

Case Report

Hyperparathyroidism due to Parathyroid Adenoma with Co-existing Vitamin D Deficiency – A Case Report

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Abstract

Primary hyperparathyroidism is often asymptomatic, may be detected during routine investigations or may present with features of hypercalcaemia. Vitamin D deficiency causing secondary hyperparathyroidism presents with musculoskeletal symptoms. Studies have shown an association between primary hyperparathyroidism and vitamin D deficiency. It has also been observed that when co-exist, these two conditions contribute to each other's disease presentation and severity. This case report depicts initial asymptomatic hyperparathyroidism developing symptoms due to co-existing parathyroid adenoma and vitamin D deficiency in a 26-year-old muslim Bangladeshi female who responded well to adequate pre, per and post parathyroidectomy medical management.

Key words: hyperparathyroidism; parathyroid adenoma; vitamin D deficiency.

(Birdem Med J 2015; 5(2): 104-106.)

Introduction

In primary hyperparathyroidism (PHPT), abnormality of parathyroid tissue leads to an inappropriate increase in parathyroid hormone (PTH) secretion. This increased PTH causes excessive renal calcium reabsorption, phosphaturia, 1,25-dihydroxyvitamin D [1,25(OH)₂D] synthesis, increased bone resorption, hypercalcaemia and its clinical sequelae.¹ These patients are usually asymptomatic and may have mild and sometimes only

intermittent hypercalcaemia.^{2,3} Population screening in the context of bone health has led to the identification of a new clinical entity, normocalcaemic PHPT. These patients have persistently elevated PTH levels, despite normal serum calcium concentrations, when causes of secondary hyperthyroidism have been excluded.^{4,5} PHPT is caused by a single parathyroid adenoma (80%), hyperplasia of the parathyroid (10-15%) and parathyroid carcinoma (1-2%).⁶ Secondary hyperparathyroidism due to vitamin D deficiency results in normo- or hypocalcaemia, normo- or hypophosphataemia and increased serum alkaline phosphatase.² Vitamin D deficiency is also common among patients with PHPT. Lower 25-hydroxyvitamin D [25(OH) D] levels have been reported to be associated with higher circulating PTH levels, increased parathyroid gland weight, accelerated bone turnover and fracture risk.⁷⁻¹⁰ PHPT can contribute to vitamin D deficiency and vice versa, suggesting that the treatment of vitamin D deficiency is indicated in PHPT.¹¹

Case Report

A 26-year-old conservative muslim, non-alcoholic, Bangladeshi university student developed low back pain following an accidental fall. As she was unable to walk due to low back pain even after taking adequate analgesics, she was admitted in a local hospital for better

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Received: January 21, 2015

Accepted: June 30, 2015

management where x-ray of lumbosacral spine showed mild osteopenic change and magnetic resonance imaging of that region revealed posterior disc bulge at L5-S1. Biochemical evaluation showed normal serum calcium (10.50 mg/dl) and albumin (34 mg/dl), low vitamin D (<4.00 ng/ml, reference value <10 indicates deficiency), markedly raised serum alkaline phosphatase (2316 U/L) and iPTH levels (>2000 pg/ml).

On admission under our care, patient had generalized aches, low back pain and walking difficulty. She had no symptoms suggestive of hypercalcemia and there were no fever, joint pain or family history of such illness. Her bladder and bowel habits were normal. On examination, her BMI was 28.03 kg/m², vital signs were normal and she was not dehydrated. She had tenderness over her lower back and hips.

Investigations showed a normal complete blood count, urine routine microscopic examination, serum creatinine (0.6mg/dl), serum calcium (10.6mg/dl) and phosphate (2.5mg/dl). Ultrasonogram of neck showed enlarged right parathyroid gland. Thyroid function test was normal, bone densitometry confirmed osteoporosis [T-score L4 (-5.5), Z-score (-5.3)]. After diagnosing vitamin D deficiency with secondary hyperparathyroidism and osteoporosis she was discharged with oral calcium 500 mg BID, calcitriol 0.25 microgram OD, Vit D3 weekly for 3 weeks and analgesics.

