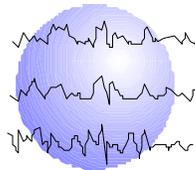


SUDDEN UNEXPECTED DEATH IN EPILEPSY (SUDEP) IN AN INTRACTABLE EPILEPSY POPULATION

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REVISED ABSTRACT

Rationale: The frequency of sudden unexpected death in epilepsy (SUDEP) in a medically refractory population has been variably reported to be between 1/40 to 1/200. This study identifies incidence of SUDEP as well as other causes of mortality in an intractable epilepsy population identified within a 10-year period.

Methods: Adult patient records from Minnesota Epilepsy Group, PA, for the period of 1990-2000, were reviewed to identify all patients who had died while under clinical care.

Results: Of 3527 patients who were medically refractory, a total of 80 deaths occurred, 63 with an identifiable cause. Of these 63, 25 patients were classified as SUDEP. Seven of those deaths were clearly associated with a seizure; however, the remaining SUDEP patient deaths could not be associated with a seizure based upon the circumstances of the demise. Additional causes of death included 1 suicide, 1 aplastic anemia, 1 Rasmussen's encephalitis, and 1 homicide.

Conclusion: In our intractable epilepsy population, SUDEP occurred with a frequency of 0.65%. This figure is somewhat lower than the published frequency for a medically refractory epilepsy population.

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INTRODUCTION

People with epilepsy have a mortality rate that is two to three times higher than the general population. Sudden unexpected death in epilepsy (SUDEP) is a phenomenon well known to the clinicians in the field of epilepsy. SUDEP is defined as sudden, unexpected, witnessed or unwitnessed, non-traumatic, non-drowning deaths of patients with epilepsy, with or without evidence of a seizure and excluding documented status epilepticus; where postmortem exam does not reveal a toxicological or anatomical cause of death¹. The mechanism of death is unknown, although apnea and cardiac irregularities have been suggested. SUDEP occurs with an incidence between 1:40 to 1:200 in a medically refractory population but the incidence of mortality is higher at a young age¹. Other risk factors include poor seizure control, male sex, subtherapeutic antiepileptic drug levels, alcohol use, previous surgery for epilepsy and the influence of sleep.

We explore the incidence of SUDEP in our patient population in a regional epilepsy center as well as other deaths that are seizure related. SUDEP accounts for a small but significant number of deaths among people with epilepsy. Most deaths from SUDEP are unwitnessed which further clouds the picture.

Medication noncompliance has also been speculated as a contributing factor to SUDEP. However, a study by K. Opeskin, et al, found that carbamazepine and phenytoin levels were very similar in patients with SUDEP vs. patients with epilepsy who died of causes other than epilepsy².

Other causes of death in people with epilepsy include the brain disorder which caused the epilepsy, a concomitant disease, status epilepticus, a seizure-related death, and suicide³.

METHODS

Adult patient records from Minnesota Epilepsy Group, P.A.[®], for the period of 1990–2000 were reviewed to identify all patients who had died while under clinical care.

Eighty patients were identified as having died during this time period. Medical records of this group were reviewed as well as autopsy reports. Interviews with family members or staff members from group homes were also obtained, when possible. No information was available in 14 cases.

Incidence of SUDEP in relation to age, IQ, and history of epilepsy surgery was compared using a χ^2 statistical analysis.

RESULTS

Of 80 deaths recorded, 25 meet the criteria for SUDEP (see Figure 1). Eighteen patients had no toxicological or clinical cause of death and seven patients died during or immediately following a seizure. The SUDEP population includes 15 males and 10 females; age range 28-57 years, with a mean age of 38 (see Figure 2). The number of lifetime antiepileptic drugs (AEDs) ranged from 1 to 12 with mean of 6.8. The number of AEDs at death ranged from 1 to 5 with a mean of 2.8. Seizure frequency varied from 1 lifetime generalized tonic clonic (GTC) seizure to > 100 myoclonic seizures a day. All patients had a history of GTC seizures.

