro de Cirurgia de Epilepsia com resultados favoráveis e taxas de complicação não superiores aos centros de países desenvolvidos.

Palavras-chave: epilepsia; procedimentos neurocirúrgicos; países em desenvolvimento

Epilepsy is a serious neurological condition, which is often neglected as a major public health problem[1]. It was first described approximately 4,000 years ago. Throughout history, it has been considered a contagious disease, or witchcraft, with a demonic or spiritual etiology, for which many treatments have been proposed[2,3]. Since then, our knowledge regarding epilepsy has greatly increased. Numerous studies have been conducted and novel treatments have been suggested. However, even today, our knowledge remains limited and there is no fully effective treatment for this condition[2,3].

Several diagnostic criteria have been indicated for refractory epilepsy. Juul-Jensen defined as refractory seizures those that failed with at least two first-line drugs[4]. Further, Gilman et al. characterized as refractory seizures those in which the first-line anticonvulsant drugs were attempted in their usual doses but did not yield the desired response[5]. The International League Against Epilepsy (ILAE) defines the term "drug resistant epilepsy" as "failure of adequate trials of two tolerated and appropriately chosen and used anti-epileptic drugs schedules (whether as monotherapies or in combination) to achieve sustained seizure freedom"[6].

Approximately 1% of the world's population is affected by epilepsy[1]. Unfortunately, there are very few studies regarding the prevalence and incidence of epilepsy in Brazil. It is

[1]Hospital Universitário Antônio Pedro, Niterói RJ, Brasil.

Correspondence: Gabriel Pereira Escudeiro; Rua Marques do Paraná, 303 / prédio principal / 3° andar; 24033-900 Niterói RJ, Brasil; E-mail: gabrielescudeiro@yahoo.com.br

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estimated that therewere 340,000 newepilepsy cases in 2005 and the prevalence reached 1.8 million patientsin thecountrythe same year[7]. Depending upon the criteria used, 9% to 24% of the patients are considered inadequately controlled with antiepileptic drugs[8].

In 1828,Benjamin Dudley reported onone of the first epilepsy surgeries, conducted on a patient who developed seizures after brain trauma. The surgeryconsisted ofdecompressive trepanation, and a good resultwas obtained[9]. In 1886, Sir Victor Horsley, guided by Hughlings Jackson, performed surgery on a 22-year-old man with a long-termepilepsy after an accident resulting in adepressed skull fracture. Horsley found an area of brain scarring, which was resected with a 0.5 cm margin and the patient became seizure free[10]. Since then, knowledge regarding epilepsy surgery has increased withcontributions from many famoussurgeons, highlighted byFedor Krause, Harvey Cushing, Otfrid Foerster, Wilder Penfield, Herbert Jasper and Paulo Niemeyer[11].

Throughthe years, bothpathophysiology andsurgical techniques for this disease have greatly improved. Epilepsy surgery has become more effective, especially in patients with mesial temporal atrophy andextratemporal lesions[12]. A Cochrane Library meta-analysis found that the group of patients who underwent surgery was 15 times more likely to become seizure free compared with exclusive clinical treatment[13].

Our aim is to describe the implementation of anepilepsy surgery center at a university hospital in the southeastern region of Brazil. By sharing our initial experience and describing the main challenges found, wehopeto stimulate theimplementation of new epilepsy surgery centers. In addition, we present the results of a series of patients treated with epilepsy surgery at our institution.

Box 1. Engel surgical outcome classification.

Class I: Free of disabling seizures
- IA: Completely seizure-free since surgery
- IB: Non-disabling simple partial seizures only since surgery
- IC: Some disabling seizures after surgery, but free of disabling seizures for at least 2 years
- ID: Generalized convulsions with antiepileptic drug withdrawal only

Class II: Rare disabling seizures ("almost seizure-free")
- IIA: Initially free of disabling seizures but has rare seizures now
- IIB: Rare disabling seizures since surgery
- IIC: More than rare disabling seizures after surgery, but rare seizures for at least 2 years
- IID: Nocturnal seizures only

Class III: Worthwhile improvement
- IIIA: Worthwhile seizure reduction
- IIIB: Prolonged seizure-free intervals amounting to greater than half the follow-up period, but not less than 2 years

Class IV: No worthwhile improvement
- IVA: Significant seizure reduction
- IVB: No appreciable change
- IVC: Seizures worse

METHODS

We reviewedall chartsof patients with medically-resistant seizureswhounderwent a surgical treatment from September2012 to April2016. The diagnostic criteria used were those proposed by the ILAE, as previously mentioned.

Regarding the surgical technique, all patients underwent a neuronavigation-based craniotomy. Non-selective amydalohippocampectomy (NSAH),Spencer's technique,was performed for mesial temporal sclerosis, with or without associated tumor.In patients with tumor-associated epilepsy in the mesial portion of temporal lobe,standard tumor resection was performed, associated withNSAH. Lateral temporal lobe tumors and extratemporal ones were treated with tumor resection by standard neurosurgical technique.

