

# Missing the diagnosis altogether

## Case 1: Bizarre ataxia of rapid onset

**Case:** This 33-year-old woman was admitted to the psychiatry ward, brought by her husband, after rapidly developing a “little girl” speech and inability to remember where she was or what she needed to do. Prior to this admission, she had spent approximately 3 weeks with intractable vomiting, which was reportedly triggered by her remorseful confession to her husband of an extramarital affair. A neurology consultation was called for what were reported as convulsive-type movements in the arms and head, screaming episodes, and a bizarre gait. She had no memory of any of the symptoms forcing her hospital admission. She also complained of feeling that “the ground is moving.” The consulting neurologist was informed of a strong suspicion for a psychogenic nature of these patient’s symptoms and deficits. A brief examination at the bedside sufficed to endorse the psychiatry team’s impression of a psychogenic disorder.

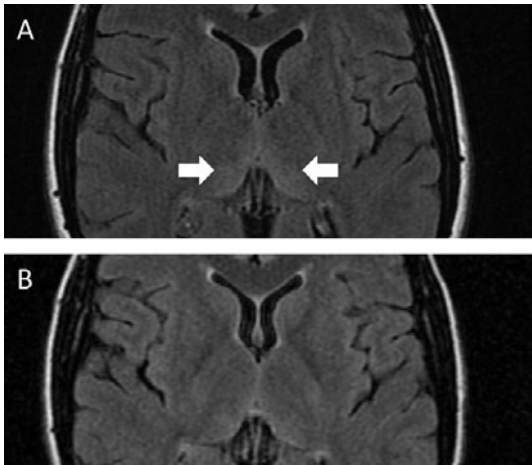
### What important piece of historical information was missing in this case?

Her statement of “the ground moving” demanded further attention and should have questioned a psychogenic disorder. At a neurological consultation 6 weeks after her hospital discharge, she described it as the perception of objects around her moving up and down and, also, sideways. This illusory movement of the environment, typically

due to the presence of nystagmus, is referred to as *oscillopsia*. A careful oculomotor exam had not been performed. In addition, the history of protracted vomiting prior to behavioral abnormalities should have brought to mind nutritional disorders which may induce oculomotor abnormalities, particularly thiamine (B<sub>1</sub>) deficiency.

### What element of the neurological examination would support the diagnosis and how to confirm it?

The oculomotor examination is critical in this case. She exhibited upbeat nystagmus, worse on primary gaze (Video 1). Her gait was wide-based and unsteady, and she resorted to a walker for most of her ambulation. Put together, the rapid development of ataxia and nystagmus in the setting of anterograde amnesia should have suggested the diagnosis of Wernicke’s encephalopathy, a nutritional deficiency of thiamine brought up by protracted vomiting. Upbeat nystagmus is uncommon and has a relatively short differential list, which includes Wernicke’s encephalopathy and paramedian lesions in the medulla and, less commonly, pons and midbrain. The upbeat nystagmus of Wernicke’s encephalopathy should be present in primary position (not just evoked exclusively on upgaze) and may be suppressed or converted to downbeat nystagmus on convergence. Other obvious oculomotor deficits reported in Wernicke’s encephalopathy are limitation of gaze in all directions and ptosis,



**Figure 1.1.** Axial FLAIR brain MRI demonstrating mild increased signal in the medial thalamic region when the patient was admitted to the psychiatry unit (A) with resolution after parenteral thiamine replacement 6 weeks later (B). The mamillary bodies, dorsal midbrain, and periaqueductal region, which are other potential targets in Wernicke's encephalopathy, were normal.

which were absent in this patient. The brain MRI from her admission to the psychiatry ward was more carefully reviewed and demonstrated mild symmetric signal increase in the medial thalamus, which had been missed (Figure 1.1A). Thiamine replacement was initiated first intravenously (500 mg) followed by oral supplementation. The oscillopsia disappeared and the abnormal signal intensity on MRI resolved (Figure 1.1B), though her gait did not return to baseline, possibly due to the delay in initiation of therapy.

**What other condition should have been suspected in this setting?**

With a prodrome of intractable vomiting, followed by ataxia, cognitive or behavioral deficits, and upbeat nystagmus in a young woman having recently confessed to an affair, arsenic poisoning could have also been suspected. Arsenic poisoning

is in the short differential list of conditions potentially presenting with upbeat nystagmus and a picture of Wernicke's encephalopathy. Sampling of hair and nails would have been an important screening test while she was in the psychiatry ward, at a time when a putative arsenic exposure would have been recent enough to remain detectable.

