CLINICAL CASE

SURGERY FOR PRIMARY HYPERPARATHYROIDISM DIAGNOSED AS ACUTE RENAL FAILURE

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Abstract

Primary hyperparathyroidism (HPTH) is a common endocrine disorder characterized by multiple organic events secondary to hypercalcemia, including renal insufficiency. We introduce a case of primary HPTH diagnosed after presentation for recent-onset of renal insufficiency. A 60-year old male with no prior medical history was initially diagnosed with renal failure in the context of progressive malaise, nausea, recent onset of moderate blood pressure. Beside low glomerular filtration rate (eGFR of 15 mL/mim/1.73m2), biochemical evaluation showed hypercalcemia of 14.4 mg/dL (normal: 8.8-10.6 mg/dL), ionic calcium of 7.27 mg/dL (normal: 4.4-5.4 mg/dL), hypercalciuria of 343 mg/24h, normal:<300 mg/24h. Examinations performed for secondary causes of hypercalcemia have revealed increased value of parathyroid hormone (PTH) of 881.2 pg/mL (normal: 12-88 pg/mL). Thyroid ultrasound and cervico-mediastinal computed tomography highlighted an inhomogeneous hypoechoic lesion on the posterior side of the left lobe, with intra-thoracic extension, measuring 3.54/4.94/5.4cm with left parathyroid adenoma significance. The hormonal profile excluded multiple endocrine neoplasia syndrome (MEN). After improvement of biochemical parameters by adequate hydration and diuretic treatment, left parathyroidectomy was performed. One month later, normal PTH, calcium total, ionic calcium, and improvement of renal function have been achieved. Long-term follow-up by a multidisciplinary team was recommended.

Keywords*: parathyroidectomy, renal failure, parathyroid adenoma*

Introduction

Hypercalcemia as a major manifestation of primary HPTH (hyperparathyroidism) causes impaired renal function, and most commonly kidney stones and nephrocalcinosis [1]. The prevalence of renal insufficiency in primary HPTH is variable, between 4.6-19.3% and is directly correlated with the duration and severity of hypercalcemia [2]. Biochemical and hormonal examinations may reveal reduced renal function even in the absence of obvious clinical symptoms related to hypercalcemia and consecutive hypercalciuria, as urinary tract infections and hydronephrosis [3,4]. Reduced kidney function may precipitate metabolic

complications as those of neurological and cardiovascular type [5]. High blood pressure is common in patients with primary HPTH in direct relationship with eGFR (Glomerular Filtration Rate) [6]. Primary HPTH associated vitamin D deficiency determines a more complex clinical picture with supplementary increased bone turnover and fracture risk [7]. Due to cardiovascular risk associated with reduced renal function, the diagnosis and early treatment of primary HPTH becomes a priority in clinical practice. We aim to introduce a case referred to surgery after HPTH was first identified based on priory unknown kidney failure.

Case presentation

A 60-year old non-smoking male with no prior medical history was admitted to the Nephrology Department for recent-onset renal failure found on routine examination based on malaise, nausea, constipation, calf pain, oscillatory blood pressure and conjunctival hyperemia. Biochemical evaluation showed high levels of creatinine (of 4.5 mg/dL, levels between 0.67 and 1.17mg/dL), and urea (of 120 mg/dL, normal levels of 17 – 43 mg/dL), glomerular filtration rate (eGFR of 15 mL/mim / 1.73m^2), hyperpotassemia (of 5.22 mmol/L normal between 3.5 and 5.1 mmol/L) and high total calcium (of 14.4 mg/dL, normal between 8.8 and 10.6 mg/dL, and also ionic calcium of 7.27 mg/dL (normal levels between 4.4 and 5.4 mg/dL), dyslipidemia (Table 1).

Evaluations for secondary causes of hypercalcemia were performed. A mediastinal opacity deviating the trachea to the right, measuring 4 cm (centimeter) diameter was found on the thoracic radiography and, also, hyperechoic kidneys on renal ultrasound. An increased value of PTH (Parathyroid Hormone) was found (of 881.2 pg/mL, normal levels between 12-88 pg/mL and hypercalciuria (of 343 mg/24hours, normal levels: <300mg/24hours).

Endocrine assessments & pre-operative assessments

The patient was transferred to the Endocrinology Department for further evaluation.

Laboratory findings showed a normal thyroid function, normal prolactin and calcitonin, low vitamin D level (consistent for vitamin D deficiency, of 19.3 ng/dL, normal levels above 300 ng/dL) confirming the sporadic form of primary HPTH (Table 1).

