Psychogenic (Functional) Movement Disorders

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REVIEW ARTICLE

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ABSTRACT

PURPOSE OF REVIEW: This article reviews a practical approach to psychogenic movement disorders to help neurologists identify and manage this complex group of disorders.

RECENT FINDINGS: Psychogenic movement disorders, also referred to as functional movement disorders, describe a group of disorders that includes tremor, dystonia, myoclonus, parkinsonism, speech and gait disturbances, and other movement disorders that are incongruent with patterns of pathophysiologic (organic) disease. The diagnosis is based on positive clinical features that include variability, inconsistency, suggestibility, distractibility, suppressibility, and other supporting information. While psychogenic movement disorders are often associated with psychological and physical stressors, the underlying pathophysiology is not fully understood. Although insight-oriented behavioral and pharmacologic therapies are helpful, a multidisciplinary approach led by a neurologist, but also including psychiatrists and physical, occupational, and speech therapists, is needed for optimal outcomes.

SUMMARY: The diagnosis of psychogenic movement disorders is based on clinical features identified on neurologic examination, and neurophysiologic and imaging studies can provide supporting information.

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INTRODUCTION

Psychogenic movement disorders have been described as a "crisis for neurology"[1] as they represent a major public health and economic problem, with an estimated annual incidence of 4 to 12 cases per 100,000.[2–4] Debate exists about the most appropriate name for this group of disorders. The term *functional movement disorders* is preferred by some who argue that this term is free of stigma and does not imply a psychological etiology of the disorder.[5] Others prefer the term *psychogenic movement disorders*, finding the term *functional* vague and confusing to patients who often see themselves as "dysfunctional" rather than "functional."[3]

Psychogenic movement disorders are among the most challenging movement disorders to treat as they are often difficult to diagnose, the presentation is variable in terms of phenomenology and course, the pathophysiology is poorly understood, and there is no consensus of the best therapeutic approach.[6] Over the past several decades, there has been greater awareness of this disorder with increased efforts into understanding and treating this common neurologic

disorder. A study of 3781 patients who were referred to neurologic centers in Scotland over a 1-year period identified 16% of patients as having psychogenic or psychological symptoms, which were the second most common symptoms after headaches.[7] While psychogenic movement disorders are most common in women, with a median age of 50 years (range of 17 to 83 years),[8] they present in all age groups, including in children.[9] Out of a group of 151 patients with psychogenic movement disorders, 33 (22%) patients were older than 60 years of age at symptom onset, indicating that psychogenic movement disorders are not uncommon in the elderly.[10]

It is important for neurologists to be familiar with the phenomenology of psychogenic movement disorders so that a diagnosis can be made as early as possible. Diagnosis is based on the identification of positive symptoms characteristic of psychogenic movement disorders rather than a diagnosis of exclusion. Neurologists are often more concerned about missing an organic disease than identifying a psychogenic movement disorder. However, patients with psychogenic disease can have similar or worse disability compared to those with organic neurologic disorders. One study of more than 3000 patients found that those with psychogenic neurologic disease had worse physical and mental health status compared to those with organic disease.[11] They were also more likely to be unemployed because of medical issues and to be receiving government disability benefits. Unfortunately, the prognosis of psychogenic neurologic symptoms is generally poor, with symptoms unchanged or worse at follow-up in most patients. A longer duration of symptoms is the greatest predictor of poor outcome, with younger age and shorter duration associated with overall better prognosis.[12]

Ancillary testing including accelerometers, EMG, EEG, as well as structural and functional imaging can provide supporting information, but some of these tools are mainly available on a research basis.[6]

In addition to making the diagnosis, the neurologist should provide ongoing support and coordinate a multidisciplinary approach to care. Increased awareness and research into understanding the mechanisms of disease and effective treatment strategies will hopefully lead to improved outcomes for patients with psychogenic movement disorders.

DIAGNOSTIC CRITERIA

The initial and most widely recognized diagnostic criteria for psychogenic movement disorders are the Fahn-Williams[13] criteria, proposed in 1988. This set of criteria categorizes patients into four categories: documented, clinically established, probable, and possible. For a classification of documented psychogenic movement disorders, persistent resolution of symptoms occurs after psychotherapy, placebo, or suggestion or when the patient is witnessed without the abnormal movements when observed unknowingly. The clinically established psychogenic movement disorders category is based on inconsistency of movements or incongruence with organic movement disorders, as well as one additional finding of other psychogenic signs, psychological disturbances, or multiple somatizations. The probable psychogenic movement disorders category is based on either the presence of movements inconsistent/incongruent with organic movement disorders or on the presence of multiple psychogenic signs or somatizations. The possible psychogenic movement disorders category only requires the presence of an emotional disturbance.

Subsequently, the Shill-Gerber[14] criteria placed more emphasis on historical information including pain, fatigue, and secondary gain. Gupta and Lang[15] proposed a combination of clinical and electrophysiologic testing primarily for tremor and myoclonus. Overall, although most patients have some evidence of childhood, sexual, or other stressors, there is a trend toward less reliance on the presence of psychological factors to make a diagnosis. The *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition* (*DSM-5*), has also updated the criteria for functional neurologic symptoms, focusing on sensory and motor symptoms inconsistent with organic disorders and eliminating the requirement of preceding psychological factors.[16,17]

CLINICAL FEATURES

Evaluating a patient with a suspected psychogenic movement disorder requires familiarity with the typical clinical features of these disorders and performing a detailed history and neurologic examination to identify these supporting features (TABLE 11-1). While no one feature is pathognomonic, it is the entire clinical picture that leads to an accurate diagnosis.

