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# Epilepsy in the Elderly

## *Yaşlılarda Epilepsi*

Belgin Petek Balcı[1], Aytül Mutlu[1], Feriha Özer[2], Özlem Çokar[1]

[1]Haseki Training and Research Hospital, Clinic of Neurology, İstanbul, Turkey
[2]Medipol University Faculty of Medicine, Department of Neurology, İstanbul, Turkey

### Summary

**Objective:** Epilepsy is frequently seen in the elderly, but its etiology, clinical presentation, comorbidities, and prognoses are different than younger patients. In this study, we investigated types of seizures, electroencephalography (EEG) findings and the cause of epilepsy in the elderly.

**Materials and Methods:** We retrospectively analyzed 95 patients who were 65 years old or older, and who had an epileptic seizure for the first time. Type of epilepsy, age, EEG findings, magnetic resonance imaging and/or cranial tomography findings, etiology, comorbidities and antiepileptic medication were evaluated.

**Results:** The average age of our patients was 75, and 50 (56%) patients were male. Among 95 patients, 55 (58%) had focal seizures, 36 (38%) had generalized tonic-clonic seizures and 4 (4%) had convulsive status epilepticus. The frequency of focal interictal epileptiform activity was 32.6% patients. Seizures were responsive to treatment administered as monotherapy in 81 (85%) patients and as politherapy in 14 (15%) patients. Our study showed that cerebrovascular disease was the most common (63%) etiological cause identified. There was no significant relationship between age and frequency of seizures and EEG abnormalities. However, a significant correlation was found between age and comorbidities.

**Conclusion:** Our results supported the focal seizure is the most common manifestation of epilepsy in the elderly. Cerebrovascular disease is the most common etiological cause of epilepsy in the elderly. Monotherapy is sufficient in the majority of patients. Continuous growth of the elderly population is increasing the need for accurate diagnosis and effective treatment. (Turkish Journal of Neurology 2015; 21:62-7)

**Key Words:** Epilepsy, seizure type, EEG, treatment, elderly patients

### Özet

**Amaç:** Epilepsi yaşlılarda sık görülen bir hastalıktır, ancak etiyolojisi, klinik sunumu, eşlik eden hastalıkları ve prognozu genç hastalardan farklıdır. Bu çalışmada epilepsi nedenleri, yaşlılarda nöbet tipleri, elektroensefalografi (EEG) bulguları araştırıldı.

**Gereç ve Yöntem:** İlk epileptik nöbetini geçiren ve altmış beş yaş üzerinde 95 hasta retrospektif olarak değerlendirildi. Yaş, epilepsi tipi, EEG bulguları, manyetik rezonans görüntüleme ve/veya kranial tomografi bulguları, etiyoloji, eşlik eden hastalıklar ve verilen antiepileptik tedaviler değerlendirildi.

**Bulgular:** Hastalarımızın yaş ortalaması 75 idi ve 50 (%56) hasta erkekti. Doksan beş hastanın 55'inde (%58) parsiyel tipte nöbet, 36'sında (%38) jeneralize tonik klonik nöbet ve 4'ünde (%4) jeneralize status epileptikus vardı. İnteriktal EEG'de fokal epileptiform aktivite sıklığı %32,6 idi. Nöbetler hastaların %85'inde (81 hasta) monoterapi ile %15'inde (14 hasta) politerapiyle kontrol altında idi. Çalışmamız serebrovasküler hastalıkların, en sık (%63) etyolojik neden olduğunu gösterdi. Yaş ve nöbet sıklığı ve EEG anormallikleri arasında anlamlı bir ilişki saptanmadı. Ancak yaş ve eşlik eden hastalıklar arasında anlamlı bir ilişki saptandı.

