The Giant Parathyroid Adenoma: The largest ever reported

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Abstract

Background

Giant parathyroid adenoma is defined as weight $>3.5^{\text{gr}}$ and size of more than 2^{cm} .

Case Presentation

This report describes the largest primary parathyroid adenoma according to the literature. The case is a 48-year-old man referred to the clinic with knee and lower back pain. He had a history of mitral valve replacement and several episodes of bilateral nephrolithiasis. After a thorough assessment, a neck mass with a possible thyroid origin was detected but further assessment showed it was of parathyroid origin. The resected mass was $9 \times 6 \times 4^{\text{cm}}$ and weighed 122^{gr} , and histopathology showed a giant parathyroid adenoma.

Conclusion

Giant parathyroid adenomas which weigh more than 110^{gr} and are larger than 8^{cm} can lead to significant hypercalcemia. Despite the size of the giant parathyroid adenomas and high parathyroid hormone levels, a calcium crisis may not always occur in these patients and the masses may be initially misdiagnosed as a thyroid mass.

Background

Primary hyperparathyroidism (PHPT) is the most common disease of parathyroid glands and third most common endocrine disease ^{1,2}. The prevalence of PHPT in the general population is 22 per 100,000. In postmenopausal women, the prevalence reaches up to 1 per 500. Parathyroid adenoma is the cause of 80%-90% of PHPT. The remaining 10%-20% of PHPT cases are due to parathyroid hyperplasia and $< 1\%$ are due to parathyroid carcinoma ⁴. Giant parathyroid adenoma (GPA) is defined as an adenoma with weight $> 3.5 \text{ gr}$ and diameter $> 2 \text{ cm}$. The normal weight of the parathyroid gland is about 70 mg to 1 gr ^{1,5}. The mainstay of the pathophysiology of hyperparathyroidism is hypersecretion of parathyroid hormone (PTH), which leads to the release of calcium from bone cells by inhibiting osteoblasts and stimulating osteoclast activity. PTH stimulates calcium reabsorption and inhibits phosphate reabsorption in kidneys. Additionally, PTH stimulates calcium absorption from the gut ⁵ by stimulating the conversion of 25-hydroxy Vit D to 1,25-hydroxy vitamin D.

Clinical manifestations of PHPT include nephrolithiasis, osteoporosis-osteopenia, pancreatitis, depression and cognitive disorders and others. The severity of symptoms correlates with adenoma's weight and PTH level ^{1,5}. Hypercalcemic patients may present a life-threatening hypercalcemic crisis due to the high level of PTH secondary to a parathyroid carcinoma or a giant parathyroid adenoma ^{3,6}. Since the most common cause of PHPT is adenoma and most adenomas are asymptomatic, PHPT cases are mostly diagnosed during screening tests with elevated calcium and parathormone level^{4,5}.

Previously, the largest reported GPA was 8 x 5 x 3.5 cm with a weight of 110 gr⁷, and was associated with hypercalcemia (3.21^{mmol/L}/ 12.84^{mg/dL}).

Case Presentation

The case is a 48-year-old Persian man, from Urmia, Iran who presented to Imam Hospital with knee pain, lower back pain, fatigue and dizziness for the last two months. Patient had history of mitral valve replacement 30 years earlier, several bilateral nephrolithotripsy and diabetes mellitus which has been under control with oral medication. His vital signs were normal. There was a palpable large and soft nodule in left lobe of his thyroid which moved with swallowing. A scar of previous cardiac surgery was visible on his left chest. The rest of examination was normal. Color Doppler ultrasonography of the thyroid and parathyroid indicated a single isoechoic nodule in right lobe (12×9.5 mm) and 2 cystic nodules in the left lobe (40×23 mm and 30×16 mm) of his thyroid. A cystic mass in the left lobe of the thyroid was visible on a CT scan with contrast and extended retrosternal, suggesting parathyroid adenoma (Fig. 1). The mentioned findings were approved using ^{99m}Tc-MIBI scintigraphy. His CBC was normal, and the biochemical tests are shown in Table 1.

Table 1
Biochemical and Urine Analysis tests of the patient.

Variable (Serum)	Patient's values	Reference range	Unit
Calcium	14.6	8.5–10.5	mg/dL
Na (Sodium)	138	136–145	mEq/L
K (Potassium)	4.3	3.5–5.5	mEq/L
Mg (Magnesium)	2.04	1.8–2.6	mg/dL
P (Phosphorous)	2.14	2.8–4.5	mg/dL
PTH (Parathyroid hormone)	2702	14–65	pg/mL
Macroscopic U/A			
Color	Yellow	Yellow	—
Appearance	Clear	Clear	—
PH	7	4.6–8	—
Protein	trace	Negative	—
Glucose	Negative	Negative	—
Blood / Hb	trace	Negative	—
Microscopic (U/A)			
WBC	1–2	0–2	per HPF
RBC	4–5	0–2	per HPF
Epithelial	2–3	0–1	per HPF
Mucus	Negative	Negative	per HPF

Based on the findings in patient's lab and imaging, the probability of a parathyroid carcinoma was high enough to send the patient to surgery for tumor resection.

