Polish Annals of Medicine

Journal homepage: https://www.paom.pl

Case report

Primary hyperparathyroidism in a 14-year-old boy – a case report

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Article info

Article history
Received: May 26, 2022
Accepted: July 21, 2022
Available online: February 7, 2023

Keywords
Primary hyperparathyroidism
Parathyroid adenoma
Paediatric endocrinology

Doi
https://doi.org/10.29089/paom/152262

Abstract

Introduction: Primary hyperparathyroidism (PHPT) is an unusual childhood disease characterized by an excessive secretion of parathyroid hormone (PTH). Its presentation may consist of nonspecific symptoms. Consequently, physicians have trouble diagnosing the disease as they fail to check the level of calcium or PTH.

Aim: To describe a case of a paediatric patient with primary hyperparathyroidism, who was successfully diagnosed and treated.

Case study: A 14-year-old boy was admitted to the Paediatric Department with suspected PHPT after performing tests at the Endocrinology Outpatient Clinic, which revealed hypercalcaemia and high PTH level. The ordering of tests was motivated by non-specific symptoms that could indicate PHPT. The ultrasonography, single photon emission computed tomography of the neck and Tc-99m MIBI parathyroid scintigraphy of the neck and upper thorax were performed, which revealed the presence of hypoechogenic structure and focal accumulation of a marker, consistent with the presence of adenoma. The patient was qualified for surgical treatment, which resulted in a resolution of pathological symptoms.

Results and discussion: Because PHPT is a rare disease among paediatric patients, and is initially characterised by non-specific clinical picture, it is usually diagnosed when advanced organ changes occur. Screening tests, such as calcium and PTH determinations, are also not routinely ordered in this age group. Once the diagnosis is made, the treatment is largely supportive and includes prevention of life-threatening complications.

Conclusions: A rare case of a boy with parathyroid adenoma was successfully managed with a multidisciplinary approach combining input from paediatric endocrinologists, radiologists and surgeons.

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1. INTRODUCTION

Primary hyperparathyroidism (PHPT) is a disease characterized by an excessive secretion of parathyroid hormone (PTH).[1] The hallmark of this disorder is the presence of increased calcium (Ca) concentration – hypercalcemia, increased parathormone (PTH) level, hypercalciuria, hypophosphatemia and hyperphosphaturia.[2] PHPT predominantly affects adults (incidence of 0.4 to 82 in 100 000 population).[3] It is unusual in childhood, occurring in 2–5 cases in 100 000 children, and without an apparent sex predilection.[4] The primary presentation of this endocrinological disease at a young age may consist of nonspecific symptoms such as polyuria, fatigue, abdominal pain, nausea, vomiting, loss of the appetite and weight or can be asymptomatic.[5] Consequently, physicians frequently fail to check the level of Ca or PTH. PHPT is in most cases (80%) caused by a solitary parathyroid adenoma. Other causes include four-gland hyperplasia, which occurs in 10%–15% of cases, multiple adenomas in 5% of cases and parathyroid cancer for less than 1% of cases.[3]

2. AIM

To describe a case of a pediatric patient with primary hyperparathyroidism, who was successfully diagnosed and treated.

3. CASE STUDY

On March 18, 2015, a 14-year-old boy presented to the Endocrinology Outpatient Clinic due to gynecomastia and low vitamin D3 level (despite supplementation). The patient was very tall (190.5 cm, >97th percentile), had long legs, and a postural defect. He was suspected to have Klinefelter's syndrome. Follicle-stimulating hormone (FSH) 7.27 mIU/mL (1.30–11.80 mIU/mL), luteinizing hormone (LH) 7.16 mIU/mL (2.80–6.80 mIU/mL), testosterone 3.4 ng/mL (3.0–10.6 ng/mL), thyroxine (fT4) 12.2 pmol/L (8.0–17.0 pmol/L) and thyroid-stimulating hormone (TSH) 1.4 mIU/L (0.4–5.0 mIU/L) tests were performed, but were either within normal range or slightly elevated (LH). After initial biochemi-