**Sonuç:** Sonuçlarımız fokal nöbetlerin yaşlı epilepsinin en sık belirtisi olduğunu desteklemektedir. Serebrovasküler hastalıklar yaşlılarda epilepsinin en fazla rastlanan etiyolojik nedenidir. Monoterapi hastaların çoğunluğunda yeterlidir. Yaşlı nüfusun devamlı büyümesi, doğru tanı ve etkili tedavi gereksinimini arttırmaktadır. (Türk Nöroloji Dergisi 2015; 21:62-7)

**Anahtar Kelimeler:** Epilepsi, nöbet tipi, EEG, tedavi, yaşlı hastalar

**Address for Correspondence/Yazışma Adresi:** Belgin Petek Balcı MD, Haseki Training and Research Hospital, Clinic of Neurology, İstanbul, Turkey
Phone: +90 216 462 24 98 E-mail: belginp1@yahoo.com
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## Introduction

Lifetime prevalence of epilepsy for all ages is 10.3/1000 (1.5-57/1000) (1). Epidemiological studies reported that seizures are more often seen in patients 75 years old or older (2,3). Epilepsy is the third most frequently seen chronic neurological disease following cerebrovascular diseases (CVD) and dementia (4). Seizures resulting from an acute disease are more often seen in the elderly than younger age groups (5). Thirty percent of acute seizures are manifested as status epilepticus in the elderly (5). These acute seizures can be triggered by metabolic and electrolyte anomalies, hypo-hyperglycemia, uremia, hyponatremia, hypocalcemia, hypothyroidism, infections, and hepatic, cardiac and respiratory deficiencies, and acute stage CVD (5,6). The etiology of the unprovoked seizures consists of CVD in the chronic stage, silent infarctions, dementia, brain tumors and cranial trauma (2,3,4,5). Auras and automatisms preceding focal seizures that are seen at a rate of 50% in the younger ages are rarely observed in the elderly (4,5,7). Therefore, the presentation of epilepsy is less specific in the elderly. Sudden loss of consciousness can be perceived as episodes of confusion, periods of impaired attention or syncope attacks and be mistaken with transient ischemic attacks, transient global amnesia, hypo-hyperglycemia or various cardiac arrhythmias (5,6,7,8,9,10).

The aim of the present study was to clinically analyze the causes of epilepsy, seizure types and EEG findings of the patients 65 years or older who were referred to our epilepsy outpatient clinic.

## Materials and Methods

The study retrospectively included patients who had their first episodes at 65 or later. All of the included patients had at least 2 seizures with a time interval in between. Patients who had acute status seizures due to metabolic disorders, infection, organ failures were not included in the study. The patients were divided into 2 age groups: 65-75 age interval group and 75-and-older age group. Routine scalp electroencephalograph (EEG) findings, brain tomography (BT) and/or cranial magnetic resonance imaging (MRI) findings and accompanying disorders were investigated. Seizure types were classified according to the clinical history.

### Statistical Analysis

The descriptive statistics were obtained from age, sex, seizure frequency, EEG findings, imaging findings, seizure types and accompanying conditions. Following the descriptive analysis, the patients were grouped as those with or without EEG findings, and those with or without accompanying disorders. The groups were compared in terms of age and seizure frequencies using Mann-Whitney U test.

## Results

Ninety patients (45 female and 50 male) who were followed for 11 months to 10 years (average: 36.11 months) were evaluated. There were 42 patients in the 65-75 age group and 53 patients in the 75-and-older age group. The mean age was 76.53 (standard deviation (std): 5.78, confidence interval (CI): 65-91) and there were no significant difference between the two sex. The mean seizure frequency was 3.42 (std: 1.60, CI: 1-7) and there were no significant difference between the two sexes.

The most common seizure type in our patient population was partial seizures, specifically simple partial seizures (SPS) (Table 1). When EEG records were analyzed, the most commonly seen findings were focal sluggishness (%32) and focal epileptic discharges. The EEG of 22 patients were normal, and generalized epileptiform discharges were identified in 34 out of 36 patients who had generalized tonic-clonic seizures (GTCS). There were no difference between the age groups in terms of EEG findings (Table 2).

