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# The use of gamma probe for the intraoperative localization of an ectopic parathyroid adenoma

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## ÖZET

**Ektopik paratiroid adenomunun intraoperatif belirlenmesi amacıyla gama prob kullanımı**

*Primer hiperparatiroidizmde en sık etyolojik faktör mediastende de yerleşebilen soliter paratiroid adenomudur. Mediastende yerleşik soliter paratiroid adenomlarına servikal insizyonla ulaşmak güçtür ve torasik bir yaklaşım gerekir. Asendan aortanın önünde timus içerisinde yerleşik primer hiperparatiroidizme neden olan paratiroid adenomlu 55 yaşındaki kadın olgumuzu sunuyoruz. Olguya paratiroid adenomunun doğru lokalizasyonunu sağlayarak cerrahiye yardımcı olan gama probun intraoperatif kullanımıyla genişletilmiş timektomi uygulandı. Histolojik tanı tümörün ektopik paratiroid adenomu olduğunu doğruladı. Hastada hem kalsiyum hem de paratiroid hormon düzeylerinde azalma ile birlikte olan sorunsuz bir postoperatif dönem gözlemlendi. Gama probun tam cerrahi rezeksiyon için ektopik paratiroid adenomunu çevre dokulardan ayırt etmesi nedeniyle çok yararlı bir araç olduğunu belirtmek istiyoruz.*

**Anahtar Kelimeler:** Paratiroid adenom, timektomi, ektopik, gama prob.

## SUMMARY

**The use of gamma probe for the intraoperative localization of an ectopic parathyroid adenoma**

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The most common etiologic factor of primary hyperparathyroidism is a solitary parathyroid adenoma that might be located in the mediastinum. The mediastinally located ectopic parathyroid adenomas are often out of reach with a cervical incision and require a thoracic approach. We present a case of 55 year-old female patient with a parathyroid adenoma located anterior to the ascending aorta within the thymus resulting in primary hyperparathyroidism. The patient underwent an extended thymectomy with intraoperative use of a gamma probe as an adjunct to surgical resection which provided the accurate localization of the parathyroid adenoma. Histologic diagnosis confirmed the tumor to be an ectopic parathyroid adenoma. The patient showed an uneventful postoperative period with decreased levels of both calcium and parathyroid hormone. We emphasize that the gamma probe serves as a very useful device to differentiate the ectopic parathyroid adenoma from surrounding tissues for complete surgical excision.

**Key Words:** Parathyroid adenoma, thymectomy, ectopic, gamma probe.

Primary hyperparathyroidism most often results from a single parathyroid adenoma in 85% of cases. Although neck is the most common localization for parathyroid adenomas, nearly 25% of the cases are ectopic adenomas located deep in the mediastinum and high in the neck which are not accessible with standard cervical approaches (1). Thus, a thorough evaluation and proper localization is of clinical significance when an ectopic parathyroid adenoma is suspected because surgical failure mainly results from the lack of preoperative imaging methods. Tc-99m-MIBI scintigraphy has been shown as the most useful diagnostic method to localize a mediastinal ectopic parathyroid adenoma which serves as a guide to the surgeon (2,3). However, accurate localization still may have some difficulties particularly in cases with minute adenomas.

We herein report a case with primary hyperparathyroidism resulting from an ectopic parathyroid adenoma located within the thymic tissue which has been localized by the intraoperative use of a gamma probe.

### CASE REPORT

A 55-year-old female was consulted from general surgery department with a possible diagnosis of a mediastinal parathyroid adenoma. She had a history of nephrolithiasis which she had been operated prior to her admission. She had had thyroid crisis following this operation and undergone a thyroidectomy after two months of medication. She had hypercalcemia with a serum calcium level of 11.0 mg/dL (range; 8.6 to 10.2 mg/dL) and hyperparathyroidism with a high level of parathyroid hormone showing 348 pg/mL (range; 9.5 to 75 pg/mL for adults) following the operation. She

was diagnosed to have a possible ectopic parathyroid adenoma located in the right paratracheal and preaortic location, which was interpreted as a lymph node in the chest computerized tomography (CT) (Figure 1). Parathyroid scintigraphy with 20 mCi 99m-Tc-MIBI showed a focal uptake in the prevascular area, anterior to the ascending aorta consistent with a parathyroid adenoma which was revealed by chest CT (Figure 2). The patient underwent an extended thymectomy through a median sternotomy in which the site of the nodule within the thymic tissue was localized by the intraoperative use of a gamma probe (Figure 3). Histologic diagnosis was a parathyroid adenoma measuring 13 x 10 mm in diameter. The postoperative course was uneventful and the patient did well with decreased levels of both parathyroid hormone and calcium. She is asymptomatic at six months follow-up.



Figure 1. Computerized tomography of the chest showing a mediastinal nodule (arrow) in the anterior mediastinum.