The operation was performed under general anesthesia. After creating a large collar incision (two finger width) in the suprasternal notch, sub-platysma flaps were created as part of a routine thyroidectomy procedure. The raphe between strap muscles was opened and the muscles were incised on the left side as high as possible.

After the thyroid was exposed, a thyroid mass that pushed the carotid sheath laterally and extended to the mediastinum caught the surgeons' attention. However, further evaluation of the mass showed the left lobe of the thyroid was pushed superiorly and was replaced by a mass which did not originate in the

thyroid, but extended to the mediastinum. An inferior thyroidal artery extending from the mass toward the carotid artery was visible. These findings favored a parathyroid origin of the mass, most likely from the inferior parathyroid glands. In order to prevent laryngeal nerve damage after sharp dissection of the carotid artery, the inferior thyroid artery was ligated, and then with sharp and blunt dissection, the lateral side of the tumor was released. After elevating the sternum with narrow Deaver, considering the posterior position of tumor, the anterior side of mass was released and the tumor was pulled forward (Fig. 2). The recurrent laryngeal nerve was visible between the trachea and medial side of the tumor, i.e. the mass was located behind the recurrent laryngeal nerve and under the inferior thyroid artery, extending toward the larynx. The mass was resected along with adjacent lymph nodes, the left lobe and isthmus of the thyroid, and without saving the other parathyroid glands. According to the operating room report, the surgeons did not explore the right parathyroid. After inserting a Hemovac drain, the neck wound was closed. The size of resected mass was 9×6×4 cm and weighed 122 gr.

Since the mass was descended to the retro-esophageal space and was located posterior to the recurrent laryngeal nerve we believe it was originated in the superior parathyroid gland. After the procedure was completed successfully, in order to prevent bone hunger syndrome an intravenous infusion of 3000 mg calcium gluconate every 8^h (9 gr/24h) was started.

On the first post-operative day, a liquid diet was started and oral CaCO₃ and Calcitriol pearls were started on the second postoperative day. Histopathological assessment of the resected mass revealed a parathyroid adenoma and multinodular goiter of the resected thyroid lobe (Fig. 3). The patient was followed up for 6 months. Calcium and calcitriol were tapered. Patient tolerated surgery and treatment well with no complications.

Discussion

Parathyroid adenoma is an uncommon, benign, and functional tumor of the parathyroid gland. The symptoms are the result of high levels PTH and higher reabsorption of Ca from bones, renal tubules and gut, causing hypercalcemia ^{1,4,8}. However, giant parathyroid adenoma can cause anatomical symptoms due to the large size of the tumor including dysphagia, odynophagia, and dyspnea ^{9,10}. Based on clinical studies, hypercalcemia is very common in most parathyroid mass cases. Also due to the increase in PTH levels and parathyroid function, ultrasonography and ^{99m}Tc-MIBI scintigraphy are very helpful procedures in making the diagnosis.¹¹.

The patient had been suffering from recurrent bilateral nephrolithiasis. Considering his back and bone pain, it was possible that the adenoma was chronically functional, so the patient had not experienced Calcium crisis symptoms. Diagnosis of a parathyroid mass was made based on lab findings including high Calcium and PTH levels. While the CBC was normal, the level of PTH was almost 50 times of its normal value. However, Calcium level was not as high as PTH which could be either due to chronic elevation of PTH or genetic resistance to PTH ¹². At that point we had no evidence to prove either option. After tumor resection and putting patient on Calcium and Calcitriol for several months then tapering

them, the patient no longer had the symptoms of hypo or hyperparathyroidism which ruled out any genetic disorder of Ca metabolism.

In summary Hyperparathyroidism should be considered as part of the differential diagnosis of any neck and cervical mass even though it is a very rare tumor.

Conclusion

This case report describes the largest giant parathyroid adenoma that has ever been diagnosed, although the size of the mass, location, and imaging might be misleading. Also, the very high level of Parathormone may not always lead to calcium crisis signs and symptoms.

Abbreviations

Primary hyperparathyroidism (PHPT)

Giant parathyroid adenoma (GPA)

Parathyroid hormone (PTH)

Declarations

Ethics approval and consent to participate

The patient's identity was kept confidential from article. Patient signed informed consent form which was approved by ethics committee of both Imam Hospital and Urmia University of Medical Sciences.

Consent for publication

Written informed consent was obtained from the patient for publication of this case report and any accompanying images. A copy of the written consent is available for review by the Editor of this journal.

Availability of data and materials

Not applicable.

Competing interests

The authors disclosed that they had no interest in this case report.

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Authors' contributions

In this case report, the chief surgeon and supervisor were RM. AS and BN who contributed their time in data collection and manuscript writing. The authors have read and approved final revision of the manuscript.

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Figures

Figure 1

The CT scan of the lower neck (right) and upper mediastinum (left) shows a huge mass pushing the trachea out of the midline.

Figure 2

Surgical view of the mass obscuring the thyroid gland (right) and dissection of the mass (left).

Figure 3

Histopathological view of the resected mass in favor of parathyroid adenoma.

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