

The Analysis of Generalized Tonic Clonic Seizures Associated Injuries in Emergency Department

Acil serviste jeneralize tonik klonik nöbetler ile ilişkili yaralanmaların analizi

Türkiye Acil Tıp Dergisi - Turk J Emerg Med 2010;10(1):7-11

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SUMMARY

Objectives: Persons with epilepsy are believed to be at greater risk of incurring accidental injury than those without seizures. During generalized seizures the individual is unable to utilize protective reflexes during falls and may consequently suffer head, orthopedic, or soft tissue injury. Our aim is to evaluate the spectrum of trauma in epilepsy patients presenting to our emergency department as a result of generalized tonic-clonic seizure (GTCS).

Methods: We retrospectively reviewed patient records collected between January 2004 and December 2007 at the Emergency Department of Dicle University Medical School. All patients aged 15 years or more with epilepsy and trauma due to generalized tonic clonic seizures were included in the study. Records were analyzed for age, gender, type of injury, sufficiency of anti-epileptic medication, and mortality.

Results: The average age of the 51 patients included in the study was 26.02±9.86 years, range 15-52 years. Thirty-three patients (64.7%) were male; the male female ratio was 1.83. Soft tissue injuries were the most common injury (26 instances). Head trauma, cuts, dental and tongue injuries were less common. Blood levels of anti-epileptic medication were in the therapeutic range in 9 (17.6%) patients, while 42 (82.4%) had sub therapeutic levels for effective treatment. Four (7.8%) of the patients died. The trauma in 2 mortalities involved burns; remaining deaths were associated with submersion injury and fall (subarachnoidal hemorrhage).

Conclusions: There was no significant association between sub therapeutic levels of anti-epileptic medication and mortality.

Key words: Epilepsy; generalized tonic clonic seizures.

ÖZET

Amacı: Epilepsi hastalarının hasta olmayanlara göre, gelişebilecek kazalara karşı daha yüksek riske sahip olduğuna inanılır. Jeneralize nöbet boyunca hastalar, düşme sonucunda oluşabilecek, kafa travması, ortopedik ya da yumuşak doku yaralanmasından kendilerini koruyacak reflekslerden yoksundurlar. Amacımız, jeneralize tonik klonik nöbet sonrası travma nedeniyle acil servisimize başvuran hastaların travma spektrumunu değerlendirmektir.

Gereç ve Yöntem: Dicle Üniversitesi Acil Servisine Ocak 2004 ile Aralık 2007 arasında, jeneralize tonik klonik nöbet sonrası travma nedeni ile başvuran 15 yaş üstü epilepsi hastalarını ICD tanı kodlarını kullanarak geriye dönük tespit ettik. Kayıtlar hastaların yaşı, cinsiyeti, yaralanma tipi, antiepileptik tedavinin yeterliliği ve mortalite açısından analiz edildi.

Bulgular: Çalışmaya alınan 51 hastanın yaş ortalaması 26.02±9.86 (15-52) idi. Otuz üç (%64.7) hasta erkek ve erkek kadın oranı 1.83 idi. En sık yaralanma tipinin yumuşak doku travması olduğu görüldü (26 olgu). Kafa travması, kesiler, diş ve dil yaralanmasının daha az sıklıkta olduğu belirlendi. Antiepileptik tedavinin kan düzeyleri 9 (%17.6) hastada yeterli seviyede iken, 42 (%82.4) hasta terapötik seviyenin altında düzeye sahipti. Hastaların 4'ü (%7.8) hayatını kaybetti. İki hasta yanık, diğerleri ise suda boğulma ve düşme sonucu gelişen subarahnoid kanama nedeniyle kaybedildi.

Sonuç: Hastaların antiepileptik ilaç düzeylerinin terapötik seviyenin altında olması ile mortalite arasında ilişki yoktur.

Anahtar sözcükler: Epilepsi; jeneralize tonik klonik nöbet.

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Introduction

Persons with epilepsy are at greater risk of accidental injury than those without seizures.^[1] Although epileptic individuals should be encouraged to live as normal a life as possible, many persons with seizure disorders must take special precautions to avoid seizure-related injuries.^[2] During generalized seizures the person is unable to utilize protective reflexes during falls and may consequently suffer head, orthopedic, or soft tissue injury.^[1]

Compared to the general population, epileptic subjects are at increased risk of mortality; accidents and trauma appear to be a more common cause of death in people with epilepsy than in the population as a whole.^[3] Beghi et al. suggested that precautions taken to avoid injury can represent a stigma for the patient with epilepsy and these can constrain daily living activities.^[4] However, it has been argued that the increased rates of accident and morbidity in individuals with epilepsy are not fully supported by the scientific evidence.^[5,6] Generalized tonic-clonic seizures (GTCS), with or without other types of seizure, were found to be a key predictor for trauma in the study of Buck et al., while generalized tonic-clonic and atonic seizures were identified as a major risk factor for trauma in the study of Nakken & Lossius as reviewed by Neufeld.^[7-9]

There is no sufficient data on the seizure associated injury from emergency departments in Turkey. In the present study, we report on the spectrum of trauma in epilepsy patients presenting to our emergency department as a result of GTCS.

