

Psychogenic Nonepileptic Seizures

TAOUFIK M. ALSAADI, M.D., and ANNA VINTER MARQUEZ, M.D.
University of California, Davis, Medical Center, Sacramento, California

Psychogenic nonepileptic seizures are episodes of movement, sensation, or behaviors that are similar to epileptic seizures but do not have a neurologic origin; rather, they are somatic manifestations of psychological distress. Patients with psychogenic nonepileptic seizures frequently are misdiagnosed and treated for epilepsy. Video-electroencephalography monitoring is preferred for diagnosis. From 5 to 10 percent of outpatient epilepsy patients and 20 to 40 percent of inpatient epilepsy patients have psychogenic nonepileptic seizures. These patients inevitably have comorbid psychiatric illnesses, most commonly depression, posttraumatic stress disorder, other dissociative and somatoform disorders, and personality pathology, especially borderline personality type. Many patients have a history of sexual or physical abuse. Between 75 and 85 percent of patients with psychogenic nonepileptic seizures are women. Psychogenic nonepileptic seizures typically begin in young adulthood. Treatment involves discontinuation of antiepileptic drugs in patients without concurrent epilepsy and referral for appropriate psychiatric care. More studies are needed to determine the best treatment modalities. (*Am Fam Physician* 2005;72:849-56. Copyright© 2005 American Academy of Family Physicians.)

Nonepileptic seizures are involuntary episodes of movement, sensation, or behaviors (e.g., vocalizations, crying, other expressions of emotion) that do not result from abnormal cortical discharges. The seizures can mimic any kind of epileptic seizure and thus can be mistaken for generalized tonic-clonic seizure, absence seizure, and simple or complex partial seizures.¹ Early recognition and appropriate treatment of nonepileptic seizures can prevent significant iatrogenic harm and may result in a better outcome.

Since ancient times, nonepileptic seizures have been recognized as a form of hysteria. In the late 1800s, Charcot first described nonepileptic seizure as a clinical disorder, calling it “hysteroepilepsy” and “epileptiform hysteria.”² The term “nonepileptic seizure” is preferable to the older terms “hysterical seizure” and “pseudoseizure,” which are considered pejorative.³

Nonepileptic seizures are classified as physiologic or psychogenic in origin (*Table 1*). In specialty epilepsy center patients, physiologic nonepileptic seizures are less common than psychogenic nonepileptic seizures.

Physiologic nonepileptic seizures have multiple causes. They may be related to syncopal episodes, complicated migraines, panic attacks, or transient ischemic attacks. They may be due to autonomic dysfunction, cardiac arrhythmias, hypoglycemia, drug intoxication or withdrawal, or alcohol intoxication or withdrawal. Movement disorders, sleep disorders, and vestibular symptoms may be mistaken for nonepileptic seizures.⁴

Psychogenic nonepileptic seizures are a physical manifestation of psychological distress. They are grouped into the category of psychoneurologic illnesses (e.g., conversion disorder, somatization disorders), in which symptoms are psychiatric in origin but neurologic in expression.⁵ This article focuses on psychogenic nonepileptic seizures.

TABLE 1

Classification of Nonepileptic Seizures

| Psychogenic | Physiologic |
|---|-----------------------------|
| Misinterpretation of physical symptoms | Cardiac arrhythmias |
| Psychopathologic processes | Complicated migraines |
| Anxiety disorders, including posttraumatic stress disorder | Dysautonomia |
| Conversion disorder | Effects of drugs and toxins |
| Dissociative disorders | Hypoglycemia |
| Hypochondriasis | Movement disorders |
| Psychoses | Panic attacks |
| Somatization disorders | Sleep disorders |
| Reinforced behavior patterns in cognitively impaired patients | Syncopal episodes |
| Response to acute stress without evidence of psychopathology | Transient ischemic attacks |
| | Vestibular symptoms |

