Spectrum of Surgical Complications of Temporal Lobe Epilepsy Surgery: A Single - Center Study

Temporal Lob Epilepsi Cerrahisinin Cerrahi Komplikasyon Spektrumu: Tek Merkezli Çalışma

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ABSTRACT

AIM: Although surgery is the most effective means of eliminating or reducing seizures in cases of medically refractory epilepsy, the expected or unexpected surgical complications must also be kept in mind in order not to decrease patients' quality of life. The aim of this present study was to assess the surgical complications of temporal lobe epilepsy surgery and their effects on the disease course in patients with intractable epilepsy arising from the tempo-mesial structures.

MATERIAL and METHODS: The records of 58 patients who underwent temporal lobectomy and/or selective amygdalalhippocampectomy at Gülhane Military Medical Academy between January 2000 and August 2010 were reviewed for peri- and post-surgical complications.

RESULTS: Post-surgical complications were detected in 7 patients (12%). The most common complication of ES was infection in 2 patients (2.9%). Other complications were hemorrhagic infarction, paresis of the frontal branch of the left facial nerve, subdural effusion, anxiety disorder, depressive disorder and late-onset psychosis.

CONCLUSION: The results of our study suggest the importance of post-operative care and long-term follow up in order to achieve favorable seizure outcome after epilepsy surgery.

KEYWORDS: Epilepsy, Epilepsy surgery, Surgery complication

ÖZ


BULGULAR: Hastaların %12 ise de BULGULAR: Hastaların 7'inde (12) cerrahi komplikasyon gözlemlendi. En sık görülen 2 hastada (%2.9) görülen enfeksiyon idi. Diğer komplikasyonlar, hemorajik infarkt, sol fasiyal sinirin frontal dalında paresi, anksiyete bozukluğu, depresif bozukluk ve geç başlangıçlı psikoz idi.

SONUÇ: Çalışmanın sonucunun, epilepsi cerrahisinin sonraki başarılı sonuçlarının, cerrahi sonrası bakım ve hastaların uzun süreli takibinin öneminde işaret etmektedir.

ANAHTAR SÖZCÜKLER: Epilepsi, Epilepsy surgery, Surgery complication

INTRODUCTION

Surgical removal of the epileptic focus has been approved as an effective therapy for patients with seizures that may be focal in origin, that are continuing to occur despite treatment with antiepileptic drugs (AEDs), and whose quality of life (QOL) is significantly impaired by epilepsy. The primary goal of epilepsy surgery (ES) is for the patient to be able to lead a seizure-free life, and preferably discontinuation or reduction of AEDs (2,8,17,22). However, similar to all of the other neurological surgeries, peri- and post-surgical complications may also accompanyed with ESs, and physicians should always be aware of these complications in order to facilitate the assessment of the risk/benefit ratio of ES. Ideal ES would eliminate seizures without causing any functional deficits. It is a well-known fact
that some neurological complications may occur, preexisting psychopathology may deteriorate, cognitive functions may be altered or de novo psychopathological syndromes may appear after ES (1,16,19,25).

Studies on the effectiveness of ES have focused on seizure outcome but there are few reports on assessing the complications of ES (9,12,20,23,27). The aim of this present study was to assess the surgical complications of ES and their effects on disease course in patients with intractable epilepsy arising from the temporo-mesial structures.

**MATERIAL and METHODS**

A consecutive, retrospective analysis of complications of ES was surveyed among 58 patients who underwent anteromedial temporal lobectomy (AMTL) and/or amygdala-hippocampectomy (AHCT) at Gülhane Military Medical Academy between January 2000 and August 2010. In AMTL, 3.5 cm of the temporal pole from temporal tip was removed including half of the superior temporal gyrus and the middle and inferior temporal gyri. In AHCT, surgical removal of the amygdala, anterior part of the tail of the hippocampus and the entire head and body of the hippocampus and parahippocampal gyrus were performed. Epileptic foci of the patients were determined and the decision of surgical procedure was made according to the results of long-term video-electroencephalography (v-EEG) monitoring, brain magnetic resonance imaging (MRI), single photon emission computed tomography (SPECT), positron emission tomography (PET) and neurophysiological tests results. Patients presenting with any space-occupying lesion, a cavernoma, or with a strictly lateral neocortical epileptic focus were excluded.

Records of 58 patients were reviewed for peri- and post-surgical complications (infections, intraparenchymal infarcts (hemorrhagic or ischemic), peripheral nerve injuries, epidural or subdural effusions, paresthesia or paresis, cognitive and behavioral changes, and death) of ES. Seizure recurrence after ES was not considered a surgical complication. Seizure type, duration of seizure, the underlying etiology of seizures, surgical procedure, seizure frequency before and after the surgery, AED therapy, and follow-up period of each patient were all recorded and their association with the surgical complications were evaluated.

