

## Hyperparathyroidism induced by heterotopic parathyroid adenoma in the anterior mediastinum

*Ön mediastende heterotopik paratiroid adenom ile tetiklenen hiperparatiroidi*

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Mediastinum-located ectopic parathyroid glands which are rarely seen do not need to be resected in most cases. The most common indication for resection of ectopic parathyroid glands is primary hyperparathyroidism. Approximately 25% of all parathyroid tumors associated with primary hyperparathyroidism are located in the mediastinum and almost all of these tumors can be removed through a cervical approach. However, 2% of the mediastinal tumors require a transthoracic approach for their removal. In this article, we report a 60-year-old female case who had an anterior mediastinal parathyroid adenoma and presented with hyperparathyroidism which required a median sternotomy.

**Keywords:** Hyperparathyroidism; mediastinum; parathyroid adenoma.

Ectopic parathyroid adenomas represent a diagnostic challenge, since they are extremely rare in clinical practice. Here we discuss a case of a 60-year-old female with symptomatic hypercalcemia, due to an ectopic parathyroid adenoma in the anterior mediastinum. She was treated by ectopic parathyroid removal along with extensive thymectomy, approached by median sternotomy. Serum calcium and parathyroid hormone levels were normalized immediately. This

Mediasten yerleşimli ektopik paratiroid bezler nadir görülmele birlikte, birçok olguda rezeke edilmesine gerek yoktur. Ektopik paratiroid bezlerin rezeksiyonunun en bilinen endikasyonu, primer hiperparatiroididir. Primer hiperparatiroidi ile ilişkili tüm paratiroid tümörlerin yaklaşık %25'i, mediasten yerleşimlidir ve bu tümörlerin neredeyse tümü servikal yaklaşım ile temizlenebilir. Ancak mediastinal tümörlerin %2'sinin transtorasik yaklaşım ile temizlenmesi gerekmektedir. Bu yazıda hiperparatiroidinin eşlik ettiği ön mediastende paratiroid adenomu olan ve temizleme için medyan sternotomi gerektiren 60 yaşında kadın bir olgu sunuldu.

**Anahtar sözcükler:** Hiperparatiroidi; mediasten; paratiroid adenoma.

case highlights ectopic parathyroid adenoma in the anterior mediastinum could be the origin of primary hyperparathyroidism that cannot be detected in neck area.

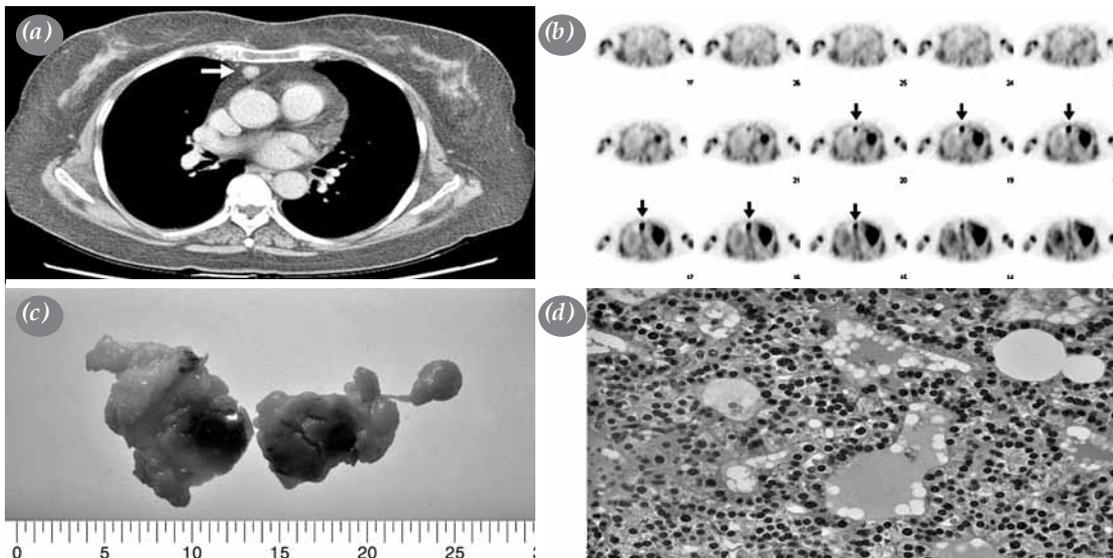
### CASE REPORT

A 60-year-old female patient presented to our department with an anterior mediastinal mass. She had a five-year history of lump sensations in the



