Transcervical resection of two parathyroid adenomas located on the anterior mediastinum

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ABSTRACT
The mediastinum is a possible location of ectopic parathyroid adenoma. Most ectopic parathyroid glands in the mediastinum are found in the superior mediastinum within the thymus. In this article, two cases with ectopic mediastinal parathyroid adenomas that were excised via transcervical resection are presented. Preoperative examination of the two cases was performed. Laboratory tests supported hyperparathyroidism. For both patients, the results of radiologic and scintigraphic examinations of the cases were compatible with parathyroid adenoma masses in the anterior mediastinum. Transcervical resection was performed via suprasternal incision through the sternal notch and the posterior wall of the sternal space by blunt dissection with the finger. The soft lesions were removed en bloc in both cases. The parathyroid hormone levels of the two cases decreased dramatically after the operation. Transcervical resection may be an alternative method to major surgery in anterior mediastinal small masses.

Keywords: Mediastinum, ectopic parathyroid adenoma, transcervical resection, minimally invasive surgery

INTRODUCTION
Primary hyperparathyroidism is accompanied by oversecretion of parathormone, leading to hypercalcemia and hypophosphatemia. The major cause of primary hyperparathyroidism is parathyroid adenoma. In some patients, adenomas can be found ectopically. The mediastinum is an ectopic location for parathyroid adenomas (1). Parathyroid glands are ectopically positioned in almost in 15%-20% of cases (2). Retrospective studies have demonstrated that 1%-3% of all patients experiencing parathyroid operations have functional mediastinal parathyroid tumors (2, 3).

Most of these tumors are found in the superior aspect of the anterior or posterior mediastinum and are thus permeable through a cervical incision; 1.4%-20% of patients require sternotomy (4). This may require surgical intervention in the form of parathyroidectomy, which is workable through a cervical incision in most cases; however, 1%-2% of these patients may require a transternal or transthoracic approach due to a deeply seated mediastinal parathyroid gland (1, 5). Minimally invasive strategies have lately been found to be an alternative to traditional open approaches due to their lower morbidity and improved results. We describe our experience with a minimally invasive versus a traditional open approach for ectopic mediastinal parathyroidectomy.

CASE PRESENTATIONS

Case 1
A 40-year-old woman (Table 1) with high levels of calcium, phosphate, and parathormone was referred to our clinic for suspected primary hyperparathyroidism. There was no relevant medical or family history. Physical examination was normal. Abnormal calcium, parathormone, and phosphate levels were detected in blood analysis. At presentation, her biochemical levels were as follows: serum calcium and phosphorus levels were 11.6 mg/dL (normal range 8.8-10.2 mg/dL) and 1.85 mg/dL (NR 2.7-4.5 mg/dL), respectively. Her intact parathormone level was 882 pg/mL (NR 15-68 pg/mL). Her thyroid function test results were within the normal range. The thyroid gland appeared normal, and no other pathologic lesion was found by cervical ultrasonography (USG) or magnetic resonance imaging (MRI). Ectopic parathyroid adenoma was suspected, and a mediastinal mass was identified in a chest computer tomography (CT) scan. CT study of the thorax revealed a nodule, 2x3 cm in diameter, located on the anterior mediastinum superior to the aortic arch (Figure 1, 2). By technetium-99 m pertechnetate methoxy-isobutyl-isonitrile (Tc-99 m MIBI) scan, the nodule was seen as an intense focus in the anterior mediastinum, and ectopic parathyroid adenoma was diagnosed. After surgery, the patient’s intact parathyroid hormone level reverted to 86 pg/mL.