**RESULTS**

Of the patients, 5 were female and 2 were male, and the mean age was 33.3 years (range 25-45 years). They were all right-handed and the side of the cerebral hemisphere supporting language function (from the Wada test and functional MRI) was left for each patient. The patients did not undergo any AED regimen changes after ES during the follow-up period (mean 3.3 years). And pre-surgical and post-surgical blood levels of the antiepileptic drugs (AEDs) were also identical and within the therapeutic ranges. No death was reported related to ES. Post-surgical complications were detected in 7 patients (12%). The most common complication of ES was infection (2.9%). Subacute hemorrhagic infarction localized at the right posterior temporal region was detected in patient-1 in the brain CT performed 10 days after ES. Complete resorption of the hematoma was observed on follow-up brain CT performed 6 weeks after the diagnosis. She continued the same AED regimen and her seizures were brought partially under control.

Paresis of the frontal branch of the facial nerve was detected in patient-2 just after the ES and persisted also during her follow-ups.

Neck stiffness, fever and alterations in consciousness were detected in patient-3 5 days after the surgery and a diagnosis of bacterial meningitis was made upon cerebrospinal fluid examination. The patient was treated with antibiotics at the intensive-care unit and was discharged with complete recovery 7 weeks after the ES.

Subdural effusion was detected in patient-4 2 months after the ES in the brain MRI. She was not re-operated and the subdural effusion resolved spontaneously within 2 months. Additionally, seizures persisted in patient-4 but decreased in frequency and severity. During her long-term follow-up, she was diagnosed with psychosis 2 years after the surgery. She was treated with haloperidol, 20 mg/ day in divided doses. Her delusions persisted and promethazine 20 mg/day was added to her treatment. She became symptom-free 6 weeks after the treatment and was discharged. She recovered completely 18 months after the ES.

Patient-5 complained of palpitations, shaking and chest pain 2 months after the surgery. She was started Escitalopram 20 mg/day with a diagnosis of de novo anxiety disorder after ES. During her long-term follow-up, her anxiety disorder was brought under control.

Irritability, aggressiveness, social withdrawal in personality and left hemi-numbness developed in patient-6 2 months after the surgery. With a diagnosis of depressive disorder, she was prescribed Citalopram 40 mg/day for the treatment and was discharged. She recovered completely 18 months after the ES.

Subdural effusion was detected in patient-7 10 days after the ES. Complete resorption of the hematoma was observed on follow-up brain CT performed 6 weeks after the diagnosis. She continued the same AED regimen and her seizures were brought partially under control.


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The characteristics of the patients were summarized in Table I.
### Table I: Characteristics of the Patients

<table>
<thead>
<tr>
<th>Patient number</th>
<th>Age</th>
<th>Gender</th>
<th>Duration of disease (year)</th>
<th>Seizure type(s) prior to surgery</th>
<th>Etiology</th>
<th>AEDs (before and after surgery)</th>
<th>Seizure frequency (before surgery)</th>
<th>Surgical procedure</th>
<th>Seizure frequency (after surgery)</th>
<th>Surgical complication</th>
<th>Follow-up period after surgery (year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>25</td>
<td>Female</td>
<td>17</td>
<td>CPS, SGTCS</td>
<td>Right MTS</td>
<td>CBZ, LEV, TP</td>
<td>2-3/month</td>
<td>Right AMTL + Subtemporal AH</td>
<td>2-3/month</td>
<td>Hemorrhagic infarction localized in the right posterior temporal region</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>30</td>
<td>Female</td>
<td>33</td>
<td>CPS</td>
<td>Left MTS</td>
<td>VPA, OXC, LEV</td>
<td>2-3/month</td>
<td>Left AMTL</td>
<td>No seizure</td>
<td>Paresis of the frontal branch of the left facial nerve</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>29</td>
<td>Male</td>
<td>27</td>
<td>CPS, SGTCS</td>
<td>Left HS</td>
<td>CBZ, TP</td>
<td>1-2/month</td>
<td>Left AMTL + Subtemporal AH</td>
<td>No seizure</td>
<td>Bacterial meningitis</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>39</td>
<td>Female</td>
<td>38</td>
<td>CPS, SGTCS</td>
<td>Right MTS</td>
<td>VPA, CBZ, LEV</td>
<td>1-2/week</td>
<td>Right AMTL + Subtemporal AH</td>
<td>1-2/month</td>
<td>Subdural effusion (2 months after the surgery) + psychosis (2 years after the surgery)</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>26</td>
<td>Female</td>
<td>11</td>
<td>CPS, SGTCS</td>
<td>Right MTS</td>
<td>VPA, CBZ</td>
<td>1-2/month</td>
<td>Right AMTL</td>
<td>No seizure</td>
<td>Anxiety disorder</td>
<td>5</td>
</tr>
<tr>
<td>6</td>
<td>39</td>
<td>Female</td>
<td>14</td>
<td>CPS</td>
<td>Right HS</td>
<td>CBZ, TP, LEV</td>
<td>1-2/week</td>
<td>Right AMTL + Trans-sylvian AH</td>
<td>No seizure</td>
<td>Depressive disorder</td>
<td>3</td>
</tr>
<tr>
<td>7</td>
<td>45</td>
<td>Male</td>
<td>20</td>
<td>CPS</td>
<td>Right MTS</td>
<td>CBZ, LEV</td>
<td>10-15/ month</td>
<td>Right AMTL</td>
<td>5-10/month (after VNS, 1-2/month)</td>
<td>Flap infection</td>
<td>5</td>
</tr>
</tbody>
</table>