HISTORY

Obtaining details regarding the onset and evolution of symptoms is important as psychogenic movement disorders usually begin suddenly and rapidly progress to severe disability. Although the course often fluctuates, spontaneous, albeit transient, remissions may occur. Patients often associate symptoms with a preceding injury or illness. In one study, 80% of patients reported a physical event prior to the onset of their symptoms.[18] In a study of 43 patients with motor conversion disorder, 56% reported a stressful life event in the month preceding symptom onset, compared to only 21% in patients with depression and 18% in controls.[19] These events were not identified on routine assessment and needed more in-depth evaluation.

Symptoms are often episodic, occurring for varying periods of time and then self-resolving. Aside from paroxysmal dyskinesias, discrete episodes of symptoms are not typical in organic movement disorders and should suggest the possibility of a psychogenic movement disorder. These episodes in psychogenic movement disorders are variable either in duration, phenomenology, or body location. The movements may be limited to certain situations such as only when seated or lying down but not interrupting walking.

In addition to the chief complaint, patients often have other transient symptoms such as intermittent speech disturbances, weakness, gait and balance problems, or tunnel vision.[20,21] Their level of disability is often discordant with their physical deficits; patients may use assistive devices such as canes, walkers, or wheelchairs or be dependent on family members for total care.

Past medical history typically includes a long list of diagnoses and surgical procedures, often with multiple somatoform symptoms. While anxiety and depression are common in neurologic disease in general, studies have shown more severe depression, anxiety, and a greater number of somatizations in patients with psychogenic movement disorders compared to those with organic disease.[22] Those with psychogenic movement disorders also report higher rates of childhood traumas (emotional, sexual, and physical) compared to those with organic movement disorders and healthy controls.[23] Family history may reveal other family members with similar disorders or other chronic neurologic

KEY POINTS

- Early diagnosis of a psychogenic movement disorder is important as longer duration of symptoms is associated with poor outcome.
- Diagnosis of a psychogenic movement disorder is based on positive signs and symptoms and is not just a diagnosis of exclusion.
- Psychogenic movement disorders are typically sudden in onset and rapidly progress to severe disability.

TABLE 11-1

Clinical Characteristics of Psychogenic Movement Disorders

History

- **Sudden onset**
- **Rapid progression**
- **Preceding illness or injury**
- **Episodic symptoms**
- **Multiple somatizations**
- **Occupation in health care profession**

General Examination

- **La belle indifference**
- **Convergence spasm**
- **Giveway weakness**
- **Nonanatomic sensory signs**
- **Extreme effort and pain during testing**
- **Excessive slowness**
- **Excessive startle**

Core Clinical Signs

- **Variability of**
  - Movement frequency
  - Direction
  - Phenomenology
  - Body location
- **Distractibility**
  - Decrease or complete cessation of involuntary movements when engaged in mental tasks or voluntary movements with an unaffected limb
- **Entrainability**
  - Involuntary movement adopts the same frequency or a harmonic of the frequency of voluntary repetitive movements performed with an unaffected limb
- **Suggestibility**
  - Involuntary movement increases or decreases with the power of suggestion, such as the application of a vibrating tuning fork
- **Other**
  - Sudden onset
  - Spontaneous remissions
  - Dual-task interference
  - Transient arrest of tremor by contralateral volitional ballistic movement
  - Whack-a-mole sign

diseases. Spending time understanding the patient's social history can help reveal the patient's family environment and social support. Patients with psychogenic movement disorders have often worked in the health care profession, acted as caregivers for the chronically ill, or worked in the health insurance industry. Taking the time to obtain a detailed history, particularly with regard to the circumstances around the onset, and an attempt to understand the person is critical in arriving at the appropriate diagnosis.

KEY POINT

● In patients with psychogenic tremor, variability of tremor frequency and direction is common, as well as suggestibility, distractibility, and entrainability.

GENERAL CLINICAL EXAMINATION

The clinical examination requires keen observation beginning in the waiting room and continuing during the history taking and the formal examination. Observing the patient's general movements, such as while he or she walks to the examination room, hangs up his or her coat, handles papers, or takes off his or her shoes, helps evaluate the consistency of the patient's abnormal movements. During the history the patient may display la belle indifference, such as smiling and giggling despite describing severe impairment.

Convergence spasm (a dysconjugate gaze with miosis) when asking the patient to fixate on a near object such as the examiner's finger has been associated with psychogenic movement disorders.[20,24] During strength testing, the patient may have giveway weakness characterized as full strength initially but associated with a tremulousness and then a sudden loss of power. Strength testing is often performed with excessive effort and associated with marked pain.[25] Identifying nonanatomic neurologic signs can be supportive, such as decreased vibration on one side of the forehead, or a complete loss of sensation and strength in the legs with normal reflexes.

A group of core clinical signs are shared by most patients with psychogenic movement disorders and should be explored when a diagnosis of psychogenic movement disorder is suspected.[26] Variability of movements is common and may include variability of phenomenology with nonpatterned movements and variability of frequency, direction, and body location. This variability without an underlying pattern differs from organic involuntary movements that are ultimately patterned despite some variability.

Distractibility refers to a decrease or cessation of movements when focusing on mental or motor tasks with the unaffected limb. A simple task is asking the patient to slowly tap each finger on one hand in sequence, or a more complex task of tapping alternating fingers. Entrainability is demonstrated by asking the patient to perform a repetitive movement in the opposite limb such as finger tapping or wrist extension/flexion, and the movements in the other limb adopt the same frequency or a harmonic of the voluntary movements. Entrainability can be demonstrated with tremor and myoclonus. Suggestibility refers to the activation or suppression of movements with the power of suggestion. This feature can be demonstrated by applying a vibrating tuning fork, suggesting (not deceiving) that different stimuli may alter movements, and observing a sudden appearance, increase, or decrease of the abnormal movement.[27] It is important to remember that these features are not independently diagnostic of a psychogenic movement disorder but should be considered in the context of the entire clinical picture.