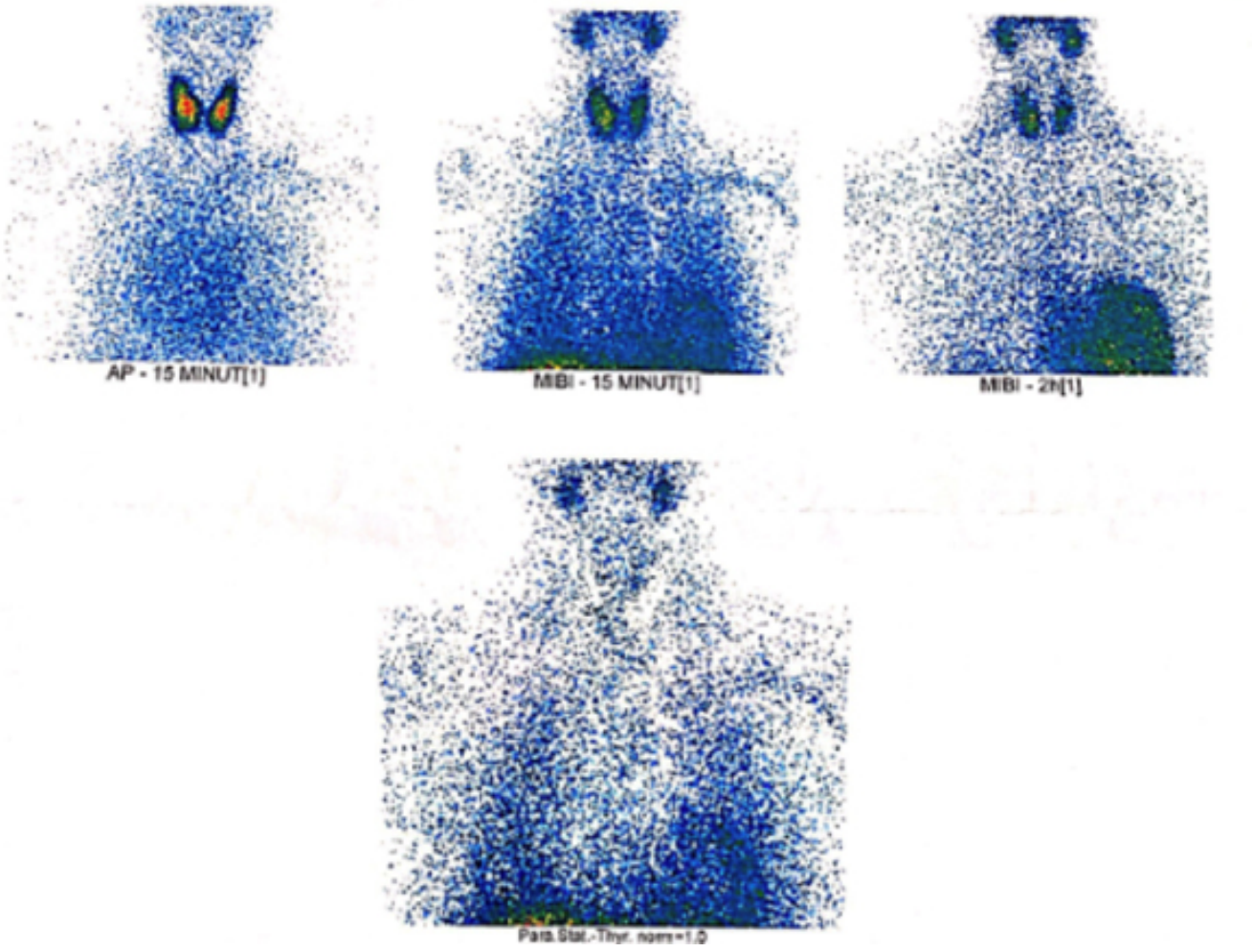

Figure 1. Tc-99m MIBI parathyroid scintigraphy in the AP projection of the neck and upper thorax revealed a focus of radionuclide accumulation measuring 13 × 10 mm (in the plane of the scan) in the projection of a soft tissue structure located posteriorly from the lower part of the right thyroid lobe, which may correspond to the presence of a right inferior parathyroid adenoma.