On subsequent follow up after one week, her serum calcium became 14.2 mg/dl, Sestamibi scan of parathyroid gland showed right lower lobe adenoma. Other investigations revealed total 25-OH-Vit D3/D2 24.33 ng/ml (15-30 ng/ml indicates insufficiency), serum PO4 3.0 mg/dl, serum chloride/phosphate ratio >33, serum alkaline phosphatase 1920 U/L and urinary calcium excretion of 24 mg/day (normal 100- 300 mg/day). Isotope bone scan, x-ray of skull and both hands were normal.

Parathyroidectomy was done by Head & Neck surgeons after adequate pre-operative preparation with calcitonin injection, intravenous furosemide and normal saline. During the post-operative period, patient was observed for clinical and biochemical evidence of development of hungry bone syndrome and prevention was given by intravenous calcium gluconate. Post-operatively there was a gradual reduction in serum calcium (10.4 mg/dl) and iPTH level (343 pg/ml). Histopathological report of the resected gland confirmed parathyroid adenoma.

Finally, patient was discharged on 14th post-operative day with oral calcium, calcitriol and magnesium supplements. At follow up visit after three days patient had no complaints and her serum calcium was 9.5 mg/dl and serum alkaline phosphatase decreased to 1400 U/L. She was advised to come for regular follow-up at out-patient department.

Discussion

The association of vitamin D deficiency and PHPT is evident on two distinct levels.¹² First, in patients with PHPT, the disease seems to be more severe with concomitant vitamin D deficiency. PHPT is frequently symptomatic in areas where vitamin D deficiency is endemic and osteitis fibrosa cystica remains a common feature of the disease. Second, vitamin D deficiency or insufficiency seems to be more prevalent in patients with PHPT than in geographically matched populations.¹²

Several putative mechanisms have been proposed to account the increased prevalence of vitamin D deficiency among individuals with PHPT. Chronic vitamin D deficiency may stimulate autonomous parathyroid glands with subsequent development of hyperplasia and transformation to adenoma or may accelerate the growth of a pre-existing adenoma.¹³ Alternatively, the PTH mediated increase in 1, 25(OH)₂D synthesis may reduce 25-hydroxyvitamin D [25(OH)D] by inhibiting cutaneous synthesis of vitamin D3, inhibiting hepatic synthesis of 25(OH)D and by increasing renal conversion of 25(OH)D to 1,25(OH)₂D.^{7,14} There are also data suggesting that the half-life of 25(OH)D is significantly shortened in PHPT, with increased metabolic clearance caused by enhanced hepatic inactivation. Finally, others pointed to decreased bio-availability of vitamin D in PHPT patients because of increased body weight.¹³⁻¹⁵

In an Indian study, it was seen that patients with PHPT who presented with bone and renal disease; half were normocalcaemic. Ninety percent of patients presented with a history of bone pain and 100% patients had fatigability. The Indian diet which showed calcium deficiency, high phosphate and phytate content explained normocalcaemia and normophosphatemia in majority of patients. The predominant bone disease was probably due to prolonged PHPT co-existing with low calcium intake and/or 25(OH)D deficiency. It was also

suggested that subclinical 1,25(OH)D deficiency may well be widely prevalent in tropical countries despite plentiful sunlight.¹⁶

Our patient who was a conservative muslim, she was initially asymptomatic later presented with generalized aches and walking difficulty. Although features of hypercalcaemia were absent, she developed osteoporosis as a complication of PHPT.

With care, vitamin D supplementation can safely be given to selected patients with asymptomatic PHPT and is suggested before deciding on medical or surgical management. Monitoring serum calcium concentration and urinary calcium excretion is recommended while achieving vitamin D repletion.¹⁷ Our patient responded well with adequate medications.

The association between vitamin D deficiency and PHPT has clear implications. Co-existing vitamin D deficiency may cause the serum calcium level to fall into the normal range, which can lead to diagnostic uncertainty. Vitamin D deficient patients undergoing parathyroidectomy are also at increased risk of postoperative hypocalcemia and hungry bone syndrome, which underscores the importance of pre-operative assessment of vitamin D status in all patients with PHPT.¹² Cases presenting with unexplained aches especially in tropical countries where vitamin D deficiency is endemic, requires thorough biochemical evaluation for co-existing PHPT and exclusion of secondary causes of hyperparathyroidism.

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