429 patients, they found a meningitis rate of 1.4% and a skin flap infection rate of 3.5% (4). Tanriverdi et al. also reported that infection was the most common complication (1.0%) of their 2449 ES procedures (23). In our study, the most common complication of ES was also infection (2 out of 7 patients) which suggests the importance of surgical techniques and post-surgical intensive care.

We detected a lesion of the frontal branch of the facial nerve in one patient (patient-2) after ES. The frontal branch of the facial nerve superior to the zygoma courses within the superficial temporal fascia. Therefore, knowledge and respect for the facial nerve, particularly the frontal branch, are of paramount importance in the safe execution of surgical procedures in the temporal area (24).

Asztely et al. have reported the long-term (approximately 10 years) follow-up results of 70 patients who underwent ES. In the psychiatric follow-up of this cohort, 36% of the patients had a diagnosis of anxiety and/or depressive disorder in the first 2 years after operation. 29% of the patients reported having had problems with depression and/or anxiety since the 2 year follow-up, without any clear relation with seizure status (2). It has been reported that the presence of post-surgical psychiatric morbidity is significantly related to a pre-surgical history of anxiety and/or depressive disorder, but not to seizure outcome (10,14,21). However, patients 5 and 6 in our study developed anxiety and depressive disorders respectively although they had no evident history of anxiety or depression before ES. These findings suggest that development of anxiety and depression after ES may not only be related with pre-surgical history but also with the surgical procedure.

Wrench et al. have reported de novo depression in 5 patients who underwent ES. Four out of 5 cases occurred within the first 3 months following surgery, and all were preceded by significant post-surgical irritability reported by the patient's family (25). Similar to these findings, patients 5 and 6 (both of whom had undergone anteromedial temporal lobectomy) developed anxiety and depression within 3 months following ES. Hypoperfusion on SPECT or hypometabolism on PET in the anterior temporal lobe, inferior frontal lobe, and anterior cingulate have been identified as the predominant regional abnormalities seen in patients with primary clinical depression (6,15). Therefore, patients who have undergone an anterior temporal lobectomy procedure during ES should be followed-up regarding the risk of developing anxiety or depression. Additionally, we believe that de novo anxiety or depression after ES is not temporarily linked to post-surgical seizure outcomes, because these 2 patients became seizure-free after ES.

De novo obsessive-compulsive disorder and excessive masturbation cases have also been reported after ES (10,19). These reports are suggestive that psychiatric problems as a complications of ES may be manifested in various clinical presentations. Psychosis after temporal lobectomy has been shown to have a clustering in the early postoperative period and most of the reported cases occurred within 5 months of the surgery (18,22). One of our patients (patient-4) who developed subdural effusion 2 months after ES also developed psychosis 2 years after ES during the follow-up period. It has been reported that patients with bilateral functional and structural abnormalities, particularly of the amygdala, are at particular risk (11,21). Blumer et al. have also argued that there is a causal link between temporal lobectomy and psychosis (5). Based on the literature and our experience, it is suggestive that follow-up duration should be kept longer for the patients who have undergone ES (especially anteromedial temporal lobectomy and/or amygdala-hippocampectomy) in order to assess the risk of developing late-onset psychosis.

The main determinative factors of the risk of ES complications may be listed as the surgical procedure itself, the surgeon's experience, the patient's age and other health conditions and post-surgical care. However, other factors such as pre-surgical neural-network organization of the patients and neural re-organization during the recovery period still remain unclear (7,26,7). Further and well-designed studies are needed to explain the relationship between the neural re-organization and seizure outcomes after ES.

The limitations of this study should be considered. Our sample size was very small and the results were not compared with those of a control (or a reference) group. However, there are only a few studies on the surgical complications of ES (9,12,23,27). In conclusion, we underline that ES has a broad spectrum of surgical complications and suggest that patients be monitored closely before, during and also after the surgery. Studies have shown that the QOL of the patients with intractable epilepsy improves after ES and post-surgical QOL is clearly related to seizure outcome (3,17). However, further studies with larger patient groups are needed in order to assess the complications of ES on patients' QOL.

REFERENCES