Materials and Methods

We reviewed patient records collected between January 2004 and December 2007 at the Emergency Department (ED) of Dicle University School of Medicine. Patients identified by using both trauma and seizure ICD codes. We studied records for all patients aged 15 years or older who were diagnosed with epilepsy and treated with anti-epileptic drugs currently and had traumatized as a result of GTCS retrospectively. We selected 51 patients out of a total of 1950 trauma cases presented to the ED during the study period. We recorded patient age, gender, injury type, location of injury, and therapeutic range of anti-epileptic drug medication in patient blood samples. Anti-epileptic drug levels were measured with spectrophotometer (COBAS Integra® 800 ROCHE).

Statistical analyses were performed using the Student's t-test for comparing mean of groups and the X²-test for nonparametric data. A 2-sided P value of less than 0.05 was accepted as statistically significant.

Results

We included 51 patients who exhibited clear relationship between the injuries and seizure activity. The average age of our patients was 26.02±9.86 years, ranging between 15 and 52 years. Thirty three (64.7%) of the patients were males; and the male-female ratio was 1.83. The injuries recorded in these patients are summarized in Table 1. Soft tissue injuries were the most common (26 cases), while head trauma, cuts, dental and tongue injuries were less common (Table 1).

In 9 (17.6%) patients anti-seizure medication drug blood levels were in therapeutic range, while in 42 (82.4%) blood levels were judged to be at sub-therapeutic levels accord-

Table 1. Type of injury.

Type	Number (%)
Soft tissue injury	26 (21.5)
Head trauma	24 (19.8)
Cuts / lacerations	17 (14.2)
Dental and tongue injury	16 (13.3)
Dental avulsion + tongue injuries	11
Dental avulsions	5
Skull fracture	10 (8.2)
Burns	9 (7.4)
Hot water burns	5
Contact burns	2
"Tanđır" burns	2
Bone fracture	8 (6.6)
Metacarpal fractures	3
Ulna fractures	2
Metacarpal + carpal fracture	1
Radius fracture	1
Clavicle fracture	1
Fracture of nasal bone	6 (4.9)
Intracranial hemorrhage	4 (3.3)
Subdural hematoma	2
Subarachnoidal hemorrhage	1
Parenchymal hemorrhage	1
Shoulder dislocation	1 (0.8)
Total	121*

*In some traumatic events there was more than one site of injury.

Table 2. Relationship between blood drug levels, gender, and mortality.

	Blood drug level		p
	Therapeutic	Subtherapeutic	
Alive	8	39	0.55*
Death	1	3	

*Non-significant.

ing to the our laboratory limits. There was no significant relationship between blood anti-epileptic drug levels and gender and mortality ($p>0.05$) (Table 2). Patients with therapeutic blood levels were on average younger patients than those with sub-therapeutic blood levels ($p<0.01$).

Four (7.8%) of these patients died as a result of trauma injuries secondary to tonic clonic seizure activity. Two of the mortalities involved burn trauma, and remaining deaths were associated with submersion injury and fall (subarachnoid hemorrhage) (Table 3).

Discussion

It has been reliably established that mortality in epilepsy is increased by as much as 3-fold compared to the age-matched general population.^[10-13] However, overall injury rate did not correlate significantly with either seizure frequency or etiology. Significantly more instances of concussion were reported in patients with generalized epilepsy, while abrasions were less common in patients with inactive epilepsy.^[14] Drowning seems to be the most frequent cause of accidental death in persons with epilepsy.^[15] We also discovered in our study that one patient died as a result of submersion injury. Mortality rate of epilepsy associated injuries was found 6% in one cohort study.^[16] Our rate was 7.8%.

Previous studies on trauma in epileptic patients addressed individuals aged 15-24 years in the large European cohort

study, while Al-Qattan reported on cases with an average age of 42.7 years.^[4,17] The mean age in our study (26.02 years) lies between these 2 studies. The male-female ratio in previous studies has ranged from 0.7 to 4;^[4,17,18] the ratio in our study (1.83) is within this range.