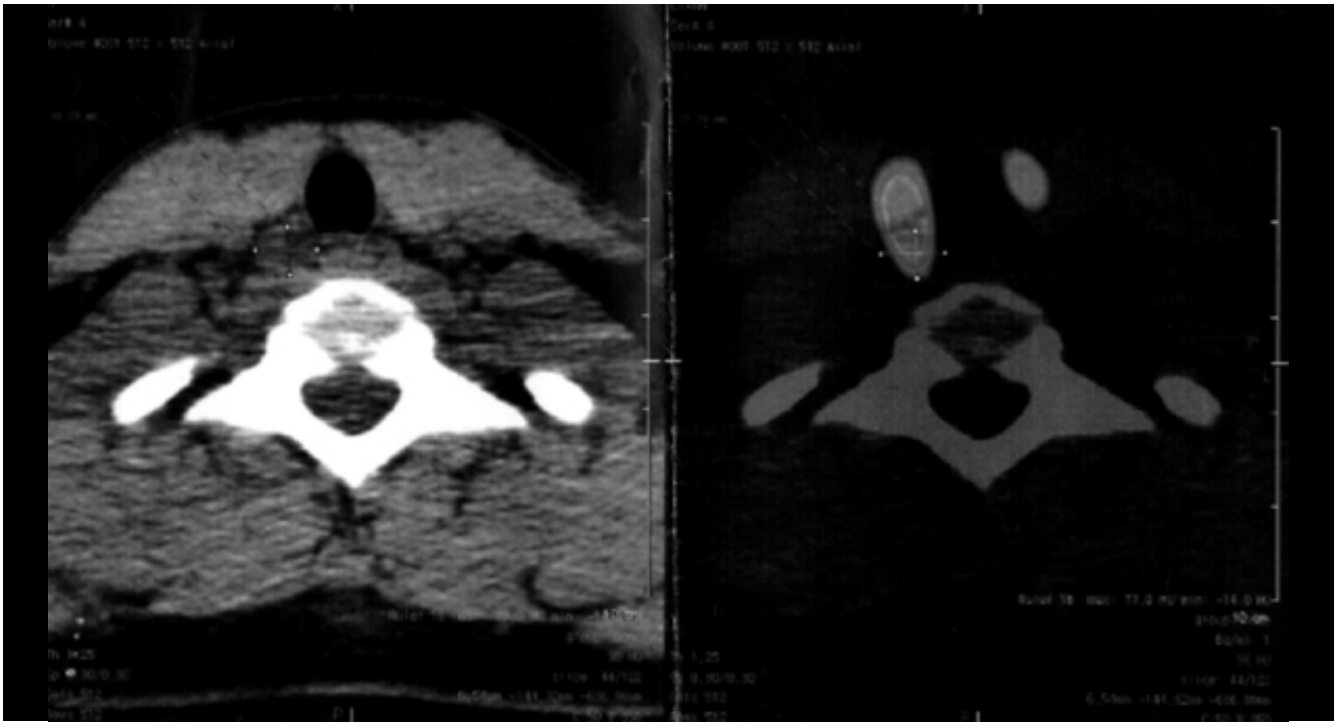

Figure 2. The SPECT-CT examination, which confirmed the presence of a focal point of marker accumulation in the projection of a soft tissue structure that may correspond to the presence of an adenoma.

cal tests and physical examination, there was no indication for a karyotype, as the patient had normal Tanner scale sexual maturation for his age, and LF, FSH and testosterone values. However, in his history, he reported three visits to the emergency department for abdominal pain and vomiting in the preceding two years (2011 and 2013). In addition, he reported that he was under the care of the Orthopaedic Outpatient Clinic and was scheduled for a surgery for clubfoot and valgus knees. Additional histopathological examination diagnosed him with limited scleroderma present on his right foot. These elements of the history prompted the performance of tests to assess Ca–P balance. After receiving laboratory results of hypercalcemia total Ca 12.4 mg/dL (9–10.7 mg/dL) and high PTH level 240.9 pg/mL (15–65 pg/mL) the patient was admitted on April 20, 2015, to the Pediatric Endocrinology and Diabetology Department because of the suspected PHPT.

