Brain Calcinosis and Seizures in an Adolescent Boy

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Introduction

Cerebral calcification was first described in 1935 by Kasanin and Crank on skull radiographs. With the advent of computed tomography (CT), it became the modality of choice for the detection of cerebral calcification. Cerebral calcification has been associated with many clinical disorders including sporadic and heredofamilial entities.[1] Hypoparathyroidism, an endocrine disorder, is among the most important treatable causes of cerebral calcification.[2] In this article, we report the case of a young boy with hypoparathyroidism and extensive cerebral calcifications who presented with seizures to the emergency department.

Clinical Presentation

A 14-year-old boy presented to the emergency department with a history of altered behavior for 2 weeks and generalized tonic–clonic seizures since 1 day. According to his mother, he was in his usual state of health 2 weeks earlier when he was noted to be withdrawn, somnolent, and with altered eating habits. He had also been frequently complaining of generalized myalgias. Other complaints included multiple self-limiting episodes of diaphoresis and diplopia. Three hours prior to his admission in our hospital, he developed carpopedal spasm at home, followed by 2 episodes of generalized tonic–clonic seizures. Each episode of seizure lasted for about 30 to 60 seconds. The seizures had no prior aura. The patient also had an episode of high-grade febrile illness in the preceding 2 weeks of presentation, which was treated with oral antibiotics. On direct questioning, his family revealed that he had a long-standing history of aches and pains. There was no family history of seizures, hypoparathyroidism, or any other known endocrine problem.

Physical examination revealed a well-nourished adolescent boy with no dysmorphic features. His temperature and blood pressure were within normal limits. However, he had a bradycardia of 60 beats per minute. Initial neurological examination revealed an alert child, who was oriented to time, place, and person. However, hypertonia, hyperreflexia, and up going planters were noted on a more detailed neurologic examination. These appeared to be representative of the postictal state. Chvostek's or Trousseau's signs were not present at that time. Subsequent neurological, motor, as well as systemic examinations at serial intervals were within normal limits.

A panel of laboratory investigations was ordered, revealing a normal complete blood count, normal serum electrolytes, normal serum glucose, low total serum calcium (4.6 mg/dL), high serum phosphorus (9.5 mg/dL), normal serum creatinine, normal serum magnesium, and normal serum vitamin D levels.

Computed tomography scan of the head showed diffuse cerebral calcifications in the basal ganglia, thalami, dentate nuclei, and gray and white matter junction in both cerebral lobes (Figure 1). His electroencephalograph (EEG) was unremarkable. His electrocardiograph (ECG) showed no abnormality apart from bradycardia.

Further Course

Parathyroid hormone (PTH) level was checked; it was less than 3 pg/mL (normal = 16-87 pg/mL). The patient was started on intravenous calcium supplementation, phosphate binder, and vitamin D supplementation. His subsequent calcium and phosphorus levels were within normal limits. Follow-ups in the clinic have not shown any derangement in calcium and phosphorus levels to date. Also, the child did not have any further episodes of seizures. On examination, he has been found to be developmentally appropriate for his age, with no evidence of

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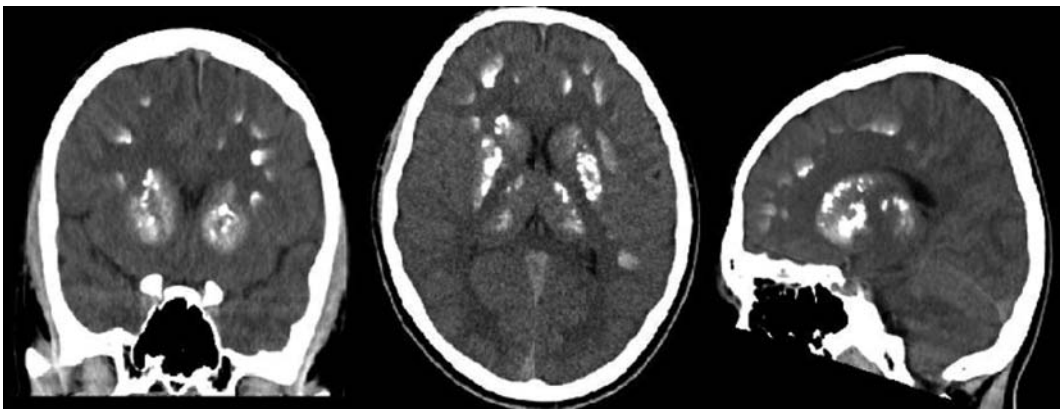

Figure 1. Different views of the computed tomography scan of the head showing extensive cerebral calcifications in a patient with hypoparathyroidism

any neurologic deficit. His myalgias have also significantly improved after institution of therapy.