anterior neck and had been followed up regularly at the Department of Otolaryngology. The patient had previously undergone tests for thyroid function, thyroid stimulating antibodies, thyroglobulin antibodies, and antithyroid microsomal antibodies, and the results were within the normal range. Neck computed tomography (CT) and neck ultrasonography (USG) that included the thyroid and parathyroid glands had revealed no abnormal findings. In addition, no parathyroid function tests, including those for calcium, phosphate, and parathyroid hormone, had been performed in the previous five years. Despite the regular follow-ups and normal laboratory test results, she complained of continuous numbness and lumpy sensations in her anterior neck upon admission to our facility. Therefore, ultrasound-guided aspiration of the thyroid and parathyroid glands were performed by an otolaryngologist, and this showed normal thyroid and parathyroid tissues. Laboratory tests performed three months earlier had revealed increased calcium [11.4 mg/dL (normal range 8.2-10.8 mg/dL)] and decreased phosphate levels [2.1 mg/dL (normal range 2.5-5.5 mg/dL)]. Although further evaluation of the parathyroid hormone level showed that it had increased to 634 pg/mL (normal range, 17-73 pg/mL), a biopsy of the thyroid and parathyroid glands did not show anything abnormal or even chief cell hyperplasia. Since these findings were suggestive of ectopic thyroid

and parathyroid glands, the patient underwent scans of these two glands. The thyroid scan revealed no ectopic lesion, but the parathyroid scan with technetium-99m (Tc-99m) sestamibi showed focal uptake in the anterior mediastinum on a two-hour delayed image (Figures 1a and b). Further evaluation via chest CT revealed a round mass measuring 2.0 cm in diameter with partial enhancement in the anterior mediastinum. In retrospect, we found that the patient had had manifestations of hypercalcemia, including mild weakness, fatigue, and depression, during the previous five-year period. It was decided that the patient would be operated on, and the surgical approaches that were considered included a right-sided approach with video-assisted thoracic surgery (VATS), a left-sided approach with VATS, video-assisted mediastinoscopy (VAM), a partial sternotomy, or a standard median sternotomy. The advantages and disadvantages of these options were explained to the patient, and she chose the standard median sternotomy approach. The patient underwent ectopic parathyroid removal along with an extensive thymectomy without any specific events or complications during the surgery or postoperative course. Gross examination revealed a 2.0x3.0x2.2 cm round, encapsulated mass, and a microscopic examination revealed that chief cells were predominant and arranged in an acinar pattern. In addition, the nuclei were small and round and



**Figure 1.** (a) Preoperative chest computed tomography showing a round mass in the anterior mediastinum, with the white arrow indicating the parathyroid adenoma. (b) Preoperative parathyroid scan with technetium-99m sestamibi single photon emission computed tomography showing a hot-uptake mass in the anterior mediastinum, with the black arrow indicating the parathyroid adenoma. (c) Gross findings. (d) The microscopic findings of the parathyroid adenoma showing that predominant chief cells arranged in an acinar pattern and the small, round nuclei with finely dense chromatin and a faintly eosinophilic cytoplasm, all of which were compatible with parathyroid adenoma (H-E stain; magnification x 400).

had finely dense chromatin with a faintly stained eosinophilic cytoplasm, which was consistent with parathyroid adenoma (Figures 1c and d). Moreover, these microscopic findings were compatible with those of ectopic parathyroid adenoma. One day after the operation, the patient's calcium level was 8.5 mg/dL, the phosphate level was 3.4 mg/dL, and the parathyroid hormone level was 26.4 pg/mL, all of which were within the normal range. The serum calcium, phosphate, and parathyroid hormone levels were regularly checked for one year, and the mild manifestations of hypercalcemia improved.