TYPES OF PSYCHOGENIC MOVEMENT DISORDERS

Various phenomenologic presentations of psychogenic movement disorders are discussed below.

Psychogenic Tremor

Psychogenic tremor is the most common psychogenic movement disorder, accounting for 50% of this group of disorders.[8] Variability of tremor frequency and direction is common, such as changing from a pronation/supination tremor to a flexion/extension tremor about the wrist,[28] as well as suggestibility, distractibility, and entrainability (**VIDEO 11-1**, *links.lww.com/CONT/A369*). A blinded rater evaluated videos of 33 subjects with essential tremor and 12 with psychogenic tremor; the patients with psychogenic tremor were significantly more likely to relay a history of sudden onset (P=.03), spontaneous remissions (P=.03), shorter duration of tremor (P=.001), greater degree of distraction with alternate finger tapping (P=.01) and with mental concentration on serial 7s (P=.01), and more suggestibility with a tuning fork (P=.04) compared to those with essential tremor.[29]

Variability of tremor amplitude is not specific for psychogenic tremor as organic tremor can have variable amplitudes as well,[30] often increasing with stress or anxiety. Irregular tremor of the head and limbs is also typical of dystonic tremor but distinguishes itself from psychogenic by features such as task specificity, a stereotyped abnormal posture, and the presence of a null point. Psychogenic tremor may be equally present in all states (rest, posture, kinetic), which is not typical for organic tremors such as in Parkinson disease, where resting tremor is typical and decreases with action. One exception is Holmes

CASE 11-1

A 41-year-old woman presented to the emergency department with sudden-onset tremor that started in her right arm. Over a period of 30 minutes it had spread to her left arm, trunk, and legs. She had retained awareness and was able to walk. She had a past medical history of interstitial cystitis and fibromyalgia. In the emergency department, she was treated with diazepam 5 mg intravenously, and her movements stopped. She was advised to follow-up with a neurologist.

She continued to have episodes of tremor on a daily basis involving an arm, a leg, or her whole body. The episodes would vary in duration, lasting from 5 minutes to 1 hour at a time and then resolve.

On initial examination by the neurologist, she had giveway weakness with extreme effort on confrontation muscle testing. She had a high-frequency postural tremor of both hands that changed from flexion/extension to pronation/supination throughout the examination. The tremor was distractible, resolving when performing voluntary finger tapping with the opposite hand. The tremor was also entrainable, adopting the frequency of voluntary movements with the opposite limb. The remainder of her neurologic examination was normal.

COMMENT

This case demonstrates features of psychogenic tremor with sudden-onset episodic tremor that rapidly progressed to involve the patient's entire body. Distractibility and entrainability are features that can be demonstrated on examination, as are associated psychogenic signs such as giveway weakness.

tremor, in which tremor occurs in all states and is associated with an underlying brain injury or lesion. Total body tremor is a typical manifestation of psychogenic tremor, including a bobbing of the head and trunk (CASE 11-1). The whack-a-mole sign refers to the sudden appearance of tremor in another part of the body when the examiner suppresses the actively tremulous limb.[31] This is easily demonstrated with tremor but can be seen with other movements as well.

Electrophysiologic testing can be useful to analyze tremor and includes accelerometry and surface EMG.[32] Accelerometry measures tremor frequency and amplitude, while surface EMG records the pattern and duration of muscle activity. The pattern and duration of EMG bursts is typically variable in psychogenic tremor. Coherence analysis records EMG activity of the involuntary movements compared to voluntary movements of the unaffected limb. Patients with psychogenic tremor often demonstrate a high coherence of frequency between both limbs, as they are not able to produce movements of varying frequencies. Mass loading (weighting the limb) often results in an increase of psychogenic tremor frequency and amplitude, seen in 70% of patients, but there is often a reduction in the amplitude but no change in frequency of tremor in patients with Parkinson disease or essential tremor.[33]

Coactivation of antagonist muscles prior to tremor onset is more commonly detected through electrophysiologic testing in psychogenic tremor compared to organic tremor. The stiffening of muscles around a joint triggers the onset of tremor. Clinically this may be visualized as a generalized tightening of limb muscles with the hand clenched in a fist. Dual-task interference testing demonstrates difficulty accurately performing voluntary movements of the opposite limb when the patient has psychogenic tremor in another limb.[34] This effect on voluntary tasks is not seen with organic tremor. The ballistic movement test demonstrates a change in tremor amplitude or transient arrest in psychogenic tremor when the patient is asked to perform a sudden movement with the opposite limb.[35] The various electrophysiologic tests to evaluate psychogenic tremor have been validated, demonstrating an 89.5% sensitivity and 95.9% specificity, with good inter-rater and test-retest reliability.[36]

Psychogenic Dystonia

Psychogenic dystonia is characterized by a sudden onset, rapid progression to a fixed dystonia, and early local pain.[37] This is in contrast to organic dystonia, which is usually mobile and action induced at onset with a fixed posture associated with pain later on in the disease course. In psychogenic dystonia, patients usually do not have associated sensory tricks and minimal or no exacerbation with action. The most common phenotype is plantar flexion and inversion of the foot, and associated weakness in the dystonic limb may be seen. On examination, active resistance to passive range of motion often occurs (CASE 11-2).When occurring in the hands, the typical pattern is a clenched fist with flexion of digits two through five with sparing of the thumb or the index finger, preserving the pincer grasp. When affecting the cervical region, the typical phenotype is a fixed laterocollis with ipsilateral shoulder elevation and contralateral shoulder depression, and the latter is not typically seen in organic cervical dystonia.

