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Quality of Life and Cost Analysis Following Epilepsy Surgery in Turkish Patients

Türk Hastalarda Epilepsi Cerrahisinden Sonra Yaşam Kalitesi ve Maliyet Analizi

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Summary

Objectives: The aim of this study was to evaluate postoperative changes in terms of seizure frequency, antiepileptic drug (AED) consumption and quality of life, and in parallel with this, to determine the changes in AED and healthcare costs after surgery.

Methods: Twenty-four patients who underwent epilepsy surgery with medically intractable epilepsy were included in the study. Demographic features, seizure frequency and number of AEDs were obtained, and the Short Form Health Survey (SF-36) was administered pre- and postoperatively. Financial records were accessed via the university hospital database and the central network database of the national social security administration.

Results: ATLE or lesionectomy was carried out in 24 patients. During the mean follow-up period of 24 months, 67% of patients achieved Class 1 and 2 seizure control and a significant reduction in the number of AEDs ($p<0.005$). On the SF-36, the general perception of health and role limitations due to emotional problems significantly improved postoperatively. The cost analysis revealed a significant reduction in AED and healthcare costs due to epilepsy in patients who underwent surgery ($p<0.005$).

Conclusion: Surgical interventions for medically intractable epilepsy are effective in seizure control and have a notable beneficial effect on quality of life as well as healthcare costs. These medical and economic benefits of epilepsy surgery should encourage Turkish neurologists to refer patients to comprehensive epilepsy centers.

Key words: Cost; epilepsy; healthcare; surgery; quality of life.

Özet

Amaç: Bu çalışmanın amacı, epilepsi cerrahisinden sonra nöbet kontrolü, antiepileptik ilaç kullanımı, yaşam kalitesindeki değişim ve bunlara paralel olarak epilepsiye bağlı sağlık harcamalarında ve ilaç maliyetindeki değişimi belirlemektir.

Gereç ve Yöntem: İlaca dirençli epilepsi nedeniyle takip edilen 24 hasta (11 kadın, 13 erkek) çalışmaya alındı. Cerrahi öncesi ve sonrası nöbet sıklığı, antiepileptik sayıları belirlenerek SF-36 ölçeği uygulandı. Cerrahi öncesinde ve sonrasında epilepsiye bağlı sağlık harcamaları ve antiepileptik ilaç giderleri hastane bilgi yönetim sisteminden ve ulusal sosyal güvenlik kurumu veri tabanından elde edildi.

Bulgular: Yirmi dört hastaya ilaca dirençli epilepsisi nedeniyle ATLE ya da lezyonektomi uygulandı. Ortalama 24 ay sonunda hastaların %67'sinde nöbet kontrolü (ILAE sınıf I ve II) sağlandı. Postoperatif antiepileptik ilaç sayısında belirgin azalma görüldü ($p=0.005$). SF-36'ya göre hastaların genel sağlık durumlarını algılayışlarında, duygusal sorunlara bağlı kısıtlılıklarında düzelme tespit edildi ($p<0.005$). Maliyet analizinde cerrahi uygulanan hastalarda hem antiepileptik ilaç maliyeti hem de epileptik nöbetlere bağlı sağlık giderlerinde belirgin azalma olduğu saptandı ($p<0.005$).

Sonuç: İlaca dirençli epilepside cerrahinin nöbet kontrolündeki etkinliği ve yaşam kalitesi üzerine yararları ve bunlara paralel ekonomik yararları dikkat çekicidir. Hem medikal hem de ekonomik açılardan olumlu sonuçları olan cerrahi uygulamaların ülkemizde artabilmesi için ilaca dirençli epilepsisi olan hastaların bu konuda özelleşmiş ve cerrahi uygulayan merkezlere daha fazla yönlendirilmeleri gerekmektedir.

Anahtar sözcükler: Maliyet; epilepsi; yaşam kalitesi; cerrahi.

