ORIGINAL ARTICLE

Morbidity Following Central Compartment Reoperation for Recurrent or Persistent Thyroid Cancer

Michael K. Kim, MD; Susan H. Mandel, MD, MPH; Zubair Baloch, MD, PhD; Virginia A. LiVolsi, MD; Jill E. Langer, MD; Liesje DiDonato, BS; Stephanie Fish, MD; Randal S. Weber, MD

Objective: To determine the incidence of recurrent laryngeal nerve injury and hypoparathyoidism, we reviewed our experience with central compartment reoperation.

Design: Patients underwent preoperative ultrasonography and magnetic resonance imaging of the neck. Ultrasound-guided fine-needle aspiration biopsy was performed and demonstrated evidence of tumor in 15 patients. At the time of surgery, hook wire electrodes were placed endoscopically into 1 or both vocal cords to monitor the integrity of the recurrent laryngeal nerve.

Patients: The study population comprised 20 patients who had undergone reoperative central compartment dissections between the years 1997 and 2001. There were 15 women and 5 men whose mean age was 49.4 years. All of the patients had prior total or subtotal thyroidectomy, and 4 patients had prior neck dissections. A primary thyroid cancer recurrence in the thyroid bed was present in 7 patients, and the remainder of the patients had cytological evidence of paratracheal or mediastinal metastases. A single patient had evidence of distant metastases involving the lung.

Main Outcome Measure: Short- and long-term postoperative morbidity.

Results: Of the 20 patients, 18 had histologic evidence of metastases to the paratracheal lymph nodes, whereas 8 patients had metastases involving the anterior mediastinal lymph nodes. The mean number of lymph nodes removed was 6.5, and the mean number of positive lymph nodes was 4.7. None of the patients with normal preoperative laryngeal function had postoperative recurrent laryngeal nerve paresis or paralysis. There were 18 patients with normal preoperative parathyroid function. Four patients developed transient postoperative hypocalcemia. All 4 patients with transient postoperative hypocalcemia are currently eucalcemic. A single patient continues to receive calcium and calcitriol supplementation 1 month following her third central compartment dissection for recurrent thyroid cancer.

Conclusions: Reoperation for recurrent or persistent thyroid cancer presents a significant challenge. However, intraoperative recurrent laryngeal nerve monitoring and preservation of the vascular pedicle of the parathyroid glands has reduced the morbidity of reoperative central compartment dissections to acceptable levels. Revision surgery in the central compartment of the neck is compatible with successful eradication of recurrent thyroid cancers and acceptable morbidity.

Arch Otolaryngol Head Neck Surg. 2004;130:1214-1216

PRIMARY THYROIDECTOMY IS associated with a low incidence of recurrent laryngeal nerve injury and permanent hypoparathyroidism when performed by an experienced surgeon.[1-3] However, in the setting of recurrent thyroid disease in the central compartment, reoperation may be associated with a higher complication rate. Indications for central compartment reoperation include primary thyroid cancer recurrence and/or metastases to the paratracheal and mediastinal lymph nodes.

Reoperative thyroid surgery is technically more demanding because of the presence of scar tissue and distorted anatomy, which may result in a greater risk of injury to the recurrent laryngeal nerve and parathyroid glands. We reviewed our experience with central compartment reoperation for recurrent thyroid cancer to determine short- and long-term postoperative morbidity.

Author affiliations are listed at the end of this article.
The authors have no relevant financial interest in this article.

METHODS

Between 1997 and 2001, 20 patients underwent central compartment reoperation for recurrent or metastatic thyroid cancer. All patients had undergone thyroid cancer surgery prior to referral. The cohort comprised 15 women and 5 men whose mean age was 49.4 years and ranged from 25 to 78 years. All patients had prior total or subtotal thyroidectomy, and 4 patients had prior neck dissections. Fifteen patients had received radioactive

iodine therapy 3 months to 18 years prior to their reoperation for recurrent thyroid cancer.

A primary recurrence in the thyroid bed was present in 7 patients, and the remainder had cytological evidence of paratracheal or mediastinal metastases. A single patient had evidence of distant metastases involving the lung. The histologic diagnosis was medullary thyroid carcinoma in 2 patients, follicular variant of papillary thyroid carcinoma in 3 patients, and papillary thyroid carcinoma in 15 patients. Of the latter, tall cell variant was found in 5 patients.

Prior to reoperation, 2 patients were receiving calcium supplementation because of hypoparathyroidism, and 6 patients had vocal cord paresis or paralysis preoperatively. Preoperatively, all patients underwent ultrasonography and contrast-enhanced magnetic resonance imaging. Ultrasound-guided fine- needle aspiration biopsy of lesions in the neck or upper mediastinum was also performed on 18 patients to provide cytologic confirmation of recurrence. At the time of surgery, recurrent laryngeal nerve monitoring was performed by placing hook wire electrodes into 1 or both vocal cords.