A mobile phenotype of psychogenic dystonia has also been described, which has a more jerky quality.[38] In one study, patients with mobile cervical dystonia were on average 10 years older than the fixed group, which had an average age of

KEY POINTS

- Total body tremor is a typical manifestation of psychogenic tremor, including a bobbing of the head and trunk.
- A rapid-onset fixed dystonia is the typical phenotype of psychogenic dystonia.

onset in their thirties.[38] The mobile group was more likely to have dystonic movements limited to the neck area, while the patients with fixed dystonia had fixed postures in the limbs as well. The mobile group was also more likely to have periods of remission with subsequent relapses.

A controversial entity referred to as peripherally induced dystonia has been described, which is preceded by a mild injury and results in a fixed dystonia often associated with signs of complex regional pain syndrome.[39] In one review of patients with peripherally induced movement disorders, more than one-third had associated complex regional pain syndrome, and nearly 15% were diagnosed with a psychogenic movement disorder. The patients were also more likely to have fixed dystonia and were less likely to respond to treatment with botulinum toxin injections.[40] A review of reported cases of peripherally induced dystonia found that many, but not all, patients have clinical features consistent with psychogenic dystonia.[41]

Psychogenic Myoclonus

Psychogenic myoclonus often presents as jerking movements of the limbs, head, or trunk that, unlike organic myoclonus, is often associated with facial

CASE 11-2

A 13-year-old girl presented to the emergency department with an abnormal posture of her foot. She had woken up the previous morning with this symptom, and she had not experienced an injury but had difficulty bearing weight because of pain.

Imaging of her foot was normal. She started to use crutches, which were lying around the house after her mother's knee surgery 1 year previously. Over the next few weeks, she visited an orthopedist, rheumatologist, and physical therapist without a diagnosis or treatment. Over the next month she developed intermittent stuttering with unintelligible speech for 30 minutes at a time, which self-resolved.

She eventually visited a neurologist 1 month after her symptoms started, and by this time, she was using a wheelchair. During history taking, she reported no recent stressors. She was a straight A student, captain of the soccer team, and editor of the yearbook. Her speech was normal during the history.

On neurologic examination, during cranial nerve testing she suddenly developed stuttering slow speech. Her foot was in a fixed posture with plantar flexion and inversion. When asked to actively try and move her foot, she exhibited extreme effort with facial grimacing. She exhibited suggestibility, with straightening her foot with the application and suggestion of a vibrating tuning fork. Her gait was effortful with her foot dragging along the floor.

COMMENT

This case of psychogenic dystonia demonstrates features of rapid onset to a fixed posture, pain, and severe disability. Suggestibility can be a helpful finding when other features such distractibility are not seen.

grimacing and forceful eyelid closure. When associated with interruptions in speech, this usually occurs between words. Psychogenic myoclonus often occurs in episodes as opposed to the random nature of organic myoclonus. Psychogenic myoclonus is typically slower than organic myoclonus, and when stimulus-induced a long delay occurs that may be associated with an exaggerated startle. Psychogenic myoclonus may occur even before a stimulus is applied, such as before the hammer hits the knee when checking reflexes.

Psychogenic myoclonus is often mistaken for propriospinal myoclonus, and a clinical diagnosis of propriospinal myoclonus is often unreliable.[42] The classic description of propriospinal myoclonus is rhythmic flexor spasms that are often stimulus-induced and worse when supine. Secondary causes are associated with spinal cord lesions and often have other signs of spinal cord dysfunction such as sensory or reflex abnormalities. A review of all published cases of propriospinal myoclonus compared primary, secondary, and psychogenic myoclonus and determined that 56% of cases were psychogenic.[43] Psychogenic myoclonus was characterized by arrhythmic, variable jerks that did not persist during sleep and more often involved the face. When compared via electrophysiologic testing, overlap occurred between organic and psychogenic cases, with slow conduction velocities during polymyographic recordings seen in more than two-thirds of organic cases and approximately 20% of psychogenic cases. A Bereitschaftspotential, an EEG finding seen in voluntary movement, was present in 63% of psychogenic cases. Variability of muscle recruitment was most likely to distinguish psychogenic from organic myoclonus.[43]

Surface EMG in psychogenic myoclonus typically demonstrates a burst muscle contraction duration greater than 70 ms as opposed to a shorter duration in organic myoclonus.[32] The EMG pattern of psychogenic jerks is typically a triphasic wave, as a consequence of agonist and antagonist muscle activation, similar to that seen in voluntary ballistic movements.[33] Furthermore, the reflex latency (the interval between a stimulus, such as sound, pinprick, or tendon tap, and jerk) in psychogenic myoclonus is variable, often greater than 100 ms, with shorter latencies in organic myoclonus. The Bereitschaftspotential is often seen in psychogenic myoclonus, but its absence does not rule out the diagnosis.

Psychogenic Gait Disorder

A psychogenic gait disorder may occur in isolation but more commonly is seen in combination with other psychogenic movements.[44,45] General neurologic examination does not show signs of spasticity, neuropathy, or cerebellar dysfunction. Patients with psychogenic gait disorders often have normal strength on motor testing but are unable to bear weight, needing maximal assistance to stand.