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Introduction

Antiepileptic drugs (AED) are not adequate to control seizures effectively in approximately 30 to 40% of individuals with epilepsy.[1,2] The unpredictable and recurrent seizures lead to cognitive, emotional and behavioral problems as well as deterioration in quality of life related to decline in social functioning, employment, marital status and self-confidence.[3-6] Furthermore, patients with epilepsy are on multiple antiepileptic drugs and suffer from stigmata, limitations in driving and independent living.[7,8] The impact of epilepsy is not limited to only physical limitations but also epilepsy patients have high rates of anxiety and depression, and experience restrictions in social life. Therefore, extensive impact of the disease affects the patients' quality of life. An increased interest and research into assessment of health related quality of life in epilepsy revealed higher quality of life in surgery patients with respect to nonsurgical controls with intractable epilepsy.[9] Furthermore, most epilepsy surgery patients report a positive overall impact of the procedure on their lives and a high willingness to undergo surgery again if that choice had to be made. The significant amelioration of health related quality of life has been reported in short term studies, in studies concerning long term outcome beyond five years and in studies with 10 years and more of follow-up.[10-12]

Surgical procedures are effective alternatives of antiepileptic drugs in patients with medically refractory epilepsy. Its use is increased, although it is frequently considered an underused treatment option especially in developing countries.[13,14] There is a serious gap between the number of patients who could benefit from epilepsy surgery and those who actually receive this treatment in Turkey. The reasons for few implementation of epilepsy surgery may be the poor awareness of epilepsy surgery among health-care professionals and the lack of health-care infrastructure to identify patients with medically refractory epilepsy. Recently, Turkish Chapter of International League against Epilepsy is working on to start an action in order to increase awareness of epilepsy surgery among health-care professionals and general population. In parallel to this issue, we aimed to report the results of our series in order to draw attention to positive results of epilepsy surgery and its cost-effectiveness. Although, it can be argued that cost analysis and quality of life issues in epilepsy surgery should be discussed separately, the main issue we want to emphasize besides reporting the results of our series, is to draw attention to the benefits of surgical treatment of the epilepsy in well selected patients. It is fairly important because it is estimated there are many more patients than who can receive optimal therapy for epilepsy and can be candidates for epilepsy surgery. In particular our aim is to increase awareness of the surgical option for patients with intractable epilepsy among Turkish neurologists and promote to refer them to comprehensive epilepsy centers.

Materials and Methods

The patients who underwent epilepsy surgery in Pamukkale University Medical Faculty between 2006 and 2010 with intractable epilepsy were enrolled in the study. The demographic data related to epilepsy were obtained from structured forms recorded during specified epilepsy clinical visits.

a) Surgery: Patients who experience epileptic seizure despite at least two antiepileptic drugs and leading to severe disability are defined as medically refractory. Presurgical workup included long term video EEG monitorization, cranial magnetic resonance imaging (MRI), and neuropsychological testing. Ictal SPECT, FDG-PET studies are performed when necessary. In non-lesional patients subdural electrodes were implanted according to a hypothesis based on the data obtained by presurgical evaluations. Electrocortical stimulation was applied in order to define seizure focus and eloquent cortex in selected patients. In patients with defined seizure focus, anterior temporal lobectomy or extratemporal cortical resections were carried out.

b) Seizure outcome: Seizure outcome is evaluated according to the classification of ILAE for seizure outcome following epilepsy surgery.[15] According to this classification, class 1 is completely seizure free and no auras; class 2 is only auras and no other seizures; class 3 is 1-3 seizure days per year with or without auras; class 4 is 4 seizure days per year to 50% reduction of baseline seizure days with or without auras; class 5 is less than 50% reduction of baseline seizure days with or without auras; class 6 is more than 100% increase of baseline seizure days with or without auras.[15]

c) Antiepileptic drug usage: The number of AEDs and their dosages are obtained before and 18 months after the surgery. A comparison analysis is carried out for the

Table 1. Summary of demographic data

Mean age at surgery (yr)	31.83±12.51
Mean duration of disease (yr)	16.57±7.12
Mean follow-up period (mo)	25.00±15.33

number of AEDs and the percentage of dose reduction is calculated.

d) Quality of life assessment: In order to evaluate quality of life, Short Form of the Quality of Life Scale (SF-36) was applied before and at 6th, 12th and 18th month after epilepsy surgery. SF-36 is a survey that includes 36 items and assesses the quality of life at 8 dimensions. The validity and reliability of Turkish translation were proved previously. [16] The 8 dimensions that are physical and social functioning, role limitations due to physical health and emotional problems, emotional wellbeing, energy/fatigue, pain and general health perception are evaluated. The total score is between 0-100 points. 0 shows bad health condition and 100 shows good health condition.

e) Cost analysis: The direct medical expenses related to epilepsy included the cost of physician visits, emergency room visits, hospitalizations due to seizures, diagnostic laboratory testing (such as blood tests and EEG etc.) and neuroimaging (MRI, computerized tomography). Healthcare costs for the 2 years prior to surgical evaluation and for 2 years afterward were calculated from records of the central network database of the national social security administration and university hospital database. Antiepileptic drug costs are calculated separately from direct medical expenses. The preoperative (the last prescribed before undergoing surgery) and the postoperative (the most current) regimens were obtained from the electronic medical records. The monthly cost of each drug was calculated using the price list indicated by Turkish Ministry of Health (2009 edition). The total cost of preoperative and postoperative drugs were calculated and compared.

