Pearls & Oy-sters: Focal hypocalcemic seizures secondary to severe vitamin D deficiency/rickets

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Pearls

- Hypocalcemia is a condition in which total serum calcium concentration is <8.5 mg/dL or ionized calcium concentration is <4 mg/dL. Severe vitamin D deficiency, disorders of parathyroid hormone (PTH), and drug intake are the most common causes of hypocalcemia.¹
- Even though clinically significant vitamin D deficiency is extremely common globally, and rickets is not rare in many parts of the world, we present the first case of videorecorded hypocalcemic seizure in this scenario.
- The incidence of hypocalcemic seizures secondary to rickets is about 3.49/million children between 0 and 15 years of age.²
- Seizures (generalized tonic, generalized tonic-clonic, and focal seizures) are often the only presenting symptom of acute hypocalcemia.³
- The estimated amount of active vitamin D in human breast milk (15–50 IU/L)⁴ is insufficient to provide the recommended daily dose and the adequacy of sunlight exposure is not easily determined.⁵
- Differential diagnosis includes other epileptic syndromes with different and often more severe etiologies.

Oy-sters

- Never forget to perform biochemical/hematologic tests including all the electrolytes because they are mandatory in the case of acute diagnostic management of an infant who presents with a first seizure.
- Treatment of hypocalcemic seizures consists of calcium replacement (and, eventually, magnesium replacement if needed); some antiepileptic drugs (AEDs) are contraindicated because they can worsen the hypocalcemia.
- This case presentation is an example that clinical disorders that are relatively common in some populations and parts of the world may be uncommon in others and it is important that they are recognized promptly by clinicians.

A 5-month-old Indian boy presented with 5 seizures at home. The episodes were characterized by motor arrest, eye deviation, cyanosis, stiffening, and loss of contact/consciousness lasting 1–5 minutes, followed by somnolence. Prenatal, perinatal, and postnatal history and psychomotor development were normal. There was a positive family history for infantile epilepsy (first cousin living in India, no further information available). The patient was the third born from unrelated parents. He was exclusively breastfed since birth without vitamin D supplementation. His mother followed a vegan diet. His medical history was unremarkable. The patient is dark-skinned and presented congenital dermal melanocytosis on lumbosacral area, buttocks, right knee, and ankles. The neurologic examination was normal. He continued to seize despite the administration of rectal and IV benzodiazepines and 2 focal seizures were recorded during videopolygraphic EEG (video 1). Hematologic measures showed blood calcium level of 5.9

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mg/dL. Extended laboratory investigations showed ionized calcium 0.65 mmol/L (normal 1.20–1.40), magnesium 1.61 mg/dL (normal 1.90–2.50), phosphate 2.8 mg/dL,^{4,7} alkaline phosphatase 902 U/L (normal 70–450), albumin 37 g/L (normal 38–54), protein 55 g/L (normal 68–86), hemoglobin 11.3 g/dL, white blood cells 14.91 K/ μ L, platelets 547 K/ μ L, PTH intact 310 pg/mL (normal 15–88), and 25-OH vitamin D (D2+D3) 4 pg/mL (normal 30–100). X-ray of the long bones (forearm and knee) showed the failure of normal mineralization at a metaphyseal zone of provisional calcification resulting in concavity of the metaphysis (cupping), consistent with rickets. The patient was treated with 10% calcium gluconate solution (given intravenously) q 6 hours and cholecalciferol (4,000 UI/d PO). After calcium normalization, seizures stopped at day 3. The patient's medications were changed to oral calcium and vitamin D supplementation. Seven days after admission, the patient was seizure-free and was discharged by the hospital.

Discussion

The patient's low serum calcium levels, elevated alkaline phosphatase, and secondary hyperparathyroidism with elevated PTH and X-ray findings were diagnostic of rickets.⁶ The lack of vitamin D supplementation (the primary cause of rickets), the decreased exposure to sunlight during the winter months, and the dark skin pigmentation likely determined vitamin D deficiency⁷ in this breastfed child whose mother followed a vegan diet. In the literature, EEG abnormalities associated with hypocalcemia include slowing of background rhythm with evolution from alpha through theta and delta dominance. Generalized spikes and sharp wave discharges of delta activity with sharp components have also been reported by other authors. Neonatal records may show reversible 3- to 4-Hz spike-wave discharges.⁸ To our knowledge, no iconographic description of seizures (video-recorded or not) has been provided.

Rickets is the consequence of severe vitamin D deficiency. It peaks between 3 and 18 months of age. Before the appearance of the clinical signs of rickets, the deficiency may present with hypocalcemic seizures, growth failure, lethargy, irritability, and recurrent respiratory infections during infancy. Treatment of the hypocalcemic seizures is calcium replacement. Therapy with anticonvulsants is not needed and some anti-epileptic drugs can worsen hypocalcemia.⁹ Calcium gluconate (10% solution 100 mg/mL) should be infused intravenously at a dose of 50–200 mg/kg every 6 hours and continued as long as the patient is symptomatic and until the serum calcium returns to normal levels. Vitamin D (ergocalciferol) should be administered in vitamin D-dependent rickets. The treatment consists of daily therapy with 3,000–5,000 IU PO; an alternative regimen consists of a 600,000 IU dose of vitamin D given orally in a single day if patient compliance or follow-up is a concern.⁶

This case presentation is an example of how clinicians need to be well-prepared to deliver thorough and culturally competent care to persons of different racial and ethnic backgrounds and cultural practices as patient populations around the globe become more heterogeneous. To our knowledge, iconographic description of seizures (video-recorded or not) has never been provided.

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Appendix Authors

Name	Location	Contribution
Rita Monni, MD	Neuropsychiatry Department, ASST Mantova	Analyzed the data, drafted the manuscript for intellectual content
Francesca Beccaria, MD	Neuropsychiatry Department, ASST Mantova	Revised the manuscript for non-intellectual content
Flavio Boscaini, MD	Neuropsychiatry Department, ASST Mantova	Revised the manuscript for non-intellectual content
Benedetta Frassine, MD	Neuropsychiatry Department, ASST Mantova	Revised the manuscript for non-intellectual content
Giuseppe Capovilla, MD	Neuropsychiatry Department, ASST Mantova	Drafted the manuscript for intellectual content

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