Patients often have to exert excessive effort when walking, greater than that seen in organic gait disorders. They may demonstrate the "huffing and puffing sign" characterized by huffing, breath holding, moaning, and facial grimacing.[46] Common manifestations of psychogenic gait are excessive slowness, intermittent buckling at the knees, lurching without falling, and magnetlike attraction to the adjacent walls. Patients may have dramatic compensatory measures such as walking with arms outstretched, referred to as "tightrope walking." Astasia-abasia refers to body contortions while tandem walking, paradoxically demonstrating excellent balance (**VIDEO 11-2**, *links.lww.com/CONT/*

KEY POINTS

- **A clinical diagnosis of propriospinal myoclonus is unreliable, and more than 50% of cases are psychogenic.**
- **Psychogenic gait often presents as slowness and buckling at the knees, dramatic compensatory measures, and improvement with minimal support.**

A370). Providing minimal support by the examiner with one finger often results in dramatic improvement in balance.

Patients may have an exaggerated response to the pull test, with arms waving in the air, reeling backward, or a simple collapse in the examiner's hands (CASE 11-3). A "fear of falling" gait, typically seen in elderly women after a fall, is not considered a psychogenic gait disorder.[47] This gait disorder is characterized by sliding feet along the ground, as if walking on ice, holding onto walls and furniture. Dramatic improvement occurs with suggestion and encouragement. This gait disorder is often confused with a parkinsonian gait.[48,49]

One study evaluated a "chair test" in nine patients with a psychogenic gait compared to those with an organic gait disorder.[50] Eight patients with a psychogenic gait disorder were able to propel themselves forward in a swivel chair when seated, whereas those with an organic gait disorder had equal impairments when seated or walking. It is important to distinguish a psychogenic gait disorder from organic disease with a complex gait pattern. For example, a dystonic gait may be task specific, only occurring in certain states such as walking forward, backward, or running. Patients with organic diseases such as Huntington disease and spinocerebellar ataxia and patients with levodopa-induced or paroxysmal dyskinesia may have a complex, bizarre gait disorder with a combination of choreic, dystonic, and ataxic features that may be misdiagnosed as psychogenic.[51]

CASE 11-3

A 54-year-old woman presented for evaluation of an abnormal gait that had started 6 months ago. She described her gait as unsteady, and she had started to use a walker. She had difficulty climbing up stairs but would climb up her front porch when no one was there to help her. She fell frequently but fortunately had had no major injuries.

Her examination showed no evidence for spasticity, neuropathy, or parkinsonism. She had giveway weakness in her proximal leg muscles. Upon standing, she developed a bouncing of the trunk, and her feet shook with each step. She had difficulty with tandem gait, with her body contorting from side to side while walking heel to toe. This improved markedly with the assistance of the examiner's pinky finger. On the pull test, she reeled back, her arms flailing, and fell into the examiner's hands.

Review of her brain MRI showed no abnormalities. On further discussion with the patient, she was the primary caregiver for her mother with Parkinson disease, who had passed away 6 months prior to the patient's symptom onset. The patient was concerned that she was developing Parkinson disease.

COMMENT

This case demonstrates one typical example of a psychogenic gait disorder: the bouncy gait. Other signs such as astasia-abasia with tandem gait, improvement with minimal assistance, and the exaggerated results of the pull test can also help make the diagnosis. It is not uncommon for patients with psychogenic movement disorders to have experience as health care providers or caregivers for family members who are ill.

Psychogenic Parkinsonism

Psychogenic parkinsonism may be seen in isolation but can be associated with underlying Parkinson disease.[48,52] In contrast to Parkinson disease, those with psychogenic parkinsonism are more commonly female and have a relatively younger age at onset.[52] Patients with psychogenic parkinsonism have also been found to have higher rates of depression at the time of presentation. Patients with depression may have symptoms that appear parkinsonian because of associated psychomotor retardation that can mimic body bradykinesia seen in Parkinson disease.

Patients with psychogenic parkinsonism perform rapid successive movements with excessive effort and slowness but without the decrement characteristic of the bradykinesia in patients with Parkinson disease.[48] Speech may be slow, whispering, or stuttering rather than hypophonic. Tremor in psychogenic parkinsonism typically affects the dominant hand and has the features of psychogenic tremor described earlier, such as variability in frequency and direction, alternating between a pronation/supination tremor and flexion/extension tremor. The tremor is often equally present while at rest, maintaining a posture, and performing kinetic movements, in contrast to the tremor in Parkinson disease that decreases with action. When walking, the hand tremor disappears whereas patients with Parkinson disease show persistent or often increased hand tremor when walking. The gait in psychogenic parkinsonism is also often effortful with feet sliding across the floor. Patients often have an exaggerated response to the pull test, with arms waving and patient reeling backward.

Dopamine transporter single-photon emission computed tomography (SPECT) is a specialized imaging technique that measures the uptake of the radioactive tracer ioflupane I^{123} at the presynaptic dopamine transporter terminals, projecting from the substantia nigra to the striatum. Decreased uptake is a surrogate marker of dopamine deficiency and distinguishes neurodegenerative parkinsonism from other causes of parkinsonism such as drug-induced, vascular, and psychogenic parkinsonism.[53]

PSYCHOGENIC FACIAL MOVEMENTS. In the past decade, an increasing number of reports have drawn attention to the broad phenomenology of psychogenic facial movements, a previously underrecognized psychogenic movement disorder.[54] The largest reported series of psychogenic facial spasms included 61 patients from 71 movement disorders centers.[55] The classic phenotype is ipsilateral platysma contraction with downward deviation of the corner of the mouth. The contractions are usually tonic, episodic, and may alternate from side to side. Ipsilateral jaw deviation is common and may be associated with ipsilateral tongue deviation. Psychogenic hemifacial spasm usually begins with the lower face as opposed to the eyelid in organic hemifacial spasm. The eyelid spasms may alternate sides and are not synchronous with the lower facial contractions. Patients often experience contralateral contraction of the frontalis as opposed to ipsilateral frontalis contraction, referred to as the "other Babinski sign" in organic hemifacial spasm.[56] Psychogenic weakness in the ipsilateral limb is also common, reported in 90% of psychogenic hemifacial spasm cases.[57]

Psychogenic blepharospasm typically involves bilateral contraction of the frontalis and corrugator, resulting in narrowed palpebral fissures, without actual contraction of the orbicularis oculi as seen in organic blepharospasm.

