

Localization and Amount of Thyroid Remnant in Totally Thyroidectomized

Total Tiroidektomi Sonrası Kalan Bakiye Tiroid Dokusunun Yeri ve Miktarı

Original Investigation
Özgün Araştırmalar

Ümit Taşkın¹, Özgür Yiğit², Sait Sağer³, Zeynep A. Çakır², Ayşe Sezim Şişman², Ela A. Sarwar², T. Fikret Cermik³

¹Clinic of Otolaryngology Head and Neck Surgery, Bağcılar Education and Research Hospital, İstanbul, Turkey

²Clinic of Otolaryngology Head and Neck Surgery, İstanbul Education and Research Hospital, İstanbul, Turkey

³Clinic of Nuclear Medicine, İstanbul Education and Research Hospital, İstanbul, Turkey

Abstract

Objective: To determine the frequency, localization and amount of thyroid remnant in extracapsular thyroidectomized patients.

Methods: We postoperatively evaluated the thyroid bed of 38 totally thyroidectomized patients using thyroid scintigraphy, a thyroid uptake study and bilateral neck ultrasonography (US) to determine the extent of residual thyroid tissues.

Results: In scintigraphic assessment, thyroid remnant was not seen in the thyroid bed in 13 cases, minimal

thyroid remnant was detected in 15 cases, and visible uptake was seen in 10 cases. Ultrasonographic findings revealed the presence of remnant in 12 cases. However, US did not detect all remnant tissues diagnosed by TS.

Conclusion: This study demonstrates that minimal thyroid remnant is left in the majority of cases, even after extracapsular total thyroidectomy, especially in the upper and middle zones.

Key Words: Thyroid remnant, thyroid scintigraphy, thyroid uptake, ultrasonography, thyroidectomy

Özet

Amaç: Ekstrakapsüler tiroidektomili hastalarda tiroid doku kalıntısının sıklığı, miktarı ve yerleşim yerini belirlemek.

Yöntemler: Total tiroidektomi yapılan 38 hastanın postoperatif dönemde tiroid yatağı ultrasonografi, tiroid sintigrafisi ve tiroid uptake alımı ölçümü ile değerlendirildi ve residüv tiroid doku varlığına baktık.

Bulgular: On üç hastada tiroid sintigrafisinde tiroid dokusu tespit edilmedi. On beş hastada minimal tiroid dokusu, 10 hastada ise görülebilir tiroid dokusu tespit

edildi. Ultrasonografik incelemede ise sadece 12 hastada tiroid dokusu görüldü. Fakat sintigrafi ile tiroid dokusu tespit edilen hastalarda ultrasonografi ile tiroid dokusu görülmedi.

Sonuç: Total tiroidektomi esnasında çoğu hastada minimal tiroid dokusu bırakılmaktadır. Fakat bunların bir kısmı ultrasonografi ile görülmemektedir.

Anahtar Kelimeler: Tiroid bakiyesi, tiroid sintigrafisi, tiroid uptake, ultrasonografi, tiroidektomi

Introduction

Surgical treatment is performed in cases of thyroid cancers and for multinodular and nodular goitres with atypical ultrasonographic or scintigraphic findings. Various surgical techniques have been described and many surgeons develop their own approaches over time. Among these, extracapsular thyroidectomy is safe and is presently the most preferred approach. However, even with this established technique, a number of complications may develop, including recurrent laryngeal nerve injury, hypothyroidism, hypoparathyroidism and recurrence of disease. Residual glandular tissue may lead to recurrence, which is especially important in thyroid cancer cases. Suitable and confident surgery is the best way to prevent recurrence, additional therapy and reoperation (1, 2). Neck ultrasonography (US), thyroid scintigraphy (TS) and measurement of serum thyroid stimulating hormone (TSH) levels are useful methods for the detection of thyroid tissue remnant.

In this study, we postoperatively evaluated the thyroid bed of 38 totally thyroidectomized patients using neck US, TS and uptake measurements. The aim was to determine the frequency, localization and amount of thyroid remnant in extracapsular thyroidectomized patients.

