

Vitamin D Toxicity Causing Hypercalcemia and AKI

Mohammed Al Tarhuni MD, Sohail Qadir MD
Spectrum Health/Michigan State University Transitional Year Residency



Introduction

- Vitamin D is a fat-soluble vitamin that primarily functions to increase intestinal absorption of calcium.
- As an easily accessible over-the-counter (OTC) supplement, it has the potential for toxicity manifesting as hypercalcemia, with complications such as nephrocalcinosis and kidney failure [1].
- This case report describes a patient who consumed "mega-doses" of OTC Vitamin D for years to help "improve energy" and presented with hypercalcemia and acute kidney injury (AKI).

Case Presentation

- The patient was a 50-year-old male with a history of obesity, hypertension, and type II diabetes mellitus who presented to the emergency room due to hypercalcemia (Ca:14.2 mg/dL; nl = 8.6-10.4) and acute kidney injury (Cr: 6.3 mg/dL; baseline ~1.0) noted on routine outpatient laboratory results.
- Patient did admit to generalized weakness, fatigue, polyarthralgia, and restless legs for the previous 2 months.
- On arrival, he was mildly hypertensive but with otherwise normal vital signs. His physical exam was notable for chronic lower extremity edema but otherwise normal.
- Laboratory workup was notable for normocytic anemia of 9.2 (nl = 14-18), albumin of 3.9 (nl = 3.5-5.0), and phosphorus of 4.7 (nl = 2.5-4.5).
- Further workup revealed an appropriately suppressed PTH level of 9.0 (nl = 11-67), normal PTHrP. His 25-OH Vitamin D3 (Calcifediol) was reported as ">60 ng/mL" and 1,25-OH-D3 (Calcitriol) was within normal limits 44 (nl = 18-64).
- Multiple myeloma workup included an unremarkable SPEP and UPEP, however kappa and lambda free light chains were mildly elevated with an elevated K/L ratio of 2.65 (nl = 0.26-1.65).
- Renal ultrasound and radiograph skeletal survey were unremarkable.

Case Presentation (continued)

- Upon further questioning, the patient was found to have been taking 20,000 IU of OTC Vitamin D3 supplements daily for the past 1-2 years.
- Patient was admitted and started on IV fluids and calcitonin for a presumptive diagnosis of Vitamin D toxicity, with improvement in hypercalcemia and AKI by the time of discharge (Ca 10.9, Cr 3.90).
- Prednisone, the preferred treatment for Vitamin D toxicity, was not started while awaiting laboratory send out to quantify exact Calcifediol levels and confirm diagnosis.
- There was persistence of hypercalcemia despite discontinuation of Vitamin D supplementation.
- Given his elevated free light chains during previous admission and meeting 3 out of 4 CRAB criteria (hypercalcemia, renal failure, anemia), bone marrow biopsy was obtained to rule out multiple myeloma.
- CT imaging of the chest, abdomen, and pelvis was also pursued to identify lymphadenopathy or signs of granulomatous disease or lymphoma.
- Finally, kidney biopsy (Fig.1) was performed to further characterize cause of kidney failure.