SORT: KEY RECOMMENDATIONS FOR PRACTICE

| <i>Clinical recommendation</i> | <i>Evidence rating</i> | <i>References</i> |
|--|------------------------|----------------------|
| Early referral of patients with apparently refractory seizures is critical. Video-electroencephalography monitoring is the gold standard for the diagnosis of psychogenic nonepileptic seizures. | C | 8, 10, 12 |
| No single clinical or historical feature is diagnostic of psychogenic nonepileptic seizures. If the number of features that are unusual for epileptic seizures increases, psychogenic nonepileptic seizures should be considered more seriously. | C | 1-3, 9, 10 |
| Treatment of psychogenic nonepileptic seizures should address the underlying cause(s). | C | 3, 9, 25, 27, 35, 36 |

A = consistent, good-quality patient-oriented evidence; B = inconsistent or limited-quality patient-oriented evidence; C = consensus, disease-oriented evidence, usual practice, expert opinion, or case series. For information about the SORT evidence rating system, see page 736 or <http://www.aafp.org/afpsort.xml>.

Diagnosis

The presence or absence of self-injury and incontinence, the ability to induce seizures by suggestion, psychological tests, historical factors, and ambulatory electroencephalography (EEG) have been found to be insufficient for the diagnosis of psychogenic nonepileptic seizures.^{1,6} Postictal prolactin levels greater than two times the upper limit of normal once were thought to differentiate generalized and complex partial seizures from psychogenic nonepileptic seizures but recently have been shown to be unreliable.⁷

VIDEO-ELECTROENCEPHALOGRAPHY

Inpatient video-electroencephalography (vEEG) monitoring is the preferred test for the diagnosis of psychogenic nonepileptic seizures. Definitive diagnosis is achieved when a patient is observed having typical seizures without accompanying EEG abnormalities. Family members or witnesses who are familiar with the patient's seizures must agree that the recorded episodes are typical events.

The importance of using vEEG monitoring recently was underscored in a study⁸ that evaluated diagnoses in patients who had been referred to an inpatient vEEG monitoring unit

for characterization of their seizures. The study found that 24 percent of the patients had been misdiagnosed: 22 patients previously diagnosed with epilepsy were found to have nonepileptic seizures, and four patients previously diagnosed with nonepileptic seizures were found to have epileptic seizures. All of the patients in the study had been referred by epileptologists or by neurologists with experience in diagnosing and treating epilepsy. Thus, even epilepsy specialists misdiagnosed seizure types in nearly one fourth of cases.

HISTORICAL AND CLINICAL FEATURES

Features that are suggestive, but not diagnostic, of psychogenic nonepileptic seizures are listed in *Table 2*.^{1,9,10} Typical features of these events include gradual onset, long duration, a waxing and waning course, and disorganized, asymmetric motor activity.⁹ The events lack the stereotypy of epileptic seizures because the pattern of symptoms and sequence of events vary between seizures.

Not all seizures with these features are psychogenic nonepileptic seizures, however. Frontal lobe seizures often are mistaken for nonepileptic seizures because of the associated dramatic motor and vocal outbursts, possible retained consciousness, and short postictal period. Frontal lobe seizures may be distinguished by their brief duration, stereotypical nature, and tendency to begin

Inpatient video-electroencephalography is the preferred test for the diagnosis of psychogenic nonepileptic seizures. Definitive diagnosis is achieved when a patient is observed having typical seizures without accompanying electroencephalographic abnormalities.

during sleep.⁹ Gelastic seizures (in which the primary automatism is laughter), reflex epilepsies, and myoclonic jerks also have been mistaken for psychogenic nonepileptic seizures.⁹

IMPORTANCE OF EARLY DIAGNOSIS

Early diagnosis of psychogenic nonepileptic seizures is critical. Unfortunately, the diagnosis often is delayed. One review¹⁰ reported a mean of 7.2 years between manifestation and accurate diagnosis of psychogenic nonepileptic seizures. Because of this delay, many patients with these events experience significant morbidity from inappropriate treatment for epileptic seizures, including adverse effects of antiepileptic drugs and aggressive, potentially harmful interventions (e.g., intubation) for pseudo–status epilepticus during emergency department visits.