Case 2
A 57-year-old woman (Table 1) was referred to our clinic from another center for suspected primary hyperparathyroidism. She had been experiencing common bone pain and nephrolithiasis. Her symptoms had become more severe over time. At presentation, her biochemical levels were as follows: serum calcium 11.7 mg/dL,
parathyroid hormone 1412 pg/mL, and phosphorus level 2.67 mg/dL. The thyroid gland appeared normal, and no other pathologic lesion was found by cervical USG. Ectopic parathyroid adenoma was suspected, and a mediastinal mass was identified in a chest CT scan. CT study of the thorax revealed a nodule, 32×20 mm in diameter, located posterior to the manubrium sterni and in front of the left brachiocephalic vein. By Tc-99 m MIBI scan, the nodule was seen as an intense focus in the anterior mediastinum, and ectopic parathyroid adenoma was diagnosed. After the operation, the patient’s intact parathyroid hormone level reverted to 126 pg/mL. In both cases, rapid PTH was not considered due to the absence of rapid PTH facilities at the center. Postoperative pathologic diagnosis was parathyroid adenoma. A whole-body Tc99 m sestamibi parathyroid scan showed an increased tracer concentration in the anterior mediastinum, which suggested the presence of active parathyroid tissue, while the same activity was not observed in the neck. Thorax CT was performed after the sestamibi parathyroid scan. The level of the lesion is of great importance in these cases because lesions under the manubrium sterni can be difficult to access by this method.

**DISCUSSION**

Churchill was the first to recognize hyperfunctioning ectopic parathyroid glands in 1932. The patient, Captain Charles E. Martell, underwent six prior unsuccessful cervical explorations and had severe osteitis fibrosa cystica until the ectopic gland was removed by a transsternal approach (1). Primary hyperparathyroidism is accompanied by hypersecretion of parathyroid hormone, which results in hypercalcemia and hypophosphatemia. Parathyroid adenoma is the major cause in most cases. In 11%-25% of cases, ectopic mediastinal hyperfunctional parathyroid tissue can be found (3).

Two different mediastinal parathyroid glands have been defined in the literature: the first type originates in the neck and descends into the chest with continuing glandular enlargement in the presence of negative intrathoracic pressure; the second type is the outcome of developmental malascent, which usually affects the inferior parathyroid glands or is due to supernumerary parathyroid glands. The first type can be removed by the transcervical approach; the second is usually deeply rooted in the mediastinum and may require an additional or an alternative access, either transsternal or transthoracic (1).

Diagnosis of ectopic mediastinal parathyroid glands is difficult, and their localization is even more so. The methods used to identify ectopic parathyroid glands include chest CT scan, MRI, or MIBI scan (1). If the parathyroid adenoma is located in the mediastinum, median sternotomy, thoracotomy, mediastinotomy, mediastinoscopy, or thoracoscopy may be required for resection, similar to other mediastinal masses (6-8). Successful and accurate preoperative localization of the ectopic glands is important, especially if minimally invasive approaches are
considered (1). 98% of these mediastinal parathyroid adeno-
mas are resectable through a neck collar incision, whereas 2%
require a different approach (9). In such cases, it is important
to plan the operation to enable complete surgical resection of
the ectopic parathyroid adenoma.

The traditional approaches to ectopic mediastinal para-
thyroid glands include median sternotomy or thoracotomy to
access the ectopic glands. Recently, minimally or less inva-
sive approaches are being seen as alternatives, with report-
ed lower morbidity and earlier return to normal life (1). The
diverse minimally or less invasive strategies reported in the
literature include splitting the manubrium (manubriotomy),
closed mediastinal exploration with dedicated equipment
followed by excision of the gland via transcervical approach,
video-assisted mediastinoscopy, video-assisted thoraco-
sopic surgery (VATS), and robot-assisted exploration (1, 10).

Surgery is the preferred treatment. Surgical excision should
be planned based on thorax CT and parathyroid scintigra-
phy findings. In such cases, cervical incision can also be
applied (3). The transcervical approach was applied for our pa-
tients; parathyroidectomy was completely successful, with no
complications.

CONCLUSION
Minimally invasive surgery for upper mediastinal parathyroid-
ectomy is safe and can be applied with low morbidity. It may
be equivalent to the traditional open approach in terms of
morbidity; however, it provides the patient with a significantly
shorter length of hospital stay.