**Discussion:** The sudden onset of an amnestic syndrome complicated by truncal ataxia and upbeat nystagmus following a 3-week period of vomiting should have alerted the consulting neurologist as to the presence of Wernicke's encephalopathy from hyperemesis-induced thiamine deficiency. This disorder typically arises as a result of thiamine deficiency in patients with chronic alcoholism, hyperemesis gravidarum, anorexia nervosa, renal insufficiency, or after the effects of prolonged starvation or IV therapy, and subtotal gastrectomy. The latter may be missed if patients are embarrassed to acknowledge this aspect of their medical history. Also there may be atypical symptoms such as optic neuropathy, papilledema, deafness, seizures, asterixis, weakness, or sensory and motor neuropathy developing as late as 18 months after bariatric surgery complicated with thiamine deficiency.<sup>1</sup> The full triad of eye signs (nystagmus with or without ophthalmoplegia and ptosis), global confusion, and ataxia of gait is seen only in a minority of patients. Pathology shows symmetric demyelination, petechial hemorrhages, and gliosis of midline gray matter areas, such as the cerebral aqueduct, and areas surrounding the third and fourth ventricles. The mammillary bodies are affected in 75% of cases, and the dorsomedial thalamus, hypothalamus, vestibular nuclei, and superior cerebellar vermis in just over 50%. Hence, a normal brain MRI should not detract from initiating thiamine in someone with an otherwise suggestive clinical picture.

In the setting of an abrupt onset such as in this patient, particularly with her "confusional state" and symmetric lesions in the paramedian thalamus, a top-of-the-basilar syndrome due to

occlusion of posterior thalamoperforating arteries could be suspected.

Only a minority of cases diagnosed at autopsy (20%) present with the full clinical triad and MRI findings, and many (approximately 30%) exhibit only mental changes.<sup>2</sup> The diagnosis of Wernicke's encephalopathy rests on the recognition of the clinical picture and response to thiamine. Measurement of blood thiamine levels by high performance liquid chromatography, erythrocyte transketolase activity (a B<sub>1</sub>-dependent enzyme), or pyruvic acid (B<sub>1</sub> is an essential cofactor for the mitochondrial enzymes pyruvate dehydrogenase and  $\alpha$ -ketoglutarate dehydrogenase) can be used to confirm thiamine deficiency.

Established or presumptive Wernicke's encephalopathy is treated with high-potency vitamin B complex. This includes a minimum of thiamine 100 mg IV for 3 days followed by daily B complex with thiamine 250 mg for 5 days or until clinical improvement ceases. Parenteral thiamine replacement improves ocular abnormalities within hours to a few days whereas confusion and ataxia have slower improvement rates. The amnesic syndrome may not recover in roughly 25% of patients, with higher rates when treatment is delayed.

**Diagnosis:** Wernicke encephalopathy

**Tip:** *Sudden onset of "bizarre" gaits and abnormal behaviors do not necessarily mean a psychogenic disorder. A full oculomotor exam of an ataxic and amnesic patient would have revealed the diagnosis and avoided delayed thiamine replacement. Paramedian gray matter lesions, even if suspected to represent a stroke, warrant an empiric trial with thiamine.*

**Case 2: Staggering progression of gait impairment, urinary incontinence, and dementia**

**Case:** This 80-year-old man with a 60 pack-year smoking habit, hypertension, and hypercholesterolemia presented with a 30-month history of step-wise progression of gait impairment, balance

impairment, and memory loss. He had experienced multiple falls and two hospitalizations for sudden-onset freezing of gait. Over the 9 months before presentation, he had become incontinent of urine. His short-term memory had progressively worsened for the past few years. L-dopa, increased to a dose of 600 mg/day, had failed to alleviate his symptoms. The patient resided in a rehabilitation facility where he received assistance with gait and transfers but he was able to bathe, dress, and feed without assistance. His past medical history was positive for hypertension, hypercholesterolemia, and microangiopathic brain disease. He had accumulated a 60 pack-year smoking habit, though he had stopped smoking 40 years before presentation.