Definitive diagnosis of psychogenic nonepileptic seizures may be therapeutic. After being informed unambiguously of the diagnosis, some patients stop having the events.¹¹

Early diagnosis of psychogenic nonepileptic seizures is important economically. One study¹² demonstrated an 84 percent reduction in total seizure-related medical charges in the six months after diagnosis of psychogenic nonepileptic seizures: average diagnostic test charges decreased by 76 percent, medication charges decreased by 69 percent, outpatient visits decreased by 80 percent, and emergency department visits decreased by 97 percent.

Family physicians have an important role in the timely diagnosis of psychogenic nonepileptic seizures through early referral of patients with apparently intractable seizures to epilepsy centers. Seizures in about 60 percent of patients with newly diagnosed epilepsy are controlled with a moderate dosage of a single antiepileptic drug (usually the first or second drug chosen); only about 10 percent of patients with inadequate control of seizures on the first antiepileptic drug become free of seizures.^{13,14} Thus, the threshold for determining that seizures are intractable should be low, and referral to an epilepsy center for clarification of the diagnosis should be prompt.

Psychogenic nonepileptic seizures have serious negative effects on patients' lives. Health-related quality of life is significantly lower in patients with these seizures than in patients with epilepsy, even intractable epilepsy.¹⁵ Decreased quality of life in patients with psychogenic nonepileptic seizures is associated with the presence of psychopathology and the adverse effects of antiepileptic

TABLE 2
Clinical and Historical Features Suggesting a Diagnosis of Psychogenic Nonepileptic Seizures

Clinical features

- Ability of observer to modify the patient's motor activity
- Asynchronous limb movements
- Avoidance behavior during seizures
- Change in symptomatology, or nonstereotypical seizure patterns
- Closed eyes during seizures
- Dystonic posturing (including opisthotonos)
- Emotional or situational trigger for the seizures
- Gradual onset and cessation of seizures
- Ictal crying, weeping
- If tongue biting is present, usually the tip (not the side) of the tongue
- Intermittent or waxing and waning motor activity
- Nonphysiologic progression
- Pelvic movements (especially forward thrusting)
- Prolonged seizures (duration of 2 to 3 minutes)
- Resisted eyelid opening
- Seizures provoked by suggestion
- Side-to-side head movements

Historical features

- Associated (often multiple) psychiatric disorders
- Flurries of seizures or recurrent pseudo–status epilepticus that lead to multiple emergency department visits or hospitalizations
- High seizure frequency
- History of sexual or physical abuse
- Lack of concern or an excessive or exaggerated emotional response
- Multiple unexplained physical symptoms
- No history of injury from seizures
- No response to antiepileptic drugs or a paradoxical increase in seizures with antiepileptic drug treatment
- Personal, family, or professional experience with epilepsy
- Seizures that occur only in the presence of others or only when the patient is alone

Adapted with permission from Reuber M, Elger CD. Psychogenic nonepileptic seizures: review and update. Epilepsy Behav 2003;4:207, with additional information from references 1 and 9.

drugs.¹⁵ These factors further emphasize the importance of early diagnosis of psychogenic nonepileptic seizures, cessation of antiepileptic drug therapy in patients without concurrent epilepsy, and treatment of the underlying psychiatric illness.

Epidemiology

The prevalence of nonepileptic seizures ranges from two to 33 cases per 100,000 persons in the general population. Hence, these seizures are approximately as common as multiple sclerosis and

trigeminal neuralgia.¹⁶ From 5 to 10 percent of outpatient epilepsy populations have psychogenic nonepileptic seizures, compared with 20 to 40 percent of inpatient epilepsy populations (hospitals and specialty epilepsy centers).^{3,17} Between

75 and 85 percent of patients with psychogenic nonepileptic seizures are women.¹⁸ Like conversion disorder, psychogenic nonepileptic seizures tend to begin in young adulthood, although the seizures can occur in a wide range of ages.¹⁸

The prevalence of psychogenic nonepileptic seizures is increased in patients with head injuries, learning disabilities, or isolated neuropsychologic deficits,¹⁰ and patients with psychogenic nonepileptic seizures have higher than average rates of abnormal results on magnetic resonance imaging (MRI) and

EEG. These factors suggest that physical brain disease may play a role in the development of the events.¹⁹ The events also occur in patients with central nervous system lesions that are associated with an increased risk of developing epilepsy, such as stroke, trauma, infection, and malformation,²⁰ as well as in patients with hippocampal sclerosis,²¹ which often is identified as a cause of temporal lobe epilepsy. Thus, the presence of MRI or EEG abnormalities may delay diagnosis and treatment of psychogenic nonepileptic seizures.