Methods

Thirty-eight totally thyroidectomized patients (7 male, 31 female) ranging in age from 28 to 64 years (mean age was 51±12 years) participated in this prospective study. Before surgery, fine needle aspiration biopsy



Address for Correspondence/Yazışma Adresi:
Ümit Taşkın, Clinic of Otolaryngology Head and Neck Surgery, Bağcılar Education and Research Hospital, 35200 Bağcılar, İstanbul, Turkey
Phone: +90 532 376 37 50
Fax: +90 212 530 10 33
E-mail: taskin_omit@yahoo.com
Received Date/Geliş Tarihi: 07.12.2012
Accepted Date/Kabul Tarihi: 24.12.2012
Available Online Date/Çevrimiçi Yayın Tarihi: 17.04.2013

© Copyright 2013 by Official Journal of the Turkish Society of Otorhinolaryngology and Head and Neck Surgery Available online at www.turkarchotolaryngol.net
© Telif Hakkı 2013 Türk Kulak Burun Boğaz ve Baş Boyun Cerrahisi Derneği Makale metnine www.turkarchotolaryngol.net web sayfasından ulaşılabilir.
doi:10.5152/tao.2013.10

was performed in all cases. For multinodular goitre, suspicious nodules were identified by the presence of any combination of the following: a dominant nodule (the largest or enlarging) or hypochoic nodules, poorly defined nodule borders, calcifications (microcalcification producing echogenic foci) or increased central vasculature of a nodule, a linear internal echo parallel to the surrounding tissue plane, or an echogenic focus larger than a microcalcification. The decision for total thyroidectomy was based on the presence of a family history of thyroid cancer, atypical US findings, a rapidly growing nodule or nodules, and a positive preoperative biopsy. Patients with cervical node metastasis, history of neck or thyroid surgery, or a history of head and neck irradiation were excluded from the study. All patients provided written informed consent to participate in the study. This investigation was approved by the local ethics committee. Extracapsular total thyroidectomy was performed on all cases by the same surgical team in our institution. During surgery, the bilateral recurrent laryngeal nerve (RLN) was exposed up to its point of entry through the cricothyroid membrane. Injury to the parathyroid glands was avoided. Vascular structures were ligated separately and as close as possible to the thyroid gland bilaterally in either the upper or lower zones. Postoperatively, patients were hospitalized for 48 h to follow up serum ionized calcium.

Patients did not receive L-thyroxin therapy until 4-6 weeks postoperatively. After this period, patients had a high serum TSH level. As a result, the possibility of detecting a thyroid remnant increased during this period. Thyroid scintigraphy, a thyroid uptake study and a bilateral neck US were conducted to determine the extent of residual thyroid tissues. Free thyroxin (FT4) and TSH concentrations were also measured in the hypothyroid state. For scintigraphic examination and uptake measurement, a Siemens E-CAM gamma camera with pinhole and low energy high-resolution collimators was used following

an intravenous injection of 185 MBq Tc-99m Pertechnetate. Scintigraphic images were obtained on a 128x128 matrix and at zoom 2. Images of the syringe were obtained before and after radiopharmaceutical injection for uptake calculation. The remnant uptakes and the corresponding areas were determined by quantitative evaluation of the scintigraphic remnant counts. Patients were grouped into three groups according to uptake. Group 1 consisted of patients with no uptake, Group 2 consisted of cases with uptake less than 0.1% (minimal uptake), and Group 3 consisted of cases with uptake exceeding 0.1% (visible uptake). The primary criterion for successful surgery was defined as no visible uptake or, if visible, less than 0.1% on thyroid scan performed just after surgery, within 1 month before thyroid hormone replacement. Neck US was performed using a linear multifrequency 7.5-10 MHz small parts transducer, integrated by colour Doppler examination at least 6 weeks after surgery. In the presence of any collection or significant oedema on the thyroid bed, US was performed after resolution of collection or oedema. The incidence of thyroid remnant, volume and count, location (upper, middle, lower zones), and US findings were evaluated and analysed statistically.