Dual-Energy X-Ray Absorbtiometry (DXA) was performed and osteopenia was found.

The anterior cervical ultrasound presented an inhomogeneous hypoechoic lesion on the posterior side of the left lobe, with intrathoracic extension, measuring 3.54 by 4.94 by 5.4 cm. (Figure 1) The cervico-mediastinal computed tomography revealed the mentioned ultrasound lesion, at the level of superior mediastinum, of 0.5 by 0.5 by 0.37 cm and deviating the trachea to the right, with left parathyroid adenoma significance (Figure 2).

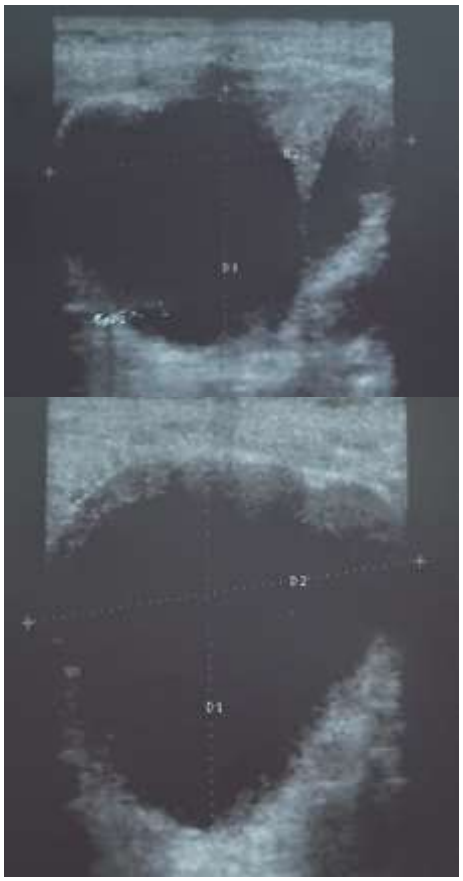
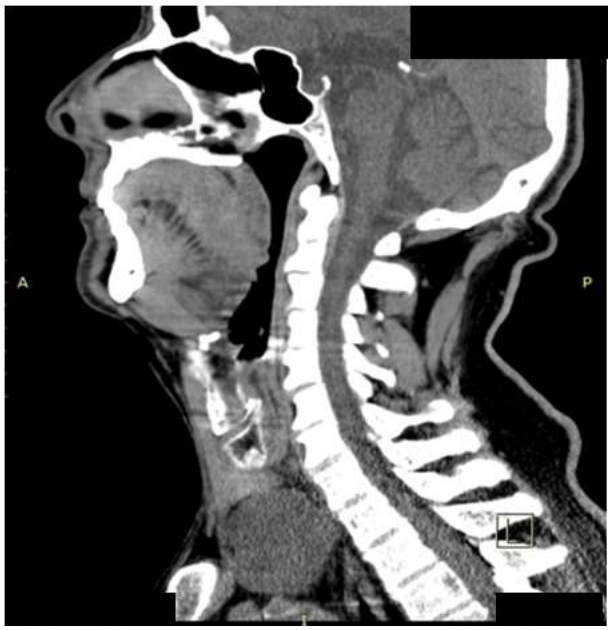


Figure 1 – Thyroid ultrasound: an inhomogeneous hypoechoic lesion on the posterior side of the left lobe



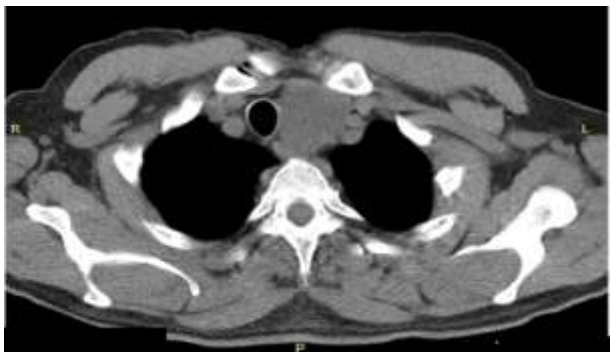


Figure 2 - Cervical and thoracic CT: left inferior parathyroid adenoma with intra-thoracic extension (different plans)