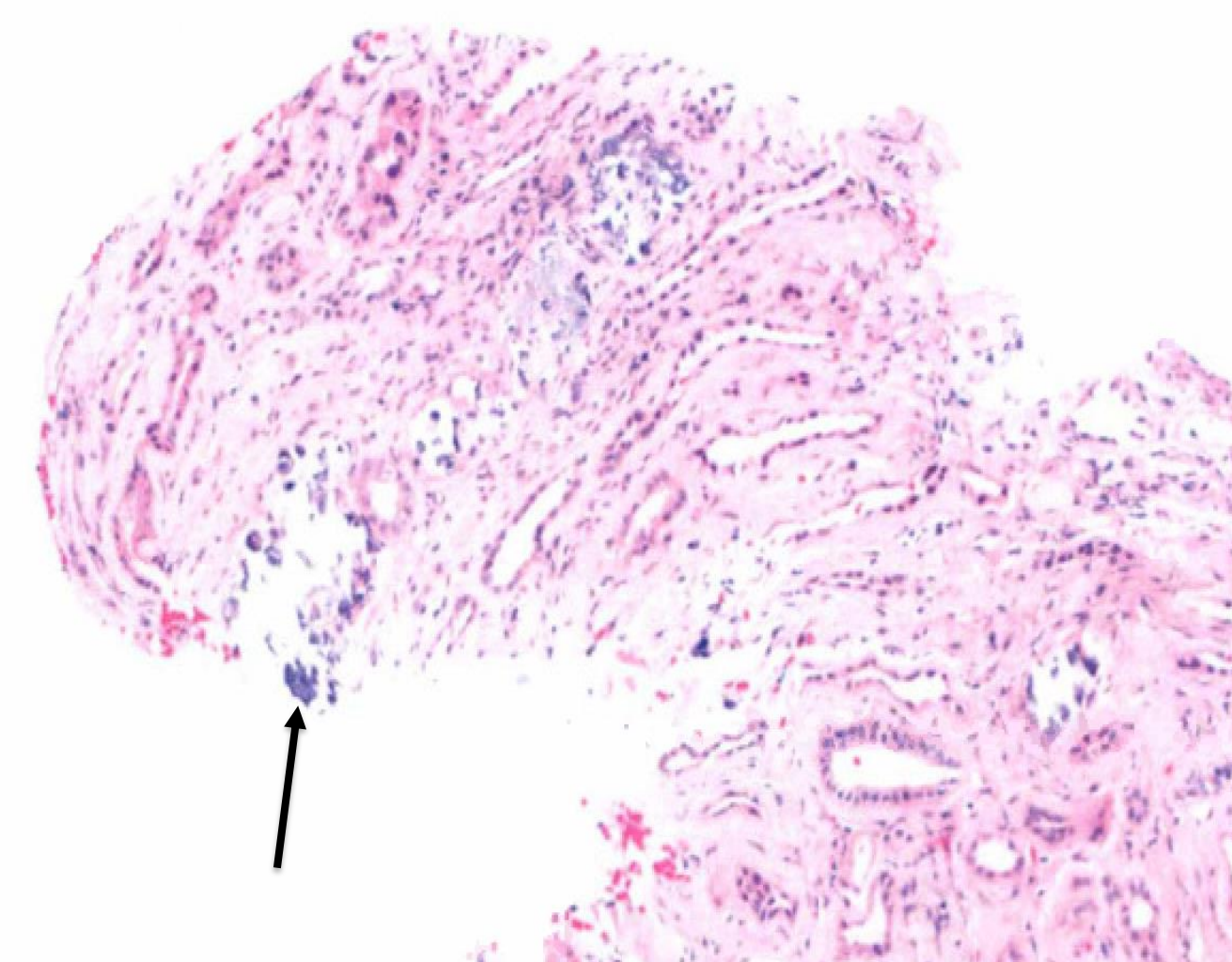


Fig.1: Kidney biopsy demonstrating calcium deposits (nephrocalcinosis)

Intervention/Response to Treatment

- No evidence for multiple myeloma or granulomatous or lymphoproliferative disease were found on bone marrow biopsy and CT imaging.
- Nephrocalcinosis was noted on kidney biopsy, supporting a diagnosis of Vitamin D toxicity.
- Eventually, calcifediol concentration returned for a value of 99 ng/mL, confirming toxicity (>80 ng/mL).
- The patient was started on prednisone with normalization of calcium levels.
- Kidney function did not normalize and the patient was diagnosed with CKD-IV.

Significance/Uniqueness of the Case

- Vitamin D supplementation has been promoted as a "treatment" or "boost" to many conditions including chronic fatigue, infections such as COVID-19, and malignancy [2].
- Rates of Vitamin D toxicity are rising
- This case is significant as it serves to:
 - Demonstrate the severe consequences of Vitamin D toxicity
 - Review the step-wise approach to hypercalcemia (Fig.2)
 - Remind the clinician to review and educate patients on safety of OTC medications and supplements

References

1. Tebben, Peter J., Ravinder J. Singh, and Rajiv Kumar. "Vitamin D-mediated hypercalcemia: mechanisms, diagnosis, and treatment." *Endocrine reviews* 37.5 (2016): 521-547.
2. Vitamin Sales Skyrocket in the Pandemic, but Buyer Beware - Medscape - Mar 02, 2021.