Estimates of the coexistence of epilepsy and psychogenic nonepileptic seizures vary from 5 percent to more than 60 percent, depending on the study setting and diagnostic criteria.³ Recent studies^{17,22} using strict criteria for a diagnosis of epilepsy found that only 5 to 10 percent of patients with nonepileptic seizures have concurrent epileptic seizures.

Etiology

All psychogenic nonepileptic seizures function as a coping mechanism.²³ Patients with these events are more likely to use maladaptive coping strategies to handle stress.²⁴ In psychogenic nonepileptic seizures, psychological conflicts are translated into a physical symptom—the seizure. In this way, intolerable distress is dissociated from the painful conscious experience of the trauma or forbidden emotions that are causing the distress.^{25,26} Thus, genuine psychogenic nonepileptic seizures (as opposed to factitious disorder or malingering) are not intentional: they are created as a psychological defense mechanism to keep internal stressors out of conscious awareness.²⁵

Psychogenic nonepileptic seizures do not have a single etiology; rather, they are the product of several different causal pathways (Table 1). The seizures may be the result of psychopathologic processes, a response to acute stress in patients without evidence of psychopathology, or a reinforced behavior pattern in cognitively impaired patients. Rarely, malingering or factitious disorder presents as psychogenic nonepileptic seizures.²⁷

From 43 to 100 percent (median: 73.5 per-

Many patients with psychogenic nonepileptic seizures experience significant morbidity from inappropriate treatment for epileptic seizures.

The Authors

TAOUFIK M. ALSAADI, M.D., is assistant professor of clinical neurology at the University of California, Davis (UCD), School of Medicine. He also is director of the epilepsy treatment center and director of clinical epilepsy research at UCD Medical Center, Sacramento. Dr. Alsaadi received his medical degree from the Damascus University School of Medicine, Syria. He completed a neurology residency at the Medical College of Wisconsin, Milwaukee, and an epilepsy and electrophysiology fellowship at the University of California, San Francisco, School of Medicine.

ANNA VINTER MARQUEZ, M.D., is a psychiatry resident at UCD Medical Center. She received her medical degree from the UCD School of Medicine, where she also completed a research fellowship in the neuropsychiatric aspects of epilepsy.

Address correspondence to Taoufik M. Alsaadi, M.D., Department of Neurology, University of California, Davis, Medical Center, 4860 Y St., Suite 3700, Sacramento, CA 95817-2307 (e-mail: taoufik.alsaadi@ucdmc.ucdavis.edu). Reprints are not available from the authors.

cent) of patients with psychogenic nonepileptic seizures have concurrent psychiatric disorders²⁸ (Table 3).²⁵ The disorders tend to be related to trauma, and include post-traumatic stress disorder (PTSD) and other anxiety disorders; depressive disorders; and conversion, somatization, and dissociation disorders. Personality pathology, particularly of the borderline type, is common.²⁹ Frequently, patients with psychogenic nonepileptic seizures also have other dissociative and somatization symptoms.^{18,30}

Patients with psychogenic nonepileptic seizures frequently have a history of (or current) physical or sexual abuse²⁴ or significant psychosocial stressors for which there is no perceived resolution.^{31,32} These “unspeakable dilemmas”³¹ often involve dysfunctional family interaction and communication.^{18,24}

A frequently cited prospective study²⁵ showed that 84 percent of patients with psychogenic nonepileptic seizures had experienced trauma. One recent study³³ found significantly higher rates of PTSD, childhood sexual abuse, dissociative symptoms, and history of assaultive trauma in patients with psychogenic nonepileptic seizures than in patients with epilepsy. Physical and sexual abuse has been linked to increased rates of several somatization syndromes, including psychogenic nonepileptic seizures.²⁶