Cranial imaging (BT/MRI) was conducted in all patients but three. Cardiovascular diseases were the most common finding in our population, followed by leukoaraiosis and cortical atrophy. Lacunar infarctions and hematomas were common in the 65-75 age-group whereas wide vein infarctions were common in 75-and-older age group (Table 3). The temporal connection between CVD and development of seizures were identified in 34 patients. Twelve patients (35.3%) showed early seizures following stroke and 22 patients (64.7%) developed late seizures.

There were no accompanying diseases in 30 of the patients; 65 patients had at least one diseases in addition to epilepsy (Table 4). When the patient population was analyzed for the seizure counts in the presence of EEG findings and accompanying conditions, the rate of accompanying conditions increased significantly as a function of age (p=0.013) (Table 5). There was no relationship between the seizure frequency and the number of accompanying conditions.

Eighty five percent of our patients received monotherapy to control their seizures (Table 6). Among those who used polytherapy, only 1 out of 3 received triple treatment, while the other two received double treatment. There were no patients who were in remission or who had resistant epileptic seizures.

**Table 1. Seizure type***

| Seizure Type | Number of Patients (n) | n (%) | 65-75 y | 65-75 y (%) | ≥75 y | ≥75 y (%) |
|---|---|---|---|---|---|---|
| GTCS | 36 | 37.9 | 13 | 30.9 | 23 | 43.4 |
| SPS | 19 | 20 | 12 | 28.6 | 7 | 13.2 |
| SPS and SGS | 16 | 16.8 | 7 | 16.7 | 9 | 16.9 |
| CPS | 12 | 12.6 | 7 | 16.7 | 5 | 9.4 |
| CPS and SGS | 8 | 8.4 | 3 | 7.1 | 5 | 9.4 |
| CSE | 4 | 4.2 | 0 | 0 | 4 | 7.5 |

GTCS: Generalized tonic clonic seizure, SGS: Secondary generalized seizures, SPS: Simple partial seizure, CPS: Complex partial seizure, CSE: Convulsive status epilepticus
*Classification made using the patient or relative's reports.

## Discussion

Even though epilepsy is considered a child or young adult disease, it is also frequently seen in the elderly. Epilepsy is the third most likely neurological disorder following stroke and dementia. Today, incidence rate of epilepsy in the elderly is getting higher with the increased lifetime expectancy in the society (6,7,11). The incidence rate is 80.8/100,000 in the general population; 85/100,000 for the 65-69 age group and 135/100,000 for 80 years or older (12).

Partial seizures are seen in most elderly patients. In our study, we also found partial seizures (57.8%) to be the most frequent, followed by GTCS (37.9%). When we looked at the subgroups, however, we found that GTCS frequency increases at 75 years or older (43.4%) and becomes comparable to that of partial seizures (48.3%). Most of the patients in our sample who had partial seizures had simple partial seizures (36.8%). Unlike previous studies, we found the rate of GTCS to be high (37.9%) (4,5,9). However, the low rates of generalized epileptiform activity detected in the EEG of patients who had GTCS, and high rates of focal findings suggested that the history of seizures from patients who were reported to have GTCS were not obtained properly. Similar to our study, the study by Mısırlı et al. also reported a high rate (46%) of generalized seizures (13). A study by Paradowski et al. reported rate of GTCS as 33.8%, and the rate of complex partial seizure (CPS) as (65.2%) (4). In the same study, it was found that the rate of CPS increases between the patient subgroups as a function of age. In our sample, the rates of partial seizures were high in either age group but interestingly the rate of GTCS was higher in 75-and-older age group.

Electroencephalogram findings of 67.4% of our patients were normal and 35.8% of them showed epileptiform activity. There was no difference between the age groups in terms of EEG findings. Sinha et al. found EEG abnormalities in 2/3rd of the patients that they investigated in a way that is similar to our methodology, and approximately half of these patients had epileptiform activity (9). Tanaka et al. found focal epileptic discharge in the EEG's of 72.9% of their patients (n=51). Eleven percent (n=8) showed focal or generalized sluggishness and 15.7% (n=11) was reported to be normal (14). GTCS rates are high when the elderly epileptic