All information was obtained from our registry platform(electronic chart). The outcomes of interest were the Engel Classifications after surgery[14] (Box 1) and the ILAE scores[15] (Box 2). Both complications andclinical outcomes were registered.

RESULTS

From September 2012 to April 2016, 13patients met the inclusion criteria. Eight men and five women were included. The mean age was 33 years old (17 to 57 years), and the follow-up was sevento 43 months, excluding one case of death in the postoperative period. All but onepatient had temporal lobe epilepsy, MRI positive findings and concordant EEG.

Demographic data such as age, gender, etiology, laterality, type of surgery and outcome scores are shown in the Table. According to the Engel outcome classification, there were fivepatients classified as IA, 3 as IB, one IC, one IIC, one IIIB, and one IVB;there were no patients in the other categories (Figure 1). According to the ILAE outcome scale, five patients were class 1, twoclass 2, threeclass 3, and twoclass 5 (Figure 2).

Of the 13patients who underwent surgery, four (31%) had some sort of complication. One (8%) patient developed a temporal bleed immediately after surgery, which was promptly drained, but this patient eventually died due to pulmonary sepsis. Only one patient (8%) developed symptomatic quadrantanopia, confirmed by complementary examinations. Two (16%) developed a psychiatric disorder;one characterized by childishbehavior

Box 2. International League Against Epilepsy outcome scale.

Class 1: Completely seizure free; no auras
Class 2: Only auras; no other seizures
Class 3: 1 to 3 seizure days per year; ± auras
Class 4: 4 seizure days per year to 50% reduction of baseline seizure days; ± auras
Class 5: Less than 50% reduction of baseline seizure days; ± auras
Class 6: More than 100% increase of baseline seizure days; ± auras

Table. Demographic data of age, gender, etiology, laterality, type of surgery and outcome scores.

Gender	Age	Alteration	Side	Procedure	ILAE	Engel
Male	53	Hippocampal atrophy	Right	NSAH	2	IB
Male	17	Temporal mesial tumor	Right	Resection + NSAH	1	IA
Female	49	Hippocampal atrophy and DNET	Right	Resection + NSAH	3	IB
Male	40	Neocortical temporal-occipital tumor	Right	SR	2	IB
Female	16	Temporal mesial tumor	Right	Resection + NSAH	1	IA
Female	25	Frontal cavernoma	Right	SR	1	IA
Male	39	Hippocampal atrophy	Right	NSAH	1	IA
Female	34	Hippocampal atrophy	Right	NSAH	1	IA
Male	58	Hippocampal atrophy	Right	NSAH	5	IVB
Female	39	Hippocampal atrophy	Right	NSAH	3	IC
Female	24	Hippocampal atrophy	Right	NSAH	3	IIC
Male	49	Neocortical temporal tumor	Right	SR	5	IIIB

SR: Standard resection; NSAH: non-selective amygdalohippocampectomy; DNET: dysembryoplastic neuroepithelial tumour

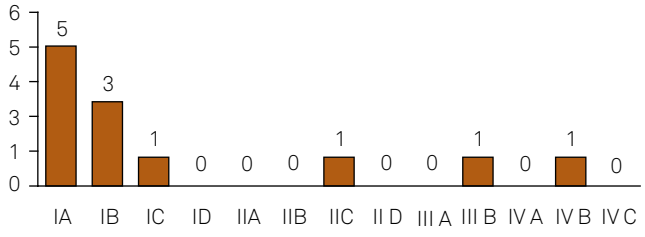

Figure 1. Engel surgical outcome classification

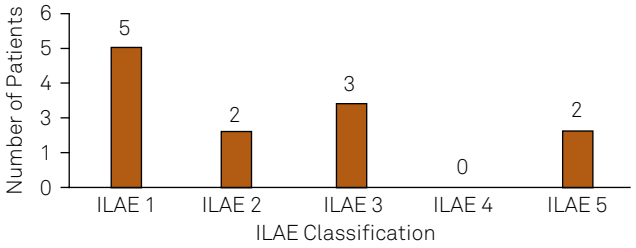

Figure 2. International League Against Epilepsy outcome scale.

and visual hallucinations and one developed depression; both were referred forpsychiatric and psychological care.

Considering the difficulties found in the implementation process, we highlight the following:

Firstly, because of the under-referral fromother physicians, such as neurologists and general physiciansfrombasic health care centers,it becamenecessary, in some cases, toactively recruit patients.Furthermore, there were not enough hospital beds,especially ones dedicated to epilepsy patients.

Secondly, there was difficulty accessing video EEG. Although EEG video equipment hadbeen obtained through a research project, there was,at the time, no medicalroom orpersonnel (medical and non-medical) for its full operation. Moreover,there wasneither transoperative stimulationnor-electrocorticography in our service.

