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Case Report
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Acromegaly with No Evidence of Pituitary Adenoma or Ectopic Source

Hipofiz Adenomu veya Ektopik Kaynak Bulunmayan Hastada Akromegali

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Abstract

Acromegaly is caused by the uncontrolled hypersecretion of growth hormone (GH) and secondary increases of insulin-like growth factor–1. More than 95% of patients with acromegaly have a growth hormone-secreting pituitary adenoma. Ectopic GH or growth hormone releasing hormone (GHRH)-secreting tumors are rare cause of acromegaly. Pituitary adenomas that cause the hypersecretion of GH are nearly always visible on magnetic resonance imaging. Rarely, patients without an ectopic source may have normal pituitary imaging. In managing this rare circumstance, exploring pituitary or medical treatment with a somatostatin analog might be useful. We describe a patient with acromegaly with no pituitary adenoma and no evidence of ectopic source, who was treated with long-acting octreotide.
Keywords: Acromegaly; negative magnetic resonance imaging; somatostatin analog treatment

Özet

Akromegali büyüme hormonunun (GH) kontrolsüz hipersekresyonu ve buna ikincil insülin benzeri büyüme faktörü-1'in (IGF-I) artışı nedeni ile oluşur. Akromegali hastalarının %95'inden fazlasında GH salgılayan hipofiz adenomu mevcuttur. Ektopik GH veya GHRH salgılayan tümörler akromegalinin nadir nedenidir. GH salgılayan hipofiz adenomları neredeyse her zaman manyetik rezonans görüntüleme (MRI) ile görüntülenebilirler. Ancak, nadiren ektopik odak saptanamayan hastalarda hipofiz MRI'da adenom gözlenmeyebilir. Bu durumda, somatostatin analogları ile tedavi veya hipofiz eksplorasyonu yararlı olabilir. Burada görüntüleme yöntemleri ile ektopik odak veya hipofiz adenomu saptanamayan ve uzun etkili octreotide ile tedavi edilen bir akromegali hastası sunulmuştur.
Anahtar kelimeler: Akromegali; negatif manyetik rezonans görüntüleme; somatostatin analog tedavisi

Introduction

Acromegaly is caused by the uncontrolled hypersecretion of growth hormone (GH) and secondary increases of insulin-like growth factor-1 (IGF-1) and has an incidence of 3-4 cases per million population per year (1). The clinical manifestations range from soft tissue swelling, acral enlargement, increase in the ring and/or shoe size, facial bone deformities, including jaw prognathism, to glucose intolerance or frank diabetes mellitus, hypertension, and cardiovascular disease (2). GH-secreting pituitary adenomas are the cause of acromegaly in over 95% of patients (3). Most of these tumors are large and easily identified on magnetic resonance imaging (MRI) of the sella. Very small microadenomas that are not visible on pituitary MRI are rare and could be identified on pituitary exploration (4). Ectopic GH- or growth hormone-releasing hormone (GHRH)-secreting tumors are a rare cause of acromegaly (5). Most frequently bronchial and pancreatic carcinoid tumors and less frequently pancreatic islet tumors, pheochromocytomas, medullary thyroid carcinomas, and small cell carcinomas of the lung are the sources of ectopic acromegaly because of GHRH secretion (6-10). We describe a patient with acromegaly with no pituitary adenoma and no evidence of ectopic source who was treated with long-acting octreotide.

Case Report

On March 2011, a 49-year-old woman was referred to our outpatient clinic with complaints of a headache, swelling of hands, and increase

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in ring and shoe size. The physical examination revealed an acromegalic face, macroglossia, and acral enlargement (Figure 1). Multiple skin tags were present on her neck. Her weight was 93 kg, height was 150 cm, and shoe number size was 40. She had hypertension for 10 years and her blood pressure was 120/80 mmHg on daily treatment with amlodipine 5 mg and ramipril 5 mg. Her fasting blood sugar was 104 mg/dL and HbA1c was 6.7%. Further investigations were performed for the diagnosis of acromegaly. level was 587 ng/mL (normal range: 90–360 ng/mL) and GH levels were 1.4 and 5 ng/mL (normal range 0-5 ng/ml). Because the GH release is pulsatile and fasting, sleep, exercise and many factors may affect the release, two seperate GH tests were performed on the same day.

Other biochemical examinations were prolactin: 7.6 ng/mL (5-23 ng/mL), luteinizing hormone: 8.9 mIU/mL (0.1-95 mIU/mL), follicle-stimulating hormone: 23 mIU/mL (0.1-21.5 mIU/mL), estradiol: 13 pg/mL (7.6-498 pg/mL), thyroid-stimulating hormone: 1.8 µIU/mL (0.27-4.2 µIU/mL), free thyroid hormone 4: 13.7 pmol/L (12-22 pmol/L), cortisol: 207 nmol/L (64-536 nmol/L), adrenocorticotropic hormone: 22.2 pg/mL (7.2-63.3 pg/mL), Na: 146 mmol/L (132-146 mmol/L), K: 4.2 mmol/L (3.5-5.1 mmol/L), Ca: 9.9 mg/dL (8.8-10.6 mg/dL), P: 4.7 mg/dL (2.5-4.5 mg/dL), and parathormone: 38 pg/mL (15-65 pg/mL). Elevated serum GH levels (serum GH level of minimum 1.2 ng/mL) during an oral glucose suppression test with 75 g of glucose confirmed the diagnosis of acromegaly (Table 1).