To determine why a patient is having psychogenic nonepileptic seizures, the physician must identify the psychologic function of the seizure.³⁴ A detailed, systematic psychiatric evaluation and an assessment of family, social, financial, and employment problems should provide insight.³⁵ Causes and suggested treatments for psychogenic nonepileptic seizures are summarized in Table 4.^{3,9,25,27,35,36}

Disease Course

Because nonepileptic seizures are not a single entity or disorder, the course is variable and depends on the underlying cause. Prognostic factors also vary (Table 5).^{9,11,27,37}

The findings of outcome studies allow some generalizations about patients with psychogenic nonepileptic seizures. Seizure cessation occurs in about 40 percent of

patients. Seizure reduction occurs in about one third of patients, and chronic, unimproved seizures continue in another one third of patients.³⁸

In a study¹¹ that assessed one- to 10-year outcomes in 164 patients with psychogenic nonepileptic seizures, 44 percent had a poor outcome (not free of seizures, dependent [i.e., unemployed or retired because of ill health]); 40 percent had an intermediate outcome (free of seizures but dependent, or not free of seizures but living independently); and 16 percent had a good outcome (free of seizures and living independently). At more than 11 years after the onset of psychogenic nonepileptic seizures and four years after diagnosis, 71 percent of patients still were having seizures, and 56 percent still were dependent. These outcomes are worse than those for newly diagnosed epilepsy and are equivalent to the outcomes for other somatoform disorders.¹¹

Treatment

No randomized controlled studies have been conducted on the treatment of psychogenic nonepileptic seizures.^{27,28} Treatment recommendations are based on the theory that

TABLE 3
Selected Comorbid Psychiatric Disorders in 45 Patients with Psychogenic Nonepileptic Seizures

| Diagnosis | Prevalence (%) | |
|---------------------------------------|----------------|----------|
| | Current* | Lifetime |
| Any dissociative disorder | 91 | 93 |
| Any somatoform disorder | 89 | 98 |
| Any affective disorder | 64 | 98 |
| Personality disorder | 62 | 62 |
| PTSD | 49 | 58 |
| Major depressive disorder | 47 | 80 |
| Anxiety disorder other than PTSD | 47 | 51 |
| Conversion symptoms, but not seizures | 4 | 82 |

PTSD = posttraumatic stress disorder.

*—“Current” indicates within the past month; listed in order of frequency.

Adapted with permission from Bowman ES, Markand ON. Psychodynamics and psychiatric diagnoses of pseudoseizure subjects. *Am J Psychiatry* 1996;153:59.

because the seizures are psychogenic in origin, they will respond to psychiatric treatment. Two uncontrolled studies^{18,39} have shown that psychotherapy is more effective than no intervention.

Various psychotherapeutic techniques with proven efficacy in other disorders have been applied to patients with psychogenic nonepileptic seizures who have similar psychiatric profiles. *Table 4*^{3,9,25,27,35,36} summa-