During the hospitalization patient reported a recurring abdominal pain accompanied by vomiting that had been present for several years. For this reason, he had an appendectomy at the age of 8 and a gastroscopy in 2013. Moreover, the patient complained of periodic bone pain and increased thirst.

Patient was in a good general condition on admission. Physical examination found: tall (190.5 cm, >97th percentile), overweight (body mass index, BMI: 27.09 kg/m^2), elevated blood pressure values in relation to the norms for age and gender – 142/81 mm Hg (maximum 135/85 mmHg), an excessively developed subcutaneous tissue, pink stretch marks on the skin of the hips and shoulders, a gynoid body structure, a gynecomastia with steatomastia, a postural defect, a clubfoot, valgus knees, a scleroderma limited to the area of the lateral ankle of the right leg, a single pigmented spots on the skin of the whole body, IV phase of sexual maturation in the Tanner staging.

After admission to the ward, tests to assess Ca and phosphate (P) metabolism were performed again, which showed: hypercalcemia, total Ca 13.2 mg/dL (9–10.7 mg/dL), low concentration of inorganic phosphorus 2.8 mg/dL (3.1–5.4 mg/dL), hypercalciuria (calcium excretion in daily urine colection 578.3 mg per 24 h (60-250 mg per 24 h), a low concentration of vitamin D3 10.4 ng/mL (30–100 ng/mL), with a simultaneous high concentration of parathyroid hormone 225.1 pg/mL (15–65 pg/mL). As part of the imaging diagnostics of the parathyroid glands, an US examination of the neck was performed on the ward, in which an oval, well circumscribed hypoechogenic focus (10 × 12 × 22 mm), probably corresponding to an enlarged right parathyroid gland, was seen behind the lower pole of the right thyroid gland. The diagnostics was extended with a technetium-99m methoxyisobutylisonitrile (Tc-99m MIBI) parathyroid scintigraphy in the anterior posterior (AP) projection of the neck and upper thorax (Figure 1) and the single-photon emission computed tomography / computed tomography (SPECT-CT) examination (Figure 2), which revealed a focus of radionuclide accumulation measuring 13 × 10 mm (in the plane of the scan) in the projection of a soft tissue structure located posteriorly from the lower part of the right thyroid lobe, which may correspond to the presence of a right inferior parathyroid adenoma.

Moreover, the ECHO of the heart showed I/II degree aortic valve insufficiency, which requires periodic control

at the Cardiology Clinic (a follow-up visit was scheduled after 6 months). Abdominal and thyroid US, an electrocardiogram and ophthalmological examination were normal. X-ray examinations did not reveal the presence of calcifications or abnormalities in the skeleton. The densitometry examination was without deviations.

During hospitalization, the child's condition remained good. Elevated blood pressure values were observed several times, but a differential diagnosis did not reveal any other causes of arterial hypertension other than the underlying disease (PHPT) and obesity.

Based on the overall clinical picture and the results of additional tests, PHPT due to parathyroid adenoma was diagnosed. Additional tests for multiple endocrine neoplasia (MEN) type 1 (MEN 1) and mutations of exons 1–15 of the HRPT2 gene – familial hyperparathyroidism with a tendency to parathyroid cancer – were performed and both came back negative.