**Table 2. Electroencephalography findings**

| EEG Findings | Number of Patients (n) | n (%) | 65-75 y | 65-75 y (%) | ≥75 y | ≥75 y (%) |
|---|---|---|---|---|---|---|
| EEG not available | 9 | 9.5 | 7 | 16.7 | 2 | 3.8 |
| Normal EEG | 22 | 21.05 | 10 | 23.8 | 12 | 22.6 |
| FS | 24 | 25.3 | 7 | 16.7 | 17 | 32.1 |
| DS | 6 | 6.3 | 2 | 4.8 | 4 | 7.5 |
| FS ve FED | 31 | 32.6 | 14 | 33.3 | 17 | 32.1 |
| FS and/or FED and SGFED | 1 | 1.1 | 1 | 2.4 | 0 | 0 |
| GED | 2 | 2.1 | 1 | 2.4 | 1 | 1.9 |

FS: Focal sluggishness, DS: Diffuse sluggishness, FED: Focal epileptic discharge, SGFED: Secondary generalize focal epileptic discharge, GED: Generalized epileptic discharge, EEG: Electroencephalography

**Table 3. Imaging findings**

| Imaging (BT/MRI) | Number of Patients (n) | n (%) | 65-75 y | 65-75 y (%) | ≥75 y | ≥75 y (%) |
|---|---|---|---|---|---|---|
| Imaging not available | 3 | 3.2 | 1 | 2.4 | 2 | 3.8 |
| Normal | 7 | 7.4 | 5 | 11.9 | 2 | 3.8 |
| Wide vascular infarct | 39 | 41.1 | 17 | 40.5 | 22 | 41.5 |
| Lacunar infarct | 13 | 13.7 | 7 | 16.7 | 6 | 11.3 |
| Hematoma (chronic) | 7 | 7.4 | 5 | 11.9 | 2 | 3.8 |
| Hematoma and infarct | 1 | 1.1 | 1 | 2.4 | 0 | 0 |
| Cortical atrophy | 6 | 6.3 | 0 | 0 | 6 | 11.3 |
| Leukoaraiosis | 8 | 8.4 | 1 | 2.4 | 7 | 13.2 |
| Encephalomalacia | 3 | 3.2 | 3 | 7.2 | 0 | 0 |
| Angioma | 2 | 2.1 | 1 | 2.4 | 1 | 1.9 |
| Sinus thrombosis | 2 | 2.1 | 1 | 2.4 | 1 | 1.9 |
| Subdural hematoma | 1 | 1.1 | 0 | 0 | 1 | 1.9 |
| Space occupying lesion (Meningioma) | 1 | 1.1 | 0 | 0 | 1 | 1.9 |
| Small vessel disease and Cortical Atrophy | 2 | 2.1 | 0 | 0 | 2 | 3.8 |

BT: Brain tomography, MRI: Magnetic resonance imaging

patients were grouped according to the verbal reports by the patient and patient relatives, but these rates were not reflected in the routine scalp EEG findings. As reported by earlier studies, the diagnostic sensitivity and specificity of routine scalp EEG is very low in the elderly (6). Thus, it was reported that extended-duration EEG monitoring can help with the diagnosis since the clinical history and routine scalp EEG findings may prove to be insufficient (4,6). Even though there was no clinical reason to suspect the diagnosis in our patients, we think that extended-duration EEG monitoring can be beneficial in classifying the type of epilepsy in patients who had a mismatch between EEG findings and seizure type. Karaçayır et al. reported that patients who had seizures following stroke showed focal sluggishness and focal epileptic discharges in EEG, much like our study (15,16).