KEY POINTS

- Psychogenic parkinsonism often coexists with organic parkinsonism.
- Psychogenic facial spasms are typically tonic contractions of the lower face with ipsilateral platysma contraction and downward deviation of the lip.

PSYCHOGENIC PALATAL MYOCLONUS. Palatal myoclonus, which is a rhythmic contraction of the soft palate, also can be psychogenic with variable frequency and amplitude and can be entrainable (**VIDEO 11-3**, *links.lww.com/CONT/A371*).[54] Patients often have associated psychogenic movements of the head and face. In reported patients, those with psychogenic palatal myoclonus were younger and more likely to be female than those with organic palatal myoclonus. They also often reported a preceding event such as a sore throat.

PSYCHOGENIC SPEECH DISORDERS. Psychogenic speech disturbances are commonly associated with other psychogenic movement disorders. In a study of 182 patients with psychogenic movement disorders, 16% of patients had associated speech disorders.[21] The most common speech disturbance was stuttering, followed by speech arrests, foreign accent syndrome (intonation and pronunciation resulting in an accent foreign to the patient's primary language), hypophonia, and dysphonia (alteration of voice quality/phonation). Of these patients, 13% had a combination of phenotypes. Speech disturbances are often episodic and last for minutes, hours, or days at a time.

PSYCHOGENIC TICS. Psychogenic tics are uncommon, with one study identifying psychogenic tics in 4.8% of 184 patients with psychogenic movement disorders.[58] Psychogenic tics can be difficult to distinguish from organic tics, which also have sudden onset and distractibility. When compared to patients with Tourette syndrome, those with psychogenic tics were more likely to be female and had an older age at presentation (36.3 years versus 18.7 years of age).[58] Patients with psychogenic tics lacked a family history or a childhood history of tics. A reemergence of childhood tics is the most common cause of tics in adulthood.

Patients with psychogenic tics lack an urge/premonitory sensation and are unable to suppress their movements. They are less likely to report a history of obsessive-compulsive disorder or attention deficit hyperactivity disorder, which are common in patients with organic tics.[59] A lack of a rostrocaudal progression has been shown in psychogenic tics, as opposed to organic tics that often start in the face and then spread. Blocking tics, which interfere with normal movement, have been demonstrated in patients with psychogenic tics and are rare in patients with organic tics. Patients with psychogenic tics also commonly had manifestations of other psychogenic movement disorders or psychogenic nonepileptic seizures.

PSYCHOGENIC STEREOTYPIES. Stereotypies, typically seen in patients with autism, tardive dyskinesia, and autoimmune anti–*N*-methyl-D-aspartate (NMDA) receptor encephalitis, have been also described as a manifestation of psychogenic movement disorders. Patients with functional stereotypies have features that may overlap with those with tardive dyskinesia, including orolingual dyskinesia, limb and trunk stereotypies, and respiratory dyskinesia.[60] Similar to tardive dyskinesia, patients with psychogenic stereotypies may have sudden onset, prominent distractibility, and spontaneous remissions, but have a much lower frequency of exposure to neuroleptic drugs.

Psychogenic Paroxysmal Dyskinesia

Psychogenic and organic paroxysmal dyskinesias can be challenging to distinguish because of their episodic nature but have certain distinctive features. A study of 26 patients with psychogenic paroxysmal dyskinesia described a mean

age at onset of 38.6 years, much later than that typically seen in organic paroxysmal dyskinesia.[61] Episodes had variable duration and phenomenology, with 69.2% having a mixed or complex phenotype. Triggers were atypical such as stress, alcohol, and loud noises. Patients generally did not respond to medications typically used for organic paroxysmal dyskinesias. Of these patients, 34% had psychogenic signs between episodes, such as gait disturbances, nonanatomic sensory disturbances, giveway weakness, and fixed dystonic posturing of the feet, and 50% had other unexplained somatic symptoms. Interestingly, 19.3% had an additional organic movement disorder. Ultimately, it is the variability of the episodes that distinguishes psychogenic from organic paroxysmal dyskinesias, which have stereotyped episodes without interictal abnormalities.

MAKING THE DIAGNOSIS

Making the diagnosis of a psychogenic movement disorder is based not only on exclusion of organic causes but, more importantly, on positive criteria such as characteristic phenomenology that is incongruent with organic movement disorders. As with many neurologic disorders, the diagnosis of a psychogenic movement disorder is a clinical diagnosis without a confirmatory laboratory test. The diagnosis should be made by a neurologist, and it should not be deferred to a psychiatrist.