TABLE 4
Psychogenic Nonepileptic Seizures: Etiologies and Suggested Treatments

| <i>Etiology</i> | <i>Description</i> | <i>Suggested treatments</i> |
|---|---|--|
| Acute or situational stressors | Seizures develop after multiple or acute stressors overwhelm the patient's coping ability; underlying psychopathology may not be present. | Supportive psychotherapy, lifestyle changes, group or family therapy as indicated |
| Anxiety, panic, physical symptoms | Atypical symptoms of anxiety or panic are misdiagnosed as psychogenic nonepileptic seizures, or the patient misinterprets physical sensations or symptoms as seizures. | Treatment of panic attacks; reassurance that physical symptoms are not seizures |
| Depression, dissatisfaction | A specific stressor does not precipitate psychogenic nonepileptic seizures; rather, the patient is generally unhappy, and the seizures function as distraction or an acceptable way to get support and attention. | Antidepressant drug therapy, cognitive behavior therapy to challenge the patient's depressive thoughts and basic assumptions about self and illness; encouragement of the patient's active involvement in lifestyle changes and problem solving |
| Poor interpersonal skills and affect regulation, disturbed family systems | Patients with this profile often are diagnosed with borderline personality disorder and frequently have a history of abuse. The patient may come from a family with poor emotional expression and therefore may be unable to identify and effectively express strong emotions. The seizures function to resolve interpersonal crises or threatening emotions or situations. | Intensive psychodynamic psychotherapy to help identify and express threatening situations or emotions (e.g., conflict, anger, feelings of rejection) and to set realistic goals for relationships; family therapy when the family system supports maintenance of psychogenic nonepileptic seizures |
| Psychosis | Rarely, psychogenic nonepileptic seizures can be a manifestation of psychosis; in most instances, however, the diagnosis of psychosis is clear. | Treatment of underlying psychosis |
| PTSD, dissociation | The patient has active chronic PTSD and dissociative symptoms. Flashbacks, recollections, or sensory triggers often initiate psychogenic nonepileptic seizures. Often, there is a history of severe childhood or current abuse. | Exposure-based therapies and selective serotonin reuptake inhibitors for PTSD |
| Reinforced behavior pattern | Reinforced behavior pattern often is the underlying cause of psychogenic nonepileptic seizures in cognitively impaired patients. The patient develops psychogenic nonepileptic seizures because of the functional advantages that are reinforced by the seizures (e.g., attention, avoidance of responsibility). | Behavior modification therapy |
| Somatization, somatoform disorder, conversion disorder | The seizures represent emotional distress converted into physical symptoms. Often, there is a long history of medical attention for unexplained physical symptoms. The patient often can identify precipitating stressful events; the seizures therefore are a conversion symptom. | Cognitive behavior therapy to identify links between stress and psychogenic nonepileptic seizures and to develop more adaptive coping; for severe somatization, regular visits not contingent on symptoms but with a focus on living with the symptoms rather than investigating and treating them |

PTSD = posttraumatic stress disorder.

Information from references 3, 9, 25, 27, 35, and 36.

TABLE 5
Prognostic Factors in Patients with Psychogenic Nonepileptic Seizures

| <i>Factors for favorable outcome</i> | <i>Factors for unfavorable outcome</i> |
|---|---|
| Acceptance of nonepileptic nature of episodes | Coexisting epilepsy |
| Family structure that supports autonomy | Disbelief of diagnosis |
| Female gender | Family structure that supports dependency and illness |
| Having friends currently | Long history of psychiatric disorders |
| Having good relationships with friends as a child | Longer duration of psychogenic nonepileptic seizures |
| Higher ability to express emotions | Male gender |
| Higher intelligence and education | Ongoing physical or sexual abuse |
| Independent lifestyle | Ongoing psychosocial stressors |
| Less dramatic psychogenic nonepileptic seizures: no positive motor features, no ictal incontinence or biting, no admissions to intensive care unit, no pseudo–status epilepticus with intubation | Pending litigation |
| Less extreme scores on traits defining emotional dysregulation | Persistent somatization |
| Less tendency to dissociate | Reluctant self-disclosure |
| Shorter duration of psychogenic nonepileptic seizures | Restricted expression of anger and positive feelings |
| Younger age at diagnosis | Unemployment or disability |

Adapted with permission from LaFrance WC, Devinsky O. Treatment of nonepileptic seizures. Epilepsy Behav 2002;3(5S):20; with additional information from references 9, 11, and 37.

rizes current treatment recommendations based on the underlying causes of psychogenic nonepileptic seizures. All recommendations are based on anecdotal evidence or small, uncontrolled studies.

In one model,²⁷ the first step is accurate diagnosis of psychogenic nonepileptic seizures based on a thorough history, a focused physical examination, and inpatient vEEG monitoring. After the diagnosis is presented to the patient and family, the next step is to create a list of predisposing factors, precipitants, and perpetuating factors for the seizures. This list is used to determine the appropriate psychotherapies and drug treatments. Antiepileptic drugs are tapered in patients with exclusively nonepileptic seizures, and appropriate psychotropic drugs are titrated for the treatment of psychiatric comorbidities.

