Idiopathic hypoparathyroidism in a blind, deaf, elderly woman with dementia

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DEMENTIA among elderly persons is a growing sociomedical problem. An estimated 10% to 15% of persons older than age 65 may be cognitively impaired, as may up to 76% of all patients in nursing homes.[1] In addition, in one study, dementia was found to have been misdiagnosed in 30% to 50% of cases when complete follow-up was obtained 5 to 10 years after the initial evaluation. The four most common causes of reversible dementia are medications, depression, metabolic disorders, and central nervous system lesions.[1,2]

Alzheimer's disease, the most common cause of progressive dementia, remains a clinical diagnosis of exclusion, and other, potentially correctable causes should always be sought and ruled out.[2] In addition, the presumed cause of the dementia must be reassessed periodically to detect any occult superimposed illness. Elderly demented persons are at considerable risk of undetected but treatable illness as a result of what Larson[1] has called "triple jeopardy": inability to provide an accurate history, social isolation (which may effectively remove a person from diagnostic surveillance), and likelihood of multiple illnesses, some of which may be inapparent or may present atypically.

Idiopathic hypoparathyroidism is a rare metabolic disorder primarily affecting children and young adults. Characterized by seizures, tetany, and cataracts, it can be readily reversed by correcting the serum calcium level.[3–9] We present a case of multifactorial dementia and idiopathic hypoparathyroidism in an elderly woman.

CASE HISTORY

A 74-year-old blind, deaf, and mute white woman presented for treatment of "visual hallucinations" and altered mental status. Her blindness had been caused by glaucoma, and both lenses had been surgically removed because of dense cataracts. She had been deaf since an early age as the result of a pertussis infection. She was able to communicate by signing and feeling other people's signs with her hands.

The patient's family had noted changes in her mental status and episodes of emesis and urinary retention over the past year. She had been admitted to another hospital approximately 10 months previously because of ileus, electrolyte imbalance, renal insufficiency with acute urinary retention, anemia, and acute delusional disorder. The delusional disorder resolved approximately 4 months later; subsequently the episodes of confusion began to recur. Laboratory evaluations at the other hospital revealed low serum concentrations of calcium and

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mid-molecule parathyroid hormone. The patient had been given vitamin D and calcium carbonate supplements (500 mg of calcium four times a day). However, compliance had been an issue, and her children were not sure how much she was actually taking.

Beginning several weeks before this hospital admission, the family would find the patient signing to herself, as if in a conversation. When asked, she would sign that she thought someone was there. In addition, her daughter described "bizarre seizures" in which the patient would extend all four extremities and jerk. This was followed by spontaneous, involuntary urination. The patient would begin to sign again approximately 2 minutes after the episode, but it was not clear whether she actually lost consciousness. The family also reported that the patient had daily spells of disorientation to time and place. She had been to a local emergency room several times because of these episodes, but no clear cause for them was found.

The patient had a history of hypothyroidism (for which she received thyroid hormone replacement therapy), hypertension, arrhythmias, and seizures due to electrolyte imbalances. She had undergone multiple extractions of calcium deposits in all fingers and toes, an implantation of a prosthetic joint in the second finger of her left hand, and a pacemaker insertion because of a Mobitz type II heart block.

TABLE
RESULTS OF LABORATORY TESTS ON ADMISSION

Test	Result	
Hemoglobin	10.2	g/dL
Hematocrit	31	%
Calcium	7.9	mg/dL
Phosphorus	4.4	mg/dL
Magnesium	2.0	mg/dL
Alkaline phosphatase	81	IU/L
25-Hydroxyvitamin D3	46	ng/mL
1,25-Dihydroxyvitamin D3	29	pg/mL
Parathyroid hormone (intact)	< 4	pg/mL
Urinary cyclic adenosine monophosphate (cAMP)	0.7	µmole/g of creatinine
Blood urea nitrogen (BUN)	61	mg/dL
Creatinine	4.6	mg/dL
Vitamin B_{12}	875	pg/mL
Folate	7.3	ng/mL
Iron	37	µg/dL
Total iron-binding capacity	168	µg/dL
Percent iron saturation	22	%
Ferritin	180	ng/mL
Thyroid-stimulating hormone	12.3	U/mL
Free thyroxine (T4U)	0.86	ng/dL
Free thyroxine index	10.2	%
Triiodothyronine (T3)	65	ng/dL

Physical and laboratory examination

The patient had severe orthostatic hypotension: her blood pressure was 130/70 mm Hg supine but only 60 mm Hg (palpated, systolic) standing. The skin was unremarkable. Her pupils were irregular and did not react to light. The tympanic membranes had moderate scarring. The thyroid was not enlarged, and the lungs were clear. Cardiac examination revealed normal heart sounds with occasional ectopic beats and a grade 1 of 6 systolic murmur. The abdominal examination was unremarkable. The patient was oriented to time but not to place. Cranial nerves V and VII through XII were intact. The extraocular muscles were difficult to evaluate but appeared intact. Torsional nystagmus was noted on fixed gaze. The deep tendon reflexes were symmetric and reduced in the lower extremities. Babinski's reflex was absent.

Her serum calcium concentration on admission was 7.9 mg/dL; other initial laboratory results are shown in the *Table*. Results of a cortisol and cosyntropin stimulation test were normal. The electroencephalogram was unremarkable. A computed tomographic scan of the head revealed coarse diffuse intraparenchymal calcifications within the basal ganglia, thalamus, both cerebellar hemispheres, and the gray-white junction (*Figure*). Computed tomography of the orbits confirmed the absence of both lenses. The electrocardiogram revealed a prolonged Q-T interval.

Hospital course

On the first day, we started fluid resuscitation (dextrose 5% and saline 0.45% at 100 mL/hour) and calcium supplementation (calcium carbonate 4 g by mouth daily). Given her history of congestive heart failure, she was not given any normal-saline boluses, which could potentially drive down her calcium level even more. Nevertheless, by the fourth day her calcium level had further decreased to 6.4 mg/dL. We therefore gave two ampules of calcium glucon-

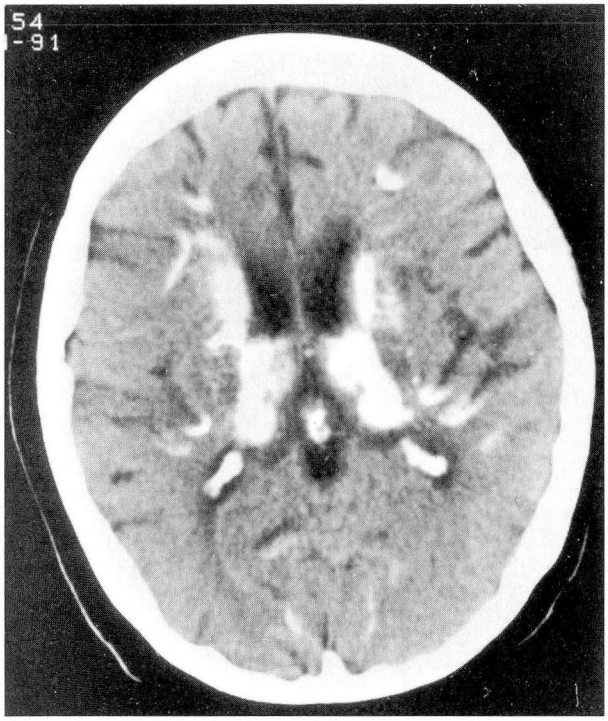

FIGURE. Computed tomographic scan showing coarse calcifications in the basal ganglia, thalami, and cerebellar hemispheres bilaterally. Diffuse, linear calcifications are present at the gray-white junction.

ate and started calcitriol (Rocaltrol) 0.25 μg by mouth four times a day. She was not experiencing any acute or life-threatening events secondary to her hypocalcemia to require emergent calcium replacement. Her blood urea nitrogen (BUN) and creatinine levels returned to normal (BUN 16 mg/dL, creatinine 0.6 mg/dL) after rehydration; her calcium level increased to 7.8 mg/dL 48 hours after the addition of calcitriol. At discharge (9 days after admission and 4 days after the start of calcitriol) her calcium level was 9.1 mg/dL.

During her hospital stay, the patient would sign inappropriately and had multiple spells of disorientation. However, she did recognize her primary physician by feeling the physician's ring. (She signed "doctor" each time she touched the ring.) She was discharged to the care of her family for observation of her mental status; her discharge medications included vitamin D (calcitriol 0.25 μg four times a day) and calcium supplements (calcium carbonate 1 g twice a day).

On follow-up 3 months later, the patient no longer exhibited signs of dementia, disorientation, or the seizures described above. Because she was doing well and was able to continue living with her family, her care was transferred to a local physician.

DISCUSSION

Hypoparathyroidism most often occurs as a complication of thyroid or parathyroid surgery. Idiopathic and pseudohypoparathyroidism (Albright hereditary osteodystrophy) are both rare. In all three forms, blood levels of calcium are low (< 8.5 mg/dL) and phosphorus levels are high (> 4.5 mg/dL). In contrast, parathyroid hormone (PTH) levels are low (< 10 pg/mL) in surgical and idiopathic hypoparathyroidism but high in pseudohypoparathyroidism, which is also characterized by bony abnormalities.

Idiopathic hypoparathyroidism

Idiopathic hypoparathyroidism typically occurs in the young; the mean age at onset is 25 to 35 years. For this diagnosis to be made, there must be no evidence of renal insufficiency, rickets, osteoporosis, or sprue.[3,5]

Neurologic manifestations. Idiopathic hypoparathyroidism is characterized by tetany and seizures.[3,5,7] Although psychiatric manifestations occur, they are not usually the presenting feature except in the elderly, in whom dementia appears to be a prominent feature.[8,9] In fact, all of the few reported cases in the elderly have been associated with psychiatric manifestations.[4,7]

Approximately 70% to 86% of all patients with idiopathic hypoparathyroidism experience seizures, compared with only 30% in all other forms of hypoparathyroidism.[5,7] Tetany occurs in approximately 70% of all patients who have seizures due to hypoparathyroidism.[3] These seizures are frequently misdiagnosed as hysterical, as they may be precipitated by emotion and are difficult to control with anticonvulsants.[3] Trousseau's and Chvostek's signs are present in only about 50% of patients.

More than 40% of cases of all forms of hypoparathyroidism are associated with an organic brain syndrome that may include dementia or delirium in the absence of tetany or seizures. Up to 10% of patients with idiopathic hypoparathyroidism suffer dementia.[7,10] In elderly patients, the psychiatric disturbances are sometimes the first and only manifestation observed, but the typical tetany and seizures

can occur later.[4,10] In idiopathic hypoparathyroidism, intellectual impairment is the most commonly observed psychiatric disturbance (30% of cases), followed by organic brain syndrome (25%). Although patients with idiopathic hypoparathyroidism commonly improve with vitamin D and calcium supplementation, not all recover.

In contrast, in surgical hypoparathyroidism, organic brain syndrome is the most common psychiatric manifestation (observed in 50% of cases), impaired intellect is rarely found, and most patients recover with treatment. Psychosis is a prominent feature of surgical hypoparathyroidism but is almost never seen in idiopathic or pseudohypoparathyroidism.[10,11] Depression, on the other hand, is a consistent feature of all three forms, along with anxiety and irritability.[6,11]

Basal ganglia calcifications. Basal ganglia calcifications and cataracts are also common in idiopathic hypoparathyroidism, even though serum calcium concentrations do not correlate with cerebrospinal fluid calcium levels.[10] Meunter and Whisnant[12] reviewed the literature and found 66 cases of extrapyramidal motor deficits in association with basal ganglia calcification or hypoparathyroidism. Of these patients, 51 had basal ganglia calcifications, and of the 51, eight had idiopathic hypoparathyroidism, seven of whom recovered with treatment. The same investigators also presented a case series of 38 patients at the Mayo Clinic who had bilateral symmetrical basal ganglia calcifications, 14 of whom had hypoparathyroidism of various causes. Twenty-two patients in this series had neurologic deficits, which reversed with treatment in five of them. The investigators concluded that basal ganglia calcifications were only a part of a complex neurological syndrome and postulated that basal ganglia calcification and hypoparathyroidism occur as independent manifestations of a single pathological process; ie, that the same noxious process attacks both the parathyroids and the basal ganglia simultaneously. Surgical hypoparathyroidism is rarely associated with basal ganglia calcifications, probably because of prompt recognition and treatment, whereas idiopathic hypoparathyroidism typically goes undiagnosed for years.[9,12]

Basal ganglia calcification is also found in other diseases and is an incidental finding at 68% to 77% of autopsies. It has a high incidence and intensity in lethargic encephalitis, carbon monoxide intoxication, anoxia, tuberous sclerosis, toxoplasmosis, and hypothyroidism, and is rarely familial. Typically, patients with symptoms of basal ganglia calcification present with slowly progressive hyperkinesis along with ataxia, dysmetria, and cerebellar speech disturbances. If the internal capsule is involved, hemiplegia or paraplegia may evolve.

CONCLUSIONS

In elderly patients presenting with mental status changes, cataracts, and basal ganglia calcifications visible on computed tomography, it is imperative to exclude hypoparathyroidism, given its potential reversibility with vitamin D and calcium supplementation. Psychiatric symptoms usually do not improve until 1 to 4 weeks after calcium levels return to normal and take another 3 to 4 weeks to resolve.[10] There have been case reports of complete recovery in 1 to 3 days with 1-alpha-hydroxycholecalciferol, but current recommended therapy is with vitamin D and calcium, which take 4 to 18 months to produce complete resolution of all symptoms.[6,8,10]

Our patient's medical care was complicated by multiple sensory deprivation. Peters et al[13] described the possible synergy between hearing impairment and other diseases, but only in "irreversible dementias." Our patient had both visual and hearing loss and was able to communicate only by signing. It is difficult to determine whether any of her dementia was related to an inability to communicate effectively, or whether the hypoparathyroidism caused the dementia and the concomitant sensory loss accelerated or attenuated it.

Dementia causes suffering not only to those afflicted, but to society as well. The expense for long-term care alone has been estimated to be $40 billion per year.[2] Our patient illustrates the need for the most accurate diagnosis possible. Her family had been advised to commit her to a nursing home, which was unnecessary after the underlying idiopathic hypoparathyroidism was treated. In addition, health personnel and family members provided a supportive environment that somewhat alleviated her sensory deprivation. Through close observation, family counseling, and appropriate medical management, we were able to avoid institutionalization, prevent seizures and tetany, and restore cognitive function.

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