It is important to convey the diagnostic process to the patient, otherwise they may mistakenly conclude that "the doctor cannot find anything wrong with me" and "the doctor does not know what is wrong with me." Confidently explaining the diagnosis is important for the patient's acceptance of the diagnosis, which is essential for positive treatment outcomes. The neurologist should reinforce that this is a true neurologic disorder and that no one is implying that "this is all in their head" or that they are "faking" it. Taking the time to explain the diagnosis and answering patient questions is especially important with psychogenic movement disorders, which are not well known to the public. Clinicians have different styles of delivering a psychogenic movement disorder diagnosis to patients. Some advocate that demonstrating the psychogenic features of their disease is a valuable part of the treatment process.[62] The dialogue and vocabulary the clinician uses can have a great impact on the patient's acceptance of the diagnosis. While different styles of communication are possible, one current approach to patients is described and illustrated by Carson and colleagues.[63]

Asking about underlying stressors or past traumatic experiences may identify contributing factors. However, the absence of such experiences does not exclude the diagnosis. Patients often have poor insight into underlying psychological factors, while family members may be more cognizant of contributing factors. Providing examples of familiar examples of physical symptoms triggered by underlying stressors can be helpful, such as palpitations and sweaty palms that can occur during public speaking. At the end of the visit, provide a written summary of the diagnosis and treatment and make follow-up appointments; this will help patients feel supported and guided through the treatment plan. Refer to the useful websites section at the end of this article for educational information that can help patients learn more about this common disorder and not feel alone.

TREATMENT

At this time, there is no consensus on the optimal treatment strategy for psychogenic movement disorders. While a multidisciplinary approach is usually

KEY POINTS

- Psychogenic tics typically lack a premonitory urge, suppressibility, and often lack a family or childhood history of tics.
- Psychogenic paroxysmal dyskinesias have variable duration and phenomenology and often have atypical triggers.
- The neurologist's role involves explaining the diagnosis, providing educational information, coordinating treatment and providing neurologic follow-up to patients diagnosed with psychogenic movement disorders.

advocated,[64] access to centers that provide this support is often limited because of the paucity of centers that specialize in psychogenic movement disorders and frequent denials of insurance coverage. The treatment plan is coordinated by the neurologist, who should provide continued follow-up and support to the patient.

Psychiatrists may play an important role in the treatment rather than in the diagnosis of patients with psychogenic movement disorders. Patients may benefit from psychotherapy to identify underlying stressors, understand potential psychodynamic factors, and develop coping mechanisms. Patients also may benefit from psychotropic medications if they have underlying depression or anxiety.[65] The type of psychotherapy implemented is varied and can include psychodynamic therapy, cognitive-behavioral therapy, and hypnosis. A retrospective study of psychodynamic therapy for patients with psychogenic movement disorders demonstrated that out of 30 patients, 60% showed improvement.[66] Cognitive-behavioral therapy is also used to identify cognitive distortions and negative beliefs and modify one's response to stressors. A pilot study of cognitive-behavioral therapy for 21 patients with psychogenic movement disorders demonstrated an improvement in motor symptoms and a reduction in anxiety and depression.[67] A 2016 study demonstrated the value of qualitative interviews with open-ended conversations, rather than standardized questionnaires.[68] Out of 36 patients with psychogenic movement disorders, 28 were identified as having an additional diagnosis of a psychiatric disorder. Such interviews provided insight to the patient's experience of their symptoms. Patients with psychogenic movement disorders have poor insight and demonstrate dysfunctional emotional processing.

Physical therapy, focused on motor retraining, has been shown to be helpful in most patients. Motor retraining focuses on regaining control over movement by demonstrating that normal movements are possible. Distraction techniques may be used to limit self-focus and allow for automatic movements.[69] Avoiding the use of canes or walkers helps decrease a patient's reliance on such assistive devices and dependency. A systematic review of physical therapy studies involving 373 patients with psychogenic movement disorders demonstrated improvement in 60% to 70% of patients.[70]

In 2015, a group of neurologists, neuropsychiatrists, and physical and occupational therapists developed consensus recommendations for physical therapy in psychogenic movement disorders.[69] They advocated for specialized physical therapy focused on a biopsychosocial approach. This involved patient education about their illness, motor retraining focusing on normal movements, and diverting attention away from their impairments. Other helpful techniques include self-observation with mirrors and videos to change their self-perception, using visualization techniques to focus on normal movements while performing exercises, and keeping a journal to reinforce treatment strategies and monitor progress.

Another possible rehabilitation strategy is using the feature of entrainment or suppressibility in psychogenic tremor as a biofeedback tool to retrain movements. A small study of 10 patients demonstrated the feasibility of this approach; patients were asked to move their wrists at varying frequencies in response to a stimulus, resulting in improvement of tremor at 6 months.[71] Inpatient programs with a combination of physical therapy and psychotherapy may have additional benefits over outpatient therapy,

involving more intensive therapies and removing the external stressors from their home environment.[72]

The Motor Retraining program for psychogenic movement disorders is a 1-week multidisciplinary inpatient rehabilitation program in Kentucky that focuses on motor retraining.[73] A retrospective chart review of 32 patients admitted to this program evaluated patient- and physician-rated outcomes at 1 week and 6 months. The mean duration of symptoms was 7.4 years, the mean age was 49.1 years, and 75% of the patients were women. Treatment included 3 hours of daily physical, occupational, and speech therapy and 1 hour of daily psychotherapy using cognitive-behavioral techniques. Physical therapy began with mental visualization followed by a step-wise approach starting with simple normal movements and advancing to more complex movements. Based on the self-reported Clinical Global Impression Scale, 87% of patients reported improvement at 1 week and 67% reported improvement at 6 months. Physician-rated videos, using the Psychogenic Movement Disorders Rating scale, demonstrated a 59.1% improvement at 1 week compared to baseline. At 1 week, wheelchair use decreased from 21.9% to 3.1 % of patients. The program was well received by patients, with 96% stating they would participate in the program again and 100% recommending the program to other patients.