Surgery expenses included presurgical work-up (long term video-EEG monitorization, invasive EEG monitorization, intracranial electrodes, cranial MRI, PET, SPECT, neuropsychological tests), and hospitalization for epilepsy surgery. All of the surgical expenses are accessed via electronic database of the purchasing department of the hospital. Surgery cost / preop direct medical expenses year - postop direct medical expenses per year gave the time required for the surgery turn out.

f) Statistical analysis: Related samples t-test is used to analyze the data before and after surgery (SPSS (version 17.0) for Windows) and p value below 0.05 is accepted as statistically significant.

Results

A total of 24 (11 female, 13 male) patients who were operated between 2006 and 2010 due to medically refractory epilepsy are enrolled in the study. Demographic and epilepsy related data are summarized in Table 1. The presurgical work-up revealed temporal lobe epilepsy and anterior temporal lobectomy with amygdalohippocampectomy (ATLE) is applied in 21/24 patients. In three patients seizures were related to extratemporal lesions and corticectomy was applied to the related regions (Table 2). The pathological examination of the resected material revealed mesial temporal sclerosis in 80% of the ATLE patients (Table 2). In 3/24 patients reversible complications occurred during the early postoperative period such as wound infection in 2/24 and subdural hematoma and hydrocephalus in 1/24.

a) Seizure outcome: Approximately 2 years of follow-up revealed that about 67% of ATLE patients achieved to complete seizure freedom (12/21) or experiencing only auras (2/21). 33% of the ATLE patients experienced rare seizures (3/21) or up to 50% reduction in seizure days from the baseline (4/21) (Table 2).

b) Antiepileptic drugs: The number of antiepileptic drugs was significantly reduced in the postoperative period ($p=0.005$) and a dose reduction of 44% was achieved in the current antiepileptic drug regime of patients undergoing ATLE and corticectomy.

c) Quality of life: The SF-36 assessments before and after (at 6th, 12th and 18th months) ATLE or corticectomy revealed a permanent improvement in not only patients' perception of their health in general, but also emotional wellbeing, energy and role limitations due to emotional problems (Table 3). At the 18th month control the patients reported that they contributed social life better. Furthermore, there was a negative correlation between the role limitations due to physical health and number of antiepileptic drugs ($r= -0.372$, $p<0.05$).

Table 2. Surgery type, invasive monitoring, pre- and postoperative AED numbers, percentage of dose reductions in current drugs, MRI findings, histopathology and ILAE outcome scales

No	Surgery type	Invasive monitoring	Preop AED #	Postop AED #	% of dose reduction in current drug/s	MRI scale	Histopathology	ILAE outcome
1	ATLE	No	2	2	0	TGT	DA	1
2	ATLE	Yes	2	2	0	PNH, ipsi HA	MTS	2
3	ATLE	No	2	1	25	MTS	MTS	1
4	ATLE	No	2	1	75	MTS	MTS	1
5	ATLE	No	1	1	75	CA	CA	1
6	ATLE	No	3	2	75	HA	MTS	1
7	ATLE	No	1	1	75	MTS	MTS	1
8	ATLE	Yes	2	2	25	HA	MTS	1
9	ATLE	Yes	5	1	50	MTS	MTS	1
10	ATLE	Yes	3	1	25	HA	MTS	4
11	ATLE	Yes	3	2	60	HA	MTS	1
12	ATLE	Yes	3	2	50	HA	CIRG	1
13	ATLE	No	2	1	70	MTS	Calcification, IR	1
14	ATLE	No	3	3	25	MTS	MTS	3
15	ATLE	No	1	0	100	MTS	MTS	2
16	ATLE	Yes	6	3	40	MTS	MTS	4
17	ATLE	No	3	2	75	MTS	MTS	3
18	ATLE	Yes	2	2	43	MTS	MTS	3
19	ATLE	No	3	3	0	HE+MTS	MTS	4
20	ATLE	Yes	2	2	25	MTS	MTS	4
21	ATLE	No	3	2	35	MTS	MTS	1
22	CC	Yes	3	3	0	CDCG	CD	4
23	FC	Yes	4	2	30	Normal	CD	4
24	PC	Yes	2	0	100	PGT	Astrocytoma	1