DISCUSSION

In the United States,in 1987, there were only 26 epilepsy surgery centers. In 1992,this increased to 67 centers[16]. Unfortunately, to the best of our knowledge, there is no such data in Brazil. However, it is well known that the number of centers that offer this type of surgery is notenoughto carefor this country's population. Thus, the implementation of epilepsy surgery centers is critical.

Ours is the only public institutionwith an epilepsy surgery team in a subregionmade up by seven cities and a population of 1,857,345[17]. It is the referral centerfor many specialties, including neurosurgery and neurology. When epidemiological data[1,8,18] is extrapolated to our population, it is estimated that approximately 1,650 to 7,350 refractory epilepsy patients could potentially benefit from surgery, or, at least, a surgical evaluation. However, our sample consisted ofonly13patients, a much lower number compared tothe estimated population.

Other authors have reported that, despite the currently available evidence, surgery for refractory epilepsy is underutilized. As Jatté et al. mentioned in their review, that there is a gap between evidence and practice, and that epilepsy surgery is underused in countries such as the USA, UK and Canada. They pointed out some factors that might contribute to the phenomenon: incomplete or biased data, under-referraltosurgery centers, access issues, efficacy of new antiepileptic drugs, effectivenessof surgery in children, lack of knowledge and misconceptions, and behavioral or cultural issues[12].

We had similar problemsto those experienced by more economically-developed countries, such as under-referral. However, we also havedifferent problems, more typical of developing countries, such as the lack of supplies and hospital beds. This observation is of utmost importance, since the regional characteristics of the health care system impose different issues for theimplementation of an epilepsy center.

Therefore, we consider the report of the current active epilepsy surgery centers'experiences,as well as theinformation exchange, to be very important.

Despite thedifficulties faced, our patients had good outcomes, as established by theEngel and ILAE classifications, and a relatively low complication rate. De Tisi et al.[19], in a series of 649 patients undergoing surgical treatment for epilepsy in the UK found that 40% became entirely seizure free and 11% improved (simple partial seizure only). Their results were very similar to ours. With respect to complications, they had a 3%mortality, 8% visual field defects in temporal lobe epilepsy, 5% wound infections, <1% hemiparesis; 2% frontalis muscle weakness; 1% dysphasia; 3% cerebrospinal fluid leaks needing intervention, and one deep venous thrombosis, with an overall complication rate of 22%[19].

In a meta-analysis conducted byTéllez-Zenteno et al.[20], with data from76 studies, they found a 66% seizure-free rate after surgery (Engel I) for temporal lobe epilepsy, including tumor and non-tumor diseases. In this same meta-analysis, they found a 46% seizure-free rateafter occipital and parietal resections and a 27% seizure-free rate after frontal lobe resections;and 35% of the patientsbecamefree of incapacitating seizures aftercallosotomy[20].

Thus, considering that temporal lobe epilepsy has a better outcome after surgical treatment[19], we decided to select patients with this condition, if possible, forourinitial experience.

Psychosocial disabilities are more prevalentin patients with refractory seizures, with lower social interaction and reduced marriage rates[21]. Vickreyet al.[22] compared the quality of life in patients with epilepsy and other diseases (hypertension, diabetes, heart disease and depression).They concluded that patients who became seizure free after surgery had a better quality of life than the others[22].

In a review of the causes of epilepsy-related death, Rufo-Campos[23]listed sudden death, status epilepticus, trauma in general, aspiration pneumonia, drowning and burns. In a study by Ferreira and Silva[24], the authors conducted a subsystem informationsurvey on mortality in the Ministry of Health between 1980 and 2003 and found 32,655 deaths to bea direct consequence of epilepsy, which was calculated as an average of 1,236 deaths per year. The authors emphasized that these data are probably underestimated due tounder-reporting[24].

Berg et al.[25] reported a 20-year delay between the onset of seizures and the referral for surgery evaluation. Sillanpääet al.[26] performed a long-term follow-up with 220 children diagnosed with epilepsy in Finland. They pointed out that the most important predictorforseizure control wasa rapid response to initial therapy, defined as the reduction of seizures– at least 75% in three months – and when this percentage was not achieved, surgery should be considered.

Considering the lack of a center for epilepsy surgery in our region, we are committed to the implementation of this project. So far, great results have beenattained.

We decided to publish our initial results and our major difficulties to encourage other neurosurgical teams, withconditions similar to ours, to implement an epilepsy center.

Epilepsy is a serious health problem and the surgicalapproach is potentially beneficial for a considerable proportion of patients with this disease, although, in some areasofthe world, the access of these patients to a surgery team is notpossible.

In conclusion,we present the implementation of an epilepsy surgery center with favorable results and low incidence of complications (very similar to more developed centers). We believe that, in a region without this resource, neurosurgeons should be encouragedto implement an epilepsy center.

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