

SEIZURES IN A SLEEP-DEPRIVED AIRMAN

CASE REPORT, BY JOHN E. MILES, MD, MPH

The relationship between sleep deprivation and seizures has been long recognized. Lack of sleep, especially when combined with emotional stress, malnutrition, and heavy alcohol intake likely lowers the threshold for seizures in both known epileptics and normal individuals. This article describes the case of a 33-year-old airline pilot who experienced his first seizure while profoundly sleep-deprived.

History

A 33-year-old male first-class airman with 3,500 hours of flight time was talking to a crewmember while piloting a flight when he suddenly became disoriented. His co-pilot noted that the airman was staring straight ahead and would not respond to questions. After being shaken by the copilot, the airman gradually recovered. He reported that he was somewhat confused for several seconds and did not initially recognize his surroundings, but he then quickly returned to normal. No abnormal motor activity was observed, and the airman did not experience incontinence. Because of a hectic schedule and poor sleep, he attributed this episode to fatigue. He grounded himself and sought medical attention. His primary care provider advised rest.

Two weeks later, the pilot was on vacation, sitting beside a pool, when he experienced a similar episode. He became slightly confused, thinking that the scenery had changed, and he did not recognize anyone or know his whereabouts. The airman described losing awareness and experiencing difficulty focusing. This episode lasted for about 30 seconds. A third and final, essentially identical, episode occurred about one week later. The airman reported that all three episodes had occurred without warning. He denied any abnormal tastes or smells prior to these episodes, but he did feel that one or two of the episodes may have been preceded by a headache.

The airman was referred to a neurologist for further evaluation. He underwent an electroencephalogram and magnetic resonance imaging of his brain. Both tests were normal. His medical history was essentially negative. He had no history of head injuries, unexplained losses of consciousness, or meningitis. He reported occasional headaches but denied any difficulties with memory or decline in mental activities. He reported no visual loss or diplopia and had normal hearing, smell, and taste. He denied paresthesias or weakness. He was taking no medications, smoked approximately a half-pack of cigarettes daily, and denied consuming any alcohol.

The airman did report significant life stressors that contributed to his recent extreme fatigue. He had been experiencing marital difficulties, complicated by a career that required him to be away from home for extended periods of time, and he was now involved in a divorce and custody battle for his children. Long cross-country commutes in order to fly for three to four days left him feeling extremely exhausted. He reported obtaining only two to three hours of sleep nightly and was eating erratically and poorly, especially while traveling.

ETIOLOGY

SLEEP DEPRIVATION AND SEIZURES

Since at least the time of Hippocrates, physicians have recognized a relationship between seizures and sleep. Researchers in the 1960s and 1970s confirmed that sleep deprivation may provoke seizures in known epileptics.⁴ Between 18 and 38% of patients with epilepsy reported sleep deprivation as being a trigger for their seizures.⁵

Other studies have found that profound sleep loss can trigger convulsions, even in normal subjects. One case series published in 1964 described three pilots who had experienced their first seizure while profoundly sleep-deprived, poorly nourished, and experiencing work-related stress. Additional studies in sleep-deprived military personnel have found significantly higher rates of seizures than in similar non-sleep-deprived populations.⁵

In fact, the risk of seizure may be as high as 1/10,000 after 24 to 36 hours of total sleep deprivation, and this risk increases to 1/2500 after two or more days without sleep. This tendency towards seizures in the sleep-deprived does not even require prolonged periods without any sleep. Simply shortened or interrupted sleep periods may accumulate over time and contribute to chronic fatigue, which has also been demonstrated to lower the threshold for seizures in both known epileptics and normal individuals.⁵

No abnormalities were noted on examination. Cranial nerves were intact. Romberg, finger-to-nose, and heel-to-shin tests were normal. No pronator drift was observed. Touch, pain, vibration, and proprioception were normal in the extremities and trunk. Gait was normal.

The neurologist diagnosed the airman as having experienced complex partial seizures, likely precipitated by his recent sleep deprivation. The airman was started on Depakote (divalproex sodium), which he took as directed for four to six weeks but then stopped due to weight gain. He was switched to Topamax (topiramate), which he took for five to six weeks but then discontinued it, against his neurologist's advice.

Aeromedical Issues

In accordance with Title 14 Code of Federal Regulations (CFR), Sections 67.109(a)(b), 209(a)(b), and 309(a)(b), an established medical history or clinical diagnosis of epilepsy is disqualifying for all flying classes. Other seizure disorders, disturbances of consciousness, or neurological conditions may also be deemed disqualifying if they make a person unable to safely perform his or her duties. Although brief in duration,

complex partial seizures such as those experienced by this airman pose a significant hazard to aviation safety. Such seizures may incapacitate an airman during critical phases of flight, and they also have the potential to generalize or progress into status epilepticus, incapacitating the airman for extended periods.¹

Role of the AME

In accordance with the *Guide for Aviation Medical Examiners*, a history or the presence of any neurological condition or disease that potentially may incapacitate an individual should be regarded as initially disqualifying. As detailed above, epilepsy and other seizure disorders are specifically disqualifying for all flying classes. Issuance of a medical certificate to an applicant in such cases must be denied or deferred, pending further evaluation.²

Prior to consideration for an airman medical certificate, an applicant with a diagnosis of epilepsy must be seizure-free for 10 years, and off anticonvulsant medications for at least three years. This requirement applies to all types of seizures. After the 10-year period of being seizure-free, a full neurological evaluation with EEG is required.³

If an airman experiences only a single seizure, certification requirements are somewhat less stringent. If the single seizure is determined to be secondary to a known pathological condition, and the cause has been corrected, an applicant may be considered for an airman medical certificate after as little as a one-year recovery period. A neurological evaluation will be needed prior to the issuance of a medical certificate, but no follow-up is required.³

An unprovoked single seizure, with no satisfactory medical explanation, usually requires a four-year recovery period with at least two years off of all anticonvulsant medications. In addition to a complete neurological examination, a current EEG, CT, or MRI scan of the brain may be required prior to consideration for medical certification.³

Outcome

This airman was notified that his most recent report of medical examination had expired for the class of certificate for which he applied. He was informed that if he were to submit a current examination, the FAA would have no alternative other than to deny his eligibility for medical certification. The airman may apply for a special issuance after completing the 10-year seizure-free period and the additional requirements detailed above.

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