ATLE: Anterior temporal lobectomy and amygdalohippocampectomy; PNH: Periventricular nodular heterotopy; HA: Hippocampal atrophy; MTS: Mesial temporal sclerosis; CC: Cingulate corticectomy; FC: Frontal corticectomy; PC: Parietal corticectomy; HE: Hypoxic encephalomalasia; CDCG: Cortical dysplasia at cingulate gyrus; TGT: Temporal glial tumor; PGT: Parietal glial tumour; CA: Cavernous angioma; DA: Diffuse astrocytoma; CD: Cortical dysplasia; CIRG: Chronic inflammation reactive gliosis; IR: Ischemic necrosis.

d) Medical and surgery costs: The mean of direct medical costs for ATLE/corticectomy patients (n=24) was 3265 TL (€1632) per year preoperatively and 691 TL (€345) per year postoperatively ($p<0.05$). Antiepileptic drug cost was 327 TL (€166) per month preoperatively versus 193 TL (€96) postoperatively ($p<0.05$). The surgery costs in patients with ATLE/ corticectomy with or without invasive monitorization (n=24) was 12255 TL (€6125) and the surgery cost turn out is approximately 4 years (Table 4).

Discussion

In Turkey, the active epilepsy prevalence is around 1% which is similar to many developing countries.[17-24] According to this, considering that approximately 700,000 epilepsy patients exist in Turkey, about 10% of this epilepsy population is surgery candidates. The benefits of epilepsy surgery in terms of seizure outcome and improvements in life quality are beyond controversy in well selected patient groups, especially in temporal lobe epilepsy with hippocampal sclerosis. Despite the enormous amount of patients who can benefit from epilepsy surgery, the number of epilepsy surgery operations per year is approximately 100 cases. The main reason of poor implementation of epilepsy surgery seems to be the inadequate number of comprehensive epilepsy centers as well as poor referral of patients to existing epilepsy centers where standard epilepsy surgery is implemented. Epilepsy surgery commission of Turkish chapter of ILAE has started to work on action intending to increase awareness about epilepsy as

Table 3. The significant difference is demonstrated in SF-36 subgroup scales in the postoperative period when compared to preoperative period

SF-36 Subgroup scales	6th month	12th month	18th month
	p	p	p
Physical functioning	n.s.	n.s.	n.s.
Role limitations due to physical health	0.05	0.05	0.05
Role limitations due to emotional problems	0.001	0.005	0.005
Energy/ fatigue	0.003	0.01	0.05
Emotional wellbeing	0.005	0.001	0.001
Social functioning	n.s.	n.s.	0.05
Pain	n.s.	n.s.	n.s.
General health perception	0.000	0.000	0.000

a surgically remediable disease among health-care professionals and general population. In parallel to this action we believe that it is important to report satisfactory results in terms of seizure outcome and quality of life.

The quality of life in epilepsy population is declined in many aspects and the most significant factors affecting the quality of life and daily living activities are seizure frequency and number of antiepileptic drugs used.[13,25] Epilepsy surgery can effectively reduce seizure frequency with very low morbidity. Furthermore, within a year following surgery reduction of antiepileptic drug dosage is possible in completely seizure free patients, thus reducing the side effects. In addition to all these benefits patients can accommodate to social life effectively by gaining independence and feeling less limited in working life, marital relations and driving. Independent from quality of life multiple drug usage, routine clinic controls, and hospitalizations due to complications of epileptic seizures, emergency room admittances due to epileptic seizures, status epilepticus or secondary traumas constitute an important amount of direct medical expenses related to epilepsy.