An excellent resource for patients with psychogenic nonepileptic seizures is available online (http://www.hsc.usf.edu/~sbenbadi/PNES_USF.html).

Author disclosure: Nothing to disclose.

REFERENCES

- Rowan AJ. Diagnosis of non-epileptic seizures. In: Gates JR, Rowan AJ, eds. Non-epileptic seizures. 2d ed. Boston: Butterworth-Heinemann, 2000:15-30.
- Krumholz A. Nonepileptic seizures: diagnosis and management. *Neurology* 1999;53(5 suppl 2):S76-83.
- Gates JR. Epidemiology and classification of non-epileptic events. In: Gates JR, Rowan AJ, eds. Non-epileptic seizures. 2d ed. Boston: Butterworth-Heinemann, 2000:3-14.
- Andermann F. Non-epileptic paroxysmal neurological events. In: Gates JR, Rowan AJ, eds. Non-epileptic seizures. 2d ed. Boston: Butterworth-Heinemann, 2000:51-69.
- Bourgeois JA, Chang CH, Hilty DM, Servis ME. Clinical manifestations and management of conversion disorders. *Curr Treat Options Neurol* 2002;4:487-97.
- Iriarte J, Parra J, Urrestarazu E, Kuyk J. Controversies in the diagnosis and management of psychogenic pseudo-seizures. *Epilepsy Behav* 2003;4:354-9.
- Shukla G, Bhatia M, Vivekanandhan S, Gupta N, Tripathi M, Srivastava A, et al. Serum prolactin levels for differentiation of nonepileptic versus true seizures: limited utility. *Epilepsy Behav* 2004;5:517-21.
- Alsaadi TM, Thieman C, Shatzel A, Farias S. Video-EEG telemetry can be a crucial tool for neurologists experienced in epilepsy when diagnosing seizure disorders. *Seizure* 2004;13:32-4.

