



Incidence of epileptic seizure-related oro-dental trauma in adults and children

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Purpose: The aim of the current study was to evaluate the incidence of epileptic seizure-associated head/neck and intra-oral injuries.

Methods: A questionnaire survey collecting information on the development of epilepsy and occurrence of oro-dental and head trauma was applied to 153 adult and 63 pediatric patients diagnosed with epilepsy. Intra-oral examination was performed in patients with a history of oro-dental trauma and the injured teeth were identified. The data were analyzed statistically.

Results: Trauma during epileptic seizures was reported by 58.8% of adults and 30.1% of children included in this study. The head and neck region, lips, and tongue were most commonly affected, and 10% of adults and 3.2% of pediatric patients had experienced tooth fracture. Stress and flu infections were the most common triggering factors for seizures in adults (43.7%) and children (23.8%), respectively. Patients diagnosed with generalized seizures sustained trauma more frequently, and a significant association between the number of antiepileptic drugs used and the incidence of trauma was observed in adults.

Conclusion: Based on the current findings, the incidence of head/neck and intra-oral injuries in epileptic patients was found to be dependent on the seizure type, number of medicine used, and the frequency of seizures.

Keywords: Children, dentistry, epilepsy, injury, oro-dental trauma.

Introduction

Epilepsy, a common brain disorder, is characterized by a physical reaction to immediate excessive electrical discharges in the nerve cells, and manifests as recurrent epileptic seizures with permanent predisposing factors

(1,2). A diagnosis of epilepsy can be made upon the occurrence of 2 or more unprovoked seizures more than 24 hours apart or 1 unprovoked seizure and a high risk (at least 60%) of recurrent unprovoked seizures over the next 10 years (1).

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Several studies (3–5) have examined the rates of accidental injuries in individuals diagnosed with epilepsy. A previous study (3) reported that patients with idiopathic, cryptogenic, or remote symptomatic epilepsy exhibited a moderately higher risk of illnesses and accidents compared to the general population. This risk may be further increased in the presence of factors such as high seizure frequency, lack of a prolonged seizure-free interval, comorbid attention deficit disorder, or cognitive handicap (6).

Unlike individuals with no neurological disorders, the risk of accidental injury is considered to be higher in patients diagnosed with epilepsy as they are unable to use their protective reflexes, particularly during their first seizure, leading to injuries affecting the head and neck region, orthopedic trauma, soft tissue wounds, burns, or submersion injuries, depending on the location of the seizure (7). In the Eastern Mediterranean Region, the prevalence of epilepsy among children ranges from 3.2–5.5 per 1000 to 3.6–44 per 1000, thus making it one of the three most common neurological diseases (8). It has been reported that generalized tonic-clonic seizures may be associated with minor oral injuries affecting the soft tissues and teeth, head injuries such as subluxation of the temporomandibular joints, or maxillofacial trauma caused by falls during episodes, and this is usually dependent on the severity of the seizures (1,2,9).

The aim of the current study was to examine the incidence of epileptic seizure-associated head and neck trauma and intra-oral injuries affecting the soft tissues, teeth, and intra-oral prosthetics in adults and children, and also to identify potential predisposing factors.

Materials and Methods

The study protocol was approved by the Research Ethics Committee of the Faculty of Medicine; Akdeniz University. Prior to commencement, a detailed explanation of the purpose of the study was given to all participating adults and the parents/guardians of participating children, and written informed consent was obtained.

This study included 153 adults and 63 children diagnosed with epilepsy at least one year ago, regardless of the frequency and number of seizures. All participants were asked to complete a questionnaire survey collecting information on the development of epilepsy, the type and frequency of antiepileptic drugs (AED) used, and the occurrence of oro-dental and head and neck trauma during their follow-up appointments at the Department of Neurology or Department of Pediatric Neurology between October 2019 and January 2020. Additional data on age, gender, associated comorbidities, type of epilepsy, duration of epilepsy, seizure

localization, seizure frequency per week or month, factors triggering seizures, and the use of mouth-guards were also recorded.

Intra-oral examination was carried out if the patients or their relatives/guardians confirmed a history of oro-dental trauma, and the injured teeth were included in the study after confirmation by an examiner. Additionally, any history of removable or fixed prosthesis fractures was also recorded. The data were statistically analyzed using the Fisher's Exact Test and Chi-Square Test ($p < 0.05$).