RESULTS

Twenty patients underwent a reoperative central compartment neck dissection, and of these, 9 also had a concomitant modified radical neck dissection. Of the 20 patients, 18 had histological evidence of metastases to the paratracheal lymph nodes, and 8 patients were also found to have metastases involving the anterior mediastinal lymph nodes.

The mean number of lymph nodes removed was 6.5, and the mean number of positive lymph nodes was 4.7 (**Table**). Four patients had soft tissue recurrence in the central compartment. Two patients required partial resection of the thyroid or cricoid cartilages, and 1 patient underwent a partial esophagectomy because of the extensive nature of the recurrent thyroid cancer.

There were no patients with normal preoperative laryngeal function who had postoperative recurrent laryngeal nerve paresis or paralysis. Among the 6 patients with preoperative vocal cord dysfunction, 3 patients were found to have encasement of the recurrent laryngeal nerve with tumor, which resulted in intraoperative resection of the nerve.

Of the 18 patients with normal preoperative parathyroid function, 4 patients developed transient postoperative hypocalcemia (serum calcium ≤8.5 mg/dL [≤2.1 mmol/L]). Among these patients with transient postoperative hypocalcemia, 3 were treated with supplemental calcium, while 1 patient also required calcitriol supplementation. Three patients with transient postoperative hypocalcemia are currently eucalcemic; however, a single patient continues to require significant supplemental calcium and vitamin D following her third central compartment dissection for recurrent thyroid cancer. Although each specimen was carefully examined for parathyroid tissue by visual inspection and frozen-section histologic analysis, no parathyroids were conclusively identified and reimplanted in this series of patients.

A total of 19 patients are currently living without histologic evidence of disease after their reoperative central compartment neck dissection. One patient is alive with evidence of disease.

Regions of the Neck Involved With Metastatic Thyroid Cancer

Cervical Level of Lymph Nodes	Patients With Positive Lymph Nodes, No.	Patients With Lymph Nodes Removed, No.
I	0	1
II	1	8
III	4	6
IV	4	7
V	1	8
Paratracheal (VI)	18	18
Mediastinal (VII)	8	8

COMMENT

Reoperative central compartment dissection is an uncommon operation with associated morbidity.[4-6] Reoperation in the central compartment for recurrent thyroid cancer presents several challenges to the surgeon. In this setting, the surgeon may encounter significant difficulty in the identification and preservation of the recurrent laryngeal nerves and parathyroid glands because of scarring and disturbance of the normal anatomic relationships. In addition, the parathyroid glands and recurrent laryngeal nerves may be encased in fibrotic tissues, making them indistinguishable from recurrent or persistent tumor.

Several series have reported an incidence of transient recurrent laryngeal nerve palsy ranging from 1% to 10% of patients undergoing primary thyroid operations.[4,7,8] Permanent vocal cord paralysis following primary surgery is uncommon and has a reported incidence between 1% and 5.6%.[6,9,10] However, the incidence of permanent recurrent laryngeal nerve paralysis for reoperative thyroid surgery is higher, ranging from 1% to 12%.[11-13] In our series, every patient with a normal preoperatively functioning larynx had normal postoperative function of their recurrent laryngeal nerves. The use of intraoperative neurological monitoring, meticulous surgical dissection, and identification of the recurrent laryngeal nerve was used for decreasing the potential for vocal cord paralysis in our patients. Additional surgical strategies used to decrease injury to the recurrent laryngeal nerve include identification of each nerve low in the tracheoesophageal groove distant from the thyroid bed and an inferior-to-superior dissection during the central compartment dissection.

Hypoparathyroidism secondary to thyroid operations may be temporary or a permanent disability. The incidence of temporary hypoparathyroidism ranges from 0.3% to 13% in several large series.[3,8,14] In the present series, 1 (6%) of 18 patients who had normal parathyroid function preoperatively has persistent hypoparathyroidism postoperatively following a third central compartment procedure.

Permanent hypoparathyroidism is a devastating and disabling complication that can occur with reoperative thyroid surgery. Revision surgery of the central compartment places the parathyroid glands at increased risk for devascularization or inadvertent removal. Although per-

manent injury to the parathyroid glands remains an uncommon event, several large series have reported an incidence of permanent hypoparathyroidism following reoperative thyroid surgery ranging from 0% to 3.5%.[4,8] The specimen should be carefully examined for parathyroid tissue. If identified, a biopsy of the gland should be performed for histologic confirmation by frozen-section histologic analysis. Reimplantation of the parathyroid glands of questionable viability into the sternocleidomastoid muscle at the time of reoperative central compartment dissection will diminish risk of long-term permanent hypoparathyroidism. In practice, however, fibrosis and multiple positive lymph nodes in the dissected specimen can make identification and confirmation of parathyroid tissue difficult. In patients with extensive extracapsular lymph node spread and multiple involved nodes, reimplantation must be performed with caution lest the surgeon inadvertently reimplant tumor along with parathyroid tissue. Furthermore, preservation of the inferior thyroid artery is recommended whenever possible to prevent devascularization of the parathyroid glands.