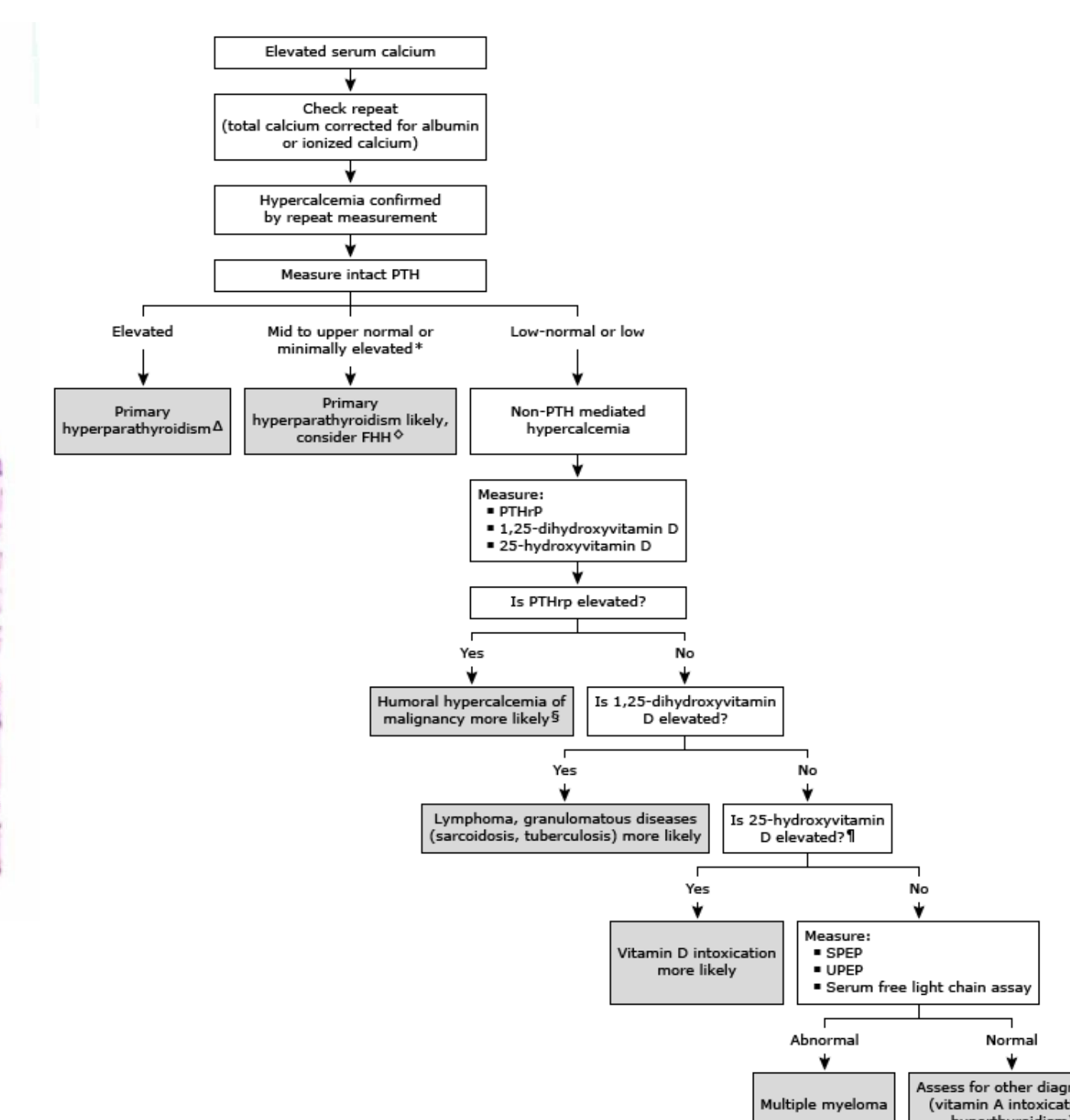


Fig.2: Step-wise diagnostic approach to hypercalcemia (UpToDate)