Results

The adult study sample consisted of 85 female and 68 male patients with a mean age of 34.2 years. Trauma during epileptic seizures was reported by 58.8% of adults, and no significant differences between females and male were observed ($p > .05$). Stress was the most common triggering factor for epileptic seizures in adults (40.5%), followed by fatigue (9.2%), high temperature (9.2%) and intense light (7.8%). Additional factors causing seizures included irregular AED use (5.2%), noise (3.9%), flu infection (2%), and hypoglycemia (1.3%). Tongue (31.4%), head and neck region (28.1%), and lips (23.5%) were the most frequently injured tissues during epileptic seizures in adults. Tooth and prosthesis fractures were observed in 10% and 1% of the patients, respectively. Trauma during a seizure was observed in 60% of adult patients using more than one type of AED and 44% of adult patients using only one type of AED, and a significant association between the number of medicines used for epilepsy and the incidence of trauma was observed ($p < .05$). Patients diagnosed with generalized seizures sustained significantly more trauma ($p < .05$), and no significant association between the frequency of seizures and the incidence of trauma was observed ($p > .05$).

The pediatric study sample consisted of 26 female and 37 male patients with a mean age was 10.3 years. Trauma during epileptic seizures was reported by 58.8% of the children, and no significant differences by gender were observed ($p = 1.00$). The most common triggering factor for epileptic seizures in children was flu infections (23.8%), followed by stress (5.9%), intense light (1.6%), crying (1.6%), operation (1.6%), and fear (1.6%). The tongue (17.5%), lips (14.3%), head and neck region (9.5%), and cheek (9.5%) were the most frequently injured tissues during epileptic seizures. One patient (2%) experienced an avulsion injury, while another (2%) had a fractured tooth. Trauma incidence during seizures was seen in 33% of children using more than one type of AED and 29% of children using only one type of AED. No significant association between the number of drugs used

Table 1. Pattern of injury observed in 163 adults and 53 children diagnosed with epilepsy

Type of injury	Number of adults (n)	%	Number of children (n)	%
Head injury (Laceration/abrasion)	43	28.1	6	9.5
Burn	4	2.6	0	0
Oral soft tissue				
Tongue	48	31.4	11	17.5
Lip	36	23.5	9	14.3
Cheek	26	17	6	9.5
Dental injury				
Avulsion	0	0	1	2
Crown fracture	15	10	1	2
Luxation	3	2	0	0
Dental prosthesis fracture	2	1.3	0	0

Table 2. Association between descriptive characteristics and incidence of injuries in adults and children diagnosed with epilepsy

Variable	Adult			Children		
	Trauma (+)	Trauma (-)	p-value	Trauma (+)	Trauma (-)	p-value
Sex						
Female	45	40	0.87	8	18	1
Male	37	31		11	26	
Frequency of seizure						
≥ 1 per week	15	19		2	4	0.22
1 per week or >1 per month	13	2	0.01	1	4	
≤ 1 per month	17	11		8	8	
0 in the last year	35	41		8	28	
Number of antiepileptic drugs used						
Monotherapy	28	36	0.07	12	30	0.77
Polytherapy	53	36		7	14	
Type of epilepsy						
Focal	56	61	0.03	11	26	0.06
Generalized	23	10		14	12	

for epilepsy and the incidence of trauma was observed ($p > .05$). Patients diagnosed with generalized epilepsy (54%) exhibited a higher incidence of trauma compared to those diagnosed with focal epilepsy (30%). However, no statistically significant differences in the incidence of trauma by type of epilepsy ($p > .05$) were observed. The frequency of seizures and the incidence of trauma were not significantly associated ($p > .05$). The descriptive characteristics of the injuries observed in 163 adults and 53 children have been shown in Table 1. The association between gender, type of epilepsy, frequency of seizures per week or month, factors triggering seizures, and injuries in adults and children diagnosed with epilepsy have been shown in Table 2.

Discussion

This study evaluated the incidence of epileptic seizure-associated head and neck injuries and intra-oral wounds

affecting the soft tissues, teeth, and intra-oral prosthetics, and also assessed potential predisposing factors.