Diminishing the need for reoperation is important. As with any cancer operation, the surgeon at the initial surgical procedure should attempt to remove all gross disease in the thyroid bed. The surgeon should carefully inspect and palpate the paratracheal and superior mediastinal nodal regions for metastasis. If nodal disease is present, a regional therapeutic dissection should be carried out. Complete removal of the primary thyroid cancer and involved regional lymph nodes will likely lessen the need for reoperation.

CONCLUSIONS

Reoperation for recurrent or persistent thyroid cancer presents a special challenge even to the most accomplished surgeon. Intraoperative recurrent laryngeal nerve monitoring may reduce the morbidity of reoperative central compartment neck dissections to acceptable levels. Preservation of the inferior thyroid artery is associated with postoperative parathyroid function.

Meticulous surgical dissection with identification of the recurrent laryngeal nerve and preservation of the vascular pedicle of the parathyroid glands safeguards against injury to these structures. Reoperative surgery in the central compartment of the neck is compatible with removal of demonstrable disease and acceptable morbidity and removal of recurrent or persistent disease.

Submitted for publication September 18, 2003; final revision received April 26, 2004; accepted May 14, 2004.

From the Fair Grounds Medical Center, Allentown, Pa (Dr Kim); and the Division of Endocrinology, Diabetes, and Metabolism, Department of Medicine (Dr Mandel), Department of Pathology and Laboratory Medicine (Drs Baloch and LiVolsi), Ultrasound Division, Department of Radiology (Dr Langer), Department of Otorhinolaryngology: Head and Neck Surgery (Ms DiDonato and Dr Weber), and Department of Endocrinology (Dr Fish), The University of Pennsylvania Health System, Philadelphia.

Correspondence: Randal S. Weber, MD, Department of Head and Neck Surgery, The University of Texas M. D. Anderson Cancer Center, 1515 Holcombe Blvd, Unit 441, Houston, TX 77030 (rsweber@mdanderson.org).

REFERENCES

1. Becker WF. Pioneers in thyroid surgery. *Ann Surg*. 1977;185:493-504.
2. Lore JM. Practical anatomical considerations in thyroid tumor surgery. *Arch Otolaryngol*. 1983;109:568-574.
3. Shaha AR, Jaffe BM. Parathyroid preservation during thyroid surgery. *Am J Otolaryngol*. 1998;19:113-117.
4. Chao TC, Jeng LB, Lin JD, et al. Reoperative thyroid surgery. *World J Surg*. 1997; 21:644-647.
5. Sasson AR, Pingpank JF, Wetherington W, et al. Incidental parathyroidectomy during thyroid surgery does not cause transient symptomatic hypocalcemia. *Arch Otolaryngol Head Neck Surg*. 2001;127:304-308.
6. Moley JF, Lairmore TC, Doherty GM, et al. Preservation of the recurrent laryngeal nerves in thyroid and parathyroid reoperations. *Surgery*. 1999;126:673-677.
7. Shemen LJ, Strong EW. Complications after total thyroidectomy. *Otolaryngol Head Neck Surg*. 1989;101:472-475.
8. Wingert DJ, Friesen SR, Illiopoulos JI, et al. Post-thyroidectomy hypocalcemia: incidence and risk factors. *Am J Surg*. 1986;152:606-610.
9. Kasemsuwan L, Nubthuenetr S. Recurrent laryngeal nerve paralysis: a complication of thyroidectomy. *J Otolaryngol*. 1997;26:365-367.
10. Wagner HE, Seiler C. Recurrent laryngeal nerve palsy after thyroid gland surgery. *Br J Surg*. 1994;81:226-228.
11. Tissel L, Hansson G, Jansson S, et al. Reoperation in the treatment of asymptomatic metastasizing medullary thyroid carcinoma. *Surgery*. 1986;99:60-66.
12. Goretzki P, Simon D, Frilling A, et al. Surgical reintervention for differentiated thyroid cancer. *Br J Surg*. 1993;80:1009-1012.
13. Patou CA, Norton JA, Brennan, MF. Hypocalcemia following thyroid surgery: incidence and prediction of outcome. *World J Surg*. 1998;22:718-724.
14. Levin KE, Clark AH, Duh QY, et al. Reoperative thyroid surgery. *Surgery*. 1992; 111:604-607.