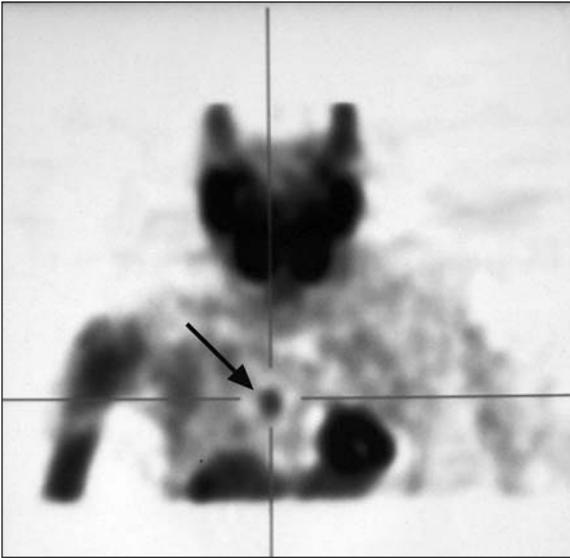


Figure 2. Technetium sestamibi scintigraphy showing a nodule (arrow) in the mediastinum with focal activity.

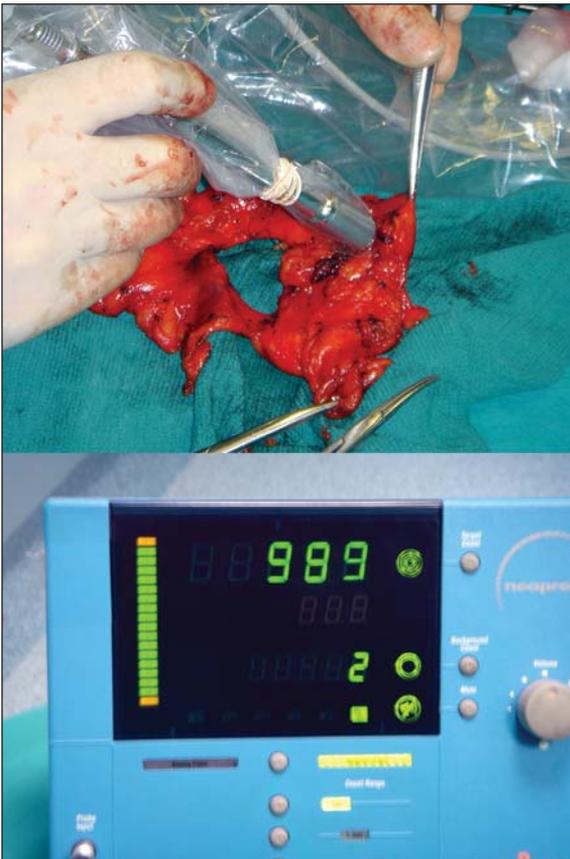


Figure 3. Ex vivo control with gamma probe by using the counter for ectopic parathyroid adenoma.

## DISCUSSION

Although bilateral neck exploration might be sufficient in 90% of cases with primary hyperparathyroidism without preoperative imaging, an ectopic mediastinal parathyroid adenoma might be responsible for surgical failure (3). Ectopic parathyroid adenomas may be localized at various sites such as nasal septum, hypopharynx, the radix of the tongue, thyroid, carotid sheath, tracheoesophageal groove, retroesophageal area, pericardium and thymus, which may require different surgical approaches including mediastinal exploration (4). Thymic location as in our case accounts for 18% of the cases, which might be attributed to the same embryologic development of both inferior parathyroids and thymus that is the third branchial pouch (4).

Preoperative localization of an ectopic mediastinal parathyroid adenoma is very crucial to obviate the surgical failure. Among the various radiologic and scintigraphic imaging methods, Tc-99m-MIBI appears as the most reliable method with its high sensitivity and diagnostic accuracy rate ranging from 90 to 100% (2,5). Tc-99m-MIBI scintigraphy has also been shown to be superior to thallium scintigraphy in the detection of a parathyroid adenoma (6). Recently, it has been shown that the use of fusion imaging of CT and single photon emission CT allowed precise anatomical localization of an ectopic parathyroid adenoma (7). Although we preoperatively obtained the images of the ectopic parathyroid adenoma located within the thymic tissue in the anterior mediastinum, we used the gamma probe as an aid to accurately diagnose the location of the tumor in the intraoperative period to distinguish the adenoma from the adjacent tissues.

Intraoperative parathyroid hormone assay has a 99% cure rate in parathyroid surgery of primary hyperparathyroidism, however the surgeon should wait for the results for an average of 15 minutes. Likewise, the results of frozen section examination are not reliable resulting from the inability to distinguish normal parathyroid tissue from parathyroid adenoma and hyperplasia.

sia. On the other hand, the use of gamma probe-guided parathyroidectomy has been recommended in parathyroid surgery to help surgeon's decision intraoperatively, and combined use of in vivo/background thyroid counts with ex vivo/background thyroid counts methods has been shown to be more accurate compared to frozen section examination (8). An ex vivo, back table gamma count of more than 20% of in vivo count might determine the parathyroid adenoma. In addition, the gamma probe-guided parathyroidectomy has also been shown to have an excellent cure rate without any need for intraoperative parathyroid hormone measurement with the use of 20% rule (9). Moreover, a recent report showed that the gamma probe was a safe and reliable device and might be used in videothoroscopic ectopic mediastinal parathyroidectomy with intraoperative parathyroid hormone level monitoring (1). Thus, the use of gamma probe has been suggested as an alternative to conventional bilateral neck exploration because it has shortened the operation time and hospital stay with an increased cost-effectiveness (10). Similarly, we found the gamma probe as an effective device for accurate detection of an ectopic parathyroid adenoma in our case.

In conclusion, an ectopic mediastinal parathyroid adenoma, which might be the cause of a surgical failure for primary hyperparathyroidism, may easily be located with the use of the gamma probe during the operation to achieve complete surgical excision.

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