Acute Treatment Response in a Vitamin D Deficient 14-year-old Male With Severe Hypocalcemia: A Case Report

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Introduction

Physiologic hypocalcemia is a potentially life-threatening biochemical abnormality that carries several risks and can result in severe symptoms that require hospitalization for rapid correction. Vitamin D deficiency is known as the most common cause of hypocalcemia. There are limited studies reported in the literature that focus on the treatment response timeline for hypocalcemia in pediatric patients with severely low calcium due to chronic vitamin D deficiency, and the potential for overtreatment with calcium and vitamin D supplementation. In this case report, we are describing an adolescent male with severe hypocalcemia evidenced by tetany. We discuss his hospital management, subsequent treatment course, and potential risk of overtreatment in an outpatient setting.

Case Report

This is a case report of a 14-year-old Caucasian male with no significant past medical or surgical history, who presented with a 3-month history of numbness, fatigue, extremity cramping and weakness. Patient also reported that on one occasion, his fingers were contracted with his thumb folded in. In the emergency department, his total serum calcium level was 6.1 mg/dL (normal 8.7 - 10.4), serum phosphorus 4.8 mg/dL, serum magnesium 2.0 mg/dL, and physical examination was positive for Chvostek sign. He received one dose of intravenous (IV) Calcium Gluconate 500 mg, which raised his serum calcium to 7.0 mg/dL, and he was admitted to the hospital.

On the pediatric floor, the patient continued to appear weak and, five hours later, his repeated serum Ca was 6.3 mg/dL. Further workup revealed low urine calcium of <1.0 mg/dL, low serum vitamin D 25-OH level of 8.5 ng/mL (normal 30 - 70), vitamin D 1,25-OH of 54 ng/mL (normal 20 - 79), and elevated PTH 363.9 pg/mL (normal 14 - 72). EKG showed a QT interval of 393 with no concerning findings per pediatric cardiology review. He received three additional doses of IV calcium gluconate and oral calcium carbonate 2,500 mg daily to increase his calcium concentration above symptom threshold and was discharged home at a level of 8.8 mg/dL.

Outpatient therapy with oral calcium carbonate 2,500 mg daily, vitamin D supplementation of 2,000 IU daily and 50,000 IU/week for 12 weeks was started. During his outpatient follow-up visit in the Endocrinology clinic six days after presentation, the patient had received 6 doses of vitamin D 2,000 IU and vitamin D 50,000 IU once, giving a total of 62,000 IU of vitamin D in six days. Repeat workup showed an increase in his total serum calcium level to 10.1 mg/dL and increase in vitamin D 1,25-dihydroxy to >156 ng/mL. Patient was subsequently recommended to stop the daily vitamin D 2,000 IU and only continue the oral calcium carbonate 2,500 mg daily and vitamin D 50,000 IU weekly.

Lab Results

	ED	Hospital Day 1	Hospital Day 2	4 days after Hospital Discharge
Clinical presentation	*Positive Chvostek sign, and numbness*	*Negative for Chvostek sign,but numbness*	*Asymptomatic*	*Asymptomatic*
Calcium	6.1 mg/dL increased to 7 mg/dL after 1st IV calcium gluconate dose. Trended downward to 6.3 mg/dL 5 hours later	7.1 mg/dL after 2nd IV calcium gluconate dose. 6.6 mg/dL after 7 hours. Increased to 7.7 mg/dL after 3rd IV calcium gluconate dose	8.2 mg/dL. Decreased to 7.2 mg/dL after 10 hours. Increased to 8.8 mg/dL after 4th IV calcium gluconate dose	10.1 mg/dL
Phosphorus	4.8 mg/dL	5.3 mg/dL 4.9 mg/dL 4.2 mg/dL	5.1 mg/dL 4.3 mg/dL 4.8 mg/dL	5.3 mg/dL
Vitamin D 25-Hydroxy	8.5 ng/mL		19.2 ng/mL	14.7 ng/mL

Figure 1. Laboratory results and clinical presentation during the ED course, Hospital admission, and Outpatient follow up.

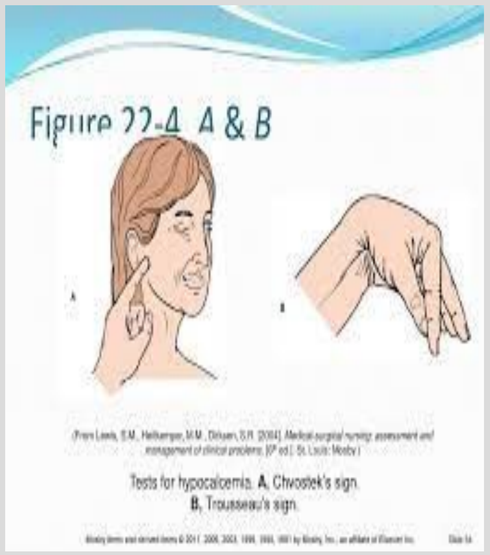

Figure 2.
A. Illustration of Chvostek's sign.
B. Illustration of Trousseau's sign.

Discussion

This patient presented with hypocalcemia and received treatment in the form of four aggressive intravenous doses of IV Calcium Gluconate (ranging from 500 to 1,000 mg), oral Calcium Carbonate 2,5000 mg daily, oral Vitamin D 50,000 IU once, and vitamin D 2,000 IU/daily. This case highlights the challenge of inpatient and outpatient management of severe pediatric hypocalcemia due to chronic vitamin D deficiency and shows that there is a potential for toxicity due to overtreatment during the course of patient management. Too much vitamin D (known as vitamin D toxicity) can be harmful. Signs of toxicity can include constipation, weakness, vomiting, nausea, polyuria, weight loss, kidney stones, kidney damage, hypercalcemia, and dehydration. Excess vitamin D can also cause damage to the kidneys. The recommended daily allowance of vitamin D is between 400 to 800 IU/day according to age and pregnancy status. Most people require no more than 2,000 IU/day.

In order to monitor for vitamin D toxicity, clinicians may obtain a 1,25-dihydroxyvitamin D level, along with serum calcium levels. Our patient initially had a pre-treatment 1,25-dihydroxyvitamin D level of 54 pg/mL on admission. In six days, the patient had a 1,25-dihydroxyvitamin D level increase from 54 pg/mL to >156 pg/mL an increase of 25-hydroxyvitamin D from 8.5 ng/dL to 14.7 ng/dL. This is explained by rapid conversion of 25-hydroxyvitamin D to 1,25-dihydroxyvitamin D by activity of 1-alpha hydroxylase enzyme located in the kidneys. This rapid conversion then prompted the physician to discontinue the vitamin D 2,000 IU/day supplement and continue treatment with 50,000 IU/weekly of vitamin D supplementation and continue 2,500 mg of oral calcium carbonate.

In conclusion

- Purpose of this case was to highlight the difficulties and risks involved in rapid correction of severe hypocalcemia in inpatient and outpatient setting.
- Key point is to pay attention to the correct vitamin D dose.
- Monitor for symptoms of toxicity in the pediatric population when treating severe hypocalcemia due to chronic vitamin D deficiency.

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