Several retrospective, questionnaire-based studies have suggested that per-individual injury rates due to seizure are approximately 30-35%, but over different time periods ranging from the past year to cumulative lifetime incidence.^[7,9] Soft-tissue injuries were reported to be the most common type of injury sustained as the result of a seizure.^[1]

In the prospective European cohort study, contusions, wounds, and abrasions accounted for 26%, 23%, and 11% of all accidents in persons with epilepsy respectively; all of these injury types were more prevalent in the cohort with epilepsy than in controls.^[4,14] A questionnaire based study shown that soft-tissue injury was the most common, followed by burns, head injury, orthopedic injury, and injuries in water.^[19] In another prospective study of multi handicapped patients with seizures, soft-tissue injuries accounted for 59 of 80 (74%) seizure-related injuries.^[8] Although soft tissue injuries were the most common injury type in our study, the rate (21.5%) was lower than those reported in the literature. This difference is based on the methodology between studies. The researchers in the previous study (Nakken & Lossius) analyzed epilepsy patients without considering the type of seizure. Our study, on the other hand, evaluated GTCS patients only. Lacerations were separately analyzed in our study and found to be at the rate of 14.2%; the cumulative percentage (35.7%) is closer to the higher rate previously reported.

Although head injuries are the most common type of accident resulting from an epileptic seizure, they are rarely life-threatening.^[2] Seventy head injuries were reported in the mail survey of Buck et al.^[7] However, serious injuries

Table 3. Table of patients who died due to seizure.

Age	Gender	Diagnosis	Findings	Blood drug level
19	Female	Burn	Third degree burn	Therapeutic
26	Female	Burn	Third degree burn	Sub therapeutic
27	Male	Submersion	Cardiopulmonary arrest at scene	Sub therapeutic
28	Male	Subarachnoidal hemorrhage	Fall from construction GCS* was 5 on presentation	Sub therapeutic

*Glasgow Coma Scale.

were reported in only 2 persons, and these involved skull fracture in one and intercranial clot requiring surgery in the other. Nakken & Lossius reported 1 case of skull fracture, 4 brain contusions, and 1 subdural hematoma among 58 seizure-related head injuries.^[8] In our patients skull fractures and intracranial hemorrhages comprised more than 50% of all recorded cranial injuries. It is possible that this discrepancy is due to differences in seizure type. The previous study suggested that the majority of seizure-related injuries occurred during generalized convulsive seizures. And GTCS were found as a first rank significant risk factor for injury, in another study.^[20,21] So our study specifically focused on GTCS; individuals with this condition are likely to be at increased risk of serious injury.

Not all studies have looked specifically at dental injury.^[1] In one retrospective survey of adults with seizures, 9.7% of patients reported sustaining a dental injury as the result of a seizure, and in 86% of these cases the injury resulted in either loss of teeth or fracture of the jaw.^[7] Dental/tongue injuries were the 4th most common injury type in our study.

Burn injury due to seizures is a potentially serious problem for people with epilepsy.^[7,17,22,23] Although the prospective European cohort study did not demonstrate a significantly greater risk of burns in persons with epilepsy,^[14] other retrospective studies have suggested an increased risk of burns. In two similarly designed studies, 1.6% and 3.7% of burn unit admissions respectively resulted from epileptic seizures.^[18,22] It is notable that 2 of the patients with burn injuries in our study died due to accidental contact with a specific type of oven, the “tandir” that is traditionally used in provincial regions.

Although individuals with epilepsy are at increased risk of fractures due to seizure-associated injury, it is notable that chronic administration of antiepileptic medication can lead to a reduction in bone mineral density; this may further increase the risk of fracture.^[1] However, no increased risk of fracture was found in individuals with epilepsy in the only prospective study to date on fracture and epilepsy.^[14] Nevertheless, fractures accounted for 11% of injuries in the epilepsy cohort studied by Beghi et al.^[4] The rate of limb fractures (6.6%) was rather lower in our patient series.

Limitations

Our study was a retrospective and small patient group study. Because of number of patients, we did not evaluate

patients according to their medication. Prospective studies which based on medication types may be more suitable for epilepsy patients.

Conclusion

The most frequent types of injuries associated with the generalized tonic clonic seizures were mild soft tissue injuries, minor head trauma, cuts/lacerations, dental and tongue injury. The mortalities associated with burn trauma, submersion injury and subarachnoid hemorrhage secondary to fall. We conclude that, despite limited number of patients involved in our study, there was no significant difference between therapeutic and sub therapeutic anti-epileptic blood levels on mortality.

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