Medical nutrition therapy and exercises were started for glycemic control. For tumor localization, contrast-enhanced MRI of the sella with dynamic images was performed, and the sella was normal and no adenoma or pituitary enlargement was seen on MRI (Figure 2). Subsequently, for the ectopic source of GH secretion localization, contrast-enhanced computed tomography (CT) scans of the chest, paranasal sinus, abdomen, and pelvis were performed, which were all normal. Thyroid ultrasonography and bilateral mammography were normal. Serum calcitonin level was also normal. We decided to perform an octreotide scan for carcinoid tumors. However, the patient did not attend the polyclinic appointment and the octreotide scan could not be performed. On April 2013, two years later, she was admitted to our outpatient clinic again with her previous complaints. Serum GH level was 2 ng/mL and IGF-1 level was 449 ng/mL. An oral glucose suppression test with 75 g of glucose was performed again and the GH level was not suppressed below 1 ng/mL (decreased to 1.2 ng/mL) (Table 1).

The patient again underwent dynamic pituitary MRI; however, no adenoma was seen. Contrast-enhanced CT scans of the chest, abdomen, and pelvis were performed to determine whether an ectopic source of GHRH or GH existed. However, all scans were normal. A ^{68}Ga-DOTANOC [(68)Gallium-DOTA, 1-Nal(3)-octreotide] positron emission tomography (PET) scan for carcinoid tumors was performed, but it did not show any ectopic uptake. Gastroduodenoscopy and colonoscopy findings were also normal. Plasma GHRH could not be measured because of a technical failure. Next, a decision to explore the pituitary gland was taken. However, the patient refused to undergo transsphenoidal surgery. The follow-up of the patient with medical treatment with lanreotide was decided because of mild increase of IGF-1 and GH levels and the patient was clinically stable with mild symptoms. The treatment with long-acting lanreotide 60 mg per month was initiated, which resulted in symptomatic improvement. After three months of therapy, further regression of the acromegaly symptoms and normalization of serum GH and IGF-1 levels of 0.5 ng/mL and 170 ng/mL, respectively, were observed. At the end of eight months of follow-up, serum IGF-1 and GH levels were 170 ng/mL and 0.5 ng/mL, respectively.

Discussion

Acromegaly is caused in over 95% of patients by a GH-secreting pituitary tumor. Pituitary enlargement with the absence of a detectable tumor is strongly suggestive of acromegaly secondary to ectopic GHRH secretion. Therefore, if the MRI is normal, abdominal and chest imaging should be performed to check for an ectopic focus of hormone secretion (11). Serum GHRH is the only specific marker for ectopic acromegaly, and if a clear pituitary adenoma is not seen on MRI, GHRH measurement should be performed if possible (12). Chromogranin A (CgA) level may be measured, but as CgA was thought as a prognostic tumor marker for patients with an established diagnosis to assess treatment response, it is not recommended as a diagnostic marker for neuroendocrine tumors such as carcinoids. We did not prefer to measure the CgA level (13,14). PET/CT scans with 68Ga-DOTANOC are highly sensitive and specific and increasingly used for detecting neuroendocrine tumors. Catheterization studies to demonstrate an arteriovenous gradient of either GH or GHRH in the tumor region are suggested if all these investigations fail (12). In this case, we could not measure GHRH and perform catheterization be-

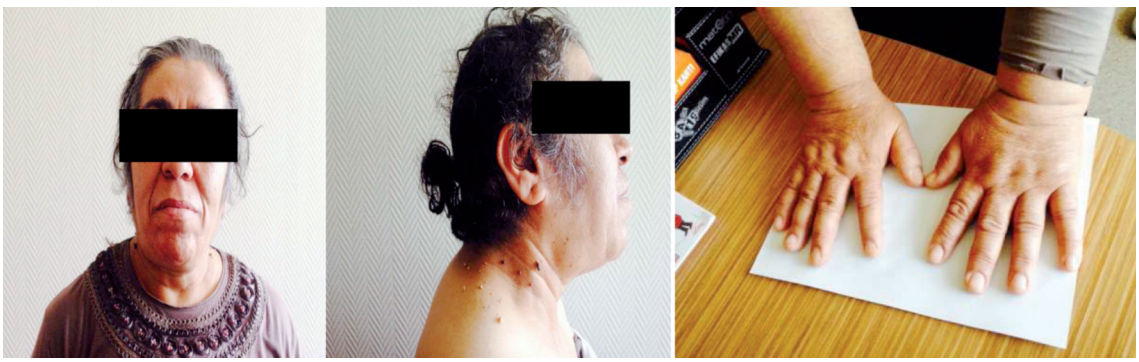

Figure 1: (A) Acromegalic face and **(B)** acral enlargement.