The quality of life among epilepsy patients is lower than that of developed countries which may be related to cultural, social and economic differences as well as non-supportive health care system.[25,26] In Turkey there are few studies evaluating quality of life after epilepsy surgery. Aydemir et al.[25] used SF-36 to evaluate quality of life in patients with hippocampal sclerosis (HS) who had selective amygdalohippocampectomy (SAH). Their study revealed that operated patients' quality of life scores were higher in all dimensions of SF-36 when compared to patients with HS but not operated on. However, only the improvement in role limitations due to emotional problems reached to statistical significance. The main factors affecting the quality of life were high seizure frequency and concomitant diseases. Furthermore, antiepileptic drug usage was negatively correlated to the quality of life. In about 48% of the patients regained their independence and improved in social activities after the surgery.[25] In another study psychiatric status, degree of disability and quality of life (WHO-QOL-BREF) were assessed.[27] The quality of life assessments did not show significant difference postoperatively, however the patients contributed social life better and were satisfied from their health in general.[27]

Table 4. Pre- and postoperative cost analysis

	Medical costs (per yr)	AED costs (per mo)
Preoperative	3265 TL	3927 TL
Postoperative	691 TL	2322 TL
p	<0.05	<0.05

In our study a significant improvement was evident in seizure control (66% seizure freedom in the second year) in patients with ATLE and lesionectomy. Our results are congruous with the previous studies reporting a 48-84% seizure freedom among the patients with temporal lobe epilepsy treated with ATLE.[28-33] Unlike previous studies evaluating quality of life after epilepsy surgery that mentioned above, this group of patients achieved a significant reduction in current antiepileptic drug dosage and improved in many dimensions of SF-36. The improvement in quality of life determined at 6th month persisted also at

12th and 18th month controls. Furthermore, patients felt more confident and contributed to social life better 18 months after the surgery. In a randomized controlled study assessing the quality of life after epilepsy surgery due to temporal lobe epilepsy revealed that quality of life started to improve at the earliest 3rd month following surgery and persisted until 12th month.[33] Another large prospective surgery series (n=396) reported immediate improvement, that maintained for 5 years, in quality of life after surgery.[34]

The cost analysis of epilepsy surgery is evaluated by different researchers from different countries. There is an agreement that surgical treatment of temporal lobe epilepsy is a cost-effective treatment in a middle-term even without indirect medical costs.[35] Moreover, surgical treatment of temporal lobe epilepsy is cheaper than medical therapy. [36] Recently it has been reported that epilepsy surgery is associated with significant postoperative savings in antiepileptic drug cost.[37] Another study revealed that seizure free patients use substantially less health-care after surgery than before surgery.[38] Besides, in patients with TLE whose seizures persisted the health-care costs remained stable over 2 years postsurgery.[38] In parallel to these results our study also revealed that direct medical expenses reduced about 78%, after ATLE surgery and the surgery costs seem to turn out in 4 years.

There are some limitations of this study. It may be argued that the number of patients is not enough to say epilepsy surgery reduces direct healthcare expenses, but these preliminary results are enough to predict patients benefit from epilepsy surgery in general terms. Some patients who are seizure free for 2-3 years after the surgery may experience seizure recurrence in the long term; therefore longer follow-up is required to make absolute conclusions. Despite the limitations of this study, it showed that to do epilepsy surgery is worth while in well selected TLE patients who are the best candidates to benefit both in terms of seizure control and quality of life. The benefits are not limited to seizure control and achieving a better quality of life but also economic gains are notable.

In conclusion, it is important to realize that epilepsy is a surgically remediable disease and postoperative benefits are undeniable. Therefore, it is important to emphasize to identify patients with medically refractory epilepsy and prompt their referral to comprehensive epilepsy centers.

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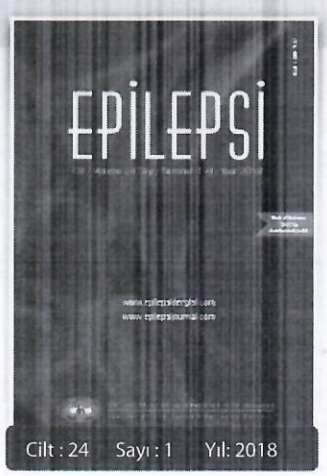

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Son Sayı
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Popüler Makaleler
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Gelecek Etkinlik ve Duyurular

11. Ulusal Epilepsi Kongresi 3 - 6 Mayıs 2018 tarihinde başlayacaktır.

4. Epilepsi Sempozyumu 5 - 7 Mayıs 2017

Semiyoloji Toplantısı 1 Nisan 2017

Dergimizde yayınlanmak üzere gönderilen makalelerde hem Türkçe hem de İngilizce dili kabul edilmekle birlikte, makalelerin İngilizce dilinde yazılması tavsiye edilmektedir.

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- Yazar ve kurum içinde
- Makale başlığı özet içinde
- Anahtar kelimeler içinde
- Tamamında