Statistical analysis

Results are expressed as mean±SD for laboratory data and as percentage for the groups of subjects. Student's t test was used to compare differences between measurements. A significant difference was defined as $p < 0.05$.

Results

A single nodule was present in 9 (23%) patients and multinodular goitre was present in the remaining 29 (77%) cases. While 34 (89%) of them had benign cytology, the remaining four (11%) had malignant cytology (three papillary carcinoma, one Hürthle cell carcinoma) preoperatively. However, in two benign cases

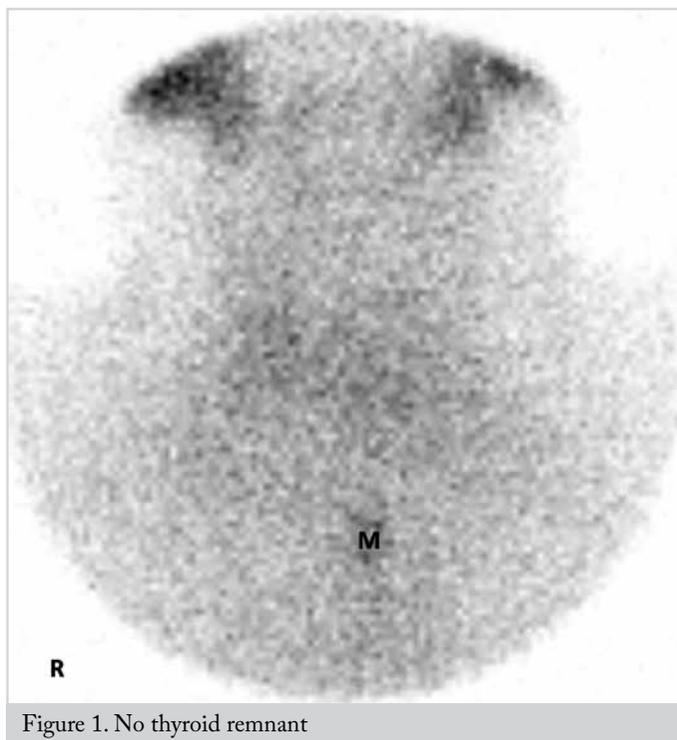


Figure 1. No thyroid remnant

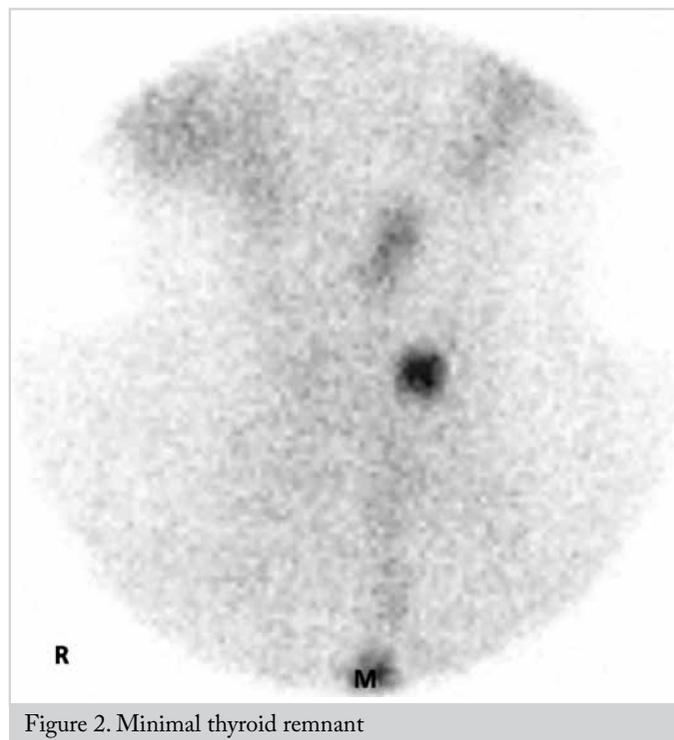


Figure 2. Minimal thyroid remnant

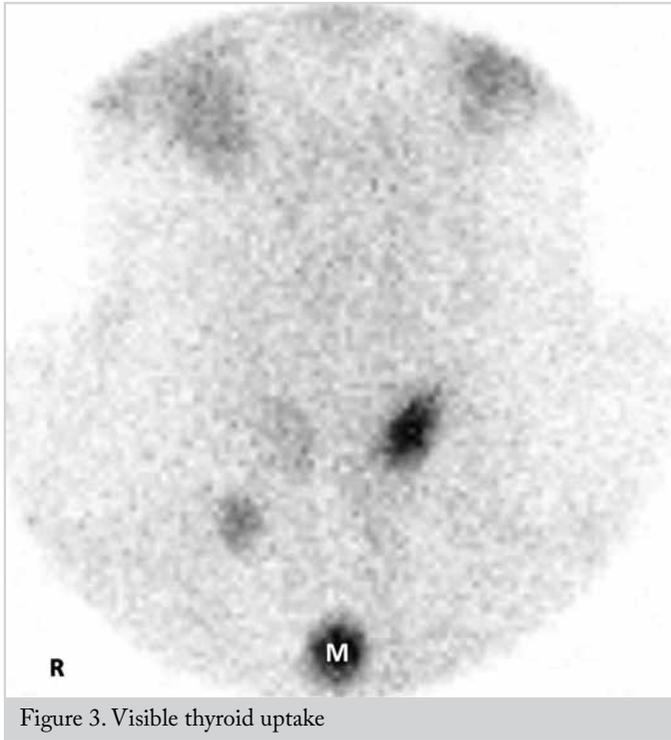


Figure 3. Visible thyroid uptake

Table 1. Localization and amount of remnant in thyroid bed.

Zones	1 cm ² (n)	2 cm ² (n)	Total (n)
Upper zones	5	7	12
Middle zones	5	8	13
Lower zones	2	2	4

with a single nodule, papillary cancer was diagnosed after post-operative histological analysis. During whole body scans, serum TSH levels were always above the normal range. The mean (\pm SD) serum TSH concentration was 62.3 ± 39.7 mIU/L. TSH levels were under 30 mIU/L, but above the normal range in seven cases with positive scintigraphy for remnant tissue. In the remaining 31 cases, serum TSH levels were above 30 mIU/L. Negative cases on ($n=13$) also had serum TSH levels above 30 mIU/L.

In scintigraphic assessment, thyroid remnant was not seen in the thyroid bed in 13 (34%) cases, minimal thyroid remnant was detected in 15 (39%) cases, and visible uptake was seen in 10 (26%) cases (Figures 1-3).

All 25 (65%) patients with minimally visible and visible uptake showed residual thyroid tissue in the thyroid bed at the post-surgical scan. In general, remnants were demonstrated in one zone, but in three cases, remnants were found in more than one zone. The localization and amount of remnant is shown in Table 1. The location of remnant in the upper and middle zones on both sides was statistically significant ($p=0.005$).

Ultrasonographical revealed the presence of remnant findings in 12 (31%) cases. In one case, remnant was detected in two different zones. However, US did not detect all remnant tissues diagnosed with TS.

Among five papillary carcinoma cases, three cases showed no residual thyroid tissue in the thyroid bed in either the US or TS examination. In one papillary cancer case, remnant was detected in the left middle zone via US (1 cm²) and TS (uptake 0.1%). In the other case, although US was negative for thyroid remnant, TS showed minimal visible uptake. In one Hurthle cell cancer case, remnant was detected in the right middle zone via US (1 cm²) and TS (uptake: 0.2%).