Nonepileptic Seizures

9. Barry JJ, Sanborn K. Etiology, diagnosis, and treatment of nonepileptic seizures. *Curr Neurol Neurosci Rep* 2001;1:381-9.
10. Reuber M, Elger CE. Psychogenic nonepileptic seizures: review and update. *Epilepsy Behav* 2003;4:205-16.
11. Reuber M, Pukrop R, Bauer J, Helmstaedter C, Tessedorf N, Elger CE. Outcome in psychogenic nonepileptic seizures: 1 to 10-year follow-up in 164 patients. *Ann Neurol* 2003;53:305-11.
12. Martin RC, Gilliam FG, Kilgore M, Faught E, Kuzniecky R. Improved health care resource utilization following video-EEG-confirmed diagnosis of nonepileptic psychogenic seizures. *Seizure* 1998;7:385-90.
13. Brodie MJ, Kwan P. Staged approach to epilepsy management. *Neurology* 2002;58(8 suppl 5):S2-8.
14. Kwan P, Brodie MJ. Effectiveness of first antiepileptic drug. *Epilepsia* 2001;42:1255-60.
15. Szafarski JP, Szafarski M, Hughes C, Ficker DM, Cahill WT, Privitera MD. Psychopathology and quality of life: psychogenic non-epileptic seizures versus epilepsy. *Med Sci Monit* 2003;9:CR113-8.
16. Benbadis SR, Hauser WA. An estimate of the prevalence of psychogenic non-epileptic seizures. *Seizure* 2000;9:280-1.
17. Benbadis SR, Agrawal V, Tatum WO 4th. How many patients with psychogenic nonepileptic seizures also have epilepsy? *Neurology* 2001;57:915-7.
18. Lesser RP. Psychogenic seizures. *Neurology* 1996;46:1499-507.
19. Reuber M, Fernandez G, Helmstaedter C, Qurishi A, Elger CE. Evidence of brain abnormality in patients with psychogenic nonepileptic seizures. *Epilepsy Behav* 2002;3:249-54.
20. Lowe MR, De Toledo JC, Rabinstein AA, Giulla MF. MRI evidence of mesial temporal sclerosis in patients with psychogenic nonepileptic seizures. *Neurology* 2001;56:823.
21. Benbadis SR, Tatum WO 4th, Murtagh R, Vale FL. MRI evidence of mesial temporal sclerosis in patients with psychogenic nonepileptic seizures. *Neurology* 2000;55:1061-2.
22. Martin R, Burneo JG, Prasad A, Powell T, Faught E, Knowlton R, et al. Frequency of epilepsy in patients with psychogenic seizures monitored by video-EEG. *Neurology* 2003;61:1791-2.
23. Alper KA, Devinsky O, Perrine K, Vazquez B, Luciano D. Nonepileptic seizures and childhood sexual and physical abuse. *Neurology* 1993;43:1950-3.
24. Krawetz P, Fleisher W, Pillay N, Staley D, Arnett J, Maher J. Family functioning in subjects with pseudoseizures and epilepsy. *J Nerv Ment Dis* 2001;189:38-43.
25. Bowman ES, Markand ON. Psychodynamics and psychiatric diagnoses of pseudoseizure subjects. *Am J Psychiatry* 1996;153:57-63.
26. Reilly J, Baker GA, Rhodes J, Salmon P. The association of sexual and physical abuse with somatization: characteristics of patients presenting with irritable bowel syndrome and non-epileptic attack disorder. *Psychol Med* 1999;29:399-406.
27. LaFrance WC, Devinsky O. Treatment of nonepileptic seizures. *Epilepsy Behav* 2002;3(55):19-23.
28. Bowman ES. Psychopathology and outcome in pseudo-seizures. In: Ettinger AB, Kanner AM, eds. *Psychiatric issues in epilepsy: a practical guide to diagnosis and treatment*. Philadelphia: Lippincott Williams & Wilkins, 2001:355-77.
29. Reuber M, Pukrop R, Bauer J, Derfuss R, Elger CE. Multidimensional assessment of personality in patients with psychogenic non-epileptic seizures. *J Neurol Neurosurg Psychiatry* 2004;75:743-8.
30. Ettinger AB, Devinsky O, Weisbrot DM, Goyal A, Shashikumar S. Headaches and other pain symptoms among patients with psychogenic non-epileptic seizures. *Seizure* 1999;8:424-6.
31. Griffith JL, Polles A, Griffith ME. Pseudoseizures, families, and unspeakable dilemmas. *Psychosomatics* 1998;39:144-53.
32. Frances PL, Baker GA, Appleton PL. Stress and avoidance in pseudoseizures: testing the assumptions. *Epilepsy Res* 1999;34:241-9.
33. Dikel TN, Fennell EB, Gilmore RL. Posttraumatic stress disorder, dissociation, and sexual abuse history in epileptic and nonepileptic seizure patients. *Epilepsy Behav* 2003;4:644-50.
34. Bowman ES. Relationship of remote and recent life events to the onset and course of non-epileptic seizures. In: Gates JR, Rowan AJ, eds. *Non-epileptic seizures*. 2d ed. Boston: Butterworth-Heinemann, 2000:269-83.
35. Reuber M, House AO. Treating patients with non-epileptic seizures. *Curr Opin Neurol* 2002;15:207-11.
36. Rusch MD, Morris GL, Allen L, Lathrop L. Psychological treatment of nonepileptic events. *Epilepsy Behav* 2001;2:277-83.
37. Ettinger AB, Dhoon A, Weisbrot DM, Devinsky O. Predictive factors for outcome of nonepileptic seizures after diagnosis. *J Neuropsychiatry Clin Neurosci* 1999;11:458-63.
38. Bowman ES. Nonepileptic seizures: psychiatric framework, treatment, and outcome. *Neurology* 1999;53(5 suppl 2):S84-8.
39. Aboukasm M, Mahr G, Gahry BR, Thomas A, Barkley GL. Retrospective analysis of the effects of psychotherapeutic interventions on outcomes of psychogenic nonepileptic seizures. *Epilepsia* 1998;39:470-3.