Other therapies such as transcutaneous electrical stimulation and transcranial magnetic stimulation have shown improvement in patients with psychogenic movement disorders in few, and mainly uncontrolled, studies.[74,75] It is unclear whether the mechanism of action of transcranial magnetic stimulation in patients with psychogenic movement disorders is due to neuromodulation, cognitive-behavioral effect through suggestion, or motor learning by stimulating normal movements.

KEY POINTS

- Patients with psychogenic movement disorders may benefit from psychotherapy and psychotropic medications to treat depression and anxiety.
- Specialized physical therapy focusing on motor retraining can be helpful for patients with psychogenic movement disorders.
- Functional MRI studies have demonstrated impaired self-agency and dysfunctional emotional processing in patients with psychogenic movement disorders.

Pathophysiology

Research efforts are increasingly dedicated to elucidating the underlying mechanism of psychogenic movement disorders.[6] Impaired self-agency (a sense of control over voluntary actions) has been associated with psychogenic movement disorders, with the temporoparietal junction identified as a key player in modulating the neural circuit for self-agency.[76] Functional MRI (fMRI) studies have demonstrated decreased connectivity between the right temporoparietal junction and bilateral sensorimotor regions in patients with psychogenic movement disorders, supporting this concept.[76] An impaired self-agency may help explain why movements that are physiologically produced through voluntary circuits are perceived by patients as involuntary.

Dysfunctional emotional processing has also been associated with psychogenic movement disorders. Alexithymia, impaired emotional processing, is manifested as the inability to identify and describe one's emotion. A cross-sectional study demonstrated that those with psychogenic motor disorders had a higher proportion of alexithymia (34.5%) compared to patients with organic movement disorders (9.1%) and healthy controls (5.9%).[77] This suggests that patients with psychogenic movement disorders may have difficulty identifying physical symptoms such as tremor/weakness as stress-related autonomic arousal.

fMRI studies have demonstrated abnormal functional connectivity in emotional processing circuits in patients with psychogenic tremor and psychogenic dystonia.[78,79] When patients with psychogenic dystonia were presented with

emotional stimuli, decreased activation was seen in select motor and sensory areas compared to subjects with organic dystonia or healthy controls.[79]

Overactivity of the limbic system has been demonstrated in patients with psychogenic movement disorders. When presented with fearful and sad faces, patients with psychogenic motor symptoms had increased activity of the amygdala compared to healthy controls.[80] This activity increased over time, with repeated exposure to fearful faces in particular, in contrast to the healthy controls that did not demonstrate this heightened arousal. Studies have also demonstrated increased connectivity between the amygdala and motor preparatory systems during states of emotional arousal,[81] suggesting a connection between this hyperarousal and movements.

Physiologic studies have tried to identify biological markers of stress in patients with psychogenic movement disorders.[6] A 2016 study evaluating the autonomic nervous system found decreased resting parasympathetic activity in psychogenic movement disorders cases versus controls.[82] This lower vagal tone may explain a vulnerability to stressful events in patients with psychogenic movement disorders. Conversely, another study failed to demonstrate a difference in circulating levels of cortisol (a marker of stress) between patients with psychogenic movement disorders and healthy controls.[83] Thus, it may be the patient's response to stress rather than the amount of stress that is impaired in psychogenic movement disorders.

CONCLUSION

Psychogenic movement disorders is a burgeoning field of neurology with increasing clinical reports and research focusing on underlying pathophysiology and treatment approaches. Increasing familiarity with this group of disorders, including physician training and public awareness, will help facilitate diagnosis and treatment. As health care professionals become more knowledgeable and comfortable treating this group of disorders, multidisciplinary treatment programs will hopefully become more accessible to patients. Further understanding of the various risk factors and underlying disease processes may identify biomarkers that help with diagnosis and disease-course monitoring and may lead to the development of more effective therapies.

USEFUL WEBSITES

FND HOPE
FND Hope is a patient advocacy organization for those with functional neurologic symptoms. Website content is provided by patients, caregivers, physicians, and researchers.
fndhope.org

FUNCTIONAL NEUROLOGICAL DISORDER SOCIETY (FNDS)
The Functional Neurological Disorder Society focuses on promoting education, research, and collaboration among health care professionals interested in functional neurologic disorders.
fndsociety.org

FUNCTIONAL NEUROLOGICAL DISORDERS (FND): A PATIENT'S GUIDE
This website is authored by Dr Jon Stone and provides information for patients regarding functional neurologic disorders in general, including psychogenic movement disorders.
neurosymptoms.org

VIDEO LEGENDS

VIDEO 11-1
Psychogenic tremor. Video shows a 51-year-old man with psychogenic tremor exhibiting involuntary movements of the head, neck, shoulders, arms, and trunk, which are intermittent, distractible, variable, and entrainable. The patient had an otherwise normal neurologic examination. The movements were initially severe and constant but progressively became intermittent and episodic, with periods of normalcy in between.
links.lww.com/CONT/A369

VIDEO 11-2
Psychogenic chorea and gait disorder. Video shows a 47-year-old woman with psychogenic chorea and gait disorder exhibiting jerky intermittent tremors and choreiform movements in both of her hands, which are distractible, variable, suggestible, and entrainable. The gait shows the classic features of astasia-abasia. The patient experienced a sudden onset of tremors and imbalance after a revision cervical spine surgery with a waxing and waning course and periods of complete remission. The episodes are triggered by stressful situations such as getting assessed for job fitness.
links.lww.com/CONT/A370

VIDEO 11-3
Psychogenic palatal myoclonus. Video shows a 35-year-old woman with psychogenic palatal myoclonus. She had an acute onset of palatal movements after an uncomplicated rhinoplasty surgery. The repetitive movements of the soft palate completely stop with distraction.
links.lww.com/CONT/A371

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