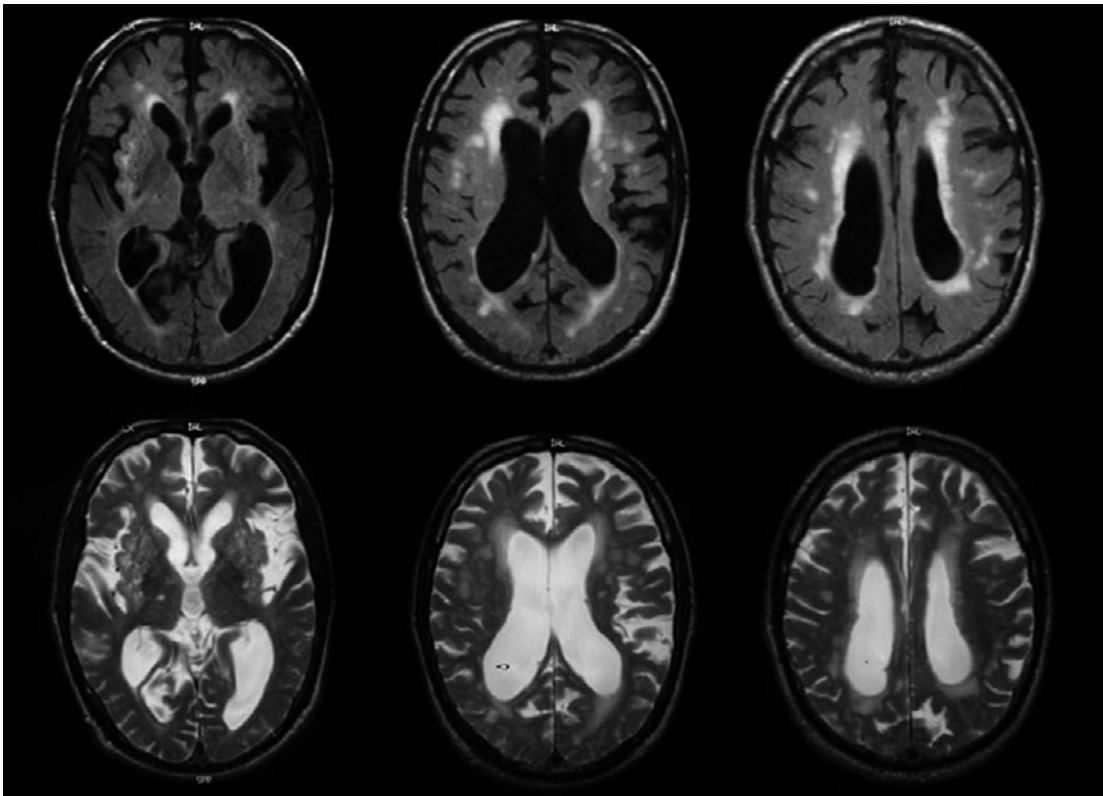
**What diagnosis reflexively sprang to mind to the examiner upon getting this story?**

The step-wise rather than gradual progression along with a couple of stroke-like events in the form of sudden-onset gait impairment occurring in someone with vascular risk factors and heavy smoking history suggested vascular parkinsonism (VaP).

Indeed, the examination that followed did not deter the clinician from this diagnosis. Although his Mini-Mental State Examination score was 25 out of 30, over the course of 2 years, his Mattis Dementia Rating Scale-2 score went from 137 to 92 (abnormal <124) and his Frontal Assessment Battery from 17 out of 18 to 8 (abnormal <13). He had snout and palmomental reflexes. He exhibited a short-stride gait without stooping, shuffling, or festination (Video 2a). He had mild paratonia in the upper limbs but no rigidity in the legs or neck. There was mild hypesthesia to temperature and light touch in a stocking-glove distribution. His postural reflexes were impaired.

**Did the brain MRI support the working diagnosis of vascular parkinsonism?**

Yes – or so the evaluating clinician suspected. The images were interpreted as representing moderate periventricular small-vessel ischemic disease with



**Figure 1.2.** Axial FLAIR (upper row) and T2-weighted (lower row) brain MRI shows increased periventricular and subcortical white matter signal interpreted as suggestive of small-vessel ischemic disease. Mild ventricular dilatation appears roughly proportionate to the apparent degree of cortical atrophy.

mild associated ventricular enlargement, proportionate to the degree of atrophy. These findings were supportive of the clinical diagnosis of VaP (Figure 1.2).

**What is missing in this story?**

A dose of humility and skepticism.<sup>3</sup> The family of this patient relayed his family physician's firm diagnosis of normal pressure hydrocephalus (NPH). The neurologist argued that neither the story nor the MRI findings supported NPH and that this was a "slam dunk" case of VaP. However, the family insisted that they wanted to move forward with treatment for presumed NPH. The

neurologist reluctantly agreed to bring the patient into the hospital for a 3-day external lumbar drainage (ELD) procedure, if only to confirm that there would be no response to cerebrospinal fluid diversion and, therefore, no benefit with a ventriculoperitoneal shunt placement.

In response to the ELD procedure the patient demonstrated substantial improvements in gait velocity (>40% straight walk, >200% in turns) and stride length, and modest improvements in cadence (Video 2b). Cognitive parameters also improved over the pre-ELD measurements. On the basis of these data, the humbled neurologist agreed to the family's request for a ventriculoperitoneal shunt (VPS) placement. However, the patient

**Table 1.1.** Features of gait in NPH/VaP vs. Parkinson’s disease

	NPH (and VaP)	Parkinson's disease
Base	Wide	Narrow
Arm swinging	Normal	Reduced
Sensory cues	No effect	Improve gait
Festination	Rare at any stage	Classic when advanced
Response to L-dopa	Typically nil	Typically marked

succumbed to complications related to a bowel perforation from the peritoneal end of the shunt. An autopsy failed to identify any evidence of vasculopathy, instead uncovering the classical neuropathology of NPH (communicating hydrocephalus with leptomeningeal fibrosis and superficial gliosis of cerebral cortex).

**Discussion:** In reviewing the clinical features on videotape, it is important to note that this patient exhibited the characteristic signs reported in a classic paper by Thompson and Marsden on Binswanger’s disease (defined by head CT without post-mortem confirmation). The most important two signs are (1) a relatively more upright posture and better arm swing that could have been expected for the degree of shortened stride length, and (2) the lack of festination, which is the hastening of cadence at the expense of progressively shortening stride length. Festination of gait is typically seen in Parkinson’s disease but rarely if ever in vascular parkinsonism, and, as this patient demonstrated, the other important cause of “lower body” parkinsonism, NPH (Table 1.1) (Video 2c).

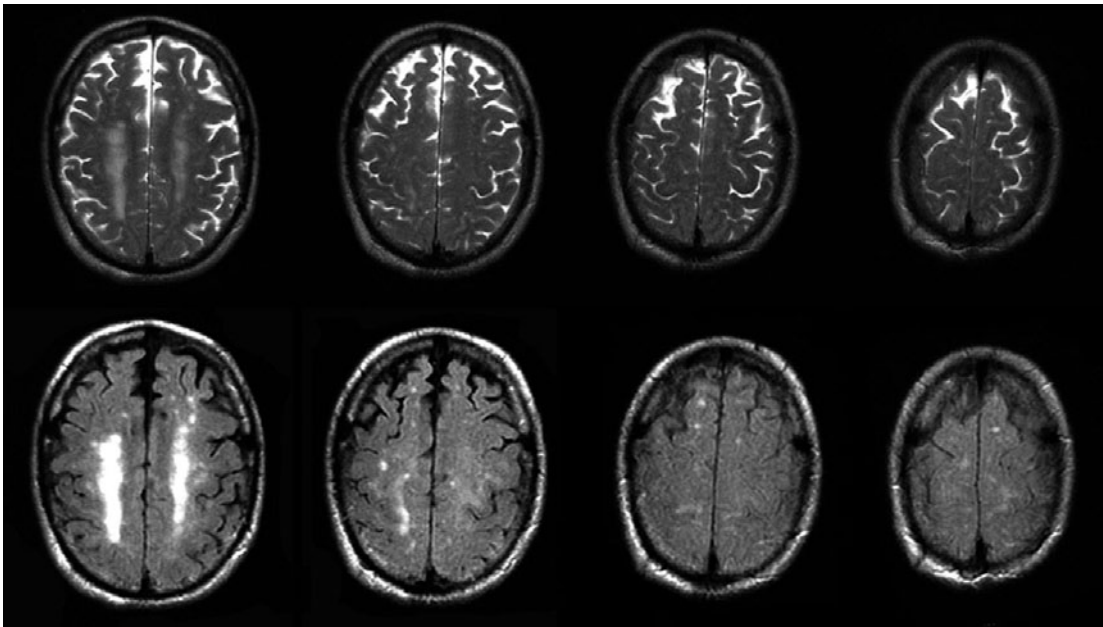
As for the brain MRI interpretation and the implications for patient care, there were two important pitfalls in this case. First, the periventricular/deep white matter hyperintensities were readily equated to small-vessel ischemic disease by the neuro-radiologist and endorsed as such by the neurologist, who adamantly believed the step-wise progression

of deficits in a man with multiple vascular risk factors and episodes of sudden-onset gait freezing could only represent vascular parkinsonism and dementia. It is worth pointing out that the correlation between brain MRI T2-weighted hyperintensities and vascular disease is tenuous and not supported by clinic-pathologic correlations. In fact, post-mortem MRI-pathologic correlations of asymptomatic individuals have shown that periventricular hyperintensities may be associated with myelin pallor, dilatation of perivascular spaces, increased extracellular spaces, and discontinuity of the ependymal lining and subependymal gliosis,<sup>4</sup> opposite to our knee-jerk interpretation of these lesions as indicative of microangiopathy. It is of interest to remember that striatal infarcts are rarely followed by clinical parkinsonism<sup>5</sup> and that clinically normal individuals may have extensive basal ganglia imaging abnormalities.<sup>6</sup> Also, a response to fluid diversion that is necessary for the diagnosis of NPH has been documented in cases of MRI-defined vascular parkinsonism,<sup>7</sup> suggesting that a substantial burden of hyperintense lesions on T2-weighted MRI or FLAIR suggestive of microangiopathy may not be at odds with the operational definition of NPH. The second pitfall is that when any degree of cortical atrophy was suspected, one should ensure that a similar extent of sulci widening is also present in the brain apex to truly rule out an ex-vacuo form of hydrocephalus. In fact, when reviewing this patient’s brain apical cuts in detail, the gyri appeared tight without any sulcal widening suggestive of atrophy (Figure 1.3). The lack of true atrophy in this case was supported by a brain weight confirmed to be a healthy 1400 mg at autopsy.

**Diagnosis:** Normal pressure hydrocephalus

**Tip:** Brain MRI interpretation of “small-vessel disease” and ventriculomegaly is fraught with inaccuracies. Hyperintensities do not necessarily imply vasculopathy. Enlarged sulci with entrapped CSF may give rise to a pseudoatrophic pattern in the brain MRI of patients with NPH. Check the apical cuts when in doubt. Finally, various degrees of ventriculomegaly and abnormal white matter signal





**Figure 1.3.** Axial FLAIR (upper row) and T2-weighted (lower row) brain MRI of the apical sections of the same patient, showing packed gyri with minimal sulcation suggesting an upward pressure of the brain by the hydrocephalus. At this level, there is no imaging support for the suspected atrophy suggested by the review of the lower-level axial images.

*coexist rendering VaP and NPH on a clinical and neuroimaging continuum. Hence, one must be humble about the diagnostic uncertainty and have a low yield to offer lumbar drainage to anyone with a history and examination reasonable for NPH. On the other hand, the patient's outcome emphasizes the need to rigorously evaluate the potential for response to shunting before undertaking this invasive and potentially complicated treatment.*

**Case 3: Excessive rigidity... and other features**

**Case:** A 55-year-old woman developed very slow gait and progressive stiffening evolving over the 16 months prior to her evaluation. Her husband, a physician, noted a wooden and upright posture with poor flexibility, very short steps, and no arm swinging, reportedly affecting both sides equally.

She developed small handwriting and ultimately inability to grab the pen with her fingers, forcing her to give up writing altogether. She complained of inability to lift the arms above the shoulders. She also noted occasionally blurry vision, slurred and slow speech, and excessive drooling in the evenings, as well as urinary urgency, frequency and occasional mild overflow incontinence. Treatment with low-dose clonazepam had improved the neck stiffness.

Examination showed axial-predominant rigidity with larger limitation in range of motion of passive compared to volitional movements, hyperreflexia, and easy elicitation of what were interpreted as leg spasms (Video 3a). There were no oculomotor or postural impairments. These features were interpreted as highly suggestive of the stiff-person syndrome (SPS). Anti-GAD antibodies were requested and the dose of clonazepam was increased sequentially to a target of 1 mg four times a day.

What features were overlooked?

The greater slowness and amplitude decrement of finger tapping on the left and the reduction in ipsilateral arm swinging while walking were important features overlooked in the early assessment. Indeed, upon re-evaluation 3 months later, she was experiencing excessive daytime sleepiness with the increased dose of clonazepam and acknowledged that her left side was more affected than the right. This brachial asymmetry, which was present early on, had been overlooked in favor of the more striking cervical rigidity. This latter feature, and the reported early response to clonazepam, dominated the early clinical rationale for SPS at the expense of other features that strongly argued against it, such as lack of hyperlordosis and normal range of truncal flexion. The patient was then given a trial of L-dopa and had a marked response at the initial dose of 100 mg three times a day, with normalization of handwriting and substantial reduction of the rigidity (Video 3b). Over the subsequent 4 years she has retained an excellent motor response with an overall increase to 150 mg four times a day, while developing non-troublesome peak-dose dyskinesias and wearing off.

**Discussion:** When the word “stiffness” is volunteered by a patient with an akinetic-rigid phenotype affecting the range of movement of axial muscle groups, it may be easier to argue in favor of SPS and neglect the more common postural instability-gait disorder phenotype of Parkinson’s disease.<sup>8</sup> This diagnostic pitfall resulted from two shortcuts in reasoning: the “framing effect,” being swayed by certain aspects of the case more than others; and a “representativeness heuristic,” that is, ignoring prior probabilities and base rate frequencies of the different clinical findings. The clinician thought about a zebra (SPS) when hearing a horse’s hoof beats (PD). Of course, the axial involvement in SPS is typically lumbar rather than cervical and is often associated with lumbar lordosis. Along these lines, the discrepancy between the voluntary and passive range of motion was not properly

interpreted. This patient exhibited clear difficulty with passive rotation of the head in all directions, yet the patient could voluntarily move her head to the extreme positions, albeit slowly. In SPS, rigidity affects the passive and volitional range of movements just about equally. Finally, the appropriate diagnosis would have been made at the initial visit if the clinician had properly focused on the asymmetry of the patient’s appendicular bradykinesia with amplitude decrement during finger tapping and reduced ipsilateral arm swing when walking. Of course, an earlier L-dopa trial would have clinched the diagnosis and prevented a misdirected work up and early treatment.

Incidentally, besides SPS, primary lateral sclerosis (PLS) and some forms of dystonia may present with severe poverty of movement (Video 3c) which may suffice to suspect them as part of the akinetic-rigid syndrome. Although these disorders are not formally listed in the differential diagnosis of parkinsonism,<sup>9</sup> their excessive muscle hyperactivity (which, in fact, defines SPS and dystonia as hyperkinetic disorders) leads to reduced movements (an ostensibly hypokinetic outcome) and subsequent mischaracterization as parkinsonian.

**Diagnosis:** Parkinson’s disease (akinetic-rigid variant)

**Tip:** *Rigidity in PD may restrict the passive but not spontaneous range of motion. Such discrepancy is not present in SPS, with which this case was confused. Response to L-dopa is critical when doubting the parkinsonian nature of anyone with excessive rigidity.*

Case 4: Jerky hemifacial spasms

**Case:** This 59-year-old man presented with a 6-month history of continuous left eye blinking, upper face twitching and facial discomfort without pain. He had felt similar difficulties 3 years previously which resolved spontaneously after 3 months. The twitching was noted as having both tonic and fine myoclonic components that attenuated or disappeared during volitional tasks (Video 4a). There

were no other abnormalities on the neurological or general examination. The patient was referred for consideration of botulinum toxin injections under the suspicion of hemifacial spasm (HFS).

**Why should one not readily accept the diagnosis of HFS?**

A subtle myoclonic component can be present at the earliest stages of HFS, usually in the periorbital region, but once spread over the ipsilateral hemiface, the movements evolve into a mixture of tonic and myoclonic jerks rather than pure myoclonic movements. Though this patient’s movements disappeared during speech and grinning, as demonstrated in the video, the (myo)clonic component was prominent. An epileptic disorder was suspected. An EEG while the patient was experiencing clinical facial twitching identified frequent epileptiform discharges with right inferior frontal maximum, corresponding to the facial homuncular region. Irregular epileptiform discharges or rhythmic/semi-rhythmic focal slowing over the right inferior frontal head region was documented during prolonged video/EEG monitoring while the patient was experiencing clinical symptoms. Carbamazepine provided almost complete resolution of the facial twitching (Video 4b). Transient recurrences of the facial twitching were documented only during periods when the patient discontinued the drug.

**Discussion:** Not all hemifacial spasms are HFS. What is typically considered a peripheral movement disorder can also be, as in this case, an epileptic phenomenon—epilepsia partialis continua. The epileptic nature of these movements was initially missed for three main reasons. First, it disappeared during sleep (though this can be the case in some forms of focal epilepsy). Second, the fine myoclonic movements were likely interpreted as post-paralytic facial myokymia, which commonly precedes or accompanies HFS.<sup>10</sup> And third, their disappearance with speech and other orofacial movements as may occur in some forms of dystonia,<sup>11</sup> assuming HFS may have been confused with focal dystonia. The

motor phenomena of focal seizures are typically not suppressed by volitional tasks.

Suspected as having isolated HFS, this patient had been referred to a movement disorders clinic for chemodenervation with botulinum toxin. However, such therapeutic strategy would not have addressed the underlying pathophysiologic mechanism, which was elucidated with EEG. With appropriate attention to phenomenologic detail, the focal spasms combining jerky and tonic features typical of HFS may be distinguishable from EPC-induced facial epileptic movements.<sup>12</sup>

**Diagnosis:** Epilepsia partialis continua mimicking hemifacial spasm.

**Tip:** *Atypical behaviors departing from the mixed myoclonic and tonic movements of HFS raise the possibility of an epileptic etiology. EEG should be considered in patients with isolated facial or appendicular movements when repetitive or intermittent myoclonus is present.*

**Case 5: Paroxysmal finger posturing**

**Case:** This 66-year-old seamstress complained of episodes of left thumb adduction and index finger extension for the last 6 months. The first such episode occurred suddenly as she was sowing a button, but subsequent episodes happened without a specific trigger. The posturing was invariably painful, lasting about 5 minutes. Their frequency had increased to about one per day. She once had cramping and stiffening of the right biceps, which “locked” her arm in an unusual position. She was referred to our attention as hand dystonia, and to consider treatment with botulinum toxin injections.

**What should dampen the enthusiasm for chemodenervation?**

Three main reasons: its episodic nature, their short duration, and the accompanying pain. Pain is rarely a manifestation of dystonia in any body





**Figure 1.4.** Intermittent painful hand posturing in a 66-year-old diabetic seamstress. These episodes consisted of rapid-onset painful thumb adduction, slight metacarpophalangeal flexion, and interphalangeal finger extension. These painful episodes lasted less than 5 minutes and disappeared abruptly.

distribution other than the neck. Paroxysmal posturing associated with pain can be thought of as psychogenic in nature,<sup>13</sup> but she had none of the episodes at the clinic, which is typically a setting when psychogenic disorders express in full bloom. In fact, she had to demonstrate what the hand posturing looked like when it occurred (Figure 1.4) (Video 5).

**Is the history more exciting than the exam?**

Nothing on the exam was remarkable, except for mild decreased sensation to temperature and vibration in the distal legs. She was known to have hypertension, diabetes mellitus type II, thyroid disease, chronic obstructive pulmonary disease, and obstructive sleep apnea. She was a former smoker. She was taking multiple medications for the above problems as well as vitamin D and calcium. Hence, her medical history was more intriguing than the exam and could shed light on the nature of the problem.

**What does the mimicked hand posturing suggest?**

Paroxysmal painful posturing of the left thumb and index finger of sudden onset and offset should remind the reader of muscle cramps rather than

dystonia, which was the initial diagnosis. The more specific combination of painful contractions of finger muscles resulting in thumb adduction, metacarpophalangeal flexion, and interphalangeal finger extension, should be recognized as tetany or carpopedal spasm (sans *pedal* [foot]; isolated carpal spasm in this case), which is a peripheral neuromuscular disorder not to be confused with dystonia.<sup>14;15</sup> In the absence of this particular topographical distribution, other conditions worth considering are tonic spasm of multiple sclerosis, neuromyotonia, and Lambert-Brody syndrome (exercise-induced pain, stiffness, and cramping in arm and leg muscles associated with impairment of relaxation).

In this setting, metabolic disorders of calcium, potassium, and phosphorus need to be examined. Our patient's ionized calcium was normal, but PTH and phosphorus were high and magnesium was low. Further investigations demonstrated these changes to be due to previously unrecognized renal insufficiency, likely a complication of her diabetes mellitus. Correction of the laboratory abnormalities and tighter management of her diabetes and renal insufficiency led to complete resolution of the tetany episodes.

**Discussion:** Tetany is classically triggered by hypocalcemia but hypomagnesemia as well as metabolic and respiratory alkalosis can also induce it.<sup>16</sup> Alkalotic states are capable of inducing tetany by binding calcium to proteins, thus lowering ionized calcium. In a paradoxical twist, metabolic alkalosis can also induce hypokalemia, which protects against tetany in the setting of hypocalcemia.<sup>17</sup> Correction of hypokalemia alone can precipitate hypocalcemic tetany.

Hypoparathyroidism is the most common cause of hypocalcemia, often as a complication of thyroid surgery or radical resection of head and neck cancers. It is confirmed when the level of parathyroid hormone (PTH) is low or inappropriately normal. Chronic hypoparathyroidism may express with *basal ganglia calcifications*.<sup>18</sup> This was definitely not the case here. Our patient's ionized calcium was normal, PTH was high, and she was

found to have high phosphorus and low magnesium underlying early renal insufficiency, likely complications of her diabetes mellitus. When PTH is high, low serum phosphorus indicates *vitamin D deficiency or resistance* (rickets) but high phosphorus, as in this case, can be seen in *pseudohypoparathyroidism* (sporadic or autosomal dominant [Albright's osteodystrophy]), rhabdomyolysis, tumor lysis syndrome, phosphate ingestion, and renal insufficiency.<sup>19</sup> The latter was discovered as the reason of her decompensation. It is possible that her (pseudo) normocalcemia may have been the result of concurrent intake of vitamin D and calcium.

The peripheral nerve hyperexcitability expressed spontaneously as tetany can also be appreciated on exam through the elicitation of the classic *Chvostek's sign* (facial contraction upon tapping the skin over the facial nerve, in front of the external auditory meatus)<sup>18</sup> and *Trousseau's sign* (elicitation of the same carpal spasm seen in our patient when a blood pressure cuff on the patient's arm is inflated 20 mmHg above systolic blood pressure for 3–5 minutes). The management of this patient will hinge on appropriate care by a diabetes specialist and nephrologist. Certainly, antidystonic drugs or botulinum toxin should not be part of her treatment. A neurologist need be mindful that iatrogenic hypocalcemia may result from such drugs as phenobarbital, alcohol, phenytoin, carbamazepine, foscarnet, and cimetidine.

**Diagnosis:** Tetany or carpal spasm

**Tip:** *Posturing does not equal dystonia. When posturing is paroxysmal, transient, and painful, tetany should be suspected and the underlying electrolytic or acid-base disorder investigated.*

**Case 6: Psychogenic tremor until proven otherwise**

*Contributed by Dr. Francesca Morgante, Università di Messina, Italy*

**Case:** This 56-year-old man developed a right-hand tremor and right leg tremor rather abruptly during

a financially stressful period, when he was trying to sell his house. This tremor interfered with some activities, including handwriting, to an extent that the referring physician was suspicious about a non-organic origin. Clonazepam, pramipexole, and ropinirole had been tried to no avail. There was a history of major depressive disorder with psychosis (at least 5 years prior to the onset of the movement disorder). His sister and brother suffered from a predominantly postural bilateral hand tremor of unclear nature. Examination showed a right-hand tremor at rest, on posture, and during action, which attenuated or disappeared with passive manipulation or finger tapping of the contralateral arm (Video 6a).

**What features are unusual for psychogenic tremor?**

Although the history, as presented, suggested a psychogenic disorder (abrupt onset, disproportionate disability to the apparent severity of the tremor) and the tremor appeared to be of similar amplitude at rest and on action, several aspects to the phenotype argued against a psychogenic etiology. First, the tremor was intermittently disrupted but never fully entrained or suppressed. Second, the intermittent right foot tremor is supported on the ground laterally rather than anteriorly, as is typical in psychogenic foot tremor (Video 6b). Third, there is a pause of the tremor on initial posture holding and a replacement of a predominantly flexion-extension tremor to a predominantly pronation-supination tremor. Finally, attention to the tremor reduces, rather than increases its amplitude.

**Which alternative diagnosis and diagnostic strategy is worth pursuing?**

The features listed above are highly suggestive of tremor-dominant PD. The foot involvement, particularly when unilateral, is more supportive of PD than of any other tremor disorder, excepting psychogenic, whereby a constellation of features make it highly distinctive (as shown