The patient was scheduled to be hospitalized on May 26, 2015 at the Department of Paediatric Surgery and Urology for surgical treatment, with a recommendation for follow-up at the Endocrine Clinic after surgery. The histopathological examination after surgical removal of the tumor located in the lower right parathyroid gland confirmed the presence of an adenoma. The patient was discharged home in a good general condition with the following recommendations: diet excluding Ca-rich products, abundant watering, blood pressure control twice a day, performing control tests for Ca and P 2 weeks after discharge, and check-ups in the clinics of Genetics, Dermatology, Rheumatology, Orthopedics and Cardiology. In the event of alarming symptoms (e.g. vomiting, abdominal pain, palpitations), the patient was advised to urgently report to the Admission Room of the Provincial Specialist Children's Hospital.

After the surgical procedure, all parameters returned to normal range (mentioned above). The PTH concentration dropped from a level of 286.6 pg/mL on May 25, 2015 – the day before surgery to 40.2 pg/mL (15–65 pg/mL) on May 26, 2015 after surgery. Patient was regularly followed up at the Endocrinology Clinic. A routine follow-up examination 1 year after surgery on May 4, 2016, presented no abnormalities in the additional biochemical examinations. In addition, the patient lost weight reaching a body weight of 80 kg. In December 2018, the parathormone level was 43.6 pg/mL (15–65 pg/mL). The patient's body weight was 89.7 kg, with a height of 196 cm (BMI 23.7). At that time, the patient, aged 17 years and 10 months, was discharged from the Outpatient Paediatric Clinic for further care at an Adult Endocrinology Clinic.

4. DISCUSSION

In adults with PHPT, the diagnosis is mostly made in the asymptomatic period of the disease, because of a widespread biochemical screening.[6] In contrast to adults, children and adolescents almost always present a classic picture of the disease with advanced organ changes at the time of diagnosis, due to the lack of multiphase screening tests, including the determination of serum calcium level or PTH concentration.[4] Once the diagnosis is made, the treatment is largely supportive and includes prevention of life-threatening complications. PHPT can manifest with a variety of symptoms involving the gastrointestinal, musculoskeletal, renal and neurological systems, and at the onset of the disease, about 80% of children are found to have end organ damage, mainly bone and kidney.[7] Failure to measure at least the Ca concentration at the first signs of the disease may lead to inadequate and delayed diagnosis of the underlying disease and development of the symptomatic form, which may ultimately result in irreversible target organ involvement: bone destruction, urolithiasis, destruction of the urinary system secondary to urolithiasis, pancreatitis or gastric ulcer disease.[3] In addition to the well-known skeletal symptoms, PHPT can cause especially during growth spurt rare skeletal deformities such as genu valgum, subluxation of upper femoral epiphysis (SUFE) and epiphyseal displacement.[8] Moreover, patients detected with PHPT need to be monitored for MEN syndrome, which is the most common cause of inherited PHPT. In MEN 1, pancreatic islet cell tumors, pituitary tumors, carcinomatous tumors, especially those originating in the embryologic foregut, and subcutaneous and visceral lipomas, hemangiomas and collagenomas may additionally be common.[4]

The patient underwent resection of an adenoma located in the lower right parathyroid gland after successful parathyroid localization. The imaging techniques with high diagnostic performance in both detecting and localizing potential cause of PHPT and in the preoperative planning is the combination of cervical US performed by an experienced parathyroid sonographer and 99mTc-MIBI SPECT or SPECT-CT.[9] The resection of parathyroid adenoma is now the procedure of choice using rapid intraoperative PTH measurements and is usually curative.[1,10]

A rare case of a 14-year-old boy with ectopic parathyroid adenoma was successfully managed with a multidisciplinary approach combining input from paediatric endocrinologists, radiologists, and surgeons.

5. CONCLUSIONS

(1) PHPT is an uncommon disorder associated invariably with delay in diagnosis.
(2) PHPT is characterised by the nonspecific symptoms.
(3) Routine control of Ca and P concentration in patients with polyuria, fatigue, abdominal pain, nausea, vomiting or appetite and weight loss is essential for appropriate and early diagnosis. Simple laboratory tests can prevent fatal complications.

Conflict of interest

None declared.

Funding
None declared.

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