Other findings in SUDEP patients include:

- ◆ cognitive impairment (40%)
- ◆ previous epilepsy surgery (40%), $p < .01$
- ◆ young adults ($75\% \leq 45$ years)
- ◆ lived alone (24%)
- ◆ lived with another person(s) (36%)
- ◆ lived in institutional setting (40%)

Of patients having previous epilepsy surgery, seizure frequency varied, with two patients having seizure free intervals of one year and three years respectively at the time of death. No patient in this group had complete seizure control following surgery.

Other causes of death included eight patients who died from seizure-related incidents:

- ◆ status epilepticus (2)
- ◆ falls associated with a seizure (4)
- ◆ drowning during a seizure (1)
- ◆ anoxic encephalopathy (1)
- ◆ brain tumor (10)
- ◆ other cancer (6)
- ◆ Alzheimer's (2)
- ◆ progressive neurological disorder (2)
- ◆ Rasmussen's (1)
- ◆ complications following epilepsy surgery (2)
- ◆ motor vehicle accidents (2)
- ◆ myocardial infarction (4)
- ◆ infection, pneumonia, respiratory (3)
- ◆ unknown (14)
- ◆ pituitary infarct (1)

DISCUSSION

Possible causes of SUDEP include apnea and various types of cardiac arrhythmias, but the mechanism of death remains unknown. Even in cases of witnessed SUDEP, resuscitation attempts have been unsuccessful.

A study by Johnston in 1995 in which seizures were induced in sheep revealed a suppression of respiratory drive accompanied by pulmonary edema as a cause of death⁴.

Although those at risk of SUDEP have uncontrolled seizures, one patient had one lifetime seizure, and two more patients had long seizure-free intervals prior to death.

In our study, a higher incidence of SUDEP is noted in young adults (≤ 45 years), the cognitively impaired, and patients who have had a poor outcome following surgery for epilepsy. The number of patients who died of SUDEP following epilepsy surgery is statistically significant, consistent with previous reports^{5,6}.

Many questions pertaining to SUDEP remain unanswered. Improved documentation at time of death, including accurate post-mortem reports, is needed.

CONCLUSIONS

- ❖ The incidence of SUDEP is lower in this study than that previously reported in similar populations.
- ❖ Epilepsy needs to be vigorously treated and patients and families should be given information about the risk of SUDEP.
- ❖ Better documentation is needed at time of death, including accurate information on death certificates and autopsy reports.

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Figure 1

CAUSES OF ALL DEATHS AT REGIONAL EPILEPSY CENTER IN TEN YEAR PERIOD

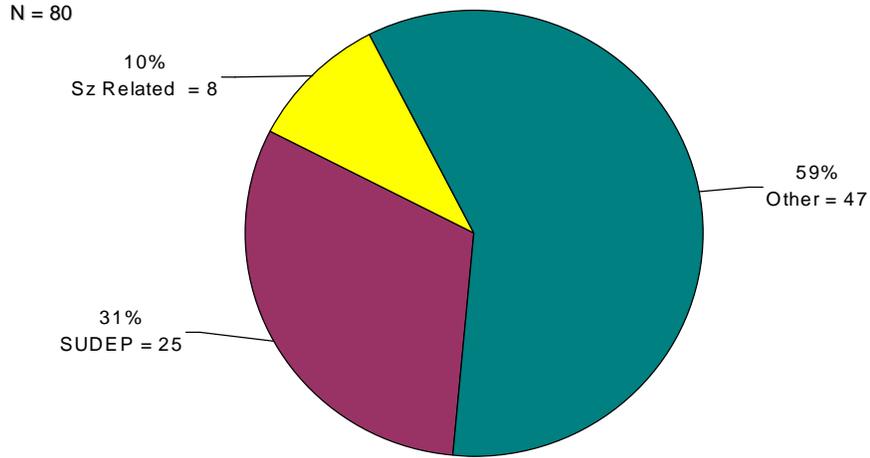


Figure 2

AGE AT TIME OF DEATH