Discussion

This study demonstrates that minimal thyroid remnant remains in the majority of cases, even after extracapsular total thyroidectomy. Several studies have shown that minimal visible remnant in the thyroid bed has no clinical importance and does not affect the subsequent follow-up and outcome (3, 4). Salvatori et al. (5) detected residual thyroid tissue following total thyroidectomy in 670 out of 720 patients. They showed that most thyroid remnants were contralateral to the tumour site and were even observed outside the thyroid bed. In our study, the upper and middle zones were the most common sites of remnants in the thyroid bed. This might be because a very small remnant of tissue (less than a fraction of a gram) is often left in the region of the ligament of Berry in order to protect the recurrent laryngeal nerve and the blood supply to the parathyroid glands after near-total thyroidectomy. Improper and inadequate skin incision, a large thyroid gland, inadequate experimentation, lower competence of the surgeon, and inadequate assistance during surgery are other possible reasons for such remnants. Another reason might be the avoidance of injury to the vascular supply of the parathyroid glands in near-total thyroidectomy. Nodular or multinodular goitre has frequently been observed following the use of US in thyroid disease. With the development of technical US, even very small lesions less than 3 mm diameter can be identified in the thyroid bed (6). In this study, US was shown to be a sensitive method for the detection of recurrent or persistent thyroid disease in patients with total thyroidectomies and it can be used safely as an effective monitoring tool in patients with even minimal thyroid remnant. One study reported that either 2D or 3D US images are effective and sensitive methods for the evaluation of thyroid nodules (7). However, in our study, thyroid scintigraphy and uptake measurement were more sensitive diagnostic tests than US for the detection of thyroid remnant, especially for minimal thyroid remnant in the thyroid bed that is clinically negligible. This might be due to the presence of oedema or serous fluid collection in the thyroid bed, which prevents the detection of minimal thyroid tissue, despite the fact that we avoided performing US too early, or could be due to higher remnant uptake in hypothyroidism after total thyroidectomy, as described by Snyder et al. (8). There are also several pathologies including remnant thyroid tissue, benign reactive lymph nodes and postoperative changes such as suture granulomas that mimic tumour recurrence in the thyroid bed (9). Therefore, to assume a role as a monitoring tool for patients with postoperative thyroid cancer, a means of differentiating benign pathologies from tumour recurrence should first be validated. It should be borne in mind that thyroid ablation is needed in all thyroid cancer cases with the exception of microcarcinomas.

Although many controversies still surround thyroid surgery, including total thyroidectomy, the increased incidence of thyroid cancer in the normal population and its multicentric involvement, as well as the increased risk of lymph node metastasis in thyroid cancer, means that there is a general consensus about the preference for total or near-total thyroidectomy (10). Another controversy concerns the necessity of Iodine 131 ablation to ablate post-surgical remnants. Therefore, to eliminate the risk of recurrence and regional metastasis, the aim of the surgeon should be to leave no thyroid remnant after total or total thyroidectomy. It is well known that ablation is not sufficient and additional surgery may be required, especially in thyroid cancer cases. At this stage, the surgical plan and competence of the surgeon are important. Pacini et al. found that apparently successful ablation did not prevent the recurrence of tumour, in contrast to data reported in the literature (11). Therefore, leaving no thyroid remnant during surgery must be the primary aim beside protection of the recurrent laryngeal nerve and parathyroid glands during near-total thyroidectomy.

Conclusion

Extracapsular total thyroidectomy is the preferred surgical method in many thyroid diseases. The aim of surgery in total thyroidectomy should be to leave no thyroid remnant. The upper and middle zones are the most commonly involved sites for remnants due to attempts to avoid injuries to the RLN and parathyroid glands in these regions. Extra concentration is required while excising thyroid tissue from these sites. With careful surgical techniques, thyroid remnant can be avoided.

Conflict of Interest

No conflict of interest was declared by the authors.

Peer-review: Externally peer-reviewed.

Author Contributions

Concept - U.T.; Design - O.Y., U.T.; Supervision - O.Y., T.F.C.; Funding - A.S.S.; Materials - A.S.S.; Data Collection and/or Processing - A.S.S., E.A.S., Z.A.C.; Analysis and/or Interpretation - U.T., S.S.; Literature Review - A.S.S., U.T., O.Y.; Writer - U.T.; Critical Review - U.T., O.Y., T.F.C.