The etiology of the elderly epileptics primarily include CVD, followed by neurodegenerative diseases, brain tumors, trauma and other causes (7,13). Population-based epidemiological studies showed that the probability of epilepsy within the first year following a CVD is 17 times higher than normal (17). We also found CVD to be the most likely condition (63.2%) in the cranial imaging findings. In our patients with CVD, 39 (41.1%) of them had wide vein infarction, 13 (13.7%) had lacunar infarction and 7 (7.4%) had chronic stage hematoma. Our findings were in line with previous studies (14,15,16,18). The cortical involvement following stroke is considered as a risk factor for epileptic seizures but the studies showed that only subcortical involvement may also cause seizures (16). In their study, Paradowski et al. identified CVD as the most common cause and reported silent infarction in one patient, and leukoaraiosis in the oldest patient subgroup (4). In the same study, they found that leukoaraiosis is more often seen in the old age (56.5%) and they suggested that this is related to the decreased oxygen consumption in various cerebral cortex areas,

**Table 4. Accompanying diseases**

| Additional Disease | Number of Patients | n (%) | 65-75 y | ≥75 y |
|---|---|---|---|---|
| No disease | 30 | 31.6 | 19 | 11 |
| HT | 21 | 22.1 | 9 | 12 |
| DM | 6 | 6.3 | 4 | 2 |
| HL | 5 | 5.3 | 0 | 5 |
| Dementia | 9 | 9.5 | 2 | 7 |
| Depression | 2 | 2.1 | 0 | 2 |
| PD | 2 | 2.1 | 0 | 2 |
| DM+HT | 5 | 5.3 | 1 | 4 |
| HT+HF | 5 | 5.3 | 3 | 2 |
| HF+by-pass operation | 2 | 2.1 | 1 | 1 |
| Thyroid Disorders | 1 | 1.1 | 0 | 1 |
| DM+Depression+PD | 2 | 2.1 | 2 | 0 |
| Asthma | 1 | 1.1 | 1 | 0 |
| MM | 1 | 1.1 | 0 | 1 |
| IHD | 1 | 1.1 | 0 | 1 |
| PD+HT+Dementia | 1 | 1.1 | 0 | 1 |
| HT+PD | 1 | 1.1 | 0 | 1 |

HT: Hypertension, DM: Diabetes mellitus, HF: Heart failure, HL: Hyperlipidemia, PD: Parkinson disease, MM: Multiple myeloma, IHD: Ischemic heart disease

**Table 5. The comparison of age and number of seizures according to electroencephalogram findings and presence of accompanying diseases**

| | EEG Findings | | z | p |
|---|---|---|---|---|
| | Present (n=64) | Absent (n=22) | | |
| Age | 77.38±6.09 | 74.82±4.82 | -1.62 | 0.106 |
| Number of Seizures | 3.38±1.60 | 3.59±1.53 | -0.69 | 0.488 |
| | Additional Disease | | | |
| | Present (n=65) | Absent (n=30) | | |
| Age | 77.55±5.87 | 74.30±4.97 | -2.50 | 0.013 |
| Number of Seizures | 3.47±1.48 | 3.40±1.66 | -0.53 | 0.596 |

EEG: Electroencephalography

**Table 6. Antiepileptic medication**

| Drugs Used | Frequency n | Percent (%) | 65-75 y | ≥75 y |
|---|---|---|---|---|
| No drugs | 3 | 3.2 | 2 | 1 |
| Phenytoin | 9 | 9.5 | 1 | 8 |
| Carbamazepine | 44 | 46.3 | 22 | 22 |
| Valproate | 6 | 6.3 | 3 | 3 |
| Oxcarbazepine | 11 | 11.6 | 4 | 7 |
| Lamotrigine | 2 | 2.1 | 1 | 1 |
| Levetiracetam | 9 | 9.5 | 2 | 7 |
| Phenytoin and Levetiracetam | 1 | 1.1 | 1 | 0 |
| Phenytoin and Maliasin | 3 | 3.2 | 2 | 1 |
| Valproate and Levetiracetam | 2 | 2.1 | 2 | 0 |
| Topiramat and Gabapentin | 1 | 1.1 | 0 | 1 |
| Topiramat and Levetiracetam | 1 | 1.1 | 1 | 0 |
| Gabapentin and Barbexaclone | 1 | 1.1 | 0 | 1 |
| Levetiracetam and Barbexaclone | 1 | 1.1 | 1 | 0 |
| Carbamazepine, Valproate and Levetiracetam | 1 | 1.1 | 0 | 1 |

which becomes a risk factor for epilepsy (4). Even though there was no statistically significant difference between our patient groups, leukoaraiosis and cortical atrophy were more often seen in the older patient subgroup. While we did not find head trauma as an etiological cause, brain tumor was found to be 1.1%. Numerous studies identified head traumas (due to chronic alcoholism) and brain tumors as etiological causes at the rates of 3-4% and 5-10%, respectively (1,2,3,4,5). The low rates observed in our study can be explained by the fact that head traumas and brain tumors were treated by the neurosurgery department in our hospital.