Table 1. Oral glucose tolerance test results.

Time (min)	Glucose (mg/dL)	GH (ng/mL)
0	99	1.6
30	161	1.2
60	217	3
90	175	5.5
120	123	4.1

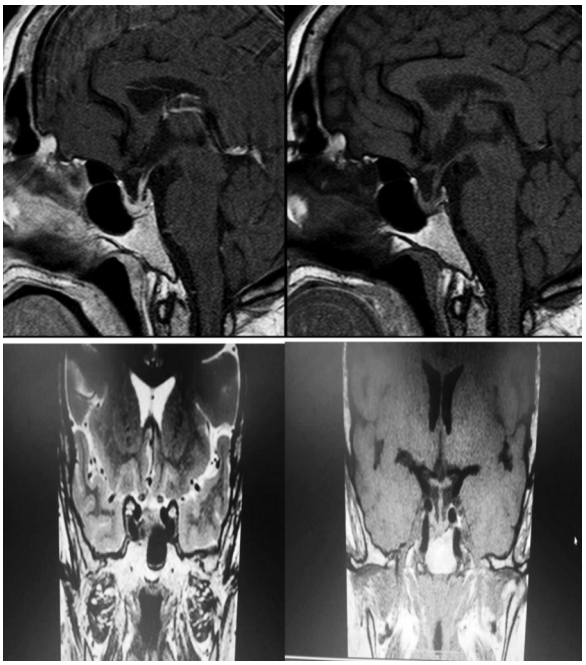

Figure 2: The pituitary MRI of patient.

cause of a technical failure. The ectopic source is mostly excluded with a ^{68}Ga-DOTANOC PET scan and other imaging methods.

Acromegaly secondary to a very small pituitary microadenoma not visualized on pituitary MRI is rare. Doppman et al. (15) described three patients with acromegaly who did not show any ectopic uptake and in whom MRI could not demonstrate pituitary adenomas. All three patients underwent pituitary exploration and the adenomas were identified at surgery (resected adenoma sizes: 6, 7, and 10 mm). Daud et al. (16) reported a patient with acromegaly who did not have imaging evidence of a pituitary adenoma with contrast-enhanced MRI. A 9-mm adenoma was later discovered at surgery and was successfully removed. Lonser et al. (17) reported a series of six patients with acromegaly in whom MRI failed to detect pituitary adenomas and who also lacked an ectopic source. However, on pituitary exploration, microadenomas were detected in all cases. Khandelwal et al. (4) reported a case of acromegaly in which imaging with conventional MRI, followed by a second, fine-cut MRI with special volumetric interpolated breath-hold examination sequences, failed to reveal a pituitary adenoma. However, on surgical exploration, a pituitary adenoma infiltrating the dura was identified and removed. An ectopic source of GH/GHRH was also ruled out.

Pituitary exploration was one of the treatment options in our patient. However, in this condition, surgery should be followed by catheterization. Our patient was not desirous for surgery and because of the technical failure to measure GHRH, mild symptoms of the patient, and mildly elevated serum GH and IGF-1 levels, following up the patient with long-acting somatostatin analog therapy was decided. An effective treatment and suppression were provided.

In the medical treatment of acromegaly, somatostatin analogs are the first option. High numbers of somatostatin receptors are expressed on most tumor cells, especially growth hormone-secreting pituitary adenomas and most neuroendocrine tumors (18,19). Somatostatin analogs can slow the growth of these tumors by binding to specific cell surface receptors. The activation of somatostatin receptors induces apoptosis and cell cycle arrest primarily because of the regulation of mitogen-activated protein kinase and phosphotyrosine phosphatase activities. Moreover, somatostatin analogs indirectly reduce tumor growth by inhibiting tumor angiogenesis and growth factor secretion in somatostatin receptor-negative tumors (20). Cabergoline may be preferred as the first treatment of choice in the management of mild acromegaly. In a meta-analysis of 15 studies of cabergoline therapy in acromegaly, normal serum IGF-1 levels were achieved in 51 of 149 patients (34%) (21). In our patient, lanreotide 60 mg was used, but cabergoline might be preferred as an initial therapy.

Currently, there is no consensus for the treatment of patients with acromegaly and negative pituitary imaging (22). For several years, small ectopic carcinoid tumors could not be detected with available imaging methods. Therefore, because of the risks of unnecessary pituitary surgery, following up patients with somatostatin analog therapy may be an option for patients with mild disease.

Authorship Contributions

Concept: Hüseyin Demirci, Işılay Kalan Sarı, Design: Hüseyin Demirci, Data Collection or Processing: Işılay Kalan Sarı, Şenay Arıkan Durmaz, Analysis or Interpretation: Işılay Kalan Sarı, Literature Search: Işılay Kalan Sarı, Hüseyin Demirci, Writing: Işılay Kalan Sarı, Şenay Arıkan Durmaz.

Conflict of Interest: No conflict of interest was declared by the authors.

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