## DISCUSSION

Hypercalcemia and hypophosphatemia are manifestations of excessive secretion of the parathyroid hormone.<sup>[1,2]</sup> Ectopic parathyroid glands are more frequently found in females than in males (3:1) and occur in patients between the ages of 40 and 80 years old. Akerström et al.<sup>[3]</sup> found that supernumerary parathyroid glands are present in approximately 5% of all autopsy specimens, and 1.25% of these had five or more of these glands. Furthermore, 2% of the patients with ectopic parathyroid glands had inferior lobes in the mediastinum while 0.2% had them in the anterior mediastinum far below the thymus.<sup>[3,5]</sup> Supernumerary parathyroid adenomas have been identified in only a few cases, and only 0.7% of these lesions are associated with primary hyperparathyroidism. Moreover, 60% of supernumerary parathyroid adenomas are located in the mediastinum while the remainder are found in the thymus and thymic tissue. These adenomas are difficult to remove via a cervical approach; thus a mediastinal approach is required.<sup>[4,5]</sup> Soler et al.<sup>[6]</sup> reported that mediastinal parathyroid glands cause hyperparathyroidism in 20% of all patients with primary hyperparathyroidism, and these glands have been incompletely removed when using the cervical approach in 2% of all patients.<sup>[1,6]</sup>

The most non-invasive diagnostic method for mediastinal parathyroid glands is contrast-enhanced CT. However, parathyroid glands that measure less than 1.5 cm are difficult to identify by CT.<sup>[5,7]</sup> Ultrasonography, magnetic resonance imaging (MRI), positron emission tomography (PET)-CT, and single photon emission computed tomography (SPECT) are also very helpful in the diagnosis of ectopic parathyroid glands, but the most reliable and practical non-invasive diagnostic technique for detecting them in the mediastinum is currently a Tc-99m sestamibi scan because it has the highest detection rate. If a tumor weighs more than 1 g, the success rate with this

type of scan reaches 86%, and if the tumor weighs more than 2.0 g, it is nearly 100%.<sup>[7]</sup>

The most popular treatment method for ectopic parathyroid glands is surgical excision via a cervical incision. However, this approach does not work as well when the parathyroid gland is located in either the anterior or posterior mediastinum and embedded in vital structures. Therefore, approximately 2% of these cases require other surgical approaches. A median sternotomy or thoracotomy have traditionally been used to treat such cases, but many surgeons have recently performed minimally invasive surgical techniques such as VATS and VAM and achieved surgical outcomes similar to those associated with the traditional surgical approach. However, there is continuing controversy regarding the use of extensive thymectomies with these kinds of procedures.<sup>[1,2]</sup> Complete resection of ectopic parathyroid glands using the VATS technique has proved to be safe and has shown good outcomes, but selective single lung ventilation and chest drain insertion through multiple port incisions are sometimes necessary with this procedure. Another option for the treatment of an ectopic parathyroid gland in the mediastinum is angiographic ablation. This is by far the least invasive treatment option, but it has a success rate of just 40%.<sup>[2]</sup> Primary hyperparathyroidism induced by ectopic parathyroid glands can be successfully treated by a sternotomy in conjunction with the exploration of the mediastinum. In addition, VATS and VAM have recently been employed in cases in which this occurred, and these have the advantages of short hospital stays, cost-effectiveness with a minimal use of fancy and pricy consumables, a comfortable incision, and no violation of the pleural space.

## Conclusion

Primary hyperparathyroidism is characterized by excessive secretion of parathyroid hormone which leads to hypercalcemia and hypophosphatemia. Ectopic mediastinal parathyroid adenoma, which produces primary hyperparathyroidism, appears to be a very uncommon disease entity, and when located in the anterior mediastinum, it should be considered as one of the rare causes of the persistent or recurrent forms of this disorder. This lesion should be surgically removed either via a median sternotomy, thoracotomy, mediastinotomy, mediastinoscopy or thoracoscopy.

## Declaration of conflicting interests

The authors declared no conflicts of interest with respect to the authorship and/or publication of this article.

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