Çıkar Çatışması

Yazarlar herhangi bir çıkar çatışması bildirmemişlerdir.

Hakem değerlendirmesi: Dış bağımsız.

Yazar Katkıları

Fikir - U.T.; Tasarım - O.Y., U.T.; Denetleme - O.Y., T.F.C.; Kaynaklar - A.S.S.; Malzemeler - A.S.S.; Veri toplanması ve/veya

işlemesi - A.S.S., E.A.S., Z.A.C.; Analiz ve/veya yorum - U.T., S.S.; Literatür taraması - A.S.S., U.T., O.Y.; Yazı yazan - U.T.; Eleştirel İnceleme - U.T., O.Y., T.F.C.

References

1. Vorburger SA, Ubersax L, Schmid SW, Balli M, Candinas D, Seiler CA. Long-term follow-up after complete resection of well-differentiated cancer confined to the thyroid gland. *Ann Surg Oncol* 2009; 16: 2862-74. [\[CrossRef\]](#)
2. Matsuyama H, Sugitani I, Fujimoto Y, Kawabata K. Indications for thyroid cancer surgery in elderly patients. *Surg Today* 2009; 39: 652-7. [\[CrossRef\]](#)
3. Barbaro D, Boni G, Meucci G, Simi U, Lapi P, Orsini P. Radioiodine treatment with 30 mCi after recombinant human thyrotropin stimulation in thyroid cancer: effectiveness for postsurgical remnants ablation and possible role of iodine content in L-thyroxine in the outcome of ablation. *J Clin Endocrinol Metab* 2003; 88: 4110-5. [\[CrossRef\]](#)
4. Luster M, Lippi F, Jarzab B, Perros P, Lassmann M, Reiners C. rhTSH-aided radioiodine ablation and treatment of differentiated thyroid carcinoma: a comprehensive review. *Endocr Relat Cancer* 2005; 12: 49-54. [\[CrossRef\]](#)
5. Salvatori M, Raffaelli M, Castaldi P, Treglia G, Rufini V, Perotti G, et al. Evaluation of the surgical completeness after total thyroidectomy for differentiated thyroid carcinoma. *Eur J Surg Oncol* 2007; 33: 648-54. [\[CrossRef\]](#)
6. Lee JH, Lee HK, Lee DH, Choi CG, Gong G, Shong YK. Ultrasonographic findings of a newly detected nodule on the thyroid bed in postoperative patients for thyroid carcinoma: correlation with the results of ultrasonography-guided fine-needle aspiration biopsy. *Clin Imaging* 2007; 31: 109-13. [\[CrossRef\]](#)
7. Slapa RZ, Slowinska-Srzednicka J, Szopinski KT. Gray-scale three-dimensional sonography of thyroid nodules: feasibility of the method and preliminary studies. *Eur Radiol* 2006; 16: 428-36. [\[CrossRef\]](#)
8. Snyder J, Gorman C, Scanlon P. Thyroid Remnant Ablation: Questionable Pursuit of an III-Defined Goal. *Diagnostic Nuclear Medicine* 1983; 24: 659-65.
9. Hegedus L, Bonnema SJ, Bennedbak FN. Management of simple nodular goiter: current status and future perspectives. *Endocr Rev* 2003; 24: 102-12. [\[CrossRef\]](#)
10. Vaskova OM, Bogdanovska AI, Josifovska TB, Majstorov VA. Effectiveness of different doses of radioiodine in the ablation of thyroid remnant after thyroidectomy in patients with differentiated thyroid carcinoma. *World Journal of Nuclear Medicine* 2008; 7: 96-9.
11. Pacini F, Ladenson PW, Schlumberger M, Driedger A, Luster M, Kloos RT. Radioiodine ablation of thyroid remnants after preparation with recombinant human thyrotropin in differentiated thyroid carcinoma: results of an international, randomized, controlled study. *J Clin Endocrinol Metab* 2006; 91: 926-32. [\[CrossRef\]](#)