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SEVERE HYPOCALCAEMIA WITH ELEVATED PTH AND NORMAL VITAMIN D: A DIAGNOSTIC PITFALL DUE TO CHRONIC NEGATIVE CALCIUM BALANCE IN A VEGAN PATIENT

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ABSTRACT

Introduction: Secondary hyperparathyroidism is usually associated with chronic kidney disease or vitamin D deficiency.

Case description: A 62-year-old man with severe osteoporosis presented with persistent hypocalcaemia and markedly elevated parathyroid hormone levels. Renal function, phosphate and vitamin D levels were normal. Extensive investigations excluded common causes. Twenty-four-hour urinary calcium excretion was profoundly reduced, indicating a chronic negative calcium balance. Dietary assessment revealed a strict vegan diet with low calcium intake and reduced bioavailability. Treatment with calcium citrate and calcitriol normalised serum calcium and reduced PTH levels.

Conclusion: A chronic negative calcium balance is an under-recognised cause of secondary hyperparathyroidism. Measurement of urinary calcium is a key diagnostic tool in these patients.

KEYWORDS

Hypocalcaemia, secondary hyperparathyroidism, vegan diet, calcium deficiency, urinary calcium

LEARNING POINTS

- Secondary hyperparathyroidism may occur despite normal vitamin D and phosphate levels.
- Very low urinary calcium excretion is a key diagnostic clue in hypocalcaemia with elevated parathyroid hormone.
- A chronic negative calcium balance should be considered in patients with restrictive diets such as veganism.

INTRODUCTION

Secondary hyperparathyroidism (SHPT) is most commonly associated with chronic kidney disease or vitamin D deficiency[1-3]. However, a chronic negative calcium balance due to insufficient intake or reduced intestinal bioavailability may also lead to SHPT even when serum phosphate and vitamin D levels are normal[4]. Plant-based diets may reduce calcium absorption because oxalates and phytates impair intestinal bioavailability[5,6]. Although recognised in nutritional and osteoporosis guidelines[7-9], there is insufficient awareness of this mechanism in clinical practice.

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CASE DESCRIPTION

A 62-year-old man was referred for endocrine evaluation after severe osteoporosis was detected on dual-energy X-ray absorptiometry. He reported strict adherence to a vegan diet for several years.

Laboratory testing showed persistent hypocalcaemia, with albumin-corrected calcium levels between 7.8 and 8.2 mg/dl. Parathyroid hormone (PTH) levels were markedly elevated (368 pg/ml). Serum phosphate (~3.9 mg/dl), magnesium and renal function (estimated glomerular filtration rate ~70 ml/min) were normal. Serum 25-hydroxyvitamin D levels were adequate (43 ng/ml).

Twenty-four-hour urinary calcium excretion was profoundly reduced (<10 mg/24 hours), indicating near-maximal renal calcium conservation.

Bone densitometry revealed severe osteoporosis (T-score −3.1 at the lumbar spine and femoral neck). Parathyroid imaging (Tc-99m sestamibi and ultrasound) showed no adenoma. Gastrointestinal endoscopy and coeliac disease screening were unremarkable.

Vitamin D deficiency, chronic kidney disease and pseudohypoparathyroidism were excluded. Primary hyperparathyroidism was unlikely given persistent hypocalcaemia and negative imaging.

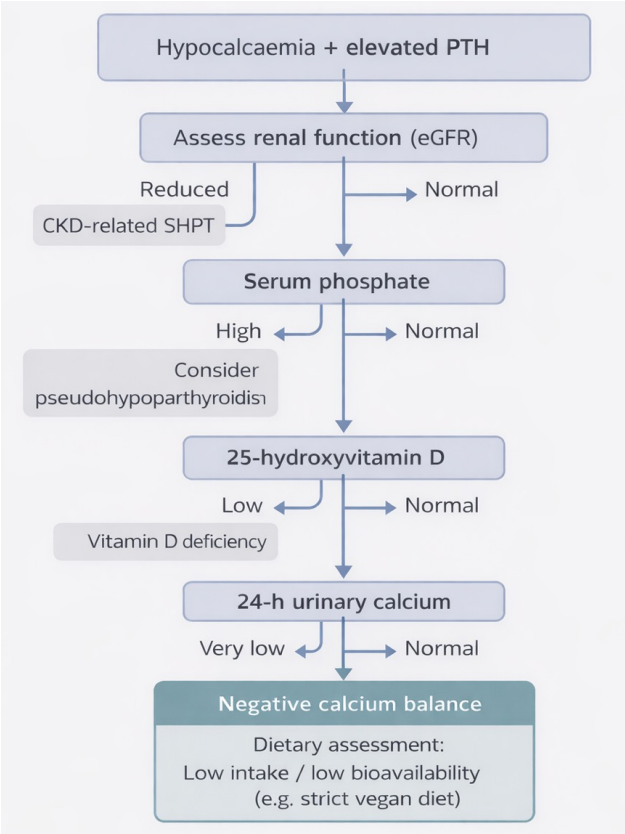


Figure 1. Diagnostic approach to hypocalcaemia with elevated PTH and normal phosphate levels. Reduced urinary calcium excretion reflects maximal renal calcium conservation and is a key diagnostic clue indicating chronic negative calcium balance.

Abbreviations: PTH, parathyroid hormone; eGFR, estimated glomerular filtration rate; CKD, chronic kidney disease; SHPT, secondary hyperparathyroidism.

Dietary assessment confirmed low calcium intake and reduced bioavailability associated with a strict vegan diet, supporting the diagnosis of SHPT due to chronic negative calcium balance.

DISCUSSION

This case shows that chronic negative calcium balance is an under-recognised cause of SHPT in the absence of vitamin D deficiency or renal disease[1,4].

A key diagnostic feature was markedly reduced urinary calcium excretion, reflecting maximal renal calcium conservation. Measurement of urinary calcium should therefore be systematically considered in patients with hypocalcaemia and elevated PTH levels, even when vitamin D status is normal, as it may help identify chronic calcium deficiency and guide diagnosis[8] *(Fig. 1)*.

Strict vegan diets may predispose to reduced calcium intake and impaired absorption due to oxalates and phytates[6-8]. Failure to recognise this mechanism may lead to misdiagnosis or unnecessary investigations. Severe hypocalcaemia associated with vegan diets has been previously reported, highlighting the impact of inadequate calcium intake and reduced bioavailability[9].

From a therapeutic perspective, calcium supplementation and optimisation of vitamin D status are essential in restoring calcium homeostasis[5,8]. Calcium citrate was chosen due to its superior absorption[6], and calcitriol was added to enhance intestinal calcium uptake. This approach resulted in normalisation of serum calcium and significant reduction of PTH levels.

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