Almost all of our patients (96.8%) went under cranial neuroimaging (BT/MRI). 63.8% of our patients showed vascular lesions, 8.4% showed leukoaraiosis and 6.3% showed cortical atrophy. Lacunar infarcts and hematomas were common in the 65-75-age group while wide vein infarction was common in 75-and-older age group. The temporal connection between CVD and seizure development was identified in 34 patients. Twelve (35.3%) patients showed early seizures following stroke, and 22 (64.7%) showed late seizures. Similar to our study, Temprano et al. reported seizures following CVD to occur at a rate of 36.6% in the early stage and 63.4% in the late stage (10). Numerous studies suggested that cortical and wide infarctions increase the risk for late onset seizures significantly (19,20).

In our sample, the most commonly seen accompanying condition to epilepsy was seen as hypertension (22.1%) followed by dementia (9.5%). Epilepsy incidence in dementia was reported to be in variable amounts (5-64%) (21). The rate of epileptic seizures increases with the progression on non-vascular dementia and Alzheimer disease. In addition, the risk for seizures was reported to be high in the early onset dementia (21,22). A large portion of our patients was 75 or older and none of them had early onset dementia. Further, hypertension and hyperlipidemia was more common in the 75-and-older age group while diabetes was more common in 65-75-age group.

The epileptic seizures seen in the elderly are usually benign and respond well to antiepileptics. Tanaka et al. reported that 77.8% of elderly patients responded well to monotherapy (14,23). In our study, this number was 85%. A large portion of our patients (46.3%) used carbamazepine and oxcarbazepine (11.6%).

There was no relationship between the presence of EEG findings, age and seizure frequency. There was also no relationship between the presence of accompanying disorders and the frequency of seizures but there was a significant relationship between the presence of accompanying disorders and age (p=0.013). To our knowledge, this is the first report in the literature on this topic.

Etiology in 37% of our patients could not be fully identified. Twenty one percent of the patients whose etiology was not fully identified showed lesions that were associated with old age such as cortical atrophy, periventricular ischemia and leukoaraiosis and small vessel disease. The roles of these lesions in the epilepsy pathogenesis are still being debated. In line with our present findings, earlier studies also identified CVD as the most common etiological cause in the elderly epileptic patients (5,6,7,13).

The majority of elderly epilepsy cases can be manifested as partial seizures and can be controlled by monotherapy. However, the fact that partial seizures sometimes present as confusional attacks and that routine scalp EEG not always reflects the seizure type indicated in the clinical history sometimes cause incomplete or incorrect diagnosis. Therefore, use of video-EEG in addition to routine EEG may improve diagnosis in the elderly epileptic patients. The rate of accompanying disorders in addition to epilepsy increases with age. Luckily, there was no link between the number of accompanying disorders and the frequency of seizures. Cerebrovascular diseases are the most common etiological causes in epilepsy in the elderly. Clinical and imaging studies done in regular intervals will be helpful in tracking the neurodegenerative processes.

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**Concept:** Belgin Petek Balcı, Aytül Mutlu, Feriha Özer,

**Design:** Belgin Petek Balcı, Aytül Mutlu

**Data Collection or Processing:** Belgin Petek Balcı, Aytül Mutlu, Özlem Çokar

**Analysis or Interpretation:** Belgin Petek Balcı, Aytül Mutlu, Özlem Çokar

**Literature Search:** Belgin Petek Balcı, Aytül Mutlu, Feriha Özer

**Written by:** Belgin Petek Balcı

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