Parameter	Preoperatively	Postoperatively	Normal limits	Units
Total Calcium	14.4 11.99*	9.44	8.8-10.6	mg/dL
Ionic Calcium	7.27 6.36*	4.79	4.4-5.4	mg/dL
Urinary Calcium	343	16.63	<300	mg/24h
PTH	881.2	70.5		
25-hydroxivitamin D	19.3	21.6	30-100	ng/mL
Urea	120 64*	60	17-43	mg/dL
Creatinine	4.5 1.91*	1.62	0.67-1.17	mg/dL
Alkaline Phosphatase	345	198	30-120	mg/dL
Potassium	5.22	4.52	3.5-5.1	mmol/L
Total cholesterol	245	224	<200	mg/dL
Triglycerides	250	202	<150	mg/dL

Table 1 - The endocrine and biochemical parameters in a 60-years-old male with primary hyperparathyroidism
***Under daily hydration and diuretic treatment**
**** One month after surgery, under daily dose of 1000 UI vitamin D**
PTH=parathyroid hormone

After correct hydration (2000 ml/day of NaCl 0.9%) and then diuretic treatment (80 mg/day furosemide), there was an improvement in biochemical parameters: decreased total calcium (to 11.99 mg/dL), and ionic calcium (to 6.36 mg/dL), correction of serum creatinine (of 1.91 mg/dL), and urea (of 64 mg/dL), and increased eGFR of 37 mL/mim/1.73m^2 (Table 1).

Surgical approach

The patient was transferred to the Surgery Department and left parathyroidectomy was performed by classical approach. The procedure went well without any incidents. He was hospitalized for 5 days. After surgery the laboratory tests revealed normal serum calcium values with PTH values in the lower normal range. The pathological report revealed an encapsulated homogenous lesion composed

mainly of clear cells with intra-cytoplasmic lipid droplets and some oxyphil cells. After discharge vitamin D supplements and hypolipidemic treatment were offered to the patient. The evaluation performed one month after surgery revealed normal serum and urinary calcium values, normal PTH level with persistence of low vitamin D values. An improvement in renal function was also obtained by increasing eGFR at 45mL/min/1.73m^2 (Table 1**).** A multidisciplinary team including endocrine, nephrological, and imagery check-up is recommended.

Discussions

Pre-operative complications of calcium and PTH excess

Although the relationship between primary HPTH and renal function is known and accepted, the complete pathophysiology is incompletely elucidated, an important role being attributed to hypercalcemia [8,9]. In many cases renal function remains unaffected even in the presence of obvious hypercalciuria [10,11]. Kidney stones is the main renal manifestation of primary HPTH, more frequent in young obese men with high 25-hydroxivitamin D and favored by the increased urine calcium phosphate and urine calcium oxalate [12,13]. In this case biochemical and imaging examinations have not confirmed the presence of kidney stones, possibly due to the low level of 25-hydroxivitamin D and the patient's age. The significant decrease of eGFR reported is more likely due to dehydration secondary to hypercalciuria [14]. Prolonged exposure to consistently elevated PTH values may induce renal fibrosis and consequently a low eGFR [15]. Less than 5% of patients have an eGFR below 30%, a contributing role being attributed to advanced age, hypertension, hyperglycemia, and increased 25-hydroxivitamin D [16]. None of the mentioned parameters were found in the presented case; moreover, a low level of 25-hydroxivitamin D was reported.

Surgical management

According to current guidelines regarding the management of primary HPTH, parathyroidectomy represents the main treatment for patients with eGFR under 60 mL/mn/1.73m2 [17,18]. For patients with eGFR of 30mL/min or higher preoperative treatment of hypercalcemia includes hydration and the administration of bisphosphonates [19,20]. For this patient, at a total calcium value of 14.4 mg/dL, ionic calcium of 7.27 mg/dL and eGFR of 15 mL/min/1.73m2, adequate hydration followed by diuretic treatment have been used to prevent the hypercalcemic crisis. For primary HPTH forms associated with low 25-hydroxivitamin D replacement treatment is recommended to keep serum 25-hydroxivitamin D above 20 ng/mL even with the risk of increasing the serum calcium [21,22]. Although not all studies confirm eGFR improvement after parathyroidectomy, most mention the preventive effect of surgery in the development of subsequent renal lesions [23,24]. In this case a significant improvement of eGFR was achieved one month after parathyroidectomy and normalization of hypercalcemia and hypercalciuria levels. A careful multidisciplinary follow-up is recommended until normalization of renal function and metabolic complications. The risk of surgery failure is related to poor peri-operative localization or hypercalcemia-related complications [25,26].

Conclusions

Due to the renal function impairment, surgery is the elected treatment of primary HPTH and should be performed with priority. Peri-operative management is multidisciplinary. Minimally invasive parathyroidectomy has an increased efficiency and a decreased rate of post-operatory complications.

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