The findings of this study showed that the majority of patients diagnosed with epilepsy had a history of trauma such as burns, head and neck wounds, or oro-dental injuries, and this was in agreement with previous studies (5,10–12). The maxillary and mandibular anterior teeth were most frequently affected, and these findings were also consistent with existing evidence. Thomas et al. (13) found that dental injuries occurred in approximately 1% of all patients diagnosed with epilepsy, and the front teeth were the most commonly affected. They suggested that this could be attributed to the patient's inability to protect themselves upon sudden onset of a seizure and the absence of an aura (13). The current study also observed seizure-related injury of the posterior maxillary and mandibular teeth, and this could be attributed to attempts made by relatives to forcefully open the patient's clenched teeth using spoons

or other hard objects. A previous study (14) described this intervention as a traditional practice rooted in the belief that it would prevent patients from biting their tongues and blocking their airways.

Stress was found to be the most common triggering factor for epileptic seizures, and this was in agreement with previous studies (5,15). A previous study (16) suggested that approximately 1 in 7 individuals were highly anxious about undergoing dental treatments and, therefore, required careful and considerate management by dental practitioners. An animal model study conducted by Er et al. (15) showed that electrical stimulation of the tooth for pulp vitality testing can trigger an epileptic seizure, and the authors suggested that dental practitioners should avoid similar initiator actions in order to minimize the risk of an epileptic seizure caused by stress during a dental visit.

The number of AEDs used played a significant role in the risk of occurrence of seizure-related physical injuries (17). Recent studies (18,19) suggesting that AED side effects such as diplopia and blurred vision often resulted in fall injuries, particularly in elderly patients. The findings of the current study confirmed a significant difference in the occurrence of traumatic injuries by the number of AED drugs used.

Similar to previous reports (11), the current study showed that patients with generalized epilepsy exhibited a higher frequency of injuries during seizures, and this could be attributed to the increased risk of fall accidents compared to other types of seizures.

In the current study, the incidence of seizure-associated trauma affecting the hard and soft tissues of pediatric patients diagnosed with epilepsy was lower than that reported by a previous study (12). Current evidence suggests that the risk of dentoalveolar trauma is further increased in patients with uncontrolled epileptic seizures, and the low rate of injury observed in the current study may be attributed to the regular use of AED since diagnosis.

Our study sample also exhibited avulsion and fracture injuries affecting the maxillary central incisors, and this was in agreement with previous studies (20,21). Such injuries can significantly affect the patient's quality of life by creating functional, aesthetic, psychological, and social difficulties.

Children with high seizure frequencies and those using more than one AED are at a greater risk of associated injuries (22–24), and this can be attributed to greater disease severity, more frequent occurrence of seizures, and an increased risk of drug-associated side effects such as compromised balance and coordination in children using more than one AED (24). However, the number of

drugs used and the frequency of seizures were not significantly associated with the incidence of injury in the current study (24).

Ting et al. (25) found that children diagnosed with generalized epilepsy exhibited a greater risk of seizure-related injury, possibly caused by a sudden loss of consciousness and falling. This was consistent with the findings of the current study. However, no significant differences in the incidence of injury were observed between children diagnosed with generalized and focal epilepsy ($p = 0.069$).

Conclusion

Dental trauma is a common consequence of epileptic seizures. Although no severe injuries were observed in the current study, a high frequency of trauma affected the patient's quality of life by causing functional and aesthetic problems. Protective measures such as using mouthguards are necessary to prevent oro-dental injuries. Moreover, the patients and their relatives should be provided with sufficient information and educational materials to minimize the risk of seizure-related injuries.

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Informed consent: Written informed consent was obtained from patients who participated in this study.

References

1. Fisher RS, Acevedo C, Arzimanoglou A, et al. ILAE official report: a practical clinical definition of epilepsy. *Epilepsia* 2014; 55: 475–82. [CrossRef]
2. Chhabra N, Chhabra A, Bansal S. An innovative approach to cessation of thumb-sucking in a child with epilepsy: a case report. *Spec Care Dentist* 2012; 32: 270–3. [CrossRef]
3. Beghi E, Cornaggia C; RESt-1 Group. Morbidity and accidents in patients with epilepsy: results of a European cohort study. *Epilepsia* 2002; 43: 1076–83. [CrossRef]
4. Lawn ND, Bamlet WR, Radhakrishnan K, O'Brien PC, So EL. Injuries due to seizures in persons with epilepsy: a population-based study. *Neurology* 2004; 63: 1565–70.
5. Gawlak D, Łuniewska J, Stojak W, et al. The prevalence of orodental trauma during epileptic seizures in terms of den-

- tal treatment - Survey study. *Neurol Neurochir Pol* 2017; 51: 361–5. [\[CrossRef\]](#)
6. Wirrell EC. Epilepsy-related injuries. *Epilepsia* 2006; 47 Suppl 1: 79–86. [\[CrossRef\]](#)
 7. Aldenkamp A, Arends J. The relative influence of epileptic EEG discharges, short nonconvulsive seizures, and type of epilepsy on cognitive function. *Epilepsia* 2004; 45: 54–63.
 8. Camfield P, Camfield C. Incidence, prevalence and aetiology of seizures and epilepsy in children. *Epileptic Disord* 2015; 17: 117–23. [\[CrossRef\]](#)
 9. Pick L, Bauer J. Zahnmedizin und Epilepsie Dentistry and epilepsy. [Article in German]. *Nervenarzt* 2001; 72: 946–9. [\[CrossRef\]](#)
 10. Buck D, Baker GA, Jacoby A, Smith DE, Chadwick DW. Patients' experiences of injury as a result of epilepsy. *Epilepsia* 1997; 38: 439–44. [\[CrossRef\]](#)
 11. Tiamkao S, Shorvon SD. Seizure-related injury in an adult tertiary epilepsy clinic. *Hong Kong Med J* 2006; 12: 260–3.
 12. Adewole RA, Ojini FI, Akinwande JA, Danesi MA. Oro-dental and maxillofacial trauma in epilepsy at a tertiary hospital in Lagos. *West Afr J Med* 2011; 30: 114–7.
 13. Thomas RH, Higgins S, Fuller GN. Dental injury during seizures associated with juvenile myoclonic epilepsy. *J Neurol Neurosurg Psychiatry* 2009; 80: 91–3. [\[CrossRef\]](#)
 14. Ogunbodede EO, Adamolekun B, Akintomide AO. Oral health and dental treatment needs in Nigerian patients with epilepsy. *Epilepsia* 1998; 39: 590–4. [\[CrossRef\]](#)
 15. Er K, Yildirim M, Taşdemir T, Akca M, Abidin I. Electrophysiological evidence on epileptiform activity enhanced by electrical stimulation of teeth in rats. *Neurol Res* 2014; 36: 673–8. [\[CrossRef\]](#)
 16. Armfield JM, Heaton LJ. Management of fear and anxiety in the dental clinic: a review. *Aust Dent J* 2013; 58: 390–407. [\[CrossRef\]](#)
 17. Moreira Falci SG, Duarte-Rodrigues L, Primo-Miranda EF, Furtado Gonçalves P, Lanza Galvão E. Association between epilepsy and oral maxillofacial trauma: A systematic review and meta-analysis. *Spec Care Dentist* 2019; 39: 362–74. [\[CrossRef\]](#)
 18. Asadi-Pooya AA, Sperling MR. *Antiepileptic drugs: a clinician's manual*. Oxford University Press; 2016. [\[CrossRef\]](#)
 19. Carvalho Filho MA, Saintrain MV, Dos Anjos RE, *et al*. Prevalence of oral and maxillofacial trauma in elders admitted to a reference hospital in northeastern Brazil. *PLoS One* 2015; 10: e0135813. [\[CrossRef\]](#)
 20. Murthy AK, Chandrakala B, Pramila M, Ranganath S. Dental trauma in children with disabilities in India: a comparative study. *Eur Arch Paediatr Dent* 2013; 14: 221–5.
 21. dos Santos MT, Souza CB. Traumatic dental injuries in individuals with cerebral palsy. *Dent Traumatol* 2009; 25: 290–4. [\[CrossRef\]](#)
 22. Bellon M, Walker C, Peterson C. Seizure-related injuries and hospitalizations: self-report data from the 2010 Australian Epilepsy Longitudinal Survey. *Epilepsy Behav* 2013; 26: 7–10. [\[CrossRef\]](#)
 23. Buffo TH, Guerreiro MM, Tai P, Montenegro MA. Seizure related accidents and injuries in childhood. *Arq Neuropsiquiatr* 2008; 66: 458–61. [\[CrossRef\]](#)
 24. Lagunju IA, Oyinlade AO, Babatunde OD. Seizure-related injuries in children and adolescents with epilepsy. *Epilepsy Behav* 2016; 54: 131–4. [\[CrossRef\]](#)
 25. Ting YW, Kwong KL. Seizure-related injuries in newly diagnosed childhood epilepsy. *Pediatr Neurol* 2010; 42: 417–21. [\[CrossRef\]](#)