Discussion

The pathogenesis of hypoparathyroidism can arise from a multitude of processes, but primarily it can be due to impaired synthesis or secretion of PTH and PTH receptor defects. Using the textual information available from different sources,[3,4] a schematic diagram of the classification of hypoparathyroidism was drawn (see Figure 2). Idiopathic hypoparathyroidism is diagnosed after the exclusion of all pertinent pathologies.

The hypocalcemia observed in hypoparathyroidism can manifest as Chvostek or Trousseau sign, tetany, seizures, and cardiac failure.[5,6] Central nervous system calcifications have been noted in association with hypoparathyroidism. These calcifications have been attributed to hypocalcaemia and are a function of its duration. The underlying mechanism is currently unknown but is thought to be due to chronic abnormality of intracellular and extracellular calcium and phosphorus concentrations. In the basal ganglia, this possibly results from a vascular degenerative process initiated by calcium crystals.[2] The most common site for calcification is globus pallidus of the basal ganglia, but it can also affect frontal cortex, subcortical white matter, thalamus, and cerebellum. Other neurological manifestations can include mood swings, personality changes, choreoathetoid movements, Parkinsonism, dystonia, hemibellismas, oculogyric crisis, and psychosis. Increased intracranial pressure, papilledema, can also be present.[3,7,8]

EEG of patients with hypoparathyroidism may show bilaterally synchronous sharp and slow wave discharges of unusually long duration and has been termed *parathyroid epilepsy*.[9] Severe hypocalcaemia may be associated with bradycardia and prolonged Q-T_C on ECG; more extensive cardiomyopathic changes are occasionally seen along with elevated cardiac enzymes.[3,10] In our patient, EEG did not show any notable abnormality, and ECG was also normal except for the bradycardia.

Through this case report, we wish to highlight certain important points. The diagnosis of hypoparathyroidism may be easily missed in children and adolescents. Nonspecific myalgias can simply be brushed off as growing bone pains in this age group. In the case of our patient, muscular pains and cramps were ignored or treated symptomatically and erratically with analgesics without further investigations.

On presentation to the emergency department, his new-onset afebrile seizure raised the suspicion of an intracranial pathology especially because of a normal initial workup. Neuroimaging was ordered for clearer delineation of the pathology. However, the picture was certainly confounded by the history of a nonspecific febrile illness in this patient in the recent past. Although a lumbar puncture test was not carried out because of weak clinical suspicion, it would have been prudent to rule out meningitis in a patient presenting with new-onset seizures if the clinical picture so dictated. We also ruled out hypoglycemia as well as serum electrolyte abnormalities before proceeding with further testing.

The discovery of diffuse cerebral calcinosis in our patient on CT scan paved the way for testing of serum calcium and PTH levels. This workup ultimately revealed

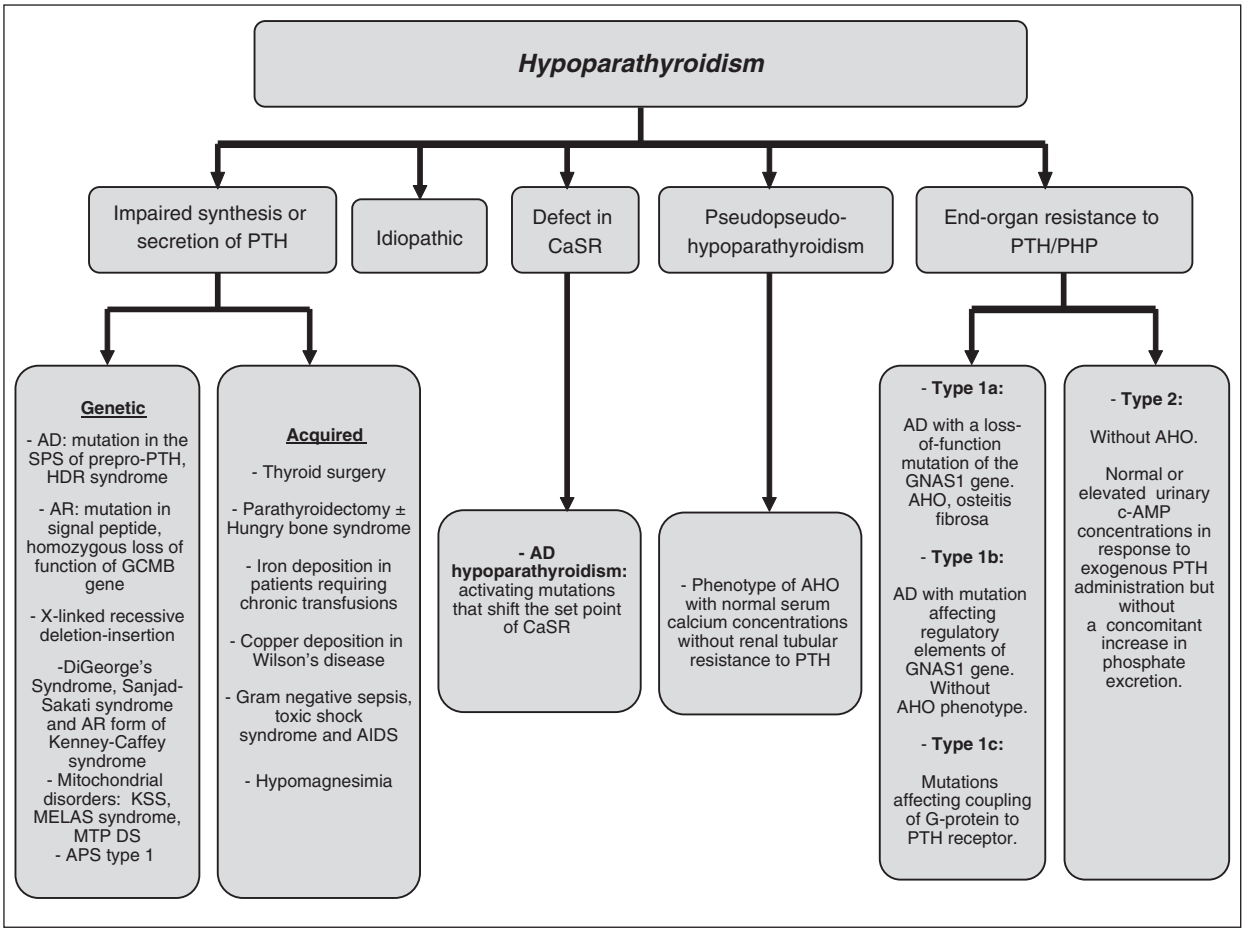

Figure 2. Classification of hypoparathyroidism. PTH = parathyroid hormone; CaSR = calcium sensing receptor; PHP = pseudohypoparathyroidism; AD = autosomal dominant; AR = autosomal recessive; HDR = hypoparathyroidism, sensorineural deafness, and renal dysplasia; KSS = Kearns Sayre syndrome; MELAS = mitochondrial encephalopathy, lactic acidosis, and stroke-like episode; MTPDS = mitochondrial trifunctional protein deficiency syndrome; APS = autoimmune polyglandular syndrome; AHO = Albright's hereditary osteodystrophy.

the underlying diagnosis. Hypoparathyroidism must be included in the differentials of young patients presenting with afebrile seizures to the emergency department in addition to the more common etiologies. We agree that it is worthwhile and cost effective to exclude other commoner etiologies such as hypoglycemia, central nervous system infection, and electrolyte abnormalities when considering such seizures. But a pediatric emergency physician should also keep this endrocrine entity in mind when confronted with a patient with a clinical picture similar to ours.

It is interesting to note that febrile illness can exacerbate hypocalcaemia,[11] and alkalosis is also known to worsen hypocalcaemia. Febrile illness can alter the acid base balance of the body. Our patient had febrile illness in the preceding 2 weeks of presentation—the same time period when he developed symptoms and seizures. Alternatively, his low PTH could have predisposed to infection. Hypoparathyroidism hinders the activation of vitamin D via insufficient PTH secretion, and vitamin D certainly has known immunological effects in the human body.[12]

Conclusion

In conclusion, we report a patient with hypoparathyroidism who presented to the emergency department with generalized seizures. Further studies should be done to gather data on the follow-up of such patients with brain calcinosis for documenting recurrence of seizures and other neuropsychiatric manifestations. It is important to diagnose hypoparathyroidism early and promptly in children because of the availability of effective treatment options, which could translate into a significant improvement in the child's quality of life[7] as was seen in our patient.

Declaration of Conflicting Interests

The authors declared no potential conflicts of